Working Draft Project American National Standard

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May 6, 2008

Information technology - USB Attached SCSI (UAS)

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T13 Technical Editor:

Curtis E. Stevens
Western Digital Technologies, Inc.
20511 Lake Forest Dr.
Lake Forest, Ca. 92630
USA

Telephone: 949-672-7933
Email: Curtis.Stevens@wdc.com

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Points of Contact

International Committee for Information Technology Standards (INCITS) T10 Technical Committee

T10 Chair
John B. Lohmeyer
LSI Corporation
4420 ArrowsWest Drive
Colorado Springs, CO 80907-3444
USA

Telephone: (719) 533-7560
Email: lohmeyer@t10.org

T10 Vice-Chair
Mark S. Evans
Western Digital Corporation
5836 Rue Ferrari
San Jose, CA 95138
USA

Telephone: (408) 363-5257
Email: mark.evans@wdc.com

T10 Web Site: http://www.t10.org

T10 E-mail reflector:
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INCITS Secretariat
Suite 200
1250 Eye Street, NW
Washington, DC 20005
USA

Telephone: 202-737-8888
Web site: http://www.incits.org
Email: incits@itic.org

Information Technology Industry Council
Web site: http://www.itic.org

Document Distribution
INCITS Online Store
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USA

Web site: http://www.techstreet.com/incits.html
Telephone: (734) 302-7801 or (800) 699-9277

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15 Inverness Way East
Englewood, CO 80112-5704
USA

Web site: http://global.ihs.com
Telephone: (303) 397-7956 or (303) 792-2181 or (800) 854-7179

American National Standard
for Information Technology

USB Attached SCSI

Secretariat
Information Technology Industry Council

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ABSTRACT

This standard specifies the requirements for the USB Attached SCSI (UAS) transport protocol. The UAS transport protocol defines a mechanism to transport SCSI commands using USB hardware. The UAS transport protocol coordinates with other members of the SCSI family of standards via the SAM-4 architecture model. This standard is intended to be used in conjunction with SCSI command set standards and USB specifications.

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If no patents have been disclosed place the statement in 5.5.2 shall be used.

If any patents have been disclosed place the statement in 5.5.3 shall be used.

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Document Status

Document 08-xxxx is the issues list for this draft. 08-xxxx contains a list of the issues associated with the document, an issue number that remains assigned to the issue for the life of document development, a resolution to the issue, an owner for the issue, and a disposition for the issue.

Revision History		
Rev	**Date**	**Description**
0	January 29, 2008	1) Initial revision

New Capabilities added to UAS

Integrated Proposal List		
#	**Doc**	**Description**
1		No proposals integrated.
2		
3		
4		

Contents

Tables

Figures

Foreword

This foreword is not part of American National Standard INCITS ***-200x.

The purpose of this standard is to define requirements for a USB protocol that is SAM-4 compliant.

With any technical document there may arise questions of interpretation as new products are implemented. INCITS has established procedures to issue technical opinions concerning the standards developed by INCITS. These procedures may result in SCSI Technical Information Bulletins being published by INCITS.

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Requests for interpretation, suggestions for improvement and addenda, or defect reports are welcome. They should be sent to the INCITS Secretariat, National Committee for Information Technology Standards, Information Technology Institute, 1250 Eye Street, NW, Suite 200, Washington, DC 20005- 3922.

This standard was processed and approved for submittal to ANSI by the InterNational Committee for Information Technology Standards (INCITS). Committee approval of the standard does not necessarily imply that all committee members voted for approval. At the time of it approved this standard, INCITS had the following members:

<<Insert INCITS member list>>

The INCITS Technical Committee T10 on SCSI Storage Interfaces, that reviewed this standard, had the following members:

Introduction

This standard encompasses the following:
Clause 1 describes the scope.
Clause 2 provides normative references for the entire standard.
Clause 3 provides definitions, abbreviations, and conventions used within the entire standard.
Clause 4 describes Models.
Clause 5 describes USB requirements.
Clause 6 describes Transport requirements.
Annex A is a placeholder

American National Standard
for Information Technology –

USB Attached SCSI (UAS)

1 Scope

The SCSI family of standards provides for many different transport protocols that define the rules for exchanging information between different SCSI devices. This standard defines the rules for exchanging information between SCSI devices using a USB interconnect. Other SCSI transport protocol standards define the rules for exchanging information between SCSI devices using other interconnects.

