

Date: February 26, 2007

To: T10 Committee

From Brad Besmer, LSI Logic

Subject: SAS-2 SES-2 Enclosure connector information

Overview

An enclosure may contain multiple expanders. If one (or more) of the expanders is not functional when the functioning expanders are being queried, there is insufficient information provided to determine slot numbers for end devices that potentially may exist at a later time when the non-functioning expanders resume functionality.

In order to resolve this issue, information must be available from ALL expanders within the enclosure.

This proposal adds minimum and maximum connector element index values to each expander within the enclosure REPORT GENERAL response. This information then provides sufficient information to infer the device slot.

Additionally, adding a new SES SAS Connector Type for Expander Virtual phys, since there are not physical connectors for these devices.

SAS-2 Changes

10.4.3.3 REPORT GENERAL function

The REPORT GENERAL function returns general information about the SAS device (e.g., a SAS device contained in an expander device). This SMP function shall be implemented by all management device servers.

Table 180 defines the request format.

Table 180 — REPORT GENERAL request

Byte\Bit	7	6	5	4	3	2	1	0
0	SMP FRAME TYPE (40h)							
1	FUNCTION (00h)							
2	Reserved							
3	REQUEST LENGTH (00h)							
4	(MSB)							
7	CRC (LSB)							

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

The FUNCTION field shall be set to 00h.

The REQUEST LENGTH field shall be set to 00h.

The CRC field is defined in 10.4.3.1.

Table 181 defines the response format.

Table 181 — REPORT GENERAL response (part 1 of 2)

Byte/Bit	7	6	5	4	3	2	1	0
0	SMP FRAME TYPE (41h)							
1	FUNCTION (00h)							
2	FUNCTION RESULT							
3	RESPONSE LENGTH (0Ch0Dh)							
4	(MSB)	EXPANDER CHANGE COUNT						(LSB)
5								
6	(MSB)	EXPANDER ROUTE INDEXES						(LSB)
7								
8	Reserved							
9	NUMBER OF PHYS							
10	TABLE TO TABLE SUPPORTED	Reserved		ZONE ADDRESS RESOLVED SUPPORTED	CONFIGURES OTHERS	CONFIGURING	EXTERNALLY CONFIGURABLE ROUTE TABLE	
11	Reserved							
12	ENCLOSURE LOGICAL IDENTIFIER							
19								
20	Reserved							
29								
30	(MSB)	STP BUS INACTIVITY TIME LIMIT						(LSB)
31								
32	(MSB)	STP MAXIMUM CONNECT TIME LIMIT						(LSB)
33								
34	(MSB)	STP SMP I_T NEXUS LOSS TIME						(LSB)
35								
36	Reserved		ZONE LOCKED	PHYSICAL PRESENCE SUPPORTED	PHYSICAL PRESENCE ASSERTED	ZONING SUPPORTED	ZONING ENABLED	
37	Reserved							
38	(MSB)	MAXIMUM NUMBER OF ROUTED SAS ADDRESSES						(LSB)
39								

Table 181 — REPORT GENERAL response (part 2 of 2)

Byte/Bit	7	6	5	4	3	2	1	0
40	ACTIVE ZONE MANAGER SAS ADDRESS							
47								
48	(MSB)	ZONE LOCK INACTIVITY TIME LIMIT						(LSB)
49								
50	Reserved							
51								
52	MINIMUM CONNECTOR ELEMENT INDEX							
53	MAXIMUM CONNECTOR ELEMENT INDEX							
54	Reserved							
55	Reserved							
52 56	(MSB)	CRC						
55 59								

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

The FUNCTION field shall be set to 00h.

The FUNCTION RESULT field is defined in 10.4.3.2.

The RESPONSE LENGTH field shall be set to ~~0Ch~~0Dh. For compatibility with previous versions of this standard, a RESPONSE LENGTH field set to 00h indicates that there are 6 dwords before the CRC field.

The EXPANDER CHANGE COUNT field counts the number of Broadcast (Change)s originated by an expander device (see 7.11). Management device servers in expander devices shall support this field. management device servers in other device types (e.g., end devices) shall set this field to 0000h. This field shall be set to at least 0001h at power on. If the expander device has originated Broadcast (Change) for any reason described in 7.11 since transmitting a REPORT GENERAL response, it shall increment this field at least once from the value in the previous REPORT GENERAL response. It shall not increment this field when forwarding a Broadcast (Change). This field shall wrap to at least 0001h after the maximum value (i.e., FFFFh) has been reached.

NOTE 79 - Application clients that use the EXPANDER CHANGE COUNT field should read it often enough to ensure that it does not increment a multiple of 65 536 times between reading the field.

NOTE 80 - Management device servers in expander devices compliant with previous versions of this standard may return an EXPANDER CHANGE COUNT field set to 0000h.

