

To: T10 Technical Committee  
From: Rob Elliott, HP (elliott@hp.com)  
Date: 18 June 2007  
Subject: 07-277r0 SAS-2 SMP PHY CONTROL and affiliations

**Revision history**

Revision 0 (18 June 2007) First revision

**Related documents**

sas2r10 - Serial Attached SCSI - 2 (SAS-2) revision 10

**Overview**

Right now, if the SMP PHY CONTROL function specifies a phy attached to a SATA device:

- a) CLEAR AFFILIATION phy operation is only accepted from the affiliated initiator
- b) LINK RESET and HARD RESET phy operations are accepted from any initiator
  - A) HARD RESET clears the affiliation, LINK RESET preserves it

This means LINK RESET lets any initiator clear the affiliated initiator's commands.

- c) If there is no affiliated initiator, this is fine; any initiator should be allowed.
- d) If there is an affiliation, it is reasonable for the affiliated initiator to use it to clean up the SATA device without losing its affiliation.
- e) If there is an affiliation, there doesn't seem to be a good reason to allow non-affiliated initiators to do this, except for testing the affiliated initiator's error handling code. In production code, it is more harmful than helpful.

SAS-2 expander devices are proposed to reject the LINK RESET phy operation if an affiliation is present and it is from an initiator without an affiliation. A new function result of AFFILIATION VIOLATION is proposed to be returned in this case. That function result is also applied to the CLEAR AFFILIATION phy operation if attempted by a non-affiliated initiator (rather than the generic SMP FUNCTION FAILED, the current result).

Also, the order of the INVALID EXPANDER CHANGE COUNT function result for several functions is moved up above the function-specific results. The overall order should be:

- 1) INVALID REQUEST FRAME LENGTH
- 2) Other invalid length fields
- 3) PHY DOES NOT EXIST - for phy specific functions
- 4) PHY VACANT - for phy specific functions
- 5) Zoning checks
- 6) INVALID EXPANDER CHANGE COUNT - for write functions
- 7) Function-specific checks
- 8) <second-to-last> SMP FUNCTION FAILED - for all functions
- 9) <last> SMP FUNCTION ACCEPTED - for all functions

**Suggested changes**

**10.4.3.2 SMP function response frame format**

An SMP response frame is sent by a management device server via an SMP target port in response to an SMP request frame. Table 224 defines the SMP response frame format.

**Table 224 — SMP response frame format**

Byte\Bit	7	6	5	4	3	2	1	0	
0	SMP FRAME TYPE (41h)								
1	FUNCTION								
2	FUNCTION RESULT								
3	RESPONSE LENGTH $((n - 7) / 4)$								
4	ADDITIONAL RESPONSE BYTES								
m									
	Fill bytes, if needed								
n - 3	(MSB)	CRC							
n								(LSB)	

The SMP FRAME TYPE field is included in each frame format defined in this clause, although that field is parsed by the SMP transport layer (see 9.4). The SMP FRAME TYPE field is set to 41h.

The FUNCTION field indicates the SMP function to which this frame is a response, and is defined in table 223 in 10.4.3.1.

The FUNCTION RESULT field is defined in table 225.

**Table 225 — FUNCTION RESULT field (part 1 of 5)**

Code	Name	SMP function(s)	Description
00h	SMP FUNCTION ACCEPTED	All	The management device server supports the SMP function. The ADDITIONAL RESPONSE BYTES field contains the requested information.
01h	UNKNOWN SMP FUNCTION	Unknown	The management device server does not support the requested SMP function. The ADDITIONAL RESPONSE BYTES field may be present but shall be ignored.
02h	SMP FUNCTION FAILED	All	The management device server supports the SMP function, but the requested SMP function failed. The ADDITIONAL RESPONSE BYTES may be present but shall be ignored.

