



Standard Guide for Hardware Implementation for Computerized Systems¹

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1. Scope

1.1 This guide provides assistance in the choice of computing hardware resources for ship and marine environments and describes:

1.1.1 The core characteristics of interoperable systems that can be incorporated into accepted concepts such as the Open System Interconnection (OSI) model;

1.1.2 Process-based models, such as the Technical Reference Model (TRM), that rely on interoperable computing hardware resources to provide the connection between the operator, network, application, and information; and,

1.1.3 The integrated architecture that can be used to meet minimum information processing requirements for ship and marine environments.

1.2 The use of models such as OSI and TRM provide a structured method for design and implementation of practical shipboard information processing systems and provides planners and architects with a roadmap that can be easily understood and conveyed to implementers. The use of such models permit functional capabilities to be embodied within concrete systems and equipment.

1.3 The information provided in this guide is understood to represent a set of concepts and technologies that have, over time, evolved into accepted standards that are proven in various functional applications. However, the one universal notion that still remains from the earliest days of information processing is that technological change is inevitable. Accordingly, the user of this guide must understand that such progress may rapidly invalidate or supersede the information contained herein. Nonetheless, the concept of implementing ship and marine computing systems based on these functional principles allows for logical and rational development and provides a sound process for eventual upgrade and improvement.

1.4 *This international standard was developed in accordance with internationally recognized principles on standard-*

ization established in the Decision on Principles for the Development of International Standards, Guides and Recommendations issued by the World Trade Organization Technical Barriers to Trade (TBT) Committee.

2. Referenced Documents

2.1 ASTM Standards:²

E1013 [Terminology Relating to Computerized Systems](#) (Withdrawn 2000)³

F1757 [Guide for Digital Communication Protocols for Computerized Systems](#)

2.2 ANSI Standards:⁴

X3.131 [Information Systems—Small Computer Systems Interface-2 \(SCSI-2\)](#)

X3.172 [American National Standard Dictionary for Information Systems](#)

X3.230 [Information Systems—Fibre Channel—Physical and Signaling Interface \(FC-PH\)](#)

X3.232 [Information Technology—SCSI-2 Common Access Method Transport and SCSI Interface Module](#)

X3.253 [Information Systems—SCSI-3 Parallel Interface \(SPI\)](#)

X3.269 [Information Technology—Fibre Channel Protocol for SCSI](#)

X3.270 [Information Technology—SCSI-3 Architecture Model \(SAM\)](#)

X3.276 [Information Technology—SCSI-3 Controller Commands \(SCC\)](#)

X3.277 [Information Technology—SCSI-3 Fast-20](#)

X3.292 [Information Technology—SCSI-3 Interlocked Protocol \(SIP\)](#)

X3.294 [Information Technology—Serial Storage Architecture—SCSI-2 Protocol \(SSA-S2P\)](#)

X3.297 [Information Systems—Fibre Channel—Physical and Signaling Interface-2 \(FC-PH2\)](#)

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² For referenced ASTM standards, visit the ASTM website, www.astm.org, or contact ASTM Customer Service at service@astm.org. For *Annual Book of ASTM Standards* volume information, refer to the standard's Document Summary page on the ASTM website.

³ The last approved version of this historical standard is referenced on www.astm.org.

⁴ Available from American National Standards Institute (ANSI), 25 W. 43rd St., 4th Floor, New York, NY 10036, <http://www.ansi.org>.

