

To: T10 Technical Committee  
 From: Rob Elliott, HP (elliott@hp.com)  
 Date: 7 August 2007  
 Subject: 07-305r1 SAS-2 Zone phy information clarifications

### **Revision history**

Revision 0 (3 July 2007) First revision

Revision 1 (7 August 2007) Incorporated comments from July 2007 SAS protocol WG. Include a save bit in each zone configuration function to specify if the saved or current values are being configured.

### **Related documents**

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

### **Overview**

In a SAS-2 editor's meeting, a question was raised about a NOTE in the zone phy information field descriptions explaining that the the REQUESTED INSIDE ZPSDS bit may be changed by the expander device after a link reset sequence. That bit is special in that the expander device overrides the programmed setting in certain situations. Two other zone phy information fields - the ZONE GROUP field and the INSIDE ZPSDS bit - can also be changed based on the link reset sequence, but are not singled out with notes.

A new table is proposed to introduce all the fields indicating which ones are accessible via IDENTIFY, DISCOVER, DISCOVER LIST, and CONFIGURE ZONE PHY INFORMATION, and indicating which fields may be automatically changed by a link reset sequence.

Zoning enabled, zone phy information, zone permission table, and the zone manager password may or may not be saved in non-volatile storage. If an expander changes a value because of the link reset sequence, the saved value is not supposed to change - just the volatile value. The terms current, saved, and default are defined to help clarify this.

The saved values need to be reported separately from the current values in the DISCOVER response so the zone manager can predict the expander's behavior after a link reset sequence (even if power is cycled).

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[Editor's Note 1: Perhaps the default values should also be reported, along with an indication that saving is supported or not. \(this is becoming as complex as mode pages\)](#)

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### **Suggested changes**

#### **4.9.1 Zoning overview**

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~~A zoning expander device may or may not preserve the following settings during power loss:~~

- ~~a) zoning enabled;~~
- ~~b) the zone permission table;~~
- ~~c) zone phy information; and/or~~
- ~~d) the zone manager password.~~

The expander device:

- a) shall maintain a current value;
- a) may maintain a saved value; and
- a) shall have a default value.

for each the following settings:

- a) zoning enabled;
- b) the zone permission table;
- c) zone phy information; and/or
- d) the zone manager password.

Support or lack of support for saved values for one setting does not imply support or lack of support for saved values for any other setting (e.g., the expander device may maintain a saved value for zoning enabled but not for the zone permission table).

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Editor’s Note 2: Should “shadow” be included here too (for zone permission table and zone phy information)? Should “active” be renamed “current” everywhere?

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For each setting, after power on or expander reduced functionality, the expander device shall set the current value to the saved value, if any, or the default value, if there is no saved value.

Table 1 describes the reasons for which a zoning expander device accepts the SMP ZONE LOCK function after power on.

**Table 1 — Zoning expander device zoning configuration after power on**

Value after power on			Reason(s) that the SMP ZONE LOCK function is accepted				
Zoning enabled	Zone permission table saved	Zone manager password	Physical presence asserted	SMP initiator port has access to zone group 2	ZONE MANAGER PASSWORD field in the ZONE LOCK request set to the zone manager password		
no	N/A <del>yes or no</del>	ZERO	yes	no	yes		
		DISABLED			no		
		All others			yes		
yes	no	ZERO		yes	no	yes	
		DISABLED				no	
		All others				yes	
	yes	yes		ZERO	yes	yes	yes
				DISABLED			no
				All others			yes

**4.9.2 Zoning expander device requirements**

In addition to the requirements for expander devices described in 4.6, a zoning expander device shall:

- a) contain a zoning expander route table (see 4.9.3.4);
- b) contain active and shadow zone permission tables that supports 128 or 256 zone groups (see 4.9.3.3);
- c) contain active and shadow zone phy information for each phy;
- d) if zoning is enabled, allow or deny connection requests based on the active zone permission table (see 4.9.3.5);
- e) set the ZONING SUPPORTED bit to one in its SMP REPORT GENERAL response (see 10.4.3.3);
- f) support the ZONING ENABLED bit in the SMP REPORT GENERAL response;
- g) support the zone lock inactivity timer;
- h) be self-configuring;
- i) contain an SMP initiator port (see 4.6.1); and
- j) support zoning-related SMP functions.

A zoning expander device may include physical presence detection to allow locking (see 4.9.6.2). The definition of physical presence detection is vendor-specific.

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4.9.3 Zone operation

4.9.3.1 Zone phy information

Each phy of a zoning expander device shall support the following zone phy information fields defined in table 3.:

- a) ~~INSIDE ZPSDS bit;~~
- b) ~~REQUESTED INSIDE ZPSDS bit;~~
- c) ~~INSIDE ZPSDS PERSISTENT bit;~~
- d) ~~ZONE GROUP PERSISTENT bit; and~~
- e) ~~ZONE GROUP field.~~