Table 225 — FUNCTION RESULT field (part 2 of 5)

Code	Name	SMP function(s)	Description
03h	INVALID REQUEST FRAME LENGTH	All	The management device server supports the SMP function, but the SMP request frame length was invalid (i.e., did not match the frame size defined for the function). The ADDITIONAL RESPONSE BYTES may be present but shall be ignored.
04h	INVALID EXPANDER CHANGE COUNT	CONFIGURE GENERAL, ENABLE DISABLE ZONING, ZONE LOCK, CONFIGURE ZONE PHY INFORMATION, CONFIGURE ZONE PERMISSION TABLE, CONFIGURE ROUTE INFORMATION, PHY CONTROL, PHY TEST FUNCTION, CONFIGURE PHY EVENT INFORMATION	The management device server supports the SMP function, but the EXPECTED EXPANDER CHANGE COUNT field does not match the current expander change count. The ADDITIONAL RESPONSE BYTES may be present but shall be ignored.
05h	BUSY	ZONE UNLOCK	The locked zoning expander device is processing the activate step.
06h	INCOMPLETE DESCRIPTOR LIST	ZONED BROADCAST, CONFIGURE ZONE PHY INFORMATION, CONFIGURE ZONE PERMISSION TABLE, CONFIGURE PHY EVENT INFORMATION	The request frame length results in the truncation of a multi-byte field or descriptor list (e.g., in the ZONED BROADCAST request, the request frame is not large enough to contain the number of broadcast source zone groups specified by the NUMBER OF BROADCAST SOURCE ZONE GROUPS field). The ADDITIONAL RESPONSE BYTES may be present but shall be ignored.

Table 225 — FUNCTION RESULT field (part 3 of 5)

Code	Name	SMP function(s)	Description
10h	PHY DOES NOT EXIST	DISCOVER, DISCOVER LIST, REPORT PHY ERROR LOG, REPORT PHY SATA, REPORT ROUTE INFORMATION, REPORT PHY EVENT INFORMATION, REPORT PHY BROADCAST COUNTS, CONFIGURE ZONE PHY INFORMATION, CONFIGURE ROUTE INFORMATION, PHY CONTROL, PHY TEST FUNCTION, CONFIGURE PHY EVENT INFORMATION	The phy specified by the PHY IDENTIFIER field or the STARTING PHY IDENTIFIER field in the SMP request frame does not exist (e.g., the value is not within the range of zero to the value of the NUMBER OF PHYS field reported in the SMP REPORT GENERAL response). The ADDITIONAL RESPONSE BYTES field may be present but shall be ignored.
11h	INDEX DOES NOT EXIST	REPORT ROUTE INFORMATION, CONFIGURE ROUTE INFORMATION	The phy specified by the PHY IDENTIFIER field in the SMP request frame does not have the table routing attribute (see 4.6.7.1), or the expander route index specified by the EXPANDER ROUTE INDEX field does not exist (i.e., the value is not in the range of 0000h to the value of the EXPANDER ROUTE INDEXES field in the SMP REPORT GENERAL response). The ADDITIONAL RESPONSE BYTES field may be present but shall be ignored.
12h	PHY DOES NOT SUPPORT SATA	REPORT PHY SATA, PHY CONTROL (TRANSMIT SATA PORT SELECTION SIGNAL), PHY CONTROL (SET ATTACHED DEVICE NAME)	The phy specified by the PHY IDENTIFIER field in the SMP request frame is not part of an STP target port. The ADDITIONAL RESPONSE BYTES field may be present but shall be ignored.
13h	UNKNOWN PHY OPERATION	PHY CONTROL	The operation specified by the PHY OPERATION field in the SMP request frame is unknown. The SMP function had no affect. The ADDITIONAL RESPONSE BYTES field may be present but shall be ignored.
14h	UNKNOWN PHY TEST FUNCTION	PHY TEST FUNCTION	The operation specified by the PHY TEST FUNCTION field in the SMP request frame is unknown. The ADDITIONAL RESPONSE BYTES field may be present but shall be ignored.

Table 225 — FUNCTION RESULT field (part 4 of 5)

