Western Digital Corporation
5863 Rue Ferrari
San Jose, CA, 95138

To: **T10 CAP Working Group**
Contact: **Mark Evans**
             Phone: 408.363.5257
             Email: mark.evans@wdc.com
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Subject: SBC-3, Clarifications for Background Scan Results log page

1 Related documents

SBC-3r10, SCSI Block Commands – 3 (SBC-3) revision 10

2 Introduction

While reviewing the Background Scan Results log page, I found several areas that were unclear to me. The following proposal attempts to clarify (i.e., not change) the portions of SBC-3 where I had questions. This proposal also adds a new field, NUMBER OF BACKGROUND MEDIUM SCANS PERFORMED, to the Background Scanning Status parameter and makes some editorial changes.

While constructing this proposal, I also realized that T10 is not consistent in the words we use to collectively refer to the DU bit, TSD bit, ETC bit, TMC field, and FORMAT AND LINKING field. SBC-4 in "7.2.1 Log page structure and page codes for all device types" reads, "The DU bit, TSD bit, ETC bit, TMC field, and FORMAT AND LINKING field are collectively referred to as the parameter control byte." However, other places in the standard call this group of bits and fields the "parameter control bits." I propose that we call this group the parameter control byte, and I've used these words in the following proposal. One way or the other, we should be consistent.

The consensus at the time this was written during the CAP working group meeting was to call this the parameter control byte where used in all T10 standards.

Revision 1 of this proposal includes input from the CAP working group held on July 12th, 2007 in Colorado Springs.

3 Proposal

Change the Background Scan Results log page clause as follows:

6.2.2 Background Scan Results log page (15h)

The Background Scan Results log page (see table 1) ~~returns~~contains the ~~B~~background ~~S~~scanning ~~S~~status parameter and zero or more Background Medium Scan parameters ~~when background scanning is supported~~. The Background Scanning Status parameter provides information about background pre-scan and background medium scan operations. Each Background Medium Scan parameter ~~corresponds to~~provides information about a logical block where an error was detected during a background scanning operation. If the Background Scan Results log page is filled, and a new error is detected during a background scanning operation, then the device server~~a new Background Medium Scan parameter~~ overwrites the oldest ~~entry~~Background Medium Scan parameter with the Background Medium Scan parameter for the new error. When a LOG SELECT command with the PCR bit set to one is processed, the device server shall:

- a) delete all Background Medium Scan parameters ~~are. However,~~ :
- b) not change the values in the Background Scanning Status parameter ~~shall not be affected~~.

Table 1 — Background Scan Results log page

Bit / Byte	7	6	5	4	3	2	1	0
0	DS (1)	SPF (0)	PAGE CODE (15h)					
1	Reserved							
2	(MSB)							
3	PAGE LENGTH (n-3)h							(LSB)
Background scan results log parameters								
4								
.....	Background Scanning Status parameter (see table 3)							
19								
Background Medium Scan parameter list								
20								
.....	Background Medium Scan parameter (first) (see table 5)							
43								
	.....							
n-23								
.....	Background Medium Scan parameter (last) (see table 5)							
n								

The disable save (DS) bit, the subpage format (SPF) bit, the PAGE CODE field, and the PAGE LENGTH field ~~is~~ are ~~defined~~ described in SPC-4.

The SPF bit shall be set to zero.

The PAGE CODE field shall be set to 15h.

The PAGE LENGTH field shall be set to (n-3)h, where n is the number of the last byte of the Background Scan Results log page.

Table 2 defines the codes for the background scan results log parameters.

Table 2 — Background Scan Results log page parameter codes

Parameter code	Description
0000h	Background Scanning Status parameter
0001h - 0800h	Background Medium Scan parameter
0801h - FFFFh	Reserved

The Background Scanning Status parameter (see table 3) contains status information about the background pre-scan and background medium scan features.