**Table 2 — Zone phy information [new table]**

Field	Description	Recommended default
INSIDE ZPSDS bit	<a href="#">Indicates if the phy is inside or on the boundary of a ZPSDS</a>	N/A <sup>a</sup>
REQUESTED INSIDE ZPSDS bit	<a href="#">Used to establish the boundary of the ZPSDS</a>	0
INSIDE ZPSDS PERSISTENT bit	<a href="#">Used to determine the value of the INSIDE ZPSDS bit after a link reset sequence</a>	0
ZONE GROUP PERSISTENT bit	<a href="#">Used to determine the zone group of the phy after a link reset sequence when the INSIDE ZPSDS bit is set to zero</a>	0
ZONE GROUP field	<a href="#">The zone group to which the phy belongs</a>	00h

<sup>a</sup> [The INSIDE ZPSDS bit is determined from the values exchanged during the link reset sequence.](#)

[Table 3 lists the usage of the current values of the zone phy information fields.](#)

**Table 3 — Zone phy information usage [new table]**

Field	Transmitted in IDENTIFY address frame <sup>a</sup>	Indicated in DISCOVER function and DISCOVER LIST function <sup>b</sup>	Attached value indicated in DISCOVER function <sup>c</sup>	Programmed with the CONFIGURE ZONE PHY INFORMATION function <sup>d</sup>	Changeable by the expander device after a link reset sequence <sup>e</sup>
INSIDE ZPSDS bit	No	Yes	No	No	Yes
REQUESTED INSIDE ZPSDS bit	Yes	Yes	Yes	Yes	Yes
INSIDE ZPSDS PERSISTENT bit	Yes	Yes	Yes	Yes	No
ZONE GROUP PERSISTENT bit	No	Yes	No	Yes	No
ZONE GROUP field	No	Yes	No	Yes	Yes

<sup>a</sup> [Defined in the IDENTIFY address frame \(see 7.8.2\).](#)  
<sup>b</sup> [Defined in the DISCOVER response \(see 10.4.3.8\) and the DISCOVER LIST response SHORT FORMAT descriptor \(see 10.4.3.14.4\).](#)  
<sup>c</sup> [Defined in the DISCOVER response \(see 10.4.3.8\).](#)  
<sup>d</sup> [Defined in the zone phy configuration descriptor \(see 10.4.3.23.3\).](#)  
<sup>e</sup> [See table 33 in 4.9.4.](#)

All phys in an expander port shall have the same zone phy information (see 4.9.3.1). [\[new paragraph\]](#)

The expander device shall preserve the zone phy information while zoning is disabled and [there is no power loss and no expander device reduced functionality \(see 4.6.8\)](#). ~~may or may not preserve the zone phy information through power loss (see 4.9.1).~~

~~If the zoning expander device preserves that zoning is enabled and does not preserve the zone phy information, it shall set the zone phy information as follows:~~

- ~~a) INSIDE ZPSDS bit set to zero;~~
- ~~b) REQUESTED INSIDE ZPSDS bit set to zero;~~
- ~~c) INSIDE ZPSDS PERSISTENT bit set to zero;~~
- ~~d) ZONE GROUP PERSISTENT bit set to zero; and~~
- ~~e) ZONE GROUP field set to 00h.~~

The INSIDE ZPSDS bit indicates if the phy is inside or on the boundary of a ZPSDS. An INSIDE ZPSDS bit set to zero indicates that the phy is attached to an end device, an expander device that does not support zoning, or a zoning expander device with zoning disabled, or a zoning expander device with zoning enabled that is outside the ZPSDS (i.e., is in another ZPSDS). An INSIDE ZPSDS bit set to one indicates that the phy is attached to a zoning expander device with zoning enabled and is thus inside a ZPSDS. The INSIDE ZPSDS bit only changes following a link reset sequence (see 4.9.4), based on:

- a) the REQUESTED INSIDE ZPSDS bit;
- b) the REQUESTED INSIDE ZPSDS bit received in the incoming IDENTIFY address frame (see 7.8.2);
- c) the INSIDE ZPSDS PERSISTENT bit; and
- d) the INSIDE ZPSDS PERSISTENT bit received in the incoming IDENTIFY address frame.

The REQUESTED INSIDE ZPSDS bit is used to establish the boundary of the ZPSDS. The REQUESTED INSIDE ZPSDS bit ~~is transmitted in the IDENTIFY address frame (see 7.8.2) to the attached phy and~~ is used to determine the values of other zone phy information fields after a link reset sequence (see 4.9.4).

~~NOTE 1 – The value of the REQUESTED INSIDE ZPSDS bit may be changed by the zoning expander device following a link reset sequence (see 4.9.4).~~

The INSIDE ZPSDS PERSISTENT bit ~~indicates the method~~[is](#) used to determine the value of the INSIDE ZPSDS bit after a link reset sequence (see 4.9.4). ~~The INSIDE ZPSDS PERSISTENT bit is transmitted in the IDENTIFY address frame (see 7.8.2).~~

The ZONE GROUP field ~~specifies~~[contains](#) the zone group to which the phy belongs. The zone group of the SMP initiator port and SMP target port in a zoning expander device shall be [401h](#). 4.9.3.2 defines more about zone groups.

The ZONE GROUP PERSISTENT bit ~~specifies the method of determining~~[is used to determine](#) the zone group of the phy after a link reset sequence when the INSIDE ZPSDS bit is set to zero (see 4.9.4).

#### 4.9.4 Zone phy information and link reset sequences

At the completion of a link reset sequence (see 4.4), if a SATA device is attached to an expander phy, the zoning expander device with zoning enabled shall set the INSIDE ZPSDS bit to zero for that expander phy.

