To: T10 Technical Committee
From: Rob Elliott, HP (elliott@hp.com)
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Subject: 07-085r0 SAS-2 Change mode page subpage names

Revision history
Revision 0 (26 January 2007) First revision

Related documents
sas2r08 - Serial Attached SCSI - 2 (SAS-2) revision 8

Overview
In SPC-4, mode page subpages have started to be called “the Xyz mode page” rather than “the Xyz subpage” or “the Uvw mode page - Xyz Subpage.” The SAS Protocol-Specific Port mode page names should be changed along these lines.

a) “Protocol-Specific Port mode page - Short format” to “Protocol-Specific Port mode page”
b) “Protocol-Specific Port mode page - Phy Control and Discover subpage” to “Phy Control and Discover mode page”
c) “Protocol-Specific Port mode page - Shared Port Control mode subpage” to “Shared Port Control mode page”
d) “Protocol-Specific Logical Unit mode page - Short format” to “Protocol-Specific Logical Unit mode page”

Suggested changes to SAS-2

3.1.169 programmed maximum physical link rate: The maximum operational physical link rate of a phy (e.g., as programmed via the SMP PHY CONTROL function (see 10.4.3.24) or the Phy Control and Discover ~~subpage~~mode page (see 10.2.7.2.3)).

3.1.170 programmed minimum physical link rate: The minimum operational physical link rate of a phy (e.g., as programmed via the SMP PHY CONTROL function (see 10.4.3.24) or the Phy Control and Discover ~~subpage~~mode page (see 10.2.7.2.3)).

4.2.7 Phy identifiers

Each SAS phy and expander phy shall be assigned an identifier called a phy identifier that is unique within the SAS device and/or expander device. Each SAS logical phys within a SAS phy shall use the same phy identifier. Each expander logical phy within an expander phy shall use the same phy identifier. The phy identifier is used for management functions (see 10.4).Phy identifiers shall be greater than or equal to 00h and less than 80h, and should be numbered starting with 00h. In an expander device or in a SAS device containing an SMP target port, phy identifiers shall be less than the value of the NUMBER OF PHYS field in the SMP REPORT GENERAL response (see 10.4.3.3). In a SAS device containing an SSP target port, phy identifiers shall be less than the value of the NUMBER OF PHYS field in the ~~Protocol-Specific Port mode page for SAS SSP~~ Phy Control And Discover ~~subpage~~mode page (see 10.2.7.2.3).

4.5 I_T nexus loss

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When a SAS port receives OPEN_REJECT (NO DESTINATION), OPEN_REJECT (PATHWAY BLOCKED), OPEN_REJECT (RESERVED INITIALIZE 0), OPEN_REJECT (RESERVED INITIALIZE 1), OPEN_REJECT (RESERVED STOP 0), OPEN_REJECT (RESERVED STOP 1), or an open connection timeout occurs in response to a connection request, it shall retry the connection request until:

a) the connection is established;
b) for SSP target ports, the time indicated by the I_T NEXUS LOSS field in the Protocol-Specific Port mode page (see 10.2.7.2) expires; or
c) the I_T nexus loss timer, if any, expires (see 4.7.1, 8.2.2.1, 10.2.7.2, and 10.4.3.15).

7.5.11.1 NOTIFY overview

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The versions of NOTIFY representing different reasons are defined in table 1.

Table 1 — NOTIFY primitives

Primitive	Description	Reference
NOTIFY (ENABLE SPINUP)	Specify to a SAS target device that it may temporarily consume additional power while transitioning into the active or idle power condition state.	7.2.5.11.2
NOTIFY (POWER LOSS EXPECTED)	Specify to a SAS target device that power loss may occur within the time specified by the POWER LOSS TIMEOUT field in the ~~Protocol-Specific Port mode page~~ Shared Port Control ~~subpage~~mode page (see 10.2.7.2.4).	7.2.5.11.3
NOTIFY (RESERVED 1)	Reserved.	
NOTIFY (RESERVED 2)		

7.2.5.11.3 NOTIFY (POWER LOSS EXPECTED)

NOTIFY (POWER LOSS EXPECTED) is transmitted by a SAS initiator port or expander port and is used tov specify to a SAS target device that power loss may occur within the time specified in the POWER LOSS TIMEOUT field in the ~~Protocol-Specific Port mode page~~ Shared Port Control ~~subpage~~mode page (see 10.2.7.2.4).