Table 3 — Background Scanning Status parameter format

Byte \ Bit	7	6	5	4	3	2	1	0
0	(MSB)			PARAMETER CODE (0000h)				
1								(LSB)
2	Parameter control byte							
	DU	Obsolete	TSD	ETC	TMC		FORMAT AND LINKING	
3	PARAMETER LENGTH (0Ch)							
4	(MSB)							
.....			ACCUMULATED POWER ON MINUTES					
7								(LSB)
8	Reserved							
9	BACKGROUND SCANNING STATUS							
10	(MSB)			NUMBER OF BACKGROUND SCANS PERFORMED				
11								(LSB)
12	(MSB)			BACKGROUND MEDIUM SCAN PROGRESS				
13								(LSB)
14	(MSB)			Reserved NUMBER OF BACKGROUND MEDIUM SCANS PERFORMED				
15								(LSB)

Table 4 defines the values for the log parameter control ~~bits~~ byte (see SPC-4) for this log parameter.

Table 4 — **Parameter control ~~bits~~byte for the Background Scan Results log parameter**

Field	Value for LOG SENSE	Value for LOG SELECT	Description
DU	0	0 or 1 (i.e., ignored)	The DU bit is not defined for list parameters, so shall be set to zero when read with the LOG SENSE command and shall be ignored when written with the LOG SELECT command.
TSD	0 or 1	0 or 1	~~No specific requirements.~~When set to zero, the device server shall save the log parameter to its medium at vendor specific intervals. When set to one, implicit saving of the log parameter is disabled by an application client.
ETC	0	0 or 1 (i.e., ignored)	The ETC bit is not defined for list parameters, so shall be set to zero when read with the LOG SENSE command and shall be ignored when written with the LOG SELECT command.
TMC	00b	any (i.e., ignored)	The TMC field is not defined for list parameters, so shall be set to 00b when read with the LOG SENSE command and shall be ignored when written with the LOG SELECT command.
FORMAT AND LINKING	11b	11b	The log parameter is a binary format list parameter.

The PARAMETER LENGTH field indicates the number of bytes ~~remaining~~ to follow in the log parameter.

The ACCUMULATED POWER ON MINUTES field indicates the number of minutes the device server has been powered on since manufacturing.

Table 5 defines the BACKGROUND SCANNING STATUS field.

Table 5 — **BACKGROUND SCANNING STATUS field**

Code	Description
00h	No background scan is active, and background scanning is disabled (i.e., the EN_BMS bit is set to zero in the Background Control mode page (see 6.3.3)).
01h	A background medium scan is active.
02h	A background pre-scan is active
03h	A background medium scan halted due to a fatal error.
04h	A background medium scan halted due to a vendor specific pattern of errors.
05h	A background medium scan halted due to the medium being formatted without the P-list.
06h	A background medium scan halted due to a vendor specific cause.
07h	A background medium scan halted due to the temperature being out of the allowed range.
08h	Background scanning is enabled (i.e., the EN_BMS bit is set to one in the Background Control mode page (see 6.3.3)), and no~~A~~ background medium scan is active ~~halted~~ (i.e., the device server is waiting for Background Medium Interval timer expiration before starting the next background media scan).
09h - FFh	Reserved

The NUMBER OF BACKGROUND SCANS PERFORMED field indicates the number of background scans (i.e., the total number of background pre-scans plus the number of background medium scans) that have been performed since the SCSI target device was originally shipped by the manufacturer.

The BACKGROUND MEDIUM SCAN PROGRESS field is a percent complete indication of the background medium scan. The returned value is a numerator that has 65 536 (i.e., 10000h) as its denominator. If there is no background scan in progress (i.e., no background scan has been initiated since power on or the most recent scan has completed), then the device server shall set the BACKGROUND MEDIUM SCAN PROGRESS field to 0000h.

The NUMBER OF BACKGROUND MEDIUM SCANS PERFORMED field indicates the number of background medium scans that have been performed since the SCSI target device was originally shipped by the manufacturer. If the NUMBER OF BACKGROUND MEDIUM SCANS PERFORMED field contains 0000h, then the number of background medium scans is not reported.

