

**Proposed  
Draft**

**Serial ATA  
International Organization**

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**Serial ATA Design Guide #004  
Title : SATA-IO Style Guide**

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The Serial ATA International Organization, Serial ATA Design Guide (“Final Specification”) is available for download at <http://www.sata-io.org>.

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Serial ATA International Organization contact information:

SATA-IO  
3855 SW 153<sup>rd</sup> Drive  
Beaverton, Oregon 97003 USA  
Tel: +1 503-619-0572  
Fax: +1 503-644-6708  
E-mail: [admin@sata-io.org](mailto:admin@sata-io.org)

## Author Information

Author Name	Company	Email address
Harvey Newman	Avago Technologies	Harvey.Newman@avagotech.com

## Workgroup Chair Information

Workgroup (Phy, Digital, etc...)	Chairperson Name	Email address
Technical Integration	Harvey Newman	Harvey.Newman@avagotech.com

## Document History

Version	Date	Comments
0	October 5, 2011	Initial release.
1	October 7, 2011	Technical Integration meeting kick-off.
2	October 14, 2011	Second Technical Integration meeting
3	October 28, 2011	Third Technical Integration meeting
4	November 4, 2011	Fourth Technical Integration meeting
5	November 11, 2011	Fifth Technical Integration meeting
6	December 2, 2011	Sixth Technical Integration meeting
7	December 9, 2011	Seventh Technical Integration meeting
8	December 16, 2011	Eighth Technical Integration meeting
9	January 13, 2012	Ninth Technical Integration meeting
10	January 20, 2012	Tenth Technical Integration meeting
11	January 27, 2012	Eleventh Technical Integration meeting
12	February 3, 2012	Twelfth Technical Integration meeting
13	February 10, 2012	Thirteenth Technical Integration meeting
14	February 17, 2012	Fourteenth Technical Integration meeting
15	February 24, 2012	Fifteenth Technical Integration meeting
16	May 18, 2012	Clean up after design guide incorporated
17	July 27, 2012	Ratified
18	May 27, 2015	Begin SATA Revision 3.3 review
19	July 28, 2015	Technical Integration clean up
20	September 2, 2015	Technical Integration check print
21	September 11, 2015	Technical Integration check print
22	November 25, 2015	Ratified

## Introduction

SATA was initially developed without an overall style guide. It has been the responsibility of the editor and the Technical Integration committee to combine input in the form of ECNs and TPRs from all the working groups. This has led to inconsistent formatting of the document across the different sections. This style guide is an attempt to leverage off the T10 style guide and provide more consistent overall appearance and readability.

Other organizations such as T10 have developed and published style guides to aid in specification development. The third edition of the T10 style guide was initially used as a reference for development of this style guide. See <http://www.t10.org/cgi-bin/ac.pl?t=d&f=12-269r0.pdf> for the version used to develop version 17 of this design guide. Since that time a new revision (see 14-006r7) has been published and reviewed for updating this design guide.

Following is a style guide to be used to provide consistent appearance within the specification and from one revision to another.

## 1 Revision history

### 1.1 Revision x.x (Ratification Date : Month DD, YYYY)

Release that integrates and consolidates the following previously published specifications including all erratum against those specifications:

- a) Serial ATA revision x; and
- b) Name of erratum.

### 1.2 Revision x.x (Ratification Date : Month DD, YYYY)

Release that incorporates errata against Revision x.x:

- a) ECNxxx - Name of ECN,
- and the following new features and enhancements:
- c) TPRxxx - Name of TPR.

## 2 Scope

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[Editor's Note 1: This clause contains a brief description of what this draft specification covers and how it relates to other specifications within the scope of this draft specification. The example below is intended to show the type of information you might want in your draft specification and may be edited or replaced.](#)

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This specification defines a high-speed serialized ATA data link interface (specifying Phy, Link, Transport, and Application layers). The serialized interface uses the command set from the ACS-3 standard, augmented with Native Command Queuing commands optimized for the serialized interface. The serialized ATA interface is defined in a register-compatible manner with parallel ATA to enable backward compatibility with parallel ATA drivers. The physical interface is defined to ease integration (low pin count, low voltages) and enable scalable performance (with currently defined data rates of 1.5 Gbit/s, 3.0 Gbit/s, and 6.0 Gbit/s).

Complementary components are also specified including interconnect solutions for various applications, port expansion devices, and failover devices.

Normative information is provided to allow interoperability of components designed to this specification. Informative information, when provided, may illustrate possible design implementation.

## 3 References

### 3.1 Normative references

The following standards contain provisions that, by reference in the text, constitute provisions of this specification. At the time of publication, the editions indicated were valid. All standards and specifications are subject to revision, and parties to agreements based on this specification are encouraged to investigate the possibility of applying the most recent editions of the standards listed below.

Copies of the following documents may be obtained from ANSI, approved ANSI standards, approved and draft international and regional standards (ISO, IEC, CEN/CENELEC, ITUT), and approved and draft foreign standards (including BSI, JIS, and DIN). For further information, contact ANSI Customer Service Department at 212-642-4900 (phone), 212-302-1286 (fax), or via the World Wide Web at <http://www.ansi.org>.

Additional availability contact information is provided below as needed.

## 3.2 Approved references

The following approved ANSI standards, approved international and regional standards (ISO, IEC, CEN/CENELEC, ITUT), may be obtained from the international and regional organizations who control them.

Serial Attached SCSI – 3 (SAS-3) [T10/BSR INCITS 519]

ASME Y14.5M Dimensioning and Tolerancing

## 3.3 References under development

The following ANSI standards under development are referenced. Draft versions of these standards are available from <http://www.T10.org> or <http://www.T13.org>.

ATA/ATAPI Command Set - 3 (ACS-3) [INCITS 2161-D]

ATA/ATAPI-8 Serial Transport (ATA8-AST) [ANSI INCITS T13/1697-D]

ATA/ATAPI-8 Parallel Transport (ATA8-APT) [ANSI INCITS T13/1698-D]

## 3.4 Other references

For information on the current status of the listed document(s), or regarding availability, contact the indicated organization.

The 8b/10b code used in Serial ATA is based on the following published references:

- a) A.X. Widmer and P.A. Franaszek, "A DC-Balanced, Partitioned-Block, 8B/10B Transmission Code." IBM Journal of Research and Development, 27, no. 5: 440-451 (September, 1983); and
- b) U.S. Patent 4,486,739. Peter A. Franaszek and Albert X. Widmer. Byte Oriented DC Balanced (0,4) 8B/10B Partitioned Block Transmission Code. (Dec. 4, 1984).

# 4 Definitions, symbols, abbreviations, and conventions

## 4.1 Terminology

### 4.1.1 Definitions

[Editor's Note 2: Clause 4.1.1 is an example of what you may want in your definitions list. Edit as appropriate.](#)

#### 4.1.1.1 active port

The active port is the currently selected host port on a Port Selector.

#### 4.1.1.2 ATA (AT Attachment)

ATA defines the physical, electrical, transport, and command protocols for the attachment of storage devices.

#### 4.1.2 Abbreviations

Abbreviations used in this standard:

<b>Abbreviation</b>	<b>Meaning</b>
b	Binary (see 4.2.4)
CRC	Cyclic Redundancy Check (see 4.1.1.25)
DUT	Device Under Test
EMI	ElectroMagnetic Interference
EMC	ElectroMagnetic Compatibility
ESD	ElectroStatic Discharge
h	Hexidecimal (see 4.2.4)
LSB	Least Significant Bit
MSB	Most Significant Bit
OOB	Out-Of-Band
ATA8-AST	ATA/ATAPI-8 Serial Transport (see 3.3)
ATA8-APT	ATA/ATAPI-8 Parallel Transport (see 3.3)

#### 4.1.3 Units

Units used in this standard:

<b>Abbreviation</b>	<b>Meaning</b>
%	Percent (i.e., $10^{-2}$ )
A	Ampere (unit of electrical current)
AWG	American wire gauge
B	Byte
bit	Bit
dB	Decibel
Gbit/s	Gigabit per second (i.e., $10^9$ bits per second)
GHz	Gigahertz (i.e., $10^9$ cycles per second)
m	Meter (unit of distance)
us	Microsecond (i.e., $10^{-6}$ seconds)

#### 4.1.4 Mathematical operators

Mathematical operators used in this standard:

<b>Abbreviation</b>	<b>Meaning</b>
+	add
/	division
=	equal
^	exclusive logical OR
>	greater than
≥	greater than or equal to
<	less than
≤	less than or equal to
x	multiplication
±	plus or minus
-	subtract

## 4.2 Conventions

### 4.2.1 Conventions overview

Lowercase is used for words having the normal English meaning. Certain words and terms used in this document have a specific meaning beyond the normal English meaning. These words and terms are defined either in 4.1 or in the text where they first appear.

The names of abbreviations, commands, and acronyms used as signal names are in all uppercase (e.g., IDENTIFY DEVICE). Field and bit names are identified using SMALL CAPS followed by either field or bit (e.g., NCQ FEATURE SET SUPPORTED bit). Fields containing only one bit are usually referred to as the NAME bit instead of the NAME field.

Names of device registers and logs begin with a capital letter (e.g., Command).

Primitive names are followed by a “P” subscript (e.g., R\_OK<sub>P</sub>).

### 4.2.2 Precedence

If there is a conflict between text, figures, and tables, the precedence shall be tables, figures, and then text.

### 4.2.3 Keywords

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[Editor's Note 3: Changes in the keyword definitions or the addition of keywords requires a specific Technical Proposal](#)

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#### 4.2.3.1 expected

A keyword used to describe the behavior of the hardware or software in the design models assumed by this specification. Other hardware and software design models may also be implemented.

#### 4.2.3.2 mandatory

A keyword indicating items to be implemented as defined by this specification.

#### 4.2.3.3 may

A keyword that indicates flexibility of choice with no implied preference.

#### 4.2.3.4 may not

A keyword that indicates flexibility of choice with no implied preference.

#### 4.2.3.5 na

A keyword that indicates that a field or value is not applicable and has no defined value and should not be checked by the recipient.

#### 4.2.3.6 obsolete

A keyword used to describe bits, bytes, fields, and code values that no longer have consistent meaning or functionality from one implementation to another. However, some degree of functionality may be required for items designated as “obsolete” to provide for backward compatibility. An obsolete bit, byte, field, or command shall never be reclaimed for any other use in any future specification. Bits, bytes, fields, and code values that had been designated as

“obsolete” in previous specifications may have been reclassified as “retired” in this specification based on the definitions herein for “obsolete” and “retired”.

#### **4.2.3.7 option, optional**

Keywords that describe features that are not required to be implemented by this specification; however, if any optional feature defined by this specification is implemented, then it shall be implemented as defined in this specification.

#### **4.2.3.8 reserved**

A keyword indicating reserved bits, bytes, words, fields, code values, or physical resources (e.g., pins on a connector) that are set-aside for future standardization. Their use and interpretation may be specified by future extensions to this or other specifications. A reserved bit, byte, word, or field shall be cleared to zero, or in accordance with a future extension to this specification. The recipient shall not check reserved bits, bytes, words, or fields. Receipt of reserved code values in defined fields shall be treated as a command parameter error and reported by returning command aborted. Reserved pins on a connector shall be left not connected.

#### **4.2.3.9 retired**

A keyword indicating that the designated bits, bytes, fields, code values, or physical resources (e.g., such as pins on a connector) that had been defined in previous standards are not defined in this specification and may be reclaimed for other uses in future standards. Retired pins on a connector should be left not connected. If retired bits, bytes, fields, code values, or physical resources (e.g., such as pins on a connector) are utilized before they are reclaimed, they shall have the meaning or functionality as described in previous standards.

#### **4.2.3.10 shall**

A keyword indicating a mandatory requirement; designers are required to implement all such mandatory requirements to ensure interoperability with other products that conform to this specification.

#### **4.2.3.11 should**

A keyword indicating flexibility of choice with a strongly preferred alternative. Equivalent to the phrase “it is recommended”.

### **4.2.4 Numbering**

A binary number is represented in this specification by any sequence of digits comprised of only the Western-Arabic numerals 0 and 1 immediately followed by a lower-case b (e.g., 0101b). Underscores or spaces may be included in binary number representations to increase readability or delineate field boundaries (e.g., 0\_0101\_1010b).

The coding within SATA is called 8b/10b. Encoded data to be transmitted should be called 8b/10b encoded pattern. When talking about decoding data use the combined term 10b/8b decoded pattern. The use of 10b and 8b alone shall not be used due to possible confusion with one zero binary or the contradiction of 8 binary.

