

T10/03-007r2

Rev 1: Revised 2002/12/31 to add the KnowledgeTek comments and LSI #288

Rev 2: Revised 2003/01/08 to add Vixel Comments and IBM #926 - #928

Voting Results on T10 Letter Ballot 03-006r0 on

Forwarding SAS to First Public Review

Ballot closed: 2002/12/23 12:00 noon MST

Organization	Name	S Vote	Add'l Info
Adaptec, Inc.	Ron Roberts	P Yes	Cmnts
Amphenol Interconnect	Michael Wingard	P Yes	
Andiamo Systems, Inc.	Claudio DeSanti	P Yes	
BREA Technologies, Inc.	Bill Galloway	P Yes	
Brocade	Robert Snively	P Abs	Cmnts
Cisco Systems, Inc.	David Peterson	P Yes	
Congruent Software, Inc.	Peter Johansson	P Abs	Cmnts
Crossroads Systems, Inc.	Robert Griswold	P Yes	
Dallas Semiconductor	James A. Lott, Jr.	P Yes	
Dell Computer Corp.	Kevin Marks	P Yes	Cmnts
EMC	Gary S. Robinson	P Yes	
Emulex		DNV	
ENDL	Ralph O. Weber	P No	Cmnts
FCI	Douglas Wagner	P Yes	
Fujitsu	Mike Fitzpatrick	P Yes	Cmnts
General Dynamics	Nathan Hastad	P Yes	
Hewlett Packard Co.	Rob Elliott	P No	Cmnts
Hitachi Cable Manchester	Zane Daggett	P Yes	
Honda Connectors	Terry Enright	P Yes	
IBM Corp.	George O. Penokie	P No	Cmnts
Intel Corp.	Cris Simpson	P No	Cmnts
KnowledgeTek, Inc.	Dennis Moore	P Yes	Cmnts
LSI Logic Corp.	John Lohmeyer	P No	Cmnts
Maxtor Corp.	Mark Evans	P Yes	Cmnts
Microsoft Corp.	Rob Haydt	A No	Cmnts
Molex Inc.	Jay Neer	P Yes	
Network Appliance Inc.	James R. (Bob) Davis	P Yes	
Nishan Systems Inc.	Charles Monia	P Yes	
Ophiidian Designs		DNV	
Panasonic Technologies, Inc.	Terence J. Nelson	P Yes	
Philips Electronics	William P. McFerrin	P Yes	
QLogic Corp.	Skip Jones	P Yes	
Quantum Corp.	Paul Entzel	P No	Cmnts
Seagate Technology	Gerald Houlder	P No	Cmnts
Storage Technology Corp.	Dennis Appleyard	A Yes	
Sun Microsystems, Inc.	Vit Novak	P Yes	
Texas Instruments	Paul D. Aloisi	P Yes	Cmnts
Toshiba	Hiroschi Suzuki	P Yes	
TycoElectronics	Jie Fan	P Yes	
UNISYS	Ron Mathews	P Yes	
Veritas Software	Roger Cummings	P Abs	Cmnts
Vixel Corp.	Kenneth Hirata	P Yes	Cmnts

Ballot totals: (29: 8: 3: 2=42)

29 Yes

8 No

3 Abstain

2 Organization(s) did not vote

42 Total voting organizations

1 Duplicate ballot(s) not counted

18 Ballot(s) included comments

This 2/3rds majority ballot passed.

29 Yes are more than half the membership eligible to vote minus abstentions

[greater than 19] AND

29 Yes are at least 25 (2/3rds of those voting, excluding abstentions [37]) AND

29 Yes are equal to or exceed a quorum [14]

Key:

P Voter is principal member

A Voter is alternate member  
 Abs Abstain vote  
 DNV Organization did not vote  
 Cmnts Comments were included with ballot  
 NoCmnts No comments were included with a vote that requires comments

\*\*\*\*\*

Comments attached to Yes ballot from Ron Roberts of  
 Adaptec, Inc.:

Global;

1.0 References to ATA through-out the draft need to be reviewed and changed to SATA where necessary. The interface protocol that SAS implements is SATA. SATA specification in turn references ATA as the upper layer protocol.

2.0 The term "initialization" is used in 3 places. It should be added to the definitions sub-clause.

3.0 The term "idle" used through-out the draft has conflicting meanings. Sometimes it refers to "idle time" and other times to "no activity". We should use "idle time" or "idle dwords" or "no activity".

General

4.0 P24, 4.1.6 2nd para - Last sentence reads "included in SAS domains if the expander device". S/B "included in SAS domains if the Initiator or expander device"

5.0 P30, 5th para - "physical links that make up to pathway", S/B "physical links that make up the pathway".

6.0 P66, Figure 33 Internal backplane environment - It is unclear where power for the target device is derived.

7.0 P68, Table 30 - For clarification, a SATA column S/B added that clearly shows that the connections are the same.

8.0 P68, Table 30 - Name Column - Names should match SATA to resolve confusion. Refer to figure 6 in SATA 1.0. Use the same terminology used in Table 31 for Rx and Tx signals.

9.0 P71, 5.4.2 2nd para - S/B "one, two, three, or four active physical links".

10.0 P72, 5.7.1 1st para - Is "transmitter and receiver characteristic tables, See Tables 35 & 36, only".

11.0 P73, Figure 35 & 36 - distance from connector pin to loads S/B specified. The connector should also be identified.

12.0 P74, Table 34 - note b - refer to the SATA 1.0 specification

13.0 P77, Top of page - add a new sub-clause 5.7.4.1

14.0 P82, 5.7.11, 3rd para - Is "specification of the external, initiator, expander .....device transmitter". S/B "specification of the initiator, expander .....device transmitter". What is an external device transmitter?

15.0 P94, 6.5 1st para - "signals are low-speed signal patterns detected". S/B "signals are low-speed envelope patterns detected".

16.0 P97, 3rd para - e.g. should read "a SAS receiver shall support its current speed and one generation less. A 3.0Gbps receiver shall support 1.5Gbps, a 6.0Gbps receiver need only support 3.0Gbps. The transmitter and

reciever portion of the PHY shall support the same rate.

17.0 P98, 6.6.1, last sentence - "After a HARD RESET a device" S/B "After receipt of a HARD RESET primitive a device".

18.0 P104, Table 49 -RCD - comments- reads "Used by transmitter and reciever to caculate the speed negotiation window time." S/B "Used by transmitter and reciever to indicate the speed negotiation window is beginning."

19.0 P104, Table 49 3rd row - "(SNTT for reciever)" S/B "(SNTR for reciever)"

20.0 P104, Table 49 6th row - "(SNLT for reciever)" S/B "(SNLR for reciever)"

21.0 P105, 1st sentence- "If the recieved phy supports the physical link rate..." S/B "If the phy supports the recieved physical link rate..."

22.0 P106, 1st sentence - "...SAS phy fails speed negotiation, it shall....." S/B "...SAS phy fails speed negotiation at all supported rates, it shall....."

23.0 P138, 7.1.4.9, 4th para - TBD?

24.0 P143, 7.1.6.5, delete "used as"

25.0 P151, clarify what is a SMP target/initiator?

26.0 P161, Figure 68 - the figure does not match the verbage on the previous page - sub-clause 7.10.

27.0 P229, the RETRANSMIT bit shall. Where is the bit shown in the SSP Frame format table 88 or table 96?

28.0 P240, remove the editors note

\*\*\*\*\*

Comments attached to Abs ballot from Robert Snively of Brocade:

I am not sufficiently familiar with the material to judge it properly. If I have an opportunity to study it, I may later modify my vote.

\*\*\*\*\*

Comments attached to Abs ballot from Peter Johansson of Congruent Software, Inc.:

Insufficient time to review the draft standard.

\*\*\*\*\*

Comments attached to Yes ballot from Kevin Marks of Dell Computer Corp.:

Request investigation of keying feature for SAS 4X external connection to allow future compatibility with SATA 4X JBODs. The current cable selection (non-keyed) is not compatible with any keyed cable. Proposal could anticipate a keyed SAS connector for controllers and JBODs, and a keyed SAS/SATA connector for controllers only.

Request investigation of the HDD connector keying feature to prevent SAS drives from plugging into SATA backplanes. Most drive slots use bays and

carriers with integrated levers for increased seating force. The drive carrier lever engages with the front panel just prior to the connection engagement, which means activating the lever to seat the drive will cause damage to the drive and midplane connectors due to the increased (10x) forces involved.

\*\*\*\*\*

Comments attached to No ballot from Ralph O. Weber of  
ENDL:

ENDL 1

PDF pg 5, pg v

Remove revision history before delivering the dpANS to Public Review.

ENDL 2

PDF pg 41, pg 6, 3.1.17 confirmation

Is a confirmation really just a single parameter passed from a lower layer to a higher layer? Or, is a confirmation a passing of parameters and other state information from a lower layer to a higher layer?

ENDL 3

PDF pg 41, pg 6, 3.1.25 device

The definition of device should include some relationship to SAS. As currently defined, a 'device' may be a pencil, a house, a spaceship, or the moon.

ENDL 4

PDF pg 41, pg 6, 3.1.27 direct current

Provide a definition for A.C.

ENDL 5

PDF pg 41, pg 6, 3.1.27 direct current

Provide a definition for 'signal'. Relying on the standard English definition for 'signal' allows a Stop sign to be a 'signal'.

ENDL 6

PDF pg 42, pg 7, Global

The reason why 'signal' is not a defined term is becoming clear, i.e. 'signal' has no consistent usage in SAS. The term 'signal' as used in the ER definition almost certainly means something very different than the term 'signal' as used in the D.C. definition. Otherwise, a SAS expander operates by switching raw waveforms from one phy to another, which seems unlikely to be the case. The inconsistent usage of 'signal' is far and away the most egregious problem ENDL discovered in its Limited Letter Ballot review.

ENDL 7

PDF pg 42, pg 7, 3.1.43 expander port

Please provide a subject for this 'sentence': 'Contains one or more phys.'

ENDL 8

PDF pg 42, pg 7, 3.1.55 hash function

Since 'domain' is equivalent to 'SAS domain' (see 3.1.31), a hash function can be applied only to a SAS domain, whatever that means. Perhaps 'domain' can be replaced with 'value range' twice in the 3.1.55 definition.

ENDL 9

PDF pg 43, pg 8, 3.1.62 indication

Is an indication really just a single parameter passed from a lower layer to a higher layer? Or, is an indication a passing of parameters and other state information from a lower layer to a higher layer?

ENDL 10

PDF pg 43, pg 8, 3.1.63 information unit

'Portion' s/b 'The portion'

## ENDL 11

PDF pg 43, pg 8, 3.1.70 link

'A physical link.' s/b 'Synonymous with physical link (see 3.1.86).'

## ENDL 12

PDF pg 44, pg 9, 3.1.80 OOB sequence

'OOB signals. Part of' s/b 'OOB signals, part of'

## ENDL 13

PDF pg 44, pg 9, 3.1.96 request

Is a request really just a single parameter passed from a higher layer to a lower layer? Or, is a request a passing of parameters and other state information from a higher layer to a lower layer?

## ENDL 14

PDF pg 44, pg 9, 3.1.98 response

Is a response really just a single parameter passed from a higher layer to a lower layer? Or, is a response a passing of parameters and other state information from a higher layer to a lower layer?

## ENDL 15

PDF pg 45, pg 10, after 3.1.110 SATA domain

Since SAS primitive has a definition, should SATA primitive have a definition?

## ENDL 16

PDF pg 45, pg 10, 3.1.115 SCSI initiator device

'originate device service' s/b 'originates device service'

## ENDL 17

PDF pg 46, pg 11, 3.1.137 table routing method

It is not clear from the definitions whether a table routing method could result in a routing to an end device. If that is possible, both table routing and direct routing may do the same thing. If that is not possible, then 'route connection requests' should be 'route connection requests to devices other than end devices'.

## ENDL 18

PDF pg 50, pg 15, 3.4 Editorial conventions

'Fields containing only one bit are usually referred to as the name bit instead of the name field.' is a repeat of the second sentence in the third paragraph in this subclause. Remove this paragraph because the earlier sentence uses small caps more correctly.

\*\*\*\*\*

Comments attached to Yes ballot from Mike Fitzpatrick of Fujitsu:

Comments for SAS Revision 3 letter ballot

## FUJITSU-1

PDF page : ix

Section : 1.19 Revision sas-r02c

Figure/Table

Paragraph/sentence/row/column

Comment : 1.19 Revision sas-03

## FUJITSU-2

PDF page : 6

Section : 3.1.18 connection

Figure/Table

Paragraph/sentence/row/column

Comment : It defines only SSP(SCSI) case. SMP/STP case should be added. since "3.1.78 nexus:" explains only SCSI and "see SAM-3"

## FUJITSU-3

PDF page : 109

Section : 6.8.2 OOB sequence status

Figure/Table : Figure 56

Paragraph/sentence/row/column : line 3

Comment : "Phy layer SAS phy (SP) state machine" / "SAS phy (SP) state machine" unification of the term as "SAS phy layer (SP) state machine"

## FUJITSU-4

PDF page : 139

Section : 7.1.4.11 OPEN\_REJECT

Figure/Table :

Paragraph/sentence/row/column line 2

Comment : "The response to some OPEN\_REJECTs is to abandon the connection request and the response to other OPEN\_REJECTs is to retry the connection request." This "response" makes confusion as RESPONSE to the originator of OPEN\_REJECT. An "action" seems better to understanding.

## FUJITSU-5

PDF page : 139

Section : 7.1.4.11 OPEN\_REJECT

Figure/Table : Table 61

Paragraph/sentence/row/column: 2nd row

Comment : OPEN\_REJECT (CONNECTION RATE NOT SUPPORTED) by "Any device".

No Expander case, this is a mistake of OOB speed matching sequence.

But how to communicate using different speed?

So, this is the case of only Expander.

## FUJITSU-6

PDF page : 139

Section : 7.1.4.11 OPEN\_REJECT

Figure/Table : Table 61

Paragraph/sentence/row/column : 1st, last row

Comment : In case of BAD/WRONG destination, Initiator can report to Upper Application, but device can do nothing except to terminate the command. This kind of logical error should be reported on appropriate method.

## FUJITSU-7

PDF page : 163

Section : 7.12.2.2 Connection request responses

Figure/Table : Table 78

Paragraph/sentence/row/column : 4th row

Comment : "OPEN address frame" indicates two connection requests crossing on the physical link." In no expander case, the action should be defined to avoid racing condition or ping-pong condition. For instance, Initiator implicitly abandon the connection request,

and

Target proceeds operation.

## FUJITSU-8

PDF page : 163

Section : 7.12.2.2 Connection request response

Figure/Table : Table 78

Paragraph/sentence/row/column : row 5 BREAK

Comment : According to 7.12.5 and 7.12.6, BREAK is used by originator at first. If BREAK is responded for Connection (OPEN address

frame),

this is a protocol error. So, "The destination port or expander port may reply with BREAK indicating the connection is not being established." is not correct. BREAK is the response of the BREAK of open requester not correct response of Connection request

(OPEN

address frame).

## FUJITSU-9

PDF page : 167

Section : 7.12.5 Abandoning a connection request

Figure/Table : Table 81

Paragraph/sentence/row/column : row 3 No response and timer expires

Comment : In case of response time out of BREAK, there should be clear action definition. Since BREAK is used for AIP timeout, the response timeout of BREAK is double timeout condition. Link initialization or something to recover or terminate queue action should be taken. (Then, the other path action should be taken on multiple port devices in future.)

\*\*\*\*\*

Comments attached to No ballot from Rob Elliott of Hewlett Packard Co.:

Summary of Comments on Serial Attached SCSI Standard

HP #1

PDF Page ix

1.19 Revision sas-r02d

This should be sas-r03 not sas-r02d.

HP #2

PDF Page 30

4.1.11 Connections

This general intro needs to make it clear that frames related to one command (ATA or SCSI) may be transferred in different connections. A connection need not stay open for the duration of the command.

HP #3

PDF Page 59

4.6.11.3 Expander route table

Change "expander" to "expander device" before (i.e., self-reference)

HP #4

PDF Page 61

4.6.11.3 Expander route table

Table 26 - Expander route table levels

Change "SAS address of the device" to "SAS address of the port" for each entry

HP #5

PDF Page 114

6.8.3 SP state machine

Implement Editor's Note 1 about the interaction between SP and SP\_DWS.

HP #6

PDF Page 137

7.1.4.4 BROADCAST

Make one of the BROADCAST primitives BROADCAST (VENDOR SPECIFIC).

HP #7

PDF Page 137

7.1.4.4 BROADCAST

Increase the total number of broadcast primitives to 8. There are 4 more D04.7 codes available.

HP #8

PDF Page 142

7.1.5.6 RRDY (Receiver ready)

Remove:

"RRDY (RESERVED 2) Reserved. Processed the same as RRDY (NORMAL)."

There is no primitive code assigned for this.

HP #9

PDF Page 143

7.2 Clock skew management

Remove blank line after second paragraph

HP #10

PDF Page 151

7.7.2 IDENTIFY address frame

"The SAS ADDRESS field indicates the SAS address of the device transmitting the IDENTIFY address frame."

It's really the SAS address of the port, not the device.

HP #11

PDF Page 160

7.9 Power management

Change "If the primitives arrives" to "If the primitive arrives"

HP #12

PDF Page 162

7.12.2.1 Connection request

"If none of the

prospective intermediate physical links does not support the requested connection rate,"

should be

"If one of the ..."

[from hcurley@indra.com]

HP #13

PDF Page 163

7.12.2.2 Connection request responses

BREAK is effectively referenced twice by table 81 since it shows up here, and this table shows up in table 81

Need to differentiate between originated and received BREAKs (the latter need responses) too

HP #14

PDF Page 165

7.12.3.1.4 Pathway Recovery

This comparison should also include the connection rate as the lowest priority bits, so two requests from a wide port (which have the same source address) resolve consistently

This parallels the normal arbitration fields specified in 7.12.3.1.1 (which uses AWT, source address, connection rate)

HP #15

PDF Page 207

7.17.3 Preparing to close an STP connection

Add "or" before the last option in the list: "detected, [or] after"

HP #16

PDF Page 216

8.3.2 Port layer

remove duplicate header numbers

HP #17

PDF Page 224

8.4.3.1.2 PL\_PM I\_T nexus loss timer

Second list:

a) Open Failed (Connection Rate Not Supported)

is unnecessary since targets are required to try 1.5 Gbps and that will never get this error

(at least for target side)

HP #18

PDF Page 228

9.2.1 SSP frame format

Table 88 - SSP frame format

Change TIMEOUT bit to RETRANSMIT

HP #19

PDF Page 240



9.2.5.1 Target port error handling  
 and 9.2.6.3.9 in the state machine  
 "the target port shall return a  
 CHECK CONDITION status with a sense key of ILLEGAL REQUEST and an  
 additional sense code of  
 INFORMATION UNIT TOO SHORT (see 9.2.6.3.9)."  
 Instead, return a RESPONSE frame with a RESPONSE CODE indicating this  
 problem. Don't involve the application layer.

HP #20

PDF Page 240

9.2.5.1 Target port error handling  
 "the target port shall return a CHECK CONDITION status with a sense key of  
 ILLEGAL  
 REQUEST and an additional sense code of INFORMATION UNIT TOO LONG (see  
 9.2.6.3.9)."  
 Instead, return a RESPONSE frame with a RESPONSE CODE and don't bother the  
 application layer.

HP #21

PDF Page 258

9.2.6.3.9.1 State description (for ST\_TTS7)  
 Editor's Note 3 - add service response argument to SCSI Command Received ()  
 and Task Management Function Request ()  
 This note should be rejected. Errors in command frame reception should  
 generate RESPONSE frames with RESPONSE CODE  
 errors, not CHECK CONDITIONS.

HP #22

PDF Page 258

9.2.6.3.9.1 State description (ST\_TTS7)  
 Editor's Note 4 - add Local Service Response to Send Command Complete ()  
 and Task Management Function Executed ()  
 Implement only if a SAM-3 proposal is accepted in the letter ballot  
 resolution timeframe.

HP #23

PDF Page 259

9.3.1 Initial FIS  
 Change "the SMP REPORT SATA PORT function" to "the SMP REPORT PHY SATA  
 function"

HP #24

PDF Page 259

9.3.2 SATA tunneling for multiple STP initiator ports  
 Change "CLOSE CLEAR AFFILIATION" to "CLOSE (CLEAR AFFILIATION)"

HP #25

PDF Page 292

10.1.9 SCSI vital product data  
 Table 128 - Device Identification VPD page required identification  
 descriptors  
 The target device name should follow the common string format being  
 proposed in 02-419 (if that is accepted by CAP).  
 Only SAS-only devices should be required to use the "naa." format name for  
 a target device name.  
 Similarly, only SAS-only devices should be required to use the NAA binary  
 formats for logical unit names.

HP #26

PDF Page 294

10.3.1 SMP functions  
 Add a GENERAL CONTROL function 80h.  
 It has bits to  
 reset internal targets of each protocol  
 clear affiliation of an internal STP target  
 only reset one at a time or multiple at a time allowed?

HP #27

PDF Page 296

10.3.1.2 REPORT GENERAL function  
 EXPANDER ROUTE INDEXES paragraph  
 ...route indexes PER PHY  
 also note that some phys may not reach this limit

HP #28  
 PDF Page 296  
 10.3.1.2 REPORT GENERAL function  
 Table 131 - REPORT GENERAL response  
 The row labeled byte 28 should be labeled byte 11.

HP #29  
 PDF Page 296  
 10.3.1.2 REPORT GENERAL function  
 Table 131 - REPORT GENERAL response  
 The first row labeled byte 31 should be labeled byte 27.

HP #30  
 PDF Page 302  
 10.3.1.4 DISCOVER function  
 "The ATTACHED SAS ADDRESS field contains the SAS address of the attached phy."  
 It's really the SAS address of the attached port, as reported by the attached phy.

HP #31  
 PDF Page 302  
 10.3.1.4 DISCOVER function  
 "The SAS ADDRESS field contains the SAS address of this phy."  
 It's really the address reported by this phy, not the address of this phy.

HP #32  
 PDF Page 382  
 Annex J SAS Logo  
 Figure J.1 - SAS Logo  
 The SCSI Trade Association has a new logo for SAS to replace this one.

\*\*\*\*\*

Comments attached to No ballot from George O. Penokie of IBM Corp.:

IBM #1  
 PDF Page ii  
 Points of Contact  
 George Penokie's email address is gop@us.ibm.com

IBM #2  
 PDF Page iii  
 Abstract  
 This abstract is inaccurate and should be rewritten to the following:  
 This standard defines mechanical, electrical, timing requirements, command, and task management delivery protocol requirements to transfer commands and data between SCSI devices attached to a SCSI serial interface. This standard is intended to be used in conjunction with the SCSI command sets. The resulting interface facilitates the interconnection of computers and intelligent peripherals and thus provides a common interface standard for both system integrators and suppliers of intelligent peripherals.

IBM #3  
 PDF Page v  
 Revision Information  
 This needs to be removed before public review.

IBM #4  
 PDF Page x  
 Contents  
 Indents only go one deep. So, for example, everything under clause 4 should

be intended to the same level no matter how many sub-sections there are. This will happen at either ANSI or ISO any way. Also, when the indents are more than four deep there is a readability issue with long section titles.

IBM #5

PDF Page x

Contents

The term 'Page' needs to be moved so the 'e' aligns with the LSD of the page number.. Page: xxxiii

IBM #6

PDF Page x

Foreword

The INCI TS Leadership should be adding here as follows:

Karen Higginbottom, Chair

David Michael, Vice-Chair

Monica Vago, Secretary

IBM #7

PDF Page x

Foreword

The t10 Leadership should be adding here as follows:

John B. Lohmeyer, Chair

George O. Penokie, Vice-Chair

Ralph O. Weber, Secretary

IBM #8

PDF Page x

Foreword

The list of t10 members should be added here. A good format is to place the list in three columns (see SPI-5)

IBM #9

PDF Page 1

Figure 1

The statement << this standard >> should in this case be replaced with SAS.

IBM #10

PDF Page 1

Figure 2

The statement << this standard >> should in this case be replaced with SAS.

IBM #11

PDF Page 4

2.3 References under development

Global

The format of the notes should be << NOTE 1 - >> the dash is missing.

IBM #12

PDF Page 4

As far as I can tell there are no references to these documents within this standard. So why are they listed as normative? They should be removed or appropriate references added.

IBM #13

PDF Page 5

3.1.13 broadcast primitive processor

The statement << The portion of an ... >> should be changed to << An object within an ... >>.

IBM #14

PDF Page 5

3.1 Definitions

The ATA definitions should be replaced with document 03-022.

IBM #15

PDF Page 6

3.1.31 domain:

Get rid of this by using << SAS domain >> in all cases.

IBM #16

PDF Page 6

3.1.32 downstream phy:

The term << primary>> should be deleted as it provide no additional information to the definition.

IBM #17

PDF Page 6

3.1.17 confirmation

A confirmation is not a parameter that is passed rather it is the a response returned from a lower layer indicating completion of a request from a higher layer.

IBM #18

PDF Page 7

3.1.39 expander connection router (ER):

The statement << The portion of an ...>> should be changed to << An object within an ... >>.

IBM #19

PDF Page 7

3.1.41 expander function:

The statement << The portion of an ... >> should be changed to << An object within an ... >>..Sequence number: 3

IBM #19

PDF Page 7

3.1.44 expander route entry:

So what is << A single destination SAS address >>? Do not all SAS addresses belong to an individual device? If so then all are single destination SAS addresses.

IBM #20

PDF Page 7

3.1.55 hash function:

Change the statement << into a hashed value >> to << into a shorter hashed value >>.

IBM #21

PDF Page 8

3.1.62 indication:

An indication is not a parameter that is passed rather it is a transaction from a lower layer that conveys a request to a higher layer.

IBM #22

PDF Page 8

3.1.72 link reset sequence:

This is way to detailed and is a duplicate of what is in 4.4. Delete <<an identification sequence, or a phy reset sequence followed by a hard reset sequence, another phy reset sequence, and an identification sequence>> and replace with <<one or more other sequences (see 4.4).>>

IBM #23

PDF Page 9

3.1.96 request:

A request is not a parameter that is passed rather it is a transaction request from a higher layer that invokes a service from a lower layer.

IBM #24

PDF Page 9

3.1.98 response:

A response is not a parameter that is passed rather it is a transaction from a higher layer that conveys the result of a request to a lower layer.

IBM #25

PDF Page 9

## 3.1.91 programmed maximum physical link rate:

The definition is no place to be defining the default value. Delete <<defaults to the hardware maximum physical link rate.>>

## 3.1.92 programmed minimum physical link rate:

The definition is no place to be defining the default value. Delete <<defaults to the hardware maximum physical link rate.>>

## IBM #27

PDF Page 10

## 3.1.116 SCSI initiator port:

The statement <<requests and responses are routed>> should be <<requests and confirmations are routed>>. Note this is also wrong in SAM-3.

## IBM #28

PDF Page 10

## 3.1.119 SCSI target port:

The statement <<requests and responses are routed>> should be <<indications and responses are routed>>. Note this is also wrong in SAM-3.

## IBM #29

PDF Page 11

## 3.1.129 spread spectrum clocking (SSC):

This should be deleted as the term is not used anywhere else in this standard.

## IBM #30

PDF Page 11

## 3.1.124 Serial Attached SCSI (SAS):

The term <<protocol>> should be <<protocols>> as there are at least two protocols defined (i.e., SMP and SSP)

## IBM #31

PDF Page 12

## 3.1.146 transport protocol service confirmation:

## 3.1.147 transport protocol service indication: .

## 3.1.148 transport protocol service request:

## 3.1.149 transport protocol service response:

I don't think these should even be in the glossary. But if they remain they need to change in the same manner suggested in the confirmation, indication, request, and response definitions.

## IBM #32

PDF Page 12

## 3.1.151 upstream phy:

The term << primary >> should be deleted as it provide no additional information to the definition.

## IBM #33

PDF Page 12

## 3.2 Symbols and abbreviations

Primitives should not be listed in the abbreviations list. Remove all primitives from the list.

## IBM #34

PDF Page 13

## 3.2 Symbols and abbreviations

Primitives should not be listed in the abbreviations list. Remove all primitives from the list.

## IBM #35

PDF Page 13

## 3.2 Symbols and abbreviations

Primitives should not be listed in the abbreviations list. Remove all primitives from the list.

## IBM #36

PDF Page 14

## 3.3.6 need not: :

Remove one of the :s

IBM #37

PDF Page 16

Figure 3

The indication goes from lower layers to higher layers. This should be response name.

IBM #38

PDF Page 16

Figure 3

The indication goes from lower layers to higher layers. This should be response name.

IBM #39

PDF Page 16

Figure 3

The Response goes from higher layers to lower layers. This should be indication name.

IBM #40

PDF Page 16

Figure 3. The Response goes from higher layers to lower layers. This should be indication name

IBM #41

PDF Page 17

3.5.3 Parameters, requests, indications, confirmations, and responses  
Loss the """" around the <<'(to all states)'\>>.

IBM #42

PDF Page 17

3.6 Bit and byte ordering

There is not need to redefine the LSB and MSB acronym as it has already been defined in the abbreviations list. Change <<least significant bit (LSB) is shown on the right and the most significant bit (MSB)>> to <<LSB is shown on the right and the MSB>>.

IBM #43

PDF Page 19

4.1.1 Architecture overview

This which should be a that.

IBM #44

PDF Page 19

4.1.1 Architecture overview

This which should be a that.

IBM #45

PDF Page 20

4.1.2 Physical links and phys

The statement <<A phy is a transceiver; it is the object in a ...>> should be changed to <<A phy is a transceiver and it is the object in a ...>>

IBM #46

PDF Page 21

4.1.2 Physical links and phys

The statement <<unique phy identifier (see 4.2.6) within the device.>> should be changed to <<phy identifier (see 4.2.6) that is unique within the device>>.

IBM #47

PDF Page 21

4.1.2 Physical links and phys

This should be deleted as it only contains information that is defined elsewhere. It adds nothing to the standard and could easily be forgotten about and not updated in the next version of the standard. Delete << Phys transmit and receive bits at physical link rates of 1,5 Gbps or 3,0 Gbps (see 5.7). The bits are part of

dwords (see 6.1) which have been 8b10b coded into 10-bit characters (see 6.2).>>

IBM #48

PDF Page 24

4.1.6 Target devices

\*\*\*

The idea that a target would support both SCSI and ATA is too weird to conceive. I would like the idea deleted. The effect is that some of the and/or's change to or and figure 9 loses the middle set of boxes.

IBM #49

PDF Page 25

Figure 10

The term <<(optional)>> should be deleted as everything is optional unless stated otherwise.

IBM #50

PDF Page 25

4.1.8.2 Edge expander device set

The statement <<grouped into edge expander device sets.>> should be changed to <<grouped into an edge expander device set>>

IBM #51

PDF Page 25

4.1.8.2 Edge expander device set

The statement <<The edge expander device sets are>> should be <<An edge expander device set is>>

IBM #52

PDF Page 25

4.1.8.2 Edge expander device set

The statement <<Edge expander device sets are>> should be <<An edge expander device set is>>.

IBM #53

PDF Page 26

Figure 11

The term <<(optional)>> should be deleted as everything is optional unless stated otherwise. Page: 28

IBM #54

PDF Page 26

4.1.10 Expander device topologies

After the sentence that ends in <<is configured.>> add in the following sentence <<The method used to configure edge expander device sets is outside the scope of this standard.>>

IBM #55

PDF Page 26

Figure 14

The bracket that is labeled <<64 edge expander device sets>> should be rotated 90 degrees and be stretched to bracket the two edge expander device sets.

IBM #56

PDF Page 29

Figure 15

The bracket that is labeled <<64 attached devices or edge expander device sets>> should be rotated 90 degrees and be stretched to bracket the edge expander device set, the initiator or target devices, and the ...s.

IBM #57

PDF Page 29

Figure 16

The bracket that is labeled <<64 physical links per edge expander device set>> should be rotated 90 degrees and be stretched to bracket the initiator or target devices.

IBM #58

PDF Page 29

Figure 16

The bracket that is labeled <<2 edge expander device sets>> should be rotated 90 degrees and be stretched to bracket the 2 edge expander device sets.

IBM #59

PDF Page 30

4.1.11 Connections

The statement <<(b) SCSI initiator port(s) to expander port(s) to SCSI target port(s); and>> is not correct. You cannot establish a connection between more than one initiator port and target port at a time. The statement should be changed to <<(b) SCSI initiator port to expander port(s) to SCSI target port; and>>. The same is probably true for item c.

IBM #60

PDF Page 30

Global

Having the anchored frame tag at the end of a paragraph can cause paragraphs, lines, and even individual words to be separated by large amounts of white space. This can make it difficult to read. The solution to this is to place the anchor in its own paragraph. I recommend this be done throughout this standard.

IBM #61

PDF Page 32

Figure 18

The text in the key list is not lined up.

IBM #62

PDF Page 33

4.2.2 SAS addresses

The statement <<names in this>> in note 7 should be <<names defined by this standard.>>

IBM #63

PDF Page 34

4.2.2 SAS addresses

The \_ notation needs to be added to the notations section.

IBM #64

PDF Page 34

4.2.6 Phy identifier

The statement <<a unique 8-bit identifier within the device.>> should be changed to <<an 8-bit identifier that is unique within the device.>>.

IBM #65

PDF Page 35

4.3.1 State machine overview

The statement <<and target devices and their relationships to each other and to the SAS device,>> should be changed to <<and target devices, their relationships to each other, and to the SAS device,>>

IBM #65

PDF Page 36. Sequence

Figure 20

The blue dotted line on the last thing on the right is not connected to the correct text box. On closer inspection it looks like there are two other blue dotted lines that look like they are going to the wrong place and there are two boxes with no lines coming out.

IBM #66

PDF Page 39

Figure 23

In general this is too detailed for a SAS standard. Reduce the details. At a minimum reduce or eliminate the SATA primitives. All



that is needed are some << SATA primitives >> labels.

IBM #67

PDF Page 39

Tables 9 through 22

There needs to be a better notation for the direction indication. the --> and <-- looks hooky.

IBM #68

PDF Page 39

Tables 9 through 22

In these tables the acronyms for the state machines are used but not all of them have been defined at this point in the standard.

One solution would be to make a list or table of all the state machines with there acronyms before table 9. Another way would be to add in keys to every table with the acronym followed by the long name.

IBM #69

PDF Page 39

4.3.3 Signals between state machines

This section needs to be replaced with proposal 03-023.

IBM #70

PDF Page 40

Tables 11 through 15

Where ever there are multiple blank rows they should be combined to make a single blank area.

IBM #71

PDF Page 45

Table 18

Why is this the only table that has something called an <<Expander function>> in the layers column? It seems out of place. At the minimum some kind of explanation is needed as to what it is and why it is here. .Page: 49

IBM #72

PDF Page 45

4.4.2 Hard reset

In the statement <<If the port is part of a SCSI device, this causes a Transport Reset>> it is not clear what the <<this>> is referring to. This needs to be corrected.

IBM #73

PDF Page 45

4.4.2 Hard reset

There should be a reference to SPC-3 at the end of the last paragraph of this section.

IBM #74

PDF Page 45

4.5 I\_T nexus loss

The statement <<an open connection time out in response>> should be changed to <<an open connection time out occurs in response>>

IBM #75

PDF Page 45

4.5 I\_T nexus loss

The term <<expires>> is not a word that should be used (look up the definition). It could easily be translated into dies. A quick fix would be to use <<times out>>. But I am open to other suggestions.

IBM #76

PDF Page 45

4.6.1 Expander device model overview

We have not used the A,B,C convention in any t10 standards yet. We have been just using the a,b,c even in second level lists. If we are going to start using this then we need to define in the conventions section how we will indicate up to four(?) levels for both

ordered and unordered lists. I don't think that is necessary and that changing this to a,b,c would not cause any confusion.

IBM #77

PDF Page 45

4.6.1 Expander device model overview

I see no benefit from the statement <<For the maximum number of phys, see 4.1.8>>. It should be deleted or at a minimum reduced to <<(see 4.1.8)>>.

IBM #78

PDF Page 45

4.5 I\_T nexus loss

The statement <<it shall retry the connection request until: >> appears to be in conflict with Table 61 – OPEN\_REJECT abandon primitives. That table includes OPEN\_REJECT (CONNECTION RATE NOT SUPPORTED). So who can it be retried and abandoned at the same time. This needs to be fixed.

IBM #78

PDF Page 50. Sequence

Figure 25

What is the statement <<Narrow or wide port>> have to do with this figure? It seems like it is saying there is a port that connects the expander function to the external SAS port. I believe it should be deleted.

IBM #79

PDF Page 50. Sequence

4.6.1 Expander device model overview

In figure 25 it appears the <<external expander port>> is called an <<external SAS port>> also the same figure lists <<IR>> while the text lists <<SL\_IR>>. This inconsistent terminology needs to be resolved.

IBM #80

PDF Page 50. Sequence

4.6.1 Expander device model overview

There are several cases of inconsistent terminology between this section and figure 25. These all need to be resolved to one set of terms.

IBM #81

PDF Page 51

4.6.6 Expander device interface

The statement <<The interaction between an XL state machine and the expander function is called the expander device interface, and uses signals called requests, confirmations, indications, and responses.>> should be changed to <<The interaction between the XL state machine and the expander function consists of requests, confirmations, indications, and responses. This interaction is called the expander device interface.>>

IBM #82

PDF Page 52

Figure 26

The outputs from the broadcast primitive processor should be called confirmation not indication. The indication only occurs when there are interim steps between the request and the confirmation.

IBM #83

PDF Page 53

Figure 27

The outputs from the broadcast primitive processor should be called confirmations not indications. The indication only occurs when there are interim steps between the request and the confirmation..Page: 55

IBM #84

PDF Page 53

Table 24

Global

All the request/indication terms should be changed to just request. There is no need to state the indication part of the procedure.

IBM #85

PDF Page 53

Table 24

Global

All the confirmation/response terms should be changed to just confirmation. There is no need to state the response part of the procedure.

This change should also be made in the globally.

IBM #86

PDF Page 53

4.6.9 Expander connection router interface

The term <<signals>> is not correct here. I'm not sure what it should be maybe <<dwords>> or <<parameters>>.

IBM #87

PDF Page 59

4.6.9 Expander connection router interface

The <<, etc.>> should be deleted because the e.g. implies an etc. at the end of the list.

IBM #88

PDF Page 59

4.6.9 Expander connection router interface

The following <<For each of the level 2 devices that:

a) is an edge expander device with M phys; and

b) is attached to a phy in the level 1 edge expander device with the table routing attribute,

the next M entries shall be the SAS addresses of the devices (level 3)

attached to that level 2 edge expander device.>> should be

changed to <<For each of the level 2 devices that is an edge expander

device with M phys and is attached to a phy in the level 1

edge expander device with the table routing attribute, the next M entries

shall be the SAS addresses of the devices (level 3)

attached to that level 2 edge expander device.>>

IBM #89

PDF Page 65

5.1 SATA cables and connectors (informative)

This section should be placed in a annex that describes any SATA specific functions. . Page: 66

IBM #90

PDF Page 65

Figure 32

The statement <<Tx to Rx on each>> should be changed to <<the Tx signal to the Rx signal on each>>

IBM #91

PDF Page 67

5.2 SAS cables and connectors

The following paragraph should be a footnote in table 29 and should be modified as shown <<The SATA device plug connector

(e.g., used by a <<SATA>> disk drive) may be attached to a SAS backplane receptacle

connector or a SAS internal cable receptacle connector, connecting the primary signal pairs and leaving the second signal pairs unconnected.

IBM #92

PDF Page 67

5.2 SAS cables and connectors

The term <<drive>> should be deleted as the form factors apply to a size of a device not the type of device.

IBM #93

PDF Page 67

### 5.3.2.1 SAS plug connector overview

The statement <<(for SAS cables) and SAS backplane receptacle connectors (for SAS backplanes).>> should be <<for SAS cables and SAS backplane receptacle connectors for SAS backplanes>>

IBM #94

PDF Page 67

### 5.3.3 SAS internal cable receptacle connector

The statement <<link, pins S8 through S14, is>> should be <<link (i.e., pins S8 through S14) is>>.

IBM #95

PDF Page 68

Table 30

So when I hook up all the voltage and precharge pins together and blow-up the drive and the possibly the power supply who is going to be responsible.

This should change to <<

The precharge pin and each corresponding voltage pin shall be connected together (e.g., the V5 precharge pin is connected to the two V5 pins).>>.

IBM #96

PDF Page 68

The statement << AT+ of connector 1 shall connect to AR+ >> should be << AT+ signal of connector 1 shall connect to AR+ signal >>.

IBM #97

PDF Page 68

### 5.3.6 SAS external cable plug connector

It the statement << It attaches >> what is the << it >> supposed to be be? I'm not sure. This needs to be fixed.

IBM #98

PDF Page 68

### 5.3.5 SAS internal connector pin assignments

The statement <<Table 30 shows>> should be <<Table 30 defines>>.

IBM #99

PDF Page 69

### 5.3.7 SAS external receptacle connector

It the statement << It attaches >> what is the << it >> supposed to be be? I'm not sure. This needs to be fixed.

IBM #100

PDF Page 69

### 5.3.8 SAS external connector pin assignments

The statement <<Table 31 shows>> should be <<Table 31 defines>>.

IBM #101

PDF Page 70

### 5.4.1 SAS internal cables

The statement << SATA-style cable receptacle on the initiator device >> should be << SATA-style cable receptacle (see SATA) on the initiator device >>.

IBM #102

PDF Page 70

### 5.4.1 SAS internal cables

The following << A SAS initiator device shall use a SATA-style host plug connector for connection to the SAS internal cable. The SATA host plug connector is defined in SATA. The signal assignment for the SAS initiator device or expander device with this connector shall be the same as defined for a SATA host in SATA. >> should be changed to << A SAS initiator device shall use a

SATA-style host plug connector (see STAT) for connection to the SAS internal cable. The signal assignment for the SAS initiator device or expander device with this connector shall be the same as a SATA host (see SATA). >>

IBM #102

PDF Page 71. Sequence

5.4.2 SAS external cables

The statement << not carry power>> should be changed to << not contain power >>.

IBM #103

PDF Page 71. Sequence

5.6 READY LED pin

The statement << READY LED signal is raised, >> should be << READY LED signal is asserted, >>

IBM #104

PDF Page 71. Sequence

5.6 READY LED pin

The following should be deleted << since this pin may be connected by a system directly to power supply GROUND. >>. The standard does not need to justify a requirement.

IBM #105

PDF Page 71. Sequence

5.6 READY LED pin

global

Whenever a signal name is used it needs to be followed by the term << signal >>. Several places in this section READY LED is used without the term << signal >>. It should have been written as << READY LED signal >> in all cases.

IBM #106

PDF Page 71. Sequence

5.6 READY LED pin

The title of this section is not correct. It should be << READY LED signal >>.

IBM #107

PDF Page 71. Sequence

5.6 READY LED pin

global

There should be a reference to where the <<standby or stopped power condition state, >> are defined.

IBM #108

PDF Page 71. Sequence

5.6 READY LED pin

global

There should be a reference to where the <<. active or idle power condition state, >> are defined.

IBM #109

PDF Page 72

5.6 READY LED pin

The references to the a,b,c list items should have a cross-reference link.

5.7.2 General interface specification

\*\*\*\*

All references to a BER should be removed from this standard. The value as specified is not low enough and specifying a lower number is not practical. Any SAS design that only meets the current specified BER will fail any qualification being used today.

IBM #111

PDF Page 72

5.7.2 General interface specification

\*\*\*\*

The following statement indicates there are cable lengths specified in this standard but there are none.

I believe that with out guidance from this standard as to what reasonable lengths are for cables this group is doing a disservice to the using community. I proposal cable lengths be specified in the same manner as they are in SPI-5.

<< TxRx connections operating at the maximum specified distances may require some form of equalization (e.g., transmitter pre-emphasis, receiver adaptive equalization, or passive cable equalization) to enable the signal requirements to be met. >>

IBM #112

PDF Page 74

Table 34

The entries in the characteristics column should be left justified.

IBM #113

PDF Page 74

Table 34

The term << or odd mode, >> is not used anywhere else in this standard and should be deleted.

IBM #114

PDF Page 74

Table 34

The statement << rate (both up and down). >> should be << rate for both power on and power off conditions. >>

IBM #115

PDF Page 75

5.7.3.2 Delivered (receive) eye mask at IR, CR, and XR

The term << delivered (receive) >> should be changed to << receive >>

IBM #116

PDF Page 76

5.7.3.3 Jitter tolerance masks

In the statement starting with << However, the leading >> the << however >> seems odd. It's not clear as to where the << however.>> is referring to. Either the sentence needs to move or the << however >> should be deleted. I think deletion is the right answer.

IBM #117

PDF Page 76

5.7.4 Transmitted signal characteristics

After the first usage of the statement << SATA 1.0 signal levels >> there needs to be a the << (see SATA) >> reference added.

IBM #118

PDF Page 77

Table 35

There need to be a reference to were the << CJTPAT test pattern >> is.

IBM #119

PDF Page 77

Table 36

This table should be broken into three tables with titles of:

<< Delivered signal characteristic at IR compliance points >>, << Delivered signal characteristic at CR compliance points >>, and << Delivered signal characteristic at XR compliance points >>. Then the first column can be deleted and the table will not flow across multiple pages.

IBM #120

PDF Page 78

Table 36

The term << guaranteed >> should be deleted in all cases. Standards in general do not give guarantees. I do not believe anything would be lost if it is deleted.

IBM #121

PDF Page 80

## 5.7.8 Jitter compliance test pattern (CJTPAT)

What the heck does CJPAT stand for: Jitter compliance test pattern or compliant protocol frame? It appears to be defined as both here. This needs to be resolved.

IBM #122

PDF Page 81

Table 39

The formatting of table 39 needs work. The super-script is running into the double lines..Sequence number: 2

IBM #122

PDF Page 81

Table 39

The last sentence of the footnotes does not have a period.

IBM #123

PDF Page 81

Table 39

The term << media >> is not defined. This needs to be added to the glossary.

IBM #124

PDF Page 82

5.7.11 Transmitter characteristics

global

The term << A. C. >> needs to be changed to <<A.C.>> in all cases.

IBM #125

PDF Page 82

5.7.11 Transmitter characteristics

global

The term << D. C. >> needs to be changed to <<D.C.>> in all cases.

IBM #126

PDF Page 82

5.7.11 Transmitter characteristics

global

There should be no << etc. >> at the end of an e.g. list. The ect is implied in all e.g. lists and is therefore not needed.

IBM #127

PDF Page 82

5.7.11 Transmitter characteristics

In the equation for S21 it is not clear what << f >> is. There needs to be a << Where: >> after the equation that describes << f >>.

IBM #128

PDF Page 82

5.7.11 Transmitter characteristics

The statement << determined by measurement made >> seems to be missing a word. I think it should be << determined by a measurement made >>.

IBM #129

PDF Page 86

The << Usage in SATA >> column should be deleted. As most there could be a footnote stating << For the SATA usage of K28.3 and K28.5 characters see SATA. >>

IBM #130

PDF Page 88

6.3.2 Transmission order

The statement << (SOF delimiter) >> is not complete in SAS because we use other delimiters. It should be change to << (e.g., SOF delimiter) >>.

IBM #131

PDF Page 88

6.3.2 Transmission order

The statement << (EOF delimiter) >> is not complete in SAS because we use other delimiters. It should be change to << (e.g., EOF delimiter) >>.

IBM #132

PDF Page 88

#### 6.3.3.1 Definitions

The statement << two (not necessarily different) transmission >> should be change to << two, not necessarily different, transmission >>.

IBM #133

PDF Page 88

#### 6.3.3.1 Definitions

The term << Current RD >> should not be capitalized. Change to << current RD >>.

IBM #134

PDF Page 88

#### 6.3.3.1 Definitions

The term << Current RD >> should not be capitalized. Change to << current RD >>.

IBM #135

PDF Page 92

#### 6.3.3.2 Generating transmission characters

In the statement << the table shall be found >> what table is being referred to? I don't know and this needs to be fixed.

IBM #136

PDF Page 93

The << 16 >> at the top needs to be fixed.

IBM #137

PDF Page 95

#### 6.5 Out of band (OOB) signals

\*\*\*\*

The term << UI >> is used throughout this section with a different meaning than in all section up to this point. In this section it is assumed to be a fixed value while in all other sections it assumed to be a value the is related to the data rate of the bus. This inconsistency cannot be allowed. The thing that is called UI in this section needs to be renamed. I like OOB! Out Of Band Interval. This would then be defined as the G! UI.

IBM #138

PDF Page 95

Table 46

This statement << UI (OOB) is different than that defined in SATA; SAS has tighter clock tolerance. >> is meaningless in this standard as there are lots of differences between SAS and SATA.

IBM #139

PDF Page 97

#### 6.5 Out of band (OOB) signals

The statement << Figure 47 describes SAS OOB signal detection by the SP receiver. >>

needs a cross-reference to the SP receiver section which 6.7.

IBM #140

PDF Page 97

#### 6.5 Out of band (OOB) signals

Here's another one of those chopped sentences that occur because of the anchor placement.

IBM #141

PDF Page 97

Tables

Global

Many of the table have spacing between the double line borders and the text



that is to close. This needs to be fixed on all tables.

IBM #142

PDF Page 99

#### 6.6.2 SATA phy reset sequence (informative)

This entire section should be deleted as it only described SATA functionality that is a duplicate of what is defined in the SATA document. If not deleted then it should be moved to a informative annex.. Sequence number: 2

IBM #142

PDF Page 99

#### 6.6.3 SAS to SATA phy reset sequence

The statement << in response to a COMINT, >> should be << in response to receiving a COMINT, >>.

IBM #143

PDF Page 100

Figure 50

The << Time z >> and it's definition are not lined up.

IBM #144

PDF Page 102

#### 6.6.4.1 SAS 00B sequence

The statement <<phy A starting the SAS 00B sequence before, after, or at the same time as SAS phy. >> should be << phy A starting the SAS 00B sequence before, after, or at the same time as SAS phy B. >>.

IBM #145

PDF Page 103

#### 6.6.4.2 SAS speed negotiation sequence

The statement << like the SATA speed negotiation sequence. >> is not relevant to this standard and should be deleted.

IBM #146

PDF Page 103

#### 6.6.4.2 SAS speed negotiation sequence

The SNLT is defined elsewhere so there is not need for the statement << a subset of the SNTT used by the receiver. >> which is more confusing than helpful. Delete it.

IBM #147

PDF Page 104

Table 49

The hot-plug time out should be a requirement not a option. The <<should>> should be changed to a << shall >>

IBM #148

PDF Page 104

This statement << UI (00B) is different than that defined in SATA; SAS has tighter clock tolerance. >> is meaningless in this standard as there are lots of differences between SAS and SATA.

IBM #149

PDF Page 104

#### 6.6.4.2 SAS speed negotiation sequence

\*\*\*\*

Much of the information in this section after table 49 is an exact duplicate of the information provided in the SAS speed negotiation states sections. It is not a good idea to have the same thing defined in two places in the standard. I suggest that the duplicate information in this section be placed in annex B.

IBM #150

PDF Page 105

#### 6.6.4.2 SAS speed negotiation sequence

The statement << (supported by phy A but not by phy B, so invalid), >> should be << (i.e., supported by phy A but not by phy B, so invalid), >>

IBM #151

PDF Page 105

#### 6.6.4.2 SAS speed negotiation sequence

The statement << (supported by phy A but not by phy B, so invalid), >> should be << (i.e., supported by phy A but not by phy B, so invalid), >>

IBM #152

PDF Page 106

#### 6.6.5 Phy reset sequence after device is attached

The transmission of COMINIT should be a requirement not a option. The <<should>> should be changed to a << shall >>

IBM #153

PDF Page 108

#### 6.8 SAS phy (SP) state machine

All the states that have << Await >> in the title should be change to << Wait >>.

IBM #154

PDF Page 108

#### 6.8.1 Overview

The statement << from the management layer >> should be deleted as the general rule is that we do not state where things come from in state diagrams.. Page: 109

IBM #155

PDF Page 108

#### 6.8.2.1.1 State description

The statement << This state shall send a Transmit COMINIT parameter to the SP transmitter and wait for COMINIT to be transmitted and/or received.>> should be << Upon entry into this state, this state shall:

- a) request a COMINIT be transmitted by sending a Transmit COMINIT parameter to the SP transmitter then wait for the receipt of a COMINIT Transmitted parameter and/or a COMINIT Detected parameter; and
- b) send a PhyNotReady parameter to the SP\_DWS state machine. >>

IBM #156

PDF Page 108

#### 6.8.2.1 SP1: OOB\_COMINIT state

There is a problem with this state in that there is not indication as to the timing relationship between the receipt of COMINIT Transmitted and COMINIT Detected. This does not allow one to pick out which one of the three transitions to make. For example a COMINIT transmitted is received so how long does the state wait before determining that no COMINIT detected is going to occur? Or the reverse? This needs to be fixed.

IBM #157

PDF Page 108

Figure 56

The statement << (to all states in the SP state machine causing transition to SP1: OOB\_COMINIT) >> should be changed to << causes all states to transition to SP1: OOB\_COMINIT) >>

IBM #158

PDF Page 108

Figure 56

The labels on the state transitions should be deleted and they don't necessarily give the complete reason for the transition.

IBM #159

PDF Page 110

#### 6.8.2.3.1 State description

The statement << This state is entered when a COMINIT sequence has been detected but the COMINIT initiated in SP1: OOB\_COMINIT has not been completely transmitted. >> should be deleted as we do not describe entry conditions only exit

condi ti ons.

IBM #160

PDF Page 110

#### 6.8.2.4.1 State description

The statement << This state is reached when a COMINIT has been transmitted and detected.>> should be deleted as we do not describe entry conditions only exit conditions.

IBM #161

PDF Page 110

#### 6.8.2.4.1 State description. The statement << This state shall send a

Transmit COMSAS parameter to the SP transmitter and wait for COMSAS to be transmitted and/or detected..>> should be << Upon entry into this state, this state shall request a COMSAS be transmitted by sending a Transmit COMSAS parameter to the SP transmitter then wait for the receipt of a COMSAS Transmitted parameter and/or a COMSAS Detected parameter. >>

IBM #162

PDF Page 110

#### 6.8.2.4 SP4: 00B\_COMSAS state

There is a problem with this state in that there is not indication as to the timing relationship between the receipt of COMSAS Transmitted and COMSAS Detected. This does not allow one to pick out which one of the three transitions to make. For example a COMSAS Detected is received so how long does the state wait before determining that no COMSAS Transmitted is going to occur? The reverse? This needs to be fixed.

IBM #163

PDF Page 110

#### 6.8.2.3.1 State description

The statement << This state waits for COMINIT to be transmitted. >> should be << This state waits for receipt of a COMINIT Transmitted parameter. >>

IBM #164

PDF Page 111

#### 6.8.2.6.1 State description

The statement << This state is entered when a COMSAS sequence has been both transmitted and detected. >> should be deleted as we do not describe entry conditions only exit conditions.

IBM #165

PDF Page 111

#### 6.8.2.7.1 State description

The statement << time out timer shall be initialized and enabled. >> should be << time out timer shall be set to it's initial value and enabled. >>

IBM #166

PDF Page 111

#### 6.8.2.7.2 Transition SP7: 00B\_AwaitCOMSAS to SP1: 00B\_COMINIT

The statements << If all of these conditions are true: ... this state shall send a Broadcast Event Notify (SATA Spinup Hold) confirmation to the expander function and perform this transition. NOTE 11 In other words, SMP PHY CONTROL-based requests to reset the phy bypass spinup hold; all other resets honor it. >> should be changed to <<This state shall send a Broadcast Event Notify (SATA Spinup Hold) confirmation to the expander function if: .... >> This deletes the note.

IBM #167

PDF Page 113

Figure 57

The term << window >> in 2 places should be << rate >>.

IBM #168

PDF Page 113

## Figure 57

The << ALIGN1 Detected >> going into SP11 looks like it is coming from SP10.

IBM #169

PDF Page 113

## Figure 57

The labels on the state transitions should be deleted and they don't necessarily give the complete reason for the transition.

IBM #170

PDF Page 114

## 6.8.3.1.1 State description

The following statement should be deleted as the information stated is already stated elsewhere << This allows time required for a transmitter to switch to either the next higher or next lower supported speed. >>

IBM #171

PDF Page 114

## 6.8.3.1.1 State description

The following statement << This state marks the beginning of the SAS speed negotiation process. >> should be << This is the initial state of the SAS speed negotiation >>.

IBM #172

PDF Page 114

## 6.8.3.1.1 State description

The following statement should be deleted as the same information is duplicated in the last sentence of this section << It is used to transmit idle in between SAS speed negotiation windows. >>.

IBM #173

PDF Page 114

## 6.8.3.1.1 State description

The statement <<... RCD timer shall be initialized and >> should be << ... RCD timer shall be set to it's initial value and enabled...>>.

IBM #174

PDF Page 114

## 6.8.3.1.2 Transition SP8: SAS\_Start to SP10: SAS\_AwaitALIGN

The statement << speed negotiation window is supported. >> should be << speed negotiation rate is supported. >> It's not the window that's supported or not supported but the link rate for that window.

IBM #175

PDF Page 114

## 6.8.3.1.3 Transition SP8: SAS\_Start to SP9: SAS\_RateNotSupported

The statement << speed negotiation window is not supported. >> should be << speed negotiation rate is not supported. >> It's not the window that's supported or not supported but the link rate for that window.

## 6.8.3.1.1 State description

This should be an a.b.c list like this:

Upon entering this state, this state shall:

- a) set the RCD timer to it's initial value;
- b) enable the RCD timer; and
- c) send the Set Rate parameter to the SP transmitter to select the next negotiated rate.

IBM #177

PDF Page 114

## 6.8.3.1.1 State description

The statement << During this state idle shall be transmitted. >> should be changed to << This state shall request idle dwords be transmitted by repeatedly sending a Transmit Idle Dword parameter to the SP transmitter (see 7.3). >>

IBM #178

PDF Page 114

#### 6.8.3.2.1 State description

The statement << During this state idle shall be transmitted. >> should be changed to << This state shall request idle dwords be transmitted by repeatedly sending a Transmit Idle Dword parameter to the SP transmitter (see 7.3). >>

IBM #179

PDF Page 114

The statement << SNTT timer shall be initialized and enabled. >> should be << SNTT timer shall be set to it's initial value and enabled. >>

IBM #180

PDF Page 114

#### 6.8.3.2.1 State description

This statement adds nothing but confusion and should be deleted << The state machine exits from this state after the SNTT expires.>>

IBM #181

PDF Page 114

#### 6.8.3.1.2 Transition SP8: SAS\_Start to SP10: SAS\_AwaitALIGN

The statement << occur if the RCD timer expires and the current >> should be << occur after the RCD timer expires if the current >>. The timer will always time out.

IBM #182

PDF Page 114

#### 6.8.3.1.3 Transition SP8: SAS\_Start to SP9: SAS\_RateNotSupported

The statement << occur if the RCD timer expires and the current >> should be << occur after the RCD timer expires if the current >>. The timer will always time out.

IBM #183

PDF Page 114

#### 6.8.3.2.2 Transition SP9: SAS\_RateNotSupported to SP14: SAS\_Fail

The statement << if the >> should be <<after the >> as the timer will always time out.

IBM #184

PDF Page 114

6.8.3.3.1 State description. The following should be made into an a,b,c list << The state machine shall start transmitting ALIGN (0) primitives at the current rate (G1, G2, G3.).

Upon entering this state, the SNTT timer and SNLT timer shall be initialized and enabled. >> as follows:

<< Upon entering this state, this state shall:

- a) request ALIGN (0) be transmitted at the current rate (e.g., G1, G2, G3) by repeatedly sending a Transmit ALIGN0 parameter to the SP transmitter; and
- b) the SNTT timer and SNLT timer shall be set to their initial value and enabled. >>.

IBM #185

PDF Page 114

#### 6.8.3.3.1 State description

The statement << synchronization occurs before >> should be changed to << synchronization (i.e., ALIGN0 Detected parameter or ALIGN1 Detected parameter received) occurs before >>.

IBM #186

PDF Page 114

#### 6.8.3.1.1 State description

The statement << speed negotiation window received as an argument. >> should be changed to << SAS Speed Negotiation Window Rate argument. >>

IBM #187

PDF Page 115

#### 6.8.3.4.1 State description

The statement << This state is reached after ALIGN (0) has been both transmitted and received. >> should be deleted as we do not describe entry conditions only exit conditions.

