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**Use of the Log Pages Assigned by X3T10 to AIIM C21
for SCSI-3 Implementations of the Proposed
ANSI/AIIM MS59 Standard**

and

**Summary of the Content of the Proposed
ANSI/AIIM MS 59 Standard**

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Use of the Log Pages Assigned by X3T10 to AIIM C21 for SCSI-3 Implementations of ANSI/AIIM MS59 Standard and Summary of the Content of the Proposed ANSI/AIIM MS 59 Standard

1. Introduction

Document X3T10 94/113r1 summarizes the changes to the proposed ANSI/AIIM MS59 standard, Media Error Monitoring and Reporting Techniques for Verification of the Information Stored on Optical Digital Data Disks.

As described in X3T10 94/113r1, MS59 specifies the use of some of the SCSI commands. MS59 requires the use of two Log pages. One Log page specifies a Media Error Log (MEL) and the other page is used to Clear the MEL.

We selected two Log codes for SCSI-2 implementations from the vendor-specific range. We selected these codes after consulting with the optical disk industry to avoid, as much as possible, conflicts with the use of these codes. We selected 39h for the MEL and 3Ah for the Clear MEL Log page.

For SCSI-3 implementations, X3T10 has assigned to AIIM C21 the Log page code 09h for the MEL page and 0Ah for the Clear MEL page.

The use of these codes is explained below.

Appendix A summarizes the media error monitoring tools specified in MS59. For more information on the contents of MS59 contact Fernando Podio, AIIM C21 Chair at NIST, Bldg 225, A61, Gaithersburg, MD 20899. Phone: (301) 975-2947, Fax: (301) 216-1369, e-mail: fernando@pegasus.ncsl.nist.gov.

2. The Media Error Log Page

ANSI/AIIM MS-59 requires the optical disk drive to implement the LOG SELECT command, the LOG SENSE command and a Media Error Log (MEL).

The MEL Page provides cumulative media error information. This page includes 31 data counters (see Table 1) that can be retrieved with the LOG SENSE command. Table 2 shows the parameter codes (from 0000h to 001Eh) associated to the log parameters. The LP bit in the parameter control byte shall be set to 0 (defining data counters). MS 59 does not specify the value of the other bits in the parameter control bytes.

Table 1 - Media Error Log Page

Byte	Bit	7	6	5	4	3	2	1	0
0		Reserved		Page Code - 39h for SCSI-2 devices or 09h for SCSI-3 devices					
1		Reserved							
2	(MSB)	Page Length							
3									
4	(MSB)	Parameter Code							
5									
6		DU	DS	TSD	ETC	TMC		Reserved	LP
7		Parameter Length							
8 - 13		Number of Read Retries							
14	(MSB)	Parameter Code							
15									
16		DU	DS	TSD	ETC	TMC		Reserved	LP
17		Parameter Length							
18 - 23		Number of Write Retries							
24	(MSB)	Parameter Code							
25									
26		DU	DS	TSD	ETC	TMC		Reserved	LP
27		Parameter Length							
28 - 33		Number of Total Bytes Corrected							
34	(MSB)	Parameter Code							
35									
36		DU	DS	TSD	ETC	TMC		Reserved	LP
37		Parameter Length							

Bit	7	6	5	4	3	2	1	0
38 - 43	Number of Sectors Read							
44	(MSB) Parameter Code (LSB)							
45								
46	DU	DS	TSD	ETC	TMC	Reserved	LP	
47	Parameter Length							
48 - 53	Number of Sectors Uncorrectable by the ECC							
54	(MSB) Parameter Code (LSB)							
55								
56	DU	DS	TSD	ETC	TMC	Reserved	LP	
57	Parameter Length							
58 - 63	Number of Sectors that Have Codewords with More than 8 Bytes in Error							
64	(MSB) Parameter Code (LSB)							
65								
66	DU	DS	TSD	ETC	TMC	Reserved	LP	
67	Parameter Length							
68 - 73	Number of Sectors that Have Codewords with 8 Bytes in Error							
74	(MSB) Parameter Code (LSB)							
75								
76	DU	DS	TSD	ETC	TMC	Reserved	LP	
77	Parameter Length							
78 - 83	Number of Sectors that Have Codewords with 7 Bytes in Error							
84	(MSB) Parameter Code (LSB)							
85								
86	DU	DS	TSD	ETC	TMC	Reserved	LP	
87	Parameter Length							