Code	Name	SMP function(s)	Description
15h	PHY TEST FUNCTION IN PROGRESS	PHY TEST FUNCTION	The specified phy is already performing a phy test function. The ADDITIONAL RESPONSE BYTES field may be present but shall be ignored.
16h	PHY VACANT	DISCOVER, REPORT PHY ERROR LOG, REPORT PHY SATA, REPORT ROUTE INFORMATION, REPORT PHY EVENT INFORMATION, CONFIGURE ROUTE INFORMATION, PHY CONTROL, CONFIGURE PHY EVENT INFORMATION	The management device server processing the SMP request frame does not have access to the phy (e.g., because of zoning or vendor-specific reasons), although the value is within the range of zero to the value of the NUMBER OF PHYs field reported in the SMP REPORT GENERAL response. The ADDITIONAL RESPONSE BYTES field may be present but shall be ignored.
17h	UNKNOWN PHY EVENT INFORMATION SOURCE	CONFIGURE PHY EVENT INFORMATION	The phy event information source specified by a PHY EVENT INFORMATION SOURCE field is not supported. The ADDITIONAL RESPONSE BYTES may be present but shall be ignored.
18h	UNKNOWN DESCRIPTOR TYPE	DISCOVER LIST	The descriptor type specified by the DESCRIPTOR TYPE field is not supported. The ADDITIONAL RESPONSE BYTES may be present but shall be ignored.
19h	UNKNOWN PHY FILTER	DISCOVER LIST	The phy filter specified by the PHY FILTER field is not supported. The ADDITIONAL RESPONSE BYTES may be present but shall be ignored.
1Ah	LOGICAL LINK RATE NOT SUPPORTED	PHY CONTROL	The logical link rate specified by the REQUESTED LOGICAL LINK RATE field is not supported.
<a href="#">1Bh</a>	<a href="#">AFFILIATION VIOLATION</a>	<a href="#">PHY CONTROL</a>	<a href="#">The specified phy operation is not allowed due to the current status of affiliations.</a>
20h	SMP ZONE VIOLATION	CONFIGURE GENERAL, ZONED BROADCAST, PHY CONTROL, PHY TEST FUNCTION, CONFIGURE PHY EVENT INFORMATION	The management device server supports the function, but zoning is enabled and the SMP initiator port does not have access to a necessary zone group according to the zone permission table (see 4.9.3.2). The ADDITIONAL RESPONSE BYTES may be present but shall be ignored.

Table 225 — FUNCTION RESULT field (part 5 of 5)

Code	Name	SMP function(s)	Description
21h	NO MANAGEMENT ACCESS RIGHTS	ZONE LOCK	<p>Any of the following are true:</p> <ul style="list-style-type: none"> <li>a) zoning is enabled, the ZONE LOCK bit is set to zero, the PHYSICAL PRESENCE bit is set to zero, the ZONE MANAGER PASSWORD field is not set to the current zone manager password, and the zone manager does not have access to zone group 2;</li> <li>b) zoning is enabled, the ZONE LOCK bit is set to one, and the request did not originate from the active zone manager; or</li> <li>c) zoning is disabled, the PHYSICAL PRESENCE bit is set to zero, the ZONE MANAGER PASSWORD field is not set to the current zone manager password.</li> </ul> <p>The ADDITIONAL RESPONSE BYTES field may be present but shall be ignored.</p>
22h	UNKNOWN ENABLE DISABLE ZONING VALUE	ENABLE DISABLE ZONING	The ENABLE DISABLE ZONING field is set to 11b (i.e., Reserved). The ADDITIONAL RESPONSE BYTES field may be present but shall be ignored.
23h	ZONE LOCK VIOLATION	ENABLE DISABLE ZONING, ZONE LOCK, ZONE ACTIVATE, ZONE UNLOCK, CONFIGURE ZONE PHY INFORMATION, CONFIGURE ZONE PERMISSION TABLE	<p>Zoning is enabled and:</p> <ul style="list-style-type: none"> <li>a) an unlocked zoning expander device receives an SMP zone configuration function request, a ZONE ACTIVATE request, or a ZONE UNLOCK request from an SMP initiator port that is not the active zone manager; or</li> <li>b) a locked zoning expander device receives an SMP ZONE LOCK request, an SMP zone configuration function request, a ZONE ACTIVATE request, or a ZONE UNLOCK request from an SMP initiator port that is not the active zone manager.</li> </ul>
24h	NOT ACTIVATED	ZONE UNLOCK	The ACTIVATE REQUIRED bit in the request is set to one but the locked zoning expander device has not processed the activate step.
25h	ZONE GROUP OUT OF RANGE	CONFIGURE ZONE PHY INFORMATION, CONFIGURE ZONE PERMISSION TABLE	The ZONE GROUP field or NUMBER OF ZONE GROUPS field contains a value that is not supported. The ADDITIONAL RESPONSE BYTES field may be present but shall be ignored.
26h	NO PHYSICAL PRESENCE	CONFIGURE ZONE MANAGER PASSWORD	The new ZONE MANAGER PASSWORD field is set to DISABLED (see table 26 in 4.9.1) but physical presence is not asserted. The ADDITIONAL RESPONSE BYTES field may be present but shall be ignored.
All others	Reserved		

Table 226 defines the priority of the SMP function results defined in table 225.