IBM #188

PDF Page 115

#### 6.8.3.4.1 State description

The following statement << This state shall repeatedly send a Transmit ALIGN0 parameter to the SP transmitter.>> should be <<This state shall request ALIGN (0) be transmitted at the current rate (e.g., G1, G2, G3) by repeatedly sending a Transmit ALIGN0 parameter to the SP transmitter. >>

IBM #189

PDF Page 115

#### 6.8.3.4.2 Transition SP11: SAS\_AwaitALIGN1 to SP14: SAS\_Fail

The following statement << This transition shall occur if the SNTT timer expires. This indicates that the other phy has not been able to lock at the current rate. >> should be <<This transition shall occur if the other phy has not locked at the current rate and the SNTT timer times-out. >>

IBM #190

PDF Page 115

#### 6.8.3.4.3 Transition SP11: SAS\_AwaitALIGN1 to SP14: SAS\_AwaitSNW

The statement <<This transition shall occur if this state receives an ALIGN1 Detected parameter before the SNTT timer expires. This indicates that the other phy has been able to lock at the current rate. >> should be changed to << This transition shall occur if the other phy has locked (i.e., ALIGN1 Detected parameter received before the SNTT timer expires). >>

IBM #191

PDF Page 115

The statement << This state is reached after ALIGN (1) has been both transmitted and received. >> should be deleted as we do not describe entry conditions only exit conditions.

IBM #192

PDF Page 115

#### 6.8.3.5.1 State description

The following statement << This state shall repeatedly send a Transmit ALIGN1 parameter to the SP transmitter.>> should be <<This state shall request ALIGN (1) be transmitted at the current rate (e.g., G1, G2, G3) by repeatedly sending a Transmit ALIGN1 parameter to the SP transmitter.>>.

IBM #193

PDF Page 115

#### 6.8.3.5.2 Transition SP12: SAS\_AwaitALIGN1 to SP13: SAS\_Pass

The statement << if the >> should be << after the >>.

IBM #194

PDF Page 115

#### 6.8.3.6.2 Transition SP13: SAS\_Pass to SP8: SAS\_Start

The statement << which is sent as an argument to the SN\_start state>> should be moved to the end of the section and restated as <<This transition shall pass a SAS Speed Negotiation Window Rate argument to the SN\_start state. >>.

IBM #195

PDF Page 116

#### 6.8.3.7.3 Transition SP14: SAS\_Fail to SP8: SAS\_Start

The statement << Which speed negotiation window to use is sent as an argument with this transition. >> should be changed to <<This transition shall pass which speed negotiation window to use in the SAS Speed Negotiation Window Rate argument to the

SN\_start state. >>.

IBM #196

PDF Page 116

#### 6.8.3.8.1 State description

The following << to provide rule checking for dword synchronization and determination of link failure. >> should be deleted as the information is already in the DWS section. A reference to DWS would be OK.

IBM #197

PDF Page 116

#### 6.8.3.8.1 State description

The statement << the receipt of a COMINIT; >> should be << the receipt of a COMINIT Detected parameter >>.

IBM #198

PDF Page 116

#### 6.8.3.8.1 State description

The statement << While in this state, dwords from the link layer are transmitted at the negotiated physical link rate >> should be deleted as it is stated 2 times in this section.

#### 6.8.3.8.1 State description

The statement << from the link layer >> should be deleted as the general rule is that we do not state where things come from in state diagrams.

IBM #200

PDF Page 117

#### 6.8.3.8.2 Transition SP15: SAS\_PHY\_Ready to SP1: 00B\_COMINIT

The statement << occur if: >> should be << occur after >>.

IBM #201

PDF Page 117

#### 6.8.4 SATA host emulation states

The statement << the SAS device (an initiator device or expander device) has >> should be << a SAS initiator device or an expander device has >>.

IBM #202

PDF Page 117

#### 6.8.4 SATA host emulation states

The statement << During SATA host emulation, the SAS device transmits a COMWAKE sequence and then waits to receive a COMWAKE. Once the COMWAKE sequence is detected, the SAS device follows the speed negotiation sequence defined in SATA. >> should be deleted as the information in this statement is duplicate information.

IBM #203

PDF Page 118

Figure 58

The COMWAKE Transmitted parameter is missing as a input to SP16.

IBM #204

PDF Page 118

Figure 58

The COMWAKE Detected parameter is missing as a input to SP17.

IBM #205

PDF Page 118

Figure 58

The COMWAKE Completed parameter is missing as a input to SP18.

IBM #206

PDF Page 118

Figure 58

The labels on the state transitions should be deleted and they don't necessarily give the complete reason for the transition..Page: 119

IBM #207

PDF Page 118

6.8.4.2.2 Transition SP17: SATA\_AwaitCOMWAKE to SP18: SATA\_AwaitNoCOMWAKE  
There is a type in the SP18 state name. It should be SATA\_AwaitNoCOMWAKE.

IBM #208

PDF Page 118

6.8.4.1.1 State description

The statement << wait for COMWAKE to be transmitted. >> should be changed to << wait for a COMWAKE Completed parameter to be received. >>.

IBM #209

PDF Page 118

6.8.4.3.1 State description

The statement << This state waits for COMWAKE to be fully received. >> should be << This state waits for a COMWAKE Completed parameter to be received. >>

IBM #210

PDF Page 118

6.8.4.4.1 State description

The statement << repeatedly send a Transmit D10.2 parameter to the SP transmitter; >> should be <<request D10.2s be transmitted by repeatedly sending a Transmit D10.2 parameter to the SP transmitter. >>

IBM #211

PDF Page 118

6.8.4.4.1 State description

The statement << start the ALIGN detect time out timer; >> should be << set the ALIGN detect timer to its initial value and enable it; >>

IBM #212

PDF Page 118

6.8.4.4.1 State description

The statement <<ALIGN to be received or an ALIGN detect time out. >> should be << ALIGN Received parameter to be received or an ALIGN detect time out to occur. >>

IBM #213

PDF Page 118

6.8.4.4.1 State description

The statement << The SAS device shall start transmitting D10.2 characters no later than 20 G1 dwords (i.e., 533 ns) after COMWAKE was deasserted. >> should be deleted as it makes no sense here. It appears to be more of a transmitter requirement rather than a requirement of this state. Also COMWAKE is not something that can be deasserted it is a sequence of signals.

IBM #214

PDF Page 118

6.8.4.4.2 Transition SP19: SATA\_AwaitALIGN to SP20: SATA\_AdjustSpeed

The statement << at any of its supported physical link rates. >> should be deleted as it makes no sense here.

IBM #215

PDF Page 118

6.8.4.5.1 State description

The statement << This state shall repeatedly send Transmit D10.2 parameters to the SP transmitter >> should be <<This state shall request D10.2s be transmitted by repeatedly sending a Transmit D10.2 parameter to the SP transmitter >>

IBM #216

PDF Page 120

6.8.4.5.2 Transition SP20: SATA\_AdjustSpeed to SP21: SATA\_TransmitALIGN

This statement << when this state receives a Transmitter Ready parameter.



>> should be <<after receiving a Transmitter Ready parameter. >>.

IBM #217

PDF Page 120

#### 6.8.4.6.1 State description

The statement << This state shall repeatedly send the Transmit ALIGNOs parameter to the SP transmitter. >> should be << This state shall request ALIGNOs be transmitted by repeatedly sending a Transmit ALIGNO parameter to the SP transmitter. >>

IBM #218

PDF Page 120

#### 6.8.4.6.1 State description

The statement << When the SP receiver detects three back-to-back non-ALIGNs, the state machine transitions to state SP22: SATA\_PHY\_Ready. >> should be deleted as all the information is in the transition description.

IBM #219

PDF Page 120

#### 6.8.4.7.4 Transition SP22: SATA\_PHY\_Ready to SP23: SATA\_PM\_Slumber

The statement << if this state receives an Enter Slumber request. >> should be << if an Enter Slumber request is received. >>.

IBM #220

PDF Page 120

#### 6.8.4.7.4 Transition SP22: SATA\_PHY\_Ready to SP23: SATA\_PM\_Slumber

The statement << if this state receives an Enter Partial request. >> should be << if an Enter Partial request is received. >>

IBM #221

PDF Page 120

#### 6.8.4.7.2 Transition SP22: SATA\_PHY\_Ready to SP1: Reset

In figure 58 this transition goes to SP1: OOB\_COMMINIT but here it goes to SP1: Reset. Only one is correct. This needs to be fixed.

IBM #222

PDF Page 120

#### 6.8.4.7.2 Transition SP22: SATA\_PHY\_Ready to SP1: Reset

The statement << This transition shall occur if this state receives a COMINIT Received parameter or a DWS Reset parameter. >> makes no sense as there is not COMINIT Received or DWS Reset in figure 58. So it is not clear what causes this transition.

IBM #223

PDF Page 120

The statement << This state shall send a PhyReady (SATA) parameter to the SP\_DWS state machine. >> should be  
Upon entering this state, this state shall send a PhyReady (SATA) parameter to the SP\_DWS state machine. >>.

IBM #224

PDF Page 120

#### 6.8.4.7.1 State description

The statement << In this state, the SP state machine hands control over dword transmission to the SP\_DWS state machine. The SP receiver monitors the input dword stream looking for COMINIT. >> should be << This state sends RhyReady (SATA) parameter to the SP\_DWS state machine to enable it. >> If this state needs to take some action if a COMINIT detected or complete happens then there needs to be a parameter input and a description as to what happens when the parameter is received.

IBM #225

PDF Page 120

#### 6.8.4.8.2 Transition SP23: SATA\_PM\_Partial to SP16: SATA\_COMWAKE

The statement << if this state receives a Exit Partial request. >> should be << if an Exit Partial request is received. >>

IBM #226

PDF Page 120

6.8.4.8.3 Transition SP23: SATA\_PM\_Partial to SP18: SATA\_AwaitNoCOMWAKE

The statement << if this state receives a COMWAKE Detected parameter. >> should be << if a COMWAKE Detected parameter is received. >>.

IBM #227

PDF Page 120

6.8.4.8.1 State description

The statement << Exit from this state is driven from receipt of COMWAKE or by request of the link layer. >> should be << This state waits for a COMWAKE Detected parameter or a Exit Partial parameter to be received. >>

IBM #228

PDF Page 120

6.8.4.9.1 State description

The statement << Exit from this state is driven from receipt of COMWAKE or by request of the link layer. >> should be << This state waits for a COMWAKE Detected parameter or a Exit Slumber parameter to be received. >>.

IBM #229

PDF Page 120

6.8.4.9.2 Transition SP24: SATA\_PM\_Slumber to SP16: SATA\_COMWAKE

The statement << if this state receives a Exit Slumber request. >> should be << if an Exit Slumber request is received. >>

IBM #230

PDF Page 121

6.8.4.9.3 Transition SP24: SATA\_PM\_Slumber to SP18: SATA\_AwaitNoCOMWAKE

The statement << if this state receives a COMWAKE Detected parameter. >> should be << if a COMWAKE Detected parameter is received. >>.

IBM #231

PDF Page 121

The statement << are sent to the SP\_DWS machine >> should be << are received by the SP\_DWS state machine >>.

IBM #232

PDF Page 121

6.9.1 Overview

There should be text here that states what happens when a PhyNotReady parameter is received.

IBM #233

PDF Page 121

6.9.1 Overview

It seems like there should a Dword Received parameter from the receiver that goes to all the states within this state machine. As a result there should be a green open arrow pointing to the edge of the SP\_DWS state machine. The following text should be added here: All the states within the SP\_DWS receive the Dword Receive parameter from the SP receiver.

IBM #234

PDF Page 121

6.9.1 Overview

The statement << from the SP state machine. >> should be deleted as the general rule is that we do not state where things come from in state diagrams.

IBM #235

PDF Page 121

6.9.1 Overview

The statement << from the SP state machine: >> should be deleted as the general rule is that we do not state where things come from in state diagrams.

IBM #236  
PDF Page 122  
Figure 59

There needs to be a cut-out so the PhyNotReady arrow points to the SP\_DWS state machine. Also the text need not state that the parameter goes to all states. That is implied. The statement << (This parameter causes a transition to SP\_DW0: AcquireSync) >>.

IBM #237  
PDF Page 122  
Figure 59

The labels on the state transitions should be deleted and they don't necessarily give the complete reason for the transition.

IBM #238  
PDF Page 123

#### 6.9.2.1 State description

The statement << This state is entered upon power on loss or previous dword synchronization. >> should be deleted as we do not define entry conditions. Sequence number: 2

IBM #238  
PDF Page 123

#### 6.9.2.1 State description

The statement << In this state, the receiver monitors the input data stream >> should be << This state monitors the Dwords received in the Dword Received parameter >>.

IBM #239  
PDF Page 123

#### 6.9.2.1 State description

The statement << character it detects into the >> should be << character detected into the >>.

IBM #240  
PDF Page 123

#### 6.9.2.2 Transition SP\_DWS0: AcquireSync to SP\_DWS1: Valid1

The statement << is detected. >> should be << is received >>.

IBM #241  
PDF Page 123

#### 6.9.3.1 State description

The statement << This state is reached after one valid primitive has been detected. >> should be deleted as we do not describe entry conditions.

IBM #242  
PDF Page 123

#### 6.9.4.1 State description

The statement << This state is reached after the receiver has detected two valid primitives. >> should be deleted as we do not describe entry conditions.

IBM #243  
PDF Page 123

#### 6.9.5.1 State description

The statement << This state is reached when the receiver has detected three valid primitives without adjusting the dword synchronization. >> should be deleted as we do not describe entry conditions.

IBM #244  
PDF Page 123

#### 6.9.3.1 State description

The statement <<In this state, the receiver shall monitor the input data stream looking >> should be << This state shall monitor the Dwords received in the Dword Received parameter looking >>

IBM #245

PDF Page 123

#### 6.9.4.1 State description

The statement <<In this state, the receiver shall monitor the input data stream looking >> should be << This state shall monitor the Dwords received in the Dword Received parameter looking >>

IBM #246

PDF Page 123

6.9.5.1 State description. The statement << In this state, the receiver shall monitor the incoming data stream looking >> should be << This state shall monitor the Dwords received in the Dword Received parameter looking >>

IBM #247

PDF Page 123

#### 6.9.3.2 Transition SP\_DWS1:Valid1 to SP\_DWS2:Valid2

The statement << This transition shall occur when a valid primitive is detected. >>

should be << This transition shall occur after receiving a Dword Received parameter that contains a valid primitive. >>

IBM #248

PDF Page 123

#### 6.9.4.2 Transition SP\_DWS2:Valid2 to SP\_DWS3:SyncAcquired

The statement << This transition shall occur when a valid primitive is detected. >>

should be << This transition shall occur after receiving a Dword Received parameter that contains a valid primitive. >>

IBM #249

PDF Page 123

#### 6.9.4.3 Transition SP\_DWS2:Valid2 to SP\_DWS0:AcquireSync

The statement << This transition shall occur when an invalid dword is detected. >>

should be << This transition shall occur after receiving a Dword Received parameter that contains an invalid Dword.>>

IBM #250

PDF Page 123

#### 6.9.5.2 Transition SP\_DWS3:SyncAcquired to SP\_DWS4:Lost1

The statement << This transition shall occur when an invalid dword (i.e., the first invalid dword) is detected.>> should be << This transition shall occur after receiving a Dword Received parameter that contains an invalid Dword (i.e., the first invalid dword).>>

IBM #251

PDF Page 123

#### 6.9.5.2 Transition SP\_DWS3:SyncAcquired to SP\_DWS4:Lost1

The statement << An expander forwarding the dword to another phy shall replace the invalid dword with ERROR for a SAS physical link or

SATA\_ERROR for a SATA physical link. >> seems out of place here. This should be defined in the expander information that describes the insertion of error primitives. As most there should be a reference to that information << For expander rules on invalid Dwords replacement see x.x.x. >>

IBM #252

PDF Page 124

#### 6.9.6.1 State description

The statement << This state is reached when one invalid dword has been received and not nullified. >> should be deleted as we do not describe entry conditions.

IBM #253

PDF Page 124

#### 6.9.7.1 State description

The statement << This state is reached when a valid dword has been

received, and another valid dword will nullify the previous invalid dword. >> should be deleted as we do not describe entry conditions.

IBM #254

PDF Page 124

#### 6.9.8.1 State description

The statement << This state is reached when two invalid dwords has been received and not nullified. >> should be deleted as we do not describe entry conditions.

IBM #255

PDF Page 124

#### 6.9.9.1 State description

The statement << This state is reached when a valid dword has been received, and another valid dword will nullify the previous invalid dword. >> should be deleted as we do not describe entry conditions.

IBM #256

PDF Page 124

#### 6.9.6.1 State description

The statement <<In this state, the receiver shall monitor the incoming data stream looking >> should be << This state shall monitor the Dwords received in the Dword Received parameter looking >>

IBM #257

PDF Page 124

#### 6.9.7.1 State description

The statement <<In this state, the receiver shall monitor the incoming data stream looking >> should be << This state shall monitor the Dwords received in the Dword Received parameter looking >>

IBM #258

PDF Page 124

#### 6.9.8.1 State description

The statement <<In this state, the receiver shall monitor the incoming data stream looking >> should be << This state shall monitor the Dwords received in the Dword Received parameter looking >>

IBM #259

PDF Page 124

#### 6.9.9.1 State description

The statement <<In this state, the receiver shall monitor the incoming data stream looking >> should be << This state shall monitor the Dwords received in the Dword Received parameter looking >>

IBM #260

PDF Page 124

#### 6.9.6.2 Transition SP\_DWS4:Lost1 to SP\_DWS5:Lost1Recovered

The statement << This transition shall occur when a valid dword is detected. >> should be << This transition shall occur after receiving a Dword Received parameter that contains an valid Dword.>>

IBM #261

PDF Page 124

#### 6.9.7.2 Transition SP\_DWS5:Lost1Recovered to SP\_DWS3:SyncAcquired

The statement << This transition shall occur when a valid dword is detected. >> should be << This transition shall occur after receiving a Dword Received parameter that contains an valid Dword.>>

#### 6.9.8.2 Transition SP\_DWS6:Lost2 to SP\_DWS7:Lost2Recovered

The statement << This transition shall occur when a valid dword is detected. >> should be << This transition shall occur after receiving a Dword Received parameter that contains an valid Dword.>>

IBM #263

PDF Page 124

6.9.6.3 Transition SP\_DWS4:Lost1 to SP\_DWS6:Lost2

The statement << This transition shall occur when an invalid dword is detected.>> should be << This transition shall occur after receiving a Dword Received parameter that contains an invalid Dword.>>

IBM #264

PDF Page 124

6.9.7.3 Transition SP\_DWS5:Lost1Recovered to SP\_DWS6:Lost2

The statement << This transition shall occur when an invalid dword is detected.>> should be << This transition shall occur after receiving a Dword Received parameter that contains an invalid Dword.>>

IBM #265

PDF Page 124

6.9.8.3 Transition SP\_DWS6:Lost2 to SP\_DWS8:Lost3

The statement << This transition shall occur when an invalid dword is detected.>> should be << This transition shall occur after receiving a Dword Received parameter that contains an invalid Dword.>>

IBM #266

PDF Page 124

6.9.6.3 Transition SP\_DWS4:Lost1 to SP\_DWS6:Lost2

The statement << An expander forwarding the dword to another phy shall replace the invalid dword with ERROR for a SAS physical link or SATA\_ERROR for a SATA physical link. >> seems out of place here. This should be defined in the expander information that describes the insertion of error primitives. As most there should be a reference to that information << For expander rules on invalid Dwords replacement see x.x.x. >>

IBM #267

PDF Page 124

6.9.7.3 Transition SP\_DWS5:Lost1Recovered to SP\_DWS6:Lost2

The statement << An expander forwarding the dword to another phy shall replace the invalid dword with ERROR for a SAS physical link or SATA\_ERROR for a SATA physical link. >> seems out of place here. This should be defined in the expander information that describes the insertion of error primitives. As most there should be a reference to that information << For expander rules on invalid Dwords replacement see x.x.x. >>

IBM #268

PDF Page 124

6.9.8.3 Transition SP\_DWS6:Lost2 to SP\_DWS8:Lost3

The statement << An expander forwarding the dword to another phy shall replace the invalid dword with ERROR for a SAS physical link or SATA\_ERROR for a SATA physical link. >> seems out of place here. This should be defined in the expander information that describes the insertion of error primitives. As most there should be a reference to that information << For expander rules on invalid Dwords replacement see x.x.x. >>

IBM #269

PDF Page 125

6.9.10.1 State description

The statement << This state is reached when three invalid dwords has been received and not nullified. >> should be deleted as we do not describe entry conditions.

IBM #270

PDF Page 125

6.9.11.1 State description

The statement << This state is reached when a valid dword has been received, and another valid dword will nullify the previous invalid dword. >> should be deleted as we do not describe entry conditions.

IBM #271

PDF Page 125

#### 6.9.10.1 State description

The statement <<In this state, the receiver shall monitor the incoming data stream looking >> should be << This state shall monitor the Dwords received in the Dword Received parameter looking >>

IBM #272

PDF Page 125

#### 6.9.11.1 State description

The statement <<In this state, the receiver shall monitor the incoming data stream looking >> should be << This state shall monitor the Dwords received in the Dword Received parameter looking >>

IBM #273

PDF Page 125

#### 6.9.9.2 Transition SP\_DWS7:Lost2Recovered to SP\_DWS4:Lost1

The statement << This transition shall occur when a valid dword is detected. >> should be << This transition shall occur after receiving a Dword Received parameter that contains an valid Dword.>>

IBM #274

PDF Page 125

#### 6.9.10.2 Transition SP\_DWS8:Lost3 to SP\_DWS9:Lost3Recovered

The statement << This transition shall occur when a valid dword is detected. >> should be << This transition shall occur after receiving a Dword Received parameter that contains an valid Dword.>>

IBM #275

PDF Page 125

#### 6.9.11.2 Transition SP\_DWS9:Lost3Recovered to SP\_DWS6:Lost2

The statement << This transition shall occur when a valid dword is detected. >> should be << This transition shall occur after receiving a Dword Received parameter that contains an valid Dword.>>

IBM #276

PDF Page 125

#### 6.9.9.3 Transition SP\_DWS7:Lost2Recovered to SP\_DWS8:Lost3

The statement << This transition shall occur when an invalid dword is detected.>> should be << This transition shall occur after receiving a Dword Received parameter that contains an invalid Dword.>>

IBM #277

PDF Page 125

6.9.10.3 Transition SP\_DWS8:Lost3 to SP\_DWS0:AcquireSync. The statement << If an invalid dword (i.e., the fourth non-nullified invalid dword) is detected, this state shall send a DWS Reset parameter to the SP state machine and this transition shall occur. >> should be << This transition shall occur after receiving a Dword Received parameter that contains an invalid Dword (i.e., the fourth non-nullified invalid dword) and after sending a DWS Reset parameter to the SP state machine.>>

IBM #278

PDF Page 125

#### 6.9.11.3 Transition SP\_DWS9:Lost3Recovered to SP\_DWS0:AcquireSync

The statement << If an invalid dword (i.e., the fourth non-nullified invalid dword) is detected, this state shall send a DWS Reset parameter to the SP state machine and this transition shall occur. >> should be << This transition shall occur after receiving a Dword Received parameter that contains an invalid Dword (i.e., the fourth non-nullified invalid dword) and after sending a DWS Reset parameter to the SP state machine.>>

IBM #279

PDF Page 125

6.9.9.3 Transition SP\_DWS7:Lost2Recovered to SP\_DWS8:Lost3

The statement << An expander forwarding the dword to another phy shall replace the invalid dword with ERROR for a SAS physical link or

SATA\_ERROR for a SATA physical link. >> seems out of place here. This should be defined in the expander information that describes the insertion of error primitives. As most there should be a reference to that information << For expander rules on invalid Dwords replacement see x.x.x. >>

IBM #280

PDF Page 125

6.10 Spin-up

The statement << NOTE 12 A SATA target device with rotating media spins up:

- a) automatically after power on (allowed by SATA);
- b) after its phy is enabled (allowed by SATA);
- c) after the reset sequence has completed (recommended by SATA); or
- d) after the Power Up in Standby flag is cleared by an application (if the ATA Power Up in Standby feature is implemented).

The ATA Power Up in Standby feature is not widely implemented, since it requires the target device to include a nonvolatile memory to remember the state of the Power Up in Standby flag. Desktop-class disk drives do not typically have nonvolatile memory storage. >> has no value to this standard and should be deleted.

IBM #281

PDF Page 127

Table 51

The footnotes have to be on each split of the table not just the last one.

IBM #282

PDF Page 135

7.1.3.1 Primitive sequence overview

The statement << ALIGNs may be sent inside primitive sequences without affecting the count or breaking the consecutiveness requirements. >> should be deleted as it is repeated in each of the next three sections. The other option would be to delete the text in all three sections and leave it here.

IBM #283

PDF Page 135

7.1.3.4 Triple primitive sequence

The statement << consecutively and followed by idle dwords until a response is received. >> should be <<consecutively followed by idle dwords. >> The statement << until a response is received >> is incomplete because it does not describe what the response is that is received. Either that has to be defined or the statement deleted.

IBM #284

PDF Page 135

7.1.3.3 Repeated primitive sequence

The statement << until a response is received >> is incomplete because it does not describe what the response is that is received. Either that has to be defined or the statement deleted.

IBM #285

PDF Page 135

7.1.3.4 Triple primitive sequence

The statement << detect a triple primitive sequence by receiving the identical primitive in three consecutive dwords. >> should be << detect a triple primitive sequence after the identical primitive is received in three consecutive dwords. >>

IBM #286

PDF Page 135



## 7.1.3.5 Redundant primitive sequence

The statement << shall be sent six times consecutively. >> should be << shall be sent six times consecutively followed by idle dwords.

IBM #287

PDF Page 135

## 7.1.3.5 Redundant primitive sequence

The statement << detect redundant primitive sequences by receiving an identical primitive for three consecutive dwords. >> should be << detect a redundant primitive sequence after the identical primitive is received in three consecutive dwords. >>

IBM #288

PDF Page 135

## 7.1.3.4 Triple primitive sequence

\*\*\*

In the statement << receiver shall not detect primitive sequences a second time until it >> it is not clear if the primitive sequence that shall not be detected is this primitive sequence or any primitive sequence or any triple primitive sequence. This needs to be made clear.

IBM #289

PDF Page 135

## 7.1.3.5 Redundant primitive sequence

\*\*\*

In the statement << receiver shall not detect primitive sequences a second time until it >> it is not clear if the primitive sequence that shall not be detected is this primitive sequence or any primitive sequence or any redundant primitive sequence. This needs to be made clear.

## 7.1.4.2 ALIGN

The statement << are used for >> should be deleted as it is duplicated in the sentence.

IBM #291

PDF Page 136

## 7.1.4.2 ALIGN

The statement << NOTE 14 SATA devices are allowed to decode every dword starting with a K28.5 as an ALIGN, since ALIGN is the only primitive defined starting with K28.5. >> as it contains no information that is relevant to this standard.

IBM #292

PDF Page 137

## 7.1.4.4 BROADCAST

Change << BROADCAST indications >> to << BROADCASTs >>.

IBM #293

PDF Page 137

## 7.1.4.4 BROADCAST

Change << BROADCAST indication >> to << BROADCAST >>.

IBM #294

PDF Page 137

## 7.1.4.4 BROADCAST

Change << second indication >> to << second BROADCAST >>.

IBM #295

PDF Page 137

## Table 60

The term << initiator affiliation. >> is not used anywhere else in this standard. So I have no idea as to what it is. It needs to be defined or changed to a term that is defined.

IBM #296

PDF Page 138

## 7.1.4.9 NOTIFY

The TBD needs to be replaced with a reference.

IBM #297

PDF Page 138

7.1.4.8 HARD\_RESET

There should be a statement that states that the HARD\_RESET shall be ignored if received at any time other than after a phy reset sequence and before the identification sequence.

IBM #298

PDF Page 138

7.1.4.9 NOTIFY

The statement << devices shall transmit NOTIFY (ENABLE\_SPINUP) >> should be changed to << devices shall use NOTIFY (ENABLE\_SPINUP) >>. The rules for usage do follow in this paragraph but the use of the word << transmit >> in this sentence makes the sentence seem incomplete.

IBM #299

PDF Page 138

7.1.4.9 NOTIFY

\*\*\*\*

The way this is now it is possible that the receiver may not get an ALIGN within the 2048 dwords if a NOTIFY replaces an ALIGN. There needs to be a rule that when sending NOTIFYS the transmitter is still required to send ALIGNs at least once every 2048 dwords.

IBM #300

PDF Page 139

Table 61

The term << affiliation >> needs to be defined.

IBM #301

PDF Page 140

Table 62

There needs to be a double line between the body and footer.

IBM #302

PDF Page 141

Table 63

The statement << Timed out waiting for an ACK or NAK. The ACK/NAK count does not match the frame count. Transmitter is going to transmit BREAK in 1 ms unless DONE is received prior to that. >> should be << The SSP state machine timed out waiting for an ACK or NAK (see 7.16.7.2) and Transmitter is going to transmit BREAK unless a DONE is received within 1 ms of transmitting the DONE.

IBM #303

PDF Page 143

7.2 Clock skew management

The statement << This is used when transmitting data >> should be << The internal clock is used when transmitting data >>. Sequence number: 2

IBM #303

PDF Page 143

7.2 Clock skew management

The statement << data needs to be latched based >> should be << dwords need to be latched based >>.

IBM #304

PDF Page 143

7.2 Clock skew management

The statement << receive data and not be able to >> should be << receive dwords and not be able to

IBM #305

PDF Page 143

7.2 Clock skew management

The statement << have data when needed >> should be << have dwords when needed >>.

IBM #306

PDF Page 143

7.1.6.3 SATA\_HOLD and SATA\_HOLD\_A (Hold and hold acknowledge)

The statement << SATA\_HOLD\_A will arrive within >> should be << SATA\_HOLD\_A arrives within >>.

IBM #307

PDF Page 144

Table 66

Make the information << Original source of data

SSP initiator phy or target phy in SSP connection, SMP initiator phy or SMP target phy in SMP connection, Any phy outside connections, or

STP target phy in an STP connection >> into a left aligned a,b,c list.

IBM #308

PDF Page 144

7.2 Clock skew management

The term << amongst >> should be << through >>

IBM #309

PDF Page 144

7.3 Idle links

The statement << While no connection is open and a physical link is idle, or while an SSP or SMP connection is open and the

physical link is idle, SAS phys shall transmit idle dwords. >> should be << SAS phys shall transmit idle words if:

a) no connection is open and a physical link is idle;

b) an SSP connection is open and the physical link is idle; or

c) an SMP connection is open and the physical link is idle. >>

IBM #310

PDF Page 145

Table 67

The paragraphs within the definitions should have the paragraph designer, basic, line spacing, fixed box unchecked. This will remove the superscripts running into the line above.

IBM #311

PDF Page 146

7.4.2 CRC generation

The statement << order - the bits within each byte of the data dword are transposed to match the implicit transposition in the 8b10b

encoding process. >> should be << order (i.e., the bits within each byte of the data dword are transposed to match the implicit transposition in the 8b10b encoding process). >>.

IBM #312

PDF Page 147

7.5 Scrambling

The statement << Table 69 shows when the scrambling logic shall treat data as big-endian and when it shall treat data as

little-endian. >> should be << Table 69 shows when the scrambling logic shall handle data as big-endian and when it shall handle data as little-endian. >> .

IBM #313

PDF Page 147

7.5 Scrambling

The statement << These patterns can cause issues in the physical >> should be << These patterns may cause issues in the physical >>.

IBM #314

PDF Page 149

7.7.1 Address frames overview

The statement << Primitives may be inserted in the address frame. >> is no

longer valid and needs to be deleted.

IBM #315

PDF Page 150

#### 7.7.2 IDENTIFY address frame

The statement << The recipient shall ignore reserved and ignored fields in the IDENTIFY address frame. >> should be deleted as the information is already stated in the keywords definitions. Page: 152

IBM #316

PDF Page 150

#### 7.7.3 OPEN address frame

The statement << The destination device shall reject the connection request with OPEN\_REJECT (PROTOCOL NOT SUPPORTED) if the PROTOCOL field is set to a value it does not support. >> should be deleted as this information is already stated in the state machines.

IBM #317

PDF Page 153

#### 7.7.3 OPEN address frame

The statement << Every phy shall support the 1,5 Gbps connection rate at every physical link rate. >> should be deleted as this is not the place to put link speed requirements.

IBM #318

PDF Page 153

The statement << The destination device shall ignore the contents of reserved fields in the OPEN address frame. >> should be deleted as it is already stated in the keywords definitions section.

IBM #319

PDF Page 153

#### 7.7.3 OPEN address frame

The statement << The INITIATOR CONNECTION TAG field is used for SSP and STP connection requests to provide an initiator port an easier context lookup when the target port originates a connection request. >> states no requires or options and should be deleted.

IBM #320

PDF Page 154

#### 7.8.1 Overview

The statement << Each phy shall also expect to receive an >> should be << Each phy receives an >>.

IBM #321

PDF Page 154

#### 7.8.1 Overview

The statement << link reset sequence. >> should be << link reset sequence (see x.x.x.) >>.

IBM #321

PDF Page 155. Sequence

#### 7.8.2 Initiator device specific rules

The statement << When this is done after a link reset sequence, this allows the application client within an initiator device to discover all the devices in the SAS domain. When this is done after a BROADCAST (CHANGE), this allows the application client within an initiator device to determine what has changed in the SAS domain. >> should be << If an application client initiates the discover process after a link reset sequence then on completion of the discovery that application client has discovered all the devices within the SAS domain. If the application client initiates the discovery process after a BROADCAST (CHANGE) then on completion of the discovery that application client has discovered any devices that have been removed or inserted into the SAS domain. >>

IBM #322

PDF Page 155. Sequence

7.8.2 Initiator device specific rules

The statement << a routing loop. It shall disable routing >> should be << a routing loop then the application client shall disable routing >> .

IBM #323

PDF Page 155. Sequence

7.8.2 Initiator device specific rules

The statement << function request is used to disable the expander port of an expander device. >> should be << function request shall be used to disable the expander port of an expander device. >>

IBM #324

PDF Page 155. Sequence

7.8.5.1 Overview

The statements << The SL\_IR state machine sends the following parameters to the SL\_IR transmitter:

a) Transmit IDENTIFY; and

b) Transmit HARD\_RESET.

The SL\_IR state machine receives the following parameters:

a) SOAF Received;

b) Data Dword Received;

c) EOF Received; and

d) HARD\_RESET Received. >> should be placed in section 7.8.6 as that is where the transmitter and receiver information is defined. That way it is all in one place.

IBM #325

PDF Page 155. Sequence

7.8.5.1 Overview

There needs to be an item << c) Transmit Idle Dword >> added to the SL\_IR transmitter list.

IBM #326

PDF Page 155. Sequence

7.8.5.1 Overview

There needs to be an items << e) IDENTIFY Transmitted

f) HARD\_RESET Transmitted >> add to the SL\_IR receiver list.

IBM #327

PDF Page 156

Figure 67. Figure 67

The << Enable Disable Link Layer (Disable) >> confirmation needs to point into each of the 3 state machines. The statement << (to all states in all state machines, causing transition to Idle state) >> should be changed to << ((This parameter causes a transition to SL\_IR\_xxx1: Idle) >> replace xxx with TIR, RIF, and IRC on the appropriate arrow.

IBM #328

PDF Page 156

Figure 67

Several of the green arrows look like they are originating from other states. They should be shortened to avoid confusion.

IBM #329

PDF Page 156

Figure 67

The << Enable Disable SAS Link (Enable) >> should indicate it goes to SL or XL.

IBM #330

PDF Page 157

7.8.6 SL\_IR transmitter and receiver

The statement << SOAF/IDENTIFY address frame/EOF; >> has a problem in that the name of the parameter that causes the transmission is called << Transmit IDENTIFY >>. Those two names are enough different so it is not obvious one is a result of the

other. One solution would be to add << (i.e., Transmit IDENTIFY parameter) >> to item b).

IBM #331

PDF Page 157

#### 7.8.6 SL\_IR transmitter and receiver

The statement << The SL\_IR receiver shall ignore any primitive received inside an IDENTIFY address frame. In this case, a data dword shall be considered inside a frame when it is received after an SOAF and before an EOAF if the primitive is received after the 8th data dword following the SOAF. >> seems to be confusing. Changing it to the following may help << The SL\_IR receiver shall ignore any primitive received inside an IDENTIFY address frame. In this case, a primitive shall be considered inside a frame when it is received within the first eight data dwords after an SOAF. >>

IBM #332

PDF Page 157

#### 7.8.6 SL\_IR transmitter and receiver

There needs to be a new paragraph that describes what the SL\_IR receiver receives. Something like << When the SL\_IR receiver receives a dword the SL\_IR receiver notifies the SL\_IR state machine of the receipt of those dwords. The following are the only received dwords that the SL\_IR transmitter shall send notifications on:

- a) SOAF;
- b) Data Dword;
- c) EOAF; or
- d) HARD\_RESET. >>.

IBM #333

PDF Page 157

#### 7.8.6.1.1 Overview

The statement << This is the only state machine in the SL\_IR state machines that transmits dwords on the physical link. >> is obvious and not necessary.

IBM #334

PDF Page 157

The statement << This state shall repeatedly send Transmit Idle Dword to the SL\_IR transmitter. >> should be << This state shall request idle dwords be transmitted by repeatedly sending a Transmit Idle Dword parameter to the SL\_IR transmitter (see 7.3). >>

IBM #335

PDF Page 157

#### 7.8.6.1.2.2 Transition SL\_IR\_TIR1: Idle to SL\_IR\_TIR2: Transmit\_Identify

The statement << when both: >> should be changed to << after >>.

IBM #336

PDF Page 157

#### 7.8.6.1.2.3 Transition SL\_IR\_TIR1: Idle to SL\_IR\_TIR3: Transmit\_Hard\_Reset

The statement << when both: >> should be changed to << after >>.

IBM #337

PDF Page 157

#### 7.8.6.1.3.1 State description

The statement << This state shall send a Transmit IDENTIFY parameter to the SL\_IR transmitter. >> should be << Upon entry into this state, this state shall send a Transmit IDENTIFY parameter to the SL\_IR transmitter. >>

IBM #338

PDF Page 158

#### 7.8.6.1.3.2 Transition SL\_IR\_TIR2: Transmit\_Identify to SL\_IR\_TIR4: Completed

The statement << This transition shall occur after this state has sent an Identify Transmitted parameter. >> should be << This transition shall occur after:

- a) receiving a IDENTIFY Transmitted parameter; and
- b) sending an Identify Transmitted parameter to the IRC state machine. >>.

IBM #339

PDF Page 158

#### 7.8.6.1.3.1 State description

The statement << When this state receives >> should be << After this state receives >>.

IBM #340

PDF Page 158

#### 7.8.6.1.4.1 State description

The statement << This state shall send a >> should be << Upon entry into this state, this state shall send a >>.

IBM #341

PDF Page 158

#### 7.8.6.1.4.1 State description

The statement << When this state receives >> should be << After this state receives >>.

IBM #342

PDF Page 158

#### 7.8.6.1.4.2 Transition SL\_IR\_TIR3: Transmit\_Hard\_Reset to SL\_IR\_TIR3: Completed

The statement << This transition shall occur after sending a HARD\_RESET Transmitted confirmation. >> should be << This transition shall occur after:

- a) receiving a HARD\_RESET Transmitted parameter; and
- b) sending a HARD\_RESET Transmitted confirmation to the management application layer. >>.

IBM #343

PDF Page 158

#### 7.8.6.1.5 SL\_IR\_TIR4: Completed state

The statement << This state shall repeatedly send the Transmit Idle Dword parameter to the SL\_IR transmitter. >> should be << This state shall request idle dwords be transmitted by repeatedly sending a Transmit Idle Dword parameter to the SL\_IR transmitter (see 7.3). >>

IBM #344

PDF Page 158

#### 7.8.6.2.2.1 State description

The statement << This state waits for an SOAF to be received from the physical link, indicating an address frame is arriving. >> should be << This state waits for an address frame to be received. >>

IBM #345

PDF Page 158

#### 7.8.6.2.2.2 Transition SL\_IR\_RIF1: Idle to SL\_IR\_RIF2: Receive\_Identify\_Frame

The statement << when both: >> should be changed to << after >>.

IBM #346

PDF Page 158

#### 7.8.6.2.3.1 State description

The statement << After receiving the frame, it shall check if it is a correct IDENTIFY address frame. >> should be << After receiving the address frame, this state shall check if it is a valid IDENTIFY address frame. >>

IBM #347

PDF Page 158

#### 7.8.6.2.1 Overview

The statement << an IDENTIFY address frame from the physical link and checks the IDENTIFY address >> should be << an IDENTIFY address frame and checks that IDENTIFY address >>.

IBM #348

PDF Page 159

#### 7.8.6.2.3.2 Transition SL\_IR\_RIF2: Receive\_Identify\_Frame to SL\_IR\_RIF3: Completed

The statement << This transition shall occur after receiving an EOAF and sending the Identify Received parameter or Address Frame Failed confirmation. >> should be << This transition shall occur after:

- a) receiving an EOAF Received parameter; and
- b) sending the Identify Received parameter or Address Frame Failed confirmation. >>

IBM #349

PDF Page 159

7.8.6.2.4 SL\_IR\_IRF3: Completed state

The statement << This state does nothing except wait for >> should be << This state waits for >>.

7.8.6.3.1 Overview

The statement << state machines function is to ensure IDENTIFY address >> should be << state machine ensures IDENTIFY address >>.

IBM #351

PDF Page 159

7.8.6.3.2.1 State description

The statement << This state shall >> should be << Upon entry into this state, this state shall: >>

IBM #352

PDF Page 159

7.8.6.3.2.1 State description

There is not description of when the << Identify Time out >> confirmation is send out. That confirmation is in figure 67 as an output from the SL\_IR\_IRC1 state. This needs to fixed.

IBM #353

PDF Page 160

7.10 Near-end analog loopback test

\*\*\*

This section should be deleted as it causes implantation problems and is of little or no use in real life.

IBM #354

PDF Page 160

7.8.6.3.3.1 State description

The statement << from the Transmit IDENTIFY or HARD\_RESET state machine, >> should be deleted as we do not state were things come from.

IBM #355

PDF Page 160

7.8.6.3.3.1 State description

The statement << initialize a receive identify time out >> should be << initialize the receive identify time out >> .

IBM #356

PDF Page 160

7.8.6.3.3.1 State description

The statement << time out timer is exceeded, this state shall: >> should be << time out timer times out, this state shall >>.

IBM #357

PDF Page 160

7.8.6.3.3.1 State description

The << Identify Sequence Complete >> confirmation is not shown in figure 67. This needs to be fixed.

IBM #358

PDF Page 160

7.8.6.3.3.1 State description

The << HARD\_RESET Received >> confirmation is not shown in figure 67. This needs to be fixed..Sequence number: 7



IBM #358

PDF Page 160

The statement << time out timer is exceeded before >> should be << time out timer times out before >> .

IBM #359

PDF Page 160

7.8.6.3.3.2 Transition SL\_IR\_IRC2: Wait to SL\_IR\_IRC3: Completed

The statement << This transition shall occur after sending a HARD\_RESET

Received confirmation, Identify Timeout

confirmation, or Identify Sequence Complete confirmation to the management application layer. >> should be << This transition

shall occur:

a) if an Identify Received parameter and an Identify Transmitter parameter are received, and after sending:

A) an Identify Sequence Complete confirmation to the management application layer;

B) in an expander device, a Broadcast Event Notify (Identification Sequence Complete) confirmation to the expander function;

C) a Phy Enabled confirmation to the port layer and the management application layer; and

D) an Enable Disable SAS Link (Enable) parameter to the SL state machine (see 7.13) in initiator devices and target devices or the XL state machine (see 7.14) in expander devices;

b) if a HARD\_RESET Received parameter is received and after sending a HARD\_RESET Received confirmation to the management application layer; or

c) if the identify timer times out and after sending an Identify Timeout confirmation to the management application layer.>>

IBM #360

PDF Page 160

7.8.6.3.4 SL\_IR\_IRC3: Completed state

The statement << This state does nothing except wait for >> should be <<

This state waits for >>.

IBM #361

PDF Page 160

The statement << SATA interface power management is not supported in SAS.

>> should be deleted. For something that is not

supported there seems to be a lot of discussion in this section.

IBM #362

PDF Page 160

7.10 Near-end analog loopback test

\*\*\*

This section should be deleted as it causes implantation problems and is of little or no use in real life.

IBM #363

PDF Page 160

7.8.6.3.3.1 State description

The statement << from the Receive IDENTIFY Address Frame state machine >>

should be deleted as the general rule is that we

do not state where things come from in state diagrams.

IBM #364

PDF Page 161

7.11 Domain changes

The statement << domain with a discover process (see 4.6.11.5) >> should be

<< domain using the discover process (see

4.6.11.5) >>. Page: 162

IBM #365

PDF Page 161

The statement << communication can begin. >> should be << any communication begins >>.

IBM #366

PDF Page 161

## 7.12.2.1 Connection request

The statement << After transmitting an OPEN address frame, the source phy shall initialize an open time out timer to 1 ms and start the timer. Whenever an AIP is received, the source phy shall reinitialize and restart the timer. Source phys are not required to enforce a limit on the number of AIPs received before abandoning the connection request, but they may do so. When any connection response is received, the source phy shall reinitialize the timer. If the timer expires before a connection response is received, the source phy may assume the destination port does not exist and shall transmit BREAK to abandon the connection request. >> is a duplicate of the information that is in the state machines and should be deleted.

IBM #367

PDF Page 163

## 7.12.3 Arbitration fairness

The statement << the SCALE bit to one; >> should be << the SCALE bit in the OPEN address frame to one; >>.

IBM #368

PDF Page 163

## 7.12.2.2 Connection request responses

\*\*\*

The text << the source port shall wait a retry delay of 15  $\mu$ s before >> has more than one problem.

One is that the term retry delay should be defined as a specific time (i.e., retry delay = 15 $\mu$ sec) the 15  $\mu$ sec would then be dropped from the text. Or the the statement needs to change to << the source port shall wait 15  $\mu$ s before >>.

The next problem is that this is a shall when it should be a should.

The last problem is that there is no tolerance on the value. It should be stated as << shall (should) wait a minimum of 15  $\mu$ s before >>.

IBM #369

PDF Page 163

## 7.12.2.2 Connection request responses

The term << possible >> should be deleted.

IBM #370

PDF Page 163

## 7.12.2.2 Connection request responses

global

The statement << I\_T\_L\_Q >> should be << I\_T\_L\_Q nexus >>. In all cases I\_T, I\_T\_L, and I\_T\_L\_Q should be I\_T nexus, I\_T\_L nexus, and I\_T\_L\_Q nexus.

IBM #371

PDF Page 163

The statement << wait timer counting the >> should be << wait timer that counts the >>.

IBM #372

PDF Page 163

## 7.12.3 Arbitration fairness

The statement << may be unfair, setting the >> should be << may be unfair by setting the >>.

IBM #373

PDF Page 163

## 7.12.3 Arbitration fairness

The term <<livelocks.>> needs to be added to the glossary.

IBM #374

PDF Page 163

## 7.12.3 Arbitration fairness

The statement << and helps prevent livelocks. >> should be deleted.

IBM #375

PDF Page 163

### 7.12.3 Arbitration fairness

The following << the SCALE bit to one; >> should be change to << the SCALE bit <<in the OPEN address frame>> to one; >>.

IBM #376

PDF Page 163

### 7.12.2.2 Connection request responses

\*\*\*

The text << the source port shall wait a retry delay of 15  $\mu$ s before >> has more than one problem.

One is that the term retry delay should be defined as a specific time (i.e., retry delay = 15usec) the 15 usec would then be dropped from the text. Or the the statement needs to change to << the source port shall wait 15  $\mu$ s before >>.

The next problem is that this is a shall when it should be a should.

The last problem is that there is no tolerance on the value. It should be stated as << shall (should) wait a minimum of 15 us before >>.

IBM #377

PDF Page 164

### 7.12.3 Arbitration fairness

Note 22 states << of the time a device must wait after receiving OPEN\_REJECT (PATHWAY BLOCKED) >> which has two problems one is the word must is used. If that is changed to a shall which seems logical then problem two occurs in that now you have a requirement in a note which is not allowed. This needs to be fixed.

IBM #378

PDF Page 164

### 7.12.3 Arbitration fairness

The statement << wins arbitration, receiving either >> should be << wins arbitration by receiving either >>.

IBM #379

PDF Page 164

The statement << arbitration request, receiving an OPEN address frame from the destination port with matching PROTOCOL and CONNECTION RATE fields. >>

should be << arbitration request if an OPEN address frame from the destination port with matching PROTOCOL and CONNECTION RATE fields was received. >>

IBM #380

PDF Page 164

### 7.12.3 Arbitration fairness

The statement << values in this order: >> should be << values in the following order: >>.

IBM #381

PDF Page 164

### 7.12.3.1.1 Arbitration overview

The statement << values in this order: >> should be << values in the following order: >>.

IBM #382

PDF Page 165

### 7.12.3.1.1 Arbitration overview

The statement << conditions are met: >> should be << conditions occur >>.

IBM #383

PDF Page 165

### 7.12.3.1.1 Arbitration overview

The statement << conditions are met: >> should be << conditions occur >>.

IBM #384

PDF Page 165

### 7.12.3.1.1 Arbitration overview

The statement << conditions are met: >> should be << conditions occur >>.

IBM #385

PDF Page 165

7.12.3.1.1 Arbitration overview

The statement << port which contains >> should be << port that contains >>.

IBM #386

PDF Page 165

7.12.3.1.1 Arbitration overview

The statement << destination (this case occurs >> should be << destination (i.e., occurs >>

IBM #387

PDF Page 165

7.12.3.1.3 Partial Pathway Timer

The statement << conditions are met: >> should be << conditions occur >>.

IBM #388

PDF Page 165

7.12.3.1.3 Partial Pathway Timer

The statement << above are not met, the >> should be << above do not occur, the >>.

IBM #389

PDF Page 165

7.12.3.1.3 Partial Pathway Timer

Delete the statement << until reaching zero, >> and place the following statement in this section <<The expander connection manager shall stop decrementing the PPT timer when it reaches zero. >>.

IBM #390

PDF Page 165

The statement << manager shall hold the PPT timer at an initial value set to the partial pathway time out value. >> does not make sense. This needs to be fixed.

IBM #391

PDF Page 165

7.12.3.1.4 Pathway Recovery

The statement << requests in order to prevent deadlock using Pathway Recovery Priority comparisons. >> should be << requests using Pathway Recovery Priority comparisons. >>.

IBM #392

PDF Page 165

7.12.3.1.4 Pathway Recovery

The statement << fields within the OPEN >> should be << fields from the OPEN >>.

IBM #393

PDF Page 165

7.12.3.1.4 Pathway Recovery

The statement << as follows: >> should be deleted as there is no list that follows.

IBM #394

PDF Page 166

7.12.4.1 All expander devices

The statement << frame will win >> should be << frame shall win >> or << frame wins >>.

IBM #395

PDF Page 166

7.12.3.1.4 Pathway Recovery

The term << effectively >> should be deleted as it adds nothing.

IBM #396

PDF Page 166

7.12.3.1.4 Pathway Recovery

The statement << only with the SOURCE SAS >> should be << only on the

SOURCE SAS >>.

IBM #397

PDF Page 166

7.12.4.1 All expander devices

In the statement << frame unless it has higher >> it is not clear what the it is referring to. This needs to be fixed.

IBM #398

PDF Page 166

7.12.4.1 All expander devices

The statement << three AIPs consecutively >> should be << three consecutive AIPs >>.

IBM #399

PDF Page 166

7.12.4.1 All expander devices

The term << immediately >> does not give enough information as to how soon immediately is. This needs to be fixed.

IBM #400

PDF Page 166

7.12.4.2 Edge expander devices

The statement << this means >> should be deleted.

IBM #401

PDF Page 166

7.12.4.2 Edge expander devices

The statement << When two edge expander >> should be << If two edge expander >>.

IBM #402

PDF Page 166

7.12.4.2 Edge expander devices

The statement << When a fanout expander >> should be << If a fanout expander >>.

IBM #403

PDF Page 167

7.12.4.3 Fanout expander devices

The statement << phys which are >> should be << phys that are >>.

IBM #404

PDF Page 167

7.12.4.3 Fanout expander devices

In the statement << it shall compare >> it is not clear what the it is. This needs to be fixed.

IBM #405

PDF Page 167

7.12.4.3 Fanout expander devices

There are a whole bunch of << it >> s in this section where it is not clear what the it is. This needs to be fixed.

IBM #406

PDF Page 167

7.12.5 Abandoning a connection request

The statement << After transmitting BREAK, the source port shall initialize a break time out timer to 1 ms and start the timer. If the timer expires before a break response is received, the source port may assume the physical link is unusable. >> should be deleted as it is duplicated in the state machine descriptions.

IBM #407

PDF Page 167

This confirms that the connection request has been abandoned.

Table 81

The statement << The BREAK was too late and an open response arrived late. The originator shall honor this as a response to the

open request it was attempting to abandon. >> is not clear and the reference to 7.12.2 does not help in understanding this. This needs to be fixed.

IBM #408

PDF Page 167

7.12.5 Abandoning a connection request

The statement << the target port. >> should be << the destination port >> as a BREAK can be sent from both targets and initiators .

IBM #409

PDF Page 167

7.12.5 Abandoning a connection request

The term << possible >> should be deleted.

IBM #410

PDF Page 168

7.12.5 Abandoning a connection request

The statement << that an open response will not occur. >> should be << that an open response shall not occur >>.

IBM #411

PDF Page 168

Figure 69

The order of the BREAKs in this figure is not clear. They should be numbered in the time order they will occur.

IBM #412

PDF Page 169

7.12.5 Abandoning a connection request

The statement << BREAK to break the connection. >> should be << BREAK to end the connection >>.

IBM #413

PDF Page 169

7.12.6 Breaking a connection

The statement << to break a connection, >> should be << to end a connection, >>..Sequence number: 3

IBM #413

PDF Page 169

7.12.6 Breaking a connection

The term << possible >> should be deleted.

IBM #414

PDF Page 169

7.12.6 Breaking a connection

The statement << may be broken as the >> should be ended as the >>

IBM #415

PDF Page 169

7.12.6 Breaking a connection

The statement << to a broken connection: >> should be << to a connection that has ended do to a BREAK: >>.

IBM #416

PDF Page 169

7.12.6 Breaking a connection

The statement << the broken connection; >> should be << to a connection that has ended do to a BREAK: >>.

IBM #417

PDF Page 169

7.12.6 Breaking a connection

The statement << a broken connection >> should be << a connection that has ended do to a BREAK >>.

IBM #418

PDF Page 169

7.12.6 Breaking a connection

The statement << a broken connection >> should be << a connection that has ended do to a BREAK >>.

IBM #419

PDF Page 170

7.12.7 Closing a connection

The statement << when the connection was opened. >> does not seem necessary and is unclear. It should be deleted.

IBM #420

PDF Page 170

7.12.7 Closing a connection

The statement << If an expander that supports attachment of a SATA target >> should start a new paragraph.

IBM #421

PDF Page 170

Figure 71

It is not at all clear what the purpose of the ACK and RRDY indications from the transmitter is all about. This needs to be fixed..Page: 171

IBM #422

PDF Page 170

7.13.1 Overview

The statement << from the SL\_IR state machines >> should be deleted as the general rule is that we do not state where things come from in state diagrams.

IBM #423

PDF Page 170

7.13.1 Overview

The statement << from the SSP, STP, and SMP link layer state machines: >> should be deleted as the general rule is that we do not state where things come from in state diagrams.

IBM #424

PDF Page 170

7.13.1 Overview

The statement << from the SL\_IR state machines >> should be deleted as the general rule is that we do not state where things come from in state diagrams.

IBM #425

PDF Page 172

Figure 72

The << Enable Disable Link Layer (Disable) >> confirmation needs to touch the edge of the state machine box. The statement << (to all states in all state machines, causing transition to SL0:Idle) >> should be changed to << (This parameter causes a transition to SL0:Idle) >>.

IBM #426

PDF Page 173

7.13.2 SL transmitter and receiver

There should be a list of inputs and outputs from the SL transmitter listed in this section. Something like this should be added. <<

The SL state machine sends the following parameters to the SL transmitter:

a, b, c list of outputs

The SL state machine receives the following parameters from the SL receiver:

a, b, c list of inputs

IBM #427

PDF Page 174

The statement << The SL receiver shall ignore any primitive received inside an OPEN address frame. In this case, a dword shall be considered inside a frame when it is received after an SOAF and before an EOAF if the primitive is received after the 8th data dword following the SOAF. >> seems to be confusing. Changing it to the following may help << The SL receiver shall ignore any

primitive received inside an OPEN address frame. In this case, a primitive shall be considered inside a frame when it is received within the first eight data dwords after an SOAF. >>

IBM #428

PDF Page 174

7.13.3.1 State description

The statement << SSP Link (Enable) confirmation is received >> should be << SSP Link (Enable) parameter is received >>

IBM #429

PDF Page 174

7.13.3.1 State description

The statement << that is used when the SL state machine is activated and there is no active connection >> should be << that is used when the SL state machine is activated and there is no pending or active connection >>. This should be the same wording that is used in the XLO state description in 7.14.2.1.

IBM #430

PDF Page 174

7.13.3.1 State description

The statement << The SL0:Idle state is the >> should be << This state is the >>.

IBM #431

PDF Page 175

7.13.4.1 State description

The statement << c) If the frame is discarded then no further action is taken by this state relating to the invalid address frame. >> should not have a c). It should just be a sentence.

IBM #432

PDF Page 177

7.13.5.2 Transition SL2:Selected to SL0:Idle

The statement in 1, 2, 3, and 4 << then after this >> should be changed to << and after this >>. This change should make the statements more clear that they are currently.

IBM #433

PDF Page 179

7.14.1 Overview

The statement << facilitated by the expander function - specifically the expander connection manager and expander connection router. >> should be << facilitated by the expander connection manager and the expander connection router. >>. Page: 180

IBM #434

PDF Page 179

7.14.1 Overview

The statement << The XL state machine shall be activated after the completion of the phy reset sequence by receiving an after receiving an Enable Disable SAS Link (Disable) parameter from the SL\_IR state machines (see 7.8.5). >> should be changed to << The state machine shall start in the XLO:Idle state. The state machine shall transition to the XLO:Idle state from any other state after receiving an Enable Disable SAS Link (Disable) parameter from the SL\_IR state machines (see 7.8.5). >>

IBM #435

PDF Page 179

7.14.1 Overview

The statement << from the expander connection manager: >> should be deleted as the general rule is that we do not state where things come from in state diagrams.

IBM #436

PDF Page 179

7.14.1 Overview

The statement << from the broadcast primitive processor: >> should be



deleted as the general rule is that we do not state where things come from in state diagrams.

IBM #437

PDF Page 179

#### 7.14.1 Overview

The statement << from the SL\_IR state machine: >> should be deleted as the general rule is that we do not state where things come from in state diagrams.

IBM #438

PDF Page 181

#### Figure 74

The << Enable Disable Link Layer (Disable) >> confirmation needs a cut out from the XL state machine and it needs to touch the edge of the state machine box. The statement << (to all states in all state machines, causing transition to XL0:Idle) >> should be changed to << (This parameter causes a transition to XL0:Idle) >>.

IBM #439

PDF Page 182

#### Figure 75

The << Enable Disable Link Layer (Disable) >> confirmation needs a cut out from the XL state machine and it needs to touch the edge of the state machine box. The statement << (to all states in all state machines, causing transition to XL0:Idle) >> should be changed to << (This parameter causes a transition to XL0:Idle) >>..Page: 183

IBM #440

PDF Page 182

#### Figure 76

The << Enable Disable Link Layer (Disable) >> confirmation needs a cut out from the XL state machine and it needs to touch the edge of the state machine box. The statement << (to all states in all state machines, causing transition to XL0:Idle) >> should be changed to << (This parameter causes a transition to XL0:Idle) >>.

IBM #441

PDF Page 182

#### 7.14.2 XL0:Idle state (before this section)

There needs to be a section added here they gives the XL transmitter and XL receiver information (i.e., the green arrows). This section would be very similar to 7.13.2 SL transmitter and receiver.

IBM #442

PDF Page 184

#### 7.14.2.1 State description

The statement << Otherwise, this state shall repeatedly send a Transmit Idle Dword parameter to the XL transmitter. >> should be << This state shall request idle dwords be transmitted by repeatedly sending a Transmit Idle Dword parameter to the XL transmitter (see 7.3). >> and should be it's own paragraph.

IBM #443

PDF Page 184

#### 7.14.2.1 State description

The statement << that occurs when there is no pending or active connection >> should be << that is used when the XL state machine is activated and there is no pending or active connection >>. This should be the same wording that is used in the SL0 state description in 7.13.3.1.

IBM #444

PDF Page 184

#### 7.14.2.1 State description

The statement << Transmit Broadcast Primitive parameter >> should be << Transmit Broadcast Primitive request >> .

IBM #445

PDF Page 184

7.14.2.1 State description

The statement << this state shall send a Transmit BROADCAST parameter to the XL transmitter. >> should be << this state shall request a BROADCAST be transmitted by sending a Transmit BROADCAST parameter to the XL transmitter. >>

IBM #446

PDF Page 184

7.14.2 XL0: Idle state

There is not description of what occurs when the Enable Disable SAS Link (Enable) parameter is received. This needs to be fixed.

IBM #447

PDF Page 184

7.14.2 XL0: Idle state

There is not description of what causes an Open Address Frame parameter to be sent to the XL5 state. This needs to be fixed.

IBM #448

PDF Page 184

7.14.2.2 Transition XL0: Idle to XL1: Request\_Path

The statement << shall occur when the following conditions are met: >> should be << shall occur if: >>.