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8.2.2.3.1 PL_OC2:Overall_Control state

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After receiving a Transmit Frame request for a destination SAS address for which there is no connection established and for which no I_T Nexus Loss timer has been created, this state shall create an I_T Nexus Loss timer for that SAS address if:

a) the protocol is SSP, the port is an SSP target port, the Protocol-Specific Port mode page is implemented, and the I_T NEXUS LOSS TIME field in the ~~Disconnect-Reconnect~~Protocol-Specific Port mode page ~~(see 10.2.7.1)~~(see 10.2.7.2) is not set to 0000h;
b) the protocol is STP, the port is an STP target port, and the STP SMP I_T NEXUS LOSS TIME field in the SMP CONFIGURE GENERAL function is not set to 0000h; or
c) the protocol is SMP, the port is an SMP initiator port, and the STP SMP I_T NEXUS LOSS TIME field in the SMP CONFIGURE GENERAL function is not set to 0000h.

10.7.2 SCSI mode parameters

10.7.2.1 SCSI mode parameters overview

Table 4 defines mode pages supported by logical units in SCSI target devices in SAS domains (i.e., with SSP target ports) that support the MODE SELECT or MODE SENSE commands.

Table 2 — SSP target port mode pages

Mode page code	Subpage code	Description	Reference
02h	00h	Disconnect-Reconnect mode page	10.7.2.2
18h	00h	Protocol-Specific Logical Unit mode page	10.2.7.2
	01h - DFh	Reserved	
	E0h - FEh	Vendor specific	
	FFh	Return all subpages for this mode page code	SPC-4
19h	00h	Protocol-Specific Port mode page	10.2.7.2
	01h	Phy Control And Discover mode page	10.2.7.3
	02h	Shared Port Control mode page	10.2.7.4
	03h - DFh	Reserved	
	E0h - FEh	Vendor specific	
	FFh	Return all subpages for this mode page code	SPC-4

10.7.2.2 Disconnect-Reconnect mode page

10.7.2.2.1 Disconnect-Reconnect mode page overview

The Disconnect-Reconnect mode page (see SPC-4) provides the application client the means to tune the performance of a service delivery subsystem. Table 3 defines the parameters which are applicable to SSP. If any field in the Disconnect-Reconnect mode page is not implemented, the value assumed for the functionality of the field shall be zero (i.e., as if the field in the mode page is implemented and the field is set to zero).

The application client sends the values in the fields to be used by the device server to control the SSP connections by means of a MODE SELECT command. The device server shall then communicate the field values to the SSP target port. The field values are communicated from the device server to the SSP target port in a vendor-specific manner.

SAS devices shall only use the parameter fields defined below in this subclause. If any other fields within the Disconnect-Reconnect mode page of the MODE SELECT command contain a non-zero value, the device server shall terminate the MODE SELECT command with CHECK CONDITION status with the sense key set to ILLEGAL REQUEST and the additional sense code set to INVALID FIELD IN PARAMETER LIST.

Table 3 — Disconnect-Reconnect mode page for SSP

Byte\Bit	7	6	5	4	3	2	1	0
0	PS	SPF (0b)	PAGE CODE (02h)					
1	PAGE LENGTH (0Eh)							
2	Reserved							
3	Reserved							
4	(MSB)	BUS INACTIVITY TIME LIMIT						
5								(LSB)
6		Reserved						
7								
8	(MSB)	MAXIMUM CONNECT TIME LIMIT						
9								(LSB)
10	(MSB)	MAXIMUM BURST SIZE						
11								(LSB)
12	Reserved							
13	Reserved							
14	(MSB)	FIRST BURST SIZE						
15								(LSB)

The PARAMETERS SAVEABLE (PS) bit is defined in SPC-4.