A range of numeric values is represented in this specification in the form “a to z” or “a..z”, where a is the lowest value included in the range, all values between a and z are included in the range, and z is the highest value included in the range (e.g., the representation “0h to 3h” or “0h..3h” includes the values 0h, 1h, 2h, and 3h).

A hexadecimal number is represented in this specification by any sequence of digits comprised of only the Western-Arabic numerals 0 to 9 and/or the upper-case English letters A to F immediately followed by a lower-case h (e.g., FA23h). Underscores or spaces may be included in hexadecimal number representations to increase readability or delineate field boundaries (e.g., B FD8C FA23h or B\_FD8C\_FA23h). A decimal number is represented in this specification by any sequence of digits comprised of only the Western-Arabic numerals 0 to 9 not immediately followed by a lower-case b or lower-case h (e.g., 25).

Name (n:m), where n shall be greater than m, denotes a set of bits (e.g., Feature (7:0)). n:m where n shall be greater than m denotes a bit range.

This specification uses the following conventions for representing decimal numbers:

- a) the decimal separator (i.e., separating the integer and fractional portions of the number) is a period;
- b) the thousands separator (i.e., separating groups of three digits in a portion of the number) is a space;
- c) the thousands separator is used in both the integer portion and the fraction portion of a number; and
- d) the decimal representation for a year is 1999 not 1 999.

Table 1 shows some examples of decimal numbers using various conventions.

**Table 1 – Numbering conventions**

French	English	This specification
0,6	0.6	0.6
3,141 592 65	3.14159265	3.141 592 65
1 000	1,000	1 000
1 323 462,95	1,323,462.95	1 323 462.95

#### **4.2.5 Units of measure**

See Appendix A.

#### **4.2.6 Byte encoded character strings conventions**

When this specification requires one or more bytes to contain specific encoded characters, the specific characters are enclosed in single quotation marks. The single quotation marks identify the start and end of the characters that are required to be encoded but are not themselves to be encoded. The characters that are to be encoded are shown in the case that is to be encoded.

An ASCII space character (i.e., 20h) may be represented in a string by the character '↵' (e.g., 'SCSI-device').

The encoded characters and the single quotation marks that enclose them are preceded by text that specifies the character encoding methodology and the number of characters required to be encoded.

EXAMPLE - Using the notation described in this subclause, the eleven ASCII characters 'SCSI device' are to be encoded as the following sequence of byte values, 53h 43h 53h 49h 20h 64h 65h 76h 69h 63h 65h.

#### **4.2.7 State machine conventions overview**

For each function to be completed a state machine approach is used to describe the sequence requirements. Each function is composed of several states to accomplish a set goal. Each state

of the set is described by an individual state machine. Figure 1 shows the general layout for each of the state machines that comprise the set of states for the function.

<b>State Designator: State name</b> <sup>a</sup>	Action list <sub>[P   W]</sub>	
1. Transition condition	→	<b>Next state 0</b>
2. Transition condition	→	<b>Next state 1</b>
<sup>a</sup> Footnote		

**Figure 1 – State machine conventions**

Each state is identified by a state designator and a state name. The state designator is unique among all states in all state machines in this document. The state designator consists of a set of letters that are capitalized followed by a unique number. The state name is a brief description of the primary action taken during the state, and the same state name may appear in other state machines. If the same primary function occurs in other states in the same state machine, they are designated with a unique letter at the end of the name. Additional actions may be taken while in a state and these actions are described in the state description text.

Each transition is identified by a transition label and a numbered transition condition. The number does not indicate order, but is used as a way to reference each transition condition in the text. The transition label consists of the state designator of the state from which the transition is being made followed by the state designator of the state to which the transition is being made. The transition condition is a brief description of the event or condition that causes the transition to occur and may include a transition action that is taken when the transition occurs. This action is described fully in the transition description text.

Upon entry to a state, all actions to be executed in that state are executed. If a state is re-entered from itself, all actions to be executed in the state are executed again.

It is assumed that all actions are executed within a state and that transitions from state to state are instantaneous.

#### **4.2.8 Byte, word, Dword, and Qword relationships**

The most significant bit in a byte (i.e., bit 7) is shown on the left (see Figure 2 part 1).

A word may be represented as an ordered set of two (2) bytes. The least significant byte (lower byte) is byte 0 and the most significant byte (upper byte) is byte 1. The most significant byte is shown on the left (see Figure 2 part 1).

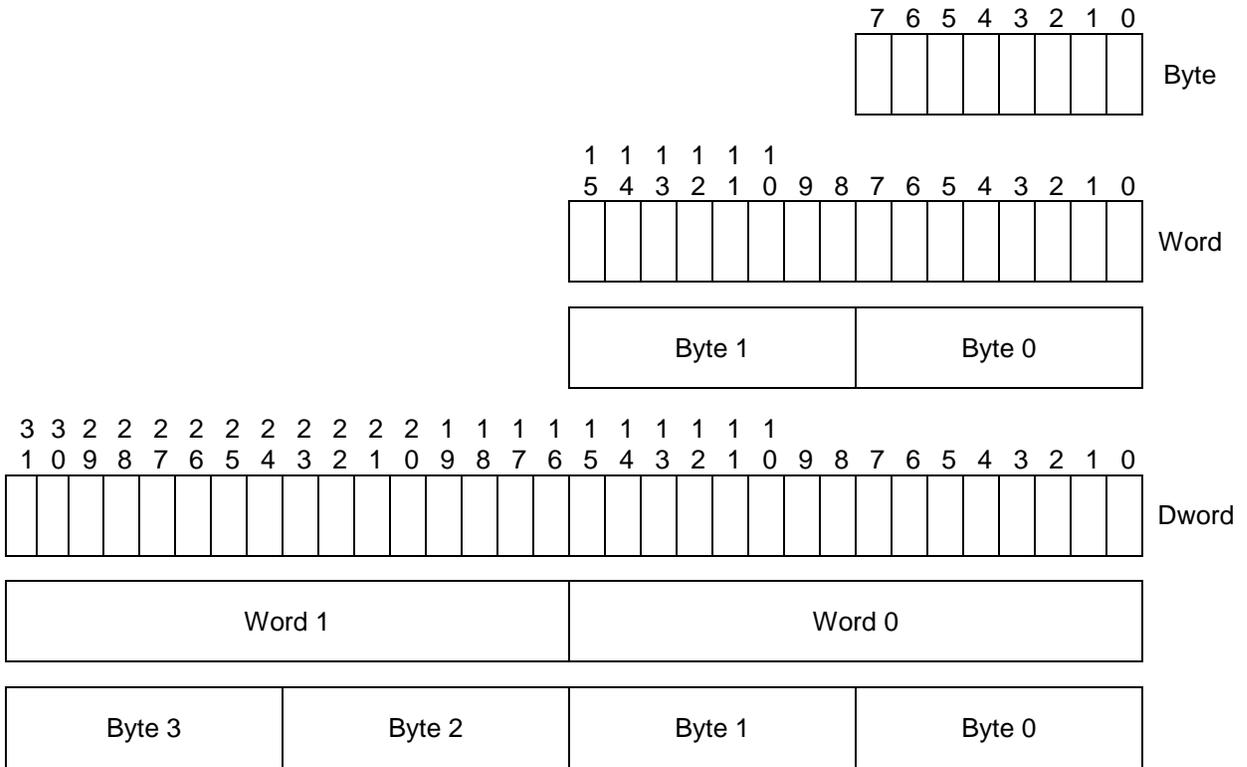
A Dword may be represented as an ordered set of two (2) words. The least significant word (lower word) is word 0 and the most significant word (upper word) is word 1. The most significant word is shown on the left (see Figure 2 part 1).

A Dword may be represented as an ordered set of four (4) bytes. The least significant byte is byte 0 and the most significant byte is byte 3. The most significant byte is shown on the left (see Figure 2 part 1).

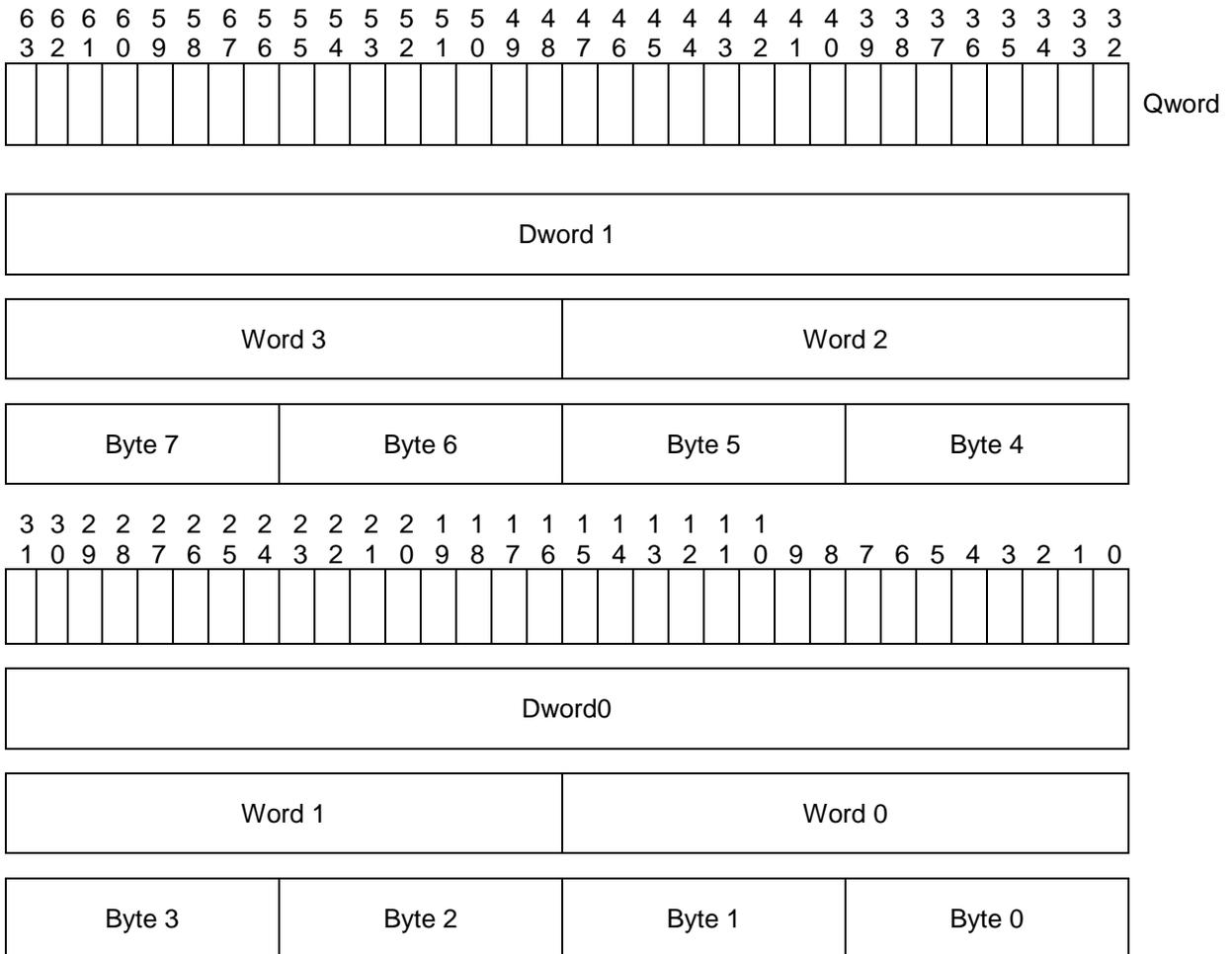
A Qword may be represented as an ordered set of two (2) Dwords. The least significant Dword (lower Dword) is Dword 0 and the most significant Dword (upper Dword) is Dword 1. The most significant Dword is shown on the left (see Figure 2 part 2).

A Qword may be represented as an ordered set of four (4) words. The least significant word is word 0 and the most significant word is word 3. The most significant word is shown on the left (see Figure 2 part 2).

A Qword may be represented as an ordered set of eight (8) bytes. The least significant byte is byte 0 and the most significant byte is byte 7. The most significant byte is shown on the left (see Figure 2 part 2).



**Figure 2 – Byte, word, Dword, and Qword relationships (part 1 of 2)**



**Figure 2 – Byte, word, Dword, and Qword relationships (part 2 of 2)**

## 5 General overview

Provide a general overview for the specification.

## 6 Document structure

### 6.1 Title page

The following page contains a template that should be use for the title page in order to maintain a consistent appearance across multiple releases of SATA-IO specifications.