**Table 226 — Function result priority (part 1 of 4)**

<b>SMP function</b>	<b>SMP function result priority</b>
REPORT GENERAL (see 10.4.3.3)	1) INVALID REQUEST FRAME LENGTH; 2) SMP FUNCTION FAILED; and 3) SMP FUNCTION ACCEPTED
REPORT MANUFACTURER INFORMATION (see 10.4.3.4)	1) INVALID REQUEST FRAME LENGTH; 2) SMP FUNCTION FAILED; and 3) SMP FUNCTION ACCEPTED
READ GPIO REGISTER (see SFF-8485)	1) INVALID REQUEST FRAME LENGTH; 2) SMP FUNCTION FAILED; and 3) SMP FUNCTION ACCEPTED
REPORT SELF-CONFIGURATION STATUS (see 10.4.3.5)	1) INVALID REQUEST FRAME LENGTH; 2) SMP FUNCTION FAILED; and 3) SMP FUNCTION ACCEPTED
REPORT ZONE PERMISSION TABLE (see 10.4.3.6)	1) INVALID REQUEST FRAME LENGTH; 2) SMP FUNCTION FAILED; and 3) SMP FUNCTION ACCEPTED
DISCOVER (see 10.4.3.8)	1) INVALID REQUEST FRAME LENGTH; 2) PHY DOES NOT EXIST; 3) PHY VACANT; 4) SMP FUNCTION FAILED; and 5) SMP FUNCTION ACCEPTED
REPORT PHY ERROR LOG (see 10.4.3.9)	1) INVALID REQUEST FRAME LENGTH; 2) PHY DOES NOT EXIST; 3) PHY VACANT; 4) SMP FUNCTION FAILED; and 5) SMP FUNCTION ACCEPTED
REPORT PHY SATA (see 10.4.3.10)	1) INVALID REQUEST FRAME LENGTH; 2) PHY DOES NOT EXIST; 3) PHY VACANT; 4) PHY DOES NOT SUPPORT SATA; 5) SMP FUNCTION FAILED; and 6) SMP FUNCTION ACCEPTED
REPORT ROUTE INFORMATION (see 10.4.3.11)	1) INVALID REQUEST FRAME LENGTH; 2) PHY DOES NOT EXIST; 3) PHY VACANT; 4) INDEX DOES NOT EXIST; 5) SMP FUNCTION FAILED; and 6) SMP FUNCTION ACCEPTED
REPORT PHY EVENT INFORMATION (see 10.4.3.12)	1) INVALID REQUEST FRAME LENGTH; 2) PHY DOES NOT EXIST; 3) PHY VACANT; 4) SMP FUNCTION FAILED; and 5) SMP FUNCTION ACCEPTED
REPORT PHY BROADCAST COUNTS (see 10.4.3.13)	1) INVALID REQUEST FRAME LENGTH; 2) PHY DOES NOT EXIST; 3) SMP FUNCTION FAILED; and 4) SMP FUNCTION ACCEPTED

Table 226 — Function result priority (part 2 of 4)