At the completion of a link reset sequence, if a SATA device is not attached to an expander phy, the zoning expander device with zoning enabled shall update the [current](#) zone phy information fields as defined in table 33 based on:

- a) the REQUESTED INSIDE ZPSDS bit and the INSIDE ZPSDS PERSISTENT bit in the zone phy information (i.e., the bits transmitted in the outgoing IDENTIFY address frame (see 7.8.2)); and
- b) the REQUESTED INSIDE ZPSDS bit and INSIDE ZPSDS PERSISTENT bit received in the incoming IDENTIFY address frame.

Table 33 — Zone phy information fields after a link reset sequence

REQUESTED INSIDE ZPSDS bit		INSIDE ZPSDS PERSISTENT bit		Zone phy information field changes
Transmitted	Received	Transmitted	Received	
0	0 or 1	0 or 1	0 or 1	The zoning expander device shall set the INSIDE ZPSDS bit to zero.
1	0			
1	1	0	0	<p>If the SAS address received in the IDENTIFY address frame during the identification sequence is different from the SAS address prior to the completion of the link reset sequence, then the zoning expander device shall <u>a</u>:</p> <p>a) set the REQUESTED INSIDE ZPSDS bit to zero; and</p> <p>b) set the INSIDE ZPSDS bit to zero.</p> <p>If the SAS address received in the IDENTIFY address frame during the identification sequence is the same as the SAS address prior to the completion of the link reset sequence, then the zoning expander device shall:</p> <p>a) set the INSIDE ZPSDS bit to one; and</p> <p>b) set the ZONE GROUP field to <del>one</del><u>01h</u>.</p>
		0	1	
		1	0	
		1	1	<p>The zoning expander device shall:</p> <p>a) set the INSIDE ZPSDS bit to one; and</p> <p>b) set the ZONE GROUP field to <del>one</del><u>01h</u>.</p>

If the ZONE GROUP PERSISTENT bit is set to one, then a link reset sequence (see 4.4) shall not cause the zone group of an expander phy to change unless the INSIDE ZPSDS bit changes from zero to one as specified in table 33. If the ZONE GROUP PERSISTENT bit is set to zero, then table 34 specifies events based on the initial condition of an expander phy that shall cause a zoning expander device with zoning enabled to change the ZONE GROUP field of the expander phy to its [reset value \(i.e., the saved value, if any, or its default value \(e.g., zero00h\) if there is no saved value\)](#).

**Table 34 — Events that cause the ZONE GROUP field to be ~~set to its default value~~ [reset](#) when the ZONE GROUP PERSISTENT bit set to zero**

Initial condition	Event after the initial condition is established
Completed link reset sequence with a SAS device attached	A subsequent link reset sequence completes and: <ol style="list-style-type: none"> <li>the SAS address received in the IDENTIFY address frame (see 7.8.2) during the identification sequence is different from the SAS address prior to the completion of the link reset sequence; or</li> <li>a SATA device is attached.</li> </ol>
Completed link reset sequence with a SATA device attached	Either: <ol style="list-style-type: none"> <li>A subsequent link reset sequence completes and:               <ol style="list-style-type: none"> <li>a hot-plug timeout (see 6.7.5) occurred between the time of the initial condition and the time the link reset sequence completed;</li> <li>the zoning expander device has detected the possibility that a new SATA device has been inserted. The method of detection is outside the scope of this standard (e.g., an enclosure services process reports a change in the ELEMENT STATUS CODE field in the Device or Array Device element (see SES-2), or a change in the WORLD WIDE NAME field in the attached SATA device's IDENTIFY DEVICE or IDENTIFY PACKET DEVICE data (see ATA8-ACS)); or</li> <li>a SAS phy or expander phy is attached;</li> </ol>               or             </li> <li>The expander phy is disabled with the SMP PHY CONTROL function (see 10.4.3.28) DISABLE phy operation.</li> </ol>

#### 4.9.6 Zone configuration

##### 4.9.6.4 Activate step

The activate step copies the zoning expander shadow register values to the zoning expander active values. The active zone manager issues one of the following:

- a Broadcast (Zone Activate) (see 4.1.13); or
- an SMP ZONE ACTIVATE request (see 10.4.3.22) to all locked zoning expander devices.

After a locked zoning expander device receives a Broadcast (Zone Activate) or processes an SMP ZONE ACTIVATE request, then the zoning expander device ~~sets~~ [shall set](#) the zoning expander active values equal to the zoning expander shadow values.

If the active zone manager receives an SMP ZONE ACTIVATE response with the FUNCTION RESULT field set to ZONE LOCK VIOLATION (see 10.4.3.2), then it should unlock all locked zoning expander devices.

The activate step may be skipped when a locked zoning expander device is unlocked:

- by a zone manager with a higher SAS address during the lock step (see 4.9.6.2); or
- because the zone lock inactivity timer expires.

10.4.3 SMP functions

The FUNCTION RESULT field is defined in table 35.

