

Device Statistics – General Errors and Rotating Media Errors

T13 Technical Proposal – e06181r10

By
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2008-10-13

A.5 Device Statistics (Log Address TBD)

A.5.1 General Errors Statistics (Page TBD)

A.5.1.1 Overview

General Errors Statistics log page TBD contains general error information about the device as described in table TBD.

The summary of this error statistics is as followed:

- a) Structure Version;
- b) Number of Reported Uncorrectable Errors;
- c) Number of Reported Device Errors that are not UNC Errors;
- d) Number of Commands Terminated by Resets; and
- e) Number of Power Loss Instance with Incomplete Write.

Table TBD – General Errors Statistics

Offset	Type	Content								
0-7	QWord	Structure Version								
		<table border="0"> <tr> <td>Bit</td> <td>Meaning</td> </tr> <tr> <td>63:56</td> <td>Device Statistics Flags, (See Table TBD)</td> </tr> <tr> <td>55:24</td> <td>Reserved</td> </tr> <tr> <td>23:16</td> <td>TBD, Page Number</td> </tr> <tr> <td>15:0</td> <td>Device Statistics Version Number = 0001h</td> </tr> </table>	Bit	Meaning	63:56	Device Statistics Flags, (See Table TBD)	55:24	Reserved	23:16	TBD, Page Number
Bit	Meaning									
63:56	Device Statistics Flags, (See Table TBD)									
55:24	Reserved									
23:16	TBD, Page Number									
15:0	Device Statistics Version Number = 0001h									
8-15	QWord	Number of Reported Uncorrectable Errors								
		<table border="0"> <tr> <td>Bit</td> <td>Meaning</td> </tr> <tr> <td>63:56</td> <td>Device Statistics Flags, (See Table TBD)</td> </tr> <tr> <td>55:32</td> <td>Timestamp (Unsigned Integer)</td> </tr> <tr> <td>31:0</td> <td>Number of Reported Uncorrectable Errors (DWord)</td> </tr> </table>	Bit	Meaning	63:56	Device Statistics Flags, (See Table TBD)	55:32	Timestamp (Unsigned Integer)	31:0	Number of Reported Uncorrectable Errors (DWord)
Bit	Meaning									
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55:32	Timestamp (Unsigned Integer)									
31:0	Number of Reported Uncorrectable Errors (DWord)									
16-24	QWord	Number of Reported Device Errors that are not Uncorrectable Errors								
		<table border="0"> <tr> <td>Bit</td> <td>Meaning</td> </tr> <tr> <td>63:56</td> <td>Device Statistics Flags, (See Table TBD)</td> </tr> <tr> <td>55:32</td> <td>Timestamp (Unsigned Integer)</td> </tr> <tr> <td>31:0</td> <td>Number of Reported Device Errors that are not Uncorrectable Errors (DWord)</td> </tr> </table>	Bit	Meaning	63:56	Device Statistics Flags, (See Table TBD)	55:32	Timestamp (Unsigned Integer)	31:0	Number of Reported Device Errors that are not Uncorrectable Errors (DWord)
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55:32	Timestamp (Unsigned Integer)									
31:0	Number of Reported Device Errors that are not Uncorrectable Errors (DWord)									
25-32	QWord	Number of Resets that have Terminated Commands								
		<table border="0"> <tr> <td>Bit</td> <td>Meaning</td> </tr> <tr> <td>63:56</td> <td>Device Statistics Flags, (See Table TBD)</td> </tr> <tr> <td>55:32</td> <td>Timestamp (Unsigned Integer)</td> </tr> <tr> <td>31:0</td> <td>Number of Resets that have Terminated Commands (DWord)</td> </tr> </table>	Bit	Meaning	63:56	Device Statistics Flags, (See Table TBD)	55:32	Timestamp (Unsigned Integer)	31:0	Number of Resets that have Terminated Commands (DWord)
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55:32	Timestamp (Unsigned Integer)									
31:0	Number of Resets that have Terminated Commands (DWord)									
33-40	QWord	Number of Power Loss Instances with Incomplete Write								
		<table border="0"> <tr> <td>Bit</td> <td>Meaning</td> </tr> <tr> <td>63:56</td> <td>Device Statistics Flags, (See Table TBD)</td> </tr> <tr> <td>55:32</td> <td>Timestamp (Unsigned Integer)</td> </tr> <tr> <td>31:0</td> <td>Number of Power Loss Instances with Incomplete Write (DWord)</td> </tr> </table>	Bit	Meaning	63:56	Device Statistics Flags, (See Table TBD)	55:32	Timestamp (Unsigned Integer)	31:0	Number of Power Loss Instances with Incomplete Write (DWord)
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63:56	Device Statistics Flags, (See Table TBD)									
55:32	Timestamp (Unsigned Integer)									
31:0	Number of Power Loss Instances with Incomplete Write (DWord)									