Figure 1 shows the relationship of this standard to the other standards and related projects in the SCSI family of standards.

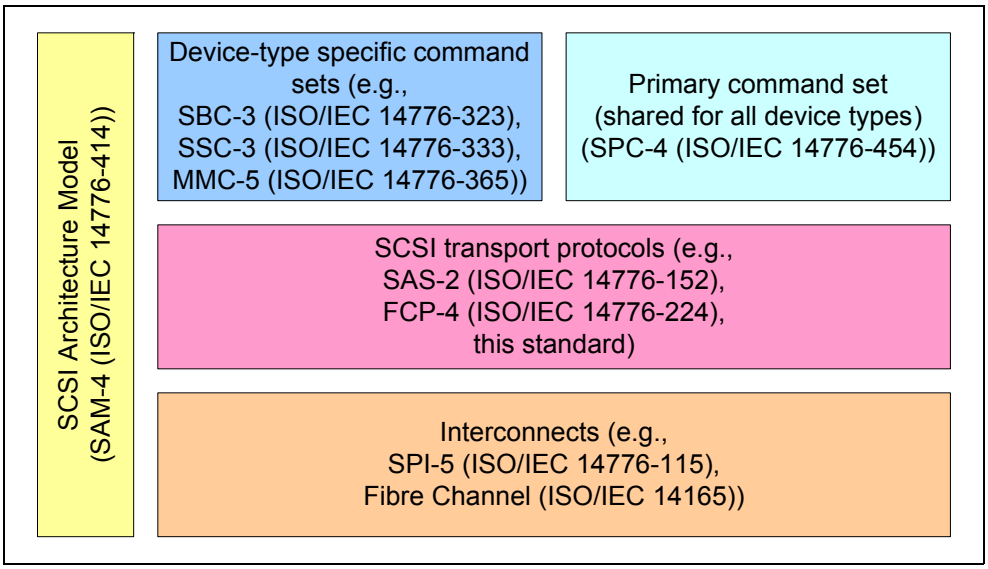

Figure 1 — SCSI document relationships

USB Attached SCSI is a new generation of USB Transport Standards. This standard supports the following features in support of USB-2 and future USB specifications:

a) does not interfere with the USB Mass Storage Class (MSC) bulk-only transport;
b) mechanism to send commands associated with any T10 standard to a USB device;
c) support for queuing in the protocol;
d) support for autosense;
e) compliance with SCSI Architecture Model - 4 (SAM-4) or later; and
f) other capabilities.

2 Normative references

2.1 Normative References

Referenced standards and specifications contain provisions that, by reference in the text, constitute provisions of this standard. At the time of publication, the editions indicated were valid. All standards are subject to revision, and parties to agreements based on this standard 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:

a) approved ANSI standards;
b) approved and draft international and regional standards (e.g., ISO, IEC); and
c) approved and draft foreign standards (e.g., 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.

Table 1 shows standards bodies and their web sites.

Table 1 — Standards bodies

Abbreviation	Standards body	Web site
ANSI	American National Standards Institute	http://www.ansi.org
DIN	German Institute for Standardization	http://www.din.de
IEC	International Engineering Consortium	http://www.iec.ch
IEEE	Institute of Electrical and Electronics Engineers	http://www.ieee.org
INCITS	International Committee for Information Technology Standards	http://www.incits.org
ISO	International Standards Organization	http://www.iso.ch
ITI	Information Technology Industry Council	http://www.itic.org
JIS	Japanese Industrial Standards Committee	http://www.jisc.org
T10	INCITS T10 SCSI storage interfaces	http://www.t10.org
T11	INCITS T11 Fibre Channel interfaces	http://www.t11.org
T13	INCITS T13 ATA storage interface	http://www.t13.org

Additional availability contact information is provided below as needed.