IBM #449

PDF Page 184

7.14.2.2 Transition XL0: Idle to XL1: Request\_Path

The is nothing in figure 74 that shows a Transmit Open or a Transmit Break. This needs to be fixed.

IBM #450

PDF Page 184

7.14.2.2 Transition XL0: Idle to XL1: Request\_Path

The following should be deleted << from another phy via the expander connection router >> as the general rule is that we do not state where things come from in state diagrams.

IBM #451

PDF Page 184

7.14.2.2 Transition XL0: Idle to XL1: Request\_Path

The following should be deleted << from another phy via the expander connection router >> as the general rule is that we do not state where things come from in state diagrams. Several of the deletions I am suggesting in 7.14 look like they should reference a section that describes the interaction between expander objects

IBM #452

PDF Page 184

7.14.2.3 Transition XL0: Idle to XL5: Forward\_Open

The following should be deleted << from another phy via the expander connection router >> as the general rule is that we do not state where things come from in state diagrams.

IBM #453

PDF Page 184

7.14.2.3 Transition XL0: Idle to XL5: Forward\_Open

The following should be deleted << from another XL state machine via the expander connection router >> as the general rule is that we do not state where things come from in state diagrams.

IBM #454

PDF Page 184

7.14.2.3 Transition XL0: Idle to XL5: Forward\_Open

The statement << shall occur when the following conditions are met: >> should be << shall occur if: >>.

IBM #455

PDF Page 184

## 7.14.2.4 Transition XL0:Idle to XL9:Break

The statement << shall occur when a BREAK Received parameter is received. >> should be << shall occur after receiving a BREAK Received parameter. >>. Sequence number: 15

IBM #455

PDF Page 184

## 7.14.2.5 Transition XL0:Idle to XL10:Break\_Wait

The statement << shall occur when a Transmit Break indication is received from another XL state machine via the expander connection router. >> should be << shall occur after receiving a Transmit Break indication. >>.

IBM #456

PDF Page 184

## 7.14.3.1 State description

The statements << This state shall send the following parameters to the XL transmitter:

- a) Transmit AIP (WAITING ON PARTIAL) when an Arbitrating (Waiting On Partial) confirmation is received from the expander connection manager;
- b) Transmit AIP (WAITING ON PARTIAL) when an Arbitrating (Blocked On Partial) confirmation is received from the expander connection manager;
- c) Transmit AIP (WAITING ON CONNECTION) when an Arbitrating (Waiting On Connection) confirmation is received from the expander connection manager; or
- d) Transmit AIP (NORMAL). >> should be << This state shall request:
  - a) an AIP (WAITING ON PARTIAL) be transmitted by sending a Transmit AIP (WAITING ON PARTIAL) parameter to the XL transmitter if an Arbitrating (Waiting On Partial) confirmation is received;
  - b) an AIP (WAITING ON PARTIAL) be transmitted by sending a Transmit AIP (WAITING ON PARTIAL) parameter to the XL transmitter if an Arbitrating (WBlocked On Partial) confirmation is received;
  - c) an AIP (WAITING ON CONNECTION) be transmitted by sending a Transmit AIP (WAITING ON CONNECTION) parameter to the XL transmitter if an Arbitrating (Waiting On Connection) confirmation is received;
  - d) an AIP (NORMAL) be transmitted by sending a Transmit AIP(NORMAL) if an ????? is received;

IBM #457

PDF Page 184

## 7.14.3.1 State description

The statement << Request Path request >> should be << Request Path confirmation >>.

IBM #458

PDF Page 185

## 7.14.3 XL1:Request\_Path state

The way Arbitrating (Block On Partial) is used is not consistent with the way confirmations and parameters are used in the rest of this standard. It is acting more like a signal is this description. This needs to be fixed. There needs to be two arguments; one for Blocked On Partial and another called something like Partial Cleared. The descriptions would then say that the timer starts on Arbitration (Blocked On Partial) and if no Arbitrating (Partial Cleared) is received before the timer times out then xyz happens.

IBM #459

PDF Page 185

## 7.14.3.1 State description

The statement << status is conveyed to the expander >> should be << status is sent to the expander >>.

IBM #460

PDF Page 185

## 7.14.3 XL1:Request\_Path state

There was no description of the Arb Reject parameter shown in figure 74 in this section.

#### 7.14.3.2 Transition XL1:Request\_Path to XL2:Request\_Open

The following should be deleted << from the expander connection manager. >> should be deleted as the general rule is that we do not state where things come from in state diagrams.

IBM #462

PDF Page 185

#### 7.14.3.2 Transition XL1:Request\_Path to XL2:Request\_Open

The following should be deleted << from the expander connection manager. >> should be deleted as the general rule is that we do not state where things come from in state diagrams.

IBM #463

PDF Page 185

#### 7.14.3.2 Transition XL1:Request\_Path to XL2:Request\_Open

The following should be deleted << from the expander connection manager. >> should be deleted as the general rule is that we do not state where things come from in state diagrams.

IBM #464

PDF Page 185

#### 7.14.3.2 Transition XL1:Request\_Path to XL2:Request\_Open

#### 7.14.3.3 Transition XL1:Request\_Path to XL4:Open\_Reject

#### 7.14.3.4 Transition XL1:Request\_Path to XL0:Idle

#### 7.14.3.5 Transition XL1:Request\_Path to XL9:Break

The term < when >> should be << after >>.

IBM #465

PDF Page 185

#### 7.14.4.1 State description

The statement << This state shall repeatedly send a Transmit Idle Dword parameter to the XL transmitter. >> should be << This state shall request idle dwords be transmitted by repeatedly sending a Transmit Idle Dword parameter to the XL transmitter (see 7.3). >>.

IBM #466

PDF Page 185

#### 7.14.4 XL2:Request\_Open state

The Transmit Idle Dword parameter, the Transmit Open request (?), and Transmit Open indication (?) are missing from figure 75. This needs to be fixed.

IBM #467

PDF Page 185

#### 7.14.4.1 State description

The statement << This state shall send a Transmit >> give no indication as to when this is supposed to happen. I am guessing the statement should be << Upon entry into this state, this state shall send a Transmit >>.

IBM #468

PDF Page 185

#### 7.14.4.1 State description

The statement << received by the destination phy as a Transmit Open indication. >> should be deleted.

IBM #469

PDF Page 185

#### 7.14.4 XL2:Request\_Open state

The statement << Transmit Open request/indication >> should be << Transmit Open request >>..Sequence number: 13

IBM #469

PDF Page 185

#### 7.14.4.2 Transition XL2:Request\_Open to XL3:Open\_Confirm\_Wait

The statement << This transition shall occur after the OPEN address frame has been forwarded to a destination phy. >> should be

<< This transition shall occur after sending an OPEN address frame transmitted by sending a Transmit OPEN Address Frame parameter to the XL transmitter of a destination phy. >>

IBM #470

PDF Page 185

#### 7.14.3.1 State description

The statement << from the expander connection manager. >> should be deleted as the general rule is that we do not state where things come from in state diagrams.

IBM #471

PDF Page 186

#### 7.14.5.3 Transition XL3: Open\_Confirm\_Wait to XL7: Connected

There is no << OPEN\_ACCEPT Transmitted >> parameter in figure 75.

IBM #472

PDF Page 186

#### 7.14.5.1 State description

Most of what is in the following statements should be placed in the section that describe the transitions as the receipt of the various confirmation (if they really are configurations) and parameter cause the state transitions. It also needs to be reworded to match the wording used in the other state diagram sections << This state shall send the following parameters to the XL transmitter:

- a) Transmit AIP (NORMAL) when an Arb Status (Normal) confirmation is received;
  - b) Transmit AIP (WAITING ON PARTIAL) when an Arb Status (Waiting On Partial) confirmation is received;
  - c) Transmit AIP (WAITING ON CONNECTION) when an Arb Status (Waiting On Connection) confirmation is received;
  - d) Transmit AIP (WAITING ON DEVICE) when an Arb Status (Waiting On Device) confirmation is received;
  - e) Transmit OPEN\_ACCEPT when an Open Accept confirmation is received;
  - f) Transmit OPEN\_REJECT when an Open Reject confirmation is received; or
  - g) Transmit Idle Dword when none of the previous conditions are present.
- This state shall send a Transmit Break request to a destination phy when a BREAK Received parameter is received. >>

IBM #473

PDF Page 186

#### 7.14.5.1 State description

The statement << g) Transmit Idle Dword when none of the previous conditions are present. >> should be << This state shall request idle dwords be transmitted by repeatedly sending a Transmit Idle Dword parameter to the XL transmitter (see 7.3). >>.

IBM #474

PDF Page 186

#### 7.14.5.1 State description

The statement << Arb Status (Waiting on Partial) is received, >> should be << Arb Status (Waiting on Partial) request is received, >>

IBM #475

PDF Page 186

7.14.5.1 State description. The statement << Otherwise, this state shall send a Phy Status (Partial Pathway) confirmation to the expander connection manager. >> is not precise in that it gives no information as to when the Phy Status (Partial Pathway) confirmation is to be sent.

IBM #476

PDF Page 186

#### 7.14.5.2 Transition XL3: Open\_Confirm\_Wait to XL0: Idle

The statement << from a destination phy, >> should be deleted.

IBM #477

PDF Page 186

#### 7.14.5.2 Transition XL3: Open\_Confirm\_Wait to XL0: Idle

The statement << from a destination phy, >> should be deleted.

IBM #478

PDF Page 186

7.14.5.2 Transition XL3:Open\_Confirm\_Wait to XL0:Idle

The statement << from a destination phy, >> should be deleted.

IBM #479

PDF Page 186

7.14.5.3 Transition XL3:Open\_Confirm\_Wait to XL7:Connected

The statement << from a destination phy, >> should be deleted.

IBM #480

PDF Page 186

7.14.5.5 Transition XL3:Open\_Confirm\_Wait to XL10:Break\_Wait

The statement << from a destination phy, >> should be deleted.

IBM #481

PDF Page 186

7.14.5.2 Transition XL3:Open\_Confirm\_Wait to XL0:Idle

7.14.5.3 Transition XL3:Open\_Confirm\_Wait to XL7:Connected

According to Figure 75 the term << confirmation >> in these sections should be << request >>.

IBM #482

PDF Page 186

7.14.5.2 Transition XL3:Open\_Confirm\_Wait to XL0:Idle

There is no parameter in figure 75 that shows anything about << path resources >> being released. This needs to be fixed.

IBM #483

PDF Page 186

7.14.5.4 Transition XL3:Open\_Confirm\_Wait to XL9:Break

The statement << after a BREAK Received parameter is received and a Transmit Break request has been sent to a destination phy, >> should be << after receiving BREAK Received parameter and requesting a BREAK be transmitted by sending a Transmit BREAK parameter to the XL transmitter of a destination phy, >>

IBM #484

PDF Page 186

7.14.5.5 Transition XL3:Open\_Confirm\_Wait to XL10:Break\_Wait

The statement << occur when a Transmit Break indication is received >> should be << occur after receiving a Transmit Break request, >>. Sequence number: 15

IBM #484

PDF Page 186

7.14.6.1 State description

There is no Arb Reject confirmation in figure 74. There is an Arb Reject parameter passed from the XL1 state. But that is not described in the XL1 state. This needs to be fixed.

IBM #485

PDF Page 186

7.14.6.1 State description

Most of what is in the following statements should be placed in the section that describe the transitions as the receipt of the various confirmation (if they really are configurations) and parameter cause the state transitions. It also needs to be reworded to match the wording used in the other state diagram sections << This state shall send the following parameters to the XL transmitter:

a) Transmit OPEN\_REJECT (NO DESTINATION) when an Arb Reject (No Destination) confirmation is received from the expander connection manager;

b) Transmit OPEN\_REJECT (BAD DESTINATION) when an Arb Reject (Bad Destination) confirmation is received from the expander connection manager;

c) Transmit OPEN\_REJECT (CONNECTION RATE NOT SUPPORTED) when an Arb Reject (Bad Connection Rate) confirmation

is received from the expander connection manager;  
 d) Transmit OPEN\_REJECT (PATHWAY BLOCKED) when an Arb Reject (Pathway Blocked) confirmation is received from the expander connection manager. >>

IBM #486

PDF Page 186

7.14.6.1 State description

The statement << This state shall >> should be << This state shall >>

IBM #487

PDF Page 186

7.14.6.1 State description

The statement << from the expander connection manager;>> should be deleted as the general rule is that we do not state where things come from in state diagrams.

IBM #488

PDF Page 186

7.14.6.1 State description

The statement << from the expander connection manager;>> should be deleted as the general rule is that we do not state where things come from in state diagrams.

IBM #489

PDF Page 187

7.14.7 XL5: Forward\_Open state

The is an << Open Address Frame >> parameter and a << Transmit Idle Dword >> parameter in figure 75 for this state that are not described in this section. That needs to be fixed.

IBM #490

PDF Page 187

7.14.7.1 State description

The statement << frame indicated by the Transmit Open indication received from a source phy >> does not make any sense. I'm not sure how to fix it but it must be fixed.. Sequence number: 3

IBM #490

PDF Page 187

7.14.7.1 State description

There is no << Transmit Open indication >> shown in figure 75. This needs to be fixed.

IBM #491

PDF Page 187

7.14.7.1 State description

The statement << This state shall send a Transmit OPEN Address Frame parameter to the XL transmitter with the fields set to the values specified by the >> has some problems. There is no indication as to where or what event causes what is stated to occur. This needs be fixed. Then it needs to be reworded to something like << After (trigger event) this state shall request an OPEN address frame be transmitted by sending a Transmit OPEN Address Frame parameter to the XL transmitter. The Transmit OPEN Address Frame arguments shall be set to the values specified by the Transmit Open indication. >>

IBM #492

PDF Page 187

How does this state know when an << OPEN address frame has been transmitted. >> when there are no Open Address Frame Transmitted parameters as inputs? This needs to be fixed.

IBM #493

PDF Page 187

7.14.8.1 State description

The statement << This state shall transmit idle dwords. >> >> should be << This state shall request idle dwords be transmitted by repeatedly sending a Transmit Idle Dword parameter to

the XL transmitter (see 7.3). >>.

IBM #494

PDF Page 187

#### 7.14.8.1 State description

There is no OPEN\_ACCEPT or OPEN\_REJECT parameters shown in figure 75. This needs to be corrected.

IBM #495

PDF Page 187

#### 7.14.8.1 State description

Most of what is in the following statements should be placed in the section that describe the transitions as the receipt of the various confirmation (if they really are configurations) and parameter cause the state transitions. It also needs to be reworded to match the wording used in the other state diagram sections.

<< This state shall send the following responses through the expander connection router to a source phy,

received by the source phy as confirmations:

- a) Open Accept when OPEN\_ACCEPT is received;
- b) Open Reject when OPEN\_REJECT is received;
- c) Backoff Retry when a higher priority OPEN address frame is received (see 7.12.3) and the source SAS address and connection rate of the received OPEN address frame are not equal to the destination SAS address and connection rate of the transmitted OPEN address frame; or
- d) Backoff Reverse Path when a higher priority OPEN address frame is received (see 7.12.3) and the source SAS address and connection rate of the received OPEN address frame are equal to the destination SAS address and connection rate of the transmitted OPEN address frame.

IBM #496

PDF Page 187

#### 7.14.8.1 State description

The statement << This state shall send the following arbitration responses through the expander connection router to a source phy,

received by the source phy as confirmations:

- a) Arb Status (Waiting On Device) when an AIP Received parameter has not been received; .b) Arb Status (Normal) when an AIP (NORMAL) Received parameter is received;
- c) Arb Status (Waiting On Partial) when an AIP (WAITING ON PARTIAL) Received parameter is received;
- d) Arb Status (Waiting On Connection) when an AIP (WAITING ON CONNECTION) Received parameter is received; and
- e) Arb Status (Waiting On Device) when an AIP (WAITING ON DEVICE) Received parameter is received.

>> should be << This state shall request:

- a) an Arb Status (Waiting On Device) be transmitted by sending an Arb Status (Waiting On Device) parameter to the XL transmitter if an AIP Received parameter is not received; >> This gives no indication as to when the parameter that is not received is checked or under what conditions it is considered not received <<
- b) an Arb Status (Normal) be transmitted by sending an Arb Status (Normal) parameter to the XL transmitter if an AIP (NORMAL) Received parameter is received;
- c) an Arb Status (Waiting On Partial) be transmitted by sending an Arb Status (Waiting On Partial) parameter to the XL transmitter if an AIP (WAITING ON PARTIAL) Received parameter is received;
- d) an Arb Status (Waiting On Connection) be transmitted by sending an Arb Status (Waiting On Connection) if an AIP (WAITING ON CONNECTION) Received parameter is received; and
- e) an Arb Status (Waiting On Device) be transmitted by sending an Arb Status (Waiting On Device) if an AIP (WAITING ON DEVICE) Received parameter is received. >>.

IBM #497

PDF Page 187

#### 7.14.6.1 State description

The statement << from the expander connection manager; >> should be deleted as the general rule is that we do not state where



things come from in state diagrams.

IBM #498

PDF Page 187

#### 7.14.6.1 State description

The statement << from the expander connection manager; >> should be deleted as the general rule is that we do not state where things come from in state diagrams.

IBM #499

PDF Page 188

#### 7.14.8.1 State description

The statement << Otherwise, this state shall send a Phy Status (Partial Pathway) confirmation to the expander connection manager. >> is not precise in that it gives no information as to when the Phy Status (Partial Pathway) confirmation is to be sent.

IBM #500

PDF Page 188

#### 7.14.8.1 State description

The statement << Arb Status (Waiting on Partial) is received, >> should be << Arb Status (Waiting on Partial) request is received, >>

IBM #501

PDF Page 188

#### 7.14.8.1 State description

The statement << This state shall send a Transmit Break request to a source phy when a BREAK Received parameter is received. >> needs to be moved into the relevant state transition. And reworded to the standard wording.

IBM #502

PDF Page 188

#### 7.14.8.2 Transition XL6:Open\_Response\_Wait to XL0:Idle

The statement << The XL7:XL0 transition shall occur after one of the following conditions are met: >> should be << This transition shall occur after: >>..Sequence number: 5

IBM #502

PDF Page 188

#### 7.14.8.2 Transition XL6:Open\_Response\_Wait to XL0:Idle

The statement << OPEN\_REJECT is received, Open Reject response has been sent to a source phy, and path resources have been released; >> should be << an OPEN\_REJECT is received, and after requesting an Open Reject be transmitted by sending an Open Reject response to the XL transmitter of a source phy and after path resources have been released >>

Also, there is nothing in figure 75 that would indicate what parameter is used to determine that << resources have been released >>.

IBM #503

PDF Page 188

#### 7.14.8.2 Transition XL6:Open\_Response\_Wait to XL0:Idle

The statement << received OPEN address frame >> should be << received OPEN Address Frame Received parameter >>

IBM #504

PDF Page 188

#### 7.14.8.2 Transition XL6:Open\_Response\_Wait to XL0:Idle

The statement << a Backoff Retry response has been sent to a source phy, and path resources have been released. >> should be << and after requesting an Backoff Retry be transmitted by sending a Backoff Retry response to the XL transmitter of a source phy and after path resources have been released >>

Also, there is nothing in figure 75 that would indicate what parameter is used to determine that << resources have been released >>.

IBM #505

PDF Page 188

7.14.8.3 Transition XL6:Open\_Response\_Wait to XL2:Request\_Open

The statement << received OPEN address frame >> should be << received OPEN Address Frame Received parameter >>

IBM #506

PDF Page 188

7.14.8.3 Transition XL6:Open\_Response\_Wait to XL2:Request\_Open

The statement << and Backoff Reverse Path response has been sent to a source phy. >> should be << and after requesting a Backoff Reverse Path be transmitted by sending a Backoff Reverse Path response to the XL transmitter of a source phy >>

IBM #507

PDF Page 188

7.14.8.5 Transition XL6:Open\_Response\_

The statement << occur after a BREAK is received and Transmit Break response is sent to a source phy. >> should be << after receiving BREAK Received parameter and requesting a BREAK be transmitted by sending a Transmit BREAK parameter to the XL transmitter of a source phy. >>

IBM #508

PDF Page 188

7.14.8.6 Transition XL6:Open\_Response\_Wait to XL10:Break\_Wait

The statement << occur when a Transmit Break indication is received >> should be << occur after receiving a Transmit Break request. >>.

IBM #509

PDF Page 188

7.14.8.6 Transition XL6:Open\_Response\_Wait to XL10:Break\_Wait

The statement << from a source phy. >> should be deleted.. Sequence number: 13

IBM #509

PDF Page 188

7.14.9.1 State description

The statement << This state shall send a Transmit Break request to a connected phy when a BREAK Received parameter is received.. >> needs to be moved into the relevant state transition. And reworded to the standard wording.

IBM #510

PDF Page 188

7.14.9.1 State description

The statement << This state shall send a Transmit Close request to a connected phy when a CLOSE Received parameter is received >> needs to be moved into the relevant state transition. And reworded to the standard wording.

IBM #511

PDF Page 188

7.14.9.1 State description

The statements << This state shall transmit all dwords received by the Transmit Dword indication from a connected phy via the expander connection router.

This state shall send all valid dwords received by the SAS phy through the expander connection router to a connected phy using the Transmit Dword request with the exception of BREAK and CLOSEes. >> are very confusing. The indications, responses, and parameters need to be more clearly defined as to which cause what action. This needs to be fixed.

IBM #512

PDF Page 188

7.14.9.2 Transition XL7:Connected to XL8:Close\_Wait

The statement << from a connected phy via the expander connection router. >> needs to be deleted.

IBM #513

PDF Page 188

#### 7.14.9.1 State description

The statement << This transition shall occur when a Transmit Close indication is received >> should be This transition shall occur after receiving a Transmit Close indication and after requesting a Transmit Close be transmitted by sending a Transmit Close parameter to the XL transmitter of a connected phy. >>

IBM #514

PDF Page 188

#### 7.14.9.1 State description

The statement << This state shall send a Phy Status (Connected) confirmation to the expander connection manager. >> gives no indication as to what event triggers the confirmation being sent. This needs to be fixed.

IBM #515

PDF Page 189

#### 7.14.9.3 Transition XL7:Connected to XL9:Break

The statement << occur when a BREAK Received parameter is received. >> should be << after receiving BREAK Received parameter and requesting a BREAK be transmitted by sending a Transmit BREAK parameter to the XL transmitter. >>

IBM #516

PDF Page 189

7.14.9.4 Transition XL7:Connected to XL10:Break\_Wait. The statement << occur when a Transmit Break indication is received >> should be << occur after receiving a Transmit Break request. >>.

IBM #517

PDF Page 189

#### 7.14.9.4 Transition XL7:Connected to XL10:Break\_Wait

The statement << from a connected phy via the expander connection router. >> should be deleted.

IBM #518

PDF Page 189

#### 7.14.10.4 Transition XL8:Close\_Wait to XL10:Break\_Wait

The statement << from a connected phy via the expander connection router. >> should be deleted.

IBM #519

PDF Page 189

#### 7.14.10.4 Transition XL8:Close\_Wait to XL10:Break\_Wait

The statement << occur when a Transmit Break indication is received >> should be << occur after receiving a Transmit Break request. >>

IBM #520

PDF Page 189

#### 7.14.10.3 Transition XL8:Close\_Wait to XL9:Break

The statement << occur when a BREAK Received parameter is received. >> should be << after receiving BREAK Received parameter and requesting a BREAK be transmitted by sending a Transmit BREAK parameter to the XL transmitter. >>

IBM #521

PDF Page 189

#### 7.14.10.2 Transition XL8:Close\_Wait to XLO:Idle

The statement << after a CLOSE has been both transmitted and received and after path resources have been released for this connection. >> should be << after receiving a Close Received parameter, after requesting a CLOSE be transmitted by sending a Transmit Close to the XL transmitter of a connected phy, and after sending a Transmit Close request to the ????. The expander device shall transmit the same CLOSE primitive

that was received (e.g. CLOSE (NORMAL) forwarded as CLOSE (NORMAL)). >>.

IBM #522

PDF Page 189

#### 7.14.10.1 State description

The statement << This state shall send a Transmit Break request to a connected phy when a BREAK Received parameter is received. >> needs to be moved into the relevant state transition. And reworded to the standard wording.

IBM #523

PDF Page 189

The statement << This state shall send a Transmit Close request to a connected phy when a CLOSE Received parameter is received. The expander device shall transmit the same CLOSE primitive that was received (e.g. CLOSE (NORMAL) forwarded as CLOSE (NORMAL)). >> needs to be moved into the relevant state transition. And reworded to the standard wording.

IBM #524

PDF Page 189

The statement << This state shall send a Transmit >> gives no indication as to when this is supposed to occur. This needs to be fixed.. Sequence number: 11

IBM #524

PDF Page 189

#### 7.14.10.1 State description

The statement << then shall repeatedly send a Transmit Idle Dword parameter to the XL transmitter. >> should be << then this state shall request idle dwords be transmitted by repeatedly sending a Transmit Idle Dword parameter to the XL transmitter (see 7.3). >>.

IBM #525

PDF Page 189

#### 7.14.10.1 State description

The statement << This state shall send a Phy Status (Connected) confirmation to the expander connection manager. >> gives no indication as to what event triggers the confirmation being sent. This needs to be fixed.

IBM #526

PDF Page 189

#### 7.14.10.1 State description

The statements << This state shall send all valid dwords received by the SAS phy through the expander connection router to a connected phy using the Transmit Dword request with the exception of BREAK and CLOSEes. >> are very confusing. The indications, responses, and parameters need to be more clearly defined as to which cause what action. This needs to be fixed.

IBM #527

PDF Page 189

#### 7.14.11.1 State description

How does this happen? << releases any path resources. >>

IBM #528

PDF Page 189

#### 7.14.11.1 State description

The statement << This state shall send a Transmit BREAK parameter to the XL transmitter. >> needs to be moved into the relevant state transition. And reworded to the standard wording.

IBM #529

PDF Page 189

The statement << This transition shall occur after transmitting a BREAK. >> should be << This transition shall occur after

requesting a BREAK be transmitted by sending a Transmit BREAK parameter to the XL transmitter. >>

IBM #530

PDF Page 189

7.14.12.1 State description

How does this happen? << releases any path resources. >>

IBM #531

PDF Page 189

The statement << send a Transmit BREAK parameter to the XL transmitter. >> should be << request a BREAK be transmitted by sending a Transmit BREAK parameter to the XL transmitter.

IBM #531

PDF Page 190. Sequence

7.14.12.2 Transition XL10: Break\_Wait to XL0: Idle

The statement << whichever occurs first. >> should be deleted.

IBM #532

PDF Page 190. Sequence

7.15 Rate matching

The statement << on any potential intermediate physical link. >> should be << on any physical link that makes up any potential pathway >>.

IBM #533

PDF Page 190. Sequence

7.15 Rate matching

The statement << to reduce EMI. >> should be deleted. As that information is not needed.

IBM #534

PDF Page 190. Sequence

Figure 77

This figure would be clearer if the phy-expander-phy boxes were removed and the arrows from the text point to the correct blobs.

IBM #535

PDF Page 190. Sequence

7.15 Rate matching

The term << immediately >> should be deleted.

IBM #536

PDF Page 190. Sequence

The statement << after seeing an OPEN\_ACCEPT. >> should be << after transmitting (receiving ??) an OPEN\_ACCEPT >>. I'm not sure which is correct but I don't think expanders are going to have eyes that will see things.

IBM #537

PDF Page 190. Sequence

7.15 Rate matching

\*\*\*\*

There is no description about when the source is supposed to start transmitting at the link rate sent in the OPEN. This needs to be specified here.

IBM #538

PDF Page 191

7.16.2 Full duplex

The statement << so the DONE (NORMAL) may be followed by RRDYS, ACKs, and NAKs. >> should be << allowing RRDYS, ACKs, and NAK to follow a DONE (NORMAL). >>

IBM #539

PDF Page 191

The statement << The link layer shall check that the number of data dwords between the SOF and EOF is at least 28 bytes and that the CRC is

valid. >> should be deleted as the requirement is contains in the state descriptions.

IBM #540

PDF Page 191

#### 7.16.4 SSP flow control

The statement << An SSP target port or an SSP target/initiator port acting in its target role may refuse to provide credit for any reason, including because it needs to transmit a frame itself. This prevents deadlocks where both ports are waiting on the other to provide credit. >> should be << To prevent deadlocks where both an SSP target port and an SSP initiator port are waiting on the other to provide credit an SSP target port or an SSP target/initiator port acting in its target role may refuse to provide credit for any reason, including because it needs to transmit a frame itself. >>

IBM #541

PDF Page 191

#### 7.16.4 SSP flow control

The statement << be interlocked. >> should be << be interlocked and which shall be non-interlocked >>.

IBM #542

PDF Page 193

#### 7.16.6 Preparing to close an SSP connection

The statement << 1 ms; the ACK/NAK count >> should be << 1 ms and as a result the ACK/NAK count >>.

IBM #543

PDF Page 193

#### 7.16.6 Preparing to close an SSP connection

The is a space missing at the end if this sentence << channel.Once a port >>.

IBM #544

PDF Page 193

#### 7.16.6 Preparing to close an SSP connection

I believe the may in the statement << it may close the connection by transmitting the CLOSE >> should be a shall.

IBM #545

PDF Page 194

#### 7.16.7.1 Overview

The statement << from the SL state machine >> should be deleted as the general rule is that we do not state where things come from in state diagrams.

IBM #546

PDF Page 194

7.16.7.1 Overview. The statement << from the SL state machine >> should be deleted as the general rule is that we do not state where things come from in state diagrams.

IBM #547

PDF Page 194

#### 7.16.7.1 Overview

The statement << from the SSP\_D1: DONE\_Wait state >> as the general rule is that we do not state where things come from in state diagrams.

IBM #548

PDF Page 194

#### 7.16.7.1 Overview

The statement << from the SSP\_D1: DONE\_Wait state >> should be deleted as the general rule is that we do not state where things come from in state diagrams.

IBM #549

PDF Page 197

#### 7.16.7 SSP link layer (SSP) state machines

There needs to be a section added after figure 84 and before 7.16.7.2 to describe the SSP transmitter and SSP receiver.  
 Something like this needs to be here . << The SSP state machine sends the following parameters to the SSP transmitter:  
 a, b, c list of outputs  
 The SSP state machine receives the following parameters from the SSP receiver:  
 a, b, c list of inputs >> in addition there should be wording like that in section 7.13.2.

IBM #550

PDF Page 199

7.16.7.5.1 State description

The statement << from the port layer >> should be deleted as the general rule is that we do not state where things come from in state diagrams.

IBM #551

PDF Page 199

7.16.7.4.1 State description

The statement << A DONE (ACK/NAK TIMEOUT) confirmation informs >> should be << A DONE Received (ACK/NAK TIMEOUT) >>.

IBM #552

PDF Page 200

7.16.7.7.1 State description

The statement << that the frame has been >> should be << that the SOF/frame/EOF have been >>..Page: 202

IBM #553

PDF Page 200

7.16.7.11 SSP\_RIM1:Rcv\_Interlock\_Monitor state

The statement << from the SSP\_TAN1:Idle state >> should be deleted as the general rule is that we do not state where things come from in state diagrams.

IBM #554

PDF Page 200

7.16.7.11 SSP\_RIM1:Rcv\_Interlock\_Monitor state

The statement << from the SSP\_RF1:Rcv\_Frame state >> should be deleted as the general rule is that we do not state where things come from in state diagrams.

IBM #555

PDF Page 203

7.16.7.14.1 State description

The statement << from the SSP\_RF1:Rcv\_Frame state. >> should be deleted as the general rule is that we do not state where things come from in state diagrams.

IBM #556

PDF Page 204

7.17.1 STP frame transmission

The statement << Table 84 shows a target port transmitting a SATA frame to an expander port. >> should be << Table 84 shows the expander port or STP initiator port translation of a SATA frame or primitive to an STP frame or primitive when the STP frame or primitive is received from a SATA target >>.

IBM #557

PDF Page 204

7.17.1 STP frame transmission

The statement << on the path to the STP initiator port solely for the frame. >> should be << on the pathway to the STP initiator port. >>. I don't understand what << solely for the frame >> means. It doesn't seem to imply that every frame requires an open to be transmitted which should not be correct.

IBM #558

PDF Page 204

#### 7.17.1 STP frame transmission

The statement << Table 85 shows an STP initiator port transmitting a frame, with the expander device attached to the SATA target port opening a connection solely for the frame. >> should be << Table 85 shows the expander port translation of a STP frame or primitive to an SATA frame or primitive when the STP frame or primitive is received from an STP initiator port or expander port. The STP initiator port opens a connection to an expander port on a pathway to the expander. >> I don't understand what << solely for the frame >> means. It doesn't seem to imply that every frame requires an open to be transmitted which should not be correct..Page: 205

IBM #559

PDF Page 204

#### 7.17.2 STP flow control

The statement << number of dwords it must store in an internal buffer if it can do so without exceeding >> should be << number of dwords it is required to store in an internal buffer if it does so without exceeding >>.

IBM #560

PDF Page 204

#### 7.17.2 STP flow control

The statement << during which each expander device must accept incoming data dwords into a buffer. >> should be << during which each expander device shall accept incoming data dwords into a buffer. >>.

IBM #561

PDF Page 204

#### 7.17.1 STP frame transmission

The statement << CLOSE on the expander >> should be << CLOSE at the expander >>.

IBM #562

PDF Page 204

#### 7.17.1 STP frame transmission

The statement << CLOSE on the expander >> should be << CLOSE at the expander >>.

IBM #563

PDF Page 204

#### 7.17.1 STP frame transmission

The statement << While the connection is open, the expander device is not involved. >> should be << While the connection is open, the expander device passes through all dwords without modification. >>

IBM #564

PDF Page 207

#### 7.17.3 Preparing to close an STP connection

The term << command-tag queuing >> is not used anywhere else in this document. Either it needs to be defined or deleted.

IBM #565

PDF Page 207

#### 7.17.3 Preparing to close an STP connection

The statement << An expander device may issue CLOSE at the end of each frame, after a time out waiting for another frame, after every n frames, after a certain time period, after a SATA\_CONT is detected, after a SATA\_HOLD is detected. >> should be an a,b,c list and needs an << or >> between the last two cases..Page: 208

IBM #566

PDF Page 207

#### 7.18.4.1 Overview

The statement << from the SL state machine >> should be deleted as the



general rule is that we do not state where things come from in state diagrams.

IBM #567

PDF Page 207

7.18.4.1 Overview

The statement << from the SL state machine >> should be deleted as the general rule is that we do not state where things come from in state diagrams.

IBM #568

PDF Page 207

7.18.4.1 Overview

The statement << from the SL state machine >> should be deleted as the general rule is that we do not state where things come from in state diagrams.

IBM #569

PDF Page 207

7.18.4.1 Overview

The statement << from the SMP\_IL3:Rcv\_response\_Frame state >> should be deleted as the general rule is that we do not state where things come from in state diagrams.

IBM #570

PDF Page 207

7.18.4.1 Overview

The statement << from the SMP\_IL3:Rcv\_response\_Frame state >> should be deleted as the general rule is that we do not state where things come from in state diagrams.

IBM #571

PDF Page 207

7.18.4.1 Overview

The statement << from the SMP\_TL2:Wait\_transmit\_frame state >> should be deleted as the general rule is that we do not state where things come from in state diagrams.

IBM #572

PDF Page 207

7.18.4.1 Overview

The statement << from the SMP\_TL1:Wait\_originate\_frame state >> should be deleted as the general rule is that we do not state where things come from in state diagrams.

IBM #573

PDF Page 210

There needs to be a section added after figure 84 and before 7.16.7.2 to describe the SMP transmitter and SMP receiver.

Something like this needs to be here . << The SMP state machine sends the following parameters to the SMP transmitter:

a, b, c list of outputs

The SMP state machine receives the following parameters from the SMP receiver:

a, b, c list of inputs >> in addition there should be wording like that in section 7.13.2

IBM #574

PDF Page 211

7.18.4.2.3.1 State description

The statement <<from the port layer >> should be deleted as the general rule is that we do not state where things come from in state diagrams.

IBM #575

PDF Page 213

8 Port layer

This section should be entirely replaced with document 03-024 plus figures.

IBM #576

PDF Page 215

### 8.3.1 Overview

global

In some places within this document AWT is used and in other places << arbitration wait timer >> is used. This needs to be made consistent. I vote for fewer acronyms.

IBM #577

PDF Page 216

Figure 91

Some of the text on the arrows needs to be positioned better. For example: the << Phy Enabled >> text entering into PL\_OC1 covers most of the arrow, it is not clear which transition the << (requests to each phy ) from the PL\_OC2 is attached to, and the name of the state machine should be across the top as in all the other state diagrams.

#### 8.3.3.1.1 State description overview

I thought all arguments had the first letter of each word capitalized. None of these do. This should be made consistent.

IBM #579

PDF Page 228

Table 88

There is no description of the << TIMEOUT >> bit, This needs to be fixed.

IBM #580

PDF Page 229

Table 89

\*\*\*\*

I thought we outlawed 0 length data frames. I think the IU size for DATA should be 1 to 1 024.

IBM #581

PDF Page 229

#### 9.2.1 SSP frame format

Why not put this information into table 89 << An SSP frame containing a COMMAND information unit (IU) is called a COMMAND frame; an SSP frame containing a TASK IU is called a TASK frame; etc. >> or make it an a,b,c list. But in any case list them all.

IBM #582

PDF Page 229

#### 9.2.1 SSP frame format

I don't see any bit named this in table 88. It needs to be added or this paragraph needs to be deleted << The RETRANSMIT bit may be set to one for RESPONSE frames and shall be set to zero for all other frame types. This field indicates the frame is a retransmission after the target port timed out waiting for the ACK or NAK for its previous attempt to transmit the frame. >>. If it stays then the term << field >> in the second sentence needs to be changed to << bit >>.

IBM #583

PDF Page 229

#### 9.2.1 SSP frame format

The statement << The TAG field allows the initiator port to establish a context for commands and task management functions. >> should be << The TAG field is an value assigned by the application client and sent to the initiator port in the SCSI command information unit and the task management information unit. The tag is used to establish a context between different commands and different task management functions. >>

IBM #584

PDF Page 229

#### 9.2.1 SSP frame format

The statement << that is unique for the I\_T nexus. >> should be << that is unique for the I\_T nexus defined by the source SAS address and the destination SAS address. >>.

#### 9.2.1 SSP frame format

The statement << SAM-3; the TAG field >> should be <<SAM-3. The TAG field >>.

IBM #586

PDF Page 229

9.2.1 SSP frame format

Delete the term << quickly >> as there is no time reference as to how quick it is.

IBM #587

PDF Page 229

9.2.1 SSP frame format

The statement << that need this field >> should be << that use this field >>.

IBM #588

PDF Page 229

9.2.1 SSP frame format

The statement << set a value that is unique for the I\_T nexus. >> should be << set it to a value that is unique for each I\_T nexus. >>

IBM #589

PDF Page 229

9.2.1 SSP frame format

The statement << need this field >> should be << use this field >>.

IBM #590

PDF Page 229

9.2.1 SSP frame format

The statement << frame (due to a >> should be << frame (e.g., due to >>.

IBM #591

PDF Page 230

9.2.1 SSP frame format

The statement << not the transport layer. >> is redundant and should be deleted.

IBM #592

PDF Page 230

9.2.2.1 COMMAND information unit

The term << performed >> should be << processed >>.

IBM #593

PDF Page 230

9.2.2.1 COMMAND information unit

The term << SCSI >> should be deleted as it is redundant with SPC-2.

9.2.2.1 COMMAND information unit

The term << specifies >> should be << contains >>.

IBM #595

PDF Page 231

The statement << For example, a six-byte CDB occupies the first six bytes of the CDB field; the remaining ten bytes are reserved and the ADDITIONAL CDB BYTES field is not present. >> should be << (e.g., a six-byte CDB occupies the first six bytes of the CDB field; the remaining ten bytes are reserved and the ADDITIONAL CDB BYTES field is not present). >>

IBM #596

PDF Page 231

9.2.2.2 TASK information unit

The << performed >> should be << processed >>.

IBM #597

PDF Page 232

9.2.2.2 TASK information unit

The term << specifies >> should be << contains >>.

IBM #598

PDF Page 232

#### 9.2.2.2 TASK information unit

The term << SCSI >> should be deleted as it is redundant with SPC-2.

IBM #599

PDF Page 232

Table 93

global

In the description column there are several cases where small caps is used when they should not be. Small caps should only be used when referencing the name of a field not the contains of the field.

For example <<

The task manager shall perform the ABORT TASK SET task management function with L set to LOGICAL UNIT NUMBER >>

should be << The task manager shall perform the ABORT TASK SET task management function with L set to logical unit number

>> .

IBM #600

PDF Page 232

#### 9.2.2.2 TASK information unit

The statement << The TARGET RESET task management function defined in SAM-3 is not supported. >> should be a footnote in table 91.

IBM #600

PDF Page 233. Sequence

#### 9.2.2.3 XFER\_RDY information unit

The term << indicates >> should be << contains >>.

IBM #601

PDF Page 233. Sequence

#### 9.2.2.3 XFER\_RDY information unit

The statement << initial application client buffer offset of the write data >> implies that all XFER\_RDYs for a given I\_T\_L\_Q nexus will have the same value. That does not seem right. Is it?

IBM #602

PDF Page 233. Sequence

#### 9.2.2.3 XFER\_RDY information unit

The statement << (using DATA frames). >> seems redundant and could be interpreted to means that there is another way to to move data besides DATA frames.

IBM #603

PDF Page 233. Sequence

#### 9.2.2.3 XFER\_RDY information unit

The term << indicates >> should be << contains >>.

IBM #604

PDF Page 233. Sequence

#### 9.2.2.3 XFER\_RDY information unit

The statement << (using DATA frames). >> seems redundant and could be interpreted to means that there is another way to to move data besides DATA frames.

IBM #605

PDF Page 233. Sequence

#### 9.2.2.3 XFER\_RDY information unit

The paragraph << The initial XFER\_RDY frame for a given command shall set the relative offset to the value of the FIRST BURST SIZE field in the Disconnect-Reconnect mode page (see 10.1.1.1.5). If any additional XFER\_RDY frames are required, the RELATIVE OFFSET field shall be set to the value of the previous XFER\_RDY frames relative offset plus the previous XFER\_RDY frames write data length. >> need to move up under the relative offset field paragraph.

IBM #606

PDF Page 233. Sequence

## Table 94

\*\*\*\*

The field name << RELATIVE OFFSET >> is a problem because when this table is combined with the header information (in table 88) you then have two fields with exactly the same name. So things get confusing real fast. I recommend changing the name of the field in XFER\_RDY to something like << XFER\_RDY RELATIVE OFFSET >>.

IBM #607

PDF Page 234

## 9.2.2.4 DATA information unit

The statement << constrained by >> should be << limited to >>.. Sequence number: 2

IBM #607

PDF Page 234

## 9.2.2.4 DATA information unit

The statement << The DATA frame shall only contain write data for a single XFER\_RDY frame. >> should be << The DATA frame shall contain no more write data than was indicated in the WRITE DATA LENGTH field of a single XFER\_RDY frame. >>.

IBM #608

PDF Page 235

## 9.2.2.5.1 RESPONSE information unit overview

This should be deleted << which defines the format and content of the response IU. >> as this information is in the table.

IBM #609

PDF Page 235

## 9.2.2.5.1 RESPONSE information unit overview

The statement << and if an error occurs >> should be << and in response to any errors that occur >>.

IBM #610

PDF Page 236

## 9.2.2.5.3 RESPONSE information unit RESPONSE\_DATA format

The term << certain >> should be deleted as it add a level in uncertainty to the standard.

IBM #611

PDF Page 237

## 9.2.2.5.4 RESPONSE information unit SENSE\_DATA format

This seems like a strange value to pick << than 1 000 and shall >> why not 1024? Unless there is some reason it should be changed to 1 024.

IBM #612

PDF Page 237

## 9.2.3 Frame sequences

The statement << sequence. The transport protocol services (see 10.1.1) invoked by the application layer are also shown. >> should be << sequence and the transport protocol services (see 10.1.1) invoked by the application layer. >>.

IBM #613

PDF Page 237

## Figures 94 - 97

Put the term << IU >> after all the IU names (e.g., TASK IU, RESPONSE IU).. Sequence number: 4

IBM #613

PDF Page 237

## 9.2.3 Frame sequences

\*\*\*\*

Somewhere in this section there should be a paragraph that states the following :

- that commands can be sent any time.
- When commands are queued data may be transferred for any command at any time.

- Responses may be returned in any order.

IBM #614

PDF Page 238

#### 9.2.3 Frame sequences

The statement << sequence. The transport protocol services (see 10.1.1) invoked by the application layer are also shown. >> should be << sequence and the transport protocol services (see 10.1.1) invoked by the application layer. >>.

IBM #615

PDF Page 238

#### 9.2.3 Frame sequences

The statement << sequence. The transport protocol services (see 10.1.1) invoked by the application layer are also shown. >> should be << sequence and the transport protocol services (see 10.1.1) invoked by the application layer. >>.

IBM #616

PDF Page 239

#### 9.2.3 Frame sequences

The statement << sequence. The transport protocol services (see 10.1.1) invoked by the application layer are also shown. >> should be << sequence and the transport protocol services (see 10.1.1) invoked by the application layer. >>.

IBM #617

PDF Page 239

#### 9.2.4.3 XFER\_RDY frame

The statement << and does not receive an ACK or NAK, it shall close >> should be << and times out waiting for ACK or NAK it shall close >>.

IBM #618

PDF Page 240

#### 9.2.4.4 DATA frame

The statement << and does not receive an ACK or NAK, it shall close >> should be << and times out waiting for ACK or NAK it shall close >>.

IBM #619

PDF Page 240

#### 9.2.4.4 DATA frame

The statement << and does not receive an ACK or NAK, it shall abort >> should be << and times out waiting for ACK or NAK it shall abort >>.

IBM #620

PDF Page 240

#### 9.2.4.5 RESPONSE frame

There is no bit named << RETRANSMIT bit >> in the SSP frame. This needs to be fixed.

IBM #621

PDF Page 240

#### 9.2.4.5 RESPONSE frame

The statement << RETRANSMIT bit of one, and it >> should be << RETRANSMIT bit set to one, and it >>

IBM #622

PDF Page 241

#### 9.2.5.2 Initiator port error handling

The statement << is not twelve bytes long, >> should be << is not 12 bytes long, >>.

IBM #623

PDF Page 241

#### 9.2.5.2 Initiator port error handling

The last three paragraphs all need a statement about what the initiator does if it does receive a RESPONSE. I believe << discard it

>> is the right answer but it needs to be stated.

IBM #624

PDF Page 242

9.2.6.1 Overview

The statement << SSP transport layer contains state >> should be << SSP transport layer (ST) contains state >>.

IBM #625

PDF Page 242

The statement << perform the following functions: >> should be << run in parallel to: >>.

IBM #626

PDF Page 242

9.2.6.2.1 Overview

The statement << (initiator send frame) >> should be deleted.

9.2.6.2.1 Overview

The statement << (initiator process response) >> should be deleted.

IBM #628

PDF Page 242

9.2.6.2.1 Overview

The statement << (initiator process response) >> should be deleted.

IBM #629

PDF Page 242

9.2.6.2.1 Overview

The statement << (initiator send frame) >> should be deleted.

IBM #630

PDF Page 242

9.2.6.2.1 Overview

The statement << (initiator send frame) >> should be deleted.

IBM #631

PDF Page 242

9.2.6.2.1 Overview

The statement << (initiator receive data) >> should be deleted.

IBM #632

PDF Page 242

9.2.6.2.1 Overview

The statement << (initiator frame router) >> should be deleted.

IBM #633

PDF Page 242

9.2.6.2.1 Overview

The statement << (initiator frame router) >> should be deleted.

IBM #634

PDF Page 242

9.2.6.2.1 Overview

The statement << (initiator frame router) >> should be deleted.

IBM #635

PDF Page 242

9.2.6.2.1 Overview

The statement << (initiator frame router) >> should be deleted.

IBM #636

PDF Page 242

9.2.6.2.1 Overview

The statement << from the SCSI

initiator devices application layer, >> should be deleted as we do not indicate where things come from only where they go to.

IBM #637

PDF Page 242

9.2.6.2.1 Overview

The statement << from the ST\_IFR (initiator frame router) state machine >> should be deleted as we do not indicate where things come from only where they go to.

IBM #638

PDF Page 242

9.2.6.2.1 Overview

The statement << from the ST\_IFR (initiator frame router) state machine >> should be deleted as we do not indicate where things come from only where they go to.

IBM #639

PDF Page 242

9.2.6.2.1 Overview

The statement << from the ST\_IFR (initiator frame router) state machine >> should be deleted as we do not indicate where things come from only where they go to.

IBM #640

PDF Page 242

9.2.6.2.1 Overview

The statement << from the ST\_ISF (initiator send frame) state machine. >> should be deleted as we do not indicate where things come from only where they go to.

IBM #641

PDF Page 242

9.2.6.2.1 Overview

The statement << from the port layer state machine >> should be deleted as we do not indicate where things come from only where they go to.

IBM #642

PDF Page 242

9.2.6 SSP transport layer state machines  
global in 9.2.6

The term << port layer state machines >> should in most if not all cases be << port layer >>.

IBM #643

PDF Page 243

9.2.6.2.1 Overview

The statement << (initiator process response) >> should be deleted.

IBM #644

PDF Page 243

9.2.6.2.1 Overview

The statement << (initiator receive data) >> should be deleted.

9.2.6.2.1 Overview

The statement << from the port layer state machine. >> should be deleted as we do not indicate where things come from only where they go to.

IBM #646

PDF Page 243

9.2.6.2.1 Overview

The statement << from the SCSI initiator device's application layer >> should be deleted as we do not indicate where things come from only where they go to.

IBM #647

PDF Page 244

9.2.6.2.1 Overview

The term << describes >> should be << shows >>.

IBM #648

PDF Page 244

Figure 98

The term << Request >> should be deleted from the << Send Task Management Request >>



IBM #649

PDF Page 245

9.2.6.2.2.1 State description

The statement << from the SCSI initiator device's application layer >> should be deleted.

IBM #650

PDF Page 245

9.2.6.2.2.1 State description

The statement << from the ST\_IFR (initiator frame router) state machine. >> should be deleted.

IBM #651

PDF Page 245

9.2.6.2.2.1 State description

The statement << from the ST\_ISF2: Prepare\_Command\_Request state, >> should be deleted.

IBM #652

PDF Page 245

9.2.6.2.2.1 State description

The statement << from the ST\_ISF3: Prepare\_Send\_Data\_Out state. >> should be deleted.

IBM #653

PDF Page 245

9.2.6.2.2.1 State description

The paragraph <<The ST\_ISF state machine shall be initiated when a Send SCSI Command or a Send Task Management Request transport protocol service request is received from the SCSI initiator device's application layer or when an XFER\_RDY Arrived parameter is received from the ST\_IFR (initiator frame router) state machine. >> does not belong here. It should be part of the overview for the state machine. This is only supposed to be information about the state not the state machine. And should be changed to << The ST\_ISF state machine shall be activated when a Send SCSI Command or a Send Task Management Request transport protocol service request is received or when an XFER\_RDY Arrived parameter is received. >>

IBM #654

PDF Page 245

9.2.6.2.2.1 State description

The paragraph <<This state shall be entered when either a COMMAND or TASK frame is received from the ST\_ISF2: Prepare\_Command\_Request state, or when a DATA frame is received from the ST\_ISF3: Prepare\_Send\_Data\_Out state. >> should be << This state is the initial state and is the state that is used after the ST\_ISF state machine has been activated. >>

IBM #655

PDF Page 245

9.2.6.2.2.1 State description

The statement << A Send SCSI Command or a Send Task Management Request transport protocol service request includes the following to be used >> should be << A Send SCSI Command transport protocol service request or a Send Task Management protocol service request includes the following to be used >>

IBM #656

PDF Page 245

9.2.6.2.2.1 State description

The statement << The request may >> should be << The transport protocol service request may >>.

IBM #657

PDF Page 245

9.2.6.2.2.1 State description

It looks like the term << request: >> should be << transport protocol service request >> in all cases in this section. This needs to be fixed.

IBM #658

PDF Page 245

9.2.6.2.2.1 State description

The statement << If the ST\_ISF state machine was initiated as the result of receiving a transport protocol service request, then this state shall transition to the ST\_ISF2:Prepare\_Command\_Request state.>> belongs in the transition description not here.

IBM #659

PDF Page 245

9.2.6.2.2.1 State description

The term << initiated >> should be << activated >> in this section.

IBM #660

PDF Page 245

9.2.6.2.2.1 State description

\*\*\*\*\*

I don't like the may's in item a) and item b). Why is this a may instead of a shall?. Page: 246

IBM #661

PDF Page 245

9.2.6.2.2.1 State description

The statement << from the port layer state machine. >> should be deleted.

IBM #662

PDF Page 245

9.2.6.2.2.1 State description

The statement << e) If the length of the XFER\_RDY frame is 12 bytes, the write data length is correct, and an ACK Transmitted confirmation has been received, then this state shall transition to the ST\_ISF3:Prepare\_Send\_Data\_Out state. >> belongs in the transition description. It should be moved there.

IBM #663

PDF Page 245

9.2.6.2.2.1 State description

The statement << If this state is entered from the ST\_ISF2:Prepare\_Command\_Request state, then this state shall send a Transmit Frame (Interlocked) request to the port layer state machine. >> should be << Upon entry into this state from the ST\_ISF2:Prepare\_Command\_Request state, this state shall send a Transmit Frame (Interlocked) request to the port layer state machine. >>

IBM #664

PDF Page 245

9.2.6.2.2.1 State description

The statement << If this state is entered from the ST\_ISF3:Prepare\_Send\_Data\_Out state, then this state shall send a Transmit Frame (Non-interlocked) request to the port layer state machine. >> should be << Upon entry into this state from the ST\_ISF3:Prepare\_Send\_Data\_Out state, this state shall send a Transmit Frame (Non-Interlocked) request to the port layer state machine. >>

IBM #665

PDF Page 245

9.2.6.2.2.1 State description

The statement << from this state >> should be deleted.

IBM #666

PDF Page 245

9.2.6.2.2.1 State description

The statement << (initiator process response) >> should be deleted.

IBM #667

PDF Page 245

#### 9.2.6.2.2.1 State description

The statement << After sending a Transmit Frame request this state shall wait for a Transmission Status confirmation. If the confirmation is not Transmission Status (Frame Transmitted), >> should be << After sending a Transmit Frame request to the port layer this state shall wait for a Transmission Status confirmation. If the confirmation is not Transmission Status (Frame Transmitted) confirmation, >>

IBM #668

PDF Page 245

The statement << After sending a Delivery Failure parameter to the ST\_IPR state machine, the ST\_ISF state machine shall terminate. >> does not belong here. It should be part of the overview for the state machine. This is only supposed to be information about the state not the state machine. It should also be reword to remove the << terminate >> term. Maybe stopped or removed or deactivated.

IBM #669

PDF Page 245

#### 9.2.6.2.2.1 State description

\*\*\*

The may in the statement << If the transmitted frame was a DATA frame, then this state may transition to the >> seems like there should be more description. The transition either occurs or it does not occur.

Also this whole paragraph should be down in the transition section. This needs to be fixed.

IBM #670

PDF Page 245

#### 9.2.6.2.2.1 State description

The statement << After sending a Delivery Failure parameter to the ST\_IPR state machine, the ST\_ISF state machine shall terminate. >> is a duplicate of what is stated just above and does not belong here. It should be in the state machine overview.

IBM #671

PDF Page 245

#### 9.2.6.2.2.1 State description

\*\*\*

The may in the statement <<This state may also send a Cancel request to the port layer state >> seems like there should be more description. The transition either occurs or it does not occur.

IBM #672

PDF Page 245

#### 9.2.6.2.2.1 State description

The statement << The ST\_ISF state machine shall terminate upon receipt of a Cancel Acknowledge confirmation. >> does not belong here. It should be in the state machine overview.

IBM #673

PDF Page 245

#### 9.2.6.2.2.2 Transition ST\_ISF1: Send\_Frame to ST\_ISF2: Prepare\_Command\_Request

The statement << occur after a Send SCSI Command or Send Task Management Request transport protocol service request has been received. >> should be << occur after receiving a Send SCSI Command or Send Task Management Request transport protocol service request. >>.

IBM #674

PDF Page 247

#### 9.2.6.2.2.3 Transition ST\_ISF1: Send\_Frame to ST\_ISF3: Prepare\_Send\_Data\_Out

The statement << a) an ACK Received confirmation has been received for a COMMAND frame for a data-out operation and the

first burst size is not zero;

b) an XFER\_RDY Arrived parameter has been received, all required values are present and correct, and an ACK Transmitted confirmation has been received; or

c) a Transmission Status (Frame Transmitted) confirmation for a Transmit Frame (Non-interlocked) request has been received and the number of data bytes that has been transmitted for the request is less than the first burst size or the write data length. >>

should be

<< a) receiving an ACK Received confirmation for a COMMAND frame for a data-out operation if the first burst size is not zero;

b) receiving an XFER\_RDY Arrived parameter with all required values present and correct, and after receiving an ACK.Transmitted confirmation; or

c) receiving a Transmission Status (Frame Transmitted) confirmation for a Transmit Frame (Non-interlocked) request if the number of data bytes that has been transmitted for the Transmit Frame (Non-interlocked) request is less than the first burst size or the write data length. >>

IBM #675

PDF Page 247

9.2.6.2.3.1 State description

The statement << received from the SCSI initiator device's application layer >> should be deleted.

IBM #676

PDF Page 247

9.2.6.2.3.1 State description

The statement << received from the SCSI initiator device's application layer >> should be deleted.

IBM #677

PDF Page 247

9.2.6.2.3.2 Transition ST\_ISF2: Prepare\_Command\_Request to

ST\_ISF1: Send\_Frame

The statement << after the ST\_ISF2: Prepare\_Command\_Request state >> should be <<after this state >>.

IBM #678

PDF Page 247

9.2.6.2.4.1 State description

The statement << (these were received either from the SCSI initiator device's application layer or included in an XFER\_RDY Arrived parameter): >> should be deleted.

IBM #679

PDF Page 248

9.2.6.2.4.1 State description

In what case would the following statement not be true? << If all of the data for the request is not included in the frame, the number of data bytes in the frame shall be a multiple of four, and the number of fill bytes shall be zero. >> If it is always true or is described somewhere else then it should be deleted.

IBM #680

PDF Page 248

9.2.6.2.4.2 Transition ST\_ISF3: Prepare\_Send\_Data\_Out to ST\_ISF1: Send\_Frame

The statement << after the ST\_ISF3: Prepare\_Send\_Data\_Out state has >> should be << after this state has >>.

IBM #681

PDF Page 248

9.2.6.2.5.1 State description

The statement << The ST\_IRD state machine shall be initiated when a Data-In Arrived parameter is received. >> should be in the state machine overview not here.

IBM #682

PDF Page 248

9.2.6.2.5.1 State description. The statement << This state machine shall terminate after sending the parameter. >> should be in the state machine overview not here.

IBM #683

PDF Page 248

9.2.6.2.5.2 Transition ST\_IRD1: Receive\_Data\_In to  
ST\_IRD2: Process\_Received\_Data\_In

The statement << by the ST\_IRD1: Receive\_Data\_In has been >> should be << by this state has been >>.

IBM #684

PDF Page 248

9.2.6.2.6 ST\_IRD2: Process\_Received\_Data\_In state

The statement << The ST\_IRD state machine shall terminate after the data-in data is processed. >> should be in the state machine overview not here.

IBM #685

PDF Page 248

9.2.6.2.7 ST\_IPR1: Process\_Received\_Response state

The statement << The ST\_IPR state machine shall be initiated when a Response Arrived parameter is received or a Delivery Failure parameter is received. >> should be in the state machine overview not here.

IBM #686

PDF Page 249

9.2.6.2.7 ST\_IPR1: Process\_Received\_Response state

The statement << The ST\_IPR state machine shall terminate after sending a confirmation. >> should be in the state machine overview not here.

IBM #687

PDF Page 249

9.2.6.2.7 ST\_IPR1: Process\_Received\_Response state

The statement << of the RETRANSMIT bit. >> is a problem because there is no RETRANSMIT bit. This needs to be fixed.

IBM #688

PDF Page 249

9.2.6.2.8 ST\_IFR1: Initiator\_Frame\_Router state

The statement << The ST\_IFR state machine shall be initiated when:

- a) an Accept\_Reject OPENs request is received;
- b) a Frame Received confirmation is received;
- c) a DONE Received confirmation is received; or
- d) a hard reset occurs. >> should be in the state machine overview not here.

IBM #689

PDF Page 249

9.2.6.2.8 ST\_IFR1: Initiator\_Frame\_Router state

The statement << If the ST\_IFR state machine was initiated as the result of receiving >> should be << If this state initially received >>.

IBM #690

PDF Page 249

The statement << The ST\_IFR state machine shall terminate after sending an Accept\_Reject OPENs request to the port layer state machine. >> should be in the state machine overview not here.

IBM #691

PDF Page 250

9.2.6.3.1 Overview

The statement << from the port layer state machine >> should be deleted.