**Table 35** — FUNCTION RESULT field (part 1 of 2)

Code	Name	SMP function(s)	Description
...	...	...	...
20h	SMP ZONE VIOLATION	CONFIGURE GENERAL, ZONED BROADCAST, PHY CONTROL, PHY TEST FUNCTION, CONFIGURE PHY EVENT INFORMATION	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).
21h	NO MANAGEMENT ACCESS RIGHTS	REPORT ZONE MANAGER PASSWORD, ZONE LOCK, CONFIGURE ZONE MANAGER PASSWORD	For ZONE LOCK, any of the following are true: 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; b) zoning is enabled, the ZONE LOCK bit is set to one, and the request did not originate from the active zone manager; or 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.  For REPORT ZONE MANAGER PASSWORD, see 10.4.3.7. For CONFIGURE ZONE MANAGER PASSWORD, see 10.4.3.24.
22h	UNKNOWN ENABLE DISABLE ZONING VALUE	ENABLE DISABLE ZONING	See 10.4.3.19
23h	ZONE LOCK VIOLATION	ENABLE DISABLE ZONING, ZONE LOCK, ZONE ACTIVATE, ZONE UNLOCK, CONFIGURE ZONE PHY INFORMATION, CONFIGURE ZONE PERMISSION TABLE	Zoning is enabled and: 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 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.
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.

**Table 35** — FUNCTION RESULT field (part 2 of 2)

Code	Name	SMP function(s)	Description
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.
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.
27h	<u>SAVING NOT SUPPORTED</u>	<u>ENABLE DISABLE ZONING, CONFIGURE ZONE MANAGER PASSWORD, CONFIGURE ZONE PHY INFORMATION, CONFIGURE ZONE PERMISSION TABLE</u>	<u>The SAVE bit is set to one and the management device server does not support saved values for the specified information.</u>
All others	Reserved		

Table 36 defines the priority of the SMP function results defined in table 35.

**Table 36** — Function result priority (part 1 of 2)

SMP function	SMP function result priority
...	...
ENABLE DISABLE ZONING (see 10.4.3.19)	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
ZONE LOCK (see 10.4.3.21)	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 10.4.3.22)	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 10.4.3.23)	1) INVALID REQUEST FRAME LENGTH; 2) ZONE LOCK VIOLATION; 3) NOT ACTIVATED; 4) BUSY; 5) SMP FUNCTION FAILED; and 6) SMP FUNCTION ACCEPTED



Table 36 — Function result priority (part 2 of 2)

SMP function	SMP function result priority
<p>CONFIGURE ZONE MANAGER PASSWORD (see 10.4.3.24)</p>	<p>1) INVALID REQUEST FRAME LENGTH; 2) INVALID EXPANDER CHANGE COUNT; 3) NO MANAGEMENT ACCESS RIGHTS; 4) NO PHYSICAL PRESENCE; 5) SMP FUNCTION FAILED; and 6) SMP FUNCTION ACCEPTED</p>
<p>CONFIGURE ZONE PHY INFORMATION (see 10.4.3.25)</p>	<p>1) INVALID REQUEST FRAME LENGTH; 2) INCOMPLETE DESCRIPTOR LIST; 3) PHY DOES NOT EXIST; 4) PHY VACANT; 5) ZONE LOCK VIOLATION; 6) INVALID EXPANDER CHANGE COUNT; 7) <u>SAVING NOT SUPPORTED</u>; 8) ZONE GROUP OUT OF RANGE; 9) SMP FUNCTION FAILED; and 10) SMP FUNCTION ACCEPTED</p>
<p>CONFIGURE ZONE PERMISSION TABLE (see 10.4.3.26)</p>	<p>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</p>

The RESPONSE LENGTH field indicates the number of dwords that follow, not includin

**10.4.3.8 DISCOVER function**

The DISCOVER function returns information about the specified phy. This SMP function provides information from the IDENTIFY address frame received by the phy and additional phy-specific information. This SMP function shall be implemented by all management device servers.

NOTE 2 - The DISCOVER LIST function (see 10.4.3.14) returns information about one or more phys.

Table 37 defines the request format.

**Table 37 — DISCOVER request**

Byte/Bit	7	6	5	4	3	2	1	0	
0	SMP FRAME TYPE (40h)								
1	FUNCTION (10h)								
2	Reserved								
3	REQUEST LENGTH (02h)								
4	Reserved								
7	Reserved								
8	Reserved							IGNORE ZONE GROUP	
9	PHY IDENTIFIER								
10	Reserved								
11	Reserved								
12	(MSB)	CRC							
15							(LSB)		

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

The FUNCTION field shall be set to 10h.

The REQUEST LENGTH field shall be set to 02h. For compatibility with previous versions of this standard, a REQUEST LENGTH field set to 00h specifies that there are 2 dwords before the CRC field.

An IGNORE ZONE GROUP bit set to one specifies that the management device server shall return information about the specified phy (i.e., the phy specified by the PHY IDENTIFIER field) regardless of the zone permission table.

An IGNORE ZONE GROUP bit set to zero specifies that the management device server shall:

- a) if the SMP initiator port has access to the specified phy based on the zone permission table, return the requested information; and
- b) if the SMP initiator port does not have access to the specified phy, return a function result of PHY VACANT in the response frame.

If the management device server is not in a zoning expander device with zoning enabled, it shall ignore the IGNORE ZONE GROUP bit.

The PHY IDENTIFIER field specifies the phy (see 4.2.8) for which the information is being requested.

The CRC field is defined in 10.4.3.1.

Table 38 defines the response format.