2.2 Approved references

At the time of publication, the following referenced standards or technical reports were approved:

Editor's Note 1: This approved reference is just a placeholder for formatting.

ANSI INCITS TR-35-2004, *Methodologies for Jitter and Signal Quality Specification (MJSQ)*. When MJSQ is referenced from this standard, the FC Port terminology used within MJSQ should be substituted with SAS phy terminology.

2.3 References under development

At the time of publication, the following referenced standards were still under development. For information on the current status of the document, or regarding availability, contact the relevant standards body or other organization as indicated.

ISO/IEC 14776-414, *SCSI Architecture Model-4 (SAM-4)* (T10/1683-D)

ISO/IEC 14776-454, *SCSI Primary Commands-4 (SPC-4)* (T10/1731-D)

ISO/IEC 14776-323, *SCSI Block Commands-3 (SBC-3)* (T10/1799-D)

ISO/IEC 14776-372, *SCSI Enclosure Services-2 (SES-2)* (T10/1559-D)

NOTE 1 — For more information on the current status of these documents, contact the INCITS Secretariat at 202-737-8888 (phone), 202-638-4922 (fax) or via Email at incits@itic.org. To obtain copies of these documents, contact Global Engineering at 15 Inverness Way, East Englewood, CO 80112-5704 at 303-792-2181 (phone), 800-854-7179 (phone), or 303-792-2192 (fax) or see http://www.incits.org.

2.4 Other references

For information on the current status of the listed documents, or regarding availability, contact the indicated organization.

Universal Serial Bus Specification Rev 2.0 (USB-2.0). April 27, 2000

Universal Serial Bus Mass Storage Class Specification Overview Rev 1.2 (MSC-1.2). June 23, 2003

NOTE 2 — For information on the current status of USB documents, see the USB Implementors Forum at http://www.usb.org.

Serial ATA 2.6 (SATA-2.6). 15 February 2007

NOTE 3 — For information on the current status of Serial ATA documents, see the Serial ATA International Organization at http://www.sata-io.org.

SFF-8086, *Compact Multilane Series: Common Elements*

NOTE 4 — For more information on the current status of SFF document, contact the SFF Committee at 408-867-6630 (phone), or 408-867-2115 (fax). To obtain copies of these documents, contact the SFF Committee at 14426 Black Walnut Court, Saratoga, CA 95070 at 408-867-6630 (phone) or 408-741-1600 (fax) or see http://www.sffcommittee.org.

PANTONE® Color Formula Guide

NOTE 5 — Pantone® and PANTONE MATCHING SYSTEM® are registered trademarks of Pantone, Inc. For more information on Pantone colors, contact Pantone, Inc. at http://www.pantone.com.

3 Definitions, symbols, abbreviations, and conventions

3.1 Definitions

3.1.1 aggregation: When used in class diagrams, a form of association that defines a whole-part relationship between the whole (i.e., aggregate) and its parts.

3.1.2 association: When used in class diagrams a relationship between two or more classes that specifies connections among their objects (i.e., relationship that specifies that objects of one class are connected to objects of another class).

3.2 Symbols and abbreviations

Abbreviation	Meaning
XOR	exclusive logical OR
^	exclusive logical OR
x	multiplication
/	division
≠ or NE	not equal
≤ or LE	less than or equal to
±	plus or minus
≈	approximately
x	multiply
+	add
-	subtract
< or LT	less than
= or EQ	equal
> or GT	greater than
≥ or GE	greater than or equal to
AWG	American wire gauge
DUT	Device under test
EMI	Electromagnetic interference
EMC	Electromagnetic compatibility
ESD	Electrostatic discharge
ISI	Intersymbol interference
IU	Information Unit
LSB	Least significant bit
LUN	Logical unit number
MSB	Most significant bit
SBC-2	SCSI Block Commands-2 (see 2.3)
SPC-3	SCSI Primary Commands-3 (see 2.3)

3.3 Keywords

3.3.1 invalid: A keyword used to describe an illegal or unsupported bit, byte, word, field or code value. Receipt by a device server of an invalid bit, byte, word, field or code value shall be reported as error.