IBM #692

PDF Page 250

#### 9.2.6.3.1 Overview

The statement <<from the SCSI target device's application layer >> should be deleted.

IBM #693

PDF Page 250

#### 9.2.6.3.1 Overview

The statement <<from the SCSI target device's application layer; >> should be deleted.

IBM #694

PDF Page 250

#### 9.2.6.2.8 ST\_IFR1: Initiator\_Frame\_Router state

The statement << If the ST\_IFR state machine was initiated as the result of receiving >> should be << If this state initially received >>.

IBM #695

PDF Page 250

#### 9.2.6.2.8 ST\_IFR1: Initiator\_Frame\_Router state

The statement << If the ST\_IFR state machine was initiated as the result of receiving >> should be << If this state initially received >>.

IBM #696

PDF Page 250

#### 9.2.6.2.8 ST\_IFR1: Initiator\_Frame\_Router state

The statement << If the ST\_IFR state machine was initiated as the result of a >> should be << If this state initially received a >>.

IBM #697

PDF Page 250

#### 9.2.6.2.8 ST\_IFR1: Initiator\_Frame\_Router state

All these << terminate >>s are a problem because the state machine comings and goings should be specified in the state machines overview.

IBM #698

PDF Page 250

#### 9.2.6.2.8 ST\_IFR1: Initiator\_Frame\_Router state

The statement << specify an existing state machine, >> should be << specify an active state machine >>.. Sequence number: 9

IBM #698

PDF Page 250

#### 9.2.6.2.8 ST\_IFR1: Initiator\_Frame\_Router state

The statement << The ST\_IFR state machine shall terminate after sending a parameter to another state machine. >> should be in the state machine overview not here.

IBM #699

PDF Page 250

#### 9.2.6.3.1 Overview

The statement << (target frame router) >> should be deleted.

IBM #700

PDF Page 250

#### 9.2.6.3.1 Overview

The statement << (target transport server) >> should be deleted.

IBM #701

PDF Page 250

#### 9.2.6.3.1 Overview

The statement << (target transport server) >> should be deleted.

IBM #702

PDF Page 250

#### 9.2.6.3.1 Overview

The term << several >> should be deleted. in item d)

IBM #703

PDF Page 251

9.2.6.3.1 Overview

The term << describes >> should be << shows >>.

IBM #704

PDF Page 251

Figure 99

Either all the crossing lines need hops or none should have them. For this figure it looks like none would be OK.

IBM #705

PDF Page 251

Figure 99

The term << Request >> in the << task Management Request Received >> should be deleted.

IBM #705

PDF Page 252. Sequence

9.2.6.3.2 ST\_TFR1: Target\_Frame\_Router state

The statement << from the SCSI target device's application layer, >> should be deleted.

IBM #706

PDF Page 252. Sequence

9.2.6.3.2 ST\_TFR1: Target\_Frame\_Router state

The statement << from the port layer state machine, >> should be deleted.

IBM #707

PDF Page 252. Sequence

9.2.6.3.2 ST\_TFR1: Target\_Frame\_Router state

The statement << The ST\_TFR state machine shall be initiated when:

- a) an Accept\_Reject OPENS request is received;
- b) a Frame Received confirmation is received; or
- c) a hard reset occurs. >> should be in the state machine overview not here.

IBM #708

PDF Page 252. Sequence

9.2.6.3.2 ST\_TFR1: Target\_Frame\_Router state

The statement << Each indication or parameter shall contain the content of the SAS frame.

The ST\_TFR state machine shall terminate after sending a Data-Out Arrived parameter or transport protocol service indication. >> should be in the state machine overview not here.

IBM #709

PDF Page 252. Sequence

9.2.6.3.2 ST\_TFR1: Target\_Frame\_Router state

The statement << If the ST\_TFR state machine was initiated as the result of receiving >> should be << If this state initially received >>.

IBM #710

PDF Page 252. Sequence

9.2.6.3.2 ST\_TFR1: Target\_Frame\_Router state

The statement << If the ST\_TFR state machine was initiated as the result of receiving >> should be << If this state initially received >>.

IBM #711

PDF Page 252. Sequence

9.2.6.3.2 ST\_TFR1: Target\_Frame\_Router state

The statement << If the ST\_TFR state machine was initiated as the result of receiving >> should be << If this state initially received >>.

IBM #712

PDF Page 252. Sequence

## 9.2.6.3.2 ST\_TFR1:Target\_Frame\_Router state

All these << terminate >>s are a problem because the state machine comings and goings should be specified in the state machines overview.

IBM #713

PDF Page 252. Sequence

The statement << with the received attribute to the port layer state machine. >> should be << with the attribute received with the Accept\_Reject OPEN to the port layer state machine. >>

IBM #714

PDF Page 252. Sequence

## 9.2.6.3.2 ST\_TFR1:Target\_Frame\_Router state

The statement << the length of the information unit is [28 + (4 x additional CDB length)] bytes. >> should be << the length of the information unit (see 9.2.5.1) >>. All the length rules are specified elsewhere and should not be here.

IBM #715

PDF Page 252. Sequence

## 9.2.6.3.2 ST\_TFR1:Target\_Frame\_Router state

The statement << the length of the information unit is 28 bytes. >> should be << the length of the information unit (see 9.2.5.1) >>.

All the length rules are specified elsewhere and should not be here.

IBM #716

PDF Page 252. Sequence

## 9.2.6.3.2 ST\_TFR1:Target\_Frame\_Router state

The statement << information unit is not 28 bytes, >> should be << information unit is not correct, >>

IBM #717

PDF Page 252. Sequence

## 9.2.6.3.2 ST\_TFR1:Target\_Frame\_Router state

The statement << If it conflicts, this state may send a Response >> should be << If the tag is checked and it conflicts this state shall send a >>. There should no requirement for checking but if checked and there is a error then the response should be a shall.

IBM #718

PDF Page 252. Sequence

## 9.2.6.3.2 ST\_TFR1:Target\_Frame\_Router state

The statement << hard reset, then the ST\_TFR state >> should be << HARD\_RESET Received confirmation, then the ST\_TFR state >>

IBM #719

PDF Page 252. Sequence

## 9.2.6.3.2 ST\_TFR1:Target\_Frame\_Router state

global

It looks like the term << request: >> when used in relation to requests from the application layer should be << transport protocol service request >> in all cases in this section. This needs to be fixed.

IBM #720

PDF Page 252. Sequence

## 9.2.6.3.2 ST\_TFR1:Target\_Frame\_Router state

The statement << then the ST\_TFR state machine shall discard >> should be << then this state machine shall discard >>.

IBM #721

PDF Page 252. Sequence

## 9.2.6.3.2 ST\_TFR1:Target\_Frame\_Router state

The statement << then the ST\_TFR state machine shall discard >> should be << then this state machine shall discard >>..Page: 253

IBM #722

PDF Page 252. Sequence

## 9.2.6.3.3.2 Transition ST\_TTS1:Target\_Request\_Response\_Router to



## ST\_TTS2: Send\_Frame

The statement << from the SCSI target device's application layer. >> should be deleted.

## IBM #723

PDF Page 252. Sequence

9.2.6.3.3.3 Transition ST\_TTS1: Target\_Request\_Response\_Router to

ST\_TTS4: Receive\_Data\_Out

The statement << from the SCSI target device's application layer. >> should be deleted.

## IBM #724

PDF Page 252. Sequence

9.2.6.3.3.4 Transition ST\_TTS1: Target\_Request\_Response\_Router to

ST\_TTS7: Prepare\_Response

The statement << from the SCSI target device's application layer. >> should be deleted.

## IBM #725

PDF Page 252. Sequence

9.2.6.3.4.1 State description

The statement << This state is entered when a DATA frame is received from the ST\_TTS3: Prepare\_Send\_Data\_In state, when an XFER\_RDY frame is received from the ST\_TTS4: Receive\_Data\_Out state, when a RESPONSE frame is received from the ST\_TTS7: Prepare\_Response state, or after the ST\_TTS7: Prepare\_Response state has determined that the vendor-specific number of retries for a RESPONSE frame has been exceeded. >> should be deleted as we do not describe entry conditions.

## IBM #726

PDF Page 252. Sequence

9.2.6.3.3.1 State description

The statement << from the SCSI target device's application layer: >> should be deleted.

## IBM #727

PDF Page 252. Sequence

9.2.6.3.3.1 State description

The statement << The ST\_TTS state machine shall be initiated when one of the following is received from the SCSI target device's application layer:

- a) a Send Data-In transport protocol service request;
  - b) a Receive Data-Out transport protocol service request;
  - c) a Task Management Function Executed transport protocol service response;
- or
- d) a Send Command Complete transport protocol service response. >> should be in the state machine overview not here.

## IBM #728

PDF Page 252. Sequence

9.2.6.3.3.1 State description

The list << a) connection rate;  
b) initiator connection tag;  
c) destination SAS address; and  
d) source SAS address. >> should be moved into the lists for each of the protocol services. I know this will create the same entries in each but it would be clearer.

## IBM #729

PDF Page 252. Sequence

Delete << also >> and add in the complete list.

## IBM #730

PDF Page 252. Sequence

9.2.6.3.3.1 State description

Delete << also >> and add in the complete list.

## IBM #731

PDF Page 252. Sequence

## 9.2.6.3.3.1 State description

Delete << also >> and add in the complete list.

IBM #732

PDF Page 252. Sequence

## 9.2.6.3.3.2 Transition ST\_TTS1: Target\_Request\_Response\_Router to ST\_TTS2: Send\_Frame

The statement << after the ST\_TTS1: Target\_Request\_Response\_Router state has received a Send Data-In transport protocol service request >> should be << after receiving a Send Data-In transport protocol service request. >>

IBM #733

PDF Page 252. Sequence

## 9.2.6.3.3.3 Transition ST\_TTS1: Target\_Request\_Response\_Router to ST\_TTS4: Receive\_Data\_Out

The statement << after the ST\_TTS1: Target\_Request\_Response\_Router state has received a Receive Data-Out transport protocol service request >> should be << after receiving a Receive Data-Out transport protocol service request. >>

IBM #734

PDF Page 252. Sequence

## 9.2.6.3.3.4 Transition ST\_TTS1: Target\_Request\_Response\_Router to ST\_TTS7: Prepare\_Response

The statement << after the ST\_TTS1: Target\_Request\_Response\_Router state has received a Task Management >> should be << after receiving a Task Management >>.

IBM #735

PDF Page 254

## 9.2.6.3.4.1 State description

The statement << from the port layer state machine. >> should be deleted.

IBM #736

PDF Page 254

## 9.2.6.3.4.1 State description

The statement << from the port layer state machine. >> should be deleted.

IBM #737

PDF Page 254

## 9.2.6.3.4.1 State description

If the TTS state machine was initiated as the result of this state receiving a Send Data-In transport protocol service request, the specified values are included with the request, and this state has received an ACK Transmitted confirmation, then this state shall transition to the ST\_TTS3: Prepare\_Send\_Data\_In state. >> should be in the state machine overview not here.

IBM #738

PDF Page 254

## 9.2.6.3.4.1 State description

The statement << state shall receive >> should be << state shall wait for receipt >>.

IBM #739

PDF Page 254

## 9.2.6.3.4.1 State description

The statement << If the frame transmitted was a DATA frame, then this state may transition to the ST\_TTS3: Prepare\_Send\_Data\_In state after receiving a Transmission Status (Frame Transmitted) confirmation. >> should be moved to the relevant state transition description.

IBM #740

PDF Page 254

## 9.2.6.3.4.1 State description

The statement << If the confirmation is ACK Received and the transmitted frame was an XFER\_RDY frame, then this state shall transition to the ST\_TTS4:Receive\_Data\_Out state. >> should be moved to the relevant state transition description.

IBM #741

PDF Page 254

## 9.2.6.3.4.1 State description

The statement << If the frame transmitted was an XFER\_RDY frame or a RESPONSE frame, then this state shall wait to receive an ACK Received, NAK Received, or Connection Failed confirmation before transitioning from this state. >> should be moved to the relevant state transition description.

IBM #742

PDF Page 254

## 9.2.6.3.4.1 State description

The statement << one of the following: >> should be << one of the following occurs >>.

IBM #743

PDF Page 255

## 9.2.6.3.4.1 State description

The statement << from the port layer state machine. >> should be deleted.

IBM #744

PDF Page 255

9.2.6.3.4.4 Transition ST\_TTS2: Send\_Frame to ST\_TTS7: Prepare\_Response The statement << from the port layer state machine: >> should be deleted.

IBM #745

PDF Page 255

## 9.2.6.3.4.1 State description

The statement << The ST\_TTS state machine shall terminate after sending the Data-In Delivered confirmation. >> should be in the state machine overview not here.

IBM #746

PDF Page 255

## 9.2.6.3.4.1 State description

The statement << The ST\_TTS state machine terminates upon receipt of a Cancel Acknowledge confirmation >> should be in the state machine overview not here.

IBM #747

PDF Page 255

9.2.6.3.4.2 Transition ST\_TTS2: Send\_Frame to ST\_TTS3: Prepare\_Send\_Data\_In The statement << this state receives >> should be << receiving >>

IBM #748

PDF Page 255

9.2.6.3.4.2 Transition ST\_TTS2: Send\_Frame to ST\_TTS3: Prepare\_Send\_Data\_In The statement << this state receives >> should be << receiving >>

IBM #749

PDF Page 255

9.2.6.3.4.3 Transition ST\_TTS2: Send\_Frame to ST\_TTS4: Receive\_Data\_Out The statement << this state has received >> should be << receiving >>

IBM #750

PDF Page 255

## 9.2.6.3.5.1 State description

The statement << the tag received from the ST\_TTS2: Send\_Frame state to construct the frame. >> should be << the received tag to construct the frame. >>.

IBM #751

PDF Page 255

9.2.6.3.5.2 Transition ST\_TTS3:Prepare\_Send\_Data\_In to ST\_TTS2:Send\_Frame  
The statement << after the ST\_TTS3:Prepare\_Send\_Data\_In state >> should be << after this state has >>.

IBM #752

PDF Page 256

9.2.6.3.6.1 State description

The statement << This state is entered after one of the following occurs:

- a) a Receive Data-Out service request is received from the ST\_TS1:Request\_Response\_Router state;
- b) a DATA frame is received from the ST\_TFR (target frame router) state machine;
- c) an ACK Received confirmation for an XFER\_RDY frame was received from the ST\_TTS2:Send\_Frame state;
- d) an XFER\_RDY frame has been constructed by the ST\_TTS5:Prepare\_XFER\_RDY state; or
- e) data-out data has been processed by the ST\_TTS6:Process\_Received\_Data\_Out state. >> should be deleted as we do not describe entry conditions.

IBM #753

PDF Page 256

The statement << from the port layer state machine >> should be deleted.

IBM #754

PDF Page 256

9.2.6.3.6.1 State description

The statement << from the ST\_TFR state machine. >> should be deleted.

IBM #755

PDF Page 256

9.2.6.3.6.1 State description

The statement << from the ST\_TFR1:Target\_Frame\_Router state. >> should be deleted.

IBM #756

PDF Page 256

9.2.6.3.6.1 State description

The statement << If this state was entered as the result of receiving a Receive Data-Out service request from the ST\_TS1:Request\_Response\_Router state then this state shall transition to the ST\_TTS5:Prepare\_XFER\_RDY state. >> should be moved to the relevant state transition description.

IBM #757

PDF Page 256

9.2.6.3.6.1 State description

The statement << The ST\_TTS state machine shall terminate after sending the confirmation. >> should be in the state machine overview not here.

IBM #758

PDF Page 256

9.2.6.3.6.1 State description

The statement << The ST\_TTS state machine shall terminate after sending the confirmation. >> should be in the state machine overview not here.

IBM #759

PDF Page 256

9.2.6.3.6.1 State description

The statement << The ST\_TTS state machine shall terminate after sending the confirmation. >> should be in the state machine overview not here.

IBM #760

PDF Page 256

9.2.6.3.6.1 State description

The statement << The

ST\_TTS state machine shall terminate after sending the confirmation. >> should be in the state machine overview not here.

IBM #761

PDF Page 256

#### 9.2.6.3.6.1 State description

The statement << If the target transport tag value matches the value sent with the corresponding XFER\_RDY frame, and the length of the data does not exceed that specified by the XFER\_RDY frame that requested the data, then this state shall transition to the ST\_TTS6: Process\_Received\_Data\_Out state. >> should be moved to the relevant state transition description.

IBM #762

PDF Page 256

#### 9.2.6.3.6.1 State description

The statement << If this state is entered from the ST\_TTS5: Prepare\_XFER\_RDY state, then this state shall transition to the ST\_TTS2: Send\_Frame state. >> should be moved to the relevant state transition description.

IBM #763

PDF Page 256

#### 9.2.6.3.6.1 State description

The statement << The ST\_TTS state machine shall terminate after sending the confirmation. >> should be in the state machine overview not here.

IBM #764

PDF Page 257

#### 9.2.6.3.6.4 Transition ST\_TTS4: Receive\_Data\_Out to

#### ST\_TTS6: Process\_Received\_Data\_Out

The statement << from the ST\_TFR (target frame router) state machine. >> should be deleted.

IBM #765

PDF Page 257

#### 9.2.6.3.9.1 State description

The statement << by this state from the ST\_TFR state machine. >> should be deleted.

IBM #766

PDF Page 257

#### 9.2.6.3.9.1 State description

The statement << This state is entered after one of the following occurs:

- a) a Response Data parameter is received by this state from the ST\_TFR state machine;
- b) a Task Management Function Executed transport protocol service response was received by the ST\_TTS1: Target\_Request\_Response\_Router state from the SCSI target device's application layer;
- c) a Send Command Complete transport protocol service response was received by the ST\_TTS1: Target\_Request\_Response\_Router state from the SCSI target device's application layer; or
- d) the ST\_TTS2: Send\_Frame state receives something other than a Transmission Status (Frame Transmitted) confirmation followed by an ACK Received confirmation for a RESPONSE frame from the port layer state machine (i.e., the frame transmission was unsuccessful). >> should be deleted as we do not describe entry conditions.

IBM #767

PDF Page 257

#### 9.2.6.3.9.1 State description

The statement << If not already running, the ST\_TTS state machine shall be initiated when a Response Data parameter is received. >> should be in the state machine overview not here.

IBM #768

PDF Page 257

9.2.6.3.6.2 Transition ST\_TTS4:Receive\_Data\_Out to ST\_TTS2:Send\_Frame

The statement << This transition shall occur after this state has received an XFER\_RDY frame from the ST\_TTS5:Prepare\_XFER\_RDY state. >> should be << This transition shall occur if this state is entered from the ST\_TTS5:Prepare\_XFER\_RDY state. >>

9.2.6.3.6.4 Transition ST\_TTS4:Receive\_Data\_Out to

ST\_TTS6:Process\_Received\_Data\_Out

The statement << after the ST\_TTS4:Receive\_Data\_Out state receives a Data-Out Arrived parameter >> should be << after receiving a Data-Out Arrived parameter >>

IBM #770

PDF Page 257

The statement << This transition shall occur after a Receive Data-Out transport protocol service request has been received by the ST\_TTS4:Receive\_Data\_Out state from the ST\_TTS1:Request\_Response\_Router state. >> should be << This transition shall occur if this state is entered from the ST\_TTS1:Request\_Response\_Router state. >>

IBM #771

PDF Page 257

9.2.6.3.7.2 Transition ST\_TTS5:Prepare\_XFER\_RDY to ST\_TTS4:Receive\_Data\_Out

The statement << after the ST\_TTS5:Prepare\_XFER\_RDY state has >> should be << after this state has >>.

IBM #772

PDF Page 258

9.2.6.3.9.1 State description

The statement << from the ST\_TTS1:Target\_Request\_Response\_Router state, >> should be deleted.

IBM #773

PDF Page 258

9.2.6.3.9.1 State description

The statement << from the port layer state machine >> should be deleted.

IBM #774

PDF Page 258

9.2.6.3.9.1 State description

The statement << from the ST\_TFR state machine, >> should be deleted.

IBM #775

PDF Page 258

9.2.6.3.9.1 State description

The statement << from the ST\_TFR state machine, >> should be deleted.

IBM #776

PDF Page 258

9.2.6.3.9.1 State description

The term << retransmit >> as in retransmit bit should be in small caps.

IBM #777

PDF Page 259

9.3.2 SATA tunneling for multiple STP initiator ports

The statement << from an STP initiator port, >> should be deleted.

IBM #778

PDF Page 259

9.2.6.3.9.2 Transition ST\_TTS7:Prepare\_Response to ST\_TTS2:Send\_Frame

The statement << after the ST\_TTS7:Prepare\_Response state has >> should be << after this state has >>.

IBM #779

PDF Page 259

9.3.2 SATA tunneling for multiple STP initiator ports

Why is the term << PHY OPERATION >> in small caps? I don't think it should be.

IBM #780

PDF Page 259

9.3.2 SATA tunneling for multiple STP initiator ports

The statement << In this state, >> should be << Under these conditions, >>.

IBM #781

PDF Page 259

9.3.2 SATA tunneling for multiple STP initiator ports

Why is the term << PHY OPERATION >> in small caps? I don't think it should be.

IBM #782

PDF Page 259

9.3.2 SATA tunneling for multiple STP initiator ports

This statement << STP initiator port issues an >> should be << STP initiator port sends an >>

IBM #783

PDF Page 259

9.3.2 SATA tunneling for multiple STP initiator ports

Why is the term << PHY OPERATION >> in small caps? I don't think it should be.

IBM #784

PDF Page 259

9.3.2 SATA tunneling for multiple STP initiator ports

Why is the term << PHY OPERATION >> in small caps? I don't think it should be.

IBM #785

PDF Page 259

9.3.3 BIST Activate FIS

The acronym << BIST >> is not in the acronyms list. It needs to be added or removed from here.

IBM #786

PDF Page 260

9.4.1 SMP overview

The statement << Other target ports >> should be << Target ports >>.

IBM #787

PDF Page 260

Figure 100

The label << Target port >> should be << Expander port or Target port >>.

IBM #788

PDF Page 260

9.4.2 SMP\_REQUEST frame

The statement << length is based on the function >> should be << length is based on the function >> length is determined by the selected function >>.

IBM #789

PDF Page 260

Table 102

There needs to be a row labeled << Full bytes in Needed >> added to this table.

IBM #790

PDF Page 261

9.4.3 SMP\_RESPONSE frame

global for SMP

The statement << the target port >> should be << the target port or expander port >> or << destination port >>

IBM #791

PDF Page 261

Table 103

There needs to be a row labeled << Full bytes in Needed >> added to this table.

IBM #792

PDF Page 261

9.4.3 SMP\_RESPONSE frame

There is no description of what the << FUNCTION >> field is. This needs to be fixed.

IBM #793

PDF Page 261

9.4.3 SMP\_RESPONSE frame

The statement << requested, and are described in the model section. >> should be << requested (see x.x.x.). >>

IBM #793

PDF Page 262. Sequence

9.4.4.1 Overview

The statement << that process requests from the management application layer and >> should be << that process management requests and >> .

IBM #794

PDF Page 262. Sequence

9.4.4.2.1 Overview

The statement << processes requests from the management application layer. >> should be << processes management requests. >>.

IBM #795

PDF Page 262. Sequence

9.4.4.2.1 Overview

The term << communicated >> should be << sent >>.

IBM #796

PDF Page 262. Sequence

9.4.4.2.1 Overview

The statement << in a return confirmation. >> should be <<as a confirmation. >>.

IBM #797

PDF Page 263

9.4.4.2.2.1 State description

The statement << from the management application layer. >> should be deleted.

IBM #798

PDF Page 263

9.4.4.2.2.1 State description

The statement << of values to be used in the CONNECTION RATE, INITIATOR CONNECTION TAG, DESTINATION SAS ADDRESS, and SOURCE SAS ADDRESS fields in the OPEN address frame, and the FUNCTION and ADDITIONAL REQUEST BYTES fields in the SMP\_REQUEST frame. >> should list the actual values, not the fields they go into, in an a,b,c list like the ones in the several of the other ST state descriptions.

IBM #799

PDF Page 264

9.4.4.2.4.1 State description

The statement << from the port layer >> should be deleted.

IBM #800

PDF Page 264

The statement << is communicated from the port layer and that confirmation is sent to the management application layer. >> should be << is sent to the management



application layer. >>.

IBM #801

PDF Page 264

#### 9.4.4.2.3.1 State description

The statement << received in the MT\_ID1:Idle to MT\_ID2:Send transition, >> should be deleted.

IBM #802

PDF Page 264

#### 9.4.4.2.3.1 State description

The statement << frame using the function and additional request bytes arguments >> should be << frame using the received function and additional request bytes arguments >>

IBM #803

PDF Page 264

#### 9.4.4.2.3.1 State description

The statement << used for the CONNECTION RATE, INITIATOR CONNECTION TAG, DESTINATION SAS ADDRESS, and SOURCE SAS ADDRESS fields in the OPEN address frame >> should list the actual values, not the fields they go into, in an a,b,c list like the ones in the several of the other ST state descriptions.

IBM #804

PDF Page 264

The statement << after a Transmission Status (SMP Frame Transmitted) confirmation is received. >> should be << after receiving a Transmission Status (SMP Frame Transmitted) confirmation. >>.

IBM #805

PDF Page 264

#### 9.4.4.2.4.1 State description

The statement << This state shall initialize a SMP frame receive time out timer to a vendor-specific time and start the timer upon entry into this state. >> should be << Upon entry into this state, this state shall initialize a SMP frame receive time out timer to a vendor-specific time and start the timer. >>

IBM #806

PDF Page 264

#### 9.4.4.2.4.2 Transition MT\_ID3:Receive to MT\_ID1:Idle

The statement

<< a) an Frame Received (SMP) confirmation is received, and, as a result, this state has sent an SMP Frame Pair Sent/Received confirmation to the management application layer;  
b) a Connection Closed or Frame Received (SMP Failure) confirmation is received, and, as a result, this state has sent an SMP Frame Tx/Rcv Failure confirmation to the management application layer; or  
c) the SMP frame receive time out timer is exceeded before a SMP Frame Pair Sent/Received confirmation is received, and, as a result, this state has sent an SMP Frame Receive Time out confirmation to the management application layer and has sent an SMP Transmit Break request to the port layer. >> should be  
<< a) receiving a Frame Received (SMP) confirmation and after sending an SMP Frame Pair Sent/Received confirmation to the management application layer;  
b) receiving a Connection Closed or Frame Received (SMP Failure) confirmation and after sending an SMP Frame Tx/Rcv Failure confirmation to the management application layer; or  
c) the SMP frame receive time out timer times out before a SMP Frame Pair Sent/Received confirmation is received and after this state has sent an SMP Frame Receive Timeout confirmation to the management application layer and has sent an SMP Transmit Break request to the port layer. >>

#### 9.4.4.3.1 Overview

The term << forwards >> should be << sends >>.

IBM #808

PDF Page 265

## 9.4.4.3.2.1 State description

The statement << from the port layer. >> should be deleted.

IBM #809

PDF Page 265

## 9.4.4.3.3.1 State description

The statement << from the management application layer. >> should be deleted.

IBM #810

PDF Page 265

## 9.4.4.3.2.2 Transition MT\_TD1:Idle to MT\_TD2:Respond

The statement << occur after an Frame Received (SMP) confirmation is received, and, as a result, this state has sent an SMP Frame Received confirmation to the >> should be << occur after receiving a Frame Received (SMP) confirmation and after sending an SMP Frame Received confirmation to the >>

IBM #811

PDF Page 265

## 9.4.4.3.3.1 State description

The statement << Upon receipt, this state shall send a Transmit Frame (SMP) request to the port layer. >> should be a new paragraph and changed to << This state shall send a Transmit Frame (SMP) request to the port layer after receiving a Tx SMP Frame request. >>.

IBM #812

PDF Page 265

## 9.4.4.3.3.2 Transition MT\_TD2:Respond to MT\_TD1:Idle

The statement

<< a) a Transmission Status (SMP Frame Transmitted) confirmation is received; or  
b) a Connection Closed confirmation is received, and, as a result, this state has sent an SMP Connection Closed confirmation to the management application layer. >> should be <<  
a) receiving a Transmission Status (SMP Frame Transmitted) confirmation ;  
or  
b) receiving a Connection Closed confirmation and after sending an SMP Connection Closed confirmation to the management application layer. >>.

IBM #813

PDF Page 267

## 10.1.1.1 Transport protocol services overview

The statement << and how each transport protocol service is implemented in SSP. >> should be << and the SSP implementation of each transport protocol service. >>.. Sequence number: 2

IBM #813

PDF Page 267

## 10.1.1.1 Transport protocol services overview

The terms << state machines >> should be deleted as we don't normally refer to state machines only layers.

IBM #814

PDF Page 267

## 10.1.1.2 Send SCSI Command transport protocol service

The statement << protocol service request to have an initiator port >> should be << protocol service request to request an initiator port >>

IBM #815

PDF Page 268

## 10.1.1.2 Send SCSI Command transport protocol service

The statement << shows how the arguments to the Send SCSI Command transport protocol service are used. >> should be << shows the usage of the Send SCSI Command transport protocol service arguments. >>.

IBM #816

PDF Page 268

10.1.1.3 SCSI Command Received transport protocol service

The statement << shows how the arguments to the SCSI Command Received transport protocol service are determined. >> should be << shows the usage of the SCSI Command Received transport protocol service arguments >>

IBM #817

PDF Page 268

10.1.1.3 SCSI Command Received transport protocol service

The statement << If a target port calls SCSI Command Received () with a TAG already in use (i.e., an overlapped command), the device server responses are defined in SAM-3. >> should be deleted as the tag checking rules are defined elsewhere in this document.

IBM #818

PDF Page 269

10.1.1.4 Send Command Complete transport protocol service

The statement << shows how the arguments to the Send Command Complete transport protocol service are used. >> should be << shows the usage of the Send Command Complete transport protocol service arguments. >>.

IBM #819

PDF Page 269

10.1.1.4 Send Command Complete transport protocol service

The statement << have a target port transmit >> should be << request a target port transmit >>..Page: 270

IBM #820

PDF Page 269

10.1.1.5 Command Complete Received transport protocol service

The statement << shows how the arguments to the Command Complete Received transport protocol service are determined. >> should be << shows the usage of the Command Complete Received transport protocol service arguments. >>.

IBM #821

PDF Page 269

10.1.1.6 Send Data-In transport protocol service

The term << I\_T\_L\_Q >> should be << I\_T\_L\_Q nexus >> in all cases.

IBM #822

PDF Page 269

10.1.1.6 Send Data-In transport protocol service

The statement << have a target port transmit >> should be << request a target port transmit >>.

IBM #823

PDF Page 271

10.1.1.6 Send Data-In transport protocol service

The statement << shows how the arguments to the Send Data-In transport protocol service are used. >> should be << shows the usage of the Send Data-In transport protocol service arguments. >>.

IBM #824

PDF Page 271

10.1.1.7 Data-In Delivered transport protocol service

The statement << shows how the arguments to the Data-In Delivered transport protocol service are determined. >> should be << shows the usage of the Data-In Delivered transport protocol service arguments. >>.

IBM #825

PDF Page 271

10.1.1.8 Receive Data-Out transport protocol service

The term << I\_T\_L\_Q >> should be << I\_T\_L\_Q nexus >> in all cases.

IBM #826

PDF Page 271

#### 10.1.1.8 Receive Data-Out transport protocol service

The statement << A device server shall not call Receive Data Out () for a given I\_T\_L\_Q until Data Out Received () has returned for the previous Receive Data Out () call (i.e., no XFER\_RDY until all write DATA frames for the previous XFER\_RDY frame, if any, and has provided link layer acknowledgement for all of the previous write DATA frames for that I\_T\_L\_Q). >> does not parse I think it should be << A device server shall not call Receive Data Out () for a given I\_T\_L\_Q nexus until Data Out Received () has been returned for the previous Receive Data Out () call (i.e., no XFER\_RDY sent until all write DATA frames for the previous XFER\_RDY frame, if any, and have been provided by link layer acknowledgements for all of the previous write DATA frames for that I\_T\_L\_Q nexus). >>

IBM #827

PDF Page 271

#### 10.1.1.7 Data-In Delivered transport protocol service

The statement << have a target port transmit >> should be << request a target port transmit >>.

IBM #828

PDF Page 272

#### 10.1.1.8 Receive Data-Out transport protocol service

The statement << shows how the arguments to the Receive Data-Out transport protocol service are used. >> should be << shows the usage of the Receive Data-Out transport protocol service arguments. >>.

IBM #829

PDF Page 272

#### 10.1.1.9 Data-Out Received transport protocol service

The statement << shows how the arguments to the Data-Out Received transport protocol service are determined. >> should be << shows the usage of the Data-Out Received transport protocol service arguments. >>.

IBM #830

PDF Page 272

#### 10.1.1.10 Send Task Management Request transport protocol service

The statement << have an initiator port transmit >> should be << request an initiator port transmit >>.

IBM #831

PDF Page 273

#### 10.1.1.12 Task Management Function Executed transport protocol service

The statement << have a target port transmit >> should be << request a target port transmit >>.

IBM #832

PDF Page 273

#### 10.1.1.10 Send Task Management Request transport protocol service

shows how the arguments to the Send Task Management Request transport protocol service are used. >> should be << shows the usage of the Send Task Management Request transport protocol service arguments. >>.

IBM #833

PDF Page 273

#### 10.1.1.11 Task Management Request Received transport protocol service

The statement << shows how the arguments to the Task Management Request Received transport protocol service are determined. >> should be << shows the usage of the Task Management Request Received transport protocol service arguments. >>.

IBM #834

PDF Page 273

10.1.1.11 Task Management Request Received transport protocol service  
 The statement << If a target port calls Task Management Request Received () with a TAG already in use, the device server responses are defined in SAM-3. >> should be deleted as the tag checking rules are defined elsewhere in this document.

IBM #835

PDF Page 274

10.1.1.12 Task Management Function Executed transport protocol service  
 The statement << shows how the arguments to the Task Management Function Executed transport protocol service are used. >> should be << shows the usage of the Task Management Function Executed transport protocol service arguments. >>.

IBM #836

PDF Page 275

10.1.1.13 Received Task Management Function-Executed transport protocol service  
 The statement << shows how the arguments to the Received Task Management Function-Executed transport protocol service are determined. >> should be << shows the usage of the Received Task Management Function-Executed transport protocol service arguments. >>.

IBM #837

PDF Page 275

10.1.2 Device server error handling  
 The information in this section could be placed in a single table. This should make the presentation of the error information easier to determine.  
 << If a device server calls Receive Data-Out () and receives a Delivery Result that indicate a deliver failure the device server shall respond as shown in table xx.  
 Table xx - Response to Delivery Result DELIVERY FAILURE  
 Columns would be: Delivery Result : Status : Sense Key : Additional sense code: >>

IBM #838

PDF Page 276

10.1.3 Application client error handling  
 The statement << it determines the ACK for the RESPONSE frame was seen by the target port. This is indicated by: >> should be deleted. The workings of the lower layers is not needed here.

IBM #839

PDF Page 276

The statement << If an application client calls Send SCSI Command () and an initiator port calls Command Complete Received () and delivers a Service Response of Service Delivery of Target Failure - ACK/NAK Timeout, the application client shall send a QUERY TASK task management function with Send Task Management Request () to determine whether the command was received successfully. If Received Task Management Function Executed () returns a Service Response of FUNCTION SUCCEEDED, the application client shall assume the command was delivered successfully. If it returns a Service Response of FUNCTION COMPLETE, and Command Complete Received () has not yet been called a second time for the command in question, the application client shall assume the command was not delivered successfully and may reuse the tag. >> is very awkward. There must be a better way to present this information. May by some kind of table like the one suggested in the target error handling suggested in the above comment..Page: 277

IBM #840

PDF Page 276

10.1.5.1 INQUIRY command  
 The statement << is modified as described >> should be << by a SAS device is described >>.

IBM #841

PDF Page 276

10.1.5.4 START STOP UNIT command

The statement << are modified as described >> should be << by a SAS device is described >>.

IBM #842

PDF Page 279

10.1.6.1.3 MAXIMUM CONNECT TIME LIMIT field

The statement << (i.e., a value of one in this field specifies that the time shall be

less than or equal to 100  $\mu$ s, a value of two in this field specifies that the time shall be less than or equal to 200

$\mu$ s, etc.). >> should be << (e.g., a value of one in this field specifies that the time shall be

less than or equal to 100  $\mu$ s, a value of two in this field specifies that the time shall be less than or equal to 200

$\mu$ s). >>

IBM #843

PDF Page 279

10.1.6.1.4 MAXIMUM BURST SIZE field

The statement << (i.e., a value of one in this field specifies that the number

of bytes transferred to the initiator port for the nexus shall be less than or equal to 512, a value of two in this

field specifies that the number of bytes transferred to the initiator port for the nexus shall be less than or equal

to 1 024, etc.). >> should be << (e.g., a value of one in this field specifies that the number

of bytes transferred to the initiator port for the nexus shall be less than or equal to 512, a value of two in this

field specifies that the number of bytes transferred to the initiator port for the nexus shall be less than or equal

to 1 024). >>

IBM #844

PDF Page 279

10.1.6.1.5 FIRST BURST SIZE field

The term << XFER\_RDY frame >> is << XFER\_RDY >> in many other places in the standard. This needs to be stated one way. I

believe just << XFER\_RDY >> is used everywhere else.

IBM #845

PDF Page 279

10.1.6.1.5 FIRST BURST SIZE field

The statement << (i.e., a value of one in this field specifies that the number of bytes transferred by the initiator port shall be less

than or equal to 512, a value of two in this field specifies that the number of bytes transferred by the initiator port shall be less than

or equal to 1 024, etc.). >> should be << (e.g., a value of one in this field specifies that the number of bytes transferred by the

initiator port shall be less than or equal to 512, a value of two in this field specifies that the number of bytes transferred by the

initiator port shall be less than or equal to 1 024). >>

IBM #846

PDF Page 279

10.1.6.1.5 FIRST BURST SIZE field

The statement << size, i.e., an initiator port shall transmit no data frames to the target port before receiving an XFER\_RDY frame. >>

should be << size (i.e., an initiator port shall transmit no data frames to the target port before receiving an XFER\_RDY frame). >>

IBM #847

PDF Page 281

10.1.6.2.2 Protocol-Specific Port mode page - short format

The statement << connection time outs before treating it as an I\_T nexus loss >> should be << connection time outs before

creating an I\_T nexus loss >>

IBM #848

PDF Page 281

10.1.6.2.2 Protocol -Specific Port mode page - short format

\*\*\*\*\*

The statement << If the mode page is implemented, the default setting shall be 2 000 ms. >> is a problem. We have never specified a default value for a more page value. Why are we going it here? I don't believe we should start now. We could possibly recommend the value in a note. Reword to << Note xx: If this mode page is implemented a non-zero default value should be specified. It is recommend that this value be 2 000 ms. >>

IBM #849

PDF Page 281

10.1.6.2.2 Protocol -Specific Port mode page - short format

The statement << indicates the target port shall never consider rejections an I\_T nexus loss. >> should be << indicates the target port shall not stop retrying OPEN\_REJECT (NO DESTINATION), OPEN\_REJECT (CONNECTION RATE NOT SUPPORTED) connection requests.

IBM #850

PDF Page 281

10.1.6.2.3 Protocol -Specific Port mode page - Phy Control And Discover subpage

The statement << and indicates the number of SAS phy mode descriptors that follow. >> is obvious and should be deleted.

IBM #851

PDF Page 282

10.1.6.2.3 Protocol -Specific Port mode page - Phy Control And Discover subpage

The statement << The PHY IDENTIFIER field, ATTACHED DEVICE TYPE field, NEGOTIATED PHYSICAL LINK RATE field, ATTACHED SSP INITIATOR bit, ATTACHED STP INITIATOR bit, ATTACHED SMP INITIATOR bit, ATTACHED SSP TARGET bit, ATTACHED STP TARGET bit, ATTACHED SMP TARGET bit, ATTACHED SAS ADDRESS field, SAS ADDRESS field, HARDWARE MINIMUM PHYSICAL LINK RATE field, and HARDWARE MAXIMUM PHYSICAL LINK RATE field are defined in the SMP DISCOVER function (see 10.3.1.4). >> needs to made into an a,b,c list..Page: 283

IBM #852

PDF Page 282

10.1.6.2.3 Protocol -Specific Port mode page - Phy Control And Discover subpage

The statement << The PHY OPERATION field, PROGRAMMED MINIMUM PHYSICAL LINK RATE field, and PROGRAMMED MAXIMUM PHYSICAL LINK RATE field are defined in the SMP PHY CONTROL function >> . >> needs to made into an a.b.c list.

IBM #853

PDF Page 282

Table 124

The term << Protocol-specific log parameter >> should be changed to << SAS log parameter >> in all cases.

IBM #854

PDF Page 284

Table 125

The term << Protocol-specific log parameter >> should be changed to << SAS log parameter >> in all cases.

IBM #855

PDF Page 285

Table 126

Left justify all the entries in the << Description >> column.

IBM #856

PDF Page 286

10.1.7.1 Protocol-Specific Log page for SAS

The statement << The PHY IDENTIFIER field, ATTACHED DEVICE TYPE field, NEGOTIATED PHYSICAL LINK RATE field, ATTACHED SSP

INITIATOR bit, ATTACHED STP INITIATOR bit, ATTACHED SMP INITIATOR bit, ATTACHED SSP TARGET bit, ATTACHED

STP TARGET bit, ATTACHED SMP TARGET bit, ATTACHED SAS ADDRESS field, and SAS ADDRESS field are defined in the

SMP DISCOVER function (see 10.3.1.4). >> needs to be made into an a,b,c list.

IBM #857

PDF Page 287

The statement << The INVALID DWORD COUNT field, DISPARITY ERROR COUNT field, LOSS OF DWORD

SYNCHRONIZATION field, and PHY RESET PROBLEM COUNT field are each defined in the SMP REPORT PHY ERROR LOG

response data (see 10.3.1.5). >> needs to be made into an a,b,c list.

IBM #858

PDF Page 287

10.1.8 SCSI power condition states

The statement << a) after power on, if the target device has not received a START STOP UNIT command with the START bit set

to zero, transition to the active power condition state after receiving NOTIFY (ENABLE\_SPINUP). The target device automatically

transitions after power on without waiting for the application client; and b) after power on, if the target device has previously received a START

STOP UNIT command with the START bit set to zero when it receives a START STOP UNIT command with the START bit set to one,

spin-up after receiving the next NOTIFY

(ENABLE\_SPINUP). The application client's request is effectively delayed until NOTIFY (ENABLE\_SPINUP) arrives. >> makes no

sense in the context of this section. Something is wrong here and I have no idea what is going on here. This needs to be fixed.

IBM #859

PDF Page 287

10.1.8 SCSI power condition states

The statement << The SA\_PC

state machine is an enhanced version of the logical unit power condition state machines described in SPC-3, SBC-2, and RBC. >>

doesn't add anything to SAS and should be deleted.

IBM #860

PDF Page 287

10.1.8 SCSI power condition states

The list of state machines needs cross-references and an indication of the initial state.

IBM #861

PDF Page 288

Figure 103

This drawing needs the orange background and the state machine title in it like all the other state machine drawings in this document.

IBM #862

PDF Page 288

10.1.8.1.1 State description

The statement << This state shall be entered upon power on. This state consumes zero time. >> should be << Upon power on this

state shall be entered. >> All states are zero time so there is no need to state it here.

IBM #863

PDF Page 289

10.1.8.2.2 Transition SA\_PC\_1: Active to SA\_PC\_2: Idle



The term << expires.>> should be << timed out >>.

IBM #864

PDF Page 289

10.1.8.2.3 Transition SA\_PC\_1: Active to SA\_PC\_3: Standby

The term << expires.>> should be << timed out >>

IBM #865

PDF Page 289

10.1.8.3.3 Transition SA\_PC\_2: Idle to SA\_PC\_3: Standby

The term << expires.>> should be << timed out >>.

IBM #866

PDF Page 290

10.1.8.5.1 State description

The statement << This state is only implemented >> should be << This state shall only implemented >>

IBM #867

PDF Page 291

10.1.8.6.1 State description

The statement << This state is only implemented >> should be << This state shall only implemented >>.

IBM #868

PDF Page 291

10.1.8.6.2 Transition SA\_PC\_5: Active\_Wait to SA\_PC\_1: Active

\*\*\*\*

The statement << the device does not temporarily consume additional power during the transition to SA\_PC\_1: Active. >> should be << the device does not temporarily consume additional power as a result of a transition to SA\_PC\_1: Active. >> but I don't understand what this is all about. The statement itself tells me nothing. This needs to be fixed.

IBM #869

PDF Page 291

10.1.8.6.3 Transition SA\_PC\_5: Active\_Wait to SA\_PC\_3: Standby

The term << expires.>> should be << timed out >>

IBM #870

PDF Page 291

10.1.8.6.5 Transition SA\_PC\_5: Active\_Wait to SA\_PC\_6: Idle\_Wait

The term << expires.>> should be << timed out >>.

IBM #871

PDF Page 291

10.1.8.7.1 State description

The statement << This state is only implemented >> should be << This state shall only implemented >>. Sequence number: 6

IBM #871

PDF Page 291

10.1.8.7.3 Transition SA\_PC\_6: Idle\_Wait to SA\_PC\_3: Standby

The term << expires.>> should be << timed out >>

IBM #872

PDF Page 292

10.1.9 SCSI vital product data

The statement << the Device Identification vital product data (VPD) page (83h) >> should be << the Device Identification VPD page (83h) >>

IBM #873

PDF Page 292

Table 128

The statement << The IDENTIFIER field contains the SAS address of the target port being used to run the INQUIRY command. >> should be << The IDENTIFIER field contains the SAS address of the target port through which the INQUIRY command was

received. >>

IBM #874

PDF Page 294

10.3.1.1 Function overview

The statement << The CRC field is included in each frame, although that field is parsed by the link layer. >> should be deleted as it is information that is stated else where and should not be here.

IBM #875

PDF Page 296

10.3.1.2 REPORT GENERAL function

The statement << 1) Table 131 defines the response format. >> should not have a << 1) >> in it. This needs to be fixed.

IBM #876

PDF Page 296

10.3.1.2 REPORT GENERAL function

The statement << for either of the following reasons: >> should be << for the following reasons: >>

IBM #877

PDF Page 296

10.3.1.2 REPORT GENERAL function

The << EXPANDER ROUTE INDEXES field >> and the << CONFIGURABLE ROUTE TABLE>> need some cross references to where the expander route table is defined and the configurable route table is defined.. Page: 297

IBM #878

PDF Page 296

10.3.1.2 REPORT GENERAL function

<< table that shall be configured. >> should be << table that is required to be configured. >>

IBM #879

PDF Page 298

10.3.1.3 REPORT MANUFACTURER INFORMATION function

\*\*\*\*

The statement << The vendor identification string should be one defined >> should be << The vendor identification string shall be as defined >>

IBM #880

PDF Page 299

10.3.1.4 DISCOVER function

The statement << by the phy, as well as the routing attribute supported >> should be << by the phy and the routing attribute supported >>

IBM #881

PDF Page 299

10.3.1.4 DISCOVER function

global

The usage of small caps should be limited to field names only. The use when talking about the value is not correct (e.g., NUMBER OF PHYS and FUNCTION RESULT) here. This needs to be fixed.

IBM #882

PDF Page 301

10.3.1.4 DISCOVER function

The statement << complete (when a SAS device is attached) or after the initial Register - Device to Host FIS has been received (when a SATA device is attached). >> should be << complete if a SAS device is attached or after the initial Register - Device to Host FIS has been received if a SATA device is attached. >>

10.3.1.4 DISCOVER function

The statement << The ROUTING ATTRIBUTE field shall not change based on the attached device type. The routing method used

by the expander connection manager shall change based on the attached device type as described in table 137. >> If not clear as to the point that is trying to be made. This needs to be fixed or deleted.

IBM #884

PDF Page 302

10.3.1.4 DISCOVER function

In the statement << link rate if they have been >> what is the << they >> referring to. This needs to be fixed.

IBM #885

PDF Page 302

Table 139

The statement << in its local data structures >> should be deleted as that kind of data structure is not defined anywhere.

IBM #886

PDF Page 302

10.3.1.4 DISCOVER function

All the << The xxx bit indicates the xxx value received during the link reset sequence. >> should be for example << An ATTACHED SSP INITIATOR bit set to one indicates an SSP initiator is attached. An ATTACHED SSP INITIATOR bit set to zero indicates an SSP initiator is not attached. >>

IBM #887

PDF Page 302

10.3.1.4 DISCOVER function

The statement << completes, when a SAS device is attached; >> should be << completes if a SAS device is attached; >>

IBM #888

PDF Page 302

10.3.1.4 DISCOVER function

The statement << completes, when a SATA device is attached; >> should be << completes if a SATA device is attached; >>

IBM #889

PDF Page 303

10.3.1.4 DISCOVER function

The statement << The default value for PARTIAL PATHWAY TIMEOUT VALUE shall be 7  $\mu$ s. >> is a problem. We have never specified a default value for a more page value. Why are we going it here? I don't believe we should start now. We could possibly recommend the value in a note. Rework to << Note xx: If this function is implemented a it is recommend that this value be 7  $\mu$ s. >>

IBM #890

PDF Page 305

10.3.1.5 REPORT PHY ERROR LOG function

The statement << have been received (outside of phy reset sequences). >> should be << have been received outside of phy reset sequences. >>

IBM #891

PDF Page 305

10.3.1.5 REPORT PHY ERROR LOG function

The statement << have been received (outside of phy reset sequences). >> should be << have been received outside of phy reset sequences. >>

IBM #892

PDF Page 305

10.3.1.5 REPORT PHY ERROR LOG function

The statement << has been lost (outside of phy reset sequences). >> should be << has been lost outside of phy reset sequences. >>.

IBM #893

PDF Page 307

## 10.3.1.7 REPORT ROUTE INFORMATION function

The statement << This function is used primarily as a diagnostic tool to resolve topology issues. >> should be << This function is used to resolve topology issues. >>

IBM #894

PDF Page 308

## 10.3.1.7 REPORT ROUTE INFORMATION function

The statement << the table routing attribute (see 4.x.x.x) the >> needs a real cross reference.

IBM #895

PDF Page 312

## 10.3.1.8 CONFIGURE ROUTE INFORMATION function

The statement << the table routing attribute (see 4.x.x.x) the >> needs a real cross reference.

IBM #896

PDF Page 312

Table 152

What happened to the << rest of data is invalid. >> statement in the two descriptions. It should be stated here also..Page: 314

IBM #897

PDF Page 312

## 10.3.1.9 PHY CONTROL function

The << PROGRAMMED MINIMUM PHYSICAL LINK RATE field >> and << PROGRAMMED MAXIMUM PHYSICAL LINK RATE field >> need to be described in separate paragraphs.

IBM #898

PDF Page 312

## 10.3.1.9 PHY CONTROL function

The statement << may be set beforehand >> should be << may be sent in an operation other than a LINK RESET operation before a LINK RESET is sent. >>

IBM #899

PDF Page 316

Table 157

What happened to the << rest of data is invalid. >> statement in the two descriptions. It should be stated here also.

IBM #900

PDF Page 319

## A.1 Compliant jitter test pattern (CJTPAT)

The statements << The second column (8b data dword) lists the >> and << The third column (Scrambler output dword) lists >> and << The fourth column (Scrambled 8b data dword) shows >> need to reference the table to which they are referencing.

IBM #901

PDF Page 326

## C.1 CRC generator and checker implementation examples

The statement << 1, 2, and 3 below are included to provide a validation >> needs a more precise. The reference to <<below >> needs to be more accurate.

IBM #902

PDF Page 330

The statement << 4.2.2 describes hashed SAS addresses >> should be << See 4.2.2 for a description of the hashed SAS addresses >>

IBM #903

PDF Page 330

Table D.1

Center all the cells.

IBM #904

PDF Page 331

D.3 Hash generation

The statement << length can be treated as >> should be << length is treated as >>.

IBM #905

PDF Page 332

D.5 Hash implementation with XORs

The statement << 24-bit HASHED SAS ADDRESS field for the SSP frame >> should be << 24-bit hashed SAS address for the SSP frame >> .

IBM #906

PDF Page 336

E.1 Scrambler implementation in C

The term << specified >> should be deleted.

IBM #907

PDF Page 340

F.3 Byte and bit ordering

The statement << Thus, the first byte contains the least >> should be << As a result the first byte contains the least >>

H.1 Overview

The statement << Hamming distance (the number of bits different in two patterns) of at least >> should be << Hamming distance (i.e., the number of bits different in two patterns) of at least >>.

IBM #909

PDF Page 366

I.2 Header file

The statement << SMP Request, must be initialized >> should be << SMP Request, is initialized >>.

IBM #910

PDF Page 369

I.2 Header file

The statement << SMP Response, must be initialized >> should be << SMP Response, is initialized >>

IBM #911

PDF Page 370

I.2 Header file

The statement << file will perform the >> should be << file performs the >>.

IBM #912

PDF Page 371

I.3 Source file

The statement << change primitives will initiate >> should be << change primitives initiate >>.

IBM #913

PDF Page 371

I.3 Source file

The statement << discover information will end up >> should be << discover information ends up >>.

I.2 Header file

The statement << expander in the chain must be configured >> should be << expander in the chain is configured >>.

IBM #915

PDF Page 373

I.2 Header file

The statement << production code must handle >> should be << production code handles >>. Requirements cannot be in an informative annex.

IBM #916

PDF Page 373

## I.2 Header file

The statement << production code must handle >> should be << production code handles >>. Requirements cannot be in informative annex.

IBM #917

PDF Page 374

## I.3 Source file

The statement << this routine will add a SAS Address >> should be << this routine adds a SAS Address >>.

IBM #918

PDF Page 374

## I.3 Source file

The statement << this routine will add a SASAddress >> should be << this routine adds a SASAddress >>.

IBM #919

PDF Page 374

## I.3 Source file

The statement << this routine will reset the ChainEntry >> should be << this routine resets the ChainEntry >>.

IBM #920

PDF Page 375

## I.3 Source file

The statement << this routine will get the route index >> should be << this routine gets the route index >>.

IBM #921

PDF Page 375

I.3 Source file. The statement << this routine will get the >> should be << this routine gets the >>.

IBM #922

PDF Page 379

## I.3 Source file

The statement << this routine will append >> should be << this routine appends >>.

IBM #923

PDF Page 380

## I.3 Source file

The statement << DiscoverProcess will get >> should be << DiscoverProcess gets >>.

IBM #924

PDF Page 380

## I.3 Source file

The statement << we find will naturally move >> should be << we find naturally moves >>.

IBM #925

PDF Page 382

## Annex J

There seems to be a bogus frame title at the end of the document. It shows up as an << untitled >> entry in the bookmarks list in Acrobat which seems to be hyper linked to something on page 172.

IBM #926

## Section 7.1.4.5 CLOSE

There is no indication as to what a device should do if it does not support STP and receives a CLOSE (CLEAR AFFILIATION). I suggest the description should be changed to << Close an open STP connection and clear the initiator affiliation. If a device does not support STP it shall process the CLOSE (CLEAR AFFILIATION) the same as CLOSE (NORMAL). >>

This needs to be resolved to prevent interoperability problems. May be not in real life but the testers will have a field day with this if we don't define a

specific behavior for SSP devices.

IBM #927

Section 7.12.2.2 Connection request responses

The requirement << After receiving an OPEN\_REJECT that indicates a retry may be performed (see table 62), the source port shall wait a retry delay of 15 |s before issuing another connection request to the same destination port. >> should be removed as it only adds needless complexity to targets and initiators. It's also not clear the reason for this requirement as the open/reject functionality will most likely be contained totally in hardware.

IBM #928

Section 9.2.1 SSP frame format

The statement <<The target port shall set this field to FFFFh for all frames other than XFER\_RDY frames. >> should be deleted.

The tag should have meaning to the target only. The current requirement suggests that the initiator may expect and verify that the tag is FFFFh for non-XFER\_RDY frames. This should not happen.

Some target implementations would prefer to use target port transfer tag to keep track of frames. That makes it easy to associate a frame in an analyzer trace (read data, response, etc.) with a particular command.

\*\*\*\*\*

Comments attached to No ballot from Cris Simpson of Intel Corp.:

intel001

PDF Page 2  
Front matter  
HIS s/b IHS

intel002

PDF Page 3  
Abstract  
"Serial ATA compatible physical layer": partly true, but overly limited. Implies that SATA is used as-is, across the board. Expand/clarify.

intel003

PDF Page 4  
ANSI stuff  
2002 s/b 2003 or 200x

intel004

PDF Page 31  
TOC  
Fix para formatting for Annex TOC entries

intel005

PDF Page 33  
Foreword  
Fix 'of it' or reword for clarification from  
"At the time of it approved this standard, INCITS had the following members:"  
to  
"At the time of standard approval, INCITS had the following members:"

intel006

PDF Page 40  
3.1.3 ATA device  
NOTE 4  
"uses the term device": place single quotes around words when the word itself is referenced:  
the term 'device', the term 'target device'

intel007

PDF Page 40

3.1.4 ATA domain

"(ATA) service delivery subsystem": Clarify whether this has the same defn as the SCSI SDS

intel008

PDF Page 40

3.1.6 ATA initiator port

"Equivalent to a host adapter": 'initiator port' is an abstraction, 'host adapter' is, at least in one sense, a piece of hardware. Clarify model, and that reference to 'HA' is to the term 'HA', not a thing. (FRAG)

intel009

PDF Page 40

3.1.3 ATA device

NOTE 4

GLOBAL

"ATA/ATAPI V1": Be consistent w/ 2.4, which uses ATAPI -7 (GLOBAL)

intel010

PDF Page 40

3.1.9 ATA target port

"task router" does not appear in ATAPI 7. Use correct ATA terminology.

intel011

PDF Page 40

3.1.14 byte

8 s/b 'eight'

intel012

PDF Page 40

3.1.15 character

10 s/b 'ten'

intel013

PDF Page 41

3.1.30 discoverer process

management application client: Clarify whether 'process' means 'algorithm' or some executing code.

intel014

PDF Page 41

3.1.25 device

'A physical entity' seems quite vague. Clarify whether that is the intent.

intel015

PDF Page 41

3.1.34 (Page 6) dword synchronization

Add '(see 6.9)'

intel016

PDF Page 42

3.1.45 expander route index

Fix typo -- change "a" to "an"

intel017

PDF Page 42

3.1.47 fanout expander device

'no phys with subtractive' - ambiguous. Change 'with' to 'having'

intel018

PDF Page 42

3.1.40 (Page 7) expander device

Make defn more generic - It provides connectivity by routing frames.

intel019



PDF Page 42

3.1.43 (Page 7) expander port

"A SAS expander device object that routes SSP, SMP, and STP frames to and from physical links or to internal initiator ports and/or target ports. Contains one or more phys."

Either add: 'routes primitives, primitive sequences and other frames too.' or make more generic by not listing every function.

intel020

PDF Page 43

3.1.62 indication

indication: Defn is same as for 'confirmation'.

Clarify whether they are identical.

intel021

PDF Page 44

3.1.95 reflection coefficient

This is the upper-case greek letter "gamma". It normally represents a complex number indicating phase as well as magnitude. Later, the char 'rho' is used, representing abs val.

intel022

PDF Page 44

3.1.84 phy

"interfaces to a service delivery subsystem" Please confirm

intent that phy is outside the SDS.

intel023

PDF Page 44

3.1.98 response

response: Confirm intent that this be interchangeable with 'request'

intel024

PDF Page 44

3.1.83 (Page 9) pathway

"A set of physical links between a SAS initiator port and a SAS target port"

Use defn from 4.1.12:

"A pathway is the physical route of a connection."

intel025

PDF Page 44

3.1.91 (Page 9) primitive sequence

"A set of primitives" change to

"A set of one or more consecutive primitives"

intel026

PDF Page 44

3.1.96 (Page 9) request:

"request" has the same definition as "response"

Clarify the difference between the two.

intel027

PDF Page 44

3.1.100 (Page 9) SAS device

"an ATA device" - Change 'device' to 'object'

intel028

PDF Page 45

3.1.104 SAS port

an expander port is also a SAS port, although it doesn't have a SAS address. Add 'expander port'.

intel029

PDF Page 45

3.1.102 (Page 10) SAS initiator device:

a SMP initiator device is also a SAS initiator device

intel030

PDF Page 45

3.1.106 (Page 10) SAS target device:

Add SSP, SMP, STP target devices, and initiators.

intel031

PDF Page 46

3.1.127 service delivery subsystem

'service requests' SDS defn appears to be at odds with that implied by 'phy' defn wrt abstraction level. Clarify.

intel032

PDF Page 46

3.1.129 spread spectrum clocking

increase -> widen

intel033

PDF Page 46

3.1.129 spread spectrum clocking

peaks -> peak amplitude

intel034

PDF Page 46

3.1.141 task

"linked commands" - remove if linked cmds not supported

intel035

PDF Page 46

3.1.128 (Page 11) speed negotiation sequence

"determine the highest common supported physical link rate"  
change to

"negotiate the operational physical link rate"

'where' s/b 'by which'

intel036

PDF Page 48

3.2 symbols and abbreviations

The lower-case greek letter "rho" is normally used to represent the "absolute" reflection coefficient (real ratio of incident to reflected voltage). It looks like an italics lower-case roman letter 'p'.

intel037

PDF Page 52

3.5.3 Parameters, requests, indications, confirmations, and responses

"Parameters": Incorrect use of the term 'parameter' to mean 'signal', 'notification', or 'indication' (in the generic sense). Replace with one of these or an appropriate term that better reflects what's really being passed. If nothing else, call it a 'message' or an 'object', so that it can carry multiple parameters, as is the actual case.

intel038

PDF Page 54

4.1.1 (Page19) Architecture overview

"A SAS device (see 4.1.4) is an ATA device or SCSI device with ports in a SAS domain:"

Expander device is also a SAS device as defined on page 9, 3.1.100 SAS device.

intel039

PDF Page 54

4.1.1 (Page 19) Architecture overview

"The service delivery subsystem in a SAS domain may include expander devices"

Expander devices are not part of the "service delivery subsystem. Expander device interfaces to the SAS service delivery subsystem. This is also shown in Figure 4 on page 20.

intel040

PDF Page 56

4.1.3 (Page 21) Ports (narrow ports and wide ports)

"A port may contain one or more phys."