Offset	Type	Content
41-511	Byte	Reserved

A.5.1.2 Structure Version

A.5.1.2.1 Description

Structure Version defines the version of the data structure arrangement for this page.

Bit 23:16 is the page number of the Log Page. Bit 15:0 is the revision number of the statistics structure.

A.5.1.2.2 Update Interval

NA

A.5.1.2.3 Measurement Unit

NA

A.5.1.2.4 Initialization

Structure Version shall be set to 0001h.

A.5.1.3 Number of Reported Uncorrectable Errors

A.5.1.3.1 Description

The Number of Reported Uncorrectable Errors statistic is a counter that records the number of errors that are reported as Uncorrectable errors in the error response of a command. Uncorrectable errors occur during background activity are not counted. This statistic is incremented by one for each uncorrectable error status reported to the host. The Timestamp field records the time of the last event.

A.5.1.3.2 Update Interval

One hour

A.5.1.3.3 Measurement Unit

Measurement unit for the Timestamp: power on hours (see xxx)

Measurement unit for the Number of Reported Uncorrectable Errors: events

A.5.1.3.4 Initialization

The Timestamp and Number of Reported Uncorrectable Errors statistics shall be initialized to zero at the time of manufacture.

A.5.1.4 Number of Reported Device Errors that are not Uncorrectable Errors

A.5.1.4.1 Description

The Number of Reported Device Errors that are not Uncorrectable Errors statistic is a counter that records the number of errors reported in the error responses of a command (i.e., Command Completion

Time Out, Media Error, Attempted Partial Range Removal, Insufficient NV Cache Space, Insufficient LBA Range Entries Remaining, Device Fault and Unit Exceptions). Uncorrectable errors and Command Aborted shall not be counted in this statistic. This statistic is incremented by one for each event reported to the host. The Timestamp field records the time of the last event.

Comment [J1]: Synchronize with Mark's Unit Exception's proposal.

Comment [J2]: Straw Poll:

1. Shall Command Aborted be counted?
Yes: 2
No: 7
Abs: 1

A.5.1.4.2 Update Interval

One hour

A.5.1.4.3 Measurement Unit

Measurement unit for the Timestamp: power on hours

Measurement unit for the Number of Reported Device Errors that are not Uncorrectable Errors: events

A.5.1.4.4 Initialization

The Timestamp and Number of Reported Device Errors that are not Uncorrectable Errors statistics shall be initialized to zero at the time of manufacture.

A.5.1.5 Number of Resets that have Terminated Commands

A.5.1.5.1 Description

The Number of Resets that have Terminated Commands statistic is a counter that records the number of Software Resets or Hardware Resets that have terminated one or more commands. This statistic is incremented by one for each reset that has terminated one or more commands. The Timestamp field records the time of the last event.

A.5.1.5.2 Update Interval

One hour

A.5.1.5.3 Measurement Unit

Measurement unit for the Timestamp: power on hours

Measurement unit for the Number of Resets that have Terminated Commands: events

A.5.1.5.4 Initialization

The Timestamp and Number of Resets that have Terminated Commands statistics shall be initialized to zero at the time of manufacture.