3.3.2 mandatory: A keyword indicating an item that is required to be implemented as defined in this standard.

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

3.3.4 may not: A keyword that indicates flexibility of choice with no implied preference.

3.3.5 obsolete: A keyword indicating that an item was defined in prior SCSI standards but has been removed from this standard.

3.3.6 option, optional: Keywords that describe features that are not required to be implemented by this standard. However, if any optional feature defined by this standard is implemented, then it shall be implemented as defined in this standard.

3.3.7 reserved: A keyword referring to bits, bytes, words, fields, and code values that are set aside for future standardization. A reserved bit, byte, word, or field shall be set to zero, or in accordance with a future extension to this standard. Recipients are not required to check reserved bits, bytes, words, or fields for zero values. Receipt of reserved code values in defined fields shall be reported as error.

3.3.8 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 standard.

3.3.9 should: A keyword indicating flexibility of choice with a strongly preferred alternative.

3.3.10 vendor specific: Something (e.g., a bit, field, code value) that is not defined by this standard. Specification of the referenced item is determined by the SCSI device vendor and may be used differently in various implementations.

3.4 Editorial conventions

Certain words and terms used in this standard have a specific meaning beyond the normal English meaning. These words and terms are defined either in the glossary or in the text where they first appear.

Upper case is used when referring to the name of a numeric value defined in this specification or a formal attribute possessed by an entity. When necessary for clarity, names of objects, procedure calls, arguments or discrete states are capitalized or set in bold type. Names of fields are identified using small capital letters (e.g., NACA bit).

Names of procedure calls are identified by a name in bold type (e.g., **Execute Command**). Names of arguments are denoted by capitalizing each word in the name (e.g., Sense Data is the name of an argument in the **Execute Command** procedure call).

Quantities having a defined numeric value are identified by large capital letters (e.g., CHECK CONDITION). Quantities having a discrete but unspecified value are identified using small capital letters. (e.g., TASK COMPLETE, indicates a quantity returned by the **Execute Command** procedure call). Such quantities are associated with an event or indication whose observable behavior or value is specific to a given implementation standard.

Lists sequenced by letters (e.g., a-red, b-blue, c-green) show no priority relationship between the listed items. Numbered lists (e.g., 1-red, 2-blue, 3-green) show a priority ordering between the listed items.

If a conflict arises between text, tables, or figures, the order of precedence to resolve the conflicts is text; then tables; and finally figures. Not all tables or figures are fully described in the text. Tables show data format and values.

Notes and examples do not constitute any requirements for implementors.

3.5 Numeric and character conventions

3.5.1 Numeric conventions

A binary number is represented in this standard by any sequence of digits comprised of only the 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 or 0_0101_1010b).

A hexadecimal number is represented in this standard by any sequence of digits comprised of only the Arabic numerals 0 through 9 and/or the upper-case English letters A through 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 standard by any sequence of digits comprised of only the Arabic numerals 0 through 9 not immediately followed by a lower-case b or lower-case h (e.g., 25).

This standard uses the ISO convention for representing decimal numbers (e.g., the thousands and higher multiples are separated by a space and a comma is used as the decimal point). Table 2 shows some examples of decimal numbers represented using the ISO and American conventions. The decimal representation for a year is 1999 not 1 999.

Table 2 — ISO and American numbering conventions examples

ISO	American
0,6	0.6
3,141 592 65	3.14159265
1 000	1,000
1 323 462,95	1,323,462.95

3.5.2 Byte encoded character strings conventions

When this standard 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, stating that eleven ASCII characters 'SCSI device' are to be encoded would be the same writing out the following sequence of byte values: 53h 43h 53h 49h 20h 64h 65h 76h 69h 63h 65h.

4 Model

4.1 Overview

A USB target shall support a single I_T_Nexus.