### 6.2 Specification Disclaimer page



# **Serial ATA International Organization**

## **Serial ATA Revision 3.2**

**7 August 2013  
Gold Revision**

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Serial ATA International Organization contact information:

SATA-IO  
3855 SW 153<sup>rd</sup> Drive  
Beaverton, Oregon 97003 USA  
Tel: +1 503-619-0572  
Fax: +1 503-644-6708  
E-mail: [admin@sata-io.org](mailto:admin@sata-io.org)

### 6.3 Table of contents (TOC), list of figures (LOF), and list of tables (LOT)

These sections of the document are automatically generated and updated using the following procedure.

Ctrl A to select all text in the document.

F9 function key to start update fields.

Select "Update entire table" for all three sections.

Confirm to ensure they are properly generated.

The order of the TOC, LOF and LOT within a specification shall be:

- 1) TOC;
- 2) LOF, if any; and
- 3) LOT, if any.

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## 7 Body of draft

The body of the draft specification is the beginning of normative information.

- 1 Revision History
  - 1.1 Revision x.x (Ratification Date: Month day, year)
- 2 Scope
- 3 References
  - 3.1 Normative references
  - 3.2 Approved references
  - 3.3 References under development
  - 3.4 Other references
- 4 Definitions, abbreviations, and conventions
- 5 General overview
- 6 Normative information

Section 1 (Revision history) contains a list of documents such as ECNs and TPRs that have changed significant sections of the specification.

Section 2 (Scope) contains a brief description of what this project covers.

Section 3 (Normative References) lists the references use by the specification. These references consist of approved standards, standards under development, and standards from other organizations that are referenced from the draft specification.

Section 4 (Definitions, abbreviations, and conversions) contains information required for a reader to understand and interpret the specification.

Section 5 (General overview) describes the project and lays the ground work for the rest of the specification.

Section 6..n (Normative information) provide the requirements for your specification within the scope and objectives.

## **8 Appendixes**

Appendixes are added as necessary to convey additional normative or informative information. Normative Appendixes precede informative ones within the draft specification structure. Appendixes appear in the order referenced in the body of the specification given normative before informative.

## **9 PDF generation**

All working drafts posted for member review shall be Acrobat (\*.pdf) files. When saving draft specifications all the source files (e.g., visio) that compose the draft specification shall be collected into a zip file and saved along with the PDF files. This allows the administrator to rebuild documents if necessary.

Using Word, Save As, Adobe PDF to generate the initial file. This file requires further processing before publication. Using Adobe Acrobat Profesional select:

- 1) Advanced;
- 2) Preflight...;
- 3) Convert Current PDF to PDF/A file (PDF/A? icon on the bottom of the Profiles page);
- 4) Remove PDF/A information (PDF/A X icon on the bottom of the Profile page, then answer Yes to Do you really want to completely remove any PDF/A information contained in the current document?);
- 5) Open the bookmarks and reduce all to the first level then close bookmarks; and
- 6) Enable comments (Comments, Enable for commenting and analysis in Adobe Reader..., Save file).

## **10 General principles and structures**

### **10.1 Consistency of draft specifications**

Uniformity of structure, of style and of terminology shall be maintained not only within each draft specification, but also within a series of associated draft standards or specifications. The structure of associated draft standards or specifications and the numbering of their clauses shall, as far as possible, be identical.

Analogous wording shall be used to express analogous provisions and identical wording shall be used to express identical provisions.

The same term shall be used throughout each draft specification or series of associated draft specifications to designate a given concept. The use of an alternative term (i.e., synonym) for a concept already defined shall be avoided. As far as possible, only one meaning shall be attributed to each term chosen.

These requirements are particularly important not only to ensure comprehension of the draft specification, or of the series of associated draft specifications, but also to derive the maximum benefit available through automated text processing techniques and computer-aided translation.

## **10.2 Description and numbering of divisions and subdivisions**

### **10.2.1 Clause**

A clause is the basic component in the subdivision of the content of a draft specification.

The clauses in each draft specification shall be numbered with Western-Arabic numerals, beginning with 1 for the Revision history clause. The numbering shall be continuous up to but excluding any Appendixes.

Each clause shall have a title, placed immediately after its number, on a line separate from the text that follows it.

### **10.2.2 Subclause**

A subclause is a numbered subdivision of a clause. A primary subclause (e.g., 5.1, 5.2) may be subdivided into secondary subclauses (e.g., 5.1.1, 5.1.2), and this process of subdivision may be continued as far as the seventh level (e.g., 5.1.1.1.1.1.1, 5.1.1.1.1.1.1.2).

Subclauses shall be numbered with Western-Arabic numerals (e.g., 5.1, 5.2).

A subclause shall not be created unless there is at least one further subclause at the same level (e.g., text in Clause 10 shall not be designated subclause 10.1 unless there is also a subclause 10.2).

Each subclause shall be given a title, which is placed immediately after its number.

### **10.2.3 Paragraph**

A paragraph is an unnumbered subdivision of a figure, clause, or subclause.

Hanging paragraphs (see Table 2) shall be avoided since reference to them is ambiguous.

EXAMPLE – In Table 2 the hanging paragraphs indicated are not able to be uniquely identified as being in Clause 5 since strictly speaking the paragraphs in 5.1 and 5.2 are also in Clause 5. To avoid this problem it is necessary to identify the unnumbered paragraphs as subclause 5.1 General, or other suitable title, and to renumber the existing 5.1 and 5.2 accordingly, to move the hanging paragraphs elsewhere, or to delete.

**Table 2 – Hanging paragraph example**

<b>Incorrect</b>	<b>Correct</b>
<p><b>5 Designation</b>                      The quick brown fox jumps over the lazy dog. <sup>a</sup>                      The quick brown fox jumps over the lazy dog. <sup>a</sup>                      The quick brown fox jumps over the lazy dog. <sup>a</sup>  <b>5.1 XXXXXXXXXXXX</b>                      The quick brown fox jumps over the lazy dog. <sup>a</sup>  <b>5.1.1 YYYYYYYYYYYYYY</b>                      The quick brown fox jumps over the lazy dog.  <b>5.1.2 YYYYYYYYYYYYYY</b>                      The quick brown fox jumps over the lazy dog.  <b>5.2 XXXXXXXXXXXX</b>                      The quick brown fox jumps over the lazy dog.                      The quick brown fox jumps over the lazy dog.                      The quick brown fox jumps over the lazy dog.                      The quick brown fox jumps over the lazy dog.  <b>6 Test report</b></p>	<p><b>5 Designation</b>  <b>5.1 General</b>                      The quick brown fox jumps over the lazy dog.                      The quick brown fox jumps over the lazy dog.                      The quick brown fox jumps over the lazy dog.  <b>5.2 XXXXXXXXXXXX</b>  <b>5.2.1 YYYYYYYYYYYYYY</b>                      The quick brown fox jumps over the lazy dog.  <b>5.2.2 YYYYYYYYYYYYYY</b>                      The quick brown fox jumps over the lazy dog.  <b>5.2.3 YYYYYYYYYYYYYY</b>                      The quick brown fox jumps over the lazy dog.  <b>5.3 XXXXXXXXXXXX</b>                      The quick brown fox jumps over the lazy dog.                      The quick brown fox jumps over the lazy dog.                      The quick brown fox jumps over the lazy dog.                      The quick brown fox jumps over the lazy dog.  <b>6 Test report</b></p>
<p><sup>a</sup> Hanging paragraph</p>	

**10.2.4 Lists**

**10.2.4.1 Lists overview**

Lists shall be introduced by a complete grammatical proposition followed by a colon, and completed by the items in the list except when if/then structures are combined with list structures (see 10.2.11.5).

Each item in a list shall be preceded by an identification with the style of the identification being determined by whether the list is intended to be an ordered list (see 10.2.4.3) or an unordered list (see 10.2.4.2).

The first word of an item in a list should be capitalized only if the word is a proper noun.

Each item in the list shall end with a semi-colon, except the last item, which ends in a period or a comma.

The second to the last entry in the list shall end with a semi-colon followed by an “and” or an “or” (i.e., ; and or ; or). The “and” is used if all the items in the list are required. The “or” is used if only one or more items in the list are required.

Where all the items in the list have the same subject, object, or verb, the subject, object, and verb should be included in the introductory proposition, where possible. Example 1 shows a format that is not recommended and example 2 shows a recommended format.

EXAMPLE 1 –

When performing an operation:

- a) the operator should not sit down;
- b) the operator should not fall over; or
- c) the operator should not sleep.

EXAMPLE 2 –

When performing an operation, the operator should not:

- a) sit down;
- b) fall over; or
- c) sleep.

Where all of the items in a list are nouns preceded by the same article, the article shall precede each noun in the list shown in example 3.

EXAMPLE 3 –

Each item in the list is preceded by an article:

- a) the red thing;
- b) the blue thing; and
- c) the green thing.

#### 10.2.4.2 Unordered lists

An unordered list is one in which the order of the listed items is unimportant (i.e., it does not matter where in the list the item occurs as all have equal importance). Each listed item starts with a lower case letter followed by a right parenthesis. If it is necessary to subdivide further an item in the latter type of list, upper case letter followed by a right parenthesis shall be used. Further subdivision alternate between lower case letters followed by a right parenthesis and uppercase letters followed by a right parenthesis. Each new unordered list is required to start with a) or A) and each sublist is required to be indented with respect to the previous list.

The following is an example of a multi-level unordered list.

EXAMPLE -

The cart contains the following:

- a) a big box containing:
  - A) a medium box containing:
    - a) a red thing;
    - b) a blue thing; or
    - c) a yellow thing;
    - and
  - B) a cylinder;
- d) a little box; and
- e) a small animal.

#### 10.2.4.3 Ordered lists

An ordered list is one in which the order of the listed items is important (i.e., item n is required before item n + 1). Each listed item starts with a Western-Arabic numeral followed by a right parenthesis. If it is necessary to subdivide further an item in the latter type of list, a Western-Arabic numeral followed by a right parenthesis shall be used. Each new ordered list is required to start with 1) and each sublist is required to be indented with respect to the previous list.

Example 1 shows a multi-level ordered list.

EXAMPLE 1 -

Assemble the device using the following procedure:

- 1) remove contents from box;
- 2) assemble item:
  - 1) place tab A in slot A;

- 2) place screw in screw hole; and
- 3) tighten screw;
- and
- 3) throw away all excess materials.

Example 2 shows a multi-level ordered list that contains unordered items.

**EXAMPLE 2 -**

Assemble the device using the following procedure:

- 1) remove contents from box:
  - A) assemble item:
    - 1) place tab A in slot A;
    - 2) place screw in screw hole; and
    - 3) tighten screw;
    - and
  - B) throw away all excess materials;
  - and
- 2) take a break.

**10.2.5 Programing source code**

If a draft specification lists programing source code (e.g., C, C++, Java, XML) a monospace font shall be used.

The recommended font is 7 point Courier New.

**EXAMPLE -** This is an example of what C source code would look like in a draft specification.

```

/*****
/*
/* crc.c
/*
/*****

#include <stdlib.h>
#include <stdio.h>

main(argc,argv)

```

**10.2.6 Appendix**

**10.2.6.1 Appendix overview**

Each Appendix shall be designated by a heading comprising the word Appendix followed by a capital letter designating its serial order, beginning with “A” (e.g., Appendix A). The Appendix heading shall be followed by the indication (normative) or (informative), and by the title. Numbers given to the clauses, subclauses, tables, figures, and mathematical formula of an Appendix shall be preceded by the letter designating that Appendix followed by a full-stop (e.g., clauses in Appendix A are designated A.1, A.2, A.3, etc.). The numbering shall start afresh with each Appendix. A specification containing only one Appendix shall have the Appendix designated as Appendix A.

**10.2.6.2 Normative Appendixes**

Normative Appendixes give provisions additional to those in the body of the document. Their presence is optional. An Appendix’s normative status shall be made clear by an indication in the table of contents and in the heading of the Appendix.

### **10.2.6.3 Informative Appendixes**

Informative Appendixes give additional information intended to assist the understanding or use of the document. They shall not contain requirements, except as described in this subclause.

Their presence is optional. An Appendix's informative status shall be made clear by an indication in the table of contents and in the heading of the Appendix.

Informative Appendixes may contain optional requirements (e.g., a test method that is optional may contain requirements but there is no need to comply with these requirements to claim compliance with the draft specification).

### **10.2.7 Notes and examples in text**

Notes and examples integrated in the text of a draft specification shall only be used for giving additional information intended to assist the understanding or use of the draft specification. Notes and example shall not contain requirements or any information considered indispensable for the use of the draft specification.

