



Mode/ Log/ VPD Pages For Describing Solid State Storage (Revision 3.0 Draft 2 - Truncated)

**Martin R. Furuholm
Pat LaVarre**

Contents

- A. Scope**
- B. Conventions**
- C. Solid State Storage mode page**
- D. Solid State Storage log page**
- E. Solid State Storage VPD page**



A. Scope

Hosts have a need to tune their behavior to fit the significant differences exhibited by the wide variety of flash memory technologies now sold to the mass market. These needs arise across a broad spectrum of “peripheral device type”s, including h 00 04 05 07 0E (i.e., DASD SBC/ RBC, C/DVD MMC, etc.).

Before this proposal, hosts had to run benchmarks to discover such characteristics, specifically benchmarks new and slow and complex enough to defeat benchmark-detection firmware in the device.

This proposal gives the device a standard way to describe its own solid storage media and also gives the host a standard place to store its own estimate of the storage capacity and health of that media.

The host may discover that a device supports this proposed feature by testing for the existence of the new mode, log, or VPD pages.

B. Conventions

In this proposal, we provide written Scope, Conventions, and the *italicized comments* as informative rationale to help accelerate discussion of this proposal.

We expect the committee will choose to delete this non-normative rationale before agreeing to add a version of this proposal into SCSI as an enhancement. Also we have not yet chosen the TBD page codes, section numbers, and table numbers.

C. Solid State Storage mode page

We designed this mode page to replace the October 04-362r0.pdf Data Out to "BYTE 18" of the mode page there, described then as: "Low Nibble; Media Health Status; High Nibble; Storage Capacity Status".

7 Parameters for all device types

7.4 Mode parameters

7.4.n Solid State Storage mode page

The Solid State Storage mode page (see table NNN) gives the application client a standard place to store its own estimate of the storage capacity and health of the media. The logical unit may display these estimates on the device server itself.

Table NNN – Solid State Storage mode page

Bit Byte	7	6	5	4	3	2	1	0
0	PS(1b)	SPF(0b)	PAGE CODE (TBD)					
1	ADDITIONAL PAGE LENGTH (0Fh)							
2-9	Reserved							
10	HOST MEDIA STORAGE CAPACITY							
11	HOST MEDIA HEALTH							
12-15	HOST SIGNATURE							

The PS bit, SPF bit, PAGE CODE field, and PAGE LENGTH field are described in *7.4.5 Mode page and subpage formats and page codes.*

The logical unit shall set PS to 1b, the SPF to 0b, and the PAGE LENGTH to 06h, as the table shows. The logical unit may, but should not, implement a distinction between current and saved mode pages.

("Implements no distinction" is a quote from SPC "6.7" "MODE SELECT(6) command" for how we ask for a Mode Select of this page with SP clear to die via INVALID FIELD IN CDB - ILLEGAL REQUEST - CHECK CONDITION.)



The HOST MEDIA STORAGE CAPACITY field specifies the percent of free space remaining.

Table NNN – HOST MEDIA STORAGE CAPACITY field

Code		Definition
00h	(0d)	No Information Provided
01h – 64h	(1d – 100d)	Percent Free, Initially 100%
65h – FEh	(2d – 254d)	Reserved
FFh	(255d)	Full = 0% Calculated

The HOST MEDIA HEALTH field specifies the percent of media life remaining.

Table NNN – HOST MEDIA HEALTH field

Code		Definition
00h	(0d)	No Information Provided
01h – 64h	(1d – 100d)	Percent Good, Initially 100%
65h – FEh	(101d – 254d)	Reserved
FFh	(255d)	End of Life = 0% Calculated

The HOST SIGNATURE field specifies another four bytes for the device server to save with the page. The application client may use these bits to more confidently decide if a compatible client calculated the other fields of this page.

D. Solid State Storage log page

We designed this log page to replace the October 04-362r0.pdf Data In from “BYTE 18” of the mode page there, described then as: “Low Nibble; Media Health Status; High Nibble; Storage Capacity Status”.