[Editor’s Note 49: A BROADCAST EXPANDER COUNT field is also needed, so recipients of that BROADCAST can pinpoint which expander it came from. Expander-wide counts for all BROADCASTs \(e.g. reception of ASYNCHRONOUS EVENT\) might be needed.](#)

The EXPANDER ROUTE INDEXES field contains the maximum number of expander route indexes per phy for the expander device (see 4.6.7.3). Management device servers in externally configurable expander devices containing phy-based expander route tables shall support this field. Management device servers in other

device types (e.g., end devices, externally configurable expander devices with expander-based expander route tables, and self-configuring expander devices) shall set the EXPANDER ROUTE INDEXES field to zero. Not all phys in an externally configurable expander device are required to support the maximum number indicated by this field.

The NUMBER OF PHYS field contains the number of phys in the device, including any virtual phys and any vacant phys.

A TABLE TO TABLE SUPPORTED bit set to one indicates the expander device is a self-configuring expander device that supports its table routing phys being attached to table routing phys in other expander devices. The TABLE TO TABLE SUPPORTED bit shall only be set to one if the EXTERNALLY CONFIGURABLE ROUTE TABLE bit is set to zero. A TABLE TO TABLE SUPPORTED bit set to zero indicates the expander device is not a self-configuring expander device that supports its table routing phys being attached to table routing phys in other expander devices.

A ZONE ADDRESS RESOLVED SUPPORTED bit set to one indicates that the zoning expander device supports address resolved zoning. A ZONE ADDRESS RESOLVED SUPPORTED bit set to zero indicates that the zoning expander device does not support address resolved zoning (see 4.9.3.1).

A CONFIGURES OTHERS bit set to one indicates that the expander device is a self-configuring expander device that performs the configuration subprocess defined in 4.8. A CONFIGURES OTHERS bit set to zero indicates the expander device may or may not perform the configuration subprocess. Self-configuring expander devices compliant with this standard shall set the CONFIGURES OTHERS bit to one.

NOTE 81 - If the CONFIGURES OTHERS bit is set to zero, the expander device may configure all externally configurable expander devices in the SAS domain.

A CONFIGURING bit set to one indicates that either:

- a) the management device server is in a self-configuring expander device, the self-configuring expander device's management application client is currently performing the discover process (see 4.7), and it has identified at least one change to its expander routing table; or
- b) the zoning expander device is locked and the zoning expander shadow values differ from the zoning expander active values.

A CONFIGURING bit set to zero indicates that the management device server is not in a self-configuring expander device currently performing the discover process and changing its expander routing table. Changes in this bit from one to zero result in a Broadcast (Change) being originated (see 7.11). Management device servers in self-configuring expander devices shall support this bit. Management device servers in externally configurable expander devices and in other device types shall set the CONFIGURING bit to zero.

An EXTERNALLY CONFIGURABLE ROUTE TABLE bit set to one indicates that the management device server is in an externally configurable expander device that has a phy-based expander route table that is required to be configured with the SMP CONFIGURE ROUTE INFORMATION function (see 4.6.7.3). An EXTERNALLY CONFIGURABLE ROUTE TABLE bit set to zero indicates that the management device server is not in an externally configurable expander device (e.g., it is in an end device, in a self-configuring expander device, or in an expander device with no phys with table routing attributes).

The ENCLOSURE LOGICAL IDENTIFIER field identifies the enclosure, if any, in which the device is located, and is defined in SES-2. The ENCLOSURE LOGICAL IDENTIFIER field shall be set to the same value reported by the enclosure services process, if any, for the enclosure. An ENCLOSURE LOGICAL IDENTIFIER field set to zero indicates no enclosure information is available.

The STP BUS INACTIVITY TIME LIMIT field contains the bus inactivity time limit for STP connections which is set by the CONFIGURE GENERAL function (see 10.4.3.15).

The STP MAXIMUM CONNECT TIME LIMIT field contains the maximum connect time limit for STP connections which is set by the CONFIGURE GENERAL function (see 10.4.3.15).

The STP SMP I_T NEXUS LOSS TIME field contains the time that an STP target port and an SMP initiator port retry certain connection requests which is set by the CONFIGURE GENERAL function (see 10.4.3.15).

A ZONE LOCKED bit set to one indicates that the zoning expander device is locked (see 4.9.6.2). A ZONE LOCKED bit set to zero indicates that the zoning expander device is not locked.

A PHYSICAL PRESENCE SUPPORTED bit set to one indicates that the expander device supports physical presence as a mechanism for allowing zoning to be enabled or disabled from phys in zone groups without access to zone group 2. A PHYSICAL PRESENCE SUPPORTED bit set to zero indicates that the expander device does not support physical presence as a mechanism for allowing zoning to be enabled or disabled.

A PHYSICAL PRESENCE ASSERTED bit set to one indicates that the expander device is currently detecting physical presence. A PHYSICAL PRESENCE ASSERTED bit set to zero indicates that the expander device is not currently detecting physical presence. The PHYSICAL PRESENCE ASSERTED bit shall be set to zero if the PHYSICAL PRESENCE SUPPORTED bit is set to zero.