A port contains one or more phys.

intel041

PDF Page 56

4.1.3 Ports (narrow ports and wide ports)

\*\*\*

Clarify whether the SAS address of the port or the device.

intel042

PDF Page 58

4.1.5 Initiator devices

"Initiator ports may support SSP and/or STP and/or SATA."

SAS initiator does not support native SATA as stated below -

"Initiator ports supporting SATA are outside the scope of this standard."

intel043

PDF Page 59

4.1.6 Target devices

Figure 9

Target device: Figure doesn't match text. Figure should show SATA target device/port, perhaps as a separate block attached to the Service delivery subsystem.

intel044

PDF Page 59

4.1.6 Target devices

SAS target device does not support SATA, it can support ATA target.

Confusing.

intel045

PDF Page 60

4.1.8.2 Edge expander device set

This sentence needs to be clarified in terms of the phys of other edge expander devices that the phys that support table routing can be attached to (eg., direct routing, subtractive routing, table routing, or all of the above) Figure 11 implies that it would only attach to a subtractive port.

intel046

PDF Page 60

4.1.8.1 Expander device overview

"Expander devices are part of the service delivery subsystem" appears to be in conflict with glossary defn for phy. Clarify SDS model.

intel047

PDF Page 60

4.1.8.1 Expander device overview

subtractive routing attribute defined in Clause 3 and general concept is clear; however, the delineation between edge/fanout due to subtractive routing is unclear. Conflicts with defn for 'edge expander device'. Please clarify.

intel048

PDF Page 60

4.1.8 (Page 25) Expander device overview

"Expander devices are part of the service delivery subsystem."

- expander is not part of the service delivery subsystem as shown in Fig. 4 on page 20. Expander interface to the service delivery subsystem.

intel049

PDF Page 60

## 4.1.8.1 Expander device overview

Fig 10 (Page 25) Expander device

Expander only interface to SATA target. The diagram is not clear that it seems it also allows the expander device interface to SATA initiators, SATA expander ports.

intel050

PDF Page 60

## 4.1.8.1 Expander device overview

"There are two types of expander devices differentiated by the routing attributes of their phys, edge expander devices and fanout expander devices."

The expander device which is not the leaf edge expander within the edge expander set behaves differently than an edge expander and fanout expander. It has the routing capability as the fanout expander but it also has a subtractive port which fanout expander does not have. Thus, there are THREE types.

intel051

PDF Page 60

## 4.1.8.2 (Page 25) Edge expander device set

"attached to the phys supporting subtractive routing on another edge expander device set;"

change to

"attached to the phys supporting subtractive routing on another edge expander or edge expander device set;"

to make it clear even an edge expander is a subset of edge expander set

intel052

PDF Page 61

## 4.1.8.3 (Page 26) Configurable expander device

"Expander devices with a configurable route table [MAY] depend on the application client within one or more initiator devices to use the discover process (see 4.6.11.5) to configure the expander route table."

The edge expander set can self-initialize itself.

intel053

PDF Page 62

## 4.1.9 Domains

Figure 12

Add 'STP' targ port.

intel054

PDF Page 62

## 4.1.9 Domains

Figure 12

Also need to show SMP connections in the SAS domain.

intel055

PDF Page 62

## 4.1.9 (Page 27) Domains

"The expander port attached to a SATA target port translates STP to SATA;"

It should also mention the case where the expander attached to a STP target port where the expander only need to pass thru STP traffic.

intel056

PDF Page 63

## 4.1.10 (Page 28) Expander device topologies

Clarify:

Is edge expander device set a \_single\_ SAS device?

Probably not because edge expander device set has one or more device name?

intel057

PDF Page 64

#### 4.1.11 (Page 29) Connections

"A connection is an association between an initiator port and a target port."

A "connection" is a physical path that is logically established and has the right to pass information between the initiator and the target as only as the logical establishment is maintained. Clarify.

intel058

PDF Page 65

#### 4.1.11

Connections "to pathway" changed to "the pathway"

intel059

PDF Page 66

#### 4.1.12 Pathways

"the pathway consists of all the physical links required to route dwords between the initiator phy and the target phy"

Definition is not quite the same as defined in 3.1.83 on page 9

intel060

PDF Page 66

#### 4.1.10 Expander device topologies

Figure 17 - Multiple connections on wide ports

Initiator

\*\*\*

This Initiator shows two ports. The Expander device has two corresponding Expander ports. CLARIFY how the expander can determine there are two ports if the initiator reports the same "device" SAS address in the Identify address frame on all 6 phys?

Need an overview of multi-ported devices and usage of device & port SAS addresses.

intel061

PDF Page 68

#### 4.2.2 SAS addresses

\*\*\*

Specify which one is reported when device has multiple ports in the same domain.

intel062

PDF Page 69

#### 4.2.5 Port identifiers

\*\*\*

Clarify whether this is the SAS address reported in the Identify message, or is it the "device" SAS address?

intel063

PDF Page 84

#### 4.6.1 Expander device model overview

bullet a).C)

Is this the "Broadcast" Primitive Processor? If so, I think the original "Broadcast" was clearer. If not, then the "BPP" acronym doesn't match. Other places including the Acronym glossary in section 3.2, and section 4.6.5, "BPP" continues to be referred to as the "Broadcast Primitive Processor".

intel064

PDF Page 84

#### 4.6.1 Expander device model overview (c):

\*\*\*

Clarify how the expander determines how to group phys under ports. If it's based on the SAS address reported in the Identify address frame, all phys attached to the same "device" must form a single port?

intel065

PDF Page 86

#### 4.6.5 Broadcast primitive processor (BPP):

I don't believe "SL\_IR primitive requests" has been defined anywhere. Does it include RESET? ALIGN? BROADCAST primitives? If there is a subset of all the primitives that applies that's different from the BROADCAST primitives defined in section 7.1, they ought to be so designated as SL\_IR primitive requests in section 7.1. If "SL\_IR primitive requests" are the same thing as "Broadcast Primitives", then the text here should use the same term.

intel066

PDF Page 90

#### 4.6.9 Expander connection router interface

Table 24

Transmit Close

Replace "an CLOSE" with "a CLOSE"

intel067

PDF Page 92

#### 4.6.11.1

Define a method for identifying/reporting this case for self-initialized.

intel068

PDF Page 94

#### 4.6.11.4 Expander route index order

change "has" to "have"

intel069

PDF Page 96

#### 4.6.11.4 Expander route index order

"U" should be changed to "V" \*\*\*

intel070

PDF Page 111

#### 5.7.3.3 Jitter Tolerance Masks

change "Z1" to "Z1tol"

intel071

PDF Page 112

#### 5.7.4 Transmitted Signal Characteristics

General comment: A 3Gb PHY hitting maximum specs for compliance point CT will not be able to pass both bit rate r/f times. Reduce min r/f time for 1,5 from 133 to 67ps.

intel072

PDF Page 116

#### 5.7.9 Impedance specifications

Table 39 - Impedance requirements footnote f:

The text uses an upper-case greek letter "gamma" that normally represents a complex number. To represent the "magnitude" of the reflection coefficient, use the lower-case greek letter "rho".

intel073

PDF Page 116

#### 5.7.9 Impedance specifications

Table 39 - Impedance requirements footnote f:

The text uses an upper-case greek letter "gamma" that normally represents a complex number. To represent the "magnitude" of the reflection coefficient, use the lower-case greek letter "rho".

intel074

PDF Page 117

#### 5.7.11 Transmitter characteristics

Clarify whether both cases must pass, or whether one or the other is sufficient.

intel075

PDF Page 139

6.6.4.2

table 49 Footnote

The reference doesn't appear to be applied to anything.

In any case the comment doesn't belong with this table as it is defined as the SAS speed negotiation.

Correct ref or delete.

intel076

PDF Page 143

6.8.1 Overview

"SP0: SAS\_PowerOn state" is not defined anywhere within the document. Define this state.

intel077

PDF Page 143

6.8.1 Overview

Define 'DWS' in clause 3

intel078

PDF Page 144

6.8.2 OOB sequence states

Fig 56

Entry action is not listed as described in 6.8.2.2.1 on page 110.

intel079

PDF Page 144

6.8.2 OOB sequence states

Fig 56

"Transmit COMSAS"

When should this action be executed? Clarify.

intel080

PDF Page 144

6.8.2 OOB sequence states

Fig 56

SP7: OOB\_AwaitCOMSAS entry action is not listed as described in 6.8.2.7.1 on page 111

intel081

PDF Page 144

6.8.2 OOB sequence states

Fig 56

The "Broadcast Event Notify" transition looks like an unconditional jump in the state diagram, but it actually only transit if all the conditions list in 6.8.2.7.2 are true.

It is very misleading as shown in the state diagram.

intel082

PDF Page 144

6.8.2 OOB sequence states

Fig 56 SAS phy (SP) state machine - OOB sequence states

With all the missing transition conditions and entry action conditions, it makes this state diagram practically useless. Add complete details or remove so as not to cause confusion.

intel083

PDF Page 144

6.8.2 OOB sequence states

Fig 56

"Transmit COMINIT"

When should this action be executed? When entering SP1?

intel084

PDF Page 144

6.8.2 OOB sequence states

Fig 56

"PhyNotReady"

When should this action be executed?

When entering SP1?

intel085

PDF Page 145

6.8.2.1.2 Transition SP1: OOB\_COMINIT to SP2: OOB\_AwaitCOMX

"a COMINIT Transmitted parameter and does not receive a COMINIT Detected parameter."

In Fig 56 on page 109, the transition condition only listed "COMINIT Transmitted"parameter"

intel086

PDF Page 145

6.8.2.1.3 (

"a COMINIT Detected parameter and does not receive a COMINIT Transmitted parameter"

In Fig 56 on page 109, the transition condition only listed " COMINIT Detected"

intel087

PDF Page 145

6.8.2.2.1 State description

Ambiguous: COMINIT and COMSAS could be read as modifiers for 'timeout'.  
Add 'detect' after each.

intel088

PDF Page 145

6.8.2.3.1 State description

"but the COMINIT initiated in  
SP1: OOB\_COMINIT has not been completely transmitted."

This condition is not shown in state diagram Fig 56 on page 109.

intel089

PDF Page 145

6.8.2.4.2 Transition SP4: OOB\_COMSAS to SP5: OOB\_AwaitCOMSAS\_Sent

"and does not receive a COMSAS Transmitted parameter."

This condition is not listed in the transition in Fig. 56 on 109,  
which may cause race condition in SM.

intel090

PDF Page 146

6.8.2.4.4

"and does not receive a COMSAS Detected parameter."

This transition condition is not listed in Fig 56 on page 109



intel091  
 PDF Page 146  
 6.8.2.6.2 (Page 111)

"The COMSAS Completed parameter may be received before this state is entered."

How long does this COMSAS Completed or other completed/transmitted/detected) signal stay valid after the event?

Since this is the only place in this state machine description where receiving "before" the state is OK. Does it mean that all other detection/transmitted/etc. parameters are required to be valid only after the corresponding state has been entered?

intel092  
 PDF Page 146  
 6.8.2.7.1 State description

In Fig 56 on page 109, it states "COMSAS detected", is "received" the same as "detected"?

intel093  
 PDF Page 147  
 6.8.2.7.5 Transition SP7: OOB\_AwaitCOMSAS to SAS\_AwaitNoCOMX

Change "SAS\_AwaitNoCOMX" to "SP2: SAS\_AwaitNoCOMX"

intel094  
 PDF Page 148  
 Figure 57 (Page 113)  
 When should "Transmit ALIGN1" should be sent?  
 The text in 6.8.3.4.1 says "repeatedly send", but this is not reflected in this state diagram.

intel095  
 PDF Page 148  
 6.8.3 SAS speed negotiation states  
 Figure 57

"No more rates" is not even close to what is described in 6.8.3.7.2 on page 116. Clarify.

intel096  
 PDF Page 149  
 6.8.3.1.1 (Page 114)  
 "During this state idle shall be transmitted."

This requirement is not listed in the state diagram state SP8 in Fig 57 on page 113

intel097  
 PDF Page 149  
 6.8.3.2.1 (Page 114)

Clarify:  
 Is "enabled" the same as "started"?

intel098  
 PDF Page 149  
 6.8.3.2.1  
 "During this state idle shall be transmitted."

This requirement is not listed in the state diagram state SP8 in Fig 57 on page 113

intel099  
 PDF Page 149  
 6.8.3.3.1 (Page 114)

Need clarification:

Is "enabled" the same as "started"?

intel 100

PDF Page 149

6.8.3.3.1 (Page 114) State description

"if synchronization occurs before the SNLT expires."

Need to clarify what "synchronization" means, I think it is trying to say either "ALIGN0 Detected" or "ALIGN1 Detected". Usually the word "synchronizatin" means something else. This sentence can be deleted because the same action is clearly described in 6.8.3.3.2 and 6.8.3.3.3.

Also, missing transition if only SNLT expires and no "synchronization" in this state?

intel 101

PDF Page 150

6.8.3.4.1

"This state is exited when the SNTT expires or when ALIGN (1) primitives are received before the SNLT timer expires."

This same information is repeated at 6.8.3.4.2

intel 102

PDF Page 150

6.8.3.5.1 (Page 115)

"This state is reached after ALIGN (1) has been both transmitted and received."

This sentence is not describing the same behavior as shown in the state diagram - Fig 57 on page 113.

Change to:

"This state is reached after ALIGN(1) has been recovered before the SNLT timer expires"

intel 103

PDF Page 151

6.8.3.8.1

"While in this state dwords from the link layer are transmitted at the negotiated physical link rate."

Who (in what state/state machine) is responsible to tell the PHY what the negotiated link rate is? Clarify.

intel 104

PDF Page 153

6.8.4 SATA host emulation states

Figure 58

SP16: SATA\_COMMWAKE

Missing input parameter "COMWAKE Transmitted" with dotted line unfilled arrow into SP16.

intel 105

PDF Page 153

6.8.4 SATA host emulation states

Figure 58 - SAS phy (SP) state machine - SATA host emulation states

SP20: SATA\_AdjustSpeed

dotted unfilled arrow with parameter (Transmit D10.2)

and

dotted unfilled arrow with parameter (Set Rate)

It seems it may have to send "Set Rate" parameter before "Transmit D10.2", please clarify.

intel 106

PDF Page 154

6.8.4.4.1 State description

"a) repeatedly send a Transmit D10.2 parameter to the SP transmitter"  
 "repeatedly send" is not shown in the state diagram in Fig 58  
 as a condition required for transmitting D10.2

intel 107

PDF Page 154

6.8.4.4.1 State description

\*\*\*

GLOBAL

"b) start the ALIGN detect timeout timer"

It looks like this is a state entry action and it  
 is not listed in the state diagram in Fig 58

THIS IS one of a pattern of incomplete definitions due to the  
 assumption of hidden, underlying state machines. Need to explicitly  
 identify these implicit state machines and the signals/messages they  
 exchange with other SMS.

intel 108

PDF Page 154

6.5.4.4.1 State description

"The SAS device shall start transmitting D10.2 characters no  
 later than 20 G1 dwords (i.e. 533 ns) after COMWAKE was deasserted"

Use of COMWAKE is confusing - sometimes parms are received,  
 sometimes CW is 'deasserted' - what is it?

This seems as a state entry action and it does not show the  
 relation of transmitting D10.2 characters no later than 20 G1  
 dwords after COMWAKE was deasserted in the state diagram in Fig 58.

Since not all SAS implementation required to support G1 speed,  
 this state should not specify requirement in "G1 dwords", instead  
 it should just specify time - 533 ns.

intel 109

PDF Page 172

7.1.4.4 BROADCAST

If an expander's routing tables are configured by initiators,  
 how does an expander know the initialization sequence has  
 completed? Clarify.

intel 110

PDF Page 173

7.1.4.9 NOTIFY

NOTIFY (ENABLE\_SPINUP)

Add correct reference.

intel 111

PDF Page 173

7.1.4.9 Notify

Meaning of 'accept' here requires clarification.

intel 112

PDF Page 176

7.1.5.3 DONE

Table 63

Ack/NAK TIMEOUT

"is going to" Sentence s/b xref to where the behavior is defined

intel 113

PDF Page 177

7.1.6.3 SATA\_HOLD and SATA\_HOLD\_A

"...transmitting a SATA\_HOLD." should be changed to  
 "...receiving an SATA\_HOLD"

intel 114

PDF Page 197

7.12.2.1 Connection Request

"If none of the prospective intermediate physical links [does not]  
 support the requested connection rate, ..."

Remove "does not"

intel 115

PDF Page 201

7.12.4.2 Edge Expander Devices

Par. 5, last sentence

"When a fanout expander device is in the domain, an OPEN\_REJECT (NO DESTINATION) is returned."

"is returned" - who returns?

intel 116

PDF Page 201

7.12.4.2 Edge expander devices

The simple edge expander device routing table described in table 80 needs to be reconciled with the expander routing table described in "4.6.11.3 Expander route table."

Text needs to describe when it's appropriate to use the simpler table vs. the more complex table and what the restrictions are if a simpler approach is used.

intel 117

PDF Page 209

7.13.3.1 State Description

par. 7 . (i.e) Explanation missing regarding what should be done about data words transmitted between consecutive EOAFs. SOAFs is clear. (Multiple occurrences)

intel 118

PDF Page 226

7.16.3 SSP frame transmission

"Every frame shall be acknowledged" By whom? Place the requirement on something.

intel 119

PDF Page 226

7.16.3 SSP frame transmission

Create new subclause for frame reception.

intel 120

PDF Page 226

7.16.3 SSP frame transmission

"Every frame shall be acknowledged" conflicts with 7.16.7.9, which describes some frames that are dropped. Qualify with 'valid' or something.

intel 121

PDF Page 233

7.16.7.2 SSP\_TIM1: Tx\_Interlock\_Monitor state

'When the number of EOF Transmitted parameters received' - These are signals, indications, something. They are not parameters. Use an appropriate term, see ANSI IT Dictionary.

intel 122

PDF Page 248

8.1 Overview

"PC\_OC" s/b replaced with "PL\_OC"

intel 123

PDF Page 248

8.1 Overview

'establish port connections and disconnections' - Sounds awkward to establish a disconn. Reword.

intel 124  
 PDF Page 248  
 8.2 Overview  
 'pass transmit data, receive data' AWK - reword.  
 Suggest 'data for transmission, received data'

intel 125  
 PDF Page 248  
 8.1 Overview  
 '...form the port layer' AWK. Rearrange sentence.  
 Suggest 'The port layer consists of...'

intel 126  
 PDF Page 249  
 8.2.2 Bus inactivity time limit timer  
 ALL OTHER TIMERS  
 'The timer shall count down' - specify when  
 (or include xref to spec, here, 8.4.4.1) it starts.  
 (For this and all other defined timers)

intel 127  
 PDF Page 252  
 8.3.2.2 Transition PL\_OC1: Idle to PC\_OC2: Overall\_Control

In this heading, the heading number is duplicated and PC\_OC2  
 should be changed to PL\_OC2

intel 128  
 PDF Page 252  
 8.3.3.1.1 State Description Overview

PM\_PM should change to PL\_PM

intel 129  
 PDF Page 252  
 8.3.3.1.1 State description overview  
 The Tx Frame parameter  
 "following arguments: Balance Required or Balance Not Required"  
 BR and BNR are not arguments, they are possible values of an argument  
 that should be called 'Balance Requirement' or something similar.  
 Correct.

intel 130  
 PDF Page 252  
 8.3.3.1.1 State description overview  
 GLOBAL  
 "parameter" s/b 'request' as per 4.3.3.2 .

intel 131  
 PDF Page 252  
 8.3.3.1.2 Keep track of connections/frame requests

"Keep track of connections/frame requests" is the first  
 time I've seen an imperative used as a subclause title.  
 Replace with "Connection frame/request tracking"

intel 132  
 PDF Page 252  
 8.3.3.1.2 Keep track of connections/frame requests

"A phy is available if it is not processing a Tx Frame"  
 What if it has lost sync, etc? Add defn for 'available'  
 or qualify. Clarify.

intel 133  
 PDF Page 252  
 8.3.3.1.1 State description overview  
 GLOBAL

The information ("parameters/arguments" to/from various state machines and layers) discussed throughout this clause needs to be defined as per 3.7.

Very confusing: for example, "parameter shall include as arguments:"

intel 134

PDF Page 253

8.3.3.1.4 SSP wide port rules

Multiple in subclause

"An initiator port shall not transmit ...for which...transmitting a frame [ ]" Add "on another phy".

intel 135

PDF Page 253

8.3.3.1.3 Select a request to process and the phy on which to process it

GLOBAL

"Tx Frame request" Elsewhere, Tx Frame is called a parameter. Change all occurrences to 'request'.

intel 136

PDF Page 253

8.3.3.1.3 Select a request to process and the phy on which to process it

1)

Is 'Tx Frame request' the same as 'Transmit Frame request' above?

If so, be consistent in usage, if not, add some modifier to one to make the distinction clear.

intel 137

PDF Page 253

8.3.3.1.3 Select a request to process and the phy on which to process it

"A destination is considered the same" - AWK

suggest:

"Destinations are considered to be identical if they have the same protocol and SAS address."

intel 138

PDF Page 253

8.3.3.1.2 Keep track of connections/frame requests

"This state shall consider a phy as having an active connection"

Drop "shall consider" and define it:

"A phy has an active connection when..."

intel 139

PDF Page 254

8.3.3.1.5 Filling in the Tx Frame arguments

3d para

"Balanced" Remove 'd'

intel 140

PDF Page 254

8.3.3.1.5 Filling in the Tx Frame arguments

3d para

"argument" -> 'value'

(This appears to be redundant to 8.3.3.1.1)

Confusing use of 'argument' and 'parameter'

intel 141

PDF Page 254

8.3.3.1.5 Filling in the Tx Frame arguments

"are transferred to the selected PL\_PM's AWT timer and PBC counter" By whom? The PL\_PM, or the PL\_OC2? Clarify.

intel 142

PDF Page 254

8.3.3.1.5 Filling in the Tx Frame arguments  
 "are not received" Place reqmt on sender that it not  
 send, or clarify that these are not present within TxFrame,  
 or are ignored on receipt.

intel 143

PDF Page 254

8.3.3.1.5 Filling in the Tx Frame arguments

"are received as arguments"

s/b

"are present in "

intel 144

PDF Page 254

8.3.3.1.5 Filling in the Tx Frame arguments

"a corresponding PL\_OC Retry Frame AWT timer"

Provide separate text listing all architectural timers and their  
 functions.

intel 145

PDF Page 254

8.3.3.1.5 Filling in the Tx Frame arguments

The I\_T nexus loss

"The selected PL\_PM timer shall be set" Express in  
 active voice (who shall?).

intel 146

PDF Page 254

8.3.3.1.5 Filling in the Tx Frame arguments

"state (i.e., either stopped,"

Clarify that you are defining the possible states or ref  
 where defined. "i.e." is a bit too casual.

intel 147

PDF Page 254

8.3.3.1.5 Filling in the Tx Frame arguments

'are read from' Use active voice.

intel 148

PDF Page 254

8.3.3.1.5 Filling in the Tx Frame arguments

"is updated" Use active voice.

intel 149

PDF Page 255

8.3.3.1.6 Confirmations

"to finish servicing each Transmit Frame request." Unclear -  
 is this how THIS state completes the request, or does it  
 tells the Transport layer to do so? Clarify.

intel 150

PDF Page 255

8.3.3.1.6 Confirmations

"Since the transport layer responses ...are instantaneous"  
 'are returned immediately' seems better if the intent is  
 (response returned as soon as request received). Clarify.

intel 151

PDF Page 255

8.3.3.1.6 Confirmations

Need comma after e.g.

"to continue" may be clearer.

intel 152

PDF Page 255

8.3.3.1.6 Confirmations

"parameter" -> "confirmation"?

intel 153  
 PDF Page 255  
 8.3.3.1.6 Confirmations  
 Table 86 header  
 "parameter" s/b 'value' or 'code'

intel 154  
 PDF Page 256  
 8.3.3.1.7 Handling Cancel requests  
 "Cancel request for a specific Transmit Frame request"  
 There is no listing I could find of the arguments to a  
 Cancel request. Add xref to that defn. Clarify the means  
 by which a specific TF request is identified.

intel 155  
 PDF Page 256  
 8.3.3.1.7 Handling Cancel requests  
 "send a Cancel Acknowledge...and terminate"  
 Either change order to (terminate, ack), or add prohibition  
 on beginning TF processing.

intel 156  
 PDF Page 256  
 8.3.3.1.7 Handling Cancel requests

"layer, this frame is currently" Ambig.  
 s/b " layer and the specified frame "? Clarify.

intel 157  
 PDF Page 256  
 8.3.3.1.7 Handling Cancel requests

"layer, this frame is currently" AMBIG  
 s/b " layer and the specified frame "? Clarify.

intel 158  
 PDF Page 260  
 8.4.3.1.4 Open Failed handling  
 "parameter" - confirmation?

intel 159  
 PDF Page 262  
 9.1 Transport Layer overview  
 clarify:  
 "only receives from the link layer those frames that are to be ACKed."

intel 160  
 PDF Page 264  
 9.2.1 SSP frame format  
 RETRANSMIT  
 "may be set to one"  
 Add xref or "shall be set to one" when a RESP frame is a retrans.

intel 161  
 PDF Page 264  
 9.2.1 SSP frame format  
 For DATA  
 "to that" s/b "to the tag"

intel 162  
 PDF Page 264  
 9.2.1 SSP frame format  
 TP Xfer Tag  
 "need" s/b "use"  
 (We don't care if they NEED it, just whether they use it)

intel 163  
 PDF Page 264  
 9.2.1 SSP frame format



TPXfer Tag  
 "do not need this field" Clarify whether TP can  
 use it sometime, but not other times. or say "use"

intel 164  
 PDF Page 264  
 9.2.1 SSP frame format  
 Table 89 - FRAME TYPE field  
 \*\*\*

Max data frame size is inefficient for block-sizes greater  
 than 512 bytes. This is a serious problem for systems that  
 use data-integrity guards on a block-by-block basis. Recommend  
 the max DATA IU payload accommodate two blocks with a  
 generously-sized block-guard (16-bytes). Change (1 024) to (1 056).

intel 165  
 PDF Page 265  
 9.2.1 SSP frame format  
 DATA frames  
 "each DATA frame shall begin on a dword boundary"  
 It's the TRANSFER, frame. Drop (i.e.)

intel 166  
 PDF Page 265  
 9.2.1.1 COMMAND information unit  
 "SPC-2" if referencing SAM-3, why not SPC-3, especially  
 when ref'd on next page. Be consistent. Suggest SPC-3.

intel 167  
 PDF Page 265  
 9.2.1 SSP frame format  
 The INFORMATION UNIT field

1  
 024 - Make space non-breaking (ctrl-space)

intel 168  
 PDF Page 266  
 9.2.2.2 TASK information unit  
 "request a" s/b "request that a"

intel 169  
 PDF Page 268  
 9.2.2.3 XFER\_RDY information unit  
 "each DATA frame shall begin on a dword boundary"  
 Remove (ie)

intel 170  
 PDF Page 268  
 9.2.2.3 XFER\_RDY information unit  
 "non-dword aligned write data length"  
 A length does not have alignment.  
 Remove the paren statement.

intel 171  
 PDF Page 268  
 9.2.2.3 XFER\_RDY information unit  
 GLOBAL  
 "frame for a given command shall set"  
 Frames don't set themselves. Place the reqmt on some port.

intel 172  
 PDF Page 270  
 9.2.2.5.1 RESPONSE information unit overview  
 Table 96 - RESPONSE information unit  
 STATUS - Following text does not give ref to where  
 STATUS values defined. (make sure for all fields)

intel 173  
 PDF Page 271

9.2.2.5.3 RESPONSE information unit RESPONSE\_DATA format  
 "The SENSE DATA field shall not be present."  
 Make clear that this and related reqmts are conditional  
 on the DATAPRES == RESP\_DATA, and not global. Suggest  
 unordered list under "If the DATAPRES..."

intel 174

PDF Page 272

Table 99

9.2.2.5.3 RESPONSE information unit RESPONSE\_DATA format  
 "NO FAILURE, when responding to a COMMAND frame"  
 Response data would not be returned if there was no  
 error. Remove this.

intel 175

PDF Page 272

9.2.2.5.4 RESPONSE information unit SENSE\_DATA format  
 "The RESPONSE DATA LIST LENGTH field shall be set to zero"  
 Make clear that these reqmts are conditional on DATAPRES value.

intel 176

PDF Page 274

9.2.4.1 COMMAND frame

"whether ...received or not" 'Whether' is sufficient to  
 cover both cases. Drop "or not".

intel 177

PDF Page 274

9.2.4.1 COMMAND frame

"command [ ] was ACKed" add "frame"

intel 178

PDF Page 274

9.2.4.3 XFER\_RDY frame

"close the connection ..return a [ ] CHECK CONDITION status"

Does this mean "generate a UA"?

Add "a RESPONSE FRAME with" (MULTIPLE places)

Does it establish a new connection to send the RESPONSE? Clarify.

intel 179

PDF Page 274

9.2.4.3 XFER\_RDY frame

"does not receive an ACK or NAK"

Over what time period? Clarify.

intel 180

PDF Page 275

9.2.5.1 Target port error handling

"too short to contain a LUN field"

Be explicit - state number of bytes.

intel 181

PDF Page 275

9.2.5.1 Target port error handling

"contains a LUN field but is too small to contain a CDB"

If frame is malformed, how could you say it has LUN but not CDB?  
 Replace this with a list of sizes, in bytes, and the appropriate  
 responses.

intel 182

PDF Page 275

9.2.5.1 Target port error handling

"OVERLAPPED COMMANDS DETECTED"

State (non) requirements on checking.

intel 183

PDF Page 275

## 9.2.5.1 Target port error handling

'TAG that is already in use' - Should be small caps only if referring to the field, but not to the value. Correct.

intel184

PDF Page 276

## 9.2.5.1 Target port error handling

ILLEGAL TARGET PORT TRANSFER TAG - Although the tag may be invalid, there's no indication that it's illegal.

Rename ASC - use INVALID.

\*\*\*\*\*

Comments attached to Yes ballot from Dennis Moore of KnowledgeTek, Inc.:

KnowledgeTek #1

PDF Page 43

## 3.1.62 indication:

The definition says < passed from lower layer... >

3.5.1 State machine conventions overview, Figure 3 shows < indication from upper layer... >

KnowledgeTek #2

PDF Page 44

## 3.1.98 response:

definition says < passed from a higher layer... >

3.5.1 State machine conventions overview, figure3 says < to upper layer... >

KnowledgeTek #3

PDF Page 88

## 4.6.7 Expander device interface detail

Figure 27

'Link Status' sb 'Phy Status' or Table 23 needs to change its entries to 'Link Status'

KnowledgeTek #4

PDF Page 88

## 4.6.7 Expander device interface detail

Figure 27

All of the requests and indications using "Send" sb "Transmit" or Table 24 should change its entries to "Send".

There are eight occurrences of "Send" in this figure that should change to "Transmit"

KnowledgeTek #5

PDF Page 88

Send

KnowledgeTek #6

PDF Page 88

Send

KnowledgeTek #7

PDF Page 88

Send

KnowledgeTek #8

PDF Page 88

Send

KnowledgeTek #9

PDF Page 88

Send

KnowledgeTek #10

PDF Page 88

Send

KnowledgeTek #11  
 PDF Page 88  
 Send

KnowledgeTek #12  
 PDF Page 92

#### 4.6.11.1 Routing attributes and methods 4th paragraph

The following paragraph implies that the routing will be either table OR direct, not both:

"A phy that has the table routing attribute allows the expander connection manager to use one of the following methods to route connection requests:

- a) the table routing method if attached to an expander device; or
- b) the direct routing method if attached to an end device."

#### 4.6.11.2 Expander device connection request routing 2nd paragraph

This paragraph says that if the "DISABLE ROUTE ENTRY bit" is set the entry is ignored (I assume that means the connection request will get an OPEN\_REJECT response???)

"If the destination SAS address of a connection request matches the attached SAS address of an expander route entry and the DISABLE ROUTE ENTRY bit is set to one in the expander route entry, then the expander connection manager shall ignore the expander route entry."

#### 4.6.11.3 Expander route table 10th paragraph

This paragraph states that the "attached" expander's entry is disabled( I assume this means directly attached and not cascaded expanders beyond the one directly attached???)

"If the discover process detects an expander route table entry that references the SAS address of an attached edge expander device, it shall set the DISABLE ROUTE ENTRY bit to one in the expander route table entry." Given the above, how can access to internal devices (i.e., SMP Target function) that share the expanders SAS address be accomplished?

KnowledgeTek #13  
 PDF Page 96

#### 4.6.11.4 Expander route index order

Table 26 - Expander route table levels.

The first entry in the table for level one should be the expander SAS address of expander N. Level two entries should begin with the device SAS addresses attached to phy0 of expander N. etc....

There is only one Level 1 entry per phy. I believe the whole table is wrong...

(I'm assuming the text is correct in paragraph 2, including numbered list, of the same clause???)

That text follows here:

For purposes of configuring the expander route table, the edge expander devices attached to the phy are assigned levels:

- 1) the attached edge expander device is considered level 1;
- 2) devices attached to it are considered level 2;
- 3) devices attached to level 2 edge expander devices are considered level 3; and
- 4) etc.

KnowledgeTek #14  
 PDF Page 98

#### 4.6.11.4

Table 27 - Expander route table entries for edge expander E0 phy 0  
 see comments for table 26

The level 1 entries should be the devices attached to the E0 phy 0, that is edge expander E1.

Level 2 entries are the devices attached to edge expander E1 (i.e., D1,1... D1,Y)

I'm assuming the text is correct in the 2nd paragraph, including numbered list, of the same clause.

KnowledgeTek #15  
 PDF Page 98

#### 4.6.11.4

Table 28 - Expander route table entries for fanout expander device F phy 0  
See comment on table 27, same type of errors apply to this table.

KnowledgeTek #16

PDF Page 99

4.6.11.5 Discover process

1st paragraph

"The order of traversal shall be to discover:

- 1) the expander device to which the initiator port is attached;
- 2) every device attached to that expander device; and
- 3) as each expander device is found, every device attached to that expander device."

The above requires traversal to go down each phy to end before moving to the next phy. This seems to complicate the process of building the routing table entries since the order is based on level. Why the requirement as stated???

KnowledgeTek #17

PDF Page 134

6.6.2.2 SATA speed negotiation sequence (informative)

Figure 49

Time reference is incorrect. 533 ns sb 53,3 ns

KnowledgeTek #18

PDF Page 143

6.8.1 Overview

A reference is made to "SP0: SAS\_PowerOn state" in the third paragraph. This state does not appear in the state figures nor is there a state description of function or how it transitions to other states. Nor is it listed in the preceding paragraph of SP states.

KnowledgeTek #19

PDF Page 145

6.8.2.3 SP3: OOB\_AwaitCOMINIT\_Sent state

6.8.2.5 SP5: OOB\_AwaitCOMSAS\_Sent state

6.8.2.6 SP6: OOB\_AwaitNoCOMSAS state

The above states have only one way out. If that event doesn't occur it appears the only way out is reset. Is that the intent???

KnowledgeTek #20

PDF Page 149

6.8.3.1.1 State description. 4th paragraph, item b)

states:

"to the value of the speed negotiation window received as an argument."

This "argument" is not shown in the state diagram figure 57 nor is there an indication of where it comes from.

KnowledgeTek #21

PDF Page 150

6.8.3.6.2 Transition SP13: SAS\_Pass to SP8: SAS\_Start

1st paragraph, item a)

SN\_start state sb SP8: SAS\_Start state.

KnowledgeTek #22

PDF Page 152

6.8.4 SATA host emulation states

1st paragraph

states:

... (an initiator device...)

Is this allowed????

KnowledgeTek #23

PDF Page 250

PM1:

KnowledgeTek #24

PDF Page 250

8.3.10 overview

Paragraph 3

Sentence 2

PL\_PM1: Idle sb PL\_OC1: Idle

KnowledgeTek #25  
 PDF Page 251  
 Clause 8.3.2.1 & 8.3.2.2  
 8.3.2.1 & 8.3.2.2 is repeated in the clause heading

KnowledgeTek #26  
 PDF Page 251  
 8.3.2 repeated

KnowledgeTek #27  
 PDF Page 252  
 Clause 8.3.2.1 & 8.3.2.2  
 8.3.2.1 & 8.3.2.2 is repeated in the clause heading

KnowledgeTek #28  
 PDF Page 252  
 8.3.3.1.1 State description overview  
 1st paragraph  
 PM\_PM sb PL\_PM

KnowledgeTek #29  
 PDF Page 268  
 2nd paragraph, last sentence states:  
 "The minimum size of the data IU is one byte."  
 9.2.1 SSP frame format  
 Table 89 states:  
 "0 - 1024 bytes" under information unit size.  
 Assuming text takes precedence over tables and the text is correct, Table 89 needs to be fixed.

KnowledgeTek #30  
 PDF Page 295  
 9.4.2 SMP\_Request Frame  
 1 023 bytes sb 1 024 bytes.

KnowledgeTek #31  
 PDF Page 296  
 9.4.3 SMP\_RESPONSE Frame  
 1 023 bytes sb 1 024 bytes

KnowledgeTek #32  
 PDF Page 333  
 10.3.1.3 REPORT MANUFACTURER INFORMATION function.  
 This paragraph does not apply and should be deleted or the field does apply and needs to be added to table 133.  
 The ADDITIONAL LENGTH field indicates the length in bytes of the parameters, including the ADDITIONAL LENGTH field. If the ADDITIONAL REQUEST BYTES of the SMP\_REQUEST is too small to transfer all of the parameters, the ADDITIONAL LENGTH shall not be adjusted to reflect the truncation.

KnowledgeTek #33  
 PDF Page 340  
 10.3.1.5 REPORT PHY ERROR LOG function  
 None of the following fields indicates if the field wraps or freezes at max count.  
 INVALID DWORD COUNT  
 DISPARITY ERROR COUNT  
 LOSS OF DWORD SYNCHRONIZATION COUNT  
 PHY RESET PROBLEM COUNT

KnowledgeTek #34  
 PDF Page 350  
 10.3.1.9 PHY CONTROL function  
 PARTIAL PATHWAY TIMEOUT VALUE description does not state if this value is always update or not regardless of phy operation requested..

\*\*\*\*\*

Comments attached to No ballot from John Lohmeyer of  
LSI Logic Corp.:

LSI #1 [JL]  
PDF Page 3  
Abstract

The abstract is incomplete. SAS also defines a physical layer and a management protocol (SMP).

Consider replacing the existing abstract with:

This standard specifies the functional requirements for the Serial Attached SCSI (SAS) physical interconnect, which is compatible with the Serial ATA physical interconnect. It also specifies three transport protocols, one to transport SCSI commands, another to transport Serial ATA commands to multiple target devices, and a third to support interface management.

LSI #2 [JL]  
PDF Page 9  
1.19 Revision Information

sas-r02c in 1.19 should be sas-r03, but all of the revision history needs to be removed for public review anyway.

LSI #3 [JL]  
PDF Page 33  
Foreword

I think it is appropriate to give a credit to the Serial Attached SCSI Working Group, which did the initial SAS proposal. This credit should go after the T10 member list.

Possible wording:

The Serial Attached SCSI Working Group provided the initial proposal for this standard. This Working Group consisted of the following member companies: <<<This list needs to be reviewed for accuracy>>>

Adaptec Corp.  
Amphenol  
BREA Technologies  
Compaq Computer Corp.  
Crossroads Systems, Inc.  
Cypress Semiconductor  
Data Transit Corp.  
Dell  
Eurologic Systems Limited  
FCI  
Fujitsu Limited  
Hewlett Packard Co.  
Hitachi America, Ltd.  
IBM Corp.  
I-TECH Corp.  
KnowledgeTek, Inc.  
LSI Logic Corp.  
Marvell Technology Group Ltd.  
Maxtor Corp.  
Molex Inc.  
NEC Electronics  
QLogic Corp.  
Seagate Technology  
Serverworks  
Sierra Logic  
Silicon Image  
Western Digital

LSI #4 [JL]  
PDF Page 40

## 3.1.8 ATA target device and 3.1.9 ATA target port

Since both ATA target device and ATA target port are equivalent to a device in ATA, does this mean that ATA target devices and ATA target ports are equivalent? If not, then one of these things is not equivalent to an ATA device.

LSI #5 [JL]

PDF Page 40

## 3.1.8 ATA target device and 3.1.9 ATA target port

See previous comment.

LSI #6 [JL]

PDF Page 41

## 3.1.32 downstream phy

Replace "direction frame transmission" with "direction of frame transmission"

LSI #7 [JL]

PDF Page 41

## 3.1.37 end device

Delete "that is not contained within an expander device".

This is the first of several comments on "internal devices" and "internal ports". The current working draft does not use this terminology consistently and needs a number of changes no matter how the problem is solved.

I prefer a solution that acknowledges that internal devices are just like external devices except for their lack of phys and does not attempt to merge internal devices into the expander device definition.

Places I addressed in my comments:

- 3.1.37 end device
- 3.1.40 expander device
- 3.1.43 expander port
- 3.1.66+ internal device
- 3.1.70 link
- 3.1.73+ logical link
- 3.1.82 partial pathway
- 3.1.83 pathway
- 4.1.3 Ports (narrow ports and wide ports)
- 4.6.1 Expander device model overview
- 4.1.8.1 Expander device overview. 4.1.8.2 Edge expander device set: 3rd paragraph. Is 64 the maximum number of phys or devices?
- 4.1.8.2 Edge expander device set, Figure 11 - Edge expander device set
- 4.1.12 Pathways
- 4.4.2 Hard reset - fifth paragraph
- 5.3.2.1 SAS plug connector overview

Places possibly needing additional changes:

- 4.1.8.2 Edge expander device set: 1st paragraph; 2nd sentence. Address internal devices?
- 4.1.8.3 Configurable expander device: 1st paragraph; last sentence. Does the ECM route requests to non-phys?
- 4.1.9 Domains, Figure 12 - Domains and connections. Should internal devices be shown?
- 4.1.10 Expander device topologies: 3rd paragraph.
- 4.1.10 Expander device topologies, Figures 14-16 Should internal devices be shown?
- 4.1.11 Connections, Figure 17 Should internal devices be shown?
- 7.7.2 IDENTIFY address frame, Table 73 - Device types and paragraph above the table
- 7.12.4.2 Edge expander devices, Table 80



10.3.1 SMP functions. We may need to revise or add functions to properly support internal devices.  
10.3.1.2 REPORT GENERAL response (in particular, the NUMBER OF PHYS field may need clarification and we may need to add a field for the number of internal ports).  
10.3.1.4 DISCOVER function, Table 138 may need a clarification

LSI #8 [JL]  
PDF Page 42  
3.1.55 hash function

Replace "and that reduces" with "reducing"

LSI #9 [JL]  
PDF Page 42  
3.1.40 expander device

Replace the last sentence with:  
"An expander device supports SMP via an internal SMP target device. However, this internal device is logically considered outside the expander device. Other internal devices (e.g., a SCSI device supporting enclosure services) may also be packaged with expander devices, however these devices are also logically considered outside the expander device."

LSI #10 [JL]  
PDF Page 42  
3.1.43 expander port

Replace "physical links or to internal initiator ports and/or target ports. Contains one or more phys." with "links. Contains zero or more phys."

LSI #11 [JL]  
PDF Page 43  
After 3.1.66

Add a new definition:  
"3.1.66+ internal device: An end device that is physically packaged with an expander device and uses a logical link."

LSI #12 [JL]  
PDF Page 43  
3.1.70 link

Replace "physical link" with "physical or logical link".

LSI #13 [JL]  
PDF Page 43  
After 3.1.73

Add a new definition:  
"3.1.73+ logical link: For internal devices, the virtual link from the expander port to the internal device port. Contains no phys."

LSI #14 [JL]  
PDF Page 44  
3.1.81 00B signal

Replace "out-of-band (00B)" with "00B".

LSI #15 [JL]  
PDF Page 44  
3.1.80 00B sequence

Replace "00B" with "out-of-band (00B)".

LSI #16 [JL]  
PDF Page 44  
3.1.82 partial pathway

Delete "physical".

LSI #17 [JL]  
PDF Page 44  
3.1.83 pathway

Delete "physical".

LSI #18 [JL]  
PDF Page 45  
3.1.101 SAS domain  
Global

Replace "an ATA domain and/or a SCSI domain" with an ATA domain, a SCSI domain, or both domains".

This comment applies to all occurrences of and/or.

LSI #19 [JL]  
PDF Page 45  
3.1.122 Serial ATA (SATA)

Add "(see 2.4)" to the end of the definition.

LSI #20 [JL]  
PDF Page 46  
3.1.124 Serial Attached SCSI (SAS)

This definition is confusing in that this standard defines three protocols (SSP, STP, and SMP) plus a physical transport. It may be easiest just to delete this definition.

LSI #21 [JL]  
PDF Page 47  
3.2 Symbols and abbreviations

Add:  
EMI electromagnetic interference

EMI is referenced in 7.15.

LSI #22 [JL]  
PDF Page 50  
3.4 Editorial conventions

The first sentence after Table 2 is redundant with the last sentence of the third paragraph. Delete one of these sentences.  
Why does one have NAME in small caps and the other is lower-case?

LSI #23 [JL]  
PDF Page 52  
3.5.2 Transitions

In the last paragraph of this subclause, replace "valid in entry" with "valid upon entry".

LSI #24 [JL]

PDF Page 52

3.5.3 Parameters, requests, etc.

In the last paragraph of this subclause, replace "onto" with "to".

LSI #25 [JL]

PDF Page 52

3.6 Bit and byte ordering

In the fourth paragraph, replace "non-monotonically" with "non-sequentially".

LSI #26 [JL]

PDF Page 53

3.7 Notation for procedures and functions

In the first procedure (Procedure Name), the parenthesis do not match. If the Search example below is correct, then there is an extra right parenthesis after input-2.

LSI #27 [JL]

PDF Page 56

4.1.3 Ports (narrow ports and wide ports)

In the third paragraph, replace "with one phy" with "with only one phy".

LSI #28 [JL]

PDF Page 56

4.1.3 Ports (narrow ports and wide ports)

Rename this subclause:

4.1.3 Ports (narrow ports, wide ports, and internal ports)

Add the following paragraph:

"An internal port in an expander device does not contain a phy and is used to connect to an internal device."

LSI #29 [JL]

PDF Page 59

4.1.6 Target devices

Figure 9 - Target device

The text "STP and SMP" is too close to the line.

LSI #30 [JL]

PDF Page 59

4.1.6 Target devices

Figure 9 - Target device

Don't most ATA targets use SATA protocol instead of STP protocol?

Also, see the related comment at 4.1.11 Connections.

LSI #31 [JL]

PDF Page 60

4.1.8.1 Expander device overview

Figure 10 - Expander Device

Modify the figure to show the required SMP target port. The internal expander ports should be included in the Expander device (shaded box) while the target and initiator internal ports should be outside the shaded box.

LSI #32 [JL]

PDF Page 60

#### 4.1.8.1 Expander device overview

Replace the second sentence of the first paragraph with:

"Expander devices include one or more internal expander ports connected to internal devices. These internal ports use a logical link that does not contain phys. All expander devices have one internal expander port connected to an internal SMP target port. They may have additional internal expander ports connected to internal initiator ports or internal target ports (e.g., a SCSI enclosure services target device)."

LSI #33 [JL]

PDF Page 60

#### 4.1.8.2 Edge expander device set

Third paragraph. Should this maximum be the number of devices or phys?

LSI #34 [JL]

PDF Page 61

#### 4.1.8.2 Edge expander device set

Figure 11 - Edge expander device set

Show the internal target port outside the Edge expander device set box.

LSI #35 [JL]

PDF Page 65

#### 4.1.11 Connections

In the first list, it appears that a connection type has been omitted:

d) ATA initiator port(s) using STP to ATA target port(s) using STP.

If this connection type is not intended to be supported, then delete STP target ports from the second paragraph in 4.1.6 and from Figure 9

LSI #36 [JL]

PDF Page 66

#### 4.1.11 Connections

In the third list, why does item d) appear on the next page? There is plenty of room to place it on the same page with the first three list items.

LSI #37 [JL]

PDF Page 66

#### 4.1.12 Pathways

Is there a pathway to an internal target device? If so, then the first paragraph needs some changes to accommodate targets without phys. I suggest re-wording the second paragraph of this paragraph as follows:

"In the case where there are expander devices between an initiator and a target, the pathway consists of all the links required to route dwords between the initiator and the target."

LSI #38 [JL]

PDF Page 67

#### 4.1.12 Pathways

Figure 18 - Pathways

The pathway lines and arcs obscure the physical link lines. Consider moving them a bit above or below the physical link lines.

LSI #39 [JL]

PDF Page 67  
4.1.12 Pathways

Add a forward reference from the e.g. in the first paragraph under Figure 18 to the subclause on connections: (see 7.12).

LSI #40 [JL]  
PDF Page 67  
4.1.12 Pathways

Delete "physical" from the paragraph after figure 18.

LSI #41 [JL]  
PDF Page 84  
4.4.2 Hard Reset

The second paragraph, first sentence is ambiguous. What exactly does "stop transmitting" mean? Is this the Tx Off Voltage in table 35? If so, add a forward reference. What are the timing requirements to stop transmitting?

LSI #42 [JL]  
PDF Page 84  
4.4.2 Hard Reset

Delete the second sentence of the fifth paragraph and add the following two paragraphs after the fifth paragraph:

"If the port is an internal port within an expander device and the internal port is connected to an internal SCSI device, this causes a Transport Reset event notification to the SCSI application layer (see 10.1.4); the SCSI device shall perform the actions defined for hard reset in SAM-3.

If the port is an internal port within an expander device and the internal port is connected to an internal ATA device, the ATA device shall perform the actions defined for power-on or hardware reset in ATA."

LSI #43 [JL]  
PDF Page 84  
4.6.1 Expander device model overview

First list, item d). Replace "internal" with "internal expander port providing a connection for an internal SMP target port."

LSI #44 [JL]  
PDF Page 85  
4.6.1 Expander device model overview  
Figure 25

Is there some reason that only one SATA port is shown? Don't ports automatically configure to the protocol of the attached device?

LSI #45 [JL]  
PDF Page 85  
4.6.1 Expander device model overview

Replace "the following:" with "additional internal expander ports providing connections for:"

LSI #46 [JL]  
PDF Page 101  
5.2 SAS cables and connectors  
Figure 33

Where SAS uses the same connector as in SATA, the color and size should match the corresponding connector in figure 31. Thus the SATA-style host plug connector should be dark green and be the same size as the dark green signal host plug connector in figure 31.

The signal portions of the SAS internal cable connectors need to be shown in pink (just like the SATA internal cable) and the end that plugs into the target device needs to be the same width as the SAS plug connector.

LSI #47 [JL]  
 PDF Page 102  
 5.2 SAS cables and connectors  
 Table 29 - Connectors

Add rows for the SATA-style host plug connector and the SATA-style signal cable receptacle.

References should be to SATA for the connector drawings and to 5.4.1 for pin assignments.

LSI #48 [JL]  
 PDF Page 102  
 5.2 SAS cables and connectors

Penultimate paragraph. Replace "second" with "secondary".

LSI #49 [JL]  
 PDF Page 102  
 5.3.2.1 SAS plug connector overview

This subclause uses "internal ports" for a different concept than used elsewhere in the standard. I recommend replacing "internal ports" with "internal connections".

LSI #50 [JL]  
 PDF Page 102  
 5.3.3 SAS internal cable receptacle connector

In list item b, delete "only".

LSI #51 [JL]  
 PDF Page 102  
 5.3.4 SAS backplane receptacle connector

In list item b, delete "only".

LSI #52 [JL]  
 PDF Page 102  
 5.3.2.1 SAS plug connector overview

Since 5.3.2.1 is the only subclause under 5.3.2, promote this subclause.

LSI #53 [JL]  
 PDF Page 103  
 5.3.5 SAS internal connector pin assignments

In the first paragraph under table 30, the second sentence is either not true or misleading. The Rx and Tx signals are not crossed in the SAS internal cable assembly using the SATA-style signal cable receptacle on one end and the SAS internal cable receptacle on the other end (see figure 34).

LSI #54 [JL]

PDF Page 104

### 5.3.8 SAS external connector pin assignments

We should recommend that external cables be labeled to indicate how many physical links are included (e.g., X1, X2, X3, and X4 on each connector's overmolding).

LSI #55 [JL]

PDF Page 106

### 5.6 READY LED pin

Replace "shall" with "should". The visual output color is not important to the operation of the interface.

LSI #56 [JL]

PDF Page 106

### 5.6 READY LED pin

Global

List item d), last sentence. Replace "vendor-specific" with "vendor specific".

Global comment: There is no hyphen if these words are not used as an adjective modifying a noun. There are also many places in the document where the hyphen needs to be added because vendor-specific is used as an adjective modifying a noun.

LSI #57 [JL]

PDF Page 121

### 6.2.1 Encoding overview

Global

Replace "10 bit" with "10-bit" whenever this phrase is used as an adjective to modify characters or bytes.

This comment also applies to the occurrences of "8 bit", which should be changed to "8-bit".

LSI #58 [JL]

PDF Page 135

### 6.6.3 SAS to SATA phy reset sequence

The text (two paragraphs above Figure 50 - SAS to SATA OOB sequence) says that the SAS phy responds with COMRESET. However figure 50 shows a COMWAKE at this point.

LSI #59 [JL]

PDF Page 135

### 6.6.4.1 SAS OOB sequence

Add forward reference in first paragraph: "hot-plug timeout (see table 49)".

LSI #60 [JL]

PDF Page 136

### 6.6.4.1 SAS OOB sequence

In the first list, shouldn't item a) be: "... has not yet transmitted a COMINIT, followed by a COMSAS; or"

LSI #61 [JL]

PDF Page 139

### 6.6.4.2 SAS speed negotiation sequence

Table 49 - SAS speed negotiation sequence tying specs (last row)

What is a SATA speed negotiation parameter doing in a SAS speed negotiation table? Either put this parameter in a different table or name of this table appropriately (e.g., delete "SAS").

LSI #62 [JL]

PDF Page 144

6.8.2 OOB sequence states

Figure 56 - SAS phy (SP) state machine - OOB sequence states

The "COMSAS Transmitted" parameter into the SP3: OOB\_AwaitCOMINIT\_Sent should be "COMINIT Transmitted".

LSI #63 [JL]

PDF Page 146

6.8.2.7.2 Transition SP7: OOB\_AwaitCOMSAS to SP1: OOB\_COMINIT

List item a) is missing the verb "is". It should read: "a) this device is in..."

LSI #64 [JL]

PDF Page 147

6.8.2.7.5 Transition SP7: OOB\_AwaitCOMSAS to SAS\_AwaitNoCOMX

Where does this transition really go? The subclause title is missing the state descriptor. Figure 56 shows this transition going to SP2: OOB\_AwaitCOMx.

LSI #65 [JL]

PDF Page 149

Editor's Notes

Global

Obviously, the four editor's notes need to be resolved and removed.

LSI #66 [JL]

PDF Page 150

6.8.3.4.1 State description

Second paragraph should read: "This state shall repeatedly send a Transmit ALIGN1 parameter..."

LSI #67 [JL]

PDF Page 150

6.8.3.4.3 Transition SP11: SAS\_AwaitALIGN1 to SP14: SAS\_AwaitSNW

Replace "SNTT" with "SNLT".

Should we add a note to clarify that this transition is not taken if ALIGN1 is detected after SNLT expires and before SNTT expires?

LSI #68 [JL]

PDF Page 150

6.8.3.5.2 Transition SP12: SAS\_AwaitALIGN1 to SP13: SAS\_Pass

Replace "if" with "after".

LSI #69 [JL]

PDF Page 150

6.8.3.6.2 Transition SP13: SAS\_Pass to SP8: SAS\_Start



The term "fallen back" is not defined. Should it be defined as an SP14 to SP2 transition?

"Fallen back" also appears in 6.8.3.6.3.

LSI #70 [JL]  
PDF Page 151  
6.8.3.8.1 State description

The last sentence of the last paragraph is redundant with the previous paragraph.

LSI #71 [JL]  
PDF Page 153  
6.8.4 SATA host emulation states

Third paragraph: Replace "specification" with "standard".

LSI #72 [JL]  
PDF Page 153  
6.8.4 SATA host emulation states  
Figure 58 - SAS phy (SP) state machine - SATA host emulation states

State SP16 needs a COMWAKE Transmitted input parameter (see 6.8.4.1.2).

LSI #73 [JL]  
PDF Page 153  
6.8.4 SATA host emulation states  
Figure 58 - SAS phy (SP) state machine - SATA host emulation states

State SP17 needs a COMWAKE Detected input parameter (see 6.8.4.2.2).

LSI #74 [JL]  
PDF Page 153  
6.8.4 SATA host emulation states  
Figure 58 - SAS phy (SP) state machine - SATA host emulation states

State SP18 needs a COMWAKE Completed input parameter (see 6.8.4.3.2).

LSI #75 [JL]  
PDF Page 154  
6.8.4.4.1 State description

In list item c, replace "ALIGN" with "ALIGN0".

LSI #76 [JL]  
PDF Page 154  
6.8.4.4.1 State description

Should the last word of this subclause be "completed"? If not, define "deasserted".

LSI #77 [JL]  
PDF Page 155  
6.8.4.6.1 State description

Replace "ALIGN0s" with "ALIGN0".

LSI #78 [JL]  
PDF Page 155  
6.8.4.7.3 Transition SP22: SATA\_PHY\_Ready to SP24: SATA\_PM\_Partial

Change this subclause name to "Transition SP22: SATA\_PHY\_Ready to SP23: SATA\_PM\_Partial" (i.e., SP24 should be SP23).

LSI #79 [JL]

PDF Page 155

6.8.4.7.4 Transition SP22: SATA\_PHY\_Ready to SP23: SATA\_PM\_Slumber

Change this subclause name to "Transition SP22: SATA\_PHY\_Ready to SP24: SATA\_PM\_Slumber" (i.e., SP23 should be SP24).

LSI #80 [JL]

PDF Page 155

6.8.4.7.2 Transition SP22: SATA\_PHY\_Ready to SP1: Reset

Change this subclause name to "Transition SP22: SATA\_PHY\_Ready to SP1: OOB\_COMINIT" (i.e., Reset should be OOB\_COMINIT).

LSI #81 [JL]

PDF Page 155

6.8.4.8.2 Transition SP23: SATA\_PM\_Partial to SP16: SATA\_COMWAKE

Change the name of this subclause to "Transition SP23: SATA\_PM\_Partial to SP17: SATA\_AwaitCOMWAKE".

LSI #82 [JL]

PDF Page 155

6.8.4.8.1 State description

6.8.4.9.1 State description

Replace "Exit from this state is driven from" with "This state is exited upon".

LSI #83 [JL]

PDF Page 158

6.9.2.1 State description

Replace "upon power on loss or previous dword synchronization" with "upon power on or loss of previous dword synchronization."

LSI #84 [JL]

PDF Page 158

6.9.3.3 Transition SP\_DWS1: Valid1 to SP\_DWS0: AcquireSync

This transition needs to be added to the text:

"This transition shall occur when an invalid dword is detected."

LSI #85 [JL]

PDF Page 158

6.9.5.1 State description

The text refers to a PhyReady (SAS) parameter and to a PhyReady (SATA) parameter as being inputs to this state. However, neither is shown in figure 59. These parameters should be added to the figure.

LSI #86 [JL]

PDF Page 159

6.9.7.1 State description

6.9.9.1 State description

6.9.11.1 State description

Replace the first sentence with: "This state is reached if a valid dword is

received while in the previous state. Receiving another valid dword in this state nullifies the previous invalid dword. "

LSI #87 [JL]  
 PDF Page 163  
 7.1.2 Primitive summary  
 Table 51  
 Table 52  
 Table 53

Note c in the three primitive tables omits single primitive from the list of primitive types. Add "as a single primitive," to the list in note c for each table.

LSI #88 [JL]  
 PDF Page 172  
 7.1.4.4 BROADCAST  
 Table 59 - BROADCAST primitives

Replace "process the same" with "process this primitive the same".

