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Information technology –
8-bit backplane interface: STEbus and mechanical core specifications for microcomputers

Technologies de l'information –
Interface de fond de panier 8 bits – Bus STE

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FOREWORD

ISO (the International Organization for Standardization) and IEC (the International Electrotechnical Commission) form the specialized system for worldwide standardization. National bodies that are members of ISO or IEC participate in the development of International Standards through technical committee established by the respective organization to deal with particular fields of technical activity. ISO and IEC technical committees collaborate in fields of mutual interest. Other international organizations, governmental and non-governmental, in liaison with ISO and IEC, also take part in the work.

In the field of information technology, ISO and IEC have established a joint technical committee, ISO/IEC JTC1. Draft International Standards adopted by the joint technical committee are circulated to national bodies for voting. Publication as an International Standard requires approval by at least 75 % of the national bodies casting a vote.

International Standard ISO/IEC 10859 was prepared by joint technical committee ISO/IEC JTC1, Information technology, SC 26: Microprocessor system.

This standard is a merging of IEEE Std 1000-1987 and IEEE 1101-1987. It has been submitted to the National Committees for vote under the Fast Track Procedure.

The numbering of the original clauses remains unchanged.

INTRODUCTION TO IEEE STANDARD FOR AN 8-BIT BACKPLANE INTERFACE: STEBUS

The initial concept for STEbus was to produce a European version of the STDBus using the Eurocard form factor with the DIN41612 connector. From that concept STE became known as STD-European.

When IEEE formed Working Group P1000 the brief specified a Standard 8-Bit Backplane Interface. At the inaugural meeting of Working Group P1000 it quickly became apparent that the opportunity was there to create a completely new, modern, high-performance 8-Bit bus, and all ideas of merely repinning the old STDbus were rapidly forgotten.

At the initial meeting of P1000 it was decided that the bus should be a part of the same family as VMEbus and Futurebus and as such should be an asynchronous bus with multimaster capability. Today it is often referred to as the baby brother of VMEbus. Unlike VMEbus though it was to be processor and manufacturer independent. This has proven to be an excellent decision as today there are many varied types of processor available on STEbus, from microcontrollers such as 8031, through Intel's 8085, 8088, and 80188; National Semiconductor's 32008 and 32016; Motorola's 6809, 68000, and 68008; Zilog's Z80 and Z280; Hitachi's 64180, and the Inmos Transputer with the promise of more to come.

A presentation was made to a packed audience at the IEE in London, England in early 1983. It met with critical acclaim. The first article about STEbus was also published about this time in an international magazine (EDN May 26, 1983).

Work continued internationally and in late 1984 Draft D3.1 was produced. This draft eradicated the daisy-chain bus request mechanism of D2.0 in favour of a simple solution that allowed position independence of cards in the rack.

This was the first firm specification and encouraged more manufacturers to look at the bus seriously. Among them were BICC-Vero, a major manufacturer of Eurocard enclosures and backplanes, and British Telecom, the UK's Telephone Utility. Market ground zero was early 1985 and since this time the number of manufacturers has continued to grow from 18 companies in Spring 1986 to more than 30 in mid-1987, with over 700 products available.

Much credit and praise is due Tim Elsmore who first conceived the idea for STEbus during his employment with GMT Electronic Systems Ltd. Paul Borrill was instrumental in negotiating with IEEE the formation of Working Group P1000 and Bill Shields was appointed Chairman.

This standard was prepared by Working Group P1000 of the Microprocessor Standards Committee.

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1 General

1.1 *Scope*

The overall level of performance that may be achieved by any computer system is determined, in large part, by the system bus that is used to effect communication between the various system elements. System performance characteristics, measured in terms of speed, reliability, suitability to a variety of purposes, and adaptability to changing technology are ultimately dependent on the particular bus structure that is used and its associated protocols.

This standard defines the IEEE Std 1000 Bus, which may be used to implement general purpose, high-performance 8-bit microcomputer systems. Such a system may be used in a stand-alone configuration, or in larger multiple-bus architectures, as a private (or secondary) bus or a high-speed I/O channel. This standard is applicable to those systems and system elements with the common commercial designation STEbus. It is intended for those users who plan to evaluate, implement, or design various system elements that are compatible with the IEEE 1000 Std Bus system structure.

The physical attributes and method of interconnect utilized by boards and modules conforming to this standard are derived from several International Electrotechnical Commission (IEC) standards. These standards, when implemented jointly in a systems environment, result in a mechanical configuration commonly referred to as *Eurocard.* Appendix B lists such applicable standards which, where referenced, are considered as if incorporated with this standard. In particular, the connector used by IEEE Std 1000 Bus boards is a 64-pin male connector utilizing the outside two rows (designated *a* and c rows), specified in IEC 60603-2, and the mating female connector is used on IEEE Std 1000 Bus backplanes. The recommended size for IEEE Std 1000 Bus boards is 100 mm × 160 mm (3,937 in × 6,299 in), commonly referred to as a *single height standard depth* Eurocard.