**Table 38 — DISCOVER response** (part 1 of 2)

Byte\Bit	7	6	5	4	3	2	1	0
0	SMP FRAME TYPE (41h)							
1	FUNCTION (10h)							
2	FUNCTION RESULT							
3	RESPONSE LENGTH (17h)							
4	(MSB)	EXPANDER CHANGE COUNT						(LSB)
5								
6	Reserved							
8								
9	PHY IDENTIFIER							
10	Reserved							
11								
12	Reserved	ATTACHED DEVICE TYPE			ATTACHED REASON			
13	Reserved			NEGOTIATED LOGICAL LINK RATE				
14	Reserved			ATTACHED SSP INITIATOR	ATTACHED STP INITIATOR	ATTACHED SMP INITIATOR	ATTACHED SATA HOST	
15	ATTACHED SATA PORT SELECTOR	Reserved		ATTACHED SSP TARGET	ATTACHED STP TARGET	ATTACHED SMP TARGET	ATTACHED SATA DEVICE	
16	SAS ADDRESS							
23								
24	ATTACHED SAS ADDRESS							
31								
32	ATTACHED PHY IDENTIFIER							
33	Reserved				ATTACHED INSIDE ZPSDS PERSISTENT	ATTACHED REQUESTED INSIDE ZPSDS	ATTACHED BREAK_REPLY CAPABLE	
34	Reserved							
39								
40	PROGRAMMED MINIMUM PHYSICAL LINK RATE				HARDWARE MINIMUM PHYSICAL LINK RATE			
41	PROGRAMMED MAXIMUM PHYSICAL LINK RATE				HARDWARE MAXIMUM PHYSICAL LINK RATE			
42	PHY CHANGE COUNT							
43	VIRTUAL PHY	Reserved			PARTIAL PATHWAY TIMEOUT VALUE			
44	Reserved			ROUTING ATTRIBUTE				
45	Reserved	CONNECTOR TYPE						

Table 38 — DISCOVER response (part 2 of 2)

Byte\Bit	7	6	5	4	3	2	1	0	
46	CONNECTOR ELEMENT INDEX								
47	CONNECTOR PHYSICAL LINK								
48	Reserved								
49	Reserved								
50	Vendor specific								
51	Reserved								
52	ATTACHED DEVICE NAME								
59	Reserved								
60	Reserved	REQUESTED INSIDE ZPSDS CHANGED BY EXPANDER	INSIDE ZPSDS PERSISTENT	REQUESTED INSIDE ZPSDS	Reserved SAVED REQUESTED INSIDE ZPSDS	ZONE GROUP PERSISTENT	INSIDE ZPSDS	ZONING ENABLED	
61	Reserved- <del>SAVED</del> ZONE GROUP								
62	Reserved								
63	ZONE GROUP								
64	SELF-CONFIGURATION STATUS								
65	SELF-CONFIGURATION LEVELS COMPLETED								
66	Reserved								
67	Reserved								
68	SELF-CONFIGURATION SAS ADDRESS								
75	Reserved								
76	Reserved								
91	Reserved								
92	Reserved								
93	Reserved								
94	REASON				NEGOTIATED PHYSICAL LINK RATE				
95	Reserved							HARDWARE MUXING SUPPORTED	
96	(MSB)	CRC							
99								(LSB)	

Editor's Note 3: It may be better to store a full array of saved values at the end (and a full array of default values, and bits indicating whether saving is support for zoning enabled, ZPT, zone phy

[information, and the zone manager password.](#)

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

The FUNCTION field shall be set to 10h.

The FUNCTION RESULT field is defined in 10.4.3.2.

The RESPONSE LENGTH field shall be set to 17h. For compatibility with previous versions of this standard, a RESPONSE LENGTH field set to 00h indicates that there are 12 dwords before the CRC field.

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A REQUESTED INSIDE ZPSDS CHANGED BY EXPANDER bit set to one indicates that the zoning expander device set the REQUESTED INSIDE ZPSDS bit to zero in the zone phy information at the completion of the last link reset sequence. A REQUESTED INSIDE ZPSDS CHANGED BY EXPANDER bit set to zero indicates that the zoning expander device did not set the REQUESTED INSIDE ZPSDS bit to zero in the zone phy information at the completion of the last link reset sequence.

NOTE 3 - The zone manager may use the REQUESTED INSIDE ZPSDS CHANGED BY EXPANDER bit to determine why the REQUESTED INSIDE ZPSDS bit has changed in the DISCOVER response from the value to which it last set the bit.

The INSIDE ZPSDS PERSISTENT bit contains the value of the INSIDE ZPSDS PERSISTENT bit in the zone phy information (see 4.9.3.1).

The REQUESTED INSIDE ZPSDS bit contains the value of the REQUESTED INSIDE ZPSDS bit in the zone phy information (see 4.9.3.1).

[The SAVED REQUESTED INSIDE ZPSDS bit contains the value of the REQUESTED INSIDE ZPSDS bit in the zone phy information that is used after power on \(see 4.9.3.1\).](#)

The ZONE GROUP PERSISTENT bit contains the value of the ZONE GROUP PERSISTENT bit in the zone phy information (see 4.9.3.1).

The INSIDE ZPSDS bit contains the value of the INSIDE ZPSDS bit in the zone phy information (see 4.9.3.1).