LSI #89 [JL]  
 PDF Page 173  
 7.1.4.6 EOAF (End of address frame)

The link to 7.4 is wrong. Replace it with a link to 7.7.

LSI #90 [JL]  
 PDF Page 173  
 7.1.4.9 NOTIFY

Last sentence of third paragraph. Delete "as described in TBD" or fill in a valid TBD.

LSI #91 [JL]  
 PDF Page 173  
 7.1.4.9 NOTIFY

In the fourth paragraph, replace "while" with "only while".

LSI #92 [JL]  
 PDF Page 175  
 7.1.4.11 OPEN\_REJECT  
 Table 62 - OPEN\_REJECT retry primitives

The wording in the description of OPEN\_REJECT (NO DESTINATION) is confusing. I think you should replace "devices" with "device" in the third line, but perhaps there is a better change.

LSI #93 [JL]  
 PDF Page 176  
 7.1.4.12 SOAF (Start of address frame)

The link to 7.4 is wrong. Replace it with a link to 7.7.

LSI #94 [JL]  
 PDF Page 177  
 7.1.6.1 SATA\_ERROR

In the first paragraph, isn't SATA\_ERROR also sent when forwarding dwords from a SATA link to a SAS link and an invalid dword is received?

LSI #95 [JL]

PDF Page 177

7.1.6.2 SATA\_PMACK, SATA\_PMNAK, SATA\_PMREQ\_P, and SATA\_PMREQ\_S (Power management acknowledgements and requests)

The link to 7.4 is not correct. I think 7.9 is the correct link.

LSI #96 [JL]

PDF Page 178

7.2 Clock skew management

In the second paragraph, replace "To solve this," with "To solve this problem,".

LSI #97 [JL]

PDF Page 178

7.2 Clock skew management

In the second paragraph, replace "strip it out" with "strip them out".

LSI #98 [JL]

PDF Page 178

7.2 Clock skew management

In the second paragraph, replace "make it to" with "are placed into".

LSI #99 [JL]

PDF Page 179

7.2 Clock skew management

Paragraph above Table 66. Change "(i.e., that is not..." to "(i.e., not...".

LSI #100 [JL]

PDF Page 181

7.4.2 CRC generation

In the sentence above 7.4.3, the link to 6.5 is wrong. I think it should be to 7.6, Bit order of CRC and Scrambler.

LSI #101 [JL]

PDF Page 182

7.4.3 CRC checking

In the penultimate paragraph, the link to 6.5 is wrong. I think it should be to 7.6, Bit order of CRC and Scrambler.

LSI #102 [JL]

PDF Page 182

7.4.3 CRC checking

In the last paragraph, the link to Annex B is wrong. I think it should be to Annex C, CRC.

LSI #103 [JL]

PDF Page 182

7.5 Scrambling

In the paragraph above table 69, the reference to 6.5 is wrong. I think it should be to 7.6, Bit order of CRC and Scrambler.

LSI #104 [JL]  
PDF Page 182  
7.5 Scrambling

In the first paragraph, second sentence, replace "issues" with "EMI issues".

LSI #105 [JL]  
PDF Page 185  
7.7.1 Address frames overview

In the paragraph below table 71, replace "entire address frame" with "address frame (bytes 0 through 27)".

LSI #106 [JL]  
PDF Page 187  
7.7.3 OPEN address frame

The descriptions of the fields in table 74 should be re-ordered to match the order of the fields in the table.

LSI #107 [JL]  
PDF Page 189  
7.8.1 Overview

In the penultimate paragraph, replace "it" with "the additional IDENTIFY address frame".

LSI #108 [JL]  
PDF Page 189  
7.8.2 Initiator device specific rules  
7.8.3 Fanout expander device specific rules  
7.8.4 Edge expander device specific rules

Delete "specific" from each of these subclause titles.

LSI #109 [JL]  
PDF Page 190  
7.8.2 Initiator device specific rules

Replace the second paragraph with "When the discover process is done after a link reset sequence, the application client within an initiator device discovers all the devices in the SAS domain. When the discover process is done after a BROADCAST (CHANGE), the application client within an initiator device determines what has changed in the SAS domain.".

LSI #110 [JL]  
PDF Page 190  
7.8.4 Edge expander device specific rules

Assuming my previous comment on the 7.8.2 title is accepted, delete "specific" in the second paragraph of this subclause.

LSI #111 [JL]  
PDF Page 190  
7.8.5.1 Overview

Delete reference to 7.8; we are already in subclause 7.8.

LSI #112 [JL]  
PDF Page 192

## 7.8.6 SL\_IR transmitter and receiver

In the paragraph below the list, what should the SL\_IR transmitter do if a primitive is requested to be transmitted while sending an IDENTIFY address frame? Discard the primitive or store it until the EOAF?

LSI #113 [JL]

PDF Page 192

## 7.8.6 SL\_IR transmitter and receiver

The last sentence of the last paragraph is not clear. We need to explain what is magical about the 8th data dword.

LSI #114 [JL]

PDF Page 193

## 7.8.6.1.4.2 Transition SL\_IR\_TIR3: Transmit\_Hard\_Reset to SL\_IR\_TIR3: Completed

Replace "SL\_IR\_TIR3: Completed" with "SL\_IR\_TIR4: Completed" in the title of this subclause.

LSI #115 [JL]

PDF Page 194

## 7.8.6.2.3.1 State description

In the last paragraph, replace "illegal" with "invalid".

LSI #116 [JL]

PDF Page 194

## 7.8.6.3.2 SL\_IR\_IRC1: Idle state

The state diagram (figure 67) shows an identify 'Timeout' parameter confirmation leaving this state, but it is not described. I think it was moved to the SL\_IR\_IRC2 state and should be deleted from this state in the state diagram.

LSI #117 [JL]

PDF Page 195

## 7.8.6.3.3.1 State description

The first list item talks about an "Identify Sequence Complete confirmation". However this confirmation does not appear in figure 67. Please add it to the figure.

LSI #118 [JL]

PDF Page 195

## 7.8.6.3.3.1 State description

The penultimate paragraph talks about an "Identify Received parameter". However this parameter does not appear in figure 67. Please add it to the figure.

LSI #119 [JL]

PDF Page 195

## 7.8.6.3.3.1 State description

The penultimate paragraph talks about an "HARD\_RESET Received confirmation". However this confirmation appears under the SL\_IR\_IRC1: Idle state in figure 67. Please move it to the SL\_IR\_IRC2: Wait state in the figure.

LSI #120 [JL]

PDF Page 195  
7.9 Power management

Replace the last sentence of the third paragraph with "If one of these primitives arrives while an STP connection is open, it may forward the primitive to the STP initiator port.".

LSI #121 [JL]  
PDF Page 196  
7.11 Domain changes

Assuming my previous comment regarding the title of subclause 7.8.2 is accepted, delete "specific" from the 5th paragraph.

LSI #122 [JL]  
PDF Page 196  
7.11 Domain changes

Assuming my previous comment regarding the title of subclause 7.8.3 is accepted, delete "specific" from the 6th paragraph.

LSI #123 [JL]  
PDF Page 196  
7.11 Domain changes

Assuming my previous comment regarding the title of subclause 7.8.4 is accepted, delete "specific" from the 7th paragraph.

LSI #124 [JL]  
PDF Page 197  
7.12.2.1 Connection request

In the last paragraph, second sentence, replace "does not support" with "supports".

LSI #125 [JL]  
PDF Page 198  
7.12.2.2 Connection request responses  
Table 78 - Connection request responses

In the description of AIP, the sentence beginning with "While the expander..." is not worded correctly. The number of expander devices (plural) does not match it (singular). Replace "it returns an AIP" with "they return AIPs".

LSI #126 [JL]  
PDF Page 198  
7.12.2.2 Connection request responses

Is there an order of precedence to the list future connection rates in the penultimate paragraph?

LSI #127 [JL]  
PDF Page 198  
7.12.2.2 Connection request responses

Last paragraph. Shouldn't the list of reasons to transmit OPEN\_ACCEPT include that the INITIATOR bit is in an acceptable state as documented in 7.7.3?

LSI #128 [JL]  
PDF Page 198

## 7.12.3 Arbitration fairness

Fourth paragraph, last word. The term "livelocks" should either be eliminated (it is only used here) or a definition should be included.

LSI #129 [JL]

PDF Page 199

## 7.12.3 Arbitration fairness

Paragraph 6. Do we also need to specify that the INITIATOR field is compatible with the role we were requesting?

LSI #130 [JL]

PDF Page 203

## 7.12.5 Abandoning a connection request

The paragraph just below table 81 and above figure 69 breaks unnaturally across a page boundary, with the last two lines on the next page even though there is plenty of space on the previous page.

LSI #131 [JL]

PDF Page 209

## 7.13.2 SL transmitter and receiver

The last two paragraphs of this subclause are nearly identical to the last two paragraphs in 7.8.6 and thus have the same issues identified there. These paragraphs need similar changes.

LSI #132 [JL]

PDF Page 209

## 7.13.3.1 State description

In the third paragraph, neither of the confirmations listed are shown in figure 72. Please add them to the figure.

LSI #133 [JL]

PDF Page 212

## 7.13.5.1 State description

Replace "by by" by "by" in the second paragraph.

LSI #134 [JL]

PDF Page 212

## 7.13.5.2 Transition SL2: Selected to SL0: Idle

Each of the 4 conditions has an English problem with the phrase ", then after". The problem can be corrected by replacing ", then" with " and" in four places.

LSI #135 [JL]

PDF Page 213

## 7.13.6.1 State description

Add either "(see SATA)" or "(see 7.17.4)" at the end of the fourth paragraph.

LSI #136 [JL]

PDF Page 215

## 7.14.1 Overview

In the paragraph after the first list, delete "an after receiving".



LSI #137 [JL]

PDF Page 219

7.14.2.2 Transition XL0: Idle to XL1: Request\_Path

Item b) references a Transmit Break indication, but the indication does not appear as an input to the XL0: Idle state in figure 74. Please add it.

LSI #138 [JL]

PDF Page 219

7.14.2.2 Transition XL0: Idle to XL1: Request\_Path

Item a) references a Transmit Open indication, but the indication does not appear as an input to the XL0: Idle state in figure 74. Please add it.

LSI #139 [JL]

PDF Page 219

7.14.3.1 State description

Should the second list include the INITIATOR bit?

LSI #140 [JL]

PDF Page 220

7.14.4.1 State description

In the second paragraph, the Transmit Idle Dword parameter is referenced, but it does not appear for this state in figure 75. Please add it to the figure.

LSI #141 [JL]

PDF Page 220

7.14.4.1 State description

In the third paragraph, the Transmit Open request is referenced, but it does not appear for this state in figure 75. Please add it to the figure.

LSI #142 [JL]

PDF Page 222

7.14.7.1 State description

In the first paragraph, the Transmit Open indication is referenced, but it does not appear in figure 75 for this state. Please add it to the figure.

LSI #143 [JL]

PDF Page 223

7.14.8.2 Transition XL6: Open\_Response\_Wait to XL0: Idle

The link (see 7.12.3) does not work.

LSI #144 [JL]

PDF Page 223

7.14.8.3 Transition XL6: Open\_Response\_Wait to XL2: Request\_Open

The link (see 7.12.3) does not work.

LSI #145 [JL]

PDF Page 223

7.14.9.1 State description

In the fourth paragraph, replace "section 7.12.4" with "subclause 7.12.4." Also, make the link work.

LSI #146 [JL]

PDF Page 228

#### 7.16.6 Preparing to close an SSP connection

The last two sentences of the last paragraph are run together. Add a space.

LSI #147 [JL]

PDF Page 229

#### 7.16.7.1 Overview

In the paragraph beginning with "The SSP\_TF state machine's...", replace "it" with "is".

LSI #148 [JL]

PDF Page 229

#### 7.16.7.1 Overview

In the paragraph beginning with "The SSP\_RF state machine's...", replace "successful or unsuccessful received." with "successfully or unsuccessfully received.".

LSI #149 [JL]

PDF Page 230

#### 7.16.7.1 Overview

Figure 82

(and Global)

The SSP\_TF3 state is split between two figures (not even consecutive figures). This is very confusing because there is no visual clue in the figure that the state is continued elsewhere. We should add some clue that it is continued somewhere else (perhaps the horizontal bar under the state name or the vertical bar should be dashed).

LSI #150 [JL]

PDF Page 237

#### 7.16.7.11 SSP\_RIM1: Rcv\_Interlock\_Monitor state

In the fourth paragraph, replace "Received Frames" with "Frame Received".

LSI #151 [JL]

PDF Page 239

#### 7.17.1 STP frame transmission

Table 84 - SATA target port transmitting a frame

In the title of the second column, replace "or STP" with "or to STP".

LSI #152 [JL]

PDF Page 239

#### 7.17.1 STP frame transmission

Table 84 - SATA target port transmitting a frame

Table 85 - STP initiator port transmitting a frame

"<repeats>" needs a better definition. If it means that the SATA\_X\_RDY primitive repeats, then replace it with "<SATA\_X\_RDY repeats>".

LSI #153 [JL]

PDF Page 240

#### 7.17.1 STP frame transmission

Last paragraph, third sentence.

Replace "...involved." with "...involved (except to repeat dwords)."

LSI #154 [JL]

PDF Page 242

7.17.3 Preparing to close an STP connection

Second paragraph.

Replace "SCSI domain" with "SAS domain".

LSI #155 [JL]

PDF Page 246

7.18.4.3.1.1 State description

Third paragraph. Replace "dword" with "dwords".

LSI #156 [JL]

PDF Page 246

7.18.4.3.1.2 Transition SMP\_TL1:Wait\_originate\_frame to  
SMP\_TL2:Wait\_transmit\_frame

The first sentence of the first paragraph would be clearer if another "after" were included after the "and" as follows: "...after a valid SMP request frame is received and after sending..."

LSI #157 [JL]

PDF Page 249

8.2.4 I\_T nexus loss timer

In list item a), replace "counting and assigned an expired status;" with "counting and shall be assigned an expired status;"

LSI #158 [JL]

PDF Page 249

8.2.4 I\_T nexus loss timer

In list item b), replace "and assigned" with "and shall be assigned".

LSI #159 [JL]

PDF Page 249

8.2.4 I\_T nexus loss timer

First paragraph, first sentence. Replace "is" with "shall be" or "may be", depending on whether this timer is mandatory or optional. Depending on this choice, the second sentence of this paragraph should start with "It shall be:" or "If implemented, it is:".

LSI #160 [JL]

PDF Page 250

8.3.1 Overview

In the second list (of states), add references to 8.3.2 for the PL\_OC1:Idle state and to 8.3.3 for the PL\_OC2:Overall\_Control state.

LSI #161 [JL]

PDF Page 250

8.3.1 Overview

In the last paragraph, last sentence. How can the Overall\_Control state machine transition to the PL\_PM1:Idle state, which is in another state machine? Should this sentence read, "The state machine shall transition to the PL\_OC2:Overall\_Control state after receiving a Phy Enabled confirmation from any phy assigned to the port."?

LSI #162 [JL]  
 PDF Page 251  
 8.3.2 8.3.2 PL\_OC1: Idle state

Delete redundant subclause number.

LSI #163 [JL]  
 PDF Page 251  
 8.3.2.1 8.3.2.1 State description

Delete redundant subclause number.

LSI #164 [JL]  
 PDF Page 252  
 8.3.3.1.1 State description overview

The example in the first line is an exhaustive list. Replace "e.g.," with "i.e.,".

LSI #165 [JL]  
 PDF Page 252  
 8.3.2.2 8.3.2.2 Transition PL\_OC1: Idle to PC\_OC2: Overall\_Control

Delete redundant subclause number.

LSI #166 [JL]  
 PDF Page 253  
 8.3.3.1.4 SSP wide port rules

First paragraph. Add forward reference to COMMAND frames subclause after "COMMAND frames". That is, "(see 9.2.4.1)".

LSI #167 [JL]  
 PDF Page 253  
 8.3.3.1.4 SSP wide port rules

Second paragraph. Add forward reference to TASK frame subclause after "TASK frame". That is, "(see 9.2.4.2)".

LSI #168 [JL]  
 PDF Page 253  
 8.3.3.1.4 SSP wide port rules

Fifth paragraph. Add forward reference to DATA frame subclause after "DATA frame". That is, "(see 9.2.4.4)".

LSI #169 [JL]  
 PDF Page 253  
 8.3.3.1.4 SSP wide port rules

Sixth paragraph. Add forward reference to RESPONSE frame subclause after "RESPONSE frame". That is, "(see 9.2.4.5)".

LSI #170 [JL]  
 PDF Page 254  
 8.3.3.1.5 Filling in the Tx Frame arguments

In list item a), shouldn't "should" be "shall"?

LSI #171 [JL]  
 PDF Page 256

### 8.3.3.1.6 Confirmations

#### Global

In the last paragraph of this subclause, replace "running" with "running,". Global: While English allows the last comma before an "and" or "or" to be omitted, it is less ambiguous to include the comma. This is especially true for lists within lists. This comment may apply elsewhere.

LSI #172 [JL]  
PDF Page 256  
8.4.1 Overview

In the second list (of states), add references:

- a) PL\_PM1: Idle (see 8.4.2);
- b) PL\_PM2: ReqWait (see 8.4.3);
- c) PL\_PM3: Connected (see 8.4.4); and
- d) PL\_PM4: Wait\_For\_Close (see 8.4.5).

LSI #173 [JL]  
PDF Page 259  
8.4.3.1.2 PL\_PM I\_T nexus loss timer

First paragraph. This paragraph deals with SSP ports. Why is item d), which is an STP confirmation, in the list?

LSI #174 [JL]  
PDF Page 260  
8.4.3.1.4 Open Failed handling

In the first paragraph, fourth line, replace "Open Failure confirmation" with "Open Failed confirmation".

LSI #175 [JL]  
PDF Page 260  
8.4.3.1.4 Open Failed handling  
Table 87 - Retry Frame conditions

In Table 87, is it obvious what is done if the I\_T nexus loss timer has expired and an Open Failed (Pathway Blocked) confirmation is received? If not, add a row to this table describing this case.

LSI #176 [JL]  
PDF Page 261  
8.4.4.1 State description

The eighth paragraph refers to a DONE (ACK/NAK TIMEOUT) Received confirmation, which does not appear in figures 92 nor 93. Should the "DONE Transmitted" confirmation in figure 93 be "DONE Received"? If so, fix figure 93 and change the confirmation in this paragraph to be "DONE Received (ACK/NAK TIMEOUT) confirmation".

LSI #177 [JL]  
PDF Page 261  
8.4.4.1 State description

Ninth paragraph. This paragraph refers to a DONE Received confirmation going to the application layer and to a DONE Received confirmation coming from the link layer. Neither appears in figures 92 and 93.

LSI #178 [JL]  
PDF Page 261  
8.4.4.1 State description

Tenth paragraph. The "Close Connection request" in the third sentence does not appear in figures 92 nor 93.

LSI #179 [JL]  
PDF Page 261  
8.4.4.1 State description

Last paragraph. The "Close Connection request" in the second sentence does not appear in figures 92 nor 93.

LSI #180 [JL]  
PDF Page 263  
9.2.1 SSP frame format  
Table 88 - SSP frame format

Byte 10 includes a TIMEOUT bit that is not described.

LSI #181 [JL]  
PDF Page 264  
9.2.1 SSP frame format

The fourth paragraph below Table 89 refers to a RETRANSMIT bit, but this bit does not appear in Table 88. Where does it go?

LSI #182 [JL]  
PDF Page 265  
9.2.1 SSP frame format

Penultimate paragraph. Find some way to prevent the 1 024 from wrapping from one line to the next line.

LSI #183 [JL]  
PDF Page 268  
9.2.2.3 XFER\_RDY information unit

First paragraph under table 94. The reference to 10.1.1.1.5 is wrong and the link does not work. I think this reference should be to 10.1.6.1.5.

LSI #184 [JL]  
PDF Page 268  
9.2.2.3 XFER\_RDY information unit

Last paragraph. The reference to 10.1.1.1.5 is wrong and the link does not work. I think this reference should be to 10.1.6.1.5.

LSI #185 [JL]  
PDF Page 279  
9.2.6.2.1 Overview

The penultimate paragraph wraps unnaturally to the top of a new page when there is plenty of room for it on the previous page.

LSI #186 [JL]  
PDF Page 279  
9.2.6.2.1 Overview

Figure 98 - SSP transport layer (ST) state machines - initiator device  
Replace "DONE (ACK/NAK TIMEOUT) Received" with "DONE Received (ACK/NAK TIMEOUT)".

LSI #187 [JL]

PDF Page 281

#### 9.2.6.2.2.1 State description

In item e) describing the XFER\_RDY Arrived parameter, replace "ACK Transmitted" with "ACK Received".

LSI #188 [JL]

PDF Page 282

#### 9.2.6.2.2.3 Transition ST\_ISF1: Send\_Frame to ST\_ISF3: Prepare\_Send\_Data\_Out

In item b) of the list, replace "ACK Transmitted" with "ACK Received".

LSI #189 [JL]

PDF Page 282

#### 9.2.6.2.3.1 State description

In the second paragraph, replace "the following received" with "the following fields received".

LSI #190 [JL]

PDF Page 282

#### 9.2.6.2.3.1 State description

In the third paragraph, replace "the following received" with "the following fields received".

LSI #191 [JL]

PDF Page 282

#### 9.2.6.2.3.1 State description

In the fourth paragraph, replace "the following" with "the following fields".

LSI #192 [JL]

PDF Page 282

#### 9.2.6.2.4.1 State description

In the first paragraph, replace "the following" with "the following fields".

LSI #193 [JL]

PDF Page 282

#### 9.2.6.2.4.1 State description

In the second paragraph, replace "the following" with "the following fields".

LSI #194 [JL]

PDF Page 283

#### 9.2.6.2.5.2 Transition ST\_IRD1: Receive\_Data\_In to ST\_IRD2: Process\_Received\_Data\_In

Don't we only want to make this transition after verifying that everything is correct with the received DATA frame?

Replace "... any value... has..." with "... all values... have...".

LSI #195 [JL]

PDF Page 284

#### 9.2.6.2.8 ST\_IFR1: Initiator\_Frame\_Router state

First paragraph, item d). Replace "a hard reset occurs" with "a HARD\_RESET Received indication is received".

LSI #196 [JL]

PDF Page 285

9.2.6.2.8 ST\_IFR1: Initiator\_Frame\_Router state

Third paragraph. Replace "Frame Received (Frame Failed) or a hard reset," with "Frame Received (Frame Failed) indication or a HARD\_RESET Received indication,".

LSI #197 [JL]

PDF Page 285

9.2.6.2.8 ST\_IFR1: Initiator\_Frame\_Router state

Fourth paragraph. How shall this state "notify the application layer"? I presume it needs to send a some kind of confirmation to the application layer.

LSI #198 [JL]

PDF Page 285

9.2.6.2.8 ST\_IFR1: Initiator\_Frame\_Router state

Item c) in the last list. Replace "Data-in parameter" with "Data-in Arrived parameter"

LSI #199 [JL]

PDF Page 287

9.2.6.3.2 ST\_TFR1: Target\_Frame\_Router state

First paragraph, item c). Replace "a hard reset occurs" with "a HARD\_RESET Received indication is received".

LSI #200 [JL]

PDF Page 287

9.2.6.3.2 ST\_TFR1: Target\_Frame\_Router state

Third paragraph. Replace "a hard reset" with "a HARD\_RESET Received indication".

LSI #201 [JL]

PDF Page 289

9.2.6.3.4.1 State description

Second paragraph. Minimally, delete "this state" as the Send Data-In transport protocol service request was not received by this state. However, this correction implies that the ST\_TTS2 state magically knows how the ST\_TTS1 state got started. It is probably better to say, "If this state was entered from the ST\_TTS1: Request\_Response\_Router state, ..."

LSI #202 [JL]

PDF Page 289

9.2.6.3.4.1 State description

Fifth paragraph. Replace "ACK Transmitted" with "ACK Received".

LSI #203 [JL]

PDF Page 289

9.2.6.3.4.1 State description

Seventh paragraph. It seems odd to say this state shall receive a Transmission Status confirmation from another state machine. Perhaps we should say "this state shall wait to receive".



LSI #204 [JL]  
PDF Page 289  
9.2.6.3.4.1 State description

Tenth paragraph. Same problem with "this state shall receive".

LSI #205 [JL]  
PDF Page 291  
9.2.6.3.6.1 State description

Second paragraph. Replace "ST\_TS1" with "ST\_TTS1".

LSI #206 [JL]  
PDF Page 291  
9.2.6.3.6.1 State description

First paragraph, item a). Replace "ST\_TS1" with "ST\_TTS1".

LSI #207 [JL]  
PDF Page 294  
9.3.2 SATA tunneling for multiple STP initiator ports

Second paragraph, item d). Replace "CLOSE CLEAR AFFILIATION)" with "CLOSE (CLEAR AFFILIATION)".

LSI #208 [JL]  
PDF Page 299  
9.4.4.2.3.2 Transition MT\_ID2: Send to MT\_ID1: Idle

Replace "and sending" with "and after sending".

LSI #209 [JL]  
PDF Page 299  
9.4.4.3.1 Overview

Replace "MT\_TD2: Send" with "MT\_TD2: Respond".

LSI #210 [JL]  
PDF Page 304  
10.1.1.5 Command Complete Received transport protocol service

First paragraph. Replace "not" with "to".

LSI #211 [JL]  
PDF Page 307  
10.1.1.10 Send Task Management Request transport protocol service

Replace the service request with the correct one:  
"Send Task Management Request (IN (Nexus, Function Identifier) )"

LSI #212 [JL]  
PDF Page 308  
10.1.1.11 Task Management Request Received transport protocol service

Replace the service indication with the correct one:  
"Task Management Request Received (IN (Nexus, Function Identifier) )"

LSI #213 [JL]  
PDF Page 309  
10.1.1.12 Task Management Function Executed transport protocol service

Replace the service response with the correct one:  
 "Task Management Function Executed (IN (Nexus, Service Response ) )"

LSI #214 [JL]

PDF Page 309

10.1.1.13 Received Task Management Function-Executed transport protocol service

Replace the service confirmation with the correct one:  
 "Received Task Management Function Executed (IN (Nexus, Service Response ) )"

LSI #215 [JL]

PDF Page 311

10.1.3 Application client error handling

Third paragraph. The "()" should not be allowed to wrap onto a new line.  
 Does Frame have an equivalent function to Word's non-breaking space?

LSI #216 [JL]

PDF Page 312

10.1.6.1.1 Disconnect-Reconnect mode page overview

First paragraph. Replace "(e.g., as if the mode page is implemented and the field is set to zero)" with "(i.e., as if the field in the mode page is implemented and the field is set to zero)".

LSI #217 [JL]

PDF Page 322

10.1.8 SCSI power condition states

To be consistent with the other subclauses in this standard, add forward references (with links) to the relevant subclauses in the second list (items a through g should point to 10.1.8.1 through 10.1.8.7).

LSI #218 [JL]

PDF Page 323

10.1.8 SCSI power condition states

Figure 103 – SCSI application layer power condition (SA\_PC) state machine for SAS

This state machine looks different from the other state machines. Minimally add the gold box.

LSI #219 [JL]

PDF Page 324

10.1.8.2.2 Transition SA\_PC\_1: Active to SA\_PC\_2: Idle

Item c). Replace "Power Condition mode page idle timer expires" with "Power Condition mode page idle condition timer (see SPC-3) expires".

LSI #220 [JL]

PDF Page 324

10.1.8.2.3 Transition SA\_PC\_1: Active to SA\_PC\_3: Standby

Item c). Replace "Power Condition mode page standby timer expires" with "Power Condition mode page standby condition timer (see SPC-3) expires".

LSI #221 [JL]

PDF Page 324

10.1.8.3.3 Transition SA\_PC\_2: Idle to SA\_PC\_3: Standby

Item c). Replace "Power Condition mode page standby timer expires" with "Power Condition mode page standby condition timer (see SPC-3) expires".

LSI #222 [JL]

PDF Page 326

10.1.8.6.3 Transition SA\_PC\_5: Active\_Wait to SA\_PC\_3: Standby

Item c). Replace "Power Condition mode page standby timer expires" with "Power Condition mode page standby condition timer (see SPC-3) expires".

LSI #223 [JL]

PDF Page 326

10.1.8.6.5 Transition SA\_PC\_5: Active\_Wait to SA\_PC\_6: Idle\_Wait

Item c). Replace "Power Condition mode page idle timer expires" with "Power Condition mode page idle condition timer (see SPC-3) expires".

LSI #224 [JL]

PDF Page 326

10.1.8.7.3 Transition SA\_PC\_6: Idle\_Wait to SA\_PC\_3: Standby

Item c). Replace "Power Condition mode page standby timer expires" with "Power Condition mode page standby condition timer (see SPC-3) expires".

LSI #225 [JL]

PDF Page 334

10.3.1.4 DISCOVER function

Second paragraph below table 134. Why not use a FUNCTION RESULT of PHY DOES NOT EXIST, which we define in table 136?

LSI #226 [JL]

PDF Page 337

10.3.1.4 DISCOVER function

The paragraph between tables 138 and 139 wraps onto the next page even though there is room on the previous page for the whole paragraph.

LSI #227 [JL]

PDF Page 346

10.3.1.8 CONFIGURE ROUTE INFORMATION function

Second paragraph below table 150. The link to 9.4.4.2 is wrong and does not work.

LSI #228 [JL]

PDF Page 347

10.3.1.8 CONFIGURE ROUTE INFORMATION function

Third paragraph below table 150. Either find the subclause number for the see 4.x.x.x reference or delete it.

LSI #229 [JL]

PDF Page 347

10.3.1.8 CONFIGURE ROUTE INFORMATION function

Paragraph between tables 151 and 152. The reference to table 149 should be to table 152.

LSI #230 [JL]

PDF Page 359  
B.1 SAS phy reset sequence examples

In the first paragraph, replace "Figure A.1" with "Figure B.1".

LSI #231 [JL]  
PDF Page 359  
B.1 SAS phy reset sequence examples

In the first paragraph below figure B.1, replace "Figure A.2" with "Figure B.2".

LSI #232 [JL]  
PDF Page 359  
B.1 SAS phy reset sequence examples

First paragraph, last sentence. This sentence does not make sense. Consider replacing "... (invalid), that phy then selects..." with "... (invalid). Both phys then select...".

LSI #233 [JL]  
PDF Page 360  
B.1 SAS phy reset sequence examples

Paragraph above Figure B.2, last sentence. This sentence does not make sense. Consider replacing "... (invalid), that phy then selects..." with "... (invalid). Both phys then select...".

LSI #234 [JL]  
PDF Page 412  
Annex I  
Global

There are several places where C comments wrap to the next line. This code will not compile correctly. We need to correct these wrapping comments.

LSI #235 [JL]  
PDF Page 417  
Annex J

We should change this logo to match the one selected by the SCSI Trade Association.

LSI #236 [TH]  
Global

There are many places which state that K28.5 and K28.3 are the only two control characters used by SAS. SATA\_ERROR has been defined using K28.6. Globally add K28.6 as a legal control character.

LSI #237 [TH]  
3.1.35 edge expander device; page 6

Definition suggests subtractive routing ports are required by edge expander - this is not the case. A simple expander may only support direct attachment.

LSI #238 [TH]  
3.1.39 expander connection router; page 7

typo: acronym (ER) should be (ECR)

LSI #239 [TH]

4.1.11 Connections; page 30

abc list of connection types is incomplete - either remove or add all possible types, i.e SMP initiator port to expander SMP target port (or SMP through expander to another expander, etc)

LSI #240 [TH]

4.3.3.1 Table 10; page 40

Broadcast Event Notify (type) list incomplete (should be consistent with Table 25).

LSI #241 [TH]

4.6.1 Expander device model overview; page 49

a) C) SL\_IR primitive processor - typo: should be broadcast primitive processor

also, c) an expander port available per phy - what does this mean? is this necessary? either clarify or remove.

LSI #242 [TH]

4.6.5 Broadcast primitive processor; page 51

typo: replace SL\_IR with broadcast (twice).

LSI #243 [TH]

4.6.7 Figure 27; page 53

update diagram text:  
change Link Status to Phy Status  
change Send Open to Transmit Open  
change Send Close to Transmit Close  
change Send Break to Transmit Break  
change Send Dword to Transmit Dword

LSI #244 [TH]

6.8.3.3 SP10: SAS\_AwaitALIGN state; page 114

Agree with editor's note regarding the closer coordination between SP and DWS state machines to detect ALIGNs and ALIGN1s. Prefer that more than a single ALIGN or ALIGN1 required to advance SP, i.e. use filtering provided by the DWS process.

LSI #245 [TH]

6.8.3.4 SP11: SAS\_AwaitALIGN1 state; page 114

Same comment as for 6.8.3.3.

LSI #246 [TH]

7.1.4.11 OPEN\_REJECT; page 140

Priority list for expander devices transmitting OPEN\_REJECT is ambiguous. Clarify using the following priorities:  
1) OPEN\_REJECT(BAD DESTINATION)

- 2) OPEN\_REJECT(NO DESTINATION)
- 3) OPEN\_REJECT(CONNECTION RATE NOT SUPPORTED)
- 4) OPEN\_REJECT(STP RESOURCES BUSY)
- 5) OPEN\_REJECT(PATHWAY BLOCKED)

LSI #247 [TH]

7.12.3 Arbitration fairness; pages 163-164

Resolve apparent inconsistency between Paragraph 2 which states expander port may include an arbitration wait timer and Paragraph 5 which states that expander ports shall include arbitration wait timers.

LSI #248 [TH]

7.12.3.1.3 Partial Pathway Timer; page 165

Partial Pathway Timeout timers are maintained by each expander phy, not by the expander connection manager. Replace expander connection manager with expander phy.

LSI #249 [TH]

7.17.1 STP frame transmission; page 204

Tables 84 and 85 should show where OPEN\_ACCEPT occurs relative to the frame transmission.

LSI #250 [TH]

7.17.2 STP flow control; page 205

Text description correlates well with Figure 86 as far as getting into the HOLD condition but recommend including more text describing the process of releasing the HOLD condition.

LSI #251 [TH]

7.17.3 Preparing to close an STP connection; page 207

Remove Paragraph 2, starting with "In a SCSI domain." - it is misleading and provides no normative content.

Recommend restricting when expander device may issue CLOSE to only include the first three cases listed (end of each frame, timeout waiting for another frame, after every n frames).

LSI #252 [TH]

9.3.1 Initial FIS

typo: SMP REPORT SATA PORT should be SMP REPORT PHY SATA.

LSI #253 [BD]

4.1.11 Connections; page 30

In second paragraph from end, should read "...links that make up the pathway..." (change "to" to "the")

LSI #254 [BD]

## 7.1.4.9 NOTIFY; page 138.

The NOTIFY does not have a table as the other primitives, and should be added.

LSI #255 [BD]

## 7.1.6.3 SATA\_HOLD and SATA\_HOLD\_A; page 142

The first sentence is incorrect. Replace sentence with "An expander device running SATA protocol shall transmit a SATA\_HOLD within 20 dwords of receiving a SATA\_HOLD when it is the source of the data dwords of the frame."

LSI #256 [BD]

## 7.1.6.4 SATA\_R\_RDY and SATA\_X\_RDY page 143

Last sentence should start "Expander or initiator devices..."

LSI #257 [BD]

## 7.7.1 Address frame overview; page 149.

Only ALIGN should be allowed inside address frames. Change third sentence to "Except for ALIGN, primitives may not be inserted in the address frame."

LSI #258 [BD]

## 7.7.3 OPEN address frame; page 153.

Middle of page, sentence starting "When requesting a connection to a target port..." conflicts with section 7.15. Change sentence to "When requesting a connection to a target port, an initiator port shall set the CONNECTION RATE field to the slowest negotiated physical link rate on any potential intermediate physical link."

LSI #259 [BD]

## 7.8.6 SL\_IR transmitter and receiver; page 157

ALIGNs are allowed inside of address frames.

Change wording in second paragraph to "... a primitive other than ALIGN is requested ...".

Change wording in third paragraph to "... shall ignore any primitive other than ALIGN received inside ...".

LSI #260 [BD]

## 7.12.3 Arbitration fairness; page 163

AWT is mandatory. Change start of second paragraph to "Each initiator port, target port, and expander port shall include an arbitration wait timer ..."

Change start of third paragraph to "Initiator ports and target ports shall implement arbitration wait timers. They shall set the timer ..."

LSI #261 [BD]

## 7.13.2 SL transmitter and receiver; page 174

ALIGNs are allowed inside of address frames.

Change wording in second paragraph to "... a primitive other than ALIGN is requested ...".

Change wording in third paragraph to "... shall ignore any primitive other than ALIGN received inside ...".

LSI #262 [BD]

## 7.13.4.1 State description; page 175

Last paragraph has a misformatted sentence with c).

LSI #263 [BD]

7.15 Rate matching; page 190

Last paragraph should read "... port discovers a SATA target ..." (change "an" to "a")

LSI #264 [BD]

7.16.6 Preparing to close an SSP connection; page 193

Last paragraph needs to include CREDIT\_BLOCKED. Change wording to "... may transmit ACK, NAK, RRDY, and CREDIT\_BLOCKED ..."

LSI #265 [BD]

7.16.7.1 Overview; page 194

Sentence starting with "The SSP\_RF state machine ..." should read "... if those frames were successfully or unsuccessfully received." (Add "ly")

LSI #266 [BD]

7.16.7.8 SSP\_TF4: Indicate\_Done\_Tx state; page 201.

Item c) should start "Wait For DONE (Credit Timeout) ...".

LSI #267 [BD]

7.16.7.12.2 Transition SSP\_TC1: Idle to SSP\_TC2: Indicate\_Credit\_Tx; page 202

Add another sentence "This transition shall pass a CREDIT\_BLOCKED argument to the Indicate\_Credit\_Tx state if a Rx Credit Status (Blocked) parameter was received."

LSI #268 [BD]

7.13.3 Preparing to close an STP connection; page 207

In second paragraph, expander behavior regarding multi initiator ports is incorrect or misleading. Replace entire paragraph with

"In a SCSI domain with a single initiator port, when a SATA target port transmits an SATA\_X\_RDY, the expander device may use the time between SATA\_X\_RDY and SATA\_R\_RDY to insert an OPEN address frame to open a connection to the initiator port. In a SAS domain with multiple initiator ports, the expander device manages the STP connection requests (see 9.3.2). Only data FISes are subject to flow control, so the expander device shall be capable of accepting a whole register FIS frame."

LSI #269 [BD]

7.13.3 Preparing to close an STP connection; page 207

Third paragraph starting "An expander device may issue CLOSE ..." conflicts with first paragraph. Remove entire paragraph.

LSI #270 [BD]

8.2.1 Timers and counters overview; page 214

Parentheses in item c) conflicts with section 4.5. Remove words in parentheses.

LSI #271 [BD]



8.2.5 Arbitration wait time (AWT) timer; page 215

Add sentence at end "The AWT timer shall not be incremented past 7FFFh."

LSI #272 [BD]

Figure 91; page 216

Arrowhead missing between PL\_OC1 and PL\_OC2

LSI #273 [BD]

8.3.3.1 State description overview; page 217

Replace "PM\_PM" with "PL\_PM".

LSI #274 [BD]

8.3.3.1.3 Select a request to process and the phy on which to process it; page 218

Second paragraph, should also take the initiator bit into account. Change sentence to "A destination is considered the same if it has the same SAS address, initiator bit, and protocol."

LSI #275 [BD]

8.4.1 Overview; page 221.

Last sentence on page. Change "PL\_PM1" to "PL\_PM1:Idle".

LSI #276 [BD]

8.4.4.1 State Description; page 226.

Fifth paragraph on page is incorrectly issuing Disable Tx Frames for any DONE Received. Correct condition is already covered in fourth paragraph. Remove entire paragraph.

LSI #277 [BD]

9.2.1 SSP Frame Format; page 228

Replace "TIMEOUT" with "RETRANSMIT" in table 88.

LSI #278 [BD]

9.2.1 SSP Frame Format; page 229

Change Information unit size in table 89 for DATA from "0 to 1024" to "1 to 1024"

LSI #279 [BD]

9.2.6.2.1 State Description; page 246

Seventh paragraph (starting with "After receiving ...") and eighth paragraph (starting with "If the transmitted frame ...") are redundant, and transport should wait for port layer confirmation regardless of whether it is data-out or data-in operation.

Change 7th paragraph to read as

"After receiving a Transmission Status (Frame Transmitted) confirmation for a COMMAND or TASK frame, this state shall then wait for one of the following confirmations from the port layer state machine before transitioning from this state:"

Remove eighth paragraph.

LSI #280 [BD]

9.4.4.2.3.1 State description; page 264

Add INITIATOR field into sentence, to read "... CONNECTION RATE, INITIATOR, INITIATOR CONNECTION TAG, ..."

LSI #281 [BD]

9.4.4.2.4.2 Transition MT\_ID3:Receive to MT\_ID1:Idle; page 264

Change all occurrences of "has sent" to "shall send" in items a), b), and c).

LSI #282 [BD]

9.4.4.3.1 Overview; page 264

Change item b) from "MT\_TD2: Send" to "MT\_TD2: Respond"

LSI #283 [BD]

10.1.3 Application client error handling; page 276

Last paragraph implies a specific implementation, and does not cover the cases when the connection is broken. Recommend to remove last paragraph. Alternately say that the method the application client uses to reuse tags is outside the scope of this standard.

LSI #284 [BD]

Annex B; page 324

Replace references to figures A.1 and A.2 to B.1 and B.2 respectively. In Figure B.1, sequence for Phy A Tx/Phy B Rx should say "Not supported by phy A". For consistency, swap the sequences so that Figures B.1 and B.2 are consistent as far as which Rx/Tx is shown on top. (In B.1, Phy A Rx is shown on top, where in B.2 Phy A Tx is shown on top).

LSI #285 [MJ]

PDF Page 107

5.7 Driver and receiver electrical characteristics

For what it's worth, an acquaintance of mine who was not involved with the drafting of the SAS spec reviewed this document on behalf of another company. He offered the unsolicited comment that this was a quite well written specification. ...Just thought I'd pass that along.

LSI #286 [MJ]

PDF Page 112

5.7.4 Transmitted signal characteristics

Table 35 – Transmitted signal characteristics at Tx compliance points

133 ps (0.2 UI) provides no overlap with required 3Gbps max rise time. I believe the initial intent was to track SATA. However, the SATA min risetime at 1.5Gbps is being changed to 100 ps (0.15 UI). I propose that SAS change this value to 67 ps (0.1 UI) at 1.5 Gbps, allowing extra room for higher performance devices.

I also propose that the minimum rise/fall time of 67 ps (0.2 UI) at 3 Gbps be changed to 50 ps (0.15 UI) for similar reasons.

LSI #287 [MJ]

PDF Page 113

5.7.4 Transmitted signal characteristics

Table 36 – Delivered signal characteristic at Rx compliance points (part 2 of 2)

"OOB detect guaranteed on (eye opening) ... OOB detect guaranteed off signal level "

It is unclear to me a) how to interpret these values, and b) how they are meant to line up (if at all) with the SATA spec values. The signal characteristic names suggest that the first spec is the eye opening of a minimum valid signal, while the second spec is the absolute peak-peak voltage of noise which must be ignored. This is fine, but it is unclear how this relates to footnote c which seems to be describing something different.

Regarding lining up with SATA, that document specifies "squellch detector threshold" with a min/max of 50/200 mVp-p. Apologies for having no clear recommended change, but it seems that a 120 mV required noise tolerance does not compare well with SATA's threshold range of 50 to 200 mV.

LSI #288 [BD]

PDF Page 285

9.2.6.2.8 ST\_IFR1: Initiator\_Frame\_Router state

Fourth paragraph beginning with "If the frame type is correct relative to the confirmation...".

The phrase at the end of this sentence "used to open the connection." is misleading in that either device may have opened the connection. Please clarify.

\*\*\*\*\*

Comments attached to Yes ballot from Mark Evans of Maxtor Corp.:

Maxtor Corporation  
500 McCarthy Boulevard  
Milpitas, CA 95035

To: T10 SAS Protocol Working Group  
From: Mark Evans  
Phone: 408-894-5310  
Email: mark\_evans@maxtor.com  
Date: 20 December 2002

Subject: SAS letter ballot comments

Introduction: The following are Maxtor's letter ballot comments against SAS-r03.

Maxtor Corporation, Comment 1

PDF Page 1, Global

Replace "Enable Disable SAS Link (Enable)" with "Enable Disable Link Layer (SAS Enable)".

Maxtor Corporation, Comment 2

PDF Page 1, Global

Replace "Enable Disable SAS Link (Disable)" with "Enable Disable Link Layer (Disable)".

Maxtor Corporation, Comment 3

PDF Page 1, Global

Replace "indicate" and all of its forms by the correct form of "specify" when the value or action originates with the initiator.

Maxtor Corporation, Comment 4

PDF Page 10, Table of contents, 4.3.3.4 Signals between link layer, port layer, and management application layer for all protocols Align the page number properly.

Maxtor Corporation, Comment 5

PDF Page 16, Table of contents, 7.8.6.2.3.2 Transition  
SL\_IR\_RIF2: Receive\_Identify\_Frame to SL\_IR\_RIF3: Completed  
Align the page number properly.

Maxtor Corporation, Comment 6  
PDF Page 19, Table of contents, 7.18.4.2.2.2 Transition  
SMP\_IL2: Indicate\_frame\_tx to SMP\_IL3: Rcv\_response\_frame  
Align the page number properly.

Maxtor Corporation, Comment 7  
PDF Page 20, Table of contents, 9.2.6.2.2.2 Transition ST\_ISF1: Send\_Frame to  
ST\_ISF2: Prepare\_Command\_Request  
Align the page number properly.

Maxtor Corporation, Comment 8  
PDF Page 21, Table of contents, 9.2.6.2.3.2 Transition  
ST\_ISF2: Prepare\_Command\_Request to ST\_ISF1: Send\_Frame  
Align the page number properly.

Maxtor Corporation, Comment 9  
PDF Page 21, Table of contents, 9.2.6.3.6.3 Transition  
ST\_TTS4: Receive\_Data\_Out to ST\_TTS5: Prepare\_XFER\_RDY  
Align the page number properly.

Maxtor Corporation, Comment 10  
PDF Page 21, ST\_TTS4: Receive\_Data\_Out  
Align the page number properly.

Maxtor Corporation, Comment 11  
PDF Page 41, 3.1.24 deterministic jitter  
Rewrite this definition to be something like: "Jitter from all sources for  
which the probability of a variation in interval occurring outside the  
specified bounds is zero. These sources include duty cycle distortion, data  
dependent jitter, sinusoidal dependent jitter, and jitter uncorrelated to  
the data."

Maxtor Corporation, Comment 12  
PDF Page 43, 3.1.62 indication  
In this standard an indication is passed from a transport layer to an  
application layer only.

Maxtor Corporation, Comment 13  
PDF Page 44, 3.1.98 response  
In this standard a response is passed from an application layer to a  
transport layer only.

Maxtor Corporation, Comment 14  
PDF Page 46, Definitions, 3.1.x  
Add a definition for pathway blocked count something like the following,  
"Pathway blocked count (PBC): the number of times that a pathway has been  
blocked when attempting to open a connection."

Maxtor Corporation, Comment 15  
PDF Page 52, 3.5.2 Transitions, third paragraph  
Delete the word "fully".

Maxtor Corporation, Comment 16  
PDF Page 56, 4.1.3 Ports (narrow ports and wide ports), NOTE 6  
In the first sentence replace "primarily" with "e.g.,"

Maxtor Corporation, Comment 17  
PDF Page 69, 4.2.3 Hashed SAS address  
Add the following paragraph at the end of this clause: "Annex D contains  
information on SAS address hashing."

Maxtor Corporation, Comment 18  
PDF Page 74, 4.3.3 Signals between state machines  
Replace this clause with T10/03-023r0.

Maxtor Corporation, Comment 19

PDF Page 84, 4.5 I\_T nexus loss, first paragraph

Change the first sentence from, "When a port receives OPEN\_REJECT (NO DESTINATION), OPEN\_REJECT (CONNECTION RATE NOT SUPPORTED), or an open connection timeout in response to a connection request, it shall retry the connection request until:" to something like, "When a port receives OPEN\_REJECT (NO DESTINATION), OPEN\_REJECT (CONNECTION RATE NOT SUPPORTED), or an open connection timeout in response to a connection request, it shall retry the connection request. After receiving an OPEN\_REJECT (NO DESTINATION) or after an open connection time out, the port shall use the same OPEN address frame to retry the connection. After receiving an OPEN\_REJECT (CONNECTION RATE NOT SUPPORTED), the port shall send a new OPEN address frame with the connection rate changed as described in 7.12.2.2. The connection request shall be retried until:"

Maxtor Corporation, Comment 20

PDF Page 100, 5.1 SATA cables and connectors (informative), first paragraph  
Figure 31 doesn't really show the cables and connectors, so the first sentence should be changed to something like, "Figure 31 shows a schematic representation of the cables and connectors defined by SATA (for reference)."

Maxtor Corporation, Comment 21

PDF Page 100, 5.1 SATA cables and connectors (informative), first paragraph  
The second sentence implies too much of a similarity between SATA and SAS devices. Either delete this sentence or change it to something like, "A SATA host is an analogue to a SAS initiator device; a SATA device is an analogue to a SAS target device."

Maxtor Corporation, Comment 22

PDF Page 101, 5.2 SAS cables and connectors

As above, Figure 32 doesn't really show the cables and connectors, so the sentence should be changed to something like, "Figure 32 shows a schematic representation of the cables and connectors defined in this standard to support an external environment."

Maxtor Corporation, Comment 23

PDF Page 106, 5.6 READY LED pin, first paragraph  
Change "turn on" to "activate".

Maxtor Corporation, Comment 24

PDF Page 106, 5.6 READY LED pin, second paragraph

In the second sentence change "when the READY LED signal is raised" to "when the READY LED signal is asserted."

Maxtor Corporation, Comment 25

PDF Page 106, 5.6 READY LED pin, third paragraph

Change the second sentence to: "The READY LED circuitry in the target device shall be ground tolerant since this pin may be connected by a system directly to power supply ground."

Maxtor Corporation, Comment 26

PDF Page 106, 5.6 READY LED pin, fifth paragraph

Change "turn on" to "activate".

Maxtor Corporation, Comment 27

PDF Page 106, 5.6 READY LED pin, bulleted list, item a)

Change the second sentence to: "In this state the target device may be removed with no danger of mechanical or electrical damage;"

Maxtor Corporation, Comment 28

PDF Page 106, 5.6 READY LED pin, bulleted list, item c)

The second sentence ("When processing a command, the target device shall negate READY LED for a period long enough to be detected by an observer (i.e., LED is usually on, but flashes off when commands are processed);" is vague in the extreme. At least add some "example" times.

Maxtor Corporation, Comment 29

PDF Page 106, 5.6 READY LED pin, fifth paragraph

Change "...may optionally be driven..." to "...may be driven..."

Maxtor Corporation, Comment 30

PDF Page 106, 5.6 READY LED pin, bulleted list, item d)

The first sentence ("If the target device is formatting the media, it shall toggle READY LED between asserted and negated at significant intervals during the format operation (e.g., with each cylinder change on a disk drive).") is also vague in the extreme. What is a "significant interval". At least add some "example" times.

Maxtor Corporation, Comment 31

PDF Page 109, 5.7.3.1 Eye masks overview, first paragraph

In the last sentence change "sigma" to "standard deviations".

Maxtor Corporation, Comment 32

PDF Page 112, 5.7.4 Transmitted signal characteristics, Table 35 -

Transmitted signal characteristics at Tx compliance points

In note c) change "...logically turned off..." to "...not being driven..."

Maxtor Corporation, Comment 33

PDF Page 117, 5.7.11 Transmitter characteristics, fourth paragraph

In the last sentence replace "...satisfies the following equation." with "...shall satisfy the following equation."

Maxtor Corporation, Comment 34

PDF Page 117, 5.7.11 Transmitter characteristics

Replace the equation after the fourth paragraph with:

$$|S_{21}| = -\{20 \log_{10}(e)\} \{[6.5 \times 10^{-6} (f^{0.5})] + [2.0 \times 10^{-10} (f)] + [3.3 \times 10^{-20} (f^2)]\} \text{ dB}$$

Maxtor Corporation, Comment 35

PDF Page 117, 5.7.11 Transmitter characteristics, fifth paragraph

Add text at the end of the last sentence in the paragraph so that the sentence reads: "A compliance interconnect is any physical interconnect with equal or greater loss at all frequencies than that required by the TCTF and that also meets the ISI loss requirements shown in figures 42 and 43."

Maxtor Corporation, Comment 36

PDF Page 117, 5.7.10 Electrical TxRx connections, first paragraph

Change "media" to "medium" (AN electrically conductive MEDIUM).

Maxtor Corporation, Comment 37

PDF Page 121, 6.2 Encoding (8b10b), 6.2.1 Encoding overview, first paragraph

In the first sentence, change "10 bit" to "10-bit". There are four additional occurrences of different values in this clause to change. There are no other occurrences of this in the draft.

Maxtor Corporation, Comment 38

PDF Page 121, 6.2 Encoding (8b10b), 6.2.1 Encoding overview, second paragraph

Change "four byte" to "four-byte".

Maxtor Corporation, Comment 39

PDF Page 121, 6.2 Encoding (8b10b), 6.2.1 Encoding overview, third paragraph

after Table 40 - Special character usage

Change "10 bit" to "10-bit".

Maxtor Corporation, Comment 40

PDF Page 121, 6.2 Encoding (8b10b), 6.2.1 Encoding overview, third paragraph

after Table 40 - Special character usage

Change "8 bit" to "8-bit".

Maxtor Corporation, Comment 41

PDF Page 121, 6.2 Encoding (8b10b), 6.2.1 Encoding overview, third paragraph

after Table 40 - Special character usage

Change "10 bit" to "10-bit".

Maxtor Corporation, Comment 42

PDF Page 121, 6.2 Encoding (8b10b), 6.2.1 Encoding overview, third paragraph

The term "disparity" is introduced without definition. Either add definitions for the various forms of "disparity", or reference 6.3.3 Valid and invalid transmission characters.

Maxtor Corporation, Comment 43

PDF Page 121, 6.2.2 8b10b coding introduction, second paragraph

In the second sentence, delete the word "greatly".

Maxtor Corporation, Comment 44

PDF Page 121, 6.2.2 8b10b coding introduction, second paragraph

In the third sentence, delete the word "easily".

Maxtor Corporation, Comment 45

PDF Page 122, 6.2.3 8b10b encoding notation conventions, fourth paragraph

Delete the sentence, "The control variable is typically not specified."

Item a) in the following bulleted list states what the values of the control variable are.

Maxtor Corporation, Comment 46

PDF Page 132, 6.5 Out of band (OOB) signals, third paragraph after Table 48

- OOB signal receiver requirements

Delete the page break in this paragraph.

Maxtor Corporation, Comment 47

PDF Page 135, 6.6.3 SAS to SATA phy reset sequence, sixth paragraph

In the last sentence delete the word "normal" or describe an abnormal SATA reset sequence.

Maxtor Corporation, Comment 48

PDF Page 144, 6.8.2 OOB sequence states, Figure 56 - SAS phy (SP) state

machine - OOB sequence states

Add a "Broadcast Event Notify" confirmation from SP1:OOB\_COMINIT (this has the argument Phy Not Ready).

Maxtor Corporation, Comment 49

PDF Page 144, 6.8.2 OOB sequence states, Figure 56 - SAS phy (SP) state

machine - OOB sequence states

The COMSAS detect timeout transition from SP7:OOB\_AwaitCOMSAS cannot go to

SP2:OOB\_AwaitCOMX because this would cause another COMSAS to be transmitted.

Add another state to which this transition goes where the timer resides.

Then, after the timer expires, a hot-plug timeout would cause a transition

to SP1:OOB\_COMINIT.

Maxtor Corporation, Comment 50

PDF Page 145, 6.8.2.1 SP1:OOB\_COMINIT state, 6.8.2.1.1 State description

Change "PhyNotReady" to "Phy Not Ready".

Maxtor Corporation, Comment 51

PDF Page 145, 6.8.2.1 SP1:OOB\_COMINIT state, 6.8.2.1.1 State description

Add "This state shall send a Broadcast Event Notify confirmation to the expander function."

Maxtor Corporation, Comment 52

PDF Page 147, 6.8.2.7.5 Transition SP7:OOB\_AwaitCOMSAS to SAS\_AwaitNoCOMX

Based on a previous comment, this transition should be deleted (also, there is no SAS\_AwaitNoCOMX state).

Maxtor Corporation, Comment 53

PDF Page 150, 6.8.3.4 SP11:SAS\_AwaitALIGN1 state, 6.8.3.4.1 State

description, second paragraph

Change "ALIGN0" to "ALIGN1".

Maxtor Corporation, Comment 54

PDF Page 158, 6.9.3 SP\_DWS1:Valid1 state

There is a transition description missing. Add: "6.9.4.3 Transition

SP\_DWS1:Valid1 to SP\_DWS0:AcquireSync, This transition shall occur when an invalid dword is detected."

Maxtor Corporation, Comment 55

PDF Page 162, 7.1.1 Primitives overview, first paragraph

Change the second sentence to: "Primitives are neither big-endian nor

little-endian; they shall be interpreted as first, second, third, and last bytes.

Maxtor Corporation, Comment 56

PDF Page 172, 7.1.4.4 BROADCAST, second paragraph after Table 59 - BROADCAST primitives

In the last sentence change "dropped" to "ignored".

Maxtor Corporation, Comment 57

PDF Page 173, 7.1.4.9 NOTIFY, first paragraph

It could be problematic to send a NOTIFY during the phy reset sequence.

Therefore, change the first sentence to: "A NOTIFY may be sent in place of an ALIGN during rate matching and clock skew management (i.e., a NOTIFY shall not be sent in place of an ALIGN during character and dword alignment during the phy reset sequence."

Maxtor Corporation, Comment 58

PDF Page 174, 7.1.4.11 OPEN\_REJECT, Table 61 - OPEN\_REJECT abandon primitives, description for OPEN\_REJECT (CONNECTION RATE NOT SUPPORTED)

Add a parenthetical something like the following to the last sentence, "(the connection shall be retried as described in 4.5)."

Maxtor Corporation, Comment 59

PDF Page 174, 7.1.4.11 OPEN\_REJECT, Table 61 - OPEN\_REJECT abandon primitives

In the description of OPEN\_REJECT (BAD DESTINATION) change "needs to be routed" to "is to be routed".

Maxtor Corporation, Comment 60

PDF Page 177, 7.1.5.6 RRDY (Receiver ready), Table 65 - RRDY primitives

Delete RRDY (RESERVED 2) as there is no such primitive.

Maxtor Corporation, Comment 61

PDF Page 179, 7.2 Clock skew management, note 19

Delete this note. An expander device may delete all ALIGNs only so long as the rules described in Table 66 are met.

Maxtor Corporation, Comment 62

PDF Page 180, 7.4.2 CRC generation, NOTE 21

Delete the word "simply".

Maxtor Corporation, Comment 63

PDF Page 182, 7.4.3 CRC checking

Delete the last paragraph ("Annex B contains examples of CRC generation/checker implementations.") as this is already stated in the Overview clause (see 7.4.1).

Maxtor Corporation, Comment 64

PDF Page 186, 7.7.2 IDENTIFY address frame

Reorder the paragraphs below Table 73 - Device types such that the descriptions of the fields are in the common-practice order of their appearance in the table (i.e., top to bottom and left to right).

Maxtor Corporation, Comment 65

PDF Page 186, 7.7.2 IDENTIFY address frame

Add the following paragraph after Table 73 - Device types: "The ADDRESS FRAME TYPE field shall be set to 0h."

Maxtor Corporation, Comment 66

PDF Page 187, 7.7.3 OPEN address frame

Reorder the paragraphs below Table 74 - OPEN address frame format such that the descriptions of the fields are in the common-practice order of their appearance in the table (i.e., top to bottom and left to right).

Maxtor Corporation, Comment 67

PDF Page 190, 7.8.2 Initiator device specific rules, second paragraph

Reword this to: "When a discover process is performed after a link reset sequence, the application client may discover all of the devices in the SAS domain. When a discover process is performed after a BROADCAST (CHANGE), the application client may determine what has changed in the SAS domain."

Maxtor Corporation, Comment 68



PDF Page 190, 7.8.2 Initiator device specific rules, fourth paragraph  
 Reword this to: "If during the discover process (see 4.6.11.5) the application client detects two ports with the same SAS address, it has found a routing loop. To break the loop the application client shall use the CONFIGURE ROUTE INFORMATION function (see 10.3.1.8) to disable the expander port through which the duplicate SAS address was detected."

Maxtor Corporation, Comment 69

PDF Page 191, 7.8.5 Identification and hard reset (SL\_IR) state machines, 7.8.5.1 Overview, Figure 67 - SAS link layer identification and hard reset (SL\_IR) state machines

In the SL\_IR\_TIR1 state: delete "(SAS Enable)" as the argument for this confirmation may be either (SAS Enable) or (SATA Enable).