SMP function	SMP function result priority
DISCOVER LIST (see 10.4.3.14)	1) INVALID REQUEST FRAME LENGTH; 2) PHY DOES NOT EXIST; 3) UNKNOWN DESCRIPTOR TYPE; 4) UNKNOWN PHY FILTER; 5) SMP FUNCTION FAILED; and 6) SMP FUNCTION ACCEPTED
REPORT EXPANDER ROUTE TABLE (see 10.4.3.15)	1) INVALID REQUEST FRAME LENGTH; 2) SMP FUNCTION FAILED; and 3) SMP FUNCTION ACCEPTED
CONFIGURE GENERAL (see 10.4.3.16)	1) INVALID REQUEST FRAME LENGTH; 2) SMP ZONE VIOLATION; 3) INVALID EXPANDER CHANGE COUNT; 4) SMP FUNCTION FAILED; and 5) SMP FUNCTION ACCEPTED
WRITE GPIO REGISTER (see SFF-8485)	1) INVALID REQUEST FRAME LENGTH; 2) SMP FUNCTION FAILED; and 3) SMP FUNCTION ACCEPTED
ENABLE DISABLE ZONING (see 10.4.3.17)	1) INVALID REQUEST FRAME LENGTH; 2) ZONE LOCK VIOLATION; 3) UNKNOWN ENABLE DISABLE ZONING VALUE; 4) INVALID EXPANDER CHANGE COUNT; 5) SMP FUNCTION FAILED; and 6) SMP FUNCTION ACCEPTED
ZONED BROADCAST (see 10.4.3.18)	1) INVALID REQUEST FRAME LENGTH; 2) INCOMPLETE DESCRIPTOR LIST; 3) SMP ZONE VIOLATION; 4) SMP FUNCTION FAILED; and 5) SMP FUNCTION ACCEPTED
ZONE LOCK (see 10.4.3.19)	1) INVALID REQUEST FRAME LENGTH; 2) ZONE LOCK VIOLATION; 3) NO MANAGEMENT ACCESS RIGHTS; 4) INVALID EXPANDER CHANGE COUNT; 5) SMP FUNCTION FAILED; and 6) SMP FUNCTION ACCEPTED
ZONE ACTIVATE (see 10.4.3.20)	1) INVALID REQUEST FRAME LENGTH; 2) ZONE LOCK VIOLATION; 3) INVALID EXPANDER CHANGE COUNT; 4) SMP FUNCTION FAILED; and 5) SMP FUNCTION ACCEPTED
ZONE UNLOCK (see 10.4.3.21)	1) INVALID REQUEST FRAME LENGTH; 2) ZONE LOCK VIOLATION; 3) NOT ACTIVATED; 4) BUSY; 5) SMP FUNCTION FAILED; and 6) SMP FUNCTION ACCEPTED



Table 226 — Function result priority (part 3 of 4)

SMP function	SMP function result priority
CONFIGURE ZONE PHY INFORMATION (see 10.4.3.23)	1) INVALID REQUEST FRAME LENGTH; 2) INCOMPLETE DESCRIPTOR LIST; 3) PHY DOES NOT EXIST; 4) ZONE LOCK VIOLATION; 5) INVALID EXPANDER CHANGE COUNT; 6) ZONE GROUP OUT OF RANGE; 7) SMP FUNCTION FAILED; and 8) SMP FUNCTION ACCEPTED
CONFIGURE ZONE PERMISSION TABLE (see 10.4.3.24)	1) INVALID REQUEST FRAME LENGTH; 2) INCOMPLETE DESCRIPTOR LIST; 3) ZONE LOCK VIOLATION; 4) INVALID EXPANDER CHANGE COUNT; 5) ZONE GROUP OUT OF RANGE; 6) SMP FUNCTION FAILED; and 7) SMP FUNCTION ACCEPTED
CONFIGURE ROUTE INFORMATION (see 10.4.3.25)	1) INVALID REQUEST FRAME LENGTH; 2) PHY DOES NOT EXIST; 3) PHY VACANT; 4) <a href="#">INVALID EXPANDER CHANGE COUNT</a> ; 5) INDEX DOES NOT EXIST; 6) <del>INVALID EXPANDER CHANGE COUNT</del> ; 7) SMP FUNCTION FAILED; and 8) SMP FUNCTION ACCEPTED
PHY CONTROL (see 10.4.3.26)	1) INVALID REQUEST FRAME LENGTH; 2) PHY DOES NOT EXIST; 3) PHY VACANT; 4) SMP ZONE VIOLATION; 5) <a href="#">INVALID EXPANDER CHANGE COUNT</a> ; 6) LOGICAL LINK RATE NOT SUPPORTED; 7) UNKNOWN PHY OPERATION; 8) PHY DOES NOT SUPPORT SATA; 9) <a href="#">AFFILIATION VIOLATION</a> ; 10) <del>INVALID EXPANDER CHANGE COUNT</del> ; 11) SMP FUNCTION FAILED; and 12) SMP FUNCTION ACCEPTED
PHY TEST FUNCTION (see 10.4.3.27)	1) INVALID REQUEST FRAME LENGTH; 2) PHY DOES NOT EXIST; 3) PHY VACANT; 4) SMP ZONE VIOLATION; 5) <a href="#">INVALID EXPANDER CHANGE COUNT</a> ; 6) UNKNOWN PHY TEST FUNCTION; 7) PHY TEST FUNCTION IN PROGRESS; 8) <del>INVALID EXPANDER CHANGE COUNT</del> ; 9) SMP FUNCTION FAILED; and 10) SMP FUNCTION ACCEPTED

Table 226 — Function result priority (part 4 of 4)