The SUBPAGE FORMAT (SPF) bit shall be set to zero for access to ~~the short format~~this mode page.

The PAGE CODE (PS) field shall be set to 02h.

The PAGE LENGTH field shall be set to 0Eh.

The BUS INACTIVITY TIME LIMIT field is defined in 10.7.2.2.2.

The MAXIMUM CONNECT TIME LIMIT field is defined in 10.7.2.2.3.

The MAXIMUM BURST SIZE field is defined in 10.7.2.2.4.

The FIRST BURST SIZE field is defined in 10.7.2.2.5.

10.7.2.2.2 BUS INACTIVITY TIME LIMIT field

The value in the BUS INACTIVITY TIME LIMIT field contains the maximum period that an SSP target port is permitted to maintain a connection (see 4.1.12) without transferring a frame to the SSP initiator port. This value shall be the number of 100 µs increments between frames that the SSP target port transmits during a connection. When this number is exceeded, the SSP target port shall prepare to close the connection (i.e., by

requesting to have the link layer transmit DONE). This value may be rounded as defined in SPC-4. A value of zero in this field shall specify that there is no bus inactivity time limit. The bus inactivity time limit is enforced by the port layer (see 8.2.3).

10.7.2.2.3 MAXIMUM CONNECT TIME LIMIT field

The value in the MAXIMUM CONNECT TIME LIMIT field contains the maximum duration of a connection (see 4.1.12). This value shall be the number of 100 μs increments that an SSP target port transmits during a connection after which the SSP target port shall prepare to close the connection (e.g., a value of one in this field means that the time is less than or equal to 100 μs and a value of two in this field means that the time is less than or equal to 200 μs). If an SSP target port is transferring a frame when the maximum connection time limit is exceeded, the SSP target port shall complete transfer of the frame before preparing to close the connection. This value may be rounded as defined in SPC-4. A value of zero in this field shall specify that there is no maximum connection time limit. The maximum connection time limit is enforced by the port layer (see 8.2.3).

10.7.2.2.4 MAXIMUM BURST SIZE field

For read data, the value in the MAXIMUM BURST SIZE field contains the maximum amount of data that is transferred during a connection by an SSP target port per I_T_L_Q nexus without transferring at least one frame for a different I_T_L_Q nexus. If the SSP target port:

a) has read data to transfer for only one I_T_L_Q nexus, and
b) has no requests to transfer write data for any I_T_L_Q nexus;

then the SSP target port shall prepare to close the connection after the amount of data specified by the MAXIMUM BURST SIZE field is transferred to the SSP initiator port.

For write data, the value shall specify the maximum amount of data that an SSP target port requests via a single XFER_RDY frame (see 9.2.2.3).

This value shall be specified in 512-byte increments (e.g., a value of one in this field means that the number of bytes transferred to the SSP initiator port for the nexus is less than or equal to 512 and a value of two in this field means that the number of bytes transferred to the SSP initiator port for the nexus is less than or equal to 1 024). A value of zero in this field shall specify that there is no maximum burst size.

In terms of the SCSI transport protocol services (see 10.2.1), the device server shall limit the Request Byte Count argument to the Receive Data-Out () protocol service and the Send Data-In () protocol service to the amount specified in this field.

10.7.2.2.5 FIRST BURST SIZE field

If the ENABLE FIRST BURST field in the COMMAND frame is set to zero, the FIRST BURST SIZE field is ignored.

If the ENABLE FIRST BURST field in the COMMAND frame is set to one, the value in the FIRST BURST SIZE field contains the maximum amount of write data in 512-byte increments that may be sent by the SSP initiator port to the SSP target port without having to receive an XFER_RDY frame (see 9.2.2.3) from the SSP target port (e.g., a value of one in this field means that the number of bytes transferred by the SSP initiator port is less than or equal to 512 and a value of two in this field means that the number of bytes transferred by the SSP initiator port is less than or equal to 1 024).