- X3.301 Information Technology—SCSI-3 Primary Commands (SPC)
- X3.304 Information Technology—SCSI-3 Multimedia Commands (MMC)
- MS58 Information Technology—Standard Recommended Practice for Implementation of Small Computer Systems Interface (SCSI-2), (X3.131.1994) for Scanners
- NCITS 306 Information Technology—Serial Storage Architecture—SCSI-3 Protocol (SSA-S3P)
- NCITS 309 Information Technology—SCSI-3 Block Commands (SBC)
- 2.3 *IEEE Standards*:⁵
 - 100 Standard Dictionary for Electrical and Electronic Terms
 - 488 Digital Interface for Programmable Instrumentation
 - 610.7 Standard Glossary for Computer Networking Terminology
 - 796 Microcomputer System Bus
 - 802.11 Wireless LAN Medium Access Control and Physical Layer Specifications
 - 1003.2d POSIX—Part 2 Shell and Utilities—Amendment: Batch Environment
 - 1003.5 Binding for System Application Program Interface (API)
 - 1003.b Binding for System Application Programming Interface (API)—Amendment 1: Real-time Extensions
 - 1014 Versatile Backplane Bus: VMEbus
 - 1101.10 Additional Mechanical Specifications for Microcomputers using the IEEE Std 1101.1 Equipment Practice
 - 1155 VMEbus Extensions for Instrumentation: VXibus
 - 1212.1 Communicating Among Processors and Peripherals Using Shared Memory (Direct Memory Access DMA)
 - 1394 High Performance Serial Bus
 - 1496 Chip and Module Interconnect Bus: Sbus
 - 1394 32-bit Microprocessor Architecture
- 2.4 *ISO Standards*:⁴
 - 1155 Portable Operating System Interface for Computer Environments (POSIX)
 - 9945-1 System Application Program Interface (API) [C language]
 - 9945-2 Shell and Utilities
- 2.5 *TIA/EIA Standard*:⁶
 - 568-A Commercial Building Telecommunications Cabling Standard

3. Significance and Use

3.1 This guide is aimed at providing a general understanding of the various types of hardware devices that form the core of information processing systems for ship and marine use. Ship and marine information processing systems require specific devices in order to perform automated tasks in a specialized environment. In addition to providing information services for each individual installation, these devices are often networked and are capable of supplementary functions that benefits ship and marine operations.

3.2 A variety of choices exists for deployment of information processing devices and greatly increases the complexity of the selection task for ship and marine systems. The choice of a particular device or system cannot be made solely on the singular requirements of one application or function. Modern information processing systems are usually installed in a complex environment where systems must be made to interact with each other. Ship and marine installations add an even further layer of complexity to the process of choosing adequate computerized systems. This guide aims to alleviate this task by giving users specific choices that are proven technologies that perform in a complex environment.

3.3 Hardware resources used in ship and marine installations are a result of careful consideration of utility and function. These resources may require some physical specialization in order to inhabit a particular environment, but they are in no way different from equipment used in shore-based situations. Ship and marine computer system configurations, interconnections, and support services are essentially the same as those found in a land-based network environment and as a result, the skill sets of ship and marine information processing system users, administrators, and support personnel are interchangeable with those of shore-based activities.

4. Standards Profiles

4.1 Standards profiles are sets of specifications bundled together to describe the technical standard for a function or a service (such as operating systems, network, and data interchange services), and will include minimum criteria for the information and technology that support specific functional requirements. Profiles equate to the lowest level process, and document agreed-to implementation requirements used in building and operating systems. Systems using the same standards, but different options, will probably not interface correctly. The Technical Reference Model (TRM) is useful for assembling standards profiles across technology categories of Computing Resources, Information Management, and Applications.

4.1.1 The TRM identifies and specifies the support services (multimedia, communications, and so forth) and interfaces that provide a common operating environment and support the flow of information among enterprise and common support applications. This model represents the computer resources, information management, and applications categories and interfaces with the communication and networking technology categories that are appropriately represented by the ISO Open System Interconnect model. The TRM addresses standard profiles that provide seamless application support over widely distributed computing resources and attendant interfaces between the computing resources and other technologies.

4.2 Computing hardware resources represent generally consists of Central Processing Unit(s) (CPU), Input and Output (I/O) interfaces, main memory, buses, and peripherals. The external environment considerations that affect computing hardware resource selection are security, communications, real-time, and high availability. The computing hardware resource provides the environment necessary to support application software. From the perspective of the application

⁵ Available from Institute of Electrical and Electronics Engineers, Inc. (IEEE), 445 Hoes Ln., P.O. Box 1331, Piscataway, NJ 08854-1331, <http://www.ieee.org>.

⁶ Available from Telecommunications Industry Association (TIA), 1320 North Courthouse Road, Suite 200, Arlington, VA 22201, <http://www.tiaonline.org>.