EXAMPLE - The following note is incorrectly drafted as a note since it contains a requirement that is explained in parentheses after the example and clearly does not constitute additional information.

NOTE 1 - Alternatively, test at a load of ... (an instruction, expressed here using the imperative, is a requirement).

Notes and examples should be placed after the paragraph, to which they refer.

All notes in the draft specification shall be preceded by NOTE n -, placed at the beginning of the first line of the text of the note. All notes shall be number from 1 to n where n is the last note in the draft specification.

A single example in a clause or subclause shall be preceded by EXAMPLE -, placed at the beginning of the first line of the text of the example. When several examples occur within the same clause or subclause, they shall be numbered from 1 to n, within the clause or subclause, where n is the last example in the clause or subclause (e.g., EXAMPLE 1 -, EXAMPLE 2 -, EXAMPLE 3 -).

In draft specifications, all lines of a note shall be inset from the margin and shall be set in smaller type (i.e., 9 point), so that its extent is able to be determined.

In draft specifications, all lines of an example may be indented from the margin and shall be set in smaller type (i.e.,9 point), so that its extent is able to be determined.

### **10.2.8 Footnotes to the text**

Footnotes in text should not be used in a draft specification. However, if they are used, rules in this subclause shall apply.

Footnotes to the text give additional information. A footnote shall not contain requirements or any normative information.

Footnotes in figures and tables follow different rules (see 10.2.19 and 10.2.30).

Footnotes to the text shall be placed at the foot of the relevant page and be separated from the text by a short thin horizontal line on the left of the page.

Footnotes to the text shall normally be distinguished by Western-Arab numerals, beginning with 1, followed by one right parenthesis and forming a continuous numerical sequence throughout the document (i.e., 1), 2), 3) ). The footnotes shall be referred to in the text by inserting the same numerals, as superscripts, after the word or sentence in question (i.e., <sup>1)2)3)</sup>).

**10.2.9 Verbal forms for the expression of provisions**

This subclause gives, in the first column of each table, the verbal form that shall be used to express each kind of provision. The equivalent expressions given in the second column shall be used only in exceptional cases when the form given in the first column is not able to be used for linguistic reasons.

The verbal forms shown in Table 3 shall be used to indicate requirements strictly to be followed in order to conform to the document and from which no deviation is permitted.

**Table 3 – Requirement**

Verbal form <sup>b</sup>	Equivalent expressions for use in exceptional cases
shall	is to is required to it is required that has to only ... is permitted it is necessary is mandatory
shall not <sup>a</sup>	is not allowed is required to be not is required that ... be not is not to be
<sup>a</sup> Do not use “may not” instead of “shall not” to express a prohibition. <sup>b</sup> To express a direct instruction, for example referring to steps to be taken in a test method, use the imperative mood in English. EXAMPLE - Switch on the recorder.	

The verbal forms shown in Table 4 shall be used to indicate that among one of the following possibilities:

- a) one is recommended as particularly suitable, without mentioning or excluding others;
- b) that a certain course of action is preferred but not necessarily required; or
- c) that, in the negative form, a certain possibility or course of action is deprecated but not prohibited.

**Table 4 – Recommendations**

Verbal form	Equivalent expressions for use in exceptional cases
should	it is recommended that ought to
should not	it is not recommended that ought not to

The verbal forms shown in Table 5 shall be used to indicate a course of action permissible within the limits of the draft specification.

**Table 5 – Permission**

<b>Verbal form</b>	<b>Equivalent expressions for use in exceptional cases</b>
may <sup>a b c</sup>	is permitted is allowed is permissible
may not <sup>a</sup>	it is not required that no ... is required need not
Note - “May” signifies permission expressed by the draft specification, whereas “can” refers to the ability of a user of the draft specification or to a possibility open to them.	
<sup>a</sup> Do not use “possible” or “impossible” in this context.	
<sup>b</sup> Do not use “can” instead of “may” in this context.	
<sup>c</sup> Do not use “might” instead of “may”.	

The verbal forms shown in Table 6 shall be used for statements of possibility and capability, whether material, physical or causal.

**Table 6 – Possibility and capability**

<b>Verbal form</b>	<b>Equivalent expressions that shall not be used</b>
be able to there is a possibility of it is possible	can <sup>a</sup> could would
be unable to there is not possibility of it is no possibility of	cannot <sup>a</sup> could not would not
Note - “May” signifies permission expressed by the draft specification, whereas “can” refers to the ability of a user of the draft specification or to a possibility open to them.	
<sup>a</sup> Due to the likelihood of misinterpretation of the verbal form “can” and “cannot” as a “may” and possibly a “shall” these verbal forms shall be avoided in a draft specification.	

The verbal forms shown in Table 7 shall be used as indicated.

**Table 7 – Miscellaneous**

<b>Verbal form</b>	<b>Equivalent expressions that shall not be used</b>
process processed processing	execute executed executing
shall	will must may only
shall not	will not must not

## **10.2.10 Prohibited verbal forms**

The following verbal forms shall not be used in draft specifications:

- a) must;
- b) can;
- c) cannot;
- d) execute;
- e) may only; and
- f) will.

NOTE 2 - This prohibition avoids confusion between the requirements of a draft specification and external statutory obligations.

## **10.2.11 Other recommended verbal form expressions**

### **10.2.11.1 Western-Arabic numerals**

The verbal forms for Western-Arabic numerals contained in statements shall be written out for numerals zero to ten and listed as numbers in all other cases (e.g., 11, 16, 1 321). This rule shall apply when the numeral is:

- a) a decimal representation of a value when not followed by units (e.g., 7 % not seven percent, 5 m not five meters or five m) or a single bit binary value (e.g., one not 1b, zero not 0b); and
- b) contained within a sentence.

The verbal form for indicating the state of a single bit field is set to one or cleared to zero.

If the value of the field is a single digit decimal number then use the English word (i.e., zero, one, two, three, four, five, six, seven, eight, and nine). If it is part of a name, a descriptor, bit number, or offset then use digits (i.e., 1, 2, 3, 4, 5, 6, 7, 8, or 9).

Table entries shall use digits.

EXAMPLE - The I support this (ISP) bit when cleared to zero specifies.... An ISP bit set to one specifies....

### **10.2.11.2 For example**

When an example is contained within a paragraph body it shall be highlighted using the verbal form "(e.g., the example text)". The verbal form "for example" and "such as" shall not be used. Examples not contained within a paragraph are handled as defined in 10.2.7.

### **10.2.11.3 Restatement**

When there is a restatement of an expression the verbal form of the restatement shall be "(i.e., the restatement text)". The verbal form "that is" and "such as" shall not be used to restate an expression.

### **10.2.11.4 Conjunction usage**

When all items within a list are required or necessary the conjunction "and" shall be used to join all the items.

When one or more, but not necessarily all, of the items within a list are required the conjunction "or" shall be used. The conjunction "or" implicitly allows all the items in a list, however, that may not be obvious to the reader. In such cases the term "and/or" may be used. The usage of "and/or" should be minimized as it is equivalent to "or".

### **10.2.11.5 If structures**

#### **10.2.11.5.1 If..., then versus if...,**

The verbal form “if “ should be followed by the verbal form “then”, however, the “then” is not required if the context of the statement is clear (e.g., If the field is set to one, the device may reject the command.). However, it is always correct to include the “then”. Inclusion of “then” is recommended to eliminate any possible confusion.

#### **10.2.11.5.2 If list structures**

An if/then structure may include an ordered list or an unordered list as shown in the examples in this subclause.

EXAMPLE 1 -

If your car runs on:

- a) gasoline; or
- b) diesel,

then visiting a gas station provides a means for feeding the car.

EXAMPLE 2 -

If:

- a) an operation is requested that is not supported; or
- b) a reset is requested,

then all processes stop.

EXAMPLE 3 -

If you are the last to leave, then:

- 1) put all the money in the safe; and
- 2) lock the doors as you leave.

#### **10.2.11.5.3 If..., then...,otherwise**

In some cases an if/then structure requires additional information to describe all cases that occur if the if/then condition is not true. If that verbal form is required it shall take the form: If this condition occurs, then take this action, otherwise take a different action.

The same structures used for the verbal form then (see 10.2.11.5.2) shall be used for otherwise.

EXAMPLE -

If you are the last to leave, then:

- 1) put all the money in the safe; and
- 2) lock the doors as you leave,

otherwise we may be robbed.

#### **10.2.11.5.4 If..., then versus when**

The “if expression, then expression” verbal form should be used if it is possible that the expression may not happen. The “when expression” verbal form should be used when it is certain that the expression is going to happen at some point.

EXAMPLE - The statement “if the world ends, then humans no longer have a home” does not assume the world is going to end, but if it does, then humans no longer have a home. The statement “when the world ends humans no longer have a home” makes the assumption that the world is going to end and at that point humans lose their home.

#### **10.2.11.6 Specify versus indicate**

In systems that contain devices that originate requests and devices that provide responses to requests:

- a) if an action is being described that only may be performed by a device originating requests or any of its constituent objects, then the term "specify" or any of its forms should be used to denote the action (e.g., an application client specifies a command code);
- b) if an action is being described that only may be performed by a device providing responses or any of its constituent objects, then the term "indicate" or any of its forms should be used to denote the action (e.g., a device server indicates status); and
- c) if an action is being described that may be performed by both a device originating requests or any of its constituent objects and by a device providing responses or any of its constituent objects, then the term "specify" or any of its forms should be used to denote the action (e.g., both an application client and a device server may specify a value in a field in a mode page).

Other terms that should be used instead of "specify" or "indicate" for instances other than those described in this subclause include: "define", "delineate", "denote", "describe", "designate", "determine", and "represent".

#### **10.2.11.7 That versus which**

The word "that" shall be used to introduce restrictive or essential relative clauses. A restrictive clause limits or restricts the scope of the noun to which it is referring (i.e., if a restrictive clause is omitted from a sentence, then the meaning of the basic sentence is changed). Restrictive clauses shall not be separated from the rest of the sentence by commas. The word "which" shall not be used to introduce restrictive relative clauses.

Example 1 demonstrates incorrect usage of the word "which" introducing a relative clause.

EXAMPLE 1 - This transition shall occur if a command is received, which requires the active power condition.

In example 2, the relative clause (i.e., requires the active power condition) is essential to the meaning of the sentence. Example 2 demonstrates the correct version of the example 1 sentence.

EXAMPLE 2 -This transition shall occur if a command is received that requires the active power condition.

Use of non-restrictive or non-essential relative clauses is discouraged as this clause type provides only parenthetical information (i.e., if a non-restrictive clause is omitted from a sentence, then the meaning of the basic sentence is not changed) and may be confused by a reader as being an essential clause. If a non-restrictive clause is used, then the clause shall be introduced by the word "which" and separated by commas from the rest of the sentence to indicate parenthesis.

#### **10.2.11.8 Vendor specific vs. vendor-specific**

"Vendor-specific" should be used if it is an adjective (e.g., vendor-specific bytes) and "vendor specific" should be used if it is a noun (e.g., vendor specific in a table cell).

#### **10.2.11.9 Single quotes vs. double quotes**

Verbal forms shall only be enclosed in single quotes when the enclosed verbal form represents a byte encoded character string (see 3.5.3). Double quotes should be used to set off titles (e.g., of

published works, essays, articles) and may be used to call attention to individual words or phrases. However, the use of double quotes should be minimized within a draft specification.

### **10.2.11.10 Unclear pronoun references**

Unclear pronoun references shall not be used. A pronoun shall only be used when the immediately preceding noun form (e.g., noun or gerund) is the reference for the pronoun.

Example 1 contains an unclear pronoun reference.

EXAMPLE 1 - If the discover process optimization is disabled and the management application client detects an expander route entry that references the SAS address of the expander device itself, then **it** shall disable the expander route entry.

In example 1 there are five noun forms with associated adjective forms preceding the “it” (i.e., discover process optimization, management application client, expander route entry, SAS address, and expander device itself). Only very careful reading of the text allows the reader to understand that the “it” in the example sentence refers to the fourth noun form preceding the pronoun (i.e., management application client). The correct construction of the sentence is shown in example 2.

EXAMPLE 2 -If the discover process optimization is disabled, and the management application client detects an expander route entry that references the SAS address of the expander device itself, then the management application client shall disable the expander route entry.

An exercise for all Editor's is to circle each pronoun in their document and draw a line to the referenced noun form. If there is any other noun form between the pronoun and the referenced noun form, the pronoun shall be changed to the correct noun.

