

Device Statistics – Errors

T13 Technical Proposal – e06181r6

By

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[This document is a proposal for the T13 to describe the Device Statistics for the device to report. The device error is the information for the device history. The statistics supported are optional, and only applicable to the applicable devices.]

Editor's note: The changes following on the update criteria assume e08106 has been accepted.

A.5 Device Statistics (Log Address TBAh)

A.5.1 Overview

The Device Statistics log contains selected statistics about the device. This log shall be read-only, and shall only be accessed via the GPL feature set. This log is supported if there is a non-zero length for log address TBAh in the General Purpose Log Directory. The format of the data is defined in table TBA. If the Device Statistics log is supported, only the Structure Version field is required. Each statistic is composed of a 1-byte flag field and a value field. If the bit 7 of the flag field is set to one then the value field of that statistic is valid. Each statistic shall be a multiple of 8 bytes long. The number of log pages may be greater than one.

A.5.2 Device Errors Statistics (Page TBA)

A.5.2.1 Overview

Device Statistics log page TBA contains error information about the device as described in table TBA.

The summary of this error statistics is as followed:

- a) Structure Version
- b) Number of Reallocation Sectors Used (Lifetime)
- c) Number of Remaining Spare Sectors for Reassign
- d) Number of Reallocation Candidate Sectors
- e) Number of Reported Uncorrectable Errors (Lifetime)
- f) Number of Reported Device Errors that are not UNC Errors (Lifetime)
- g) Number of Retry Revolutions (Lifetime)
- h) Number of Soft Errors (Lifetime)
- i) Number of Write Faults (Lifetime)
- j) Number of Seek Error (Lifetime)
- k) Number of Mechanical Start Failures (Lifetime)
- l) Number of Commands Terminated by Resets (Lifetime)
- m) Number of Power Loss Instance with Incomplete Write (Lifetime)

Table TBA – Error 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>Reserved</td> </tr> <tr> <td>55:48</td> <td>Device Statistics Version Number = 0001h</td> </tr> <tr> <td>47:16</td> <td>Reserved</td> </tr> <tr> <td>15:0</td> <td>TBAh, Page Number</td> </tr> </table>	Bit	Meaning	63:56	Reserved	55:48	Device Statistics Version Number = 0001h	47:16	Reserved
Bit	Meaning									
63:56	Reserved									
55:48	Device Statistics Version Number = 0001h									
47:16	Reserved									
15:0	TBAh, Page Number									
8-15	QWord	Number of Reallocation Sectors Used (Lifetime)								
		<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 Reallocation Sectors Used (Lifetime)</td> </tr> </table>	Bit	Meaning	63:56	Device Statistics Flags, (See Table TBD)	55:32	Reserved	31:0	Number of Reallocation Sectors Used (Lifetime)
Bit	Meaning									
63:56	Device Statistics Flags, (See Table TBD)									
55:32	Reserved									
31:0	Number of Reallocation Sectors Used (Lifetime)									
16-23	QWord	Number of Remaining Spare Sectors for Reassign								