Editor's Note 2: This subclause describes the 4 pipe USB model where 2 pipes are command and status, and 2 pipes are data in/out

---

4.2 Placeholder

5 USB

5.1 Overview

This clause describes all information associated with USB to support this transport. This includes USB descriptors and backward compatibility with existing mass storage protocols.

5.2 Backward Compatibility

This transport shall coexist with other USB Mass storage protocols and interfaces

5.3 USB Resource Requirements

5.3.1 Overview

This transport requires one Device Descriptor, one Configuration Descriptor, one Interface Descriptor, and two Endpoint Descriptors (Bulk-in and Bulk-Out). This transport also utilizes the control endpoint.

5.3.2 USB Class Specific Requests

Editor's Note 3: Should we add something here to return the maximum queue depth?

5.3.3 USB Descriptors

5.3.3.1 Device Descriptor

Table 3 — USB Device Descriptor

Bit / Byte	7	6	5	4	3	2	1	0
0	B LENGTH (12h)							
1	B DESCRIPTOR TYPE (01h)							
2	(LSB) BCD USB							
3	BCD USB (MSB)							
4	B DEVICE CLASS (00h)							
5	B DEVICE SUBCLASS (00h)							
6	B DEVICE PROTOCOL (00h)							
7	B MAX PACKET SIZE							
8	(LSB) ID VENDOR							
9	ID VENDOR (MSB)							
10	(LSB) ID PRODUCT							
11	ID PRODUCT (MSB)							
12	(LSB) BCD DEVICE							
13	BCD DEVICE (MSB)							
14	I MANUFACTURER							
15	I PRODUCT							
16	I SERIAL NUMBER							
17	B NUM CONFIGURATIONS							

See USB-20 for a descripiton of all the fields in this descriptor.

Editor's Note 4: Do we want to specify WWN somewhere here, possibly in place of or as the serial number?

5.3.3.2 Configuration Descriptor

Table 4 — USB Configuration Descriptor

Bit / Byte	7	6	5	4	3	2	1	0
0	B LENGTH (09h)							
1	B DESCRIPTOR TYPE (02h)							
2	(LSB)	W TOTAL LENGTH						
3								(MSB)
4	B NUM INTERFACES							
5	B CONFIGURATION VALUE							
6	I CONFIGURATION							
7	Reserved	SELF POWERD	REMOTE WAKEUP	Reserved				
8	MAX POWER							

See USB-20 for the descripiton of all the fields in this descriptor.

5.3.3.3 Interface Descriptor

Table 5 — USB Interface Descriptor

Bit / Byte	7	6	5	4	3	2	1	0
0	B LENGTH (09h)							
1	B DESCRIPTOR TYPE (04h)							
2	B INTERFACE NUMBER							
3	B ALTERNATE SETTING							
4	B NUM ENDPOINTS							
5	B INTERFACE CLASS							
6	B INTERFACE SUBCLASS							
7	B INTERFACE PROTOCOL							
8	I INTERFACE							

See USB-20 for the descripiton of all the fields in this descriptor.

The B INTERFACE PROTOCOL field shall be set to xx (will be assigned by USB).

5.3.3.4 Endpoint Descriptors

Table 6 — USB Bulk-In Endpoint Descriptor

Bit / Byte	7	6	5	4	3	2	1	0
0	B LENGTH (07h)							
1	B DESCRIPTOR TYPE (05h)							
2	DIR (1b)	Reserved			ENDPOINT NUMBER			
3	BM ATTRIBUTES (02h)							
4	(LSB)	W MAX PACKET SIZE						
5								(MSB)
6	Reserved							

See USB-20 for the descripiton of all the fields in this descriptor.

The W MAX PAKET SIZE field shall be greater than or equal to 16.

Table 7 — USB Bulk-Out Endpoint Descriptor

Bit / Byte	7	6	5	4	3	2	1	0
0	B LENGTH (07h)							
1	B DESCRIPTOR TYPE (05h)							
2	DIR (0b)	Reserved			ENDPOINT NUMBER			
3	BM ATTRIBUTES (02h)							
4	(LSB)	W MAX PACKET SIZE						
5								(MSB)
6	Reserved							

See USB-20 for the descripiton of all the fields in this descriptor.