Specifying a non-zero value in the FIRST BURST SIZE field is equivalent to an implicit XFER_RDY frame for each command requiring write data where the WRITE DATA LENGTH field of the XFER_RDY frame is set to 512 times the value of the FIRST BURST SIZE field.

The rules for data transferred using the value in the FIRST BURST SIZE field are the same as those used for data transferred for an XFER_RDY frame (i.e., the number of bytes transferred using the value in the FIRST BURST SIZE field is as if that number of bytes was requested by an XFER_RDY frame).

If the amount of data to be transferred for the command is less than the amount of data specified by the FIRST BURST SIZE field, the SSP target port shall not transmit an XFER_RDY frame for the command. If the amount of data to be transferred for the command is greater than the amount of data specified by the FIRST BURST SIZE field, the SSP target port shall transmit an XFER_RDY frame after it has received all of the data specified by

the FIRST BURST SIZE field from the SSP initiator port. All data for the command is not required to be transferred during the same connection in which the command is transferred.

A value of zero in this field shall specify that there is no first burst size (i.e., an SSP initiator port shall transmit no write DATA frames to the SSP target port before receiving an XFER_RDY frame).

The first burst size is handled by the SCSI transport protocol services (see 10.2.1) and the SSP transport layer (see 9.2.6).

10.2.7.2 Protocol-Specific Port mode page

~~**10.2.7.2.1 Protocol-Specific Port mode page overview**~~

~~The Protocol-Specific Port mode page (see SPC-4) contains parameters that affect SSP target port operation. If the mode page is implemented, all logical units in SCSI target devices in SAS domains supporting the MODE SELECT or MODE SENSE commands shall implement the page.~~

~~If a SAS target device has multiple SSP target ports, changes in the short page parameters for one SSP target port should not affect other SSP target ports.~~

~~Table 4 defines the subpages of this mode page.~~

~~**Table 4 — Protocol-Specific Port mode page subpages**~~

~~Subpage~~	~~Description~~	~~Reference~~
~~Short page~~	~~Short format~~	~~10.2.7.2.2~~
~~Long page 00h~~	~~Not allowed~~	
~~Long page 01h~~	~~Phy Control And Discover subpage~~	~~10.2.7.3~~
~~Long page 02h~~	~~Shared Port Control subpage~~	~~10.2.7.4~~
~~Long page E0h - FEh~~	~~Vendor specific~~	
~~Long page FFh~~	~~Return all subpages for the Protocol-Specific Port mode page~~	~~SPC-4~~
~~All others~~	~~Reserved~~	

~~**10.2.7.2.2 Protocol-Specific Port mode page - short format**~~

The Protocol-Specific Port mode page (see SPC-4) contains parameters that affect SSP target port operation. If the mode page is implemented by one logical unit in a SCSI target device, it shall be implemented by all logical units in the SCSI target device that support the MODE SELECT or MODE SENSE commands.

The mode page policy (see SPC-4) for ~~the Protocol-Specific Port~~this mode page ~~short format subpage~~ shall be either shared or per target port. If a SAS target device has multiple SSP target ports, the mode page policy should be per target port.

Parameters in this mode page:

a) shall affect all phys in the SSP target port if the mode page policy is per target port~~.~~; and
b) shall affect all SSP target ports in the SAS target device if the mode page policy is shared.

Table 5 defines the format of the page for SAS SSP.

Table 5 — Protocol-Specific Port mode page for SAS SSP ~~— short format~~

Byte\Bit	7	6	5	4	3	2	1	0
0	PS	SPF (0b)	PAGE CODE (19h)					
1	PAGE LENGTH (06h)							
2	Reserved		BROADCAST ASYNCHRONOUS EVENT	READY LED MEANING	PROTOCOL IDENTIFIER (6h)			
3	Reserved							
4	(MSB)	I_T NEXUS LOSS TIME						
5								(LSB)
6	(MSB)	INITIATOR RESPONSE TIMEOUT						
7								(LSB)

The PARAMETERS SAVEABLE (PS) bit is defined in SPC-4.

