

**Proposed
Draft**

**Serial ATA
International Organization**

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1 Introduction

1.1 Problem Statement

When comparing the Phy Event Counters log definition between SATA 3.3 and ACS-4, a discrepancy was identified. Upon further examination of the Phy Event Counters log definition, it was determined the SATA 3.3 definition was incorrect.

1.1.1 ACS-4 Example

Below is excerpt from ACS-4 r18 (www.t13.org). Key area of discussion is highlighted yellow. For example, lets assume that **Count 0 Length** is 16 bits (2 Bytes). Based on the below definition, then the byte offset for **Counter 0 Value** is 6-7.

Table 280 — SATA Phy Event Counters log Format

Offset	Type	Description
0..3	bytes	Reserved
4..5	word	Counter 0 Identifier
6..Counter 0 Length+5	bytes	Counter 0 Value
...		...
n..n+1	word	Counter x Identifier
n+2..Counter x Length+n+1	bytes	Counter x Value
...		...
508..510	bytes	Reserved
511	byte	Checksum

If the device receives a BIST Activate FIS, then the device shall reset all SATA Phy event counters to their reset value (see SATA 3.3).

If the SATA Phy Event Counters log is read and the FEATURE field set to 0001h, the device shall return the current counter values for the command and then reset all Phy event counter values.

9.15.2 Counter x Identifier

SATA Phy event counter identifier that corresponds to Counter n Value. Specifies the particular event counter that is being reported. Valid identifiers are listed in SATA 3.3.

9.15.3 Counter x Value

Value of the SATA Phy event counter that corresponds to Counter x Identifier. The number of significant bits is determined by Counter x Identifier bits 14:12, see SATA 3.3 for more information. The length of Counter x Value shall always be a multiple of 16 bits. All counters are one-extended (e.g., if a counter is only physically implemented as eight bits after it reaches the maximum value of FFh, it shall be one-extended to FFFFh). The counter shall stop (i.e., not wrap to zero) after reaching its maximum value.

9.15.4 Counter x Length

Size of the SATA Phy event counter as defined by bits 14:12 of Counter n Identifier. The size of the SATA Phy event counter shall be a multiple of 16 bits.

9.15.5 Checksum

The data structure checksum is the two's complement of the sum of the first 511 bytes in the data structure. Each byte shall be added with unsigned arithmetic and overflow shall be ignored. The sum of all 512 bytes of the data structure is zero when the checksum is correct.

1.1.2 SATA 3.3 Example

Below is excerpt from SATA 3.3. Key area of discussion is highlighted yellow.

To align with ACS-4 example, lets assume that **COUNT 0 LENGTH** is 16 bits (2 Bytes) and $n=4$. Based on the below definition, then the bytes for **COUNTER n VALUE** is only byte 6. This presents 2 problems:

1. COUNTER n VALUE is not a multiple of 16 bits (2 bytes). By spec, the length of COUNTER n VALUE shall be a multiple of 16 bits.
2. It doesn't align with ACS-4 definition

Byte	7	6	5	4	3	2	1	0
0	Reserved							
1	Reserved							
2	Reserved							
3	Reserved							
...	...							
n	COUNTER n IDENTIFIER							
n + 1								
n + 2	COUNTER n VALUE							
n + COUNTER n LENGTH								
...	...							
508	Reserved							
509								
510								
511	DATA STRUCTURE CHECKSUM(7:0)							

Figure 400 – Phy event counters log data structure definition

Field Definitions

COUNTER n IDENTIFIER

Phy event counter identifier that corresponds to the COUNTER n VALUE field. Specifies the particular event counter that is being reported. The Identifier is 16 bits in length. Valid identifiers are listed in Figure 399.

COUNTER n VALUE

Value of the Phy event counter that corresponds to the COUNTER n IDENTIFIER field. The number of significant bits is determined by the COUNTER n IDENTIFIER field, bits 14:12 (see 13.9.3). The length of the COUNTER n VALUE field shall be a multiple of 16 bits. The counter shall stop (and not wrap to zero) after reaching its maximum value.

COUNTER n LENGTH

Size of the Phy event counter as defined by bits 14:12 of the COUNTER n IDENTIFIER field. The size of the Phy event counter shall be a multiple of 16 bits.

DATA STRUCTURE CHECKSUM

The DATA STRUCTURE CHECKSUM field value is the 2's complement of the sum of the first 511 bytes in the data structure. Each byte shall be added with unsigned arithmetic and overflow shall be ignored. The sum of all 512 bytes of the data structure is zero if the checksum is correct.

2 Proposed Changes

[Editor's Note: Existed text is black. New text is marked as underlined in blue color. Material to be deleted is ~~red with strikethrough markings~~.]

<13.9.4> Phy Event Counters log (11h)

The Phy Event Counters log is one page (i.e., 512 bytes) in length. The first Dword of the log contains information that applies to the rest of the log. Software should continue to process counters until a counter identifier with value 0h is found or the entire log has been read. A counter identifier with value 0h indicates that the log contains no more counter values past that point. Log 11h is defined in Figure 400.

If IDENTIFY DEVICE data Word 76 bit 15 is set to one, the Phy Event Counters may be read using either of the READ LOG EXT or READ LOG DMA EXT commands.

If IDENTIFY DEVICE data Word 76 bit 15 is cleared to zero, the Queued Error log shall be read using the READ LOG EXT command. An attempt to read the Phy Event Counters log using the READ LOG DMA EXT command shall be aborted and the state of the device shall not change.

Byte	7	6	5	4	3	2	1	0
0	Reserved							
1	Reserved							
2	Reserved							
3	Reserved							
4	COUNTER 0 IDENTIFIER							
5	COUNTER 0 VALUE							
6								
5 + COUNTER 0 LENGTH	...							
...	...							
n	COUNTER X IDENTIFIER							
n + 1	COUNTER X VALUE							
n + 2								
n + 1 + COUNTER X LENGTH	...							
...	...							
508	Reserved							
509	DATA STRUCTURE CHECKSUM(7:0)							
510								
511								

Field Definitions

COUNTER X IDENTIFIER

Phy event counter identifier that corresponds to the COUNTER X VALUE field. Specifies the particular event counter that is being reported. The Identifier is 16 bits in length. Valid identifiers are listed in Figure 399.

COUNTER X VALUE

Value of the Phy event counter that corresponds to the COUNTER X IDENTIFIER field. The number of significant bits is determined by the COUNTER X IDENTIFIER field, bits 14:12 (see 13.9.3). The length of the COUNTER X VALUE field shall be a multiple of 16 bits. The counter shall stop (and not wrap to zero) after reaching its maximum value.

COUNTER X LENGTH

Size of the Phy event counter as defined by bits 14:12 of the COUNTER X

IDENTIFIER field. The size of the Phy event counter shall be a multiple of 16 bits.

DATA STRUCTURE CHECKSUM

The DATA STRUCTURE CHECKSUM field value is the 2's complement of the sum of the first 511 bytes in the data structure. Each byte shall be added with unsigned arithmetic and overflow shall be ignored. The sum of all 512 bytes of the data structure is zero if the checksum is correct.