A ZONING ENABLED bit set to one indicates that zoning is enabled in the expander device. A ZONING ENABLED bit set to zero indicates that zoning is disabled in the expander device.

[The SAVED ZONE GROUP field contains the value of the ZONE GROUP field in the zone phy information that is used after power on \(see 4.9.3.1\).](#)

The ZONE GROUP field contains the value of the ZONE GROUP field in the zone phy information (see 4.9.3.1).

...

The CRC field is defined in 10.4.3.2.

#### **10.4.3.19 ENABLE DISABLE ZONING function**

The ENABLE DISABLE ZONING function enables or disables zoning. This SMP function shall be supported by SMP target ports in zoning expander devices (see 4.9). Other SMP target ports shall not support this SMP function.

This function is an SMP zone configuration function (see 4.9.6.3).

Table 39 defines the request format.

**Table 39 — ENABLE DISABLE ZONING request**

Byte\Bit	7	6	5	4	3	2	1	0
0	SMP FRAME TYPE (40h)							
1	FUNCTION (81h)							
2	Reserved							
3	REQUEST LENGTH (02h)							
4	(MSB)	EXPECTED EXPANDER CHANGE COUNT						(LSB)
5								
6	Reserved							<del>Reserved</del> SAVE
7	Reserved							
8	Reserved						ENABLE DISABLE ZONING	
9	Reserved							
11	Reserved							
12	(MSB)	CRC						(LSB)
15								

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

The FUNCTION field shall be set to 81h.

The REQUEST LENGTH field shall be set to 02h.

The EXPECTED EXPANDER CHANGE COUNT field is defined in the CONFIGURE GENERAL request (see 10.4.3.18).

[A SAVE bit set to one specifies that the management device server shall apply the specified changes to the saved value of the zoning enabled setting \(i.e., update non-volatile storage\). A SAVE bit set to zero specifies that the management device server shall apply the specified changes to the current value of the zoning enabled setting.](#)

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Editor's Note 4: Could define a two-bit SAVE field where: 00b = vendor-specific, 01b = update current only, 10h = update saved only, 11h = update both.

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Editor's Note 5: Don't want the expander to take too long saving while holding open an SMP connection. If viewed as a problem, could define that the function must complete immediately, and return a SAVING bit in REPORT GENERAL indicating that saving is still underway in the background.

---

The ENABLE DISABLE ZONING field is defined in table 40.

**Table 40 — ENABLE DISABLE ZONING field**

Code	Description
00b	No change
01b	Enable zoning
10b	Disable zoning
11b	Reserved

If the ENABLE DISABLE ZONING field is set to 11b (i.e., reserved), the management device server shall return a function result of UNKNOWN ENABLE DISABLE ZONING VALUE in the response frame (see table 35 in 10.4.3.2).

The CRC field is defined in 10.4.3.1.

...

#### 10.4.3.22 ZONE ACTIVATE function

The ZONE ACTIVATE function causes the zoning expander device to set the zoning expander active values equal to the zoning expander shadow values ([see 4.9.6.4](#)). All zoning expander devices shall support this function. This function is an SMP zone configuration function (see 4.9.6.3).

Table 41 defines the request format.

**Table 41 — ZONE ACTIVATE request**

Byte\Bit	7	6	5	4	3	2	1	0
0	SMP FRAME TYPE (40h)							
1	FUNCTION (87h)							
2	Reserved							
3	REQUEST LENGTH (01h)							
4	(MSB)	EXPECTED EXPANDER CHANGE COUNT						(LSB)
5								
6	Reserved							
7								
8	(MSB)	CRC						(LSB)
11								

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

The FUNCTION field shall be set to 87h.

The REQUEST LENGTH field shall be set to 01h.

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

The CRC field is defined in 10.4.3.1.

Table 42 defines the response format.

**Table 42 — ZONE ACTIVATE response**

Byte\Bit	7	6	5	4	3	2	1	0
0	SMP FRAME TYPE (41h)							
1	FUNCTION (87h)							
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 87h.

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.

#### 10.4.3.23 ZONE UNLOCK function

The ZONE UNLOCK function unlocks a zoning expander device ([see 4.9.6.5](#)). All zoning expander devices shall support this function. This function is an SMP zone configuration function (see 4.9.6.3).

If a locked zoning expander device processes a ZONE UNLOCK request from the active zone manager then the management device server shall set the ZONE LOCKED bit to zero in the REPORT GENERAL response (see 10.4.3.3). If the CONFIGURING bit is set to one in the REPORT GENERAL response then the zoning expander device shall set the CONFIGURING bit to zero and originate a Broadcast (Change) from either:

- a) each zone group whose zone permission table entries or zone phy information has changed; or
- b) zone group 1.



Table 43 defines the request format.

**Table 43 — ZONE UNLOCK request**

Byte\Bit	7	6	5	4	3	2	1	0	
0	SMP FRAME TYPE (40h)								
1	FUNCTION (88h)								
2	Reserved								
3	REQUEST LENGTH (01h)								
4	Restricted								
5									
6	Reserved							ACTIVATE REQUIRED	
7	Reserved								
8	(MSB)								
11	CRC						(LSB)		

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

The FUNCTION field shall be set to 88h.

