

To: T10 Technical Committee  
From: Rob Elliott, HP (elliott@hp.com)  
Date: 25 October 2002  
Subject: 02-444r0 SAS Interpretation of invalid SAS address

**Revision History**

Revision 0 (25 October 2002) First revision

**Related Documents**

sas-r02b - Serial Attached SCSI revision 2b  
02-394r1 - SAS SPC-3 Protocol-Specific log page  
02-397r0 - SAS Protocol-Specific Port mode page

**Overview**

In the SAS Editor's meeting in October 2002 and in the 22 October 2002 SAS protocol call, it was proposed that a SAS address of all zeros (including the NAA field) be used to indicate an "invalid SAS address." Depending on the usage, this would have meanings like "address unknown" or "no device attached." It was intended to eliminate the need to carry a valid bit alongside the 64-bit SAS address everywhere it is used.

Reviewing a preliminary draft of this proposal on 24 October 2002, the SAS WG felt that the equivalent of a valid bit could/should be added everywhere. No special handling of an address of all zeros is necessary.

The biggest change is adding 4 bytes to the protocol-specific log page to carry the ATTACHED DEVICE TYPE field. When zero, it means the ATTACHED SAS ADDRESS field is undefined.

The rule still remains that the IEEE Registered format (starting with an NAA field set to 5) shall be used.

**Suggested Changes**

**IDENTIFY address frame**

SAS ADDRESS field - no changes.

**OPEN address frame**

SOURCE SAS ADDRESS field - no changes.

DESTINATION SAS ADDRESS field - no changes. Expander will route based on any address.

**SSP frame header**

HASHED SOURCE SAS ADDRESS field - no changes.

HASHED DESTINATION SAS ADDRESS field - no changes.

**SAS phy log descriptor (in Protocol-Specific log page)(from 02-394)**

SAS ADDRESS field - no changes.

ATTACHED SAS ADDRESS field - invalid when the ATTACHED DEVICE TYPE field is zero.

[Add ATTACHED DEVICE TYPE field, all the attached nnn protocol bits, and the CURRENT PHYSICAL LINK RATE field. Use the four byte format like the SMP DISCOVER frame. New log descriptor shown below.]

[To the protocol-specific log page proposal for CAP (02-394), add a well-known logical unit that supports LOG SELECT/LOG SENS to return the protocol-specific log page.]

**SAS phy mode descriptor (in Protocol-Specific Port mode page)(from 02-397)**

SAS ADDRESS field - no special rules

ATTACHED SAS ADDRESS field - invalid when the ATTACHED DEVICE TYPE field is zero.

ATTACHED DEVICE TYPE field - no device attached

[Add the attached nnn protocol bits to the mode page, since the log page will have it. New mode descriptor shown below.]

[George Penokie will write a CAP proposal for a well-known logical unit that supports MODE SELECT/MODE SENSE to return protocol-specific mode page]

**DISCOVER response**

SAS ADDRESS field - no changes.

ATTACHED DEVICE TYPE field - no device attached

ATTACHED SAS ADDRESS field - invalid when the ATTACHED DEVICE TYPE field is zero.

*The new paragraph about the ATTACHED SAS ADDRESS field for the DISCOVER response is:*

The ATTACHED SAS ADDRESS field contains the SAS address of the attached phy. If the ATTACHED DEVICE TYPE field is set to 000b, the ATTACHED SAS ADDRESS field is invalid.

**Discover process**

Add this rule to 4.6.11.3 Expander route table:

The discover process shall set the DISABLE ROUTE ENTRY bit to one in each table route entry for each phy that has its ATTACHED DEVICE TYPE set to zero.

**REPORT PHY SATA response**

STP SAS ADDRESS field - no changes.

Add a function-specific FUNCTION RESULT that means "this phy does not support being attached to SATA devices."

**REPORT ROUTE INFORMATION response**

ROUTED SAS ADDRESS field - no changes.

**CONFIGURE ROUTE INFORMATION response**

ROUTED SAS ADDRESS field - no changes.

*The modified log descriptor is shown below (modifying 02-394r1). In addition to inserting bytes 4-7, moved the*

PHY IDENTIFIER field to byte 1 to match the location in the mode page and the SMP responses..

**Table 1 — SAS phy log descriptor**

Bit Byte	7	6	5	4	3	2	1	0
0								
1	PHY IDENTIFIER							
2	Reserved							
3	Reserved							
4	Reserved	ATTACHED DEVICE TYPE			Reserved			
5	Reserved				CURRENT PHYSICAL LINK RATE			
6	Reserved				ATTACHED SSP INITIATOR	ATTACHED STP INITIATOR	ATTACHED SMP INITIATOR	Reserved
7	Reserved				ATTACHED SSP TARGET	ATTACHED STP TARGET	ATTACHED SMP TARGET	Reserved
8	(MSB)	ATTACHED SAS ADDRESS						(LSB)
15								
16	(MSB)	SAS ADDRESS						(LSB)
23								
24	(MSB)	INVALID DWORD COUNT						(LSB)
27								
28	(MSB)	DISPARITY ERROR COUNT						(LSB)
31								
32	(MSB)	LOSS OF DWORD SYNCHRONIZATION						(LSB)
35								
36	(MSB)	PHY RESET PROBLEM						(LSB)
39								

The PHY IDENTIFIER field, ATTACHED DEVICE TYPE field, CURRENT PHYSICAL LINK RATE field, ATTACHED SSP INITIATOR bit, ATTACHED STP INITIATOR bit, ATTACHED SMP INITIATOR bit, ATTACHED SSP TARGET bit, ATTACHED STP

TARGET bit, ATTACHED SMP TARGET bit, ATTACHED SAS ADDRESS field, and SAS ADDRESS field are defined in the SMP DISCOVER function (see 10.3.x).

The modified mode descriptor is shown below (modifying 02-397r0).

**Table 2 — SAS phy mode descriptor**

Bit Byte	7	6	5	4	3	2	1	0
0	Reserved							
1	PHY IDENTIFIER							
2	PHY OPERATION							
3	Reserved							
4	Reserved	ATTACHED DEVICE TYPE			Reserved			
5	Reserved				CURRENT PHYSICAL LINK RATE			
6	Reserved				ATTACHED SSP INITIATOR	ATTACHED STP INITIATOR	ATTACHED SMP INITIATOR	Reserved
7	Reserved				ATTACHED SSP TARGET	ATTACHED STP TARGET	ATTACHED SMP TARGET	Reserved
8	(MSB)	ATTACHED SAS ADDRESS						
15							(LSB)	
16	(MSB)	SAS ADDRESS						
23							(LSB)	
24	PROGRAMMED MINIMUM PHYSICAL LINK RATE				HARDWARE MINIMUM PHYSICAL LINK RATE			
25	PROGRAMMED MAXIMUM PHYSICAL LINK RATE				HARDWARE MINIMUM PHYSICAL LINK RATE			
26	Vendor-specific							
27								
28	Reserved							
31								

The PHY IDENTIFIER field, ATTACHED DEVICE TYPE field, CURRENT PHYSICAL LINK RATE field, ATTACHED SSP INITIATOR bit, ATTACHED STP INITIATOR bit, ATTACHED SMP INITIATOR bit, ATTACHED SSP TARGET bit, ATTACHED STP TARGET bit, ATTACHED SMP TARGET bit, 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.