

Device Statistics – Solid State

T13 Technical Proposal – e06184r9

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[This document is a proposal for the T13 to describe the Device Statistics for the device to report. The solid state statistics is the information specific for the solid state storage such as SSD. The statistics supported are optional, and only applicable to the applicable devices.]

A.5 Device Statistics (Log Address TBDh)

A.5.1 Overview

The optional 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 TBDh in the General Purpose Log Directory. The format of the data is defined in table TBD. 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 Solid State Device Statistics (Page TBD)

A.5.2.1 Overview

Device Statistics log page TBD contains solid state device information about the device as described in table TBD.

The summary of this solid state statistics is as followed:

- a) Structure Version
- b) Number of Defective Logical Blocks in the Solid State Media (Lifetime)
- c) Number of Solid State Media Erase Operations (Lifetime)
- d) Percentage of the Rated Lifetime Used
- e) Percentage of Spare Blocks Remaining in Solid State Media
- f) Number of Error Events on Erase (Lifetime)
- g) Number of Error Events on Program (Lifetime)

Table TBD – Solid State 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>0003h</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	0003h									
8-15	QWord	Number of Defective Logical Blocks in the Solid State Media (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 Defective Logical Blocks in the Solid State Media (Lifetime)</td> </tr> </table>	Bit	Meaning	63:56	Device Statistics Flags, (See Table TBD)	55:32	Reserved	31:0	Number of Defective Logical Blocks in the Solid State Media (Lifetime)
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31:0	Number of Defective Logical Blocks in the Solid State Media (Lifetime)									
16-23	QWord	Number of Solid State Media Erase Operations (Lifetime)								
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Bit	Meaning									
63:56	Device Statistics Flags, (See Table TBD)									
55:32	Reserved									
31:0	Number of Solid State Media Erase Operations (Lifetime)									
24-31	QWord	Percentage of the Rated Lifetime Used								

Offset	Type	Content
		<p>Bit Meaning</p> <p>63:56 Device Statistics Flags, (See Table TBD)</p> <p>55:16 Reserved</p> <p>15:0 Percentage of the Rated Lifetime Used</p>
32-39	QWord	Percentage of Spare Blocks Remaining in Solid State Media
		<p>Bit Meaning</p> <p>63:56 Device Statistics Flags, (See Table TBD)</p> <p>55:8 Reserved</p> <p>7:0 Percentage of Spare Blocks Remaining in Solid State Media</p>
40-47	QWord	Number of Error Events on Erase (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 Error Events on Erase (Lifetime)</p>
48-55	QWord	Number of Error Events on Program (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 Error Events on Program (Lifetime)</p>
-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 Defective Logical Blocks in the Solid State Media (Lifetime)

A.5.2.3.1 Description

Number of Defective Logical Blocks (Lifetime) in the Solid State Media is a counter that records the number of defected sectors (LBA blocks) that has been found after the device is manufactured. Number of Defective Logical Blocks (Lifetime) in the Solid State Media is incremented by one for each defected LBA block found.

A.5.2.3.2 Update Interval

Number of Defective Logical Blocks (Lifetime) in the Solid State Media 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

Measure Unit: LBA Block

A.5.2.3.4 Initialization

Number of Defective Logical Blocks (Lifetime) in the Solid State Media shall be initialized to zero at the time of manufacture.

A.5.2.4 Number of Solid State Media Erase Operations (Lifetime)

A.5.2.4.1 Description

Number of Solid State Media Erase Operations (Lifetime) is a counter that records the number of erase performed by the device after the device is manufactured. Number of Solid State Media Erase Operations (Lifetime) is incremented by one for each erase operation is performed.

A.5.2.4.2 Update Interval

Number of Solid State Media Erase Operations (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.5.2.4.3 Measurement Unit

Measure Unit: Event

A.5.2.4.4 Initialization

Number of Solid State Media Erase Operations (Lifetime) shall be initialized to zero at the time of manufacture.

A.5.2.5 Percentage of the Rated Lifetime Used

A.5.2.5.1 Description

Percentage of the Rated Lifetime Used is a value that records the percentage of current usage state of the solid state media. The rated lifetime of the solid state media is set by the number of erase cycles the device is capable of. The value of the percentage of the rated lifetime used is calculated from the current erase cycle divided by the rated erase cycles. This value may be greater than 100 percent. Percentage of the Rated Lifetime Used is measured in the percentage of erase cycles.

A.5.2.5.2 Update Interval

Percentage of the Rated Lifetime Used 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

Measure Unit: Percent

A.5.2.5.4 Initialization

Percentage of the Rated Lifetime Used shall be initialized to zero at the time of manufacture.

A.5.2.6 Percentage of Spare Blocks Remaining in Solid State Media

A.5.2.6.1 Description

Percentage of Spare Blocks Remaining in Solid State Media is a value that records the percentage of remaining spare blocks which can be used for defect reassign. The percentage is calculated from the remaining number of spare blocks compare with the original number of spare blocks. Percentage of Spare Blocks Remaining in Solid State Media is measured in the percentage of remaining spare blocks available.

A.5.2.6.2 Update Interval

Percentage of Spare Blocks Remaining in Solid State Media 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

Measure Unit: Percent

A.5.2.6.4 Initialization

Percentage of Spare Blocks Remaining in Solid State Media shall be initialized to one hundred at the time of manufacture.

A.5.2.7 Number of Error Events on Erase (Lifetime)

A.5.2.7.1 Description

Number of Error Events on Erase (Lifetime) is a counter that records the number of events the device detects error in the erase operation after the device is manufactured. Number of Error Events on Erase (Lifetime) is incremented by one for each error found while the erase operation is performed.

A.5.2.7.2 Update Interval

Number of Error Events on Erase (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

Measure Unit: Event

A.5.2.7.4 Initialization

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

A.5.2.8 Number of Error Events on Program (Lifetime)

A.5.2.8.1 Description

Number of Error Events on Program (Lifetime) is a counter that records the number of events the device detects error in the program operation after the device is manufactured. Device program operation is for device to write the solid state media. Number of Error Events on Program (Lifetime) is incremented by one for each error found while the program operation is performed.

A.5.2.8.2 Update Interval

Number of Error Events on Program (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

Measure Unit: Event

A.5.2.8.4 Initialization

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