The REQUEST LENGTH field shall be set to 01h.

An ACTIVATE REQUIRED bit set to one specifies that the management device server shall unlock the zoning expander device only if the activate step has been completed. An ACTIVATE REQUIRED bit set to zero specifies that the management device server shall unlock the zoning expander device regardless of whether the activate step has been completed.

The CRC field is defined in 10.4.3.1.

Table 44 defines the response format.

**Table 44 — ZONE UNLOCK response**

Byte\Bit	7	6	5	4	3	2	1	0	
0	SMP FRAME TYPE (41h)								
1	FUNCTION (88h)								
2	FUNCTION RESULT								
3	RESPONSE LENGTH (00h)								
4	(MSB)								
7	CRC						(LSB)		

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

The FUNCTION field shall be set to 88h.

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.

#### 10.4.3.24 CONFIGURE ZONE MANAGER PASSWORD function

The CONFIGURE ZONE MANAGER PASSWORD function requests actions by the expander device containing the SMP target port. This SMP function shall be supported by SMP target ports in zoning expander devices. Other SMP target ports shall not support this SMP function. This SMP function shall only be processed if:

- a) the request is received from any SMP initiator port and specifies the correct zone manager password;  
or
- b) the request is received from any SMP initiator port while physical presence is asserted.

Table 45 defines the request format.

**Table 45 — CONFIGURE ZONE MANAGER PASSWORD request**

Byte\Bit	7	6	5	4	3	2	1	0
0	SMP FRAME TYPE (40h)							
1	FUNCTION (89h)							
2	Reserved							
3	REQUEST LENGTH (11h)							
4	(MSB)	EXPECTED EXPANDER CHANGE COUNT						(LSB)
5								
6	Reserved							Reserved <a href="#">SAVE</a>
7	Reserved							
8	ZONE MANAGER PASSWORD							
39								
40	NEW ZONE MANAGER PASSWORD							
71								
72	(MSB)	CRC						(LSB)
75								

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

The FUNCTION field shall be set to 89h.

The REQUEST LENGTH field shall be set to 11h.

The EXPECTED EXPANDER CHANGE COUNT field is defined in the CONFIGURE GENERAL request (see 10.4.3.18).

[A SAVE bit set to one specifies that the management device server shall apply the specified change to the saved value of the zone manager password \(i.e., update non-volatile storage\). A SAVE bit set to zero specifies that the management device server shall apply the specified changes to the current value of the zone manager password.](#)

If physical presence is not asserted and the ZONE MANAGER PASSWORD field does not match the current zone manager password maintained by the management device server, then the management device server shall return a function result of NO MANAGEMENT ACCESS RIGHTS in the response frame (see table 35 in 10.4.3.2).

The NEW ZONE MANAGER PASSWORD field specifies a new value for the zone manager password maintained by the management device server. A NEW ZONE MANAGER PASSWORD field set to zero specifies that the zone manager password is disabled and all zone managers have access. A NEW ZONE MANAGER PASSWORD field set to DISABLED (see table 26 in 4.9.1) specifies that the zone manager password is disabled and shall only be allowed if physical presence is asserted.

The CRC field is defined in 10.4.3.1.

...

#### **10.4.3.25 CONFIGURE ZONE PHY INFORMATION function**

##### **10.4.3.25.1 CONFIGURE ZONE PHY INFORMATION function overview**

The CONFIGURE ZONE PHY INFORMATION function configures zone phy information for one or more phys in a locked zoning expander device. This function shall be supported by all zoning expander devices. This function is an SMP zone configuration function (see 4.9.6.3).

SMP zone configuration functions change the zoning expander shadow values. These do not become zoning expander active values until the activate step (see 4.9.6.4).

## 10.4.3.25.2 CONFIGURE ZONE PHY INFORMATION request

Table 46 defines the request format.

Table 46 — CONFIGURE ZONE PHY INFORMATION request

Byte\Bit	7	6	5	4	3	2	1	0
0	SMP FRAME TYPE (40h)							
1	FUNCTION (8Ah)							
2	Reserved							
3	REQUEST LENGTH ((n - 7) / 4)							
4	(MSB)	EXPECTED EXPANDER CHANGE COUNT						(LSB)
5								
6	Reserved							Reserved SAVE
7	NUMBER OF ZONE PHY CONFIGURATION DESCRIPTORS							
<b>Zone phy configuration descriptor list</b>								
8	Zone phy configuration descriptor (first)(see table 47 in 10.4.3.25.3)							
11								
...	...							
n - 7	Zone phy configuration descriptor (last)(see table 47 in 10.4.3.25.3)							
n - 4								
n - 3	(MSB)	CRC						(LSB)
n								

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

The FUNCTION field shall be set to 8Ah.

The REQUEST LENGTH field specifies the number of dwords that follow, not including the CRC field.

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

[A SAVE bit set to one specifies that the management device server shall apply the specified changes to the saved values of the zone phy information \(i.e., update the non-volatile storage\). A SAVE bit set to zero specifies that the management device server shall apply the specified changes to the shadow values of the zone phy information.](#)

The NUMBER OF ZONE PHY CONFIGURATION DESCRIPTORS field specifies the number of zone phy configuration descriptors in the request. If the number of zone phy configuration descriptors exceeds the number of phys of the zoning expander device then the [function management device server](#) shall report INVALID REQUEST FRAME LENGTH in the response FUNCTION RESULT field.