A.5.1.6 Number of Power Loss Instances with Incomplete Write

Comment [J3]: Straw Poll:

Do you agree to keep this statistic in this proposal:
Yes: 3
No: 6
Abs: 1

This poll serves as a recommendation from the WG to T13 Plenary to decide.

AR: Suggest people to verify the implementation from each respect company.

A.5.1.6.1 Description

The Number of Power Loss Instances with Incomplete Write statistic is a counter that records the number of events that the device has not completed a write operation due to a power loss. This statistic is incremented by one for each active write to the media which is interrupted by a power loss. The Timestamp field records the time of the last event.

A.5.1.6.2 Update Interval

One hour

A.5.1.6.3 Measurement Unit

Measurement unit for the Timestamp: power on hours

Measurement unit for the Number of Power Loss Instances with Incomplete Write: events

A.5.1.6.4 Initialization

The Timestamp and Number of Power Loss Instances with Incomplete Write statistics shall be initialized to zero at the time of manufacture.

A.5.2 Rotating Media Errors Statistics (Page TBD)

A.5.2.1 Overview

The Rotating Media Errors Statistics log page TBD contains rotating media error information about the device as described in table TBD.

The summary of this error statistics is as followed:

- a) Structure Version
- b) Number of Defective Logical Sectors;
- c) Number of Remaining Spare Logical Sectors;
- d) Number of Reallocation Candidate Logical Sectors;
- e) Number of Retry Revolutions;
- f) Number of Read Errors Requiring Multiple Revolutions;
- g) Number of Write Retries;
- h) Number of Seek Errors; and
- i) Number of Mechanical Start Failures.

Table TBD – Rotating Media Errors Statistics

Offset	Type	Content								
0-7	QWord	Structure Version								
		<table border="0"> <tr> <td>Bit</td> <td>Meaning</td> </tr> <tr> <td>63:56</td> <td>Device Statistics Flags, (See Table TBD)</td> </tr> <tr> <td>55:24</td> <td>Reserved</td> </tr> <tr> <td>23:16</td> <td>TBD, Page Number</td> </tr> <tr> <td>15:0</td> <td>Device Statistics Version Number = 0001h</td> </tr> </table>	Bit	Meaning	63:56	Device Statistics Flags, (See Table TBD)	55:24	Reserved	23:16	TBD, Page Number
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55:24	Reserved									
23:16	TBD, Page Number									
15:0	Device Statistics Version Number = 0001h									
8-15	QWord	Number of Defective Logical Sectors								
		<table border="0"> <tr> <td>Bit</td> <td>Meaning</td> </tr> <tr> <td>63:56</td> <td>Device Statistics Flags, (See Table TBD)</td> </tr> <tr> <td>55:32</td> <td>Timestamp (Unsigned Integer)</td> </tr> <tr> <td>31:0</td> <td>Number of Defective Logical Sectors (DWord)</td> </tr> </table>	Bit	Meaning	63:56	Device Statistics Flags, (See Table TBD)	55:32	Timestamp (Unsigned Integer)	31:0	Number of Defective Logical Sectors (DWord)
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63:56	Device Statistics Flags, (See Table TBD)									
55:32	Timestamp (Unsigned Integer)									
31:0	Number of Defective Logical Sectors (DWord)									
16-23	QWord	Number of Remaining Spare Logical Sectors								
		<table border="0"> <tr> <td>Bit</td> <td>Meaning</td> </tr> <tr> <td>63:56</td> <td>Device Statistics Flags, (See Table TBD)</td> </tr> <tr> <td>55:32</td> <td>Reserved</td> </tr> <tr> <td>31:0</td> <td>Number of Remaining Spare Logical Sectors (DWord)</td> </tr> </table>	Bit	Meaning	63:56	Device Statistics Flags, (See Table TBD)	55:32	Reserved	31:0	Number of Remaining Spare Logical Sectors (DWord)
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63:56	Device Statistics Flags, (See Table TBD)									
55:32	Reserved									
31:0	Number of Remaining Spare Logical Sectors (DWord)									
16-23	QWord	Number of Remaining Spare Logical Sectors Normalized Number of Remaining Spare Logical Sectors								