SMP function	SMP function result priority
CONFIGURE PHY EVENT INFORMATION (see 10.4.3.28)	1) INVALID REQUEST FRAME LENGTH; 2) INCOMPLETE DESCRIPTOR LIST; 3) PHY DOES NOT EXIST; 4) PHY VACANT; 5) SMP ZONE VIOLATION; 6) <u>INVALID EXPANDER CHANGE COUNT</u> ; 7) UNKNOWN PHY EVENT INFORMATION SOURCE; 8) <del>INVALID EXPANDER CHANGE COUNT</del> ; 9) SMP FUNCTION FAILED; and 10) SMP FUNCTION ACCEPTED

#### 10.4.3.26 PHY CONTROL function

The PHY CONTROL function requests actions by the specified phy. This SMP function may be implemented by any management device server. In zoning expander devices, if zoning is enabled then this function shall only be processed from SMP initiator ports that have access to zone group 2 or the zone group of the specified phy (see 4.9.3.2).

Table 227 defines the request format.

**Table 227 — PHY CONTROL request**

Byte\Bit	7	6	5	4	3	2	1	0
0	SMP FRAME TYPE (40h)							
1	FUNCTION (91h)							
2	Reserved							
3	REQUEST LENGTH (09h)							
4	(MSB)	EXPECTED EXPANDER CHANGE COUNT						(LSB)
5	Reserved							
6	Reserved							
8	Reserved							
9	PHY IDENTIFIER							
10	PHY OPERATION							
11	Reserved							UPDATE PARTIAL PATHWAY TIMEOUT VALUE
12	Reserved							
23	Reserved							
24	ATTACHED DEVICE NAME							
31	Reserved							
32	PROGRAMMED MINIMUM PHYSICAL LINK RATE				Reserved			
33	PROGRAMMED MAXIMUM PHYSICAL LINK RATE				Reserved			
34	Reserved							
35	Reserved							
36	Reserved				PARTIAL PATHWAY TIMEOUT VALUE			
37	Reserved							
39	Reserved							
40	(MSB)	CRC						(LSB)
43	Reserved							

The SMP FRAME TYPE field shall be set to 40h.

The FUNCTION field shall be set to 91h.

The REQUEST LENGTH field shall be set to 09h. For compatibility with previous versions of this standard, a REQUEST LENGTH field set to 00h specifies that there are 9 dwords before the CRC field.

The EXPECTED EXPANDER CHANGE COUNT field is defined in the SMP CONFIGURE GENERAL request (see 10.4.3.16).

The PHY IDENTIFIER field specifies the phy (see 4.2.8) to which the SMP PHY CONTROL request applies.

Table 228 defines the PHY OPERATION field.

**Table 228** — PHY OPERATION field (part 1 of 3)

Code	Operation	Description
00h	NOP	No operation.
01h	LINK RESET	<p><u>If:</u>                      a) <u>a SAS phy is attached;</u>                      b) <u>a SATA phy is attached and there is no affiliation; or</u>                      c) <u>a SATA phy is attached and an affiliation exists for the STP initiator port with the same SAS address as the SMP initiator port that opened this SMP connection;</u>  <u>then:</u>                      a) <u>if</u> the specified phy is not a virtual phy, perform a link reset sequence (see 4.4) on the specified phy; <u>and</u>                      b) <u>if</u> the specified phy is a virtual phy, perform an internal reset and enable the specified phy.</p> <p><u>If a SATA phy is attached and an affiliation does not exist for the STP initiator port with the same SAS address as the SMP initiator port that opened this SMP connection, then the management device server shall return a function result of AFFILIATION VIOLATION in the response frame.</u> <sup>a</sup></p> <p>See 7.11 for Broadcast (Change) requirements related to this phy operation in an expander device.</p> <p>Any affiliation (see 7.17.4) shall continue to be present. The phy shall bypass the SATA spinup hold state, if implemented (see 6.8.3.9).</p> <p>The management device server shall return the PHY CONTROL response without waiting for the LINK RESET phy operation to complete.</p> <p>While the LINK RESET phy operation is in progress, the management device server sets the NEGOTIATED PHYSICAL LINK RATE field and the NEGOTIATED PHYSICAL LINK RATE field to RESET_IN_PROGRESS in the SMP DISCOVER response (see 10.4.3.8).</p>
<p><sup>a</sup> <u>Phys compliant with previous versions of this standard did not reject this phy operation due to affiliations.</u></p> <p><sup>b</sup> <u>Phys compliant with previous versions of this standard returned SMP FUNCTION REJECTED.</u></p>		