The SUBPAGE FORMAT (SPF) bit shall be set to zero for access to ~~the short format mode page~~this mode page.

The PAGE CODE field shall be set to 19h.

The PAGE LENGTH field shall be set to the number of bytes in the page after the PAGE LENGTH field (i.e., 06h).

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The PROTOCOL IDENTIFIER field shall be set to 6h indicating this is a SAS SSP specific mode page.

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10.2.7.3 ~~10.2.7.2.3 Protocol Specific Port mode page~~ Phy Control And Discover ~~subpage~~mode page

The Phy Control And Discover mode page contains parameters that affect SSP target phy operation. If the mode page is implemented by one logical unit in a SCSI target device, it shall be implemented by all logical units in the SCSI target device that support the MODE SELECT or MODE SENSE commands.

~~The Phy Control And Discover subpage contains phy specific parameters.~~ The mode page policy (see SPC-4) for this ~~sub~~mode shall be shared. Parameters in this ~~sub~~mode page shall affect only the referenced phy.

Table 6 defines the format of the ~~subpage for SAS SSP~~mode page.

Table 6 — ~~Protocol Specific Port mode page for SAS SSP~~ Phy Control And Discover ~~sub~~mode page

Byte\Bit	7	6	5	4	3	2	1	0
0	PS	SPF (1b)	PAGE CODE (19h)					
1	SUBPAGE CODE (01h)							
2	(MSB)	PAGE LENGTH (n - 3)						
3								(LSB)
4	Reserved							
5	Reserved				PROTOCOL IDENTIFIER (6h)			
6	Reserved							
7	NUMBER OF PHYS							
SAS phy mode descriptor list								
8	SAS phy mode descriptor (first)(see table 5)							
55								
...	...							
n - 47	SAS phy mode descriptor (last)(see table 5)							
n								

The PARAMETERS SAVEABLE (PS) bit is defined in SPC-4.

The SUBPAGE FORMAT (SPF) bit shall be set to one to access ~~the long format mode pages~~this mode page.

The PAGE CODE field shall be set to 19h.

The SUBPAGE CODE field shall be set to 01h.

The PAGE LENGTH field shall be set to the number of bytes in the page after the PAGE LENGTH field (i.e., 4 + (the value of the NUMBER OF PHYS field) × (the length in bytes of the SAS phy mode descriptor)).

The PROTOCOL IDENTIFIER field shall be set to 6h indicating this is a SAS SSP specific mode page.

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10.2.7.4 ~~10.2.7.2.4 Protocol Specific Port mode page~~ Shared Port Control ~~subpage~~mode page

The Shared Port Control mode page contains parameters that affect SSP target port operation. If the mode page is implemented by one logical unit in a SCSI target device, it shall be implemented by all logical units in the SCSI target device that support the MODE SELECT or MODE SENSE commands.

~~The Shared Port Control subpage~~mode page ~~contains port-specific parameters.~~ The mode page policy (see SPC-4) for this ~~sub~~mode page shall be shared.

Table 6 defines the format of ~~the subpage for SAS SSP~~this mode page.

Table 7 — ~~Protocol Specific Port mode page for SAS SSP~~ Shared Port Control ~~sub~~mode page

Byte\Bit	7	6	5	4	3	2	1	0
0	PS	SPF (1b)	PAGE CODE (19h)					
1	SUBPAGE CODE (02h)							
2	(MSB)	PAGE LENGTH (000Ch)						
3								(LSB)
4	Reserved							
5	Reserved				PROTOCOL IDENTIFIER (6h)			
6	(MSB)	POWER LOSS TIMEOUT						
7								(LSB)
8		Reserved						
15								

The PARAMETERS SAVEABLE (PS) bit is defined in SPC-4.