The W MAX PAKET SIZE field shall be greater than or equal to 16.

5.4 Backword Compatibility

Editor's Note 5: USB devices may present support for this standard as an alternate interface. This would allow an existing host to detect a legacy interface. Newer hosts would look for alternate interfaces and turn on UAS.

6 Transport

6.1 Overview

This clause describes the transport protocol. This includes Information Units, data transfer sequences, and transport management.

6.2 Information Units

6.2.1 Overview

Table 8 is a summary of the information units described in this subclause.

Table 8 — IU Identifier Summary

Identifier	Description	Reference
00h	Reserved	
01h	COMMAND IU ID	6.2.2
02h	Reserved	
03h	SENSE IU ID	6.2.5.1
04h	RESPONSE IU ID	6.2.5.2
05h	TASK MANAGEMENT IU ID	6.2.6
06h	READ READY ID	6.2.3
07h	WRITE READY ID	6.2.4
08h..FFh	Reserved	

6.2.2 Command IU

Each Command IU shall be sent in a single USB packet. The Command IU shall not share a packet with any other Information Unit or data. Table 9 describes the Command IU.

Table 9 — Command IU

Byte \ Bit	7	6	5	4	3	2	1	0
0	COMMAND IU ID (01h)							
1	Reserved							
2	(MSB)			COMMAND IDENTIFIER				
3								(LSB)
4	(MSB)			LENGTH				
5								(LSB)
6	Reserved		TASK PRIORITY			TASK ATTRIBUTE		
7	Reserved							
8				LOGICAL UNIT NUMBER				
15								
16				CDB				
31								
32				ADDITIONAL CDB BYTES				
33..LENGTH+5								

The COMMAND IU ID of 01h defines the format of the IU that follows.

The LENGTH field defines the number of bytes in this Command IU folliwing the LENGTH field. The LENGTH field shall be greater than 15. This is the number of bytes needed to transport a six byte CDB.

The COMMAND IDENTIFIER field is defined in SAM-4.

The LOGICAL UNIT NUMBER field contains the address of the logical unit. The structure of the LOGICAL UNIT NUMBER field shall be as defined in SAM-4. If the addressed logical unit does not exist, the task manager shall follow the rules for selection of incorrect logical units defined in SAM-4.

The TASK PRIORITY field specifies the relative scheduling of the task containing this command in relation to other tasks already in the task set, if the tasks have SIMPLE task attributes (see SAM-4).

The TASK ATTRIBUTE field is defined in table 10.

Table 10 — TASK ATTRIBUTE field

Code	Task Attribute	Description
000b	SIMPLE	Specifies that the task be managed according to the rules for a simple task attribute (see SAM-4).
001b	HEAD OF QUEUE	Specifies that the task be managed according to the rules for a head of queue task attribute (see SAM-4).
010b	ORDERED	Specifies that the task be managed according to the rules for an ordered task attribute (see SAM-4).
011b	Reserved	
100b	ACA	Specifies that the task be managed according to the rules for an automatic contingent allegiance task attribute (see SAM-4).
101b..111b	Reserved	

6.2.3 Read Ready IU

The Read Ready IU is sent by a target port to inform the initiator port that the target is ready to send data for a read command or a bidirectional command. Table 16 describes the Read Ready IU.

Table 11 — Read Read Ready IU

Bit / Byte	7	6	5	4	3	2	1	0
0	READ READY IU ID (06h)							
1	Reserved							
2	(MSB)			COMMAND IDENTIFIER				
3								(LSB)

The READ READY IU ID of 06h defines the format of the IU that follows.

The COMMAND IDENTIFIER field is defined in SAM-4.

6.2.4 Write Ready IU

The Write Ready IU is sent by a target port to request write data from the initiator port during a write command or a bidirectional command. Table 16 describes the Write Ready IU.

Table 12 — Write Read Ready IU

Bit / Byte	7	6	5	4	3	2	1	0
0	TRANSFER READY IU ID (07h)							
1	Reserved							
2	(MSB)			COMMAND IDENTIFIER				
3								(LSB)

The WRITE READY IU ID of 07h defines the format of the IU that follows.