Table 228 — PHY OPERATION field (part 2 of 3)

Code	Operation	Description
02h	HARD RESET	<p>If the specified phy is not a virtual phy, perform a link reset sequence (see 4.4) on the specified phy and enable the specified phy. If the attached phy is a SAS phy or an expander phy, the link reset sequence shall include a hard reset sequence (see 4.4.2). If the attached phy is a SATA phy, the phy shall bypass the SATA spinup hold state. See 7.11 for Broadcast (Change) requirements related to this phy operation in an expander device.</p> <p>If the specified phy is a virtual phy, perform an internal reset and enable the specified phy.</p> <p>Any affiliation (see 7.17.4) shall be cleared.</p> <p>The management device server shall return the PHY CONTROL response without waiting for the HARD RESET phy operation to complete.</p> <p>While the HARD RESET phy operation is in progress, the management device server sets the NEGOTIATED PHYSICAL LINK RATE field and the NEGOTIATED PHYSICAL LINK RATE field to RESET_IN_PROGRESS in the SMP DISCOVER response (see 10.4.3.8).</p>
03h	DISABLE	<p>Disable the specified phy (i.e., stop transmitting valid dwords and receiving dwords on the specified phy). The LINK RESET and HARD RESET operations may be used to enable the phy. See 7.11 for Broadcast (Change) requirements related to this phy operation in an expander device.</p>
04h	Reserved	
05h	CLEAR ERROR LOG	<p>Clear the error log counters reported in the REPORT PHY ERROR LOG function (see 10.4.3.9) for the specified phy.</p>
06h	CLEAR AFFILIATION	<p>Clear an affiliation (see 7.17.4) from the STP initiator port with the same SAS address as the SMP initiator port that opened this SMP connection. If there is no such affiliation, the management device server shall return a function result of <b>SMP FUNCTION FAILED</b><a href="#">AFFILIATION VIOLATION</a><sup>b</sup> in the response frame.</p>
07h	TRANSMIT SATA PORT SELECTION SIGNAL	<p>This function shall only be supported by phys in an expander device.</p> <p>If the expander phy incorporates an STP/SATA bridge and supports SATA port selectors, the phy shall transmit the SATA port selection signal (see 6.6) which causes the SATA port selector to select the attached phy as the active host phy and make its other host phy inactive. See 7.11 for Broadcast (Change) requirements related to this phy operation in an expander device.</p> <p>Any affiliation (see 7.17.4) shall be cleared.</p> <p>If the expander phy does not support SATA port selectors, then the management device server shall return a function result of PHY DOES NOT SUPPORT SATA.</p> <p>If the expander phy supports SATA port selectors but is attached to a SAS phy or an expander phy, the management device server shall return a function result of SMP FUNCTION FAILED.</p>
<p><sup>a</sup> <a href="#">Phys compliant with previous versions of this standard did not reject this phy operation due to affiliations.</a></p> <p><sup>b</sup> <a href="#">Phys compliant with previous versions of this standard returned SMP FUNCTION REJECTED.</a></p>		

Table 228 — PHY OPERATION field (part 3 of 3)

Code	Operation	Description
08h	CLEAR STP I_T NEXUS LOSS	The STP I_T NEXUS LOSS OCCURRED bit in the REPORT PHY SATA function (see 10.4.3.10) shall be set to zero.
09h	SET ATTACHED DEVICE NAME	If the expander phy is attached to a SATA phy, set the ATTACHED DEVICE NAME field reported in the DISCOVER response (see 10.4.3.8) to the value of the ATTACHED DEVICE NAME field in the PHY CONTROL request.
All others	Reserved	
<p><sup>a</sup> <a href="#">Phys compliant with previous versions of this standard did not reject this phy operation due to affiliations.</a></p> <p><sup>b</sup> <a href="#">Phys compliant with previous versions of this standard returned SMP FUNCTION REJECTED.</a></p>		

If the PHY IDENTIFIER field specifies the phy which is being used for the SMP connection and a phy operation of LINK RESET, HARD RESET, or DISABLE is requested, the management device server shall not perform the requested operation and shall return a function result of SMP FUNCTION FAILED in the response frame.

