To: T10 Technical Committee
From: Rob Elliott, HP (elliott@hp.com)
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Subject: 02-397r0 SAS Protocol Specific mode page

Revision History
Revision 0 (13 October 2002) First revision

Related Documents
sas-r02a - Serial Attached SCSI revision 2a

Overview
The Serial Management Protocol (SMP) includes a DISCOVER page that reports information about a phy, and a PHY CONTROL page to control various things (e.g. enable/disable a phy).

Targets not implementing SMP may still want to provide these controls. A mode page is proposed to do so.

Readable fields available in SMP that might apply to targets:

a) number of phys (REPORT GENERAL)
b) attached SSP/STP/SMP initiator/target bitmasks (DISCOVER)
c) attached SAS address (DISCOVER)
d) SAS address (DISCOVER)
e) programmed/hardware minimum/maximum physical link rate (DISCOVER)
f) margin settings (2 bytes vendor-specific, 4 bytes reserved) (REPORT PHY MARGIN SETTINGS)

Writable fields in SMP that might apply to targets:

a) Phy operation - Link reset (PHY CONTROL)
b) Phy operation - Hard reset (PHY CONTROL)
c) Phy operation - Enable (PHY CONTROL)
d) Phy operation - Disable (PHY CONTROL)
e) Phy operation - NEA loopback (PHY CONTROL)
f) Phy operation - Clear error log (PHY CONTROL)
g) Programmed minumum/maximum physical link rate (PHY CONTROL)
h) margin controls (2 bytes vendor-specific, 4 bytes reserved) (PHY MARGIN CONTROL)

The SMP REPORT PHY ERROR LOG page already has an equivalent SCSI log page.

Mode pages should not report/change target ports other than the target port through which the mode page is being accessed. They may report/change target ports using the same protocol, however.

This means a SAS port must be used to access the SAS version of the Protocol-Specific mode page. It may affect all the SAS phys in all the SAS ports in the target device.

The short subpage is left for simple parameters that affect all phys (e.g. I_T nexus loss time). The long subpages are proposed to handle phy-specific parameters (everything in DISCOVER, PHY CONTROL, and PHY MARGIN CONTROL).

VPD pages might be a better location to report phy identifier/SAS address maps. However, they are very volatile, which VPD usually is not.

Suggested Changes

0.0.0.1 Protocol-Specific Port mode page

0.0.0.1.1 Overview

The Protocol-Specific Port mode page (see SPC-3) contains parameters that affect SAS SSP target port operation. This mode page and all subpages of this mode page are optional. If the mode page is implemented, all logical units in SAS SSP target devices supporting the MODE SELECT or MODE SENSE commands shall implement the page. If implemented, there shall be one copy of the mode page shared by all initiator ports.

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

Table 2 shows the subpages of this mode page.

Table 1 — Protocol-Specific Port Control mode page subpages

Subpage	Description	Reference
Short page	Short format	x.y.z
Long page 00h	Not allowed	
Long page 01h	Phy Control And Discover subpage	x.y.z
Long page 02h	*Phy Margin Control subpage*	*x.y.z*
Long page E0h - FEh	Vendor-specific	
Long page FFh	Return all subpages for the Port Control mode page	SPC-3
All others	Reserved	

Editor's Note 1: I propose we not define the margin control page at this time.

0.0.0.1.2 Protocol-Specific Port mode page - short format

The short format of this mode page shall be implemented by all SAS SSP target devices. Parameters in this page shall affect all phys in the target port, and may affect all SAS SSP target ports in the target device. Table 2 shows the format of the page for SAS SSP.

Table 2 — Protocol-Specific Port Control mode page for SAS SSP - short format

Bit Byte	7	6	5	4	3	2	1	0
0	PS	SPF (0)	PAGE CODE (19h)					
1	PAGE LENGTH (06h)							
2	Reserved				PROTOCOL IDENTIFIER (6h)			
3	Reserved							
4	(MSB)	I_T NEXUS LOSS TIME						
5								(LSB)
6	Reserved							
7	Reserved							

The SPF field shall be set to zero for access to the short format mode page. The PROTOCOL IDENTIFIER field shall be set to 6h indicating this is a SAS SSP specific mode page.

The I_T NEXUS LOSS TIME field indicates how long in milliseconds the target port shall retry connection requests to an initiator port that are rejected with OPEN_REJECT (NO DESTINATION), OPEN_REJECT (LINK RATE NOT SUPPORTED), or connection timeouts before treating it as an I_T nexus loss (see 4.6). The default setting shall be 2 000 ms. An I_T NEXUS LOSS TIME of zero indicates the target port shall never consider rejections an I_T nexus loss.

Editor's Note 2: any value in a bunch of reserved fields at the end, or can this mode page size grow in the future?

Editor's Note 3: track any changes to REPORT GENERAL in the short page or new subpages

0.0.0.1.3 Protocol-Specific Port mode page - Phy Control And Discover subpage

The Phy Control And Discover subpage contains phy-specific parameters. Parameters in this page shall affect only the referenced phy. Table 3 shows the format of the subpage for SAS SSP.

Table 3 — Protocol-Specific Port Control mode page for SAS SSP - Phy Control And Discover subpage

Bit Byte	7	6	5	4	3	2	1	0
0	PS	SPF (1b)	PAGE CODE (19h)					
1	SUBPAGE CODE (01h)							
4	(MSB)	PAGE LENGTH (n - 3)						
5								(LSB)
6	Reserved							
7	NUMBER OF PHYS							
SAS phy mode descriptors								
8	First SAS phy mode descriptor							
...	...							
n	Last SAS phy mode descriptor							

The SPF field is set to one to access the long format mode pages.

The NUMBER OF PHYS field contains the number of phys in the target device and indicates the number of SAS phy mode descriptors that follow. This field shall not be changeable.

A SAS phy mode descriptor shall be included for each phy in the target device, starting with the lowest numbered phy and ending with the highest numbered phy.

Table 4 shows the SAS phy mode descriptor.

Table 4 — SAS phy mode descriptor

Bit Byte	7	6	5	4	3	2	1	0
8	Reserved							
9	PHY IDENTIFIER							
10	PHY OPERATION							
11	Reserved							
12	Reserved	ATTACHED DEVICE TYPE			Reserved			
13	Reserved				CURRENT PHYSICAL LINK RATE			
14	Reserved							
15	Reserved							
16	(MSB)	ATTACHED SAS ADDRESS						
23								(LSB)
24	(MSB)	SAS ADDRESS						
31								(LSB)
32	PROGRAMMED MINIMUM PHYSICAL LINK RATE				HARDWARE MINIMUM PHYSICAL LINK RATE			
33	PROGRAMMED MAXIMUM PHYSICAL LINK RATE				HARDWARE MINIMUM PHYSICAL LINK RATE			
34	Vendor-specific							
35								
36	Reserved							
39								

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 (see 10.3.x).

The PHY IDENTIFIER field, ATTACHED DEVICE TYPE field, CURRENT PHYSICAL LINK RATE field, 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.x). These fields shall not be changeable.

Editor's Note 4: track any changes to DISCOVER and PHY CONTROL in this subpage