The zone phy configuration descriptor list contains zone phy configuration descriptors as defined in 10.4.3.25.3.

The CRC field is defined in 10.4.3.1.

10.4.3.25.3 Zone phy configuration descriptor

Table 47 defines the zone phy configuration descriptor.

Table 47 — Zone phy configuration descriptor

Byte\Bit	7	6	5	4	3	2	1	0
0	PHY IDENTIFIER							
1	Reserved		INSIDE ZPSDS PERSISTENT	REQUESTED INSIDE ZPSDS	Reserved		ZONE GROUP PERSISTENT	Reserved
2	Reserved							
3	ZONE GROUP							

The PHY IDENTIFIER field specifies the phy to which the zone phy configuration descriptor information shall be applied. If the PHY IDENTIFIER field specifies a phy that does not exist then the management device server shall report PHY DOES NOT EXIST in the response FUNCTION RESULT field.

The INSIDE ZPSDS PERSISTENT bit specifies the value of the INSIDE ZPSDS PERSISTENT bit in the zone phy information (see 4.9.3.1).

The REQUESTED INSIDE ZPSDS bit specifies the value of the REQUESTED INSIDE ZPSDS bit in the zone phy information (see 4.9.3.1).

The ZONE GROUP PERSISTENT bit specifies the value of the ZONE GROUP PERSISTENT bit in the zone phy information (see 4.9.3.1).

The ZONE GROUP field specifies the value of the ZONE GROUP field in the zone phy information (see 4.9.3.1). Zone group values between 128 and 255, inclusive, are reserved.

10.4.3.25.4 CONFIGURE ZONE PHY INFORMATION response

Table 48 defines the response format.

Table 48 — CONFIGURE ZONE PHY INFORMATION response

Byte\Bit	7	6	5	4	3	2	1	0
0	SMP FRAME TYPE (41h)							
1	FUNCTION (8Ah)							
2	FUNCTION RESULT							
3	RESPONSE LENGTH (00h)							
4	(MSB)		CRC				(LSB)	
7								

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

The FUNCTION field shall be set to 8Ah.

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.

### 10.4.3.26 CONFIGURE ZONE PERMISSION TABLE function

#### 10.4.3.26.1 CONFIGURE ZONE PERMISSION TABLE function overview

The CONFIGURE ZONE PERMISSION TABLE function configures the zone permission table. This function shall be supported by all zoning expander devices. This function is an SMP zone configuration function (see 4.9.6.3).

SMP zone configuration functions change the zoning expander shadow values and do not become zoning expander active values until the zoning expander device processes the activate step (see 4.9.6.4).

Annex I describes examples of using multiple zone configuration descriptors.

#### 10.4.3.26.2 CONFIGURE ZONE PERMISSION TABLE request

Table 49 defines the request format.

**Table 49 — CONFIGURE ZONE PERMISSION TABLE request**

Byte\Bit	7	6	5	4	3	2	1	0
0	SMP FRAME TYPE (40h)							
1	FUNCTION (8Bh)							
2	Reserved							
3	REQUEST LENGTH ((n - 7) / 4)							
4	(MSB)	EXPECTED EXPANDER CHANGE COUNT						(LSB)
5								
6	STARTING SOURCE ZONE GROUP							
7	NUMBER OF ZONE PERMISSION CONFIGURATION DESCRIPTORS							
8	NUMBER OF ZONE GROUPS	Reserved					Reserved SAVE	
9	Reserved							
15	Reserved							
Zone permission configuration descriptor list								
16	Zone permission configuration descriptor (first)(see table 393 in							
31	10.4.3.26.3)							
	...							
n - 20	Zone permission configuration descriptor (last)(see table 393 in							
n - 4	10.4.3.26.3)							
n - 3	(MSB)	CRC						(LSB)
n								

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

The FUNCTION field shall be set to 8Bh.

The REQUEST LENGTH field specifies the number of dwords that follow, not including the CRC field.

The EXPECTED EXPANDER CHANGE COUNT field is defined in the SMP CONFIGURE GENERAL request (see 10.4.3.18).

The STARTING SOURCE GROUP field specifies the first source zone group (i.e., s) to be written with the first zone permission configuration descriptor.

The NUMBER OF ZONE PERMISSION CONFIGURATION DESCRIPTORS field specifies the number of zone permission configuration descriptors that follow.

The NUMBER OF ZONE GROUPS field specifies the number of elements in each zone permission configuration descriptor and is defined in table 50.

**Table 50 — NUMBER OF ZONE GROUPS field**

Code	Description
00b	128 zone groups
01b	256 zone groups
All others	Reserved

[A SAVE bit set to one specifies that the management device server shall apply the specified changes to the saved values of the zone permission table \(i.e., update the non-volatile storage\). A SAVE bit set to zero specifies that the management device server shall apply the specified changes to the shadow values of the zone permission table.](#)

The zone permission configuration descriptor list contains zone permission configuration descriptors as defined in 10.4.3.26.3. The device server shall process the zone permission configuration descriptors in order (i.e., a subsequent zone permission configuration descriptor overrides a previous zone permission configuration descriptor).

The CRC field is defined in 10.4.3.2.