### **10.2.11.11 Comma usage**

The following are the rules for comma usage. Commas should not be used in any case other than those listed below:

- a) commas shall be used to separate a series of three or more elements when used in a sentence (e.g., Red, blue, and yellow are the primary colors.). The serial comma (i.e., the last comma before the conjunction) shall always be used. The serial comma is sometimes known as the Harvard comma in the United States and commonly known as the Oxford comma in the United Kingdom and elsewhere outside the United States. However, in cases where three or more elements are used, a list should be used (see 10.2.4);
- b) a comma shall be used to separate quoted language (e.g., The chairperson said, “The meeting will begin.”);
- c) commas shall be used to separate:
  - A) street addresses and city names (e.g., 123 Maple Street, Anytown);
  - B) city and state names (e.g., Omaha, Nebraska);
  - C) city and country names (e.g., Geneva, Switzerland);
  - D) the month and day of the month from the year in a date (e.g., November 11, 2001);
  - E) the year from subsequent sentence elements when the month and day are included in a date (e.g., November 11, 2001, is the date of the meeting); and
  - F) names and titles (e.g., Jill Robinson, the chair of the committee, is present.);
- d) a comma shall be used to separate introductory elements of a sentence when a verb form is used in the introductory element (e.g., If the PS bit is set to one in the MODE SENSE data, then the mode page shall be saveable by issuing a MODE SELECT command with the SP bit set to one.). This rule shall apply to “if...then” sentences whether or not “then” is used in the sentence;
- e) a comma should be used after a short introductory adverbial phrase if the comma is required for clarity (e.g., In this mode, a maximum of four bytes of READ BUFFER

descriptor information is returned.). However, it is recommended that adverbial phrases be placed adjacent to the word modified by the phrase for maximum clarity and in order to eliminate the comma (e.g., A maximum of four bytes of READ BUFFER descriptor information is returned in this mode.);

- f) commas shall be used to separate the independent clauses of a compound sentence connected by a coordinating conjunction (e.g., and, but, or, nor, and yet). Though casual English usage allows for omission of the comma in short compound sentences when the connection between the clauses is close, this omission shall not be used. In most cases it is recommended that two independent clauses be separated into two sentences;
- g) commas shall be used to separate non-restrictive relative clauses (e.g., A device server may alter any mode parameter in any mode page as a result of changes to other mode parameters, even if the altered mode parameters are reported as non-changeable.). A non-restrictive relative clause is any clause that may be removed from a sentence without altering its basic meaning (see 6.4.3.8); and
- h) commas shall be used to separate coordinate adjectives if they independently modify the noun and if the meaning is retained when an “and” or “but” is placed between the adjectives (e.g., They drove down the long, winding road.). However, it is never wrong in these cases to replace the comma with the appropriate conjunction (e.g., They drove down the long and winding road.).

### **10.2.12 Colon and semi-colon**

Colons shall only be used:

- a) in the introduction to a list (see 10.2.4);
- b) in equation format (see 10.2.40.1);
- c) Uniform Resource Locator (URL) addresses (e.g., <http://www.sata-io.org>);
- d) to separate a state name from a state description (see 4.2.7); or
- e) specifying bit ranges (see 4.2.4).

Semi-colons shall only be used to separate list items (see 10.2.4). Colons and semi-colons shall not be used to separate independent clauses.

### **10.2.13 Spelling, reference works, and abbreviated terms**

All words follow common English meaning unless defined. The following reference works for English are suggested:

- a) “The Shorter Oxford English Dictionary”;
- b) “The Concise Oxford Dictionary”;
- c) “The Collins Concise English Dictionary”;
- d) “Webster’s New World College Dictionary”; or
- e) “Chambers Concise Dictionary”.

Abbreviated terms shall be used with care, and their use shall be limited to those cases where it is not likely to cause confusion. Once an abbreviated form is defined use that form consistently throughout the draft specification (i.e., do not mix the abbreviated form of a term with the non-abbreviated form within a draft specification).

If a list of abbreviated terms is not given in the draft specification or the abbreviated term is not in the list, then the first time that an abbreviated term is used, the full term shall be given with the abbreviated term following in parentheses.

An abbreviated term shall be specified only if used subsequently in the draft specification.

The general rule is that an abbreviated term comprises capital letters, without a full-stop after each letter.

The following on line dictionaries are suggested:

- a) <http://oxforddictionaries.com/>;
- b) <http://www.collinsdictionary.com/>;
- c) <http://www.merriam-webster.com/>; and
- d) <http://www.chambers.co.uk/>.

#### **10.2.14 Use of trade names**

A correct designation or description of a product shall be given rather than a trade name (brand name).

Proprietary trade names (i.e., trade marks) for a particular product should as far as possible be avoided, even if they are in common use.

If, exceptionally, trade names are unavoidable, their nature shall be indicated (e.g., by the symbol ® for a registered trade mark) as shown in example 1.

EXAMPLE 1 - Instead of Teflon<sup>®</sup>, write polytetrafluoroethylene (PTFE).

If it is known that only one product is currently available that is suitable for the successful application of the draft specification, the trade name of the product may be given in the text of the draft specification but shall be associated with a footnote as shown in example 2.

EXAMPLE 2 -... [trade name of product] ... is the trade name of a product supplied by ... [supplier] .... This information is given for the convenience of users of this draft specification and does not constitute an endorsement by ... [SATA-IO] ... of the product named. Equivalent products may be used if they lead to the same results.

If it is considered essential to give an example, or examples, of commercially available products suitable for successful application of the draft specification because the product characteristics are difficult to describe in detail, trade names may be given in a footnote as shown in Example 3.

EXAMPLE 3 -... [trade name(s) of product(s)] ... is (are) an example(s) of a suitable product(s) available commercially. This information is given for the convenience of users of this specification and does not constitute an endorsement by ... [SATA-IO] ... of this (these) product(s).

#### **10.2.15 Figures**

##### **10.2.15.1 Figures Usage**

Figures should be used when they are the most efficient means of presenting information in an easily comprehensible form. Each figure shall be explicitly referred to from text.

Command parameters and state machines shall be classified as figures.

##### **10.2.15.2 Form**

Figures shall be in the form of line drawings. Photographs may be used only if it is not possible to convert them into line drawings.

Figures shall be clearly delineated from body text. This may be accomplished by white space around the figure or by placing a single line frame around the figure.

The font size for text within a figure should be no smaller than 10 pt., however font sizes as small as 8 pt. may be used.

### **10.2.15.3 Figure Format**

#### **10.2.15.3.1 Figure Designation**

Figures shall be designated Figure n where n is a Western-Arabic numeral, beginning with 1. This numbering shall be independent of the numbering of the clauses and of any tables. A specification containing only one figure shall have the figure designated as Figure 1.

For the numbering of figures in Appendixes, see 10.2.6.1.

#### **10.2.15.3.2 Layout of figure designation and title**

The figure title shall be centered horizontally below the figure and laid out as in the following example:

**Figure 3 – Details of apparatus**

The figure designation and title shall be separated by an em dash.

#### **10.2.15.3.3 Continuation of figures**

When a figure is continued over several pages, the figure designation shall be repeated, followed by the title and by (part n of n), as in the following example:

**Figure 4 – Details of apparatus (part 1 of 2)**

Any statements concerning units shall be repeated on all pages after the first, where applicable.

### **10.2.16 Keys in figures**

Keys, when used, shall be located above the figure title and shall precede figure notes. The list of keys shall be preceded with the term “Key:” following by a list of keys and a description of the key. See Figure 5 for an example.

If a figure is continued over several pages, any keys should be repeated on all pages after the first.

### **10.2.17 Normative text in figures**

Any requirements relating to the content of a figure shall be given in the text, in a footnote in the figure, or as a paragraph between the figure and its title.

If a figure is continued over several pages, any normative text should be repeated on all pages after the first.

### **10.2.18 Notes in figures**

Notes in figures shall be treated independently from notes integrated in the text (see 10.2.7).

Notes, when used, shall be located above the figure title and shall precede figure footnotes. A single note in a figure shall be preceded by “NOTE -”, placed at the beginning of the first line of the text of the note. When several notes occur in the same figure, they shall be designated “NOTE n -”. All notes shall be numbered from 1 to n where n is the last note in the figure. A separate numbering sequence shall be used for each figure. See Figure 5 for an example.

Notes in figures shall not contain requirements or any normative information. Any requirements relating to the content of a figure shall be given in the text, in a footnote in the figure, or as a paragraph between the figure and its title.

It is not necessary that notes in figures be referred to.

If a figure is continued over several pages, any notes should be repeated on all pages after the first.

### 10.2.19 Footnotes in figures

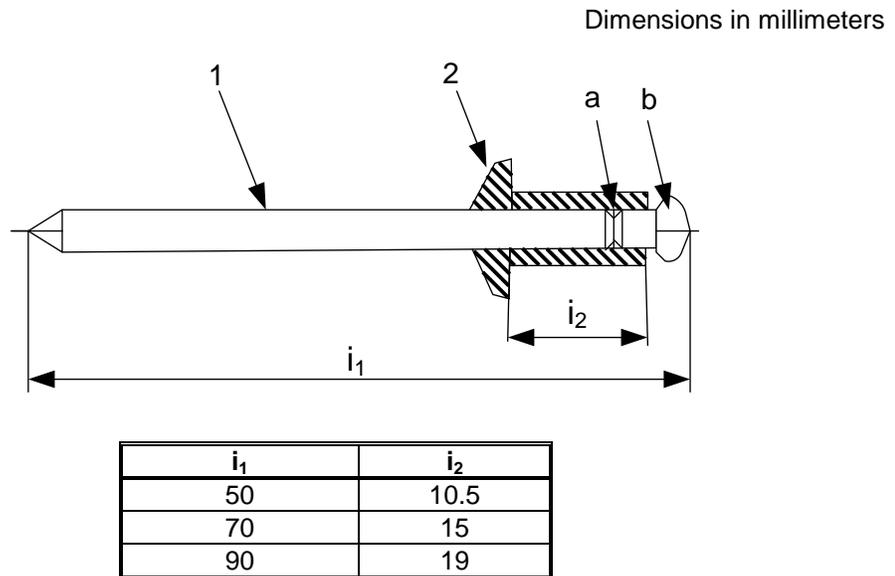
Footnotes in figures shall be treated independently from footnotes in the text (see 10.2.8).

Footnotes, when used, shall be located immediately above the figure title except in state machines (see 4.2.7).

Footnotes in figures shall be distinguished by superscript lower case letters, beginning with "a". The footnotes shall be referred to in the figure by inserting the same superscript lower case letter. See Figure 5 for an example.

Footnotes in figures may contain requirements.

If a figure is continued over several pages, any footnotes should be repeated on all pages after the first.



Key:

- 1 = mandrel shank
- 2 = blind rivet head

The mandrel shall be designed such that the blind rivet end deforms during installation, and the shank may expand.

NOTE - This figure illustrates a type A rivet head.

<sup>a</sup> The break area shall be milled.

<sup>b</sup> The mandrel head is commonly chromium plated.

**Figure 5 – Blind rivet**

### 10.2.20 Tables Usage

Tables should be used when they are the most efficient means of presenting information in an easily comprehensible form. Each table shall be explicitly referred to from text.

A table within a table is not permitted. Subdivision of a table into subsidiary tables is not permitted.

### 10.2.21 Tables Form

The outside ruling shall consist of double line ruling. The ruling between headings and footings, if any, shall be:

- a) if row ruling is “none”, then single line ruling (see Table 8); or
- b) if row ruling is “single line” ruling, then double line ruling (see Table 9).

The font size for text within a table should be no smaller than 10 pt., however font sizes as small as 8 pt. may be used.

**Table 8 – No row ruling table example**

<b>Heading 1</b>	<b>Heading 2</b>
cell 11 words	cell 21 words
cell 12 words	cell 22 words
cell 13 words	cell 23 words
cell 14 words	cell 24 words
Note - Words in footnote.	

**Table 9 – Row ruling table example**

<b>Heading 1</b>	<b>Heading 2</b>
cell 11 words	cell 21 words
cell 12 words	cell 22 words
cell 13 words	cell 23 words
cell 14 words	cell 24 words
Note - Words in footnote.	

### 10.2.22 Pattern Table Form

Patterns shall be documented in the following table format. Transmission Order shall be indicated with an arrow clearly showing the progression of the bit stream as seen on the wire. Starting and ending running disparity shall be indicated with a positive “+” or negative “-” sign before and after each Dword. Include character name such as Dx.y or Kx.y, followed by the 8 bit pre-encoded hex value in peripheries, followed by the starting running disparity indicated with a positive “+” or negative “-” sign. The 10 bit encoded binary sequencing shall be split into each 4 bit value. The corresponding hex value shall also be included.