The COMMAND IDENTIFIER field is defined in SAM-4.

6.2.5 Status IUs

6.2.5.1 Sense IU

The Sense IU is used to pass status from the target to the initiator. Each Sense IU shall be sent in a single USB packet. The Sense IU shall not share a packet with any other Information Unit or data. Table 13 describes the Sense IU.

Table 13 — Sense IU

Byte \ Bit	7	6	5	4	3	2	1	0
0	SENSE IU ID (03h)							
1	Reserved							
2	(MSB)							
3	COMMAND IDENTIFIER							(LSB)
4								
5	LENGTH							
6	STATUS							
7	Reserved							
8								
LENGTH + 5	SENSE DATA							

The SENSE IU ID of 03h defines the format of the IU that follows.

The COMMAND IDENTIFIER field is defined in SAM-4.

The LENGTH field defines the number of bytes in this Status Unit following the LENGTH field. The LENGTH field shall be greater than 0002h.

The STATUS field shall be set to the status code for the command that has ended (see SAM-4 for a list of status codes).

The SENSE DATA field shall be set to the sense data (see SAM-4). If no SENSE DATA is available, then the LENGTH field shall be set to 0002h.

6.2.5.2 Response IU

The Response IU is used to pass task management status information from the target to the initiator. Each Response IU shall be sent in a single USB packet. The Response IU shall not share a packet with any other Information Unit or data. Table 14 describes the Response IU.

Table 14 — Response IU

Byte \ Bit	7	6	5	4	3	2	1	0
0	RESPONSE IU ID (04h)							
1	Reserved							
2	(MSB)							
3	COMMAND IDENTIFIER							(LSB)
4								
6	ADDITIONAL RESPONSE INFORMATION							
7	RESPONSE CODE							

The RESPONSE IU ID of 04h defines the format of the IU that follows.

The COMMAND IDENTIFIER field is defined in SAM-4.

The ADDITIONAL RESPONSE INFORMATION field contains additional response information for certain task management functions (e.g., QUERY UNIT ATTENTION) as defined in SAM-4. ADDITIONAL RESPONSE

INFORMATION shall be set to 00000000h if the task management function does not define ADDITIONAL RESPONSE INFORMATION or the logical unit does not support response information.

Table 15 defines the RESPONSE CODE field, which specifies the error condition or the completion status of a task management function. See 6.2.6 for the mapping of these response codes to SCSI service responses.

Table 15 — RESPONSE CODE field

Code	Description
00h	TASK MANAGEMENT FUNCTION COMPLETE [a]
01h	Reserved
02h	INVALID INFORMATION UNIT
03h	Reserved
04h	TASK MANAGEMENT FUNCTION NOT SUPPORTED [a]
05h	TASK MANAGEMENT FUNCTION FAILED [a]
06h	Reserved
07h	Reserved
08h	TASK MANAGEMENT FUNCTION SUCCEEDED [a]
09h	INCORRECT LOGICAL UNIT NUMBER [a]
0Ah	OVERLAPPED TAG ATTEMPTED [b]
0Bh-FFh	Reserved

[a] Only valid when responding to a Task Unit.
[b] Returned in case of command/task management function or task management function/task management function tag conflicts.

6.2.6 Task Management IU

The Task Management IU is sent by an initiator to request that a task management function be processed by the task manager in a logical unit. Table 16 describes the Task Management IU.

Table 16 — Task Management IU

Bit / Byte	7	6	5	4	3	2	1	0
0	TASK MANAGEMENT IU ID (05h)							
1	Reserved							
2	(MSB)							
3	COMMAND IDENTIFIER							(LSB)
4	TASK MANAGEMENT FUNCTION							
5	Reserved							
6	(MSB)							
7	TAG OF TASK TO BE MANAGED							(LSB)
8								
15	LOGICAL UNIT NUMBER							

The TASK MANAGEMENT IU ID of 05h defines the format of the IU that follows.