Offset	Type	Content
		<p>Bit Meaning</p> <p>63:56 Device Statistics Flags, (See Table TBD)</p> <p>55:32 Reserved</p> <p>31:0 Number of Remaining Spare Sectors for Reassign</p>
24-31	QWord	Number of Reallocation Candidate Sectors
		<p>Bit Meaning</p> <p>63:56 Device Statistics Flags, (See Table TBD)</p> <p>55:32 Reserved</p> <p>31:0 Number of Reallocation Candidate Sectors</p>
32-39	QWord	Number of Reported Uncorrectable Errors (Lifetime)
		<p>Bit Meaning</p> <p>63:56 Device Statistics Flags, (See Table TBD)</p> <p>55:32 Reserved</p> <p>31:0 Number of Reported Uncorrectable Errors (Lifetime)</p>
40-47	QWord	Number of Reported Device Errors that are not UNC Errors (Lifetime)
		<p>Bit Meaning</p> <p>63:56 Device Statistics Flags, (See Table TBD)</p> <p>55:32 Reserved</p> <p>31:0 Number of Reported Device Errors that are not UNC Errors (Lifetime)</p>
48-55	QWord	Number of Retry Revolutions (Lifetime)
		<p>Bit Meaning</p> <p>63:56 Device Statistics Flags, (See Table TBD)</p> <p>55:48 Reserved</p> <p>47:0 Number of Retry Revolutions (Lifetime)</p>
56-63	QWord	Number of Soft Errors (Lifetime)
		<p>Bit Meaning</p> <p>63:56 Device Statistics Flags, (See Table TBD)</p> <p>55:48 Reserved</p> <p>47:0 Number of Soft Errors (Lifetime)</p>
64-71	QWord	Number of Write Faults (Lifetime)
		<p>Bit Meaning</p> <p>63:56 Device Statistics Flags, (See Table TBD)</p> <p>55:32 Reserved</p> <p>31:0 Number of Write Faults (Lifetime)</p>
72-79	QWord	Number of Seek Error (Lifetime)
		<p>Bit Meaning</p> <p>63:56 Device Statistics Flags, (See Table TBD)</p> <p>55:32 Reserved</p> <p>31:0 Number of Seek Error (Lifetime)</p>
80-87	QWord	Number of Mechanical Start Failures (Lifetime)
		<p>Bit Meaning</p> <p>63:56 Device Statistics Flags, (See Table TBD)</p> <p>55:32 Reserved</p> <p>31:0 Number of Mechanical Start Failures (Lifetime)</p>

Offset	Type	Content						
88-95	QWord	Number of Commands Terminated by Resets (Lifetime)						
		<table> <thead> <tr> <th>Bit</th> <th>Meaning</th> </tr> </thead> <tbody> <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 Commands Terminated by Resets (Lifetime)</td> </tr> </tbody> </table>	Bit	Meaning	63:56	Device Statistics Flags, (See Table TBD)	55:32	Reserved
Bit	Meaning							
63:56	Device Statistics Flags, (See Table TBD)							
55:32	Reserved							
31:0	Number of Commands Terminated by Resets (Lifetime)							
96-103	QWord	Number of Power Loss Instance with Incomplete Write (Lifetime)						
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Bit	Meaning							
63:56	Device Statistics Flags, (See Table TBD)							
55:32	Reserved							
31:0	Number of Power Loss Instance with Incomplete Write (Lifetime)							
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 statistics. The structure is defined by the T13 committee. When a new structure is defined the version number will be assigned.

Bit 56:48 is used for the revision number of the statistics structure. Bit 15:0 is used for the page number of the Log Page for this statistics.

A.5.2.2.2 Update Interval

Update interval is not applicable to the Structure Version field.

A.5.2.2.3 Measurement Unit

Measurement unit is not applicable to the Structure Version field.

A.5.2.2.4 Initialization

Structure Version shall be initialized to the corresponding number at the time of manufacture.

A.5.2.3 Number of Reallocation Sectors Used (Lifetime)

A.5.2.3.1 Description

Number of Reallocation Sectors Used (Lifetime) is a counter that records the number of sectors (LBA blocks) that has been reallocated after the device is manufactured. Number of Reallocation Sectors Used (Lifetime) is incremented by one for each LBA block reallocated.

A.5.2.3.2 Update Interval

Number of Reallocation Sectors Used (Lifetime) is updated on the following events. When the device is operational the counter is updated and stored in a non-volatile location at a minimum interval of one hour.

A.5.2.3.3 Measurement Unit

Measurement Unit: LBA Block

A.5.2.3.4 Initialization

Number of Reallocation Sectors Used (Lifetime) shall be initialized to zero at the time of manufacture.

A.5.2.4 Number of Remaining Spare Sectors for Reassign

A.5.2.4.1 Description

Number of Remaining Spare Sectors for Reassign is a counter that records the number of sectors (LBA blocks) that are available to be used for the bad sector reallocated after the device is manufactured. Number of Remaining Spare Sectors for Reassign is decremented by one for each LBA block reallocated.

A.5.2.4.2 Update Interval

Number of Remaining Spare Sectors for Reassign is updated on the following events. When the device is operational the counter is updated and stored in a non-volatile location at a minimum interval of one hour.

A.5.2.4.3 Measurement Unit

Measurement Unit: LBA Block

A.5.2.4.4 Initialization

Number of Remaining Spare Sectors for Reassign shall be initialized to a vendor specific number at the time of manufacture.