In the event a Dword needs to be repeated multiple times, this information shall use the following format and be placed in the table immediately below the hex value cells. Repeating a single Dword multiple times is only valid if the starting and ending running disparity are the same.

Above Dword is repeated a total of 256 times for long version. Above Dword is repeated a total of 16 times for short version.
--

If there is only one version of the pattern then use the following format.

Above Dword is repeated a total of 2 times.  
2 Dword ALIGNp.

When multiple Dwords need to be repeated multiple times, this information shall use the following format. This is commonly necessary if two Dwords need to be combined to have the running disparity to be the same at the beginning and end of the repeated pattern.

Above 2 Dwords are repeated a total of 128 times for long version.  
Above 2 Dwords are repeated a total of 8 times for short version.

Immediately following the table a summary of the total bits for the long and short version including a description of the patterns used to create the overall pattern. Place within double line rulling.

Long version 2 048 Dwords.  
256 DW SSOP  
256 DW HTDP (64 DW, 64 DW, 64 DW, 64 DW)  
512 DW LTDP (1 DW, 1 DW, 509 DW, 1 DW)  
256 DW LBP ((1 DW,1 DW) × 128)  
512 DW LFSCP (255 DW, 1 DW, 255 DW, 1 DW)  
256 DW HTDP (64 DW, 64 DW, 64 DW, 64 DW)

Short version 128 Dwords.  
16 DW SSOP  
16 DW HTDP (4 DW, 4 DW, 4 DW, 4 DW)  
32 DW LTDP (1 DW, 1 DW, 29 DW, 1 DW)  
16 DW LBP ((1 DW,1 DW) × 8)  
32 DW LFSCP (15 DW, 1 DW, 15 DW, 1 DW)  
16 DW HTDP (4 DW, 4 DW, 4 DW, 4 DW)

Table 10 may be used as a template to create pattern tables and serves as an example format.

**Table 10 – Pattern Name (acronym) Starting with RD+**

Transmission Order →											
+	D12.0(0Ch)+		D11.4(8Bh)-			D12.0(0Ch)+		D11.3(6Bh)-			-
	0011b	0101b	0011b	0100b	1101b	0011b	0101b	0011b	0100b	1100b	
	3h	5h	3h	4h	Dh	3h	5h	3h	4h	Ch	
	D12.0(0Ch)-		D11.4(8Bh)+			D12.0(0Ch)-		D11.3(6Bh)+			+
	0011b	0110b	1111b	0100b	0010b	0011b	0110b	1111b	0100b	0011b	
	3h	6h	Fh	4h	2h	3h	6h	Fh	4h	3h	
Above 2 Dwords are repeated a total of 512 times for long version. Above 2 Dwords are repeated a total of 32 times for short version.											
+	D10.2(4Ah)+		D10.2(4Ah)+			D10.2(4Ah)+		D10.2(4Ah)+			+
	0101b	0101b	0101b	0101b	0101b	0101b	0101b	0101b	0101b	0101b	
	5h	5h	5h	5h	5h	5h	5h	5h	5h	5h	
Above Dword is repeated a total of 1 024 times for long version. Above Dword is repeated a total of 64 times for short version.											
Long version 2 048 Dwords. 1 024 DW LBP ((1 DW, 1 DW) × 512) 1 024 DW HFTP (1 DW × 1024) Short version 128 Dwords. 64 DW LBP ((1 DW, 1 DW) × 32) 64 DW HFTP (1 DW × 64)											

**10.2.23 Tables Designation**

Table shall be designated Table n where n is a Western-Arabic numeral, beginning with 1. This numbering shall be independent of the numbering of the clauses and of any figures. A specification containing only one table shall have the table designated as Table 1.

For the numbering of tables in Appendixes, see 10.2.6.1.

**10.2.24 Layout of table designation and title**

The table title shall be centered horizontally above the table and laid out as in the following example:

**Table 11 – Mechanical properties**

The table designation and title shall be separated by an em dash.

The font size for text within a table cell should be no smaller than 10 pt., however font sizes as small as 8 pt. may be used.

### **10.2.25 Headings**

Heading shall be in bold text. The first word in the heading of each column or row shall begin with a capital letter. The units used in a given column, if any, shall be indicated under the column heading.

### **10.2.26 Position of tables**

All table shall be positioned immediately after the table anchor. To accomplish this the Start entry in the Table Designer should be set to Anywhere and shall not be set to Float.

### **10.2.27 Continuation of tables**

Every effort should be made to keep tables to one page or less. To accomplish this the Orphan Rows entry in the Table Designer should be set to 99. When a table is continued over several pages, the table designation shall be repeated, followed by the title and by (part n of n), as in the following example:

**Table 12 – Table title (part 1 of 2)**

The column headings together with any statement concerning units shall be repeated on all pages after the first. Footers, including keys, notes, and footnotes, shall be displayed on the last page and should be repeated on all other pages.

### **10.2.28 Keys in tables**

Keys, if used, shall be located within a separate table footer and shall precede table notes. The list of keys shall be preceded with the term “Key:” followed by a list of keys and a description of the key. See Table 13 for an example.

### **10.2.29 Notes in tables**

Notes in tables shall be treated independently from notes integrated in the text (see 10.2.7).

Notes, if used, shall be located within a table footer of the relevant table and shall precede table footnotes. A single note in a table shall be preceded by “NOTE - ”, placed at the beginning of the first line of the text of the note. If several notes occur in the same table, they shall be designated “NOTE n”. All notes shall be number from 1 to n where n is the last note in the table. A separate numbering sequence shall be used for each table. See Table 13 for an example.

Notes in tables shall not contain requirements or any normative information. Any requirements relating to the content of a table shall be given in the text, in a footnote to the table or as a paragraph within the table.

It is not necessary that notes in tables be referred to.

### **10.2.30 Footnotes in tables**

Footnotes in tables shall be treated independently from footnotes to the text (see 10.2.8). They shall be located within the footer of the relevant table.

Footnotes in tables shall be distinguished by superscript lower case letters, beginning with “a”. The footnotes shall be referred to in the table by inserting the same superscript lower case letter. See Table 13 for an example.

Footnotes in tables may contain requirements.

**Table 13 – Table with notes and footnotes**

<b>Type</b>	<b>Length mm</b>	<b>Inside diameter mm</b>	<b>Description</b>
O	$l_1^a$	$d_1$	A paragraph containing a requirement.
M	$l_2$	$d_2^{b\ c}$	
Key: M = Implementation is mandatory. O = Implementation is optional.			
Note 1 - Table note. Note 2 - Table note.			
<sup>a</sup> Table footnote. <sup>b</sup> Table footnote. <sup>c</sup> Table footnote.			

**10.2.31 Fields and bits in tables that contain fixed values**

In tables that define fields and bits (e.g., parameter lists, commands, frame headers) where a field is specified as a fixed value there shall be a statement in the same subclause as the table stating that the fixed value field or bit shall be set as shown in that table. The following statement is an example that meets this requirement.

EXAMPLE -The << NAME OF BIT>> bit and the <<NAME OF FIELD>> field shall be set as shown in table n for the << name of table >>.

**10.2.32 References General**

As a general rule, references to particular pieces of text shall be used instead of repetition of the original source material, since such repetition involves the risk of error or inconsistency and increases the length of the draft specification. However, if it is considered necessary to repeat such material, its source shall be identified precisely.

References shall be made in the forms indicated in 10.2.34 to 10.2.36 and shall not be made to page numbers.

**10.2.33 References to the draft specification as a whole in its own text**

For an individual draft specification the form “this specification” shall be used, except in the introductory texts for the Normative references (see clause 3) and the Terms and definitions (see clause 4) clauses.

The wording shall be altered as a function of the document type concerned (e.g., this specification, this technical report).

Such references are understood to include all amendments and revisions to the draft specification or technical report.

Do not use the form document or standard when referring to a specification or technical report.

### 10.2.34 References to elements of text

For references to elements of text use, for example, the following forms:

- a) see clause 8;
- b) according to 3.1;
- c) as defined in 3.1 b);
- d) details as given in 3.1.1;
- e) see Appendix B;
- f) the requirements given in B.2;
- g) see the note in table 2;
- h) (see x.x.x);
- i) see 6.6.3, example 2; or
- j) see 3.1, equation (3).

The term subclause shall not be used when referencing another subclause (e.g., see subclause 6.6.3 should be see 6.6.3).

### 10.2.35 References to elements of text within a glossary or definitions subclause

In a glossary subclause or a definitions subclause the reference “(see x.x.x)” provides more information about the item immediately preceding the reference.

Example 1 shows a reference “(see 3.1.76)” which informs the reader that subclause 3.1.76 contains further information on procedure calls. Example 2 shows two references, one informs the reader that subclause 3.1.37 contains further information on fields and the other that subclause 3.6.2 contains further information on procedure call input arguments.

EXAMPLE 1 –

#### 4.1.4 argument

A datum provided as input to or output from a procedure call (see 3.1.76).

EXAMPLE 2 –

#### 4.1.13 code value

A defined numeric value, possibly a member of a series of defined numeric values, representing an identified and described instance or condition. Code values are defined to be used in a specific field (see 4.1.37), in a procedure call input argument (see 4.6.2), in a procedure call output argument, or in a procedure call result.

In a glossary subclause or a definitions subclause the reference, “This is the definition. See x.x.x.” indicates additional information on the term being defined is at the reference.

Example 3 shows a reference, “See 5.5.” which informs the reader that subclause 5.5 contains further information on background operations.

EXAMPLE 3 –

#### 4.1.6 background operation

An operation started by a command that continues processing after the task containing the command is no longer in the task set. See 5.5.

Example 4 shows an incorrect reference usage where example 5 shows the correct usage of the references in example 4.

EXAMPLE 4 –

#### 4.1.22 deferred error

An error generated by a background operation (see 4.1.6 and SPC-4).

EXAMPLE 5 –

#### **4.1.22 deferred error**

An error generated by a background operation (see 4.1.6). See SPC-4.

### **10.2.36 References to figures and tables**

Every figure and table included in the document shall normally be referred to in the text.

To reference figure and table use, for example, the following forms:

- a) shown in Figure A.6;
- b) (see Figure 3);
- c) given in Table 2; or
- d) (see Table B.2).

### **10.2.37 References to other documents**

#### **10.2.37.1 General**

All normative references shall be given in the Normative references clause (see clause 3).

#### **10.2.37.2 References**

References may be made only to a complete document or a part thereof.

References shall be understood to include all amendments to and revisions of the referenced document.

Use the following forms:

- a) as defined in ISO/IEC 15888:1996;
- b) (see ISO/IEC 15888:1996);
- c) as defined in SCSI-2; or
- d) (see SCSI-2).

### **10.2.38 Representation of numbers and numerical values**

The decimal sign shall be a period on the line in all language versions.

If a value less than one is written in decimal form, the decimal sign shall be preceded by a zero.

EXAMPLE 1 - 0.001

For decimal numbers group of three digits reading to the left or to the right of a decimal sign shall be separated by a space from preceding digits or following digits respectively, except for four digit numbers designating years.

Binary and hex numbers shall have each group of four digits reading to the left of a decimal sign separated by a space from preceding digits.

EXAMPLE 2 -23 456; 2 345; 2.345; 2.345 6; 2.345 67; but the year 1997

The symbol  $\times$  should be used to indicate multiplication of numbers and numerical values. If there are adjacent items those items are multiplied if there is no operator separating the items. See 10.2.41 for examples of when no operator may be used.

EXAMPLE 3 -Write  $1.8 \times 10.3$  not  $1.8 * 10.3$ .

Exponents shall be shown as superscripts.

EXAMPLE 4 -Write 3<sup>6</sup> not 3\*\*6 or 3^6 or 3^6.

To express values of physical quantities, Western-Arabic numerals followed by the international symbol for the unit (see ISO 80000-1:2009) shall be used.

A range of values should be denoted with a “to” (e.g., 1 to 4, 6 to 20, 1 to 100). A range of values may be denoted with a “..” (e.g., 1..4, 6..20, 1..100). A range of values shall not be denoted with a “-” (e.g., 1-4, 6-20, 1-100).

### **10.2.39 Quantities, units, symbols, and signs**

The International System of units (SI) as set out in ISO 80000-1:2009 shall be used. Symbols for quantities shall be chosen, wherever possible, from the various parts of ISO 80000-1:2009.

The units in which any values are expressed shall be indicated.