The total number of background pre-scans that have been performed is the value in the NUMBER OF BACKGROUND SCANS PERFORMED field minus the value in the NUMBER OF BACKGROUND MEDIUM SCANS PERFORMED field.

A Background Medium Scan parameter (see table 6) describes a defect location on the medium that was encountered bduring a background scanning operation (see 4.19.2 and 4.19.3).

Table 6 — Background Medium Scan parameter format

Byte \ Bit	7	6	5	4	3	2	1	0
0	(MSB)			PARAMETER CODE (0001h – 0800h)				
1								(LSB)
2	Parameter control byte							
2	DU	Obsolete	TSD	ETC	TMC		FORMAT AND LINKING	
3	PARAMETER LENGTH (14h)							
4	(MSB)							
.....	ACCUMULATED POWER ON MINUTES							
7								(LSB)
8	REASSIGN STATUS				SENSE KEY			
9	ADDITIONAL SENSE CODE							
10	ADDITIONAL SENSE CODE QUALIFIER							
11	Vendor specific							
.....								
15								
16	(MSB)							
.....	LOGICAL BLOCK ADDRESS							
23								(LSB)

Table 7 defines the values for the log parameter control ~~bits~~ byte (see SPC-4) for this log parameter.

Table 7 — Parameter control ~~bits~~byte for the Background Medium Scan log parameter

Field	Value for LOG SENSE	Value for LOG SELECT	Description
DU	0	0 or 1 (i.e., ignored)	The DU bit is not defined for list parameters, so shall be set to zero when read with the LOG SENSE command and shall be ignored when written with the LOG SELECT command.
TSD	0 or 1	0 or 1	~~No specific requirements.~~When set to zero, the device server shall save the log parameter to its medium at vendor specific intervals. When set to one, implicit saving of the log parameter is disabled by an application client.
ETC	0	0 or 1 (i.e., ignored)	The ETC bit is not defined for list parameters, so shall be set to zero when read with the LOG SENSE command and shall be ignored when written with the LOG SELECT command.
TMC	00b	any (i.e., ignored)	The TMC field is not defined for list parameters, so shall be set to 00b when read with the LOG SENSE command and shall be ignored when written with the LOG SELECT command.
FORMAT AND LINKING	11b	11b	The value is a binary format list parameter.

The PARAMETER LENGTH field indicates the number of bytes ~~remaining~~ to follow in the log parameter.

The ACCUMULATED POWER ON MINUTES field indicates the number of minutes the device server has been powered on since manufacturing at the time the background scan error occurred.

Table 8 defines the REASSIGN STATUS field.

Table 8 — REASSIGN STATUS **field** (part 1 of 2)

Code	Reported	Description
0h	No	Reserved
1h	Yes	~~The~~An error was detected while reading the logical block specified by the LOGICAL BLOCK ADDRESS field ~~failed~~during a background scanning operation, and reassignment of the logical block is pending receipt of: [a] [b] a) a command performing a write operation, if auto~~matic~~ write reallocation is allowed (i.e., the AWRE bit is set to one in the Read-Write Error Recovery mode page (see 6.3.5); or b) a REASSIGN BLOCKS command (see 5.18).
2h	No	~~The~~An error was detected while reading the logical block specified by the LOGICAL BLOCK ADDRESS field ~~failed~~during a background scanning operation, and the logical block was successfully reassigned by the device server with recovered data.
3h	Reserved	
4h	Yes	~~The~~An error was detected while reading the logical block specified by the LOGICAL BLOCK ADDRESS field ~~failed~~during a background scanning operation, and: a) ~~ ~~reassign~~ment of the logical block~~ by the device server failed; and b) ~~ ~~the logical block may or may not have an uncorrectable error.
5h	No	~~The~~An error was detected while reading the logical block specified by the LOGICAL BLOCK ADDRESS field ~~failed~~during a background scanning operation, and the error was ~~recovered~~corrected by the device server ~~via a ~~rewrit~~ing the logical block without reassignment~~e in place~~.

Key:

Yes = The LOWIR bit is set to one in the Background Control mode page (see 6.3.3).
No = The LOWIR bit is set to zero in the Background Control mode page.