Bit	7	6	5	4	3	2	1	0
88 - 93	Number of Sectors that Have Codewords with 6 Bytes in Error							
94	(MSB) Parameter Code							
95	(LSB)							
96	DU	DS	TSD	ETC	TMC	Reserved	LP	
97	Parameter Length							
98 - 103	Number of Sectors that Have Codewords with 5 Bytes in Error							
104	(MSB) Parameter Code							
105	(LSB)							
106	DU	DS	TSD	ETC	TMC	Reserved	LP	
107	Parameter Length							
108 - 113	Number of Sectors that Have Codewords with 4 Bytes in Error							
114	(MSB) Parameter Code							
115	(LSB)							
116	DU	DS	TSD	ETC	TMC	Reserved	LP	
117	Parameter Length							
118 - 123	Number of Sectors that Have Codewords with 3 Bytes in Error							
124	(MSB) Parameter Code							
125	(LSB)							
126	DU	DS	TSD	ETC	TMC	Reserved	LP	
127	Parameter Length							
128 - 133	Number of Sectors that Have Codewords with 2 Bytes in Error							
134	(MSB) Parameter Code							
135	(LSB)							

Bit	7	6	5	4	3	2		
Byte								
136	DU	DS	TSD	ETC	TMC		Reserved	LP
137	Parameter Length							
138 -143	Number of Sectors that Have Codewords with 1 Bytes in Error							
144	(MSB) Parameter Code (LSB)							
145								
146	DU	DS	TSD	ETC	TMC		Reserved	LP
147	Parameter Length							
148- 153	Total Number of Bytes in Error							
154	(MSB) Parameter Code (LSB)							
155								
156	DU	DS	TSD	ETC	TMC		Reserved	LP
157	Parameter Length							
158-163	Number of Sectors with Over Maximum Number of Bytes in Error							
164	(MSB) Parameter Code (LSB)							
165								
166	DU	DS	TSD	ETC	TMC		Reserved	LP
167	Parameter Length							
168-173	Number of Sectors with $[(6 * \text{Maximum})/8 \text{ to } ((7 * \text{Maximum})/8 - 1)]$ Bytes in Error							
174	(MSB) Parameter Code (LSB)							
175								
176	DU	DS	TSD	ETC	TMC		Reserved	LP
177	Parameter Length							
178-183	Number of Sectors with $[(5 * \text{Maximum})/8 \text{ to } ((6 * \text{Maximum})/8 - 1)]$ Bytes in Error							
184	(MSB) Parameter Code (LSB)							
185								

Bit	7	6	5	4	3	2	1	0
186	DU	DS	TSD	ETC	TMC		Reserved	LP
187	Parameter Length							
188-193	Number of Sectors with $[(4 * \text{Maximum})/8 \text{ to } ((5 * \text{Maximum})/8 - 1)]$ Bytes in Error							
194	(MSB) Parameter Code (LSB)							
195								
196	DU	DS	TSD	ETC	TMC		Reserved	LP
197	Parameter Length							
198-203	Number of Sectors with $[(3 * \text{Maximum})/8 \text{ to } ((4 * \text{Maximum})/8 - 1)]$ Bytes in Error							
204	(MSB) Parameter Code (LSB)							
205								
206	DU	DS	TSD	ETC	TMC		Reserved	LP
207	Parameter Length							
208-213	Number of Sectors with $[(2 * \text{Maximum})/8 \text{ to } ((3 * \text{Maximum})/8 - 1)]$ Bytes in Error							
214	(MSB) Parameter Code (LSB)							
215								
216	DU	DS	TSD	ETC	TMC		Reserved	LP
217	Parameter Length							
218-223	Number of Sectors with $[\text{Maximum}/8 \text{ to } ((2 * \text{Maximum})/8 - 1)]$ Bytes in Error							
224	(MSB) Parameter Code (LSB)							
225								
226	DU	DS	TSD	ETC	TMC		Reserved	LP
227	Parameter Length							

Bit	7	6	5	4	3	2	1	0
228-233	Number of Sectors with [0 to (Maximum/8)-1] Bytes in Error							
224	Parameter Code							
225								
226	DU	DS	TSD	ETC	TMC	Reserved	LP	
227	Parameter Length							
228-233	Number of Sectors with 3 Sector IDs in Error							
234	Parameter Code							
235								
236	DU	DS	TSD	ETC	TMC	Reserved	LP	
237	Parameter Length							
238-243	Number of Sectors with 2 Sector IDs in Error							
244	Parameter Code							
245								
246	DU	DS	TSD	ETC	TMC	Reserved	LP	
247	Parameter Length							
248-253	Number of Sectors with 1 Sector ID in Error							
254	Parameter Code							
255								
256	DU	DS	TSD	ETC	TMC	Reserved	LP	
257	Parameter Length							
258-263	Number of Sectors with 0 Sector ID in Error							
264	Parameter Code							
265								
266	DU	DS	TSD	ETC	TMC	Reserved	LP	
267	Parameter Length							