A.5.2.5 Number of Reallocation Candidate Sectors

A.5.2.5.1 Description

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

A.5.2.5.2 Update Interval

Number of Reallocation Candidate Sectors is updated on the following events. When the device is operational the counter is updated and stored in a non-volatile location at a minimum interval of one hour.

A.5.2.5.3 Measurement Unit

Measurement Unit: LBA Block

A.5.2.5.4 Initialization

Number of Reallocation Candidate Sectors shall be initialized to zero at the time of manufacture.

A.5.2.6 Number of Reported Uncorrectable Errors (Lifetime)**A.5.2.6.1 Description**

Number of Reported Uncorrectable Errors (Lifetime) is a counter that records the number of errors that are reported as Uncorrectable (UNC) errors in the error response of a command. UNC errors occur during background activity are not counted. Number of Reported Uncorrectable Errors (Lifetime) is incremented by one for each uncorrectable error status is reported to the host.

A.5.2.6.2 Update Interval

Number of Reported Uncorrectable Errors (Lifetime) is updated on the following events. When the device is operational the counter is updated and stored in a non-volatile location at a minimum interval of one hour.

A.5.2.6.3 Measurement Unit

Measurement Unit: Event (of uncorrectable error status is reported to the host)

A.5.2.6.4 Initialization

Number of Reported Uncorrectable Errors (Lifetime) shall be initialized to zero at the time of manufacture.

A.5.2.7 Number of Reported Device Errors that are not UNC Errors (Lifetime)**A.5.2.7.1 Description**

Number of Reported Device Errors that are not UNC (Uncorrectable) Errors (Lifetime) is a counter that records the number of errors reported in the error response of a command that are of these types: CCTO, MED, APRRR, INCS, ILRER and Special Error for Request Sense. The UNC error is not counted in this statistics. Number of Reported Device Errors that are not UNC Errors (Lifetime) is incremented by one for each reported device errors that are not UNC error is reported to the host.

A.5.2.7.2 Update Interval

Number of Reported Device Errors that are not UNC Errors (Lifetime) is updated on the following events. When the device is operational the counter is updated and stored in a non-volatile location at a minimum interval of one hour.

A.5.2.7.3 Measurement Unit

Measurement Unit: Event

A.5.2.7.4 Initialization

Number of Reported Device Errors that are not UNC Errors (Lifetime) shall be initialized to zero at the time of manufacture.

A.5.2.8 Number of Retry Revolutions (Lifetime)**A.5.2.8.1 Description**

Number of Retry Revolutions (Lifetime) is a counter that records the number of extra revolutions due to device retry. This statistic is only valid for rotational media. Number of Retry Revolutions (Lifetime) is incremented by one for each extra revolution takes to retry.

A.5.2.8.2 Update Interval

Number of Retry Revolutions (Lifetime) is updated on the following events. When the device is operational the counter is updated and stored in a non-volatile location at a minimum interval of one hour.

A.5.2.8.3 Measurement Unit

Measurement Unit: Revolution

A.5.2.8.4 Initialization

Number of Retry Revolutions (Lifetime) shall be initialized to zero at the time of manufacture.

A.5.2.9 Number of Multiple Revolutions Read Errors (Lifetime)

A.5.2.9.1 Description

Number of Multiple Revolutions Read Errors (Lifetime) is a counter that records the number of soft errors device encountered during the read operation. Soft error is defined as error that requires more than two times of read attempts in order to get the correct data. The data corrected by the error correction mechanism that does not require extra retry is not counted. This counter is incremented by one for each sector that encounters the soft error. Number of Multiple Revolutions Read Errors (Lifetime) is incremented by one for each Soft Error encountered.

A.5.2.9.2 Update Interval

Number of Multiple Revolutions Read Errors (Lifetime) is updated on the following events. When the device is operational the counter is updated and stored in a non-volatile location at a minimum interval of one hour.

A.5.2.9.3 Measurement Unit

Measurement Unit: Event

A.5.2.9.4 Initialization

Number of Multiple Revolutions Read Errors (Lifetime) shall be initialized to zero at the time of manufacture.