[a] If the application client knows the correct data for the logical block, then ~~T~~the application client should use a command performing a write operation to reassign the logical block using the correct data~~if it knows what data belongs on the logical block~~ (e.g., in a redundancy group (see 4.15.1), ~~it uses~~the application client writes data to the logical block regenerated from the data on the other logical units in the redundancy group). If the application client uses a~~The~~ REASSIGN BLOCKS command to reassign the logical block, then the device server may not be able to recover the data and does not report whether or not ~~it successfully does so~~the data was recovered.

[b] The REASSIGN STATUS field in a given log parameter changes from 1h or 4h to 6h, 7h, or 8h when the logical block is reassigned or rewritten with valid data, or failed (i.e., the data in the reassigned block is not valid). If the logical block is reassigned or rewritten, then any subsequent medium error ~~to~~occurring for the logical block is reported in a new log parameter with the same value in the LOGICAL BLOCK ADDRESS field as the value in the LOGICAL BLOCK ADDRESS field in the log parameter for the previous medium error for the logical block.

Table 8 — REASSIGN STATUS field (part 2 of 2)

Code	Reported	Description
6h	Yes	An error was detected while reading t~~T~~he logical block specified by the LOGICAL BLOCK ADDRESS field ~~failed~~during a background scanning operation, and the logical block:~~ failed,~~ a) ~~-~~was successfully reassigned by the application client~~,~~; and b) ~~-~~contains valid data (e.g., ~~by~~as the result of reassignment by a REASSIGN BLOCKS command ~~that successfully~~during which the data was recovered ~~the data~~, or by a command performing a write operation). [a]
7h	Yes	An error was detected while reading t~~T~~he logical block specified by the LOGICAL BLOCK ADDRESS field ~~failed~~during a background scanning operation, and the logical block:~~ failed,~~ a) ~~-~~was successfully reassigned by the application client~~,~~; and b) ~~-~~does not contain~~s~~ valid data (e.g., ~~by~~as the result of reassignment by a REASSIGN BLOCKS command ~~that did not successfully~~during which the data was not recover~~ed~~ ~~the data~~). [a]
8h	Yes	An error was detected while reading t~~T~~he logical block specified by the LOGICAL BLOCK ADDRESS field ~~failed~~during a background scanning operation, and the logical block was not successfully reassigned by the application client (e.g., ~~by~~as the result of a REASSIGN BLOCKS command that failed)
9h - Fh	Reserved	

Key:

Yes = The LOWIR bit is set to one in the Background Control mode page (see 6.3.3).
No = The LOWIR bit is set to zero in the Background Control mode page.

[a] If the application client knows the correct data for the logical block, then ~~T~~the application client should use a command performing a write operation to reassign the logical block using the correct data~~if it knows what data belongs on the logical block~~ (e.g., in a redundancy group (see 4.15.1), ~~it uses~~the application client writes data to the logical block regenerated from the data on the other logical units in the redundancy group). If the application client uses a~~The~~ REASSIGN BLOCKS command to reassign the logical block, then the device server may not be able to recover the data and does not report whether or not ~~it successfully does so~~the data was recovered.

[b] The REASSIGN STATUS field in a given log parameter changes from 1h or 4h to 6h, 7h, or 8h when the logical block is reassigned or rewritten with valid data, or failed (i.e., the data in the reassigned block is not valid). If the logical block is reassigned or rewritten, then any subsequent medium error ~~to~~occurring for the logical block is reported in a new log parameter with the same value in the LOGICAL BLOCK ADDRESS field as the value in the LOGICAL BLOCK ADDRESS field in the log parameter for the previous medium error for the logical block.

The SENSE KEY field, ADDITIONAL SENSE CODE field, and the ADDITIONAL SENSE CODE QUALIFIER field may contain a hierarchy of additional information relating to error conditions that occurred during background scanning. The~~y~~ content of these fields is~~are~~ represented in the same format used by the sense data (see SPC-4).

The LOGICAL BLOCK ADDRESS field indicates the LBA associated with the medium error.