A ZONING SUPPORTED bit set to one indicates that zoning is supported by the expander device (i.e., it is a zoning expander device). A ZONING SUPPORTED bit set to zero indicates that zoning is not supported by the expander device.

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 ZONING ENABLED bit shall be set to zero if the ZONING SUPPORTED bit is set to zero.

The MAXIMUM NUMBER OF ROUTED SAS ADDRESSES field contains the number of routed SAS addresses in an expander-based expander route table (see 4.6.7.3 and 4.9.3.4). Management device servers in expander devices containing expander-based expander route tables shall support this field. Management device servers in other device types (e.g., end devices and expander devices with phy-based expander route tables) shall set this field to 0000h.

The ACTIVE ZONE MANAGER SAS ADDRESS field indicates the SAS address of the zone manager that last locked the zoning expander device. If the zoning expander device is currently being configured by a vendor-specific sideband method then the ACTIVE ZONE MANAGER SAS ADDRESS field shall be set to zero. This field shall be set to zero at power on.

The ZONE LOCK INACTIVITY TIME LIMIT field indicates the minimum time between any SMP ZONE LOCK requests, SMP zone configuration function requests, or SMP ZONE ACTIVATE requests from the active zone manager that the locked expander device allows and is set in the SMP ZONE LOCK request (see 10.4.3.18).

[The MINIMUM CONNECTOR ELEMENT INDEX field indicates the minimum connector element index value returned by any SMP DISCOVER response within the enclosure for any CONNECTOR TYPE values indicating an internal connector \(ie. 0x20 through 0x2F\).](#)

[The MAXIMUM CONNECTOR ELEMENT INDEX field indicates the maximum connector element index value returned by any SMP DISCOVER response within the enclosure for any CONNECTOR TYPE values indicating an internal connector \(ie. 0x20 through 0x2F\).](#)

The CRC field is defined in 10.4.3.2.

SES-2 Changes:

7.3.26 SAS Connector element

The SAS Connector element manages a SAS connector or a portion of a SAS connector.

The format of the control field for a SAS Connector element is defined in table 182.

Table 182 — SAS Connector element for control-type diagnostic pages

Byte\Bit	7	6	5	4	3	2	1	0
0	COMMON CONTROL							
1	RQST IDENT	Reserved						
2	Reserved							
3	Reserved							

The common control field is specified in 7.2.2.

A rqst ident (request identify) bit set to one specifies that the enclosure services process identify the element by a visual indication. A rqst ident bit set to zero specifies that the enclosure services process not identify the element by a visual indication.

The format of the status field for a SAS Connector element is defined in table 183.

Table 183 — SAS Connector element for status-type diagnostic pages

Byte\Bit	7	6	5	4	3	2	1	0
0	COMMON STATUS							
1	IDENT	CONNECTOR TYPE						
2	CONNECTOR PHYSICAL LINK							
3	Reserved							

The common status field is specified in 7.2.3.

An ident (identify) bit set to one indicates that the enclosure services process is currently identifying the element by a visual indication because the rqst ident bit was set to one in the control-type diagnostic page. An ident bit set to zero indicates that the enclosure services process is not currently identifying the element by a visual indication based on the rqst ident bit in the control-type diagnostic page, or a visual indication is not implemented.

The connector type field indicates the type of connector and is defined in table 184.

Table 184 — CONNECTOR TYPE field

Code	Description	Maximum number of physical links (informative)
00h	No information	unknown
01h	SAS 4x receptacle (see SAS-1.1 and SFF-8470)	4
02h	Mini SAS 4x receptacle (see SAS-1.1 and SFF-8088)	4
03h to 0Eh	Reserved for external connectors	
0Fh	Vendor-specific external connector	unknown
10h	SAS 4i plug (see SAS-1.1 and SFF-8484)	4
11h	Mini SAS 4i receptacle (see SAS-1.1 and SFF-8087)	4
12h to 1Fh	Reserved for internal wide connectors	
20h	SAS Drive receptacle (see SAS-1.1 and SFF-8482)	2
21h	SATA host plug (see SAS-1.1 and ATA/ATAPI-7 V3)	1
22h	SAS Drive plug (see SAS-1.1 and SFF-8482)	2
23h	SATA device plug (see SAS-1.1 and ATA/ATAPI-7 V3)	1
24h	SAS virtual device	1
25 24h to 2Fh	Reserved for internal connectors to end devices	
30h to 3Eh	Reserved for internal connectors	
3Fh	Vendor-specific internal connector	unknown
40h to 6Fh	Reserved	
70h to 7Fh	Vendor specific	

The connector physical link field indicates the physical link in the connector represented by this element. A connector physical link field set to FFh indicates that the element represents the entire connector, not just one physical link in the connector. Physical links in a connector shall be numbered starting with zero. If a connector has only one physical link, the connector physical link field should be set to 00h rather than FFh.