The unit symbols for planar angles (i.e., degree, minute and second) shall follow immediately the numerical value (See Appendix A). All other unit symbols shall be preceded by a non-breaking space. In order to insert a non-breaking space into Word press Ctrl+Shift+Spacebar. Another option is to insert Symbol Special Character Non-breaking Space. In Unicode it is encoded at U+00A0.

Mathematical signs and symbols shall be in accordance with ISO 80000-1:2009.

A list concerning quantities and units to be used is given for information in Appendix A.

Double quotes and single quotes shall not be used as units.

### **10.2.40 Mathematical formula**

#### **10.2.40.1 Types of equation**

Equations between quantities are preferred to equations between numerical values. Equations shall be expressed in mathematically correct form, the variables being represented by letter symbols the meanings of which are explained in connection with the equations, unless they appear in a Definitions, symbols, abbreviations, and conventions clause (see clause 4).

The style shown in example 1 shall be followed.

EXAMPLE 1 –

$$v = \frac{l}{t}$$

where:

- v is the speed of a point in uniform motion;
- l is the distance travelled; and
- t is the duration.

If an equation between numerical values is used, the style shown in example 2 shall be followed.

EXAMPLE 2 –

$$v = 3.6 \times \frac{l}{t}$$

where:

- v is the numerical value of the speed, expressed in kilometers per hour (km/h), of a point in uniform motion;
- l is the numerical value of the distance travelled, expressed in meters (m); and
- t is the numerical value of the duration, expressed in seconds (s).

However, the same symbol shall never be used within a draft standard both for a quantity and for its corresponding numerical value (e.g., use of the equation in example 1 and of the equation in example 2 in the same context would imply that  $1 = 3.6$  which obviously is not true).

Descriptive terms or names of quantities shall not be arranged in the form of an equation. Names of quantities or multiletter abbreviated terms (e.g., presented in italics), shall not be used in the place of symbols.

EXAMPLE 3 -

Write

$$\rho = \frac{m}{v}$$

and not

$$\text{density} = \frac{\text{mass}}{\text{volume}}$$

EXAMPLE 4 -

Write

$$\dim(E) = \dim(F) \cdot \dim(l)$$

where:

- E is energy;
- F is force; and
- l is length,

and not

$$\dim(\text{energy}) = \dim(\text{force}) \times \dim(\text{length})$$

EXAMPLE 5 -  
Write

$$t_i = \sqrt{\frac{S_{ME,i}}{S_{MR,i}}}$$

where:

$t_i$  is the statistical value for the system i;  
 $S_{ME,i}$  is the residual mean square for the system i; and  
 $S_{MR,i}$  is the mean square due to regression for the system,

and not

$$t_i = \sqrt{\frac{MSE_i}{MSR_i}}$$

where:

$t_i$  is the statistical value for the system i;  
 $MSE_i$  is the residual mean square for the system i; and  
 $MSR_i$  is the mean square due to regression for the system i.

Notations (e.g.,  $\frac{v}{\text{km/h}}$ ,  $\frac{l}{\text{m}}$ , and  $\frac{t}{\text{s}}$  or v / (km/h), l/m, and t/s) for numerical values may be used.

They may be useful on the axes of graphs and in the headings of columns in tables.

### 10.2.41 Presentation

As far as possible, symbols having more than one level of subscript or superscript (see example 1) should be avoided. Symbols and formula that would involve printing more than two lines of type should be presented in as shown in the example 3.

EXAMPLE 1 -  $D_{1, \max}$  is preferable to  $D_{1_{\max}}$

EXAMPLE 2 - In the text,  $\frac{a}{b}$  is preferable to a / b.

EXAMPLE 3 -In a displayed formula, use:

$$\frac{\sin\left[\frac{(N+1)\phi}{2}\right]\sin\left(\frac{N}{2}\phi\right)}{\sin\left(\frac{\phi}{2}\right)}$$

rather than

$$\frac{\sin[(N+1)\phi/2]\sin((N\phi)/2)}{\sin(\phi/2)}$$

EXAMPLE 4 -To express a mass fraction the following method of expression is sufficient:

$$w = \frac{m_D}{m_S}$$

However, the following equation is also acceptable:

$$w = \frac{m_D}{m_S} \times 100 \%$$

but other expressions (i.e., the percentage by mass) should be avoided.

### 10.2.42 Numbering

If it is necessary to number some or all of the formulas in a draft standard in order to facilitate cross-reference, Arabic numbers in parentheses shall be used, beginning with 1:

$$x^2 + y^2 < z^2 \quad (1)$$

The numbering shall be continuous and independent of the numbering of clauses, tables and figures. Subdivision of formula (e.g., (2a), (2b)) is not permitted.

For the numbering of formula in Appendixes see 10.2.6.1.

The coding within SATA is called 8b/10b. Encoding data to be transmitted should be called 8b/10b encoded pattern. When talking about decoding data use the combined term 10b/8b decoded pattern. The use of 10b and 8b alone shall not be used due to possible confusion with one zero binary or the contradiction of 8 binary.

### 10.2.43 Values, dimensions, and tolerances

Values and dimensions shall be indicated as being minimum or maximum, and specified with their tolerances in an unambiguous manner.

EXAMPLE 1 - 80 mm × 25 mm × 50 mm instead of 80 × 25 × 50 mm.

EXAMPLE 2 - 80 uF ± 2 uF instead of (80 ± 2) uF.

EXAMPLE 3 - 10 kPa to 12 kPa instead of 10 to 12 kPa or 10 - 12 kPa.

EXAMPLE 4 - 0 °C to 10 °C instead of 0 to 10 °C or 0 - 10 °C.

In order to avoid misunderstanding, tolerances on values expressed in percent shall be expressed in a mathematically correct form.

EXAMPLE 5 - Write "from 63 % to 67 %" to express a range.

EXAMPLE 6 - Write 65 % ± 2 % to express a center value with tolerance.

The form 65 ± 2 % shall not be used (i.e., units of measurement on both terms is required).

The degree should be divided decimally, for example write 17.25° rather than 17°15'.

For more information on values, dimensions, and tolerances see also Appendix A.

Any value or dimension that is mentioned for information only shall be clearly distinguishable from requirements.

## Appendix A. (normative) Quantities and units

The following list comprises provisions that are specified elsewhere in the ISO/IEC Directives, or in the particular International Standards dealing with quantities and units:

- a) the decimal sign shall be a period;
- b) Serial ATA specifications shall use only:
  - A) SI units, as given in the various parts of ISO 80000-1:2009;
  - B) a few additional units used with the SI, namely day (d), degree ( $^{\circ}$ ), liter (l), ton (t), and electronvolt (eV), as shown in ISO 80000-1:2009;
  - C) the units neper (Np), bel (B), sone, phon, and octave, which are also given in ISO 80000-1:2009; and
  - D) the units baud (Bd), bit (bit), octet (o), byte (B), erlang (E), hartley (Hart), natural unit of information (nat), shannon (Sh), and var (var), which are given in ISO 80000-1:2009 for use in electrical technology and information technology;

NOTE 3 - For consistency, in Serial ATA specifications only the symbol "l" is used for liter, although the symbol "L" is also given in ISO 80000-1:2009.

- c) do not mix symbols and names of units (e.g., write either "millimeters per second" or "mm/s", and not "mm per second" or "millimeters/second");
- d) combine numerical values written in figures with unit symbols (e.g., "5 m"). Avoid such combinations as "five m" and "5 meters". There shall be a space between the numerical value and the unit symbol except in the case of superscript-type unit symbols used for plane angle (e.g.,  $5.66^{\circ}$ ). However, the degree should be subdivided decimally;
- e) do not use non-standardized abbreviated terms for units (e.g., "sec" instead of "s" for seconds, "mins" instead of "min" for minutes, "hrs" instead of "h" for hours, "cc" instead of "cm<sup>3</sup>" for cubic centimeters, "lit" instead of "l" for liters, "amps" instead of "A" for amperes, "rpm" instead of "r/min" for revolutions per minute);
- f) internationally standardized unit symbols shall not be modified by adding subscripts or other information;

### EXAMPLE 1 –

Examples of standardized units and modifiers:

- a) "U<sub>max</sub> = 500 V" and not "U = 500 V<sub>max</sub>";
- b) "a mass fraction of 5 %" and not "5 % (m/m)"; or
- c) "a volume fraction of 7 %" and not "7 % (V/V)";
- g) do not mix information with unit symbols (e.g., write "the water content is 20 ml/kg" and not "20 ml H<sub>2</sub>O/kg" or "20 ml of water/kg");
- h) equations between quantities are preferred to equations between numerical values;
- i) the quantity "weight" is a force (i.e., gravitational force) and is measured in newtons (N). The quantity "mass" is measured in kilograms (kg);
- j) quotient quantities shall not contain the word "unit" in the denominator (e.g., write "mass per length" or "lineic mass" and not "mass per unit length");
- k) distinguish between an object and any quantity describing the object (e.g., between "surface" and "area", "body" and "mass", "resistor" and "resistance", "coil" and "inductance");
- l) units shall be placed on all numerical values when a range is specified;

### EXAMPLE 2 –

Examples of units placed on numerical values when a range is specified are:

- a) "10 mm to 12 mm" and not "10 to 12 mm" or "10 – 12 mm";
- b) "0 °C to 10 °C" and not "0 to 10 °C" or "0 – 10 °C";
- c) "24 mm × 36 mm" and not "24 × 36 mm" or "(24 × 36) mm";
- d) "23 °C ± 2 °C" not "(23 ± 2) °C" or "23 ± 2 °C"; and

- e) “ $60 \pm 3$  %” and not “ $60 \pm 3$  %” or “ $60$  %  $\pm 3$  %”;
- m) two or more physical quantities shall not be added or subtracted unless they belong to the same category of mutually comparable quantities. Accordingly, the method of expression for a relative tolerance (e.g.,  $230 \text{ V} \pm 5$  %) does not conform to this basic law of algebra.

The following methods of expression may be employed instead:

- A) “ $230 \text{ V} \pm 11.5 \text{ V}$ ”; or
- B) “ $230 \text{ V}$ , with a relative tolerance of  $\pm 5$  %”;

EXAMPLE 3 –

The following form is often used, although not correct:  $(230 \pm 5 \%) \text{ V}$ ;

- n) do not write “log” in formula if the base needs to be specified. Write “lg”, “ln”, “lb”, or “log<sub>a</sub>” where <sub>a</sub> represents the base;
- o) use the mathematical signs and symbols recommended in ISO 80000-1:2009 (e.g., “tan” and not “tg”);
- p) to indicate powers of ten for decimal units the following notation may be used:
  - A)  $10^3$  may be expressed as “kilo” or “k”;
  - B)  $10^6$  may be expressed as “mega” or “M”;
  - C)  $10^9$  may be expressed as “giga” or “G”;
  - D)  $10^{12}$  may be expressed as “tera” or “T”;
  - E)  $10^{15}$  may be expressed as “peta” or “P”; and
  - F)  $10^{18}$  may be expressed as “exa” or “E”;
 and
- q) to indicate powers of two for binary units the following notation may be used:
  - A)  $2^{10}$  may be expressed as “kibi” or “Ki”;
  - B)  $2^{20}$  may be expressed as “mebi” or “Mi”;
  - C)  $2^{30}$  may be expressed as “gibi” or “Gi”;
  - D)  $2^{40}$  may be expressed as “tebi” or “Ti”;
  - E)  $2^{50}$  may be expressed as “pebi” or “Pi”; and
  - F)  $2^{60}$  may be expressed as “exbi” or “Ei”.

## APPENDIX B. (informative) COMMAND AND STATUS EXAMPLES

Editor's Note 4: Tables in this Appendix have all the entries in the bit row and byte column in a bold font, however, an editor may choose to make those entries in a normal font. It is required that all tables of this style use the same type of font (i.e., bold or not bold) within a specification. The command value should be bold.

### B.1 Example of Command Inputs

<general description of the command>

<b>Field</b>	<b>7</b>	<b>6</b>	<b>5</b>	<b>4</b>	<b>3</b>	<b>2</b>	<b>1</b>	<b>0</b>
FEATURES(7:0)	SECTOR COUNT(7:0)							
FEATURES(15:8)	SECTOR COUNT(15:8)							
COUNT(7:0)	TAG					Reserved		
COUNT(15:8)	PRIO(1:0)		Reserved					
LBA(7:0)	LBA(7:0)							
LBA(15:8)	LBA(15:8)							
LBA(23:16)	LBA(23:16)							
LBA(31:24)	LBA(31:24)							
LBA(39:32)	LBA(39:32)							
LBA(47:40)	LBA(47:40)							
ICC(7:0)	ICC(7:0)							
AUXILIARY(7:0)	Reserved							
AUXILIARY(15:8)	Reserved							
AUXILIARY(23:16)	Reserved							
AUXILIARY(31:24)	Reserved							
DEVICE(7:0)	FUA	1	Res	0	Reserved			
COMMAND(7:0)	<b>60h</b>							

**Figure B.1 – Example command definition**

Editor's note 5: Order field definitions top to bottom and left to right.