A.5.2.10 Number of Write Faults (Lifetime)

A.5.2.10.1 Description

Number of Write Faults (Lifetime) is a counter that records the number of events that the device has to abort its write operation due to detection of write fault conditions. The aborting of write is occurring on the operation that device is writing to the media. The aborted write maybe recovered by retries or other recovery procedures. The fault condition is defined as the normal write has to be retried to ensure write operation is performed correctly. This event can be but not limited to off track write prevention or power noise. In case of power loss, the event may not be recorded. Number of Write Faults (Lifetime) is incremented by one for each write fault event encountered.

A.5.2.10.2 Update Interval

Number of Write Faults (Lifetime) is updated on the following events. When the device is operational the counter is updated and stored in a non-volatile location at a minimum interval of one hour.

A.5.2.10.3 Measurement Unit

Measurement Unit: Event

A.5.2.10.4 Initialization

Number of Write Faults (Lifetime) shall be initialized to zero at the time of manufacture.

A.5.2.11 Number of Seek Error (Lifetime)

A.5.2.11.1 Description

Number of Seek Error (Lifetime) is a counter that records the number of seek errors detected since the device is manufactured. Number of Seek Error (Lifetime) is incremented by one for each seek error event encountered

A.5.2.11.2 Update Interval

Number of Seek Error (Lifetime) is updated on the following events. When the device is operational the counter is updated and stored in a non-volatile location at a minimum interval of one hour.

A.5.2.11.3 Measurement Unit

Measurement Unit: Event

A.5.2.11.4 Initialization

Number of Seek Error (Lifetime) shall be initialized to zero at the time of manufacture.

A.5.2.12 Number of Mechanical Start Failures (Lifetime)

A.5.2.12.1 Description

Number of Mechanical Start Failures (Lifetime) is a counter that records the number of spin-up errors since the device is manufactured. The criteria for spin-up failure are vendor specific. Number of Mechanical Start Failures (Lifetime) is incremented by one for each spin-up failure event encountered.

A.5.2.12.2 Update Interval

Number of Mechanical Start Failures (Lifetime) is updated on the following events. When the device is operational the counter is updated and stored in a non-volatile location at a minimum interval of one hour.

A.5.2.12.3 Measurement Unit

Measurement Unit: Event

A.5.2.12.4 Initialization

Number of Mechanical Start Failures (Lifetime) shall be initialized to zero at the time of manufacture.

A.5.2.13 Number of Commands Terminated by Resets (Lifetime)

A.5.2.13.1 Description

Number of Commands Terminated by Resets (Lifetime) is a counter that records the number of events that command is terminated by a reset before it reports the command completion. The reset can be either Soft Reset, Device Reset if the device is ATAPI, or Hard Reset. This statistics is for the device to record number of reset events host has generated to terminate the command execution. Number of Commands Terminated by Resets (Lifetime) is incremented by one for each event a command is terminated by reset.

A.5.2.13.2 Update Interval

Number of Commands Terminated by Resets (Lifetime) is updated on the following events. When the device is operational the counter is updated and stored in a non-volatile location at a minimum interval of one hour.

A.5.2.13.3 Measurement Unit

Measurement Unit: Event

A.5.2.13.4 Initialization

Number of Commands Terminated by Resets (Lifetime) shall be initialized to zero at the time of manufacture.

A.5.2.14 Number of Power Loss Instances with Incomplete Write (Lifetime)

A.5.2.14.1 Description

Number of Power Loss Instances with Incomplete Write (Lifetime) is a counter that records the number of events that the device has to abort its write operation due to power loss. The aborting of write is occurring on the operation that device is writing to the media. The power loss aborted write cannot be reported to the host due to loss of power. Device support this statistics needs to track aborted write at the time when power is lost. Number of Power Loss Instances with Incomplete Write (Lifetime) is incremented by one for each event that a write is not completed due to power loss.

A.5.2.14.2 Update Interval

Number of Power Loss Instances with Incomplete Write (Lifetime) is updated on the following events. When the device is operational the counter is updated and stored in a non-volatile location at a minimum interval of one hour.

A.5.2.14.3 Measurement Unit

Measurement Unit: Event

A.5.2.14.4 Initialization

Number of Power Loss Instances with Incomplete Write (Lifetime) shall be initialized to zero at the time of manufacture.