Maxtor Corporation, Comment 70

PDF Page 191, 7.8.5 Identification and hard reset (SL\_IR) state machines, 7.8.5.1, Overview, Figure 67 - SAS link layer identification and hard reset (SL\_IR) state machines

In the SL\_IR\_RIF1 state: delete "(SAS Enable)" as the argument for this confirmation may be either (SAS Enable) or (SATA Enable).

Maxtor Corporation, Comment 71

PDF Page 191, 7.8.5 Identification and hard reset (SL\_IR) state machines, 7.8.5.1, Overview, Figure 67 - SAS link layer identification and hard reset (SL\_IR) state machines

In the SL\_IR\_IRC1 state: delete "(SAS Enable)" as the argument for this confirmation may be either (SAS Enable) or (SATA Enable).

Maxtor Corporation, Comment 72

PDF Page 191, 7.8.5 Identification and hard reset (SL\_IR) state machines, 7.8.5.1, Overview, Figure 67 - SAS link layer identification and hard reset (SL\_IR) state machines

In the SL\_IR\_IRC2 state: Add a "HARD\_RESET Received" confirmation from this state to the upper layers. This is already partly in the text for this state, and another Maxtor comment to the text clarifies this.

Maxtor Corporation, Comment 73

PDF Page 191, 7.8.5 Identification and hard reset (SL\_IR) state machines, 7.8.5.1, Overview, Figure 67 - SAS link layer identification and hard reset (SL\_IR) state machines

In the SL\_IR\_IRC2 state: add the "Identification Sequence Complete" confirmation to the management application layer. This is described in the corresponding text for this state.

Maxtor Corporation, Comment 74

PDF Page 192, 7.8.6 SL\_IR transmitter and receiver, third paragraph  
 Reword this to: "The SL\_IR receiver shall ignore any primitives received inside an OPEN address frame (i.e., after an SOAF but before the subsequent EOAF) except SOAF and BREAK. If a receiver receives a second SOAF after receiving an SOAF but before receiving a subsequent EOAF, then the receiver shall ignore the dwords before the second SOAF (i.e., the receiver shall consider the second SOAF as the start of a new IDENTIFY address frame). If a receiver receives a BREAK after receiving an SOAF but before receiving a subsequent EOAF, then the receiver shall ignore the dwords before the BREAK (i.e., ignore the IDENTIFY address frame)."

Maxtor Corporation, Comment 75

PDF Page 195, 7.8.6.3.3 SL\_IR\_IRC2:Wait state, 7.8.6.3.3.1 State description, fourth paragraph  
 Change "management application layer" to "port layer". Other Maxtor comments have the port layer sending this to the transport layer, then to the application layer.

Maxtor Corporation, Comment 76

PDF Page 196, 7.10 Near-end analog loopback test, second paragraph after Figure 68 - Test modes  
 Change "...device set..." to "...device to set..."

Maxtor Corporation, Comment 77

PDF Page 196, 7.10 Near-end analog loopback test, third paragraph after

## Figure 68 - Test modes

Change "...the application client shall transmit a BREAK or CLOSE..." to "...the application client shall request that a BREAK or CLOSE be transmitted..."

## Maxtor Corporation, Comment 78

PDF Page 197, 7.12.2.1 Connection request, third paragraph

Delete the clause "but they may do so" at the end of the third sentence.

## Maxtor Corporation, Comment 79

PDF Page 197, 7.12.2.1 Connection request, second paragraph

Change the last phrase in the second sentence from "...decides to abandon the connection request with BREAK." to "...abandons the connection request with BREAK."

## Maxtor Corporation, Comment 80

PDF Page 197, 7.12.2.1 Connection request, fourth paragraph

The second sentence is incorrect. Change it to: "If none of the intermediate physical links support the requested connection rate, the expander device shall return OPEN\_REJECT (CONNECTION RATE NOT SUPPORTED)."

## Maxtor Corporation, Comment 81

PDF Page 198, 7.12.3 Arbitration fairness, second paragraph

Change "arbitration wait timer" to "AWT timer."

## Maxtor Corporation, Comment 82

PDF Page 198, 7.12.3 Arbitration fairness, second paragraph

Change "arbitration wait timer" to "AWT timer."

## Maxtor Corporation, Comment 83

PDF Page 198, 7.12.3 Arbitration fairness, third paragraph

Change "arbitration wait timer" to "AWT timer."

## Maxtor Corporation, Comment 84

PDF Page 198, 7.12.3 Arbitration fairness, third paragraph

Change "arbitration wait timer" to "AWT timer."

## Maxtor Corporation, Comment 85

PDF Page 198, 7.12.3 Arbitration fairness, fourth paragraph

Change "arbitration wait timer" to "AWT timer."

## Maxtor Corporation, Comment 86

PDF Page 198, Change "...the target port shall set the connection rate for future requests..." to "...the source port shall set the connection rate for future requests..."

## Maxtor Corporation, Comment 87

PDF Page 199, 7.12.3 Arbitration fairness, fifth paragraph

Change "arbitration wait timer" to "AWT timer."

## Maxtor Corporation, Comment 88

PDF Page 202, 7.12.5 Abandoning a connection request, Table 81 - Abandon connection request responses, second row

Change the entry in the Response column to "Open response (see 7.12.2)".

Change the entry in the Description column to "An open response arrived after the BREAK was sent. The originator shall ignore the response."

## Maxtor Corporation, Comment 89

PDF Page 202, 7.12.4.3 Fanout expander devices

There are too many "its" (and other wrongness) in this clause. Change it to be something like: "When a fanout expander device receives a connection request, the fanout expander shall determine if a pathway exists to the destination device by comparing the destination SAS address of the request to the SAS addresses of the devices to which the fanout expander's phys are attached. For all phys that are attached to edge expander devices, the fanout expander shall compare the destination SAS address to all of the enabled SAS addresses in the expander route table. [new paragraph] If the expander device discovers that there are one or more pathways to the device having the destination SAS address, then the expander device shall arbitrate for access and forward the connection request. [new paragraph] If the

expander device does not discover a pathway to the device having the destination SAS address, then the expander device shall reply to the source of the connection request with OPEN\_REJECT (NO DESTINATION). If the destination phy is in the same expander port as the source phy, the expander device shall reply to the source with OPEN\_REJECT (BAD DESTINATION)."

Maxtor Corporation, Comment 90

PDF Page 202, 7.12.5 Abandoning a connection request, first paragraph after Table 81 - Abandon connection request responses  
Change the last phrase from "...not the target port." to "...not the destination port."

Maxtor Corporation, Comment 91

PDF Page 209, 7.13.2 SL transmitter and receiver, third paragraph  
Reword this paragraph to: "The SL receiver shall ignore any primitives received inside an OPEN address frame (i.e., after an SOAF but before the subsequent EOAF) except SOAF and BREAK. If a receiver receives a second SOAF after receiving an SOAF but before receiving a subsequent EOAF, then the receiver shall ignore the dwords before the second SOAF (i.e., the receiver shall consider the second SOAF as the start of a new IDENTIFY address frame). If a receiver receives a BREAK after receiving an SOAF but before receiving a subsequent EOAF, then the receiver shall ignore the dwords before the BREAK (i.e., ignore the IDENTIFY address frame)."

Maxtor Corporation, Comment 92

PDF Page 211, 7.13.4.4 Transition SL1:ArbSel to SL3:Connected, second paragraph  
Delete the comma in "(STP, Source Opened)".

Maxtor Corporation, Comment 93

PDF Page 211, 7.13.4.4 Transition SL1:ArbSel to SL3:Connected, third paragraph  
Delete the comma in "(SSP, Source Opened)".

Maxtor Corporation, Comment 94

PDF Page 211, 7.13.4.4 Transition SL1:ArbSel to SL3:Connected, fourth paragraph  
Delete the comma in "(SMP, Source Opened)".

Maxtor Corporation, Comment 95

PDF Page 212, 7.13.5.3 Transition SL2:Selected to SL3:Connected, first bulleted list  
In item b): delete the comma in "(SSP, Destination Opened)".

Maxtor Corporation, Comment 96

PDF Page 212, 7.13.5.3 Transition SL2:Selected to SL3:Connected, second bulleted list  
In item b): delete the comma in "(SMP, Destination Opened)".

Maxtor Corporation, Comment 97

PDF Page 212, 7.13.5.3 Transition SL2:Selected to SL3:Connected, third bulleted list  
In item b): delete the comma in "(STP, Destination Opened)".

Maxtor Corporation, Comment 98

PDF Page 225, 7.15 Rate matching, first paragraph  
Change the first part of the first sentence from "Initiator ports shall use SMP to discover the negotiated physical link rate..." to "Initiator ports shall discover the negotiated physical link rate..." There are other methods besides SMP that an initiator may use, and targets are not required to support SMP.

Maxtor Corporation, Comment 99

PDF Page 229, 7.16.7 SSP link layer (SSP) state machines, 7.16.7.1 Overview, ninth paragraph  
Change the first sentence to: "The SSP\_RF state machine's function is to receive frames and to determine whether or not those frames were received successfully."

Maxtor Corporation, Comment 100

PDF Page 234, 7.16.7.4 SSP\_D1: DONE\_Wait state, 7.16.7.4.1 State description, last paragraph

Change "DONE (ACK/NAK TIMEOUT) confirmation" to DONE Received (ACK/NAK TIMEOUT) confirmation".

Maxtor Corporation, Comment 101

PDF Page 234, 7.16.7.4 SSP\_D1: DONE\_Wait state, 7.16.7.4.1 State description, last paragraph

Add an "i.e." in the last clause: "...other DONE Received confirmations (i.e., DONE Received (Close Connection) and DONE Received (Credit Timeout)) may be used by the application layer to decide when to reuse tags."

Maxtor Corporation, Comment 102

PDF Page 234, 7.16.7.5.2 Transition SSP\_TF1: Connected\_Idle to SSP\_TF2: Tx\_Wait, second paragraph

Change "Tx Frame (Balanced)" to "Tx Frame (Balance Required)".

Maxtor Corporation, Comment 103

PDF Page 234, 7.16.7.5.2 Transition SSP\_TF1: Connected\_Idle to SSP\_TF2: Tx\_Wait, second paragraph

Change "Tx Frame (Nonbalanced)" to "Tx Frame (Balance Not Required)".

Maxtor Corporation, Comment 104

PDF Page 236, 7.16.7.9 SSP\_RF1: Rcv\_Frame state, first bulleted list

Change item c) from "Received Frame" to "Frame Received".

Maxtor Corporation, Comment 105

PDF Page 245, 7.18.4 SMP link layer (SMP) state machines, 7.18.4.1 Overview, Figure 89 - SMP link layer (SMP) state machines - target device

Add a "Frame Transmitted" confirmation from the SMP\_TL2 state to the port layer.

Maxtor Corporation, Comment 106

PDF Page 248, 8 Port layer

Replace this clause as described in T10/03-024r0.

Maxtor Corporation, Comment 107

PDF Page 251, 8.3 Port layer overall control (PL\_OC) state machine, 8.3.1

Overview, Figure 91 - Port layer overall control (PL\_OC) state machine

In the PL\_OC2 state: delete the confirmation "Port Ready" as there is no text that describes what this is supposed to be.

Maxtor Corporation, Comment 108

PDF Page 251, 8.3 Port layer overall control (PL\_OC) state machine, 8.3.1

Overview, Figure 91 - Port layer overall control (PL\_OC) state machine

In the PL\_OC2 state: add a Phy Enabled confirmation from the link layer to this state, as a second Phy Enabled may be received after transition from PL\_OC1 to PL\_OC2.

Maxtor Corporation, Comment 109

PDF Page 251, 8.3 Port layer overall control (PL\_OC) state machine, 8.3.1

Overview, Figure 91 - Port layer overall control (PL\_OC) state machine

In the PL\_OC1 state: add a Enable Disable Link Layer (Enable) confirmation from the link layer to this state. This may also cause the transition to PL\_OC2.

Maxtor Corporation, Comment 110

PDF Page 251, 8.3 Port layer overall control (PL\_OC) state machine, 8.3.1

Overview, Figure 91 - Port layer overall control (PL\_OC) state machine

In the PL\_OC2 state: add a Enable Disable Link Layer (Enable) confirmation from the link layer, as a second Phy Enabled may be received after transition from PL\_OC1 to PL\_OC2.

Maxtor Corporation, Comment 111

PDF Page 251, 8.3 Port layer overall control (PL\_OC) state machine, 8.3.1

Overview, Figure 91 - Port layer overall control (PL\_OC) state machine

Add a Enable Disable Link Layer (Disable) confirmation from the link layer to this state machine (i.e., to all states in the state machine).

Maxtor Corporation, Comment 112

PDF Page 251, 8.3 Port layer overall control (PL\_OC) state machine, 8.3.1 Overview, Figure 91 - Port layer overall control (PL\_OC) state machine  
Add a HARD\_RESET Received confirmation from the link layer to this state machine (i.e., to all states in the state machine).

Maxtor Corporation, Comment 113

PDF Page 251, 8.3 Port layer overall control (PL\_OC) state machine, 8.3.1 Overview, Figure 91 - Port layer overall control (PL\_OC) state machine  
In the PL\_OC1 state: add a HARD\_RESET Received confirmation going from this state to the transport layer.

Maxtor Corporation, Comment 114

PDF Page 257, 8.4 Port layer phy manager (PL\_PM) state machine, 8.4.1 Overview, Figure 92 - Port layer phy manager (PL\_PM) state machine (part 1)  
Add a Enable Disable Link Layer (Disable) confirmation from the link layer to this state machine (i.e., to all states in the state machine).

Maxtor Corporation, Comment 115

PDF Page 257, 8.4 Port layer phy manager (PL\_PM) state machine, 8.4.1 Overview, Figure 92 - Port layer phy manager (PL\_PM) state machine (part 1)  
Add a HARD\_RESET Received confirmation received by this state machine (i.e., to all states in the state machine) from the link layer.

Maxtor Corporation, Comment 116

PDF Page 258, 8.4 Port layer phy manager (PL\_PM) state machine, 8.4.1 Overview, Figure 93 - Port layer phy manager (PL\_PM) state machine (part 2)  
Delete the "Connection Failed" confirmation from this figure.

Maxtor Corporation, Comment 117

PDF Page 258, 8.4 Port layer phy manager (PL\_PM) state machine, 8.4.1 Overview, Figure 93 - Port layer phy manager (PL\_PM) state machine (part 2)  
The DONE Transmitted confirmation would be better shown in part 1 as it results in a Disable Tx Frames parameter being sent to the PL\_OC state machine.

Maxtor Corporation, Comment 118

PDF Page 258, 8.4 Port layer phy manager (PL\_PM) state machine, 8.4.1 Overview, Figure 93 - Port layer phy manager (PL\_PM) state machine (part 2)  
Add a DONE Received confirmation from the link layer to this state.

Maxtor Corporation, Comment 119

PDF Page 263, 9.2 SSP transport layer, 9.2.1 SSP frame format, Table 88 - SSP frame format  
Change "TIMEOUT" to "RETRANSMIT" as it is described in the text that follows the table.

Maxtor Corporation, Comment 120

PDF Page 264, 9.2.1 SSP frame format, fourth paragraph below Table 89 - FRAME TYPE field  
Change the first part of the sentence to: "The RETRANSMIT bit may be set to one for RESPONSE frames (see 9.2.4.5)..." The RETRANSMIT bit SHALL be set to one in RESPONSE frames under certain conditions (see 9.2.4.5)."

Maxtor Corporation, Comment 121

PDF Page 264, 9.2.1 SSP frame format, ninth paragraph below Table 89 - FRAME TYPE field  
In the first sentence delete "quickly".

Maxtor Corporation, Comment 122

PDF Page 264, 9.2.1 SSP frame format, ninth paragraph below Table 89 - FRAME TYPE field  
In the fourth sentence change "Target ports that do not need this field..." to "Target ports that do not use this field..."

Maxtor Corporation, Comment 123

PDF Page 265, 9.2.1 SSP frame format  
Add the following paragraph as next to last in the clause: "Fill bytes shall be included so that the CRC field is aligned on a four byte boundary. The contents of the fill bytes are vendor-specific."

Maxtor Corporation, Comment 124

PDF Page 265, 9.2.1 SSP frame format, next-to-last paragraph  
Change the parenthetical to "(1 024 bytes of data plus a 24-bytes header plus a 4-byte CRC)."

Maxtor Corporation, Comment 125

PDF Page 271, 9.2.2.5.1 RESPONSE information unit overview  
Add a new last paragraph in this clause: "For description of the content of the STATUS field see SAM-3. For description of the content of the SENSE DATA field see SPC-3."

Maxtor Corporation, Comment 126

PDF Page 278, 9.2.6.2 Initiator device state machines, 9.2.6.2.1 Overview  
After the paragraph describing the ST\_IFR state machine: there is a superfluous page break.

Maxtor Corporation, Comment 127

PDF Page 279, 9.2.6.2 Initiator device state machines, 9.2.6.2.1 Overview,  
Figure 98 - SSP transport layer (ST) state machines - initiator device  
In the ST\_ISF1 state: add an "ACK Transmitted" confirmation from the port layer. There is already text that describes this.

Maxtor Corporation, Comment 128

PDF Page 279, 9.2.6.2 Initiator device state machines, 9.2.6.2.1 Overview,  
Figure 98 - SSP transport layer (ST) state machines - initiator device  
In the ST\_IFR1 state: delete the confirmation "DONE (ACK/NAK TIMEOUT) Received" as there are no words describing this, and there is already an (ACK/NAK TIMEOUT) argument for the Transmission Status confirmation.

Maxtor Corporation, Comment 129

PDF Page 279, 9.2.6.2 Initiator device state machines, 9.2.6.2.1 Overview,  
Figure 98 - SSP transport layer (ST) state machines - initiator device  
In the ST\_ISF1 state: delete the confirmation "Nexus Lost". If there is a Transmission Status with an argument other than (Frame Transmitted), this state sends a Delivery Failure (Service Delivery Subsystem Failure) parameter to the ST\_IPR state machine. This results in that state machine sending this information to the application layer.

Maxtor Corporation, Comment 130

PDF Page 280, 9.2.6.2.2 ST\_ISF1:Send\_Frame state, 9.2.6.2.2.1 State description, second bulleted list  
Add: I\_T nexus loss count.

Maxtor Corporation, Comment 131

PDF Page 284, 9.2.6.2.8 ST\_IFR1:Initiator\_Frame\_Router state, first bulleted list  
Change "a hard reset occurs" to "a HARD\_RESET Received confirmation is received." Other Maxtor proposals and comments supplement this change.

Maxtor Corporation, Comment 132

PDF Page 285, 9.2.6.2.8 ST\_IFR1:Initiator\_Frame\_Router state, fifth paragraph  
Change "ACK/NAK balanced)" to "(ACK/NAK Balanced)".

Maxtor Corporation, Comment 133

PDF Page 285, 9.2.6.2.8 ST\_IFR1:Initiator\_Frame\_Router state, fifth paragraph  
Change the first occurrence of "(ACK/NAK Not Balanced)" to "Received (ACK/NAK Unbalanced)".

Maxtor Corporation, Comment 134

PDF Page 285, 9.2.6.2.8 ST\_IFR1:Initiator\_Frame\_Router state, fifth paragraph  
Change the second occurrence of "(ACK/NAK Not Balanced)" to "Received (ACK/NAK Unbalanced)".

Maxtor Corporation, Comment 135

PDF Page 285, 9.2.6.2.8 ST\_IFR1:Initiator\_Frame\_Router state, third paragraph  
Change "hard reset" to "HARD\_RESET Received confirmation." Other Maxtor

proposals and comments supplement this change.

Maxtor Corporation, Comment 136

PDF Page 285, 9.2.6.3 Target device state machines, 9.2.6.3.1 Overview, first bulleted list

Item a) is missing from the list. Insert the following: "a) receives and processes data-in and data-out delivery service requests from the SCSI target application layer;"

Maxtor Corporation, Comment 137

PDF Page 286, 9.2.6.3 Target device state machines, 9.2.6.3.1 Overview, Figure 99 - SSP transport layer (ST) state machines - target device

In the ST\_TTS2 state: add an "ACK Transmitted" confirmation from the port layer. There is already text that describes this.

Maxtor Corporation, Comment 138

PDF Page 286, 9.2.6.3 Target device state machines, 9.2.6.3.1 Overview, Figure 99 - SSP transport layer (ST) state machines - target device

In the ST\_TTS2 state, delete the "Nexus Lost" confirmation to the application layer. This information is sent to the application layer via the Data-In Delivered confirmation.

Maxtor Corporation, Comment 139

PDF Page 287, 9.2.6.3.2 ST\_TFR1: Target\_Frame\_Router state, fourth paragraph  
Change "(ACK/NAK Not Balanced)" to "Received (ACK/NAK Unbalanced)".

Maxtor Corporation, Comment 140

PDF Page 287, 9.2.6.3.2 ST\_TFR1: Target\_Frame\_Router state, first bulleted list

Change "a hard reset occurs" to "a HARD\_RESET Received confirmation is received." Other Maxtor proposals and comments supplement this change.

Maxtor Corporation, Comment 141

PDF Page 287, 9.2.6.3.2 ST\_TFR1: Target\_Frame\_Router state, third paragraph  
Change "hard reset" to "HARD\_RESET Received confirmation." Other Maxtor proposals and comments supplement this change.

Maxtor Corporation, Comment 142

PDF Page 289, 9.2.6.3.4 ST\_TTS2: Send\_Frame state, 9.2.6.3.4.1 State description

Delete the ninth paragraph ("If the confirmation is Transmission Status (Open Failed) and it includes an I\_T Nexus Lost argument, this state shall send a Nexus Lost confirmation to the application layer.") This information is sent to the application layer via the Data-In Delivered confirmation.

Maxtor Corporation, Comment 143

PDF Page 295, 9.4.2 SMP\_REQUEST frame, first paragraph after Table 102 - SMP\_REQUEST frame format

Change to: "The SMP FRAME TYPE field shall be set to 40h specifying that this is an SMP\_REQUEST frame. If the SMP FRAME TYPE field is not set to 40h, then the target port shall return a FUNCTION RESULT of SMP FUNCTION FAILED in the RESPONSE frame."

Maxtor Corporation, Comment 144

PDF Page 295, 9.4.2 SMP\_REQUEST frame, second paragraph after Table 102 - SMP\_REQUEST frame format

Change to: "The FUNCTION field specifies which function is being requested (see 10.3.1.1). If the value in the FUNCTION field is not supported, then the target port shall return a FUNCTION RESULT of SMP FUNCTION FAILED in the RESPONSE frame."

Maxtor Corporation, Comment 145

PDF Page 295, 9.4.2 SMP\_REQUEST frame, fourth paragraph after Table 102 - SMP\_REQUEST frame format

Change to: "Fill bytes shall be included at the end of the data in the ADDITIONAL REQUEST BYTES field so that the CRC field is aligned on a four byte boundary. The contents of the fill bytes are vendor-specific."

Maxtor Corporation, Comment 146

PDF Page 295, 9.4.2 SMP\_REQUEST frame, third paragraph after Table 102 -

SMP\_REQUEST frame format

Change the parenthetical to "(1 024 bytes of data plus a 24-bytes header plus a 4-byte CRC)."

Maxtor Corporation, Comment 147

PDF Page 296, 9.4.3 SMP\_RESPONSE frame

Add a new second paragraph after Table 103 - SMP\_RESPONSE frame format:

"The FUNCTION field specifies which function is being requested (see 10.3.1.1)."

Maxtor Corporation, Comment 148

PDF Page 296, 9.4.3 SMP\_RESPONSE frame, second paragraph after Table 104 - Function results

Change to: "Fill bytes shall be included at the end of the data in the ADDITIONAL REQUEST BYTES field so that the CRC field is aligned on a four byte boundary. The contents of the fill bytes are vendor-specific."

Maxtor Corporation, Comment 149

PDF Page 296, 9.4.3 SMP\_RESPONSE frame, first paragraph after Table 104 - Function results

Change the parenthetical to "(1 024 bytes of data plus a 24-bytes header plus a 4-byte CRC)."

Maxtor Corporation, Comment 150

PDF Page 313, 10.1.6.1.1 Disconnect-Reconnect mode page overview, second paragraph after Table 119 -Disconnect-Reconnect mode page for SSP

Change to: "The PAGE CODE (PS) field shall be set to 02h and the PAGE LENGTH field shall be set to 0Eh."

Maxtor Corporation, Comment 151

PDF Page 315, 10.1.6.2.2 Protocol-Specific Port mode page - short format

Add a paragraph after Table 121 - Protocol-Specific Port Control mode page for SAS SSP - short format: "The PARAMETERS SAVEABLE (PS) bit is defined in SPC-3."

Maxtor Corporation, Comment 152

PDF Page 315, 10.1.6.2.2 Protocol-Specific Port mode page - short format

Add a paragraph after the description of the SPF field after Table 121 - Protocol-Specific Port Control mode page for SAS SSP - short format: "The PAGE CODE field shall be set to 19h."

Maxtor Corporation, Comment 153

PDF Page 315, 10.1.6.2.2 Protocol-Specific Port mode page - short format, second paragraph after Table 121 -Protocol-Specific Port Control mode page for SAS SSP - short format

Delete OPEN\_REJECT (CONNECTION RATE NOT SUPPORTED). Other comments make it so that this is no longer a reason for I\_T nexus loss.

Maxtor Corporation, Comment 154

PDF Page 316, 10.1.6.2.3 Protocol-Specific Port mode page - Phy Control And Discover subpage

Add a paragraph after Table 122 - Protocol-Specific Port Control mode page for SAS SSP - Phy Control And Discover subpage: "The PARAMETERS SAVEABLE (PS) bit is defined in SPC-3."

Maxtor Corporation, Comment 155

PDF Page 316, 10.1.6.2.3 Protocol-Specific Port mode page - Phy Control And Discover subpage

Add a paragraph after the description of the SPF field after Table 122 - Protocol-Specific Port Control mode page for SAS SSP - Phy Control And Discover subpage: "The PAGE CODE field shall be set to 19h."

Maxtor Corporation, Comment 156

PDF Page 316, 10.1.6.2.2 Protocol-Specific Port mode page - short format, second paragraph after Table 121 -Protocol-Specific Port Control mode page for SAS SSP - short format Delete OPEN\_REJECT (CONNECTION RATE NOT SUPPORTED). See the previous comment.

Maxtor Corporation, Comment 157

PDF Page 322, 10.1.8 SCSI power condition states, first bulleted list



Add a line feed before item a).

Maxtor Corporation, Comment 158

PDF Page 322, 10.1.8 SCSI power condition states, first bulleted list  
Change the text in item a) to: "After power on, if the target device has not received a START STOP UNIT command with the START bit set to zero, the target device transitions to the active power state after receiving an ENABLE SPINUP. The target device transitions to the active state after power on

Maxtor Corporation, Comment 159

PDF Page 322, 10.1.8 SCSI power condition states, first bulleted list  
Change the text in item b) to: "After power on, if the target device receives a START STOP UNIT command with the START bit set to zero before receiving an ENABLE SPINUP, the target device shall wait to transition to the active power state until receiving a START STOP UNIT command with the START bit set to one and an ENABLE SPINUP. This delays the application client's request until the NOTIFY (ENABLE\_SPINUP) arrives."

Maxtor Corporation, Comment 160

PDF Page 324, 10.1.8.2.2 Transition SA\_PC\_1:Active to SA\_PC\_2:Idle, and several other places in this clause  
"FORCE IDLE" is named "FORCE\_IDLE\_0" in the proposal to include this in SBC-2 (02-464).

Maxtor Corporation, Comment 161

PDF Page 324, 10.1.8.2.3 Transition SA\_PC\_1:Active to SA\_PC\_3:Standby, and several other places in this clause  
"FORCE STANDBY" is named "FORCE\_STANDBY\_0" in the proposal to include this in SBC-2 (02-464).

Maxtor Corporation, Comment 162

PDF Page 324, 10.1.8.2.3 Transition SA\_PC\_1:Active to SA\_PC\_3:Standby, bulleted list  
Change item c) to: "the STANDBY bit is set to one in the Power Condition mode page, the standby condition timer is not disabled by a START STOP UNIT command, and the standby condition timer is zero."

Maxtor Corporation, Comment 163

PDF Page 324, 10.1.8.3.3 Transition SA\_PC\_2:Idle to SA\_PC\_3:Standby, bulleted list  
Change item c) to: "the STANDBY bit is set to one in the Power Condition mode page, the standby condition timer is not disabled by a START STOP UNIT command, and the standby condition timer is zero"

Maxtor Corporation, Comment 164

PDF Page 325, 10.1.8.4.3 Transition SA\_PC\_3:Standby to SA\_PC\_5:Active\_Wait, bulleted list  
Add an item to the list: "a START STOP UNIT command with the START bit set to one is received."

Maxtor Corporation, Comment 165

PDF Page 325, 10.1.8.5.2 Transition SA\_PC\_4:Stopped to SA\_PC\_3:Standby, bulleted list  
Add an item to the list: "a START STOP UNIT command with the POWER CONDITION field set to FORCE\_STANDBY\_0 is received."

Maxtor Corporation, Comment 166

PDF Page 326, 10.1.8.5.4 Transition SA\_PC\_4:Stopped to SA\_PC\_6:Idle\_Wait, bulleted list  
Add an item to the list: "a START STOP UNIT command with the POWER CONDITION field set to FORCE\_IDLE\_0 is received."

Maxtor Corporation, Comment 167

PDF Page 326, 10.1.8.6.3 Transition SA\_PC\_5:Active\_Wait to SA\_PC\_3:Standby, bulleted list  
Change item c) to: "the IDLE bit is set to zero in the Power Condition mode page, the STANDBY bit is set to one in the Power Condition mode page, the standby condition timer is not disabled by a START STOP UNIT command, and the standby condition timer is zero."

Maxtor Corporation, Comment 168

PDF Page 326, 10.1.8.6.3 Transition SA\_PC\_5:Active\_Wait to SA\_PC\_3:Standby, bulleted list

Add item d) to the list: "the IDLE bit is set to zero in the Power Condition mode page, the STANDBY bit is set to one in the Power Condition mode page, the standby condition timer is zero, and a command completes."

Maxtor Corporation, Comment 169

PDF Page 326, 10.1.8.6.5 Transition SA\_PC\_5:Active\_Wait to SA\_PC\_6:Idle\_Wait, bulleted list

Add item d) to the list: "the IDLE bit is set to one in the Power Condition mode page, the idle condition timer is not disabled by a START STOP UNIT command, and the idle condition timer is zero."

Maxtor Corporation, Comment 170

PDF Page 326, 10.1.8.7.3 Transition SA\_PC\_6:Idle\_Wait to SA\_PC\_3:Standby, bulleted list

Change item c) to: " the IDLE bit is set to zero in the Power Condition mode page, the STANDBY bit is set to one in the Power Condition mode page, the standby condition timer is not disabled by a START STOP UNIT command, and the standby condition timer is zero."

Maxtor Corporation, Comment 171

PDF Page 326, 10.1.8.7.3 Transition SA\_PC\_6:Idle\_Wait to SA\_PC\_3:Standby, bulleted list

Add item d) to the list: "the IDLE bit is set to zero in the Power Condition mode page, the STANDBY bit is set to one in the Power Condition mode page, the standby condition timer is zero, and a command completes."

Maxtor Corporation, Comment 172

PDF Page 330, 10.3.1.2 REPORT GENERAL function

Add two paragraphs after Table 130 - REPORT GENERAL request:

- 1) "The SMP FRAME TYPE field shall be set to 40h (see 9.4.2)." and
- 2) "The FUNCTION field shall be set to 00h (see 9.4.2)."

Maxtor Corporation, Comment 173

PDF Page 331, 10.3.1.2 REPORT GENERAL function

Add two paragraphs after Table 131 - REPORT GENERAL response:

- 1) "The SMP FRAME TYPE field shall be set to 41h." and
- 2) "The FUNCTION field shall be set to 00h."

Maxtor Corporation, Comment 174

PDF Page 331, 10.3.1.2 REPORT GENERAL function, paragraph before Table 131 - REPORT GENERAL response

Remove the indent from, remove the bulleted number from, and add a line feed after this sentence.

Maxtor Corporation, Comment 175

PDF Page 332, 10.3.1.3 REPORT MANUFACTURER INFORMATION function

Add two paragraphs after Table 132 - REPORT MANUFACTURER INFORMATION request

- 1) "The SMP FRAME TYPE field shall be set to 40h (see 9.4.2)." and
- 2) "The FUNCTION field shall be set to 01h (see 9.4.2)."

Maxtor Corporation, Comment 176

PDF Page 332, 10.3.1.2 REPORT GENERAL function, fifth paragraph after Table 131 - REPORT GENERAL response

Change the first part of the sentence from, "If an edge expander device supports an expander route table, then..." to "For an edge expander device, as an edge expander shall support this field."

Maxtor Corporation, Comment 177

PDF Page 332, 10.3.1.2 REPORT GENERAL function, sixth paragraph after Table 131 - REPORT GENERAL response

Change the first part of the sentence from, "If a fanout expander device supports an expander route table, then..." to "For an fanout expander device," as a fanout expander shall support this field.

Maxtor Corporation, Comment 178

PDF Page 333, 10.3.1.3 REPORT MANUFACTURER INFORMATION function

Add two paragraphs after Table 133 - REPORT MANUFACTURER INFORMATION response

- 1) "The SMP FRAME TYPE field shall be set to 41h." and
- 2) "The FUNCTION field shall be set to 01h."

Maxtor Corporation, Comment 179

PDF Page 333, 10.3.1.3 REPORT MANUFACTURER INFORMATION function

After Table 133 - REPORT MANUFACTURER INFORMATION response: delete the paragraph describing the ADDITIONAL LENGTH field, as there is no field of this name in table 133.

Maxtor Corporation, Comment 180

PDF Page 334, 10.3.1.4 DISCOVER function

Add two paragraphs after Table 134 - DISCOVER request:

- 1) "The SMP FRAME TYPE field shall be set to 40h (see 9.4.2)." and
- 2) "The FUNCTION field shall be set to 10h (see 9.4.2)."

Maxtor Corporation, Comment 181

PDF Page 335, 10.3.1.4 DISCOVER function

Add two paragraphs after Table 134 - DISCOVER response:

- 1) "The SMP FRAME TYPE field shall be set to 41h." and
- 2) "The FUNCTION field shall be set to 10h."

Maxtor Corporation, Comment 182

PDF Page 336, 10.3.1.4 DISCOVER function, after Table 137 - Routing attributes

Move the description of the ATTACHED DEVICE TYPE field to be before the description of the ROUTING ATTRIBUTE field so that they are in the common-practice order of their appearance in the table (i.e., top to bottom and left to right).

Maxtor Corporation, Comment 183

PDF Page 336, 10.3.1.4 Discover, paragraph after Table 138 - Attached device types

The second sentence is unclear. Reword this to be something like: "The negotiated physical link rate may be less than the programmed minimum physical link rate or greater than the programmed maximum physical link rate if one of the programmed rates has been changed since the link reset sequence."

Maxtor Corporation, Comment 184

PDF Page 337, 10.3.1.4 DISCOVER function

Part one: change the order of the following field descriptions so that they are in the common-practice order of their appearance in the table (i.e., top to bottom and left to right): PROGRAMMED MINIMUM PHYSICAL LINK RATE, HARDWARE MINIMUM PHYSICAL LINK RATE, PROGRAMMED MAXIMUM PHYSICAL LINK RATE, and HARDWARE MAXIMUM PHYSICAL LINK RATE.

Maxtor Corporation, Comment 185

PDF Page 337, 10.3.1.4 Discover, paragraph after Table 138 - Attached device types

Part two of the previous comment, and move this part of the sentence to be with the previous part.

Maxtor Corporation, Comment 186

PDF Page 338, 10.3.1.4 DISCOVER function

Part two: change the order of the following field descriptions so that they are in the common-practice order of their appearance in the table (i.e., top to bottom and left to right): PROGRAMMED MINIMUM PHYSICAL LINK RATE, HARDWARE MINIMUM PHYSICAL LINK RATE, PROGRAMMED MAXIMUM PHYSICAL LINK RATE, and HARDWARE MAXIMUM PHYSICAL LINK RATE.

Maxtor Corporation, Comment 187

PDF Page 338, 10.3.1.5 REPORT PHY ERROR LOG function

Add two paragraphs after Table 141 - REPORT PHY ERROR LOG request:

- 1) "The SMP FRAME TYPE field shall be set to 40h (see 9.4.2)." and
- 2) "The FUNCTION field shall be set to 11h (see 9.4.2)."

Maxtor Corporation, Comment 188

PDF Page 338, 10.3.1.5 REPORT PHY ERROR LOG function, first paragraph after

## Table 141 - REPORT PHY ERROR LOG request

Add a sentence to the paragraph: "If the value is not within the range of zero to NUMBER OF PHYS (see 9.4.4.2), the target port shall return a FUNCTION RESULT of SMP FUNCTION FAILED in the response frame."

## Maxtor Corporation, Comment 189

PDF Page 339, 10.3.1.5 REPORT PHY ERROR LOG function

Add two paragraphs after Table 142 - REPORT PHY ERROR LOG response:

- 1) "The SMP FRAME TYPE field shall be set to 41h." and
- 2) "The FUNCTION field shall be set to 11h."

## Maxtor Corporation, Comment 190

PDF Page 340, 10.3.1.6 REPORT PHY SATA function

Add two paragraphs after Table 144 - REPORT PHY SATA request:

- 1) "The SMP FRAME TYPE field shall be set to 40h (see 9.4.2)." and
- 2) "The FUNCTION field shall be set to 12h (see 9.4.2)."

## Maxtor Corporation, Comment 191

PDF Page 340, 10.3.1.5 REPORT PHY ERROR LOG function

Add the following paragraph after the paragraph describing the FUNCTION RESULT field: "The PHY IDENTIFIER field indicates the phy (see 4.2.6) for which physical configuration link information is being returned."

## Maxtor Corporation, Comment 192

PDF Page 340, 10.3.1.5 REPORT PHY ERROR LOG function, the three paragraphs below Table 143 - Function results for REPORT PHY ERROR LOG

Delete the parentheses around the phrase "outside of phy reset sequences".

## Maxtor Corporation, Comment 193

PDF Page 341, 10.3.1.6 REPORT PHY SATA function

Add two paragraphs after Table 145 - REPORT PHY SATA response:

- 1) "The SMP FRAME TYPE field shall be set to 41h." and
- 2) "The FUNCTION field shall be set to 12h."

## Maxtor Corporation, Comment 194

PDF Page 341, 10.3.1.6 REPORT PHY SATA function, first paragraph after Table 144 - REPORT PHY SATA request

Add a sentence to the paragraph: "If the value is not within the range of zero to NUMBER OF PHYS (see 9.4.4.2), the target port shall return a FUNCTION RESULT of SMP FUNCTION FAILED in the response frame."

## Maxtor Corporation, Comment 195

PDF Page 342, 10.3.1.6 REPORT PHY SATA function

Add the following paragraph after Table 146 - Function results for REPORT PHY SATA: "The PHY IDENTIFIER field indicates the phy (see 4.2.6) for which physical configuration link information is being returned."

## Maxtor Corporation, Comment 196

PDF Page 342, 10.3.1.7 REPORT ROUTE INFORMATION function, first paragraph  
In the last sentence, delete "primarily".

## Maxtor Corporation, Comment 197

PDF Page 343, 10.3.1.7 REPORT ROUTE INFORMATION function

Add two paragraphs after Table 147 - REPORT ROUTE INFORMATION request:

- 1) "The SMP FRAME TYPE field shall be set to 40h (see 9.4.2)." and
- 2) "The FUNCTION field shall be set to 13h (see 9.4.2)."

## Maxtor Corporation, Comment 198

PDF Page 344, 10.3.1.7 REPORT ROUTE INFORMATION function

Add two paragraphs after Table 148 - REPORT ROUTE INFORMATION response:

- 1) "The SMP FRAME TYPE field shall be set to 41h." and
- 2) "The FUNCTION field shall be set to 13h."

## Maxtor Corporation, Comment 199

PDF Page 346, 10.3.1.8 CONFIGURE ROUTE INFORMATION function

Add two paragraphs after Table 150 - CONFIGURE ROUTE INFORMATION request:

- 1) "The SMP FRAME TYPE field shall be set to 40h (see 9.4.2)." and
- 2) "The FUNCTION field shall be set to 90h (see 9.4.2)."

## Maxtor Corporation, Comment 200

PDF Page 347, 10.3.1.8 CONFIGURE ROUTE INFORMATION function

Add two paragraphs after Table 151 - CONFIGURE ROUTE INFORMATION response:

- 1) "The SMP FRAME TYPE field shall be set to 41h." and
- 2) "The FUNCTION field shall be set to 90h (see 9.4.2)."

Maxtor Corporation, Comment 201

PDF Page 348, 10.3.1.9 PHY CONTROL function

Add two paragraphs after Table 153 - PHY CONTROL request:

- 1) "The SMP FRAME TYPE field shall be set to 40h (see 9.4.2)." and
- 2) "The FUNCTION field shall be set to 91h (see 9.4.2)."

Maxtor Corporation, Comment 202

PDF Page 348, 10.3.1.9 PHY CONTROL function

After Table 153 - PHY CONTROL request: move the paragraph describing the CRC field to the end of the clause so that it is in the common-practice order of its appearance in the table (i.e., top to bottom and left to right).

Maxtor Corporation, Comment 203

PDF Page 348, 10.3.1.9 PHY CONTROL function, first paragraph after Table 153 - PHY CONTROL request

Add a sentence to the paragraph: "If the value is not within the range of zero to NUMBER OF PHYS (see 9.4.4.2), the target port shall return a FUNCTION RESULT of SMP FUNCTION FAILED in the response frame."

Maxtor Corporation, Comment 204

PDF Page 350, 10.3.1.9 PHY CONTROL function

Add two paragraphs after Table 156 - PHY CONTROL response:

- 1) "The SMP FRAME TYPE field shall be set to 41h." and
- 2) "The FUNCTION field shall be set to 91h."

Maxtor Corporation, Comment 205

PDF Page 352, A.1 Compliant jitter test pattern (CJTPAT), first paragraph

In the first sentence change "low-density pattern" to "low transition density pattern" in two places.

Maxtor Corporation, Comment 206

PDF Page 352, A.1 Compliant jitter test pattern (CJTPAT), paragraph below Table A.1- CJTPAT for RD+

Change this paragraph to be something like: "If the same 8b characters are used when there is negative running disparity (RD-) and when there is positive running disparity, the resulting 10b pattern generated for each disparity type is different. 8b characters used when there is RD- may not provide the critical phase shifts as the same characters used when there is RD+. To achieve the same phase shift effects with RD- as with RD+, a different 8b pattern is required to be used for each disparity type."

Maxtor Corporation, Comment 207

PDF Page 417, Annex J, Figure J.1 - SAS Logo

Replace the old logo with the new logo.

\*\*\*\*\*

Comments attached to No ballot from Rob Haydt of  
Microsoft Corp.:

### 9.3.2 SATA tunneling for multiple initiator ports

The affiliation mechanism creates a policy that encourages initiators to fight over resources. The policy that multiple initiators shouldn't be actively connecting to an STP target shouldn't be enforced by hardware. It should be a usage convention.

\*\*\*\*\*

Comments attached to No ballot from Paul Entzel of

Quantum Corp.:

1. (T) Section 4.1.3, second paragraph (unordered list). It is unclear in the standard, but I don't think Phys don't have SAS addresses. This wording needs improvement to indicate exactly what the SAS Address in question is assigned to.
2. (T) Section 4.2.1, first paragraph. In FCP-2, the device (node) is allowed to share the same name as LUN 0. Is that true for SAS also?
3. (T) Section 4.2.6, first paragraph. Should be "6-bit".
4. (T) Section 4.3, entire section. These state machines do not belong in this standard as normalized text. The standard should be specifying observable behavior, not implementation such as this.
5. (E) Table 12, there are 2 cases of missing ")".
6. (E) Table 15, there are 2 cases of missing ")".
7. (T) Section 4.4.2, last paragraph. The additional sense code "HARD RESET OCCURRED" does not exist.
8. (T) Section 4.6.1, first paragraph unordered list, item c. This sounds like it forbids an expander from supporting only wide ports with multiple phys per port.
9. (E) Section 4.6.2, third paragraph. Change the second sentence to "If an expander device contains more than one internal SMP port, more than one internal SSP port, or more than one internal STP port, the additional ports shall include SAS addresses different from that of the expander device."
10. (E) Section 7.1.4.6, second paragraph. Reference is wrong - should be 7.7.
11. (E) Section 7.1.4.12, second paragraph. Reference is wrong - should be 7.7.
12. (T) Section 7.7.2, seventh paragraph after table 73. Shouldn't this be "the SAS Address of the port transmitting the IDENTIFY address frame"?
13. (T) Section 7.8.1, fourth paragraph. In section 7.7.2, the SAS ADDRESS field is defined as belonging to the device, not the port. Here it looks like the port's SAS Address. If it is not the port's SAS address, but is in fact the device's SAS Address, this statement is incorrect and it is not possible to detect that multiple Phys are attached to the same port using the SAS Address. If instead a Phy is supposed to report the SAS Address of the port it is attached to, then expander devices will need to assign a unique SAS Address to each port.
14. (E) Section 7.8.6. Hanging paragraphs, add a level 3 subclause heading.
15. (E) Section 7.8.6, last paragraph. The wording of the second sentence is unclear, and it occurs at least twice in the document. I think it is trying to limit the frame length for the purpose of ignoring primitives to cover the case where the EOAF is missed. Better wording is: "For the purpose of ignoring primitives, IDENTIFY frames consist of a SOAF followed by a maximum of 8 dwords and an EOAF."
16. (T) Section 7.8.6.1.2.1. States can't take action. The state machine can take action while in a state or when entering or leaving a state. Even better, the port can take an action when the state machine is in a state, or when it (the state machine) transitions into or out of a state. This issue is prevalent in these state machine descriptions.
17. (E) Section 7.12.1, second paragraph. What about XFER\_RDY?
18. (E) Section 7.12.2.1, third paragraph. The term "connection response" is used in this paragraph without definition. The term "connection request response" is defined in the next subclause. Are these the same?

19. (E) Section 7.12.2.1, third paragraph. The method of performing timeouts is vendor specific and should not be specified this way. Fix the wording so that timeout periods are used rather than timers.
20. (E) Section 7.12.2.1, forth paragraph. There is a double negative in the second sentence that confuses the meaning.
21. (E) Section 7.12.2.1, forth paragraph, last sentence. Change "Rate matching is used on any..." to "Rate matching shall be used on any..."
22. (T) Section 7.12.2.2, last paragraph. The first paragraph in subclause 7.16.1 describes another reason for sending an OPEN\_REJECT.
23. (T) Section 7.13 and 7.14. The state machines described in subclauses 7.13 and 7.14 are implementation details that are vendor specific and should not be included as normative text within a T10 standard. This standard should be limited to specifying observable behavior and refrain from specifying implementation.
24. (T) Section 7.16.5, the paragraph before figure 79. The term "back channel" and "backchannel" is used here without definition.
25. (E) Section 7.16.6, unordered list. "unbalanced", "imbalanced", "nonbalanced" and "not balanced" are all terms that are used throughout the document. Should look for one consistent, defined term.
26. (T) Subclause 7.16.7 describes an implementation of subclauses 7.16.1 through 7.16.6. This is inappropriate for normative text and should be removed.
27. (T) Section 7.18.1, first paragraph. Several of the management functions may require software or firmware intervention. No provision is included to break the connection and free the resource while this intervention takes place. This could lead to serious performance degradation in SAS networks.
28. (T) Section 7.18.1, last paragraph. What is the action for frames with less than 8 bytes and good CRC?
29. (T) Section 7.18.2, second sentence. What should the source expect to receive if it transmits more than 1 request?
30. (T) Subclause 7.18.4 describes an implementation of subclauses 7.18.1 through 7.18.3. This is inappropriate for normative text and should be removed.
31. (E) Section 9.1. Change "...that are going to be ACKed..." to "that are ACKed..."
32. (T) Table 88. TIMEOUT bit should be RETRANSMIT bit.
33. (T) Table 89. Data frames are 1 to 1024 bytes (can't have zero length data frame).
34. (T) Section 9.1, forth paragraph after table 89. The frame can be retransmitted after receiving a NAK also.
35. (E) Section 9.1, seventh paragraph after table 89. I don't understand the last sentence in this paragraph.
36. (E) Section 9.2.2.1, first paragraph after table 90. The rules for handling commands sent to logical units that do not exist are defined in SAM-2, not SPC-2.
37. (T) Section 9.2.2.1. What is the correct response to a COMMAND frame with a TASK ATTRIBUTE field value that is not supported by the logical unit?
38. (T) Section 9.2.2.1, second paragraph after table 91. Defining fields to be reserved generally means they must be tested for zero. Change the second sentence from "Any bytes between the end of the CDB and the end of the two fields are reserved" to "Any bytes between the end of the CDB and the end of these two field shall be ignored". Change the last sentence to "...the remaining ten bytes shall be ignored and the..."
39. (T) Section 9.2.2.2, paragraph preceding table 93. I could find no rules

for handling task management

functions addressed to logical units that do not exist in either SPC-2 or SAM-2.

40. (E) Table 93. Why is 20h spelled out here with the "all others" below indicating "reserved"?

41. (T) Section 9.2.2.2, first paragraph after table 93. What if a valid TMF is not supported?

42. (T) Section 9.2.2.2, third paragraph after table 93. What is returned if the task with TAG OF TASK TO BE MANAGED is in the task set?

43. (T) Section 9.2.2.3, first paragraph after table 94. This is confusing to have RELATIVE OFFSET field in the payload of the frame and a field with exactly the same name in the header of the frame. Recommend that this field be removed and the RELATIVE OFFSET field in the frame header be used for this purpose.

44. (T) Section 9.2.2.3, first paragraph after table 94. Link to section doesn't work.

45. (T) Section 9.2.2.3, second paragraph after table 94. The last sentence in this paragraph should be "...the target port shall set the WRITE DATA LENGTH field to less than or equal to the value in the MAXIMUM BURST SIZE field times 512 (see 10.1.6.14)."

46. (T) Section 9.2.2.3, fourth paragraph after table 94. Change the first sentence in this paragraph to: "...set the relative offset to 512 times the value of the FIRST BURST SIZE field in the Disconnect-Reconnect mode page (see 10.1.1.1.5). Fix the link to the section.

47. (E) Section 9.2.2.4, first paragraph after note 23. This paragraph is redundant with the first 2 paragraphs on this page. We get it already.

48. (T) Table 99. A command frame that does not have an invalid field value will not return a RESPONSE IU with RESPONSE\_DATA format, but will instead use the SENSE\_DATA format.

This means that option 'a' under Code 0 is not required. It would also be helpful to add a paragraph explaining this behavior to the subclause.

49. (T) Section 9.2.2.5.4, fourth paragraph. Add statement that the NUMBER OF FILL BYTES field in the frame header shall indicate the number of fill bytes added.

50. (T) Section 9.2.4.3, second paragraph. The lack of an ability to recover from these types of errors at the link level will preclude the use of this interface on devices other than disk drives. When this shortcoming is solved in the next generation of SAS, it will create interoperability issues that will hinder the acceptance of this interface. Quantum has produced a proposal (02-487) that will solve this problem that should be included before forwarding SAS.

51. (T) Section 9.2.4.4, first paragraph. The lack of an ability to recover from these types of errors at the link level will preclude the use of this interface on devices other than disk drives. When this shortcoming is solved in the next generation of SAS, it will create interoperability issues that will hinder the acceptance of this interface. Quantum has produced a proposal (02-487) that will solve this problem that should be included before forwarding SAS.

52. (T) Section 9.2.5.1, fifth paragraph. What is to be done with a COMMAND frame with an unsupported TASK ATTRIBUTE value?

53. (E) Section 9.25.2, third paragraph. An initiator always has the option of sending a TASK frame with an ABORT TASK or ABORT TASK SET task management function. Perhaps it would be better to remove the recurring statements and add a paragraph that states that an initiator may use this means to abort the task when an error is detected with it.



54. (T) Subclause 9.2.6 describes an implementation of subclauses 9.2.1 through 9.2.5. This is inappropriate for normative text and should be removed.
55. (T) Section 9.4.2, second paragraph after table 102. Where is FUNCTION described?
56. (T) Section 9.4.2, third paragraph after table 102. Should be 1 024 bytes based on description of max size frame?
57. (T) Section 9.4.3, first paragraph after table 104. Should be 1 024 bytes based on description of max size frame?
58. (T) Subclause 9.4.4 describes an implementation of subclauses 9.4.1 through 9.4.3. This is inappropriate for normative text and should be removed.
59. (T) Table 108. There is no RSPVALID field in the RESPONSE frame.
60. (T) Table 109. There is no RSPVALID field in the RESPONSE frame.
61. (T) Table 116. There are no RSPVALID or SNSVALID fields in the RESPONSE frame.
62. (T) Table 117. There are no RSPVALID or SNSVALID fields in the RESPONSE frame.
63. (T) Section 10.1.3, last paragraph and unordered list. This paragraph is placing a requirement on an application client that involves knowledge of activities not seen at that level.
64. (T) Section 10.1.5. Without a port login, the only method available to associate persistent reservation to an initiator port is to use the hashed source address. A statement to clarify this should be added in this subclause. What action should be taken in cases where a conflict exists?
65. (T) Section 10.1.5. Similar to SPI, there is no port login function that can be used by a device to manage each I\_T nexus. Unlike SPI, SAS networks can be configured with hundreds of initiators. How does a device report an error caused by receipt of a command from an initiator when no more resources are available to manage a new I\_T nexus?
66. (T) Section 10.1.6.1.1. Unfortunately, there is precedence for this. However, mode pages are a bad way to configure the transport layer. It requires too much information be shared between layers and between logical units, which should not be sharing information. A much better method of configuring the transport layer was introduced when port logins were added, and that is exactly where the parameters included in this page belong. Unfortunately again, this transport layer does not include the concept of a port login, a shortcoming that will undoubtedly be corrected in future versions causing great interoperability issues for years to come.
67. (E) Section 10.1.6.1.5, first paragraph. The wording of the last sentence is confusing. Try replacing "... where the transfer length is specified in the WRITE DATA LENGTH field" with "where the WRITE DATA LENGTH field is equal to 512 times the FIRST BURST SIZE."
68. (T) Section 10.1.6.1.5, forth paragraph. The last sentence in this paragraph should be removed or the term "this connection" should be clarified.
69. (T) Table 122. What happened to byte 2 and 3?
70. (T) Section 10.1.6.2.2. A description for the PAGE LENGTH field should be added that states the PAGE LENGTH shall be equal to the (NUMBER OF PHYS value times the SAS phy mode descriptor length) plus 2 and is not adjusted for truncation.
71. (E) Section 10.3.1.2, paragraph immediately preceding table 131. This paragraph should not be numbered.
72. (T) Section 10.3.1.4, the paragraphs below table 139 that describe the SAS ADDRESS field. According to the definition of SAS Address in 3.1.99, Phys don't have SAS

Addresses. These must be

either the SAS address of the Port or the device.

73. (E) Section 10.3.1.7, third paragraph below table 147. Reference numbers need to be fixed.

74. (E) Section 10.3.1.8, third paragraph after table 150. Reference numbers need to be fixed.

75. (T) Annex D. This annex indicates that hashed address collisions should be very infrequent, but they will still happen. What action is taken when a collision is detected?

\*\*\*\*\*

Comments attached to No ballot from Gerald Houlder of  
Seagate Technology:

Seagate #1 [JC]

PDF Page 9

1.19 Revision sas-r02c (21 November 2002)

"sas-r02c"

s. b.

"sas-r03"

Seagate #2 [GH]

PDF Page 41

3.1.25 device: A physical entity.

Delete this definition of device. SAM-x, SPC-x, SPI-x, etc. have gotten along fine without defining device even though they all use the word hundreds of times. The given definition is so broad that it isn't helpful anyway.

Seagate #3 [GH]

PDF Page 41

Synonymous with SAS domain.

The definition for domain should be more general purpose because several types of domains are referred to in SAS. Use the definition of domain from SAM-2 -- "An I/O system consisting of a set of devices that interact with one another by means of a service delivery subsystem" with the acronym SCSI removed so the definition can be applied to "ATA domain" which also appears in this draft.

Seagate #4 [GH]

PDF Page 42

expander connection router (ER):

Change ER to ECR to be consistent with other references to this item.

Seagate #5 [GH]

PDF Page 43

Synonymous with

This is not accurate or useful. use the generic "initiator device" description here (which can also be applied to ATA initiator device) and change "SAS initiator device" to "an initiator device in SAS domain".

Seagate #6 [GH]

PDF Page 43

Synonymous with

This is not accurate or useful. use the generic "initiator port" description here (which can also be applied to ATA initiator port) and change "SAS initiator port" to "an initiator port in SAS domain".

Seagate #7 [GH]

PDF Page 44

higher layer state machine to a lower layer

This wording is identical to "request" definition!! I think you mean "lower

layer state machine to higher layer"

Seagate #8 [GH]  
 PDF Page 45  
 defined by SATA.  
 replace with "protocol defined by SATA industry group".

Seagate #9 [GH]  
 PDF Page 46  
 Synonymous with  
 This is not accurate or useful. use the generic "target device" description here (which can also be applied to ATA target device) and change "SAS target device" to "a target device in SAS domain".

Seagate #10 [GH]  
 PDF Page 46  
 Synonymous with  
 This is not accurate or useful. use the generic "target port" description here (which can also be applied to ATA target port) and change "SAS target port" to "a target port in SAS domain".

Seagate #11 [JC]  
 PDF Page 46  
 Global: To be compatible with ATA terminology  
 STP initiator port  
 s. b.  
 STP host port

Seagate #12 [JC]  
 PDF Page 46  
 Global: To be compatible with ATA terminology  
 STP target port  
 s. b.  
 STP device port

Seagate #13 [GH]  
 PDF Page 48  
 millisecond (10-6 seconds)  
 Should be 10-3 seconds.

Seagate #14 [JC]  
 PDF Page 48  
 3.2 Symbols and abbreviations  
 The - 3 in the abbreviation for SCSI s. b. dropped to be consistent with 1 Scope.

Seagate #15 [GH]  
 PDF Page 49  
 not::  
 remove the extra : after the word not.

Seagate #16 [GH]  
 PDF Page 50  
 Fields containing only one bit are usually referred to as the name bit instead of the name field.  
 Remove this sentence - it is redundant with sentence 2 paragraphs earlier (paragraph starting with "Names of fields are ..").

Seagate #17 [JW]  
 PDF Page 51  
 3.5.1 -State Machine Conventions overview  
 Figure 3 - State machine conventions  
 Change <State designator: State\_name>  
 to "STATE DESIGNATOR: State\_Name"  
 also change SMP state machine names to agree with this (Fig 88, 89) and associated text

Seagate #18 [JW]

PDF Page 51

3.5.2 Transitions

change <label, a brief>

to "label, or a brief"

Seagate #19 [JW]

PDF Page 51

State designator: State\_name

Seagate #20 [JW]

PDF Page 51

State designator: State\_name

Seagate #21 [JW]

PDF Page 51

State designator: State\_name

Seagate #22 [GH]

PDF Page 56

8b10b coded

This term should be defined in definitions clause (3.1).

Seagate #23 [GH]

PDF Page 56

a SAS

Replace with "a different SAS".

Seagate #24 [JW]

PDF Page 56

4.1.2 Physical links and phys

change <(see 6.1)>

to ???

(the reference is to "dwords" but 6.1 is "Phy layer overview" and not about  
dwords)

Seagate #25 [JC]

PDF Page 56

Change:

are

To:

is

Seagate #26 [JW]

PDF Page 59

4.1.6 Target devices

I think this wording <or STP> should be deleted,

Seagate #27 [JW]

PDF Page 59

4.1.6 Target devices

I think this wording <, and STP target ports> should be deleted

Seagate #28 [JW]

PDF Page 59

4.1.6 Target devices

I think this wording <, STP> should be deleted

Seagate #29 [GH]

PDF Page 62

are not required to

Change to "do not". I contend that something that translates SSP to SATA is  
a bridge device, not an  
expander.

Seagate #30 [GH]

PDF Page 64

Should there be more rules to define an "edge expander device set"? For  
instance, it is not clear to

me why this group of 6 edge expander devices is considered to be two edge expander device sets instead of one edge expander device set. I'm sure there must be a way to connect the 6 edge expander devices so that they are considered to be one expander device set.

Seagate #31 [GH]  
 PDF Page 65  
 port(s);  
 change to "port(s) using SSP;".

Seagate #32 [GH]  
 PDF Page 65  
 Should an example d) be added to describe a SCSI initiator port to expander port(s) using SMP?  
 If this is interpreted as a complete list of allowed connection types, the example must be added.

Seagate #33 [JC]  
 PDF Page 65  
 4.1.11 Connections  
 Change:  
 to  
 To:  
 the

Seagate #34 [JW]  
 PDF Page 70  
 4.3.1 State machine overview \*\*\*  
 Figure 19 - State machines  
 Figure 20 - Transmit data path and state machines  
 Figure 23 - STP link STP transport and ATA application layers state machines  
 For the STP paths, these state machines are only valid for the initiator device. Also, the STP transport layer and the STP link layer are not documented in this document, and these layers are not the same as the SATA defined layers because they must interface to the SAS port layer in order to get a port assigned for the transmit function. This is a big hole in this document. In addition this figure is not valid for target devices. The target device can only be a SATA device with a SATA link layer (which does not support sending or receiving SAS address frames - which gets you in and out of the SAS link layer (SL)). There is also no port layer in a SATA device. the SATA devices have no concept of ports or SAS addressing. Note: These comments are also applicable to figures 20 and 23.