#### Field Definitions

TAG        The TAG value ...

PRIO       The Priority (PRIO) field value ...

All other fields as defined in <reference>.

## B.2 Example of Success Outputs

<general description>

0	Error(7:0)							R	Status Hi			R	Status Lo			N	I	R	Reserved				FIS Type (A1h)			
1	ACT(31:0)																									

**Figure B.2 – Example command – Successful completion**

### Field Definitions

- Error The Error register shall contain 00h.
- R Reserved, shall be cleared to zero.
- Status As defined in <reference>. The ERR bit shall be cleared to zero indicating successful command completion. Bit 4 may be set to one.
- I Interrupt bit, the interrupt bit shall be set to one.
- ACT The ACT field ...

All other fields as defined in <reference>.

## B.2.1 Example of Error Outputs

<general description>

Field	7	6	5	4	3	2	1	0
ERROR(7:0)	ERROR(7:0)							
COUNT(7:0)	na							
COUNT(15:8)	na							
LBA(7:0)	na							
LBA(15:8)	na							
LBA(23:16)	na							
LBA(31:24)	na							
LBA(39:32)	na							
LBA(47:40)	na							
DEVICE(7:0)	na							
STATUS(7:0)	BSY	DRDY	DF	na	DRQ	na	na	ERR

**Figure B.3 – Example command – error on command receipt**

### Field Definitions

- ERROR ATA error code for the failure condition of the failed command
  - BSY 0
  - DRDY 1
  - DF 0
  - DRQ 0
  - ERR 1
- Status bit 4 may be set to one.

## B.3 Example data structure

### B.3.1 Example data structure with lines separating rows

Editor's Note 6: Example data structure without lines separating rows that you may cut, copy, paste, etc. is shown in Figure B.4.

Word	Description
0..7	As defined in the ATA8-ACS standard
8	Serial ATA command / feature sets supported 15..8 Reserved 7 1 = Reporting support for RECEIVE FPDMA QUEUED <sup>a</sup> , and SEND FPDMA QUEUED <sup>a</sup> is changeable 6 1 = Reporting support for NCQ QUEUE MANAGEMENT <sup>a</sup> is changeable 5 1 = Reporting support for Automatic Partial to Slumber transitions is changeable 4 1 = Reporting support for software settings preservation is changeable 3 1 = Reporting support for asynchronous notification is changeable 2 1 = Reporting support for interface power management is changeable 1 1 = Reporting support for non-zero buffer offsets in DMA Setup FIS <sup>a</sup> is changeable 0 1 = Reporting support for Native Command Queuing <sup>a</sup> is changeable
9	Reserved for Serial ATA
10..255	As defined in the ATA8-ACS standard
<sup>a</sup> Applicable to non-PACKET devices only (i.e., IDENTIFY DEVICE).	

Figure B.4 – Example data structure

## APPENDIX C. (informative) ELEMENTS OF THIS TEMPLATE

### C.1 Style formats

This file is a reference for the style formats in the template for the body of a draft specification. This paragraph is the basic style format for draft specification, called “Normal”.

Table C.1 shows the paragraph formats available from the paragraph catalog for this document.

**Table C.1 – Draft specification styles** (part 1 of 3)

Style	Description
Heading 1 Heading 2 Heading 3 Heading 4 Heading 5 Heading 6 Heading 7 Heading 8	These are the clause and subclause header paragraphs for the specification’s body. Heading 1 is used for a clause title. Heading 2, ...3, ...4, ...5, ...6, ...7, and ...8, are used to insert the x.1, x.1.1, x.1.1.1, x.1.1.1.1, x.1.1.1.1.1, x.1.1.1.1.1.1, and x.1.1.1.1.1.1.1 subclauses, respectively.
NoNumHd	This is a clause heading with the same styles as Heading 1 except this is no clause number and it is not forced to start at the top of a page.
Heading A Heading A2 Heading A3 Heading A4	These are the clause and subclause header styles for an Appendix. Heading A is used for the Appendix number (e.g., A, B, C). Heading A2, ...3, and ...4 are used to insert the A.1, A.1.1, and A.1.1.1 subclauses, respectively.
Normal Normal Indent Equation	Normal is used for most body paragraph styles. Normal Indent indents all the lines in the paragraph except the first. This is useful for descriptions of variables that following an equation or the arguments following a procedure call. Equation is used when an equation is placed in its own paragraph. The style formats that surround a paragraph also affect the white space before and after the paragraph.
IndentList	This is an indented style with no prefix (e.g., no a), A), 1), or bullet). It may be used in lists to position a paragraph at the correct position by tabbing.
UnOrderList0Reset UnOrderList0 UnOrderList1 UnOrderList2 UnOrderList3 UnOrderList0Text	These styles produce an a,b,c unordered list. The a) entry should use the UnOrderList0Reset style. Subsequent list entries at the same level as a) use the UnOrderList0. Additional levels of indention and numbering are obtained using the UnOrderList1, UnOrderList2, and UnOrderList3 styles. Text in a separate paragraph at the first level may be added using a UnOrderList0Text.

**Table C.1– Draft specification style (part 2 of 3)**

Style	Description
OrderedList0Reset OrderedList0 OrderedList1 OrderedList2	These styles produce a 1, 2, 3 ordered list. The 1) entry should use the OrderedList0Reset style. Subsequent list entries at the same level as 1) use the OrderList0 style. Additional levels of indention and numbering are obtained using the OrderedList1, and OrderedList2 styles.
Note NoteExampleText NoteUnorderedListReset NoteUnorderedList	These style formats are used for notes. The Note style starts a note. If another style needs to be added to a note, the NoteExampleText style is used. If an unordered list needs to be added to the note the NoteUnorderedListReset and NoteUnorderedList style is used.
ExampleNoNumber ExampleList ExampleAppendix NoteExampleText	These style formats are used for examples. The ExampleNoNumber style starts an example when there is only one example in the subclause (i.e., the example is not numbered). In the main body of the text (i.e., anything but Appendixes) if there is more that one example in the subclause the ExampleList is used. In the Appendixes use the ExampleAppendix style. If another style needs to be added to an example, the NoteExampleText style is used.
Table TableAppendix Figure FigureAppendix	These are the table and figure title style formats for the draft specification's body and Appendixes.
TableFootnote TableFootnoteAppendix TableFootnoteText	This style is used for normative table notes (called table footnotes by ISO). Normative table notes appear in the bottom most footing row in the table. Use Table > Add Rows or Columns (Add Row To Footing) to get footing rows. Do not put normative table notes in a row in the body of the table. For tables in the main body of the text (i.e., anything but Appendixes) use the TableFootnote style. For tables in the Appendixes use the TableFootnoteAppendix style. If another style needs to be added to a footnote, the TableFootnoteText style is used.
TableNote TableNoteAppendix TableNoteNoNumber	This style is used for informative table notes. Informative table notes appear in a separate footing row above the footing row with footnotes, if any. Use Table > Add Rows or Columns (Add Row To Footing) to get footing rows. Do not put informative notes in a row in the body of the table. The TableNoteNoNumber style starts a note when there is only one note in the table (i.e., the note is not numbered). For tables in the main body of the draft specification (i.e., anything but Appendixes) if there is more than one note in the table, the TableNote style is used for all the notes. For tables in the Appendixes use the TableNoteAppendix style.
FigureFootnote FigureFootnoteAppendix FigureFootnoteText	This style is used for normative figure notes (called figure footnotes byISO). Normative figure notes appear in the bottom of the figure. For figures in the main body of the draft specification (i.e., anything but Appendixes) use the FigureFootnote style. For figures in the Appendixes use the FigureFootnoteAppendix style. If another style needs to be added to a footnote, the FigureFootnoteText style is used.

**Table C.1– Draft specification style (part 3 of 3)**

Style	Description
FigureNote FigureNoteAppendix FigureNoteNoNumber	This style is used for informative figure notes. The FigureNoteNoNumber style starts a note when there is only one note in the figure (i.e., the note is not numbered). For figures in the main body of the draft specification (i.e., anything but Appendixes) if there is more than one note in the figure, the FigureNote style is used for all the notes. For figures in the Appendixes use the FigureNoteAppendix style.
CellBodyCenterMiddle CellBodyLeftMiddle CellBodyLeftTop CellBodyRightMiddle	CellBodyCenterMiddle, CellBodyLeftMiddle, CellBodyLeftTop, and CellBodyRightMiddle are the styles used in the specification cell body in tables. CellBodyCenterMiddle is centered text in the middle of a cell. CellBodyLeftMiddle is a left aligned text in the middle of a cell. CellBodyLeftTop is centered text in the top of a cell. CellBodyRightMiddle is a right aligned text in the middle of a cell.
CellHeadingCenterMiddle CellHeadingLeftMiddle CellHeadingRightTop	CellHeadingCenterMiddle, CellHeadingLeftMiddle, and CellHeadingRightTop are the styles used for column headings in tables. CellHeadingCenterMiddle is centered text in the middle of a cell. CellHeadingLeftMiddle is a left aligned text in the middle of a cell. CellHeadingRightTop text is right aligned at the top of a cell.
PageHeader PageFooter	These are the style formats for page headings and footings. They should be used only in the master pages.
EdNote EdNoteText	These are the Editor’s Note style formats. In EdNote you may edit the paragraph numbering to insert your initials. The EdNoteText allows additional paragraphs to be added to an editor note at the correct indentation.
Code	This is a monospaced font that should only be used when the draft specification requires code listings.
Contacts Cover Title0 Cover Title1 Cover Title2	These are style formats that are used in the front matter, specifically the first two cover pages. These are the title page styles. CoverTitle0 is used for the most prominate main title. CoverTitle1 and ...2 are used for lower level title content.
TOCPage	This is used as the header for page numbers in the TOC, LOT, and LOF.

## C.2 Text attributes

Table C.2 shows the fonts that should be used in a draft specification. Use of fonts other than those listed in Table C.2 may result in errors during generation of the Acrobat file.

**Table C.2 – Draft specification fonts**

Name	Description
Arial	Used for all text except as indicated in this table.
Courier New	Used for programing source code listings.
Symbol	Used for equations and for characters that are not available in the specification character set.

## C.3 Cross reference formats

Table C.3 shows the draft specification related variables defined in this document.

**Table C.3— Draft specification cross reference formats**

Text	Description
(see clause x)	Use for parenthetical references to clauses.
(see x.y.z) or (see a.y.z)	Use for parenthetical references to subclauses.
(see Figure x)	Use for parenthetical references to figures.
(see Table x)	Use for parenthetical references to tables.
X	Use for reference to an Appendix. This reference only places the letter of the Appendix (e.g., A, B, C) being referenced in the text. The editor is required to place the term Appendix or Appendix as appropriate (e.g, Appendix a, Appendix A) in the text.
Clause x	Use for a start of sentence reference to a clause or any reference to a subclause (avoid doing this).
clause x	Use for a mid-sentence reference to a clause.
x.y.z or a.y.z	Use for a mid-sentence reference to a subclause.
Figure x	Use for a start of sentence reference to a figure.
figure x	Use for a mid-sentence reference to a figure.
Table	Use for a start of sentence reference to a table.
table x	Use for a mid-sentence reference to a table.
x	Use in tables for references to table footnotes.

## Bibliography

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Architecture for microcomputer buses [ANSI/IEEE 1212, 1994 Edition]. See <http://www.iso.org/>.

ISO/IEC 14776-412, Information technology - Small computer system interface (SCSI) - Part 412: Architecture

model-2 (SAM-2).

ISO/IEC 14776-413, Information technology - Small computer system interface (SCSI) - Part 412: Architecture

model-3 (SAM-3).

ISO/IEC 10646-1:2000, Information technology - Universal Multiple-Octet Coded Character Set (UCS) - Part 1:

Architecture and Basic Multilingual Plane. See <http://www.iso.org/>.

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Editor's Note 7: This is an example of what a bibliography should look like if one is placed in a Serial ATA specification. A standard that is not required but is listed in informative text (i.e., in a note or informative Appendix) is required to be listed in a bibliography at the end of the specification.

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