The IEEE Std 1000 Bus structure is based on the master-slave concept in which a master, having gained control of the bus, may address and command slaves. Masters and slaves communicate with each other by use of an asynchronous interlocked handshake protocol. This technique allows for the construction of computer systems that incorporate devices of widely varying speeds. Multiple masters may be implemented within a single system.

Two independent address spaces are supported: memory and I/O. Memory transactions reference a 1 megabyte physical address space, while I/O transactions reference a 4 kilobyte physical address space. System integrity during all such transactions is enhanced by provision of a transfer error signal.

Provision is made for interboard condition alerts such as interrupt requests, DMA requests, system-specific error conditions, or other specialized status conditions. Within this scheme eight prioritized attention request levels, each with vectored response capability, are available for user assignation.

This standard deals only with those characteristics that must be specified so as to ensure the successful design and implementation of compatible boards and systems. Issues relating to individual design specifications, and performance or safety requirements are not addressed.

1.2 *Features*

The fundamental features offered by IEEE Std 1000 Bus are as follows:

8-bit Data Field Width

1 Megabyte Memory Address Range

4 Kilobyte I/O Address Range

Asynchronous Data Transfer

Transfer Error Signal

Multiple Masters

Eight Attention Request Lines

IEC 603-2 Connector

Single or Double Eurocard Boards and Modules

5 V, ±12 V and Standby Power Supply Distribution

Total Position Independence of Boards and Modules in Backplane

Total Inter-Board Compatibility

Total Central Processing Unit (CPU) Generic Device Family Independence

Potential 5 Megabyte per Second Data Transfers

1.3 *Objects*

This standard is intended to

1) define a general purpose microcomputer board interface;

2) specify those device-independent electrical, mechanical, and functional interface parameters that must be met so as to effect unambiguous communication between system elements and to effect physical compatibility;

3) specify the terminology and definitions related to the specification;

4) enable the interconnection of a wide variety of independently manufactured boards within a single functional system;

5) define a standard that places the minimum number of restrictions on the performance characteristics of boards within a conforming system;

6) allow microcomputer system users of relatively modest experience to assemble modularly expandable computer systems with a high probability of success.

INTRODUCTION TO MECHANICAL CORE SPECIFICATIONS FOR MICROCOMPUTERS

With the introduction of international (IEC) microcomputer architectures based on the "Euroboard form factor," the IEEE Computer Society Technical Committee On Microprocessors and Microcomputers found it appropriate to form a separate IEEE Standard to expand upon the IEC 60297 series of standards, Dimensions of mechanical structures of the 482,6 mm Series (see [9] and [10] in Section 3 of this document).[1)]

This standard provides design engineers with the dimensions and tolerances necessary to ensure mechanical function compatibility. This standard provides environmental specifications as an addendum to IEC 60297-3: 1984, *Dimensions of mechanical structures of the 482,6 mm Series. Part 3: Subracks and associated plug-in units* [10].

This mechanical standard offers total system integration guidelines. It offers advantages such as reduction in design and development time, manufacturing cost savings, and distinct marketing advantages.

This document covers standardized dimensions of a range of modular subracks, and a compatible range of plug-in units, printed boards, backplanes, and connectors.

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1) The numbers in brackets correspond to those of the references listed in section 3.

1 Scope

1.1 *Basic dimensions of subracks*

This standard covers the basic dimensions of a range of modular subracks conforming to IEC 60297-3-1984 [10], for mounting in equipment according to IEC 60297-1-1986 [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 60603-2-1980 [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)]

[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 60050, *International Electrotechnical Vocabulary.*

[4] IEC 60068-2-1: 1974, *Environmental testing – Part 2: Tests A: Cold*.

[5] IEC 60068-2-2: 1974, *Environmental testing – Part 2: Tests B: Dry heat*.

[6] IEC 60068-2-6: 1982, *Environmental testing – Part 2: Test Fc and Guidance: Vibration (sinusoidal).*

[7] IEC 60068-2-11: 1981, *Environmental testing – Part 2: Test Ka: Salt mist.*

[8] IEC 60068-2-27: 1972, *Environmental testing – Part 2: Test Ea: Shock.*

[9] IEC 60297-1: 1986, *Dimensions of mechanical structures of the 482,6 mm (19 in) Series – Part 1: Panels and racks.*

[10] IEC 60297-3: 1984, *Dimensions of mechanical structures of the 482,6 mm (19 in) Series – Part 3: Subracks and associated plug-in units.*

[11] IEC 60348: 1978, *Safety requirements for electronic measuring apparatus.*

[12] IEC 60603-2: 1980, *Connectors for frequencies below 3 MHz for use with printed boards – Part 2: Two-part connectors for printed boards, for basic grid of 2,54 mm (0,1 in), with common mounting features.*

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2) ANSI/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 Street, NW, Washington, DC 20006.

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

[13] IEC 60651: 1979, *Sound level meters.*

[14] IEC 60707: 1981, *Methods of test for the determination of the flammability of solid electrical insulating materials when exposed to an igniting source.*

[15] IEC 60916: 1988, *Mechanical structures for electronic equipment – Terminology*

[16] ISO TC-10 series on *Technical drawings, dimensioning, and tolerancing*.