The COMMAND IDENTIFIER field is defined in SAM-4.

Table 17 defines the TASK MANAGEMENT FUNCTION field.

Table 17 — Task Management Functions

Code	Task management function	Uses the LOGICAL UNIT NUMBER field	Uses the TAG OF TASK TO BE MANAGED field	Description
00h	Reserved			
01	ABORT TASK	yes	yes	The task manager shall perform the ABORT TASK task management function with L set to the value of the LOGICAL UNIT NUMBER field and Q set to the value of the TAG OF TASK TO BE MANAGED field (see SAM-4). [a]
02h	ABORT TASK SET	yes	no	The task manager shall perform the ABORT TASK SET task management function with L set to the value of the LOGICAL UNIT NUMBER field (see SAM-4). [a]
03h	Reserved			
04h	CLEAR TASK SET	yes	no	The task manager shall perform the CLEAR TASK SET task management function with L set to the value of the LOGICAL UNIT NUMBER field (see SAM-4). [a]
05h-07h	Reserved			
08h	LOGICAL UNIT RESET	yes	no	The task manager shall perform the LOGICAL UNIT RESET task management function with L set to the value of the LOGICAL UNIT NUMBER field (see SAM-4). [a]
09h-0Fh	Reserved			
10h	I_T NEXUS RESET	no	no	The task manager shall perform the I_T NEXUS RESET task management function (see SAM-4). [a]
11h-3Fh	Reserved			
40h	CLEAR ACA	yes	no	The task manager shall perform the CLEAR ACA task management function with L set to the value of the LOGICAL UNIT NUMBER field (see SAM-4). [a]
41h-7Fh	Reserved			
80h	QUERY TASK	yes	yes	The task manager shall perform the QUERY TASK task management function with L set to the value of the LOGICAL UNIT NUMBER field and Q set to the value of the TAG OF TASK TO BE MANAGED field (see SAM-4). [a]
81h	QUERY TASK SET	yes	no	The task manager shall perform the QUERY TASK SET task management function with L set to the value of the LOGICAL UNIT NUMBER field (see SAM-4). [a]
82h	QUERY UNIT ATTENTION	yes	no	The task manager shall perform the QUERY UNIT ATTENTION task management function with L set to the value of the LOGICAL UNIT NUMBER field (see SAM-4). [a]
83h-FFh	Reserved			

[a] The task manager shall perform the specified task management function with the I and T arguments set to the initiator port and target port involved in the connection used to deliver the Task Management IU.

If the TASK MANAGEMENT FUNCTION field contains a reserved or unsupported value, the task manager shall return a Response IU with the RESPONSE CODE field set to TASK MANAGEMENT FUNCTION NOT SUPPORTED.

If the TASK MANAGEMENT FUNCTION field is set to ABORT TASK or QUERY TASK, the TAG OF TASK TO BE MANAGED field specifies the TAG value from the Command IU that contained the task to be aborted or checked. For all other task management functions, the TAG OF TASK TO BE MANAGED field shall be ignored.

The LOGICAL UNIT NUMBER field contains the address of the logical unit. The structure of the LOGICAL UNIT NUMBER field shall be as defined in SAM-4. If the addressed logical unit does not exist, the task manager shall return a Response IU with the RESPONSE CODE field set to INCORRECT LOGICAL UNIT NUMBER.

6.3 Information Unit Sequences

6.3.1 Send Data-In

6.3.2 Receive Data-Out

Need to add ping-pong diagrams that show sequence of events.

6.4 Transport Requirements

6.4.1 Data Transfer Transport Portocol Services

Once the device has started processing the Data-In delivery service or the Data-Out delivery service for the I_T_L_Q the device shall complete the Data-In or Data-out service before beginning another Data-In or Data-Out service for the I_T_Nexus.

6.5 Asynchronous Notification

Editor's Note 5: Since SAM-4 does not define a mechanism for Asynchronous Status Notificiatoin, we may need to define one here. This would remove the need to poll in removable media devices.

6.6 Virtualization

Place holder.

Annex A
(Normative)

Place Holder

A.1 Overview