Offset	Type	Content
		<p>Bit Meaning 63:56 Device Statistics Flags, (See Table TBD) 55:8 Reserved 7:0 Normalized Number of Remaining Spare Logical Sectors (Signed Byte)</p> <hr/> <p>Not Normalized Number of Remaining Spare Logical Sectors</p> <hr/> <p>Bit Meaning 63:56 Device Statistics Flags, (See Table TBD) 55:32 Reserved 31:0 Not Normalized Number of Remaining Spare Logical Sectors (DWord)</p>
24-31	QWord	<p>Number of Reallocation Candidate Logical Sectors</p> <hr/> <p>Bit Meaning 63:56 Device Statistics Flags, (See Table TBD) 55:32 Reserved 31:0 Number of Reallocation Candidate Logical Sectors (DWord)</p>
48-55	QWord	<p>Number of Retry Revolutions</p> <hr/> <p>Bit Meaning 63:56 Device Statistics Flags, (See Table TBD) 55:48 Reserved 47:0 Number of Retry Revolutions (Unsigned Integer)</p>
56-63	QWord	<p>Number of Read Errors Requiring Multiple Revolutions</p> <hr/> <p>Bit Meaning 63:56 Device Statistics Flags, (See Table TBD) 55:48 Reserved 47:0 Number of Read Errors Requiring Multiple Revolutions (Unsigned Integer)</p>
64-71	QWord	<p>Number of Write Retries</p> <hr/> <p>Bit Meaning 63:56 Device Statistics Flags, (See Table TBD) 55:32 Timestamp (Unsigned Integer) 31:0 Number of Write Retries (DWord)</p>
72-79	QWord	<p>Number of Seek Errors</p> <hr/> <p>Bit Meaning 63:56 Device Statistics Flags, (See Table TBD) 55:32 Timestamp (Unsigned Integer) 31:0 Number of Seek Errors (DWord)</p>
80-87	QWord	<p>Number of Mechanical Start Failures</p> <hr/> <p>Bit Meaning 63:56 Device Statistics Flags, (See Table TBD) 55:32 Timestamp (Unsigned Integer) 31:0 Number of Mechanical Start Failures (DWord)</p>
104-511	Byte	Reserved

A.5.2.2 Structure Version

A.5.2.2.1 Description

Structure Version defines the version of the data structure arrangement for this page.

Bit 23:16 is the page number of the Log Page. Bit 15:0 is the revision number of the statistics structure.

A.5.2.2.2 Update Interval

NA

A.5.2.2.3 Measurement Unit

NA

A.5.2.2.4 Initialization

Structure Version shall be set to 0001h.

A.5.2.3 Number of Defective Logical Sectors

A.5.2.3.1 Description

The Number of Defective Logical Sectors statistic is a counter that records the number of logical sectors that has been reallocated due to media defects after the device is manufactured. This statistic is incremented by one for each logical sector reallocated. The Timestamp field records the time of the last event.

A.5.2.3.2 Update Interval

One hour

A.5.2.3.3 Measurement Unit

Measurement unit for the Timestamp: power on hours (see xxx)

Measurement unit for the Number of Defective Logical Sectors: logical sectors

A.5.2.3.4 Initialization

The Timestamp and Number of Defective Logical Sectors statistics shall be initialized to zero at the time of manufacture.

A.5.2.4 Number of Remaining Spare Logical Sectors

A.5.2.4.1 Normalized

A.5.2.4.1.1 Description

The Normalized Number of Remaining Spare Logical Sectors statistic is a counter that records the percentage of the remaining number of logical sectors that are available for reallocation after the device is manufactured. This statistic is calculated with the percentage of remaining available logical sectors divided by the total logical sectors spared for reallocation at the manufacture. The percentage starts from

100% at the time of manufacturing and decrement according to the value calculated, with a range from 100% to 0%.

A.5.2.4.1.2 Update Interval

One hour

A.5.2.4.1.3 Measurement Unit

Percentage

A.5.2.4.1.4 Initialization

This statistic shall be initialized to 100 at the time of manufacture.