An UPDATE PARTIAL PATHWAY TIMEOUT VALUE bit set to one specifies that the PARTIAL PATHWAY TIMEOUT VALUE field shall be honored. An UPDATE PARTIAL PATHWAY TIMEOUT VALUE bit set to zero specifies that the PARTIAL PATHWAY TIMEOUT VALUE field shall be ignored.

The ATTACHED DEVICE NAME field is used by the SET ATTACHED DEVICE NAME phy operation and is reserved for all other phy operations. If a management application client detects the ATTACHED DEVICE NAME field set to zero in the DISCOVER response when a SATA device is attached, it shall set the ATTACHED DEVICE NAME field based on the IDENTIFY (PACKET) DEVICE data retrieved by an ATA application client in the same SAS initiator device as follows:

- a) if IDENTIFY (PACKET) DEVICE data word 255 (i.e., the Integrity word) is correct and words 108-111 (i.e., the World Wide Name field) are not set to zero, set this field to the world wide name indicated by words 108-111 according to table 12 in 4.2.5;
- b) if IDENTIFY (PACKET) DEVICE data word 255 (i.e., the Integrity word) is correct and words 108-111 (i.e., the World Wide Name) are set to zero, set this field to 00000000 00000000h; and
- c) if IDENTIFY (PACKET) DEVICE data word 255 (i.e., the Integrity word) is not correct, set this field to 00000000 00000000h.

The PROGRAMMED MINIMUM PHYSICAL LINK RATE field specifies the minimum physical link rate the phy shall support during a link reset sequence (see 4.4.1). Table 229 defines the values for this field. If this field is changed along with a phy operation of LINK RESET or HARD RESET, that phy operation shall utilize the new value for this field. This value is reported in the DISCOVER response (see 10.4.3.8).

The PROGRAMMED MAXIMUM PHYSICAL LINK RATE field specifies the maximum physical link rates the phy shall support during a link reset sequence (see 4.4.1). Table 229 defines the values for this field. If this field is changed along with a phy operation of LINK RESET or HARD RESET, that phy operation shall utilize the new value for this field. This value is reported in the DISCOVER response (see 10.4.3.8).

**Table 229** — PROGRAMMED MINIMUM PHYSICAL LINK RATE **and** PROGRAMMED MAXIMUM PHYSICAL LINK RATE **fields**

Code	Description
0h	Do not change current value
1h - 7h	Reserved
8h	1,5 Gbps
9h	3 Gbps
Ah	6 Gbps
Bh - Fh	Reserved for future physical link rates

If the PROGRAMMED MINIMUM PHYSICAL LINK RATE field or the PROGRAMMED MAXIMUM PHYSICAL LINK RATE field is set to an unsupported or reserved value, or the PROGRAMMED MINIMUM PHYSICAL LINK RATE field and PROGRAMMED MAXIMUM PHYSICAL LINK RATE field are set to an invalid combination of values (e.g., the minimum is greater than the maximum), the management device server shall not change either of their values and may return a function result of SMP FUNCTION FAILED in the response frame. If it returns a function result of SMP FUNCTION FAILED, it shall not perform the requested phy operation.

The PARTIAL PATHWAY TIMEOUT VALUE field specifies the amount of time in microseconds the expander phy shall wait after receiving an Arbitrating (Blocked On Partial) confirmation from the ECM before requesting that the ECM resolve pathway blockage (see 7.12.4.5). A PARTIAL PATHWAY TIMEOUT VALUE field value of zero (i.e., 0  $\mu$ s) specifies that partial pathway resolution shall be requested by the expander phy immediately upon reception of an Arbitrating (Blocked On Partial) confirmation from the ECM. The PARTIAL PATHWAY TIMEOUT VALUE field is only honored when the UPDATE PARTIAL PATHWAY TIMEOUT VALUE bit is set to one. This value is reported in the DISCOVER response (see 10.4.3.8).

The CRC field is defined in 10.4.3.1.

Table 230 defines the response format.

**Table 230** — PHY CONTROL response

Byte\Bit	7	6	5	4	3	2	1	0	
0	SMP FRAME TYPE (41h)								
1	FUNCTION (91h)								
2	FUNCTION RESULT								
3	RESPONSE LENGTH (00h)								
4	(MSB)	CRC							
7							(LSB)		

The SMP FRAME TYPE field shall be set to 41h.

The FUNCTION field shall be set to 91h.

The FUNCTION RESULT field is defined in 10.4.3.2.

The RESPONSE LENGTH field shall be set to 00h.

The CRC field is defined in 10.4.3.2.