7. Parameters for all device types

7.2 Log parameters

7.2.n Solid State Storage log page

The Solid State Storage log page (see table NNN) provides the logical unit a standard place to report its own estimate of the storage capacity and health of the media. The application client may display these estimates.

Table NNN – Solid State Storage log page

Bit Byte	7	6	5	4	3	2	1	0
0	PAGE CODE (TBD)							
1	Reserved							
2-3	(MSB) ... ADDITIONAL PAGE LENGTH (0Ch) ... (LSB)							
4	(MSB) ... PARAMETER CODE (TBD) Solid State Storage ... (LSB)							
5	DU	DS	TSD	ETC	TMC		LBIN	LP
6	ADDITIONAL PARAMETER LENGTH (0Ah)							
7-8	Reserved							
10	DEVICE MEDIA STORAGE CAPACITY							
11	DEVICE MEDIA HEALTH							
12-15	DEVICE SIGNATURE							

The DU DS TSD ETC TMC LBIN LP bits and fields, collectively referred to as the PARAMETER CONTROL byte, are described by spc3r21b.pdf Table 193 Log parameter.



The DEVICE MEDIA STORAGE CAPACITY field contains the percent of free space remaining.

Table NNN – DEVICE MEDIA STORAGE CAPACITY field

Code		Definition
00h	(0d)	No Information Provided
01h – 64h	(1d – 100d)	Percent Free, Initially 100%
65h – FEh	(2d – 254d)	Reserved
FFh	(255d)	Full = 0% Calculated

The DEVICE MEDIA HEALTH field contains the percent of media life remaining.

Table NNN – DEVICE MEDIA HEALTH field

Code		Definition
00h	(0d)	No Information Provided
01h – 64h	(1d – 100d)	Percent Good, Initially 100%
65h – FEh	(101d – 254d)	Reserved
FFh	(255d)	End of Life = 0% Calculated

The DEVICE SIGNATURE field contains another four bytes to distinguish the algorithms the logical unit applied to calculate the other fields of this page. The application client may use these bits to more confidently decide if a compatible logical unit calculated the other fields of this page.

E. Solid State Storage VPD page

We designed this VPD page to replace the rest of the October 04-362r0 Data In from the mode page there.

7 Parameters for all device types

7.6 Vital product data parameters

7.6.n Solid State Storage VPD page

The Solid State Storage VPD page (see table NNN) describes the structure of the media in enough detail to let the application client adapt to the significant differences exhibited by a wide variety of solid state storage technologies. The structure described divides a medium into chip dies which divide into erase blocks which divide into pages which divide into sectors of 0.5 KiB each.

Table NNN – Solid State Storage VPD page

Bit Byte	7	6	5	4	3	2	1	0
0	PERIPHERAL QUALIFIER			PERIPHERAL DEVICE TYPE				
1	PAGE CODE (TBD)							
2	Reserved							
3	ADDITIONAL PAGE LENGTH (NNh)							
...	...							

The PERIPHERAL QUALIFIER field and the PERIPHERAL DEVICE TYPE field are defined in SPC-3.

The PAGE CODE field shall be set to (TBD).

The ADDITIONAL PAGE LENGTH field is defined in SPC-3.

The rest of the October 04-362r0 Data In, from the mode page there, will appear here, but hasn't yet, as you can see. This is where this draft got stuck in a long list of fields and their individual details.

Change Log

In reverse chronological order, with reference to <http://t10.org/doc04.htm>

3. TBD

2. January 17, 2005

04-362r1 SBC-2: Solid State Storage Description Mode/ Log/ VPD Description Pat LaVarre PDF (maybe less than 35,000 bytes)

SCSI in general substituted for SCSI thru USB in particular.

Data divided into mode, log, and VPD pages.

Scope & Conventions summarized.

1. October 2004

04-362r0 SBC-2: Proposal for USB Solid State Drive Mode Sense specification Martin R. Furuholm [PDF](#) (30831 bytes).

First proposal published.

Revisions recommended by 04-367r1 Minutes of CAP Working Group - Nov 9-10, 2004 Weber & Lohmeyer [HTM](#) (18323)