A.5.2.4.2 Not Normalized

A.5.2.4.2.1 Description

The Not Normalized Number of Remaining Spare Logical Sectors statistic is a counter that records the number of logical sectors that are available for reallocation after the device is manufactured. This statistic is decremented by one for each spare logical sector used for reallocation.

A.5.2.4.2.2 Update Interval

One hour

A.5.2.4.2.3 Measurement Unit

Logical sectors

A.5.2.4.2.4 Initialization

This statistic shall be initialized at the time of manufacture.

A.5.2.5 Number of Reallocation Candidate Sectors

A.5.2.5.1 Description

The Number of Reallocation Candidate Sectors statistic is a counter that records the number of logical sectors that are candidates for reallocation. Criteria for adding or removing sectors from the candidate list are vendor specific. This statistic is incremented by one for each logical sector candidate for reallocation. This statistic shall be decremented by one when any one of the candidates is removed from the candidate sector list by methods such as reallocation or repair.

A.5.2.5.2 Update Interval

One hour

A.5.2.5.3 Measurement Unit

Logical sectors

A.5.2.5.4 Initialization

This statistic shall be initialized to zero at the time of manufacture.

A.5.2.6 Number of Retry Revolutions

A.5.2.6.1 Description

The Number of Retry Revolutions statistic is a counter that records the number of extra revolutions due to retry. This statistic is incremented by one for each extra revolution takes to retry.

A.5.2.6.2 Update Interval

One hour

A.5.2.6.3 Measurement Unit

Revolutions

A.5.2.6.4 Initialization

This statistic shall be initialized to zero at the time of manufacture.

A.5.2.7 Number of Read Errors Requiring Multiple Revolutions

A.5.2.7.1 Description

The Number of Read Errors Requiring Multiple Revolutions statistic is a counter that records the number of soft errors the device encountered during read operations. A soft error is defined as error that requires more than two revolutions to correctly read the data. This statistic is incremented by one for each logical block that encounters a soft error.

A.5.2.7.2 Update Interval

One hour

A.5.2.7.3 Measurement Unit

Events

A.5.2.7.4 Initialization

This statistic shall be initialized to zero at the time of manufacture.

A.5.2.8 Number of Write Retries

A.5.2.8.1 Description

The Number of Write Retries statistic is a counter that records number of retries during write operation. This statistic is incremented by one each time a retry is performed while writing a logical sector. The Timestamp field records the time of the last event.

A.5.2.8.2 Update Interval

One hour

A.5.2.8.3 Measurement Unit

Measurement unit for the Timestamp: power on hours
Measurement unit for the Number of Write Retries: events

A.5.2.8.4 Initialization

The Timestamp and Number of Write Retries statistics shall be initialized to zero at the time of manufacture.

A.5.2.9 Number of Seek Errors

A.5.2.9.1 Description

The Number of Seek Errors statistic is a counter that records the number of seek errors detected since the device is manufactured. This statistic is incremented by one for each seek error event encountered. The Timestamp field records the time of the last event.

A.5.2.9.2 Update Interval

One hour

A.5.2.9.3 Measurement Unit

Measurement unit for the Timestamp: power on hours
Measurement unit for the Number of Seek Errors: events

A.5.2.9.4 Initialization

The Timestamp and Number of Seek Errors statistics shall be initialized to zero at the time of manufacture.

A.5.2.10 Number of Mechanical Start Failures

A.5.2.10.1 Description

The Number of Mechanical Start Failures statistic is a counter that records the number of mechanical start errors after the device is manufactured. The criteria for mechanical start failure are vendor specific. This statistic is incremented by one for each mechanical start failure event encountered. The Timestamp field records the time of the last event.

A.5.2.10.2 Update Interval

One hour

A.5.2.10.3 Measurement Unit

Measurement unit for the Timestamp: power on hours
Measurement unit for the Number of Mechanical Start Failures: events

A.5.2.10.4 Initialization

The Timestamp and Number of Mechanical Start Failures statistics shall be initialized to zero at the time of manufacture.