The SUBPAGE FORMAT (SPF) bit shall be set to one to access ~~the long format mode pages~~this mode page.

The PAGE CODE field shall be set to 19h.

The SUBPAGE CODE field shall be set to 02h.

The PAGE LENGTH field shall be set to the number of bytes in the page after the PAGE LENGTH field (i.e., 000Ch).

The PROTOCOL IDENTIFIER field shall be set to 6h indicating this is a SAS SSP specific mode page.

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10.2.7.5 Protocol-Specific Logical Unit mode page

~~**10.2.7.5.1 Protocol-Specific Logical Unit mode page overview**~~

The Protocol-Specific Logical Unit mode page (see SPC-4) contains parameters that affect SSP target port operation on behalf of the logical unit.

~~Table 8 defines the subpages of this mode page.~~

~~**Table 8 — Protocol-Specific Logical Unit mode page subpages**~~

~~Subpage~~	~~Description~~	~~Reference~~
~~Short page~~	~~Short format~~	~~10.2.7.5.2~~
~~Long page 00h~~	~~Not allowed~~	
~~Long page E0h - FEh~~	~~Vendor specific~~	
~~Long page FFh~~	~~Return all subpages for the Protocol-Specific Logical Unit mode page~~	~~SPC-4~~
~~All others~~	~~Reserved~~	

~~10.2.7.5.2 Protocol-Specific Logical Unit mode page - short format~~

The mode page policy (see SPC-4) for ~~the Protocol-Specific Logical Unit~~this mode page ~~short format subpage~~ shall be either shared or per target port. If ~~a~~the SAS target device has multiple SSP target ports, the mode page policy should be per target port.

Parameters in this mode page:

a) shall affect all phys in the SSP target port if the mode page policy is per target port~~,~~; and
b) shall affect all SSP target ports in the SAS target device if the mode page policy is shared.

Table 9 defines the format of the page for SAS SSP.

Table 9 — Protocol-Specific Logical Unit mode page for SAS SSP ~~- short format~~

Byte\Bit	7	6	5	4	3	2	1	0
0	PS	SPF (0b)	PAGE CODE (18h)					
1	PAGE LENGTH (06h)							
2	Reserved			TRANSPORT LAYER RETRIES	PROTOCOL IDENTIFIER (6h)			
3	Reserved							
7								

The PARAMETERS SAVEABLE (PS) bit is defined in SPC-4.

The SUBPAGE FORMAT (SPF) bit shall be set to zero for access to ~~the short format~~this mode page.

The PAGE CODE field shall be set to 18h.

The PAGE LENGTH field shall be set to the number of bytes in the page after the PAGE LENGTH field (i.e., 06h).

The PROTOCOL IDENTIFIER field shall be set to 6h indicating this is a SAS SSP specific mode page.

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10.2.8 SCSI log parameters

10.2.8.1 Protocol-Specific Port log page

The Protocol-Specific Port log page for SAS defined in table 10 is used to return phy event information concerning the SAS target device's phy(s).

Table 10 — Protocol-Specific Port log page for SAS SSP

Byte\Bit	7	6	5	4	3	2	1	0
0	DS	SPF (0b)	PAGE CODE (18h)					
1	SUBPAGE CODE (00h)							
2	(MSB)	PAGE LENGTH (m - 3)						
3								(LSB)
Protocol-specific port log parameter list								
4	Protocol-specific port log parameter (first)(see table 207)							
...	...							
	Protocol-specific port log parameter (last)(see table 207)							
m								

The DISABLE SAVE (DS) bit is defined in SPC-4.

The SUBPAGE FORMAT (SPF) bit shall be set to zero for access to this log page.

The PAGE CODE field shall be set to 18h.

The SUBPAGE CODE field shall be set to 00h.

The PAGE LENGTH field shall be set to the number of bytes in the log page after the PAGE LENGTH field.

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