Seagate #35 [JW]  
 PDF Page 71  
 4.3.2 Transmit data path  
 Figure 20 transmit data path and state machines  
 This picture should have a port layer box between each transport and link layer box

Seagate #36 [JW]  
 PDF Page 72  
 4.3.2 Transmit data path  
 change <link, SSP>  
 to "link, SSP port, SSP"

Seagate #37 [JW]  
 PDF Page 72  
 4.3.2 Transmit data path  
 Figure 21 title  
 change <link, SSP>  
 to "link, SSP port, SSP"

Seagate #38 [JW]  
 PDF Page 73  
 4.3.2 Transmit data path  
 chnge <link, SMP>  
 to "link, SMP port, SMP"

Seagate #39 [JW]  
 PDF Page 73  
 4.3.2 Transmit data path  
 Figure 22 title  
 change <link, SMP>  
 to "link, SMP port, SMP"

Seagate #40 [JW]  
 PDF Page 73  
 4.3.2 Transmit data path  
 figure 22 SMP link, SMP transprt ...  
 Should't there be a "DONE" box and line like in figure 21 ???

Seagate #41 [JW]  
 PDF Page 74  
 4.3.2 Transmit data path  
 chnge <link, STP>  
 to "link, STP port, STP"

Seagate #42 [JW]  
 PDF Page 74  
 4.3.2 Transmit data path  
 Figure 23 title  
 change <link, STP>  
 to "link, STP port, STP"

Seagate #43 [JW]  
 PDF Page 74  
 4.3.2 Transmit data path  
 Figure 23 - STP link, STP transport and ATA application layer state machines  
 Only valid for initiator layer. Figure 23 states that the STP transport and link layer state machines are "based" on the SATA state machines but are not documented - especially on how they interface to the port layer. This figure doesn't really agree with figure 19 - State machines

Seagate #44 [JW]  
 PDF Page 77  
 4.3.3.1 Signals between phy layer and other layers  
 Table 13 - Confirmations between SSP link layer, port layer, and SSP transport layer  
 add "ACK Transmitted" as a confirmation from the link to the port layer and from the port to the transport layer.

Seagate #45 [JW]  
 PDF Page 78  
 4.3.3.3 Signals between link layer, port layer, and transport layer for SMP  
 Table 15 - Confirmations between link layer, port layer, and SMP transport layer  
 remove <Connection Opened (SMP, Source Opened)>  
 (this signal is repeated in Table 16 - Confirmations between link layer and port layer)

Seagate #46 [JW]  
 PDF Page 78  
 4.3.3.3 Signals between link layer, port layer, and transport layer for SMP  
 Table 15 - Confirmations between link layer, port layer, and SMP transport layer  
 remove <Connection Closed (Close Timeout)>. (this signal is repeated in Table 16 - Confirmations between link layer and port layer)

Seagate #47 [JW]

PDF Page 78

4.3.3.3 Signals between link layer, port layer, and transport layer for SMP  
Table 15 – Confirmations between link layer, port layer, and SMP transport  
layer

remove <Connection Closed (Close Timeout)>

(this signal is repeated in Table 16 – Confirmations between link layer and  
port layer

Seagate #48 [JW]

PDF Page 78

Timeout)

Seagate #49 [JW]

PDF Page 78

4.3.3.3 Signals between link layer, port layer, and transport layer for SMP  
Table 15 – Confirmations between link layer, port layer, and SMP transport  
layer

remove <CConnection Closed (Break Received)>

(this signal is repeated in Table 16 – Confirmations between link layer and  
port layer  
Received)

Seagate #50 [JW]

PDF Page 78

4.3.3.3 Signals between link layer, port layer, and transport layer for SMP  
Table 15 – Confirmations between link layer, port layer, and SMP transport  
layer

remove <Connection Closed (Link Broken)>

(this signal is repeated in Table 16 – Confirmations between link layer and  
port layer

Seagate #51 [JW]

PDF Page 78

4.3.3.3 Signals between link layer, port layer, and transport layer for SMP  
Table 15 – Confirmations between link layer, port layer, and SMP transport  
layer

remove <Connection Closed (Normal)>

(this signal is repeated in Table 16 – Confirmations between link layer and  
port layer

Seagate #52 [JW]

PDF Page 78

4.3.3.3 Signals between link layer, port layer, and transport layer for SMP  
Table 15 – Confirmations between link layer, port layer, and SMP transport  
layer

change <Connection Closed> to "Transmission Status (Connection Lost)

Seagate #53 [JW]

PDF Page 78

4.3.3.3 Signals between link layer, port layer, and transport layer for SMP  
Table 15 – Confirmations between link layer, port layer, and SMP transport  
layer

remove <Open Failed (Retry)>

(this signal is repeated in Table 16 – Confirmations between link layer and  
port layer

Seagate #54 [JW]

PDF Page 78

4.3.3.3 Signals between link layer, port layer, and transport layer for SMP  
Table 15 – Confirmations between link layer, port layer, and SMP transport  
layer

remove <Open Failed (Port LayerRequest)>

(this signal is repeated in Table 16 – Confirmations between link layer and  
port layer

Seagate #55 [JW]

PDF Page 84

4.6.1 Expander device model overview

change <SL\_IR primitive processor (BPP);> to  
"broadcast primitive processor (BPP);"

Seagate #56 [AC]

PDF Page 102

5.3.3 SAS internal cable receptacle connector

"only" is unnecessary in this sentence and should be removed.

Seagate #57 [AC]

PDF Page 102

5.3.4 SAS backplane receptacle connector

"only" is unnecessary in this sentence and should be removed.

Seagate #58 [GH]

PDF Page 104

Table 31 defines

change to "Table 31 in clause 5.3.8 defines .." for clarity. Change both occurrences on this page.

Seagate #59 [GH]

PDF Page 105

internal

spelling should be "internal".

Seagate #60 [AC]

PDF Page 105

5.4.1 SAS internal cables

Figure 34 – SAS internal cable assembly and destination pin assignments

P11 is not bidirectional should only have one arrow on the far end.

Seagate #61 [AC]

PDF Page 105

5.4.1 SAS internal cables

Figure 34 – SAS internal cable assembly and destination pin assignments

These grounds should have an arrow on both ends as they are a shield rather than a directional

signal or power function.

Seagate #62 [AC]

PDF Page 105

5.4.1 SAS internal cables

Figure 34 – SAS internal cable assembly and destination pin assignments

These grounds should have an arrow on both ends as they are a shield rather than a directional

signal or power function.

Seagate #63 [AC]

PDF Page 105

5.4.1 SAS internal cables

Figure 34 – SAS internal cable assembly and destination pin assignments

These grounds should have an arrow on both ends as they are a shield rather than a directional

signal or power function.

Seagate #64 [GH]

PDF Page 106

The LED and the current limiting resistor may be external to the target device.

\*\*\*Change this to read " The LED and the current limiting circuitry shall be external to the target device." The standard must definitely state where the current limiting circuitry and the LED are located.

Seagate #65 [JW]

PDF Page 106

5.6 READY LED pin

Table 32 – Output characteristics of the READY LED signal

change <LED off> to

"LED off / negated"



Seagate #66 [JW]  
 PDF Page 106  
 5.6 READY LED pin  
 Table 32 – Output characteristics of the READY LED signal  
 change <LED on> to  
 "LED on / asserted"

Seagate #67 [GH]  
 PDF Page 107  
 operate within  
 \*\*\*Change to "meet". The word within is ambiguous.

Seagate #68 [GH]  
 PDF Page 107  
 that  
 Replace with "this".

Seagate #69 [AC]  
 PDF Page 107  
 5.7.2 General interface specification  
 Change "interoperability" to "compliance"

Seagate #70 [AC]  
 PDF Page 107  
 5.7.2 General interface specification  
 Change "conforming" to "compliant"

Seagate #71 [AC]  
 PDF Page 107  
 5.7.1 Compliance points  
 Change "physical definition" to "description" as this is consistent with  
 the column label in Table 33.

Seagate #72 [GH]  
 PDF Page 108  
 Figures 35 and 36 seem out of place here. Should they be moved to the Test  
 Loads clause or  
 somewhere else?

Seagate #73 [GH]  
 PDF Page 109  
 limits.  
 change to "limits imposed on the signal at that particular compliance  
 point". The added clarification is  
 considered significant by Al Kramer.

Seagate #74 [AC]  
 PDF Page 112  
 5.7.4 Transmitted signal characteristics  
 Table 35 – Transmitted signal characteristics at Tx compliance points  
 \*\*\*  
 Change 133 to 67

Seagate #75 [GH]  
 PDF Page 114  
 \*\*\*The requirements of both notes b and d should be worded the same except  
 for the swept  
 frequency range (first sentence of each note). Combining requirements of  
 both should make both  
 notes look like this:  
 The jitter values given are normative for a combination of deterministic  
 jitter, random jitter, and  
 sinusoidal jitter that receivers shall be able to tolerate without  
 exceeding a BER of 10<sup>-12</sup>. Receivers  
 shall tolerate sinusoidal jitter of  
 progressively greater amplitude at lower frequencies, according to the mask  
 in figure 39 with the  
 same deterministic jitter and random jitter levels as were used in the high  
 frequency sweep.

Seagate #76 [GH]

PDF Page 114

\*\*\*Again the requirements of notes c and e should be combined and applied to both notes:

No value is given for random jitter. For compliance with this standard, the actual random jitter amplitude shall be the value that brings total jitter to the stated value at a probability of 10-12. The additional 0,1 UI of sinusoidal jitter is added to ensure the receiver has sufficient operating margin in the presence of external interference.

Seagate #77 [JC]

PDF Page 123

6.3.3.1 Definitions

Change:

an primitive

To:

a primitive

Seagate #78 [AC]

PDF Page 128

6.4 Bit order

Figure 44 – SAS bit transmission logic

Correct figure so that 16 is horizontal like the rest of the numbers instead of vertical.

Seagate #79 [AC]

PDF Page 131

6.5 Out of band (OOB) signals

Change "SP" to "SAS phy (SP)", as this is the first occurrence.

Seagate #80 [GH]

PDF Page 132

then

Replace with "than".

Seagate #81 [JC]

PDF Page 132

6.5 Out of band (OOB) signals

Change:

proceeding

To:

preceding

Seagate #82 [AC]

PDF Page 132

6.5 Out of band (OOB) signals

This is more clear if the two cases are put in the opposite order and

"then" should be "than". Replace

the highlighted text with:

"A receiver shall not detect the same OOB signal again until it has detected lack of transitions for a

time greater than the proceeding idle time (i.e., a COMINIT negation time for a COMINIT idle time or

a COMSAS negation time for a COMSAS idle time) or has detected a different OOB signal (e.g., if the

idle time changes).

Seagate #83 [GH]

PDF Page 133

COMINIT Completed

This transition is defined here, but is not used anywhere in the SP state machine (figure 56, page 133). Why?

Seagate #84 [AC]

PDF Page 133

6.5 Out of band (OOB) signals

Change "SAS phy (SP)" to "SP"

Seagate #85 [AC]

PDF Page 133

6.5 Out of band (OOB) signals

Figure 47 – OOB signal detection

Bracket 6 is on the wrong side of the burst. It should be at the trailing edge instead of the leading edge.

Seagate #86 [AC]

PDF Page 135

6.6.3 SAS to SATA phy reset sequence

This does not have to be a "legacy" device.

Seagate #87 [JC]

PDF Page 136

6.6.4.1 SAS OOB sequence

Change:

COMSAS,

To:

COMINIT;

Seagate #88 [JW]

PDF Page 137

6.6.4.1 SAS OOB sequence

change <as SAS phy.> to

"as SAS phy B."

Seagate #89 [JC]

PDF Page 137

6.5 Out of band (OOB) signals Figure 51Scenario 2:

The figure shows a sequence, COMINIT from B to COMSAS from A to COMSAS from B. By

definition, B may send its COMSAS after sending and receiving COMINIT. B

may send COMSAS

even if it does not receive a COMSAS from A.

The figure should be changed:

Remove the arrow from A's COMSAS to B's COMSAS and

add an arrow from B's COMINIT to B's COMSAS.

Seagate #90 [JC]

PDF Page 137

6.5 Out of band (OOB) signals Figure 51Scenario 3:

This scenario is not very interesting. It is just a flip of scenario 2.

Delete?

Seagate #91 [JC]

PDF Page 139

6.6.4.2 SAS speed negotiation sequence, Table 49 – SAS speed. .

The value of ALIGN detect timeout maximum needs a tolerance. A minimum value is also required.

The current requirement would allow a phy to not wait.

Seagate #92 [JC]

PDF Page 139

6.6.4.2 SAS speed negotiation sequence, Table 49 – SAS speed. .

Note "a" is not referenced in the table.

Seagate #93 [GH]

PDF Page 141

The specification is not clear and does not have an example (either here or in Annex B) of a Phy that

may only support G2, but not G1. Thus, the speed negotiation window may be as following: G2

rate, G3 rate, then G2 rate (negotiated rate). Or is this protocol allowed?

Seagate #94 [AC]

PDF Page 141

6.6.5 Phy reset sequence after device is attached

GEndr is wrong. Change "into a receptacle." to "onto a plug."

Seagate #95 [AC]

PDF Page 141

#### 6.6.5 Phy reset sequence after device is attached

This explanation needs additional detail to be clear. Make the following changes to the text by adding additional information and deleting "after the attachment".

In this example, SAS phy B is attached to SAS phy A some time before SAS phy B's second hot-plug timeout occurs, but while SAS phy A is still in a hot-plug timeout and unable to detect a valid COMINIT from SAS phy B. SAS phy A completes its hot-plug timeout and transmits COMINIT. SAS phy B's OOB detection circuitry detects a COMINIT, ...

Seagate #96 [GH]

PDF Page 142

COMINIT Completed;

This parameter is not used anywhere in SP state machine.

Seagate #97 [JW]

PDF Page 142

#### 6.6.5 Phy reset sequence after device is attached

Figure 55 – Hot-plug and the phy reset sequence

This figure is not self explanatory. It needs some words to explain what you are trying to portray.

Seagate #98 [AC]

PDF Page 142

#### 6.6.5 Phy reset sequence after device is attached

Figure 55 – Hot-plug and the phy reset sequence

Change "SAS phy A attached to SAS phy B" to "SAS phy B attached to SAS phy A. Phy A and Phy B

Rx signals are not present until this time."

Seagate #99 [AC]

PDF Page 142

#### 6.6.5 Phy reset sequence after device is attached

Figure 55 – Hot-plug and the phy reset sequence

The "Time y" arrowhead should be on the other side of the squiggle to have the event illustrated later in the timing sequence.

Seagate #100 [AC]

PDF Page 142

#### 6.6.5 Phy reset sequence after device is attached

Figure 55 – Hot-plug and the phy reset sequence

The "Time y" arrowhead should be on the other side of the squiggle to have the event illustrated later in the timing sequence.

Seagate #101 [GH]

PDF Page 144

COMSAS

Should be "COMINIT".

SP3: OOB\_AwaitCOMINIT\_Sent state: COMSAS Transmitted should be change to COMINIT Transmitted. There is inconsistency between states: in SP1: OOB\_COMINIT

state, there is an output "Transmit COMINIT" indicating to the SP transmitter to start transmit

COMINIT and wait for COMINIT to be transmitted and/or received. However, this is no output

parameter in the SP7: OOB\_AwaitCOMSAS state to start the COMSAS timer, or an output parameter

in the SP2: OOB\_AwaitCOMX to start the hotplug timer.

Seagate #102 [GH]

PDF Page 148

The descriptions for SP8: SAS\_Start and SP9: SAS\_RateNotSupported indicated that the idle shall be

transmitted during these states. Some of the other state are self-explanatory. However, clearly defining whether idle should be transmitted for the SP14: SAS\_Fail or SP13: SAS\_Pass would be helpful. Additionally, the states such as fallback state and inc\_speed states defined in sas\_r02.pdf make the speed negotiation state machine a lot more clear, but these states are removed in the current version.

Seagate #103 [JW]

PDF Page 148

6.8.3 SAS speed negotiation states

Figure 57 – SAS phy (SP) state machine - SAS speed negotiation states

change <Await\_SNW> to

"AwaitSNW"

(will then be consistent with text)

Seagate #104 [GH]

PDF Page 149

(1) SP19: AwaitingALIGN should be SP19: SATA\_AwaitingALIGN.

(2) This editor's note should be incorporated into the speed negotiation state machine. Additionally, this statement is not very clear whether the DWS state machine should be started for the speed negotiation window (G1 rate, G2 rate, G3 rate, G? rate (negotiated rate)), or the DWS state machine should be started only at the negotiated rate window?

Seagate #105 [JC]

PDF Page 156

6.9 SAS phy dword synchronization (SP\_DWS) state machine

The DWS state machine starts with a state 0. Other state machines start with state 1.

Seagate #106 [JC]

PDF Page 166

7.1.2 Primitive summary, Table 54

It would be better if the 2nd character of the CLS primitives were unique from BREAK, ERROR, and HARD\_RESET. Since there are multiple CLS primitives, the 3rd and 4th characters will be used to distinguish the types. It would be simpler for the hardware if the 2nd character for CLS was unique from the other primitives.  
D02.0

Seagate #107 [JC]

PDF Page 166

7.1.2 Primitive summary, Table 54

It would be better if the 2nd character of the OPEN\_REJECT primitives were the same rather than  
D31.4 and D29.7.

Seagate #108 [JC]

PDF Page 168

7.1.2 Primitive summary, Table 55

It would be better if the 2nd character of the NAK primitives were unique from ACK, CREDIT\_BLOCKED, and RRDY. Since there are multiple NAK primitives, the 3rd and 4th characters will be used to distinguish the types. It would be simpler for the hardware if the 2nd character for CLS was unique from the other primitives.

Seagate #109 [JW]

PDF Page 173

7.1.4.6 E0AF (End of address frame)

change <7.4> to "7.7"

(section 7.4 is about crc)

Seagate #110 [JW]  
 PDF Page 173  
 7.1.4.7 ERROR  
 change <6.9> to o????  
 (6.9 about SAS DWORD synchroni zati on )

Seagate #111 [JW]  
 PDF Page 173  
 7.1.4.9 NOTIFY  
 change <TBD> to a real reference  
 (Should be no TBD's in the spec.)

Seagate #112 [JW]  
 PDF Page 175  
 7.1.4.11 OPEN\_REJECT  
 Table 62 – OPEN\_REJECT retry primi tives  
 change <devices> to "device"

Seagate #113 [JW]  
 PDF Page 176  
 7.1.4.12 SOAF (Start of address frame)  
 change <7.4> to "7.7"

Seagate #114 [JW]  
 PDF Page 177  
 7.1.6.2 SATA\_PMACK, SATA\_PMNAK, SATA\_PMREQ\_P, and SATA\_PMREQ\_S (Power  
 management  
 acknowledgements and requests)  
 change <7.4> to ????  
 (7.4 is about CRC)

Seagate #115 [JC]  
 PDF Page 178  
 7.2 Clock skew management  
 Change: "devices" to: "origi nati ng devi ces"

Seagate #116 [JC]  
 PDF Page 179  
 7.4.1 CRC Overvi ew  
 3rd paragraph  
 "Annex B contains. . ."  
 s.b.  
 "Annex C contains. . ."

Seagate #117 [JC]  
 PDF Page 180  
 7.4.2 CRC generation  
 Add a subclause:  
 7.4.x CRC ini ti al val ue  
 The CRC value shall be ini ti al ized with a value of FFFFFFFFh before the  
 cal cul ati on be gi ns.

Seagate #118 [JW]  
 PDF Page 181  
 7.4.2 CRC generation  
 (last sentence)  
 change <6.5> to correct reference  
 (reference should be to dword flow, 6.5 is about 00B signal s)

Seagate #119 [JW]  
 PDF Page 182  
 7.4.3 CRC checki ng  
 change <6.5> to correct reference  
 (reference should be to dword flow, 6.5 is about 00B signal s)

Seagate #120 [JW]  
 PDF Page 182  
 7.5 Scrambli ng  
 change <6.5> to correct reference

(reference should be to dword flow, 6.5 is about 00B signal s)

Seagate #121 [JC]

PDF Page 182

7.5 Scrambling

There is no endianness to the scrambling process. Scrambling operates on the parallel 32 bits of a dword. Both SAS and SATA process the bits of a dword without regard to the byte significance the same way, lower 16 bits followed by the upper 16 bits.

Delete this sentence and Table 69- Scrambling endianness.

Seagate #122 [JC]

PDF Page 182

7.4.3 CRC Checking

"Annex B contains. . ."

s.b.

"Annex C contains. . ."

Seagate #123 [JC]

PDF Page 182

7.5 Scrambling

Scrambling works for all repeating patterns.

Change:

Long strings of zeros or ones

To:

Long strings of repeating patterns, e.g., all zeros and ones,

Seagate #124 [JC]

PDF Page 182

7.5 Scrambling

change

(i.e., between

frames),

to:

(i.e., between

frames and not sending primitives)

Seagate #125 [JC]

PDF Page 182

7.5 Scrambling

The initialize value is determined by the scrambler implementation, serial or parallel. Also, a

clarification:

Change to:

The data scrambling value shall be initialized at each SOF, SOAF, and SATA\_SOF by both the

transmitter and receiver. The data being transmitted shall be

XORed with the data scrambling value by the transmitter, and the data being received shall be

XORed with the data scrambling value by the receiver. The initial value is selected to produce the

required scrambling value for the first value following a reset, e.g., any SOF or device reset (see

Annex E). For a given dword displacement from the last data scrambling value reset, the data

scrambling value is the same.

Seagate #126 [JC]

PDF Page 188

7.7.3 OPEN address frame

for clarification add:

This support may use rate matching.

Seagate #127 [JC]

PDF Page 189

7.7.3 OPEN address frame

The concept of the scale bit is confusing to implementors. Suggest dropping the scale bit and

describing the behavior of a 16 bit AWT by range:

The ARBITRATION WAIT TIME field indicates how long the port transmitting the OPEN address frame has been waiting for a connection request to be accepted. For values from 0000h to 7FFFh the AWT increments in 1 usec steps. For values from 8000h to FFFFh the AWT increments in 1 msec steps. The maximum value represents 32 767 ms + 32 768  $\mu$ s. Also, delete table 77, the scale bit in table 74.

Seagate #128 [JC]

PDF Page 190

7.8.3 Fanout expander device specific rules

The identify sequence completes of a port by port basis and there is no global indication of when it complete for all ports on the expander.

Suggest:

"After completing the identify sequence on a port, the expander connection manager within a fanout expander device shall be capable of processing connection requests from the attached device on the port. The connection manager may return OPEN\_REJECT (NO DESTINATION) if configuration is not complete."

Seagate #129 [JC]

PDF Page 190

7.8.4 Edge expander device specific rules

same comment as for 7.8.3 -The identify sequence completes of a port by port basis and there is no global indication of when it complete for all ports on the expander.

Suggest:

"After completing the identify sequence on a port, the expander connection manager within a edge expander device shall be capable of processing connection requests from the attached device on the port. The connection manager may return OPEN\_REJECT (NO DESTINATION) if configuration is not complete."

Seagate #130 [JW]

PDF Page 191

7.8.5 Identification and hard reset (SL\_IR) state machines

7.8.5.1 Overview

Figure 67 – SAS Link Layer identification and hard reset (SL\_IR) state machines

Add a pink "out arrow up" with the text "HARD\_RESET Received"

This will agree with Table 18

Seagate #131 [JW]

PDF Page 191

7.8.5 Identification and hard reset (SL\_IR) state machines

7.8.5.1 Overview

Figure 67 – SAS Link Layer identification and hard reset (SL\_IR) state machines

Add a pink "out arrow up" with the text "Identify Sequence Complete" (this will agree with the text in section 7.8.6.3.3.1 and table 18)

Seagate #132 [JW]

PDF Page 192

7.8.6 SL\_IR transmitter and receiver

change <shall not transmit the indicated primitive>

to "shall transmit the indicated primitive"

(section 7.7.1 says that primitives may be inserted inside an address frame)

Seagate #133 [JC]

PDF Page 196

7.10 Near-end analog loopback test

Targets should be allowed to perform loopback also.

change to:

"This test mode may be invoked in initiator or target devices using



vendor-specific means."

also add a paragraph:

"Once the test is completed in a target device, the target phy shall start a phy reset sequence."

Seagate #134 [JC]

PDF Page 198

7.12.2.2 Connection request responses

The OPEN may require a rate match that is not support by the receipient.

Add: "if the requested connection rate is supported."

Seagate #135 [JC]

PDF Page 198

7.12.3 Arbitration fairness

may should be shall. Optional implementation may/will lead to

non-interoperable devices. Also if

optional, the behavior has to be described in the rest of the document.

Seagate #136 [JC]

PDF Page 198

7.12.3 Arbitration fairness

The AWT has to be mandatory.

Chnane to:

Initiator ports and target ports shall set the arbitration wait timer to zero for fair operation and start the timer when they transmit the first OPEN address frame for the connection request.

Seagate #137 [JC]

PDF Page 198

7.12.3 Arbitration fairness

This is duplicated in 7.7.3. Delete here.

The arbitration wait timer shall count in microseconds from 0  $\mu$ s to 32 767  $\mu$ s and in milliseconds from

32 768  $\mu$ s to 32 767 ms + 32 768  $\mu$ s.

Seagate #138 [JC]

PDF Page 198

7.12.3 Arbitration fairness

In conjunction with a comment in 7.7.3 to rmove the scale bit:

Change to:

However, unfair ports shall not set the ARBITRATION WAIT TIME field to a value greater than

7FFFh; this limits the amount of unfairness and helps prevent livelocks.

Seagate #139 [JC]

PDF Page 198

7.12.2.2 Connection request responses

\*\*\*The retry delay timer greatly complicates selecting another transfer request for a queue. If a

request to a different destination has to be selected, a good deal of hardware is required. If done by a

processor, the performance would be poor.

Suggest deleting the retry delay. If the expander gets congested, buy more capacity.

Seagate #140 [JC]

PDF Page 199

7.12.2.2 Connection request responses

change:

matching PROTOCOL and CONNECTION RATE fields.

to:

a matching PROTOCOL field and a supported connection rate.

Seagate #141 [JC]

PDF Page 199

7.12.3 Arbitration fairness

Change:

the timer

To:

The arbitration wait timer

Seagate #142 [JC]

PDF Page 199

#### 7.12.3.1.1 Arbitration overview

This subclause uses "primitive" in a different meaning than the rest of the draft. Also, it is an overview and should not present the attribute/confirmation details. Suggest a rewrite to:

The expander connection manager shall arbitrate and assign or deny path resources for connection attempts requested by each expander phy in response to receiving valid OPEN address frames.

Arbitration includes adherence to the SAS arbitration fairness algorithm and path recovery. Path recovery is used to avoid potential deadlock scenarios within the SAS topology by deterministically choosing which partial pathway(s) to tear down to allow at least one connection to complete.

The expander connection manager responds to connection request with arbitration won, lost, and reject to the requesting phy.

Each path request contains the Arbitration Wait Time and the Source SAS Address arguments from the received OPEN address frame.

If two path requests contend, the winner shall be determined by comparing OPEN address frame field values in this order:

- 1) Largest Arbitration Wait Time;
- 2) Largest Source SAS Address; and
- 3) Largest Connection Rate.

The expander connection shall generate the arbitration reject response when any of the following conditions are met:

- a) the request does not map to a valid phy;
- b) the request specifies an unsupported connection rate; or
- c) the request specifies a destination port which contains at least one partial pathway and pathway recovery rules require this connection request to release path resources.

When two phys receive an OPEN address frame destined for each other, the expander connection manager shall provide an arbitration lost response to the phy that received the lowest priority OPEN address frame when all of the following conditions are met:

- a) the request is for an available phy at a supported connection rate; and
- b) the destination phy of this connection request has received a higher priority OPEN address frame with this phy as its destination.

The expander connection manager shall generate the arbitration won response when all of the following conditions are met:

- a) the request maps to an available phy at a supported connection rate; and
- b) no higher priority connection requests are present with this phy as the destination.

Seagate #143 [JC]

PDF Page 199

#### 7.12.3 Arbitration fairness

The AWT is not reset on OPEN\_REJECT (PATHWAY BLOCKED). This appears to be the only exception to resetting the timer.

Add:

(except OPEN\_REJECT (PATHWAY BLOCKED) )

Seagate #144 [JC]

PDF Page 199

#### 7.12.3.1.1 Arbitration overview

Why is Largest Connection Rate used for compare? Does this mean that AWT and Source SAS address are the same?

Seagate #145 [JC]  
 PDF Page 200  
 7.12.3.1.2 Arbitration status  
 Change: value  
 To: type

Seagate #146 [JC]  
 PDF Page 205  
 7.13 SAS link layer state machine for initiator phys and target phys (SL)  
 The SL state machine starts with 0 state. Most others start with 1.

Seagate #147 [JW]  
 PDF Page 209  
 7.13.2 SL transmitter and receiver  
 change <shall not transmit the indicated primitive>  
 to "shall transmit the indicated primitive"  
 (section 7.7.1 says you can)

Seagate #148 [JW]  
 PDF Page 209  
 7.13.3 SLO: Idle state  
 7.13.3.1 State description  
 <After an Enable Disable SSP Link (Enable) confirmation is received this state shall send an Enable Disable SSP Link (Enable) confirmation to the port layer.>  
 Three things:  
 1) Fig 72 says "SAS Link" (not SSP) and  
 2) these say confirmations and if so should be denoted by pink up and down arrows in figure 72  
 3) This confirmation is not on the Port layer state machines or mentioned in the port layer writeup.

Seagate #149 [JW]  
 PDF Page 209  
 7.13.2 SL transmitter and receiver  
 <shall send a Change Received confirmation>  
 (this confirmation is not listed in table 18 - Confirmations between ... or application layer)

Seagate #150 [JW]  
 PDF Page 215  
 7.14 SAS link layer state machine for expander phys (XL)  
 7.14.1 Overview  
 remove <by receiving an>  
 (third paragraph - after k))

Seagate #151 [JC]  
 PDF Page 221  
 7.14.6.1 State description  
 Spelling:  
 This should be "This"

Seagate #152 [JC]  
 PDF Page 225  
 7.15 Rate matching  
 The termination of inserting ALIGNs is not covered.  
 Add a sentence:  
 The source shall stop inserting ALIGNs for rate matching with the first word of CLOSE.

Seagate #153 [JC]  
 PDF Page 226  
 7.16.3 SSP frame transmission  
 Delete:  
 NAK means the frame was received with an error;  
 NAK (CRC ERROR) is the only defined NAK.

Seagate #154 [JW]

PDF Page 229

7.16.7 SSP Link Layer (SSP) state machines

7.16.7.1 Overview

change <The SSP\_TCM state machine contains the SP\_TCM1:Tx\_credit\_monitor state> to

"The SSP\_TCM state machine contains the SP\_TCM1:Tx\_Credit\_Monitor state"

Seagate #155 [JW]

PDF Page 229

7.16.7 SSP Link Layer (SSP) state machines

7.16.7.1 Overview

<The SSP\_TF state machine's function is to control when the SSP\_T state machine>

two things:

1) change <it> to "is"

2) change <the SSP\_T state machine> to "a SSP transmitter"

(I can not find a <SSP\_T> state machine. Does it need to be defined? We defined for the SL state machines in Figure 73)

Seagate #156 [JW]

PDF Page 232

7.16.7 SSP Link Layer (SSP) state machines

7.16.7.1 Overview

Figure 84 – SSP Link Layer (SSP) state machines (part 3 - primitive transmission)

change <Frame> to

"frame"

(see text on section 7.16.7.7)

Seagate #157 [JW]

PDF Page 232

7.16.7 SSP Link Layer (SSP) state machines

7.16.7.1 Overview

Figure 84 – SSP Link Layer (SSP) state machines (part 3 - primitive transmission)

change <Frame> to

"frame"

Seagate #158 [JW]

PDF Page 233

7.16.7.3 SSP\_TCM1:Tx\_credit\_monitor state

change <TCM1:Tx\_credit\_monitor state> to

CM1:Tx\_Credit\_Monitor state

Seagate #159 [JW]

PDF Page 234

change <Done> to

"DONE"

Seagate #160 [JW]

PDF Page 235

7.16.7.6.3 Transition SSP\_TF2:Tx\_Wait to SSP\_TF4:Indicate\_Done\_Tx

change <Connection Closed> to "Close Connection"

Seagate #161 [JW]

PDF Page 235

7.16.7.6.3 Transition SSP\_TF2:Tx\_Wait to SSP\_TF4:Indicate\_Done\_Tx

change <Done> to

"DONE"

Seagate #162 [JW]

PDF Page 235

7.16.7.6.3 Transition SSP\_TF2:Tx\_Wait to SSP\_TF4:Indicate\_Done\_Tx

change <Done> to

"DONE"

Seagate #163 [JW]

PDF Page 235

7.16.7.6.3 Transition SSP\_TF2:Tx\_Wait to SSP\_TF4:Indicate\_Done\_Tx  
change <Done> to  
"DONE"

Seagate #164 [JW]

PDF Page 235

7.16.7.6.3 Transition SSP\_TF2:Tx\_Wait to SSP\_TF4:Indicate\_Done\_Tx  
change <Done> to  
"DONE"

Seagate #165 [JW]

PDF Page 235

7.16.7.6.3 Transition SSP\_TF2:Tx\_Wait to SSP\_TF4:Indicate\_Done\_Tx  
change <Done> to  
"DONE"

Seagate #166 [JW]

PDF Page 235

7.16.7.8 SSP\_TF4:Indicate\_Done\_Tx state  
change <Done> to  
"DONE"

Seagate #167 [JW]

PDF Page 236

7.16.7.8 SSP\_TF4:Indicate\_Done\_Tx state  
change <parameter> to  
"Wait For DONE (CREDIT TIMEOUT) parameter"

Seagate #168 [JW]

PDF Page 236

7.16.7.9 SSP\_RF1:Rcv\_Frame state  
change <Received Frame> to  
"Frame Received"

Seagate #169 [JW]

PDF Page 237

7.16.7.11 SSP\_RIM1:Rcv\_Interlock\_Monitor state  
change <Received Frame> to  
"Frame Received"

Seagate #170 [JW]

PDF Page 237

7.16.7.11 SSP\_RIM1:Rcv\_Interlock\_Monitor state  
change <Received Frame> to  
"Frame Received"

Seagate #171 [JW]

PDF Page 237

7.16.7.11 SSP\_RIM1:Rcv\_Interlock\_Monitor state  
change <Received Frame> to  
"Frame Received"

Seagate #172 [JW]

PDF Page 237

7.16.7.13.1 State description  
change <CREDIT\_BLOCKED by sending> to  
"CREDIT\_BLOCKED be transmitted by sending"

Seagate #173 [JC]

PDF Page 242

7.17.3 Preparing to close an STP connection  
Change:  
detected, after  
To:  
detected or after

Seagate #174 [JW]

PDF Page 243

7.18.4 SMP Link Layer (SMP) state machines  
7.18.4.1 Overview

change <Rcv\_response\_Frame> to  
 "Rcv\_Response\_Frame"  
 (in all other state diagrams the first letter of all state names are  
 capitalized - this comment applies to  
 all state names in the SMP section and SMP figures)

Seagate #175 [JW]  
 PDF Page 243  
 7.18.4 SMP Link Layer (SMP) state machines  
 7.18.4.1 Overview  
 change <(see 7.18.4.2)(initial state);> to  
 (see 7.18.4.2.1)(initial state);

Seagate #176 [JC]  
 PDF Page 244  
 7.18.4.1 Overview, Table 88  
 Round corners of white box to match format of other state machines

Seagate #177 [JC]  
 PDF Page 249  
 8.2.2 Bus inactivity time limit timer  
 This timer is optional by definition in SCSI.  
 Add text:  
 Support for the bus inactivity timer is optional. The Disconnect-Reconnect  
 mode page may be  
 accessed to determine support for this timer. When this timer is not  
 support, the bus inactivity timer  
 shall not be treated as expired in this standard.

Seagate #178 [JC]  
 PDF Page 249  
 8.2.3 Maximum connect time limit timer  
 Add text:  
 Support for the maximum connect time limit timer is optional. The  
 Disconnect-Reconnect mode page  
 may be accessed to determine support for this timer. When this timer is not  
 support, the maximum  
 connect time limit timer shall not be treated as expired in this standard.

Seagate #179 [JC]  
 PDF Page 249  
 8.2.4 I\_T nexus loss timer  
 Add text:  
 Support for the I\_T nexus loss timer is optional. The Protocol-Specific  
 Port mode page may be  
 accessed to determine support for this timer see 10.1.6.2. When this timer  
 is not support, the I\_T  
 nexus loss timer shall not be treated as expired in this standard.

Seagate #180 [JC]  
 PDF Page 250  
 8.2.5 Arbitration wait time (AWT) timer  
 Add a sentence:  
 Support of the AWT is mandatory.

Seagate #181 [JC]  
 PDF Page 250  
 8.2.6 Pathway blocked count (PBC) counter  
 Add a sentence:  
 Support of the PBC is mandatory.

Seagate #182 [JW]  
 PDF Page 252  
 8.3.3 PL\_OC2: Overall\_Control state  
 8.3.3.1 State description  
 8.3.3.1.1 State description overview  
 Delete <a) I\_T nexus loss time;>  
 and reorder the following arguments restarting at a)

Seagate #183 [JW]

PDF Page 253

#### 8.3.3.1.4 SSP wide port rules

(delete all of the following text. these are not wide port rules and none of the terms i.e., COMMAND, QUERY TASK, have been defined and are out of context)

<An initiator port that is a wide port may transmit COMMAND frames on multiple links simultaneously.

An initiator port shall not transmit a TASK frame requesting a task management function that only affects a

single I\_T\_L\_Q nexus (e.g., ABORT TASK or QUERY TASK; see SAM-3) specifying an I\_T\_L\_Q

nexus for

which the initiator port is transmitting a frame or is waiting for a link layer acknowledgement for a frame.

An initiator port shall not transmit a TASK frame requesting a function that only affects an I\_T\_L

nexus (e.g.,

ABORT TASK SET, CLEAR TASK SET, CLEAR ACA, or LOGICAL UNIT RESET; see SAM-3)

specifying an

I\_T\_L nexus for which the initiator port is transmitting a frame or is waiting for a link layer acknowledgement

for a frame.

An initiator port shall not transmit a TASK frame requesting a function that only affects an I\_T nexus

(see

SAM-3) specifying an I\_T nexus for which the initiator port is transmitting a frame or is waiting for a link layer

acknowledgement for a frame.>

Seagate #184 [JW]

PDF Page 254

#### 8.3.3.1.5 Filling in the Tx Frame arguments

4th paragraph (about I\_T nexus loss arguments.

add

"For each destination, the PL\_OC\_I\_T nexus loss timer is stopped, set to zero, and assigned a

stopped status after each Connection Opened confirmation is received and

after each power-on reset

or hard reset function is completed "

Seagate #185 [JW]

PDF Page 256

#### 8.4 Port layer phy manager (PL\_PM) state machine

##### 8.4.1 Overview

change <PL\_OC state machine;> to

"transport layer;"

Seagate #186 [JW]

PDF Page 258

#### 8.4 Port layer phy manager (PL\_PM) state machine

##### 8.4.1 Overview

Figure 93 – Port layer phy manager (PL\_PM) state machine (part 2)

add a pink "In Arrow" here with text of "DONE Received"

Seagate #187 [JW]

PDF Page 258

#### 8.4 Port layer phy manager (PL\_PM) state machine

##### 8.4.1 Overview

Figure 93 – Port layer phy manager (PL\_PM) state machine (part 2)

add a pink "out Arrow " here with text of "DONE Received"

Seagate #188 [JW]

PDF Page 258

#### 8.4 Port layer phy manager (PL\_PM) state machine

##### 8.4.1 Overview

Figure 93 – Port layer phy manager (PL\_PM) state machine (part 2)  
add a pink down arrow with a "Close Connection" text

Seagate #189 [JW]

PDF Page 259

8.4.3.1.3 Connection Opened handling

change <Tx Frame,> to  
"Tx Frame parameter,"

Seagate #190 [JW]

PDF Page 260

8.4.4 PL\_PM3: Connected state

8.4.4.1 State description

change <This state shall generate a Tx Frame request to the link layer when a Tx Frame parameter is received from the PL\_OC state machine.> to

"This state shall generate a Tx Frame (Balanced) request to the link layer when a Tx Frame parameter with a Balance Required argument is received from the PL\_OC state machine.

This state shall generate a Tx Frame (Nonbalanced) request to the link layer when a Tx Frame parameter with a Balance Not Required argument is received from the PL\_OC state machine."

Seagate #191 [JW]

PDF Page 260

8.4.3.1.4 Open Failed handling

change <Tx Frame> to  
"Tx Frame parameter"

Seagate #192 [JW]

PDF Page 261

8.4.4.1 State description (-- for PL\_PM3: Connected state)

in the area started by <for SSP ports> add " For SSP and SMP ports, this state shall send a

Transmission Status (Connection Lost) confirmation to the transport layer if a Connection Closed

(Break Received), Connection Closed (Close Timeout) , or Connection Closed (Link Broken)

confirmation is received from the link layer."

Seagate #193 [JW]

PDF Page 261

8.4.4 PL\_PM3: Connected state

8.4.4.1 State description

insert between c) and d)

"d) DONE Received"

Seagate #194 [JW]

PDF Page 261

8.4.4 PL\_PM3: Connected state

8.4.4.1 State description

change <d)> to "e"

Seagate #195 [JW]

PDF Page 261

8.4.4 PL\_PM3: Connected state

8.4.4.1 State description

change <e)> to "f"

Seagate #196 [JW]

PDF Page 261

8.4.4 PL\_PM3: Connected state

8.4.4.1 State description

change <Tx Frame> to

"Tx Frame Request"

Seagate #197 [JW]

PDF Page 261



## 8.4.4 PL\_PM3: Connected state

## 8.4.4.1 State description

change <Tx Frame> to

"Tx Frame Request"

Seagate #198 [JC]

PDF Page 261

## 8.4.4.1 State description

second to last paragraph

The shall in the following sentence is misleading for an optional timer.

the bus inactivity time limit timer shall be initialized

suggest:

the bus inactivity time limit timer if supported shall be initialized

Seagate #199 [JC]

PDF Page 261

## 8.4.4.1 State description

last paragraph

The shall in the following sentence is misleading for an optional timer.

the maximum connect time timer shall be initialized

suggest:

initialized the maximum connect time timer if supported shall be initialized

Seagate #200 [JW]

PDF Page 263

## 9.2.1 SSP frame format

Table 88 – SSP frame format

change <TIMEOUT> to

"RETRANSMIT"

(will make definitions on next page and later text consistent)

Seagate #201 [JC]

PDF Page 264

## 9.2.1 SSP frame format

The RETRANSMIT bit is in the text but not in Table 88. Is the function out?

Seagate #202 [JC]

PDF Page 265

## 9.2.1 SSP frame format

Delete. This sentence is redundant with the last paragraph in 9.2.2.4 DATA information unit.

Seagate #203 [JC]

PDF Page 268

## 9.2.2.3 XFER\_RDY information unit - Table 94 – XFER\_RDY information unit

The use of the same field name, RELATIVE OFFSET, in the header and XFR\_RDY is confusing.

Suggest:

XFR\_RDY\_OFFSET,

REQUEST\_OFFSET,

STARTING\_OFFSET,

etc.

RELATIVE OFFSET

Seagate #204 [JC]

PDF Page 268

## 9.2.2.3 XFER\_RDY information unit

reference to 10.1.1.1.5

should be 10.1.6.1.5

Seagate #205 [JC]

PDF Page 268

## 9.2.2.3 XFER\_RDY information unit

reference to 10.1.1.1.5

should be 10.1.6.1.5

Seagate #206 [JC]

PDF Page 269

## 9.2.2.4 DATA information unit

Delete: This sentence is redundant with the first paragraph on the page.

Seagate #207 [JC]  
 PDF Page 274  
 9.2.4.1 COMMAND frame  
 Delete:  
 in the next connection  
 This would mean the initiator would have to shutdown any queued transfer  
 request to satisfy the next  
 connection requirement.

Seagate #208 [JW]  
 PDF Page 279  
 9.2.6.2 Initiator device state machines  
 9.2.6.2.1 Overview  
 Figure 98 – SSP transport layer (ST) state machines - initiator device  
 remove (ACK/NAK TIMEOUT)

Seagate #209 [JW]  
 PDF Page 279  
 TIMEOUT)

Seagate #210 [JW]  
 PDF Page 279  
 9.2.6.2 Initiator device state machines  
 9.2.6.2.1 Overview  
 Figure 98 – SSP transport layer (ST) state machines - initiator device  
 add a pink in arrow with the nomenclature of "ACK Transmitted" on it  
 (i.e. add a "ACK Transmitted " received confirmation here)

Seagate #211 [JW]  
 PDF Page 285  
 9.2.6.2.8 ST\_IFR1: Initiator\_Frame\_Router state  
 change <Data-in parameter> to  
 "Data-in Arrived parameter"

Seagate #212 [JW]  
 PDF Page 285  
 9.2.6.3 Target device state machines  
 9.2.6.3.1 Overview  
 change <Data-Out  
 Received> to  
 "Data -Out Arrived or Response Data"  
 ( to be consisten with figure 99 - SSP Transport Layer state machine -  
 target device)

Seagate #213 [JW]  
 PDF Page 286  
 9.2.6.3 Target device state machines  
 9.2.6.3.1 Overview  
 Figure 99 – SSP transport layer (ST) state machines - target device  
 add a pink in arrow with the nomenclature of "ACK Transmitted" on it  
 (i.e. add a "ACK Transmitted " received confirmation here)

Seagate #214 [JW]  
 PDF Page 291  
 9.2.6.3.6 ST\_TTS4: Receive\_Data\_Out state  
 9.2.6.3.6.1 State description  
 change <ST\_TS1: L to  
 "ST\_TTS1"

Seagate #215 [JC]  
 PDF Page 295  
 9.4.2 SMP\_REQUEST frame  
 Why is this not 1 024?

Seagate #216 [JC]  
 PDF Page 296  
 9.4.3 SMP\_RESPONSE frame  
 Why is this not 1 024?

Seagate #217 [JW]

PDF Page 298

9.4.4.2.1 Overview (for Initiator device state machine)

Figure 101 - SMP transport layer state machine - initiator device  
change <Connection Closed> to "Transmission Status"

Seagate #218 [JW]

PDF Page 298

9.4.4.2 Initiator device state machine

9.4.4.2.1 Overview

Figure 101 - SMP transport layer state machine - initiator device (MT\_ID)  
remove <Connection  
Closed> and the pink arrow

Seagate #219 [JC]

PDF Page 298

9.4.4.2.2.2 Transition MT\_ID1:Idle to MT\_ID2:Send

Why is the initiator connection tag included when the SMP transfer is  
interlocked?

Seagate #220 [JW]

PDF Page 299

9.4.4.2.3.2 Transition MT\_ID2:Send to MT\_ID1:Idle

change <Connection Closed> to "Transmission Status (Connection Lost)"

Seagate #221 [JW]

PDF Page 299

9.4.4.2.4.2 Transition MT\_ID3:Receive to MT\_ID1:Idle

change <Connection Closed> to "Transmission Status (Connection Lost)"

Seagate #222 [JW]

PDF Page 300

9.4.4.3.3.2 Transition MT\_TD2:Respond to MT\_TD1:Idle

change <Connection Closed> to "Transmission Status (Connection Lost)"

Seagate #223 [JW]

PDF Page 300

9.4.4.3.1 Overview

Figure 102 - SMP transport layer (MT) state machines - target device  
Remove <Connection> and the input arrow

Seagate #224 [JW]

PDF Page 300

Closed

Seagate #225 [JW]

PDF Page 301

This section does not talk about receiving from the transport layer the I\_T  
Nexus loss timer expired  
or not arguments or the connection lost arguments and what to do with them.  
It should be added.

Seagate #226 [JC]

PDF Page 322

10.1.8 SCSI power condition states

SA\_PC state machine numbering is not consistent with other state machines.

SA\_PC state machine

start with "0", others start with "1".

Seagate #227 [JW]

PDF Page 323

10.1.8.1.3 Transition SA\_PC\_0:Powered\_On to SA\_PC\_5:Active\_Wait

change <SA\_PC\_5:Active state.> to

"SA\_PC\_5:Active\_Wait state."

Seagate #228 [JW]

PDF Page 333

10.3.1.3 REPORT MANUFACTURER INFORMATION function

the <ADDITIONAL LENGTH field> location is not listed in table 133 - report  
manufacture information

response

Seagate #229 [JC]

PDF Page 340

10.3.1.5 REPORT PHY ERROR LOG function

The meaning of "outside of phy reset sequences" is not specific.

Suggest substituting:

"while PhyReady is valid from the SP state machine" each counter in this clause to be more specific.

Seagate #230 [AC]

PDF Page 356

A.1 Compliant jitter test pattern (CJTPAT)

Case of the next to the last character is incorrect. 35B5A9Edh should be 35B5A9EDh

Seagate #231 [AC]

PDF Page 357

A.1 Compliant jitter test pattern (CJTPAT)

Case of the next to the last character is incorrect. 8CF328Eah should be 8CF328EAh

Seagate #232 [AC]

PDF Page 358

A.1 Compliant jitter test pattern (CJTPAT)

Case of the next to the last character is incorrect. AFF087Ebh should be AFF087EBh

Seagate #233 [AC]

PDF Page 358

A.1 Compliant jitter test pattern (CJTPAT)

Case of the next to the last character is incorrect. E21035Efh should be E21035EFh

Seagate #234 [JW]

PDF Page 359

B.1 SAS phy reset sequence examples

change <phy B> to

"phy A" ?????

Seagate #235 [JC]

PDF Page 359

B.1 SAS phy reset sequence examples

Figure A.1

S.B.

Figure B.1

Seagate #236 [JC]

PDF Page 359

B.1 SAS phy reset sequence examples

Figure A.2

S.B.

Figure B.2

Seagate #237 [JC]

PDF Page 362

C.3 CRC implementation with XORs

Change:

These equations generate the 32 bit CRC for frame transmission.

To:

These equations generate the multiplier function shown in figures C.1 and C.2.

Seagate #238 [JC]

PDF Page 374

F.1 STP differences from SATA

Add:

h) BIST activated frames not supported.

Seagate #239 [JC]

PDF Page 376  
 F.3 Byte and bit ordering, Figure F2  
 change byte order to:  
 (4th : 3rd : 2nd : 1st)  
 to match Figure F.3

Seagate #240 [JC]  
 PDF Page 376  
 F.3 Byte and bit ordering, Figure F2  
 change byte order to:  
 (1st : 2nd : 3rd : 4th)  
 to match Figure F.3

Seagate #241 [JC]  
 PDF Page 378  
 G.1 Overview, Table G.1  
 For completeness, continue table to include representations for PHYs W &  
 Z. should be a  
 cut-and-paste of what's there with a replacement of X->W and Y->Z plus  
 device A -> C and B->D.

Seagate #242 [JC]  
 PDF Page 380  
 G.2 Connection request - Open accept, Figure G.2  
 Add reference Fig 26 and Fig 27 to help the reader understand how to  
 interpret req/rsp and cnf/ind  
 columns in the figures.

Seagate #243 [JC]  
 PDF Page 406  
 I.3 Source file  
 Should:  
 header file  
 Be:  
 code file

\*\*\*\*\*

Comments attached to Yes ballot from Paul D. Aloisi of  
 Texas Instruments:

SAS Letter ballot Comments  
 Texas Instruments  
 Paul Aloisi

1. Editorial 4.1.4 last sentence needs work.  
 In figures that show ports but no phys, the ports still contain phys and may  
 or may not be wide ports.

In figures that show ports but no phys, the phy level of detail is not  
 shown,  
 the ports actually contain one or more phys.

2. Editorial 4.1.5 and 4.16 first sentence does make sense in a SAS  
 standard,  
 unless it is explained better. SCSI and ATA port that support SMP can be  
 used  
 in SAS domains. If a device supports SCSI or ATA without SMP is outside of  
 the  
 scope of this standard.

3. Technical 4.1.8 should have a Fan out expander section and a description  
 of  
 the relationship between the expanders in a large configuration. I have seen  
 it in presentations, but there is no clear description of it in the  
 standard.  
 There should be a clear definition of a fan out expander as a section.  
 4.1.8.1 Expander device overview

- 4.1.8.2 Edge expander device set
- 4.1.8.3 Configurable expander device

4. Figure 34 the title has internal misspelled

5. Technical 6.8.3.3.1, 9.2.4.5 and 9.2.3.9.1 still have an editors note, this should have been addressed before the letter ballot.

\*\*\*\*\*

Comments attached to Abs ballot from Roger Cummings of Veritas Software:

Not within our organization's scope of expertise

\*\*\*\*\*

Comments attached to Yes ballot from Kenneth Hirata of Vixel Corp.:

Vixel 001  
 PDF Page 40  
 3.1.3 ATA device  
 3.1.5 ATA initiator device  
 3.1.6 ATA initiator port  
 3.1.8 ATA target device  
 3.1.9 ATA target port  
 Change "(see ATA/ATAPI V1)" to "(see ATA/ATAPI -7 V1)"

Vixel 002  
 PDF Page 44  
 3.1.92 programmed minimum physical link rate  
 3rd line  
 Change "defaults to the hardware maximum physical link rate" to "defaults to the hardware minimum physical link rate".

Vixel 003  
 PDF Page 50  
 3.4 Editorial conventions  
 Sentence underneath table 2.  
 Remove "Fields containing only one bit are usually referred to as the name bit instead of the name field.", this is a duplicate of last sentence in 3rd paragraph of this section.

Vixel 004  
 PDF Page 55  
 Clause 4.1.1, Figure 4  
 All inheritance lines.  
 Change direction of all arrows (inheritance) in diagram. They appear to point the wrong way.

Vixel 005  
 PDF Page 55  
 Clause 4.1.1, Figure 4  
 Aggregation line between Service Delivery Subsystem and Expander device.  
 Change "0..\*" to "0..65", should have upper bounds as specified in later clause.

Vixel 006  
 PDF Page 55  
 Clause 4.1.1, Figure 4  
 Aggregation line between Expander device and SAS device.  
 Clarify. What is this modeling, the fact that the Expander is a SAS device, or that an SMP application must reside in an Expander device?  
 If this illustrates that an Expander is a SAS device, this line should be an "association", not an "aggregation".

Vixel 007  
 PDF Page 55

Clause 4.1.1, Figure 4  
Aggregation line between Expander device and Expander port.  
Change "1..\*" to "2..64". see clause 4.1.8.1.

Vixel 008  
PDF Page 55  
Clause 4.1.1, Figure 4  
Aggregation line between Expander port and Phy.  
Change "1..\*" to "1..64".

Vixel 009  
PDF Page 58  
Clause 4.1.4.  
Sentence below figure 7.  
Move "In figures that show ports but no phys, the ports still contain phys and may or may not be wide ports." to clause 3.4.

Vixel 010  
PDF Page 58  
Clause 4.1.5  
2nd paragraph  
Change "Initiator ports may support SSP and/or STP and/or SATA." to "Initiator ports may support SSP and/or STP.". SATA is outside the scope of the standard.

Vixel 011  
PDF Page 58  
Clause 4.1.5  
2nd paragraph  
Remove "Initiator ports supporting SATA are outside the scope of this standard.". SATA is outside the scope of the standard.

Vixel 012  
PDF Page 69  
Clause 4.2.4  
NOTE 8  
Change "Port names are not defined in SAS, because the SAS address used by ports in different SAS domains may be the same. Also, there is no login process in SSP to exchange port names." to "Port names are not defined in SAS, because there is no login process in SSP to exchange port names." Removed part that conflicts with clause 4.2.2, "SAS address shall be worldwide unique."

Vixel 013  
PDF Page 71  
Clause 4.3.2, figure 20.  
Define what the dashed blue lines mean in these figures, they appear to be used in a different manner than defined in clause 3.5.

Vixel 014  
PDF Page 84  
Clause 4.4.2  
2nd paragraph, 1st sentence.  
In the sentence "When a port detects a hard reset, it shall stop transmitting on each of the phys contained in that port until a phy reset sequence occurs on that phy.", what does "that phy" mean? Does it mean the phy that received the hard reset, or each phy in the port?

Vixel 015  
Clause 4.6.1  
PDF Page 84  
Clause 4.6.5 (2 instances)  
PDF Page 86  
Please provide a definition for "SL\_IR primitive".

Vixel 016  
PDF Page 89  
Clause 4.6.8, table 23  
(3 instances)  
3rd, 4th, and 5th rows  
Change "Phy" to "Link" to match terminology used in clause 4.6.7, figure 27

Vixel 017

PDF Page 92

Clause 4.6.11.1

8th paragraph

Change "may only" to "shall" in "An edge expander device may only use phys with the table routing attribute to attach to phys with the subtractive routing attribute in other edge expander devices within an edge expander device set.". "may only " not in list of keywords.

Vixel 018

PDF Page 93

Clause 4.6.11.3

2nd paragraph beneath figure 28.

Remove "To avoid an overflow of an edge expander route index during the discover process (see 4.6.11.5) the number of edge expander route indexes per phy identifier shall be greater than or equal to the sum of all cascaded edge expander phys addressable through the edge expander phy.". This requirement is an implementation issue and should not be in the standards.

Vixel 019

PDF Page 93

Clause 4.6.11.3

4th paragraph beneath figure 28.

For clarification, add "together" to "Fanout expander devices shall not be cascaded.".

Vixel 020

PDF Page 94

Clause 4.6.11.3

2nd paragraph

"If the discover process detects an expander route table entry that references the SAS address of an attached edge expander device, it shall set the DISABLE ROUTE ENTRY bit to one in the expander route table entry." needs clarification. What is the purpose of setting the DISABLE ROUTE ENTRY bit here? This would seem to preclude using the expander SAS address for expander internal ports.

Vixel 021

PDF Page 96

Clause 4.6.11.4

Table 26, 3rd row under "Level 3 entries".

For clarity and completeness, include expanders X and Y in this example.

Vixel 022

PDF Page 98

Clause 4.6.11.4

1st sentence

In the paragraph, "Table 27 shows the expander route index order for the edge expander E0 in figure 30.", add a clarification that the route table in the table is for one phy on expander E0.

Vixel 023

PDF Page 99

Clause 4.6.11.5

Add an example to clarify these rules for order of traversal:

The order of traversal shall be to discover:

- 1) the expander device to which the initiator port is attached;
- 2) every device attached to that expander device; and
- 3) as each expander device is found, every device attached to that expander device.

Vixel 024

PDF Page 173, 176

Clause 7.1.4.6

Clause 7.1.4.12

Change "See 7.4" reference to "See 7.7".

Vixel 025

PDF Page 189



## Clause 7.8.2

## 1st paragraph

Does the requirement "After a link reset sequence, or after receiving a BROADCAST (CHANGE), the application client within an initiator device shall perform a discover process (see 4.6.11.5).", preclude an expander from performing the discover process? Does this require an expander to implement a full SCSI initiator if it only intends to perform the discover process? If so, this needs to be clarified so that an expander can perform the discover process without implementing a full SCSI initiator.

## Vixel 026

## PDF Page 215

## Clause 7.14.1

## 1st paragraph

Change "The XL state machine shall be activated after the completion of the phy reset sequence by receiving an after receiving an Enable Disable SAS Link (Disable) parameter from the SL\_IR state machines (see 7.8.5)." to "The XL state machine shall be activated after the completion of the phy reset sequence by receiving an Enable Disable SAS Link (Disable) parameter from the SL\_IR state machines (see 7.8.5).".

## Vixel 027

## PDF Page 225

## Clause 7.15

## 3rd paragraph

The sentence, "Every phy in the physical link shall insert ALIGNs between dwords to match the connection rate." is ambiguous in which faster phy does the insertion. Should this be the transmitting faster phy? Also doesn't mention removal of ALIGNs. This should be described.

## Vixel 028

## PDF Page 332

## Clause 10.3.1.2

## 1st paragraph

The requirement "If an edge expander device supports an expander route table, then the number of expander route indexes for each phy identifier shall be greater than or equal to the number of phys downstream from the edge expander phy.", is an implementation issue and should not be in the standards. Remove this.

## Vixel 029

## PDF Page 332

## Clause 10.3.1.2

## 2nd paragraph

The requirement "If a fanout expander device supports an expander route table, then the number of expander route indexes shall be 64." is an implementation issue and should not be in the standards. Remove this.

## Vixel 030

## PDF Page 336

## Clause 10.3.1.4

## Paragraph below table 137

The sentence "The routing method used by the expander connection manager shall change based on the attached device type as described in table 137." is confusing because of the sentence it immediately follows. It appears to describe something that is not related to the table. It would be clearer if this sentence was made a separate paragraph, or a note.

\*\*\*\*\* End of Ballot Report \*\*\*\*\*