Bit	7	6	5	4	3	2	1	0
268-273	Number of Sectors with Errors in the Sector Mark - Sectors Readable							
274	(MSB) Parameter Code (LSB)							
275								
276	DU	DS	TSD	ETC	TMC		Reserved	LP
277	Parameter Length							
278-283	Number of Sectors with Errors in the Data Sync - Sectors Readable							
284	(MSB) Parameter Code (LSB)							
285								
286	DU	DS	TSD	ETC	TMC		Reserved	LP
287	Parameter Length							
288-293	Number of Sectors with Missing ReSync Marks - Sectors Readable							
294	(MSB) Parameter Code (LSB)							
295								

Table 2 - Parameter Codes for the Media Error Log Page

Parameter Code	Description
0000h	Number of Read Retries
0001h	Number of Write Retries
0002h	Number of Total Bytes Corrected
0003h	Number of Sectors Read
0004h	Number of Sectors Uncorrectable by the ECC
0005h	Number of Sectors that Have Codewords with More than 8 Bytes in Error
0006h	Number of Sectors that Have Codewords with 8 Bytes in Error
0007h	Number of Sectors that Have Codewords with 7 Bytes in Error
0008h	Number of Sectors that Have Codewords with 6 Bytes in Error

Parameter Code	Description
0009h	Number of Sectors that Have Codewords with 5 Bytes in Error
000Ah	Number of Sectors that Have Codewords with 4 Bytes in Error
000Bh	Number of Sectors that Have Codewords with 3 Bytes in Error
000Ch	Number of Sectors that Have Codewords with 2 Bytes in Error
000Dh	Number of Sectors that Have Codewords with 1 Byte in Error
000Eh	Total Number of Bytes in Error
000Fh	Number of Sectors with Over Maximum Number of Bytes in Error
0010h	Number of Sectors with $[(6 * \text{Maximum}) / 8 \text{ to } ((7 * \text{Maximum}) / 8 - 1)]$ Bytes in Error
0011h	Number of Sectors with $[(5 * \text{Maximum}) / 8 \text{ to } ((6 * \text{Maximum}) / 8 - 1)]$ Bytes in Error
0012h	Number of Sectors with $[(4 * \text{Maximum}) / 8 \text{ to } ((5 * \text{Maximum}) / 8 - 1)]$ Bytes in Error
0013h	Number of Sectors with $[(3 * \text{Maximum}) / 8 \text{ to } ((4 * \text{Maximum}) / 8 - 1)]$ Bytes in Error
0014h	Number of Sectors with $[(2 * \text{Maximum}) / 8 \text{ to } ((3 * \text{Maximum}) / 8 - 1)]$ Bytes in Error
0015h	Number of Sectors with $[\text{Maximum} / 8 \text{ to } ((2 * \text{Maximum}) / 8 - 1)]$ Bytes in Error
0016h	Number of Sectors with $[0 \text{ to } (\text{Maximum} / 8 - 1)]$ Bytes in Error
0017h	Number of Sectors Requiring no Correction with ECC
0018h	Number of Sectors with 3 Sector IDs in Error
0019h	Number of Sectors with 2 Sector IDs in Error
001Ah	Number of Sectors with 1 Sector IDs in Error
001Bh	Number of Sectors with 0 Sector IDs in Error
001Ch	Number of Sectors with Errors in the Sector Mark - Sectors Readable
001Dh	Number of Sectors with Errors in the Data Sync - Sectors Readable
001Eh	Number of Sectors with Missing ReSync Marks - Sectors Readable

3. The Clear MEL Page

MS59 specifies three approaches to clear the MEL page.

The first alternative is by using the LOG SELECT command with the Clear MEL Page (see Table 3). This page does not have any log parameters. When a target receives this page, it shall clear the MEL Page.

The second alternative is by using the LOG SELECT command with the Parameter Code Reset (PCR) bit of one and the parameter list length of zero. No page shall be sent to the target. All implemented parameters of the target are set to their default values.

The third alternative is by using the LOG SELECT command with the Page Code (PC) set to 11b and the parameter list length of zero. No page shall be sent to the target. All the cumulative parameters are set to their default values.

Table 3 - Clear MEL Page

Bit	7	6	5	4	3	2	1	0	
0	Reserved		Page Code - 3Ah for SCSI-2 devices or 0Ah for SCSI-3 devices						
1	Reserved								
2	(MSB)	Page Length = 0							
3								(LSB)	

Annex A. Summary of the Contents of ANSI/AIIM MS59, Media Error Monitoring and Reporting Techniques for Verification of the Information Stored on Optical Digital Data Disks.

A.1 Scope and Purpose

A.1.1 Scope

ANSI/AIIM MS59 defines high level media error monitoring and reporting techniques (a set of functional commands) for verification of the information stored on optical digital data disks. This high level interface approach is independent of the host operating system (e.g. DOS, Unix, OS/2, etc) and the interface that communicate the optical disk device with the host (e.g. SCSI-2, IPI, LAN, etc). In addition, this high level interface approach is media type and size independent. That is, it can be used with systems that use WORM (write-once read many), rewritable or partially read-only media and optical disk drives for different media sizes from 90 mm to 356 mm media. In addition, the standard also defines an implementation of a selected set of SCSI-2 commands to provide for media error monitoring and reporting techniques at the device level.

The media error information that can be obtained using these tools include (a) a list of reallocated sectors; (b) corrections that exceeded some media error levels; (c) warning on some verify media error levels; (d) total number of bytes in error, number of bytes in error per sector and maximum number of bytes in error in any sector codeword; (e) the uncorrected or corrected sector content; (f) errors encountered reading header information such as the sector address, sector marks, and synchronization signals; and (g) maximum length of contiguous defective bytes.

MS 59 covers the optical digital data disks that use the following recording technologies: (a) Write-Once Read Many Times, including WORM and MO-WORM (WORM type using the magneto-optical effect), technologies; and (b) rewritable/read-only technology. This standard applies to removable and non-removable optical disk media. Part of the information on MS 59 may be useful for CD-ROM subsystems, but the implementations for that technology is beyond the scope of MS 59.

A.1.2 Purpose

The purpose of MS 59 is to provide users of optical disk-based information systems with standard media error monitoring and reporting techniques for verification of the information stored on optical digital data disks.

These techniques allow users of MS 59: (a) to have a better understanding of the status of their data stored on optical disks; (b) to obtain media error information as directed by the system administrator; (c) to effect data recovery with tools of the desired level of sophistication; (d) to

provide media error information allowing the user to make decisions about the media at the present time, and also provide error information which will highlight trends of the future, in particular selected disks or, in their entire data sets; (e) make decisions about how long the media can be used without an unacceptable risk of data loss; and (f) to develop more cost effective backup, recopying and data transfer policies.

The user or implementor of MS 59 will be able to: (a) format the optical digital data disks with or without certification; (b) set the media error level values in the optical disk drive; (c) reallocate sectors when these media error levels are exceeded; and (d) set the verify media error level values to obtain early warning information about the status of the data.

In addition, the user or implementor will be able to: (a) obtain information about the values of those set media error levels and verify media error levels; and (b) obtain information about all the reallocated sectors and/or a defect list of initial media defects.

The user or implementor will be able to have access to a media error log with information about the optical digital data disk error activity detected by the drive, and to the corrected or uncorrected content of a selected sector, including user data bytes and error correction bytes.

The high level interface approach specified in MS 59 is independent of the host operating system and can be used for any interface that communicate the optical disk subsystem with the host. In addition, this high level interface is media type and size independent.

The use of a selected set of SCSI-2 commands with specific implementations and selected pages related to media error monitoring and reporting is specified. For the purpose of implementing this approach, any command, option or implementation not covered in this standard stays as specified in the SCSI-2 standard.

A.2 Functional and Device Level Commands Specified in ANSI/ISO MS59

A.2.1 Functional Level for Optical Disk-based Subsystems

The following functional level commands are specified in MS 59:

Define Media Error Recovery Procedures (DMERP)

The DMERP command is used to define to the optical disk device the error recovery procedures, media error reporting, and media error data transfer that shall be executed.

Read Defect Data List (RDDL)

The RDDL command is used to obtain a read defect data list from the optical disk device.

Read Media Error Data (RDMED)

The RDMED command is used to request the optical disk device to transfer the content of a sector to the host. The data transferred to the host shall include the user data bytes, the ECC bytes, the DMP bytes and any other bytes that are part of the sector data field and can be corrected by the ECC.

Read Log Data (RLD) - Media Error Log and Current Media Error Levels

This command is used to request that the optical disk device report log data to the host. The following logs are specified:

MEL - This log is the MEDIA ERROR LOG. This LOG provides detailed information of different media error levels.

CMELL - This log is the CURRENT MEDIA ERROR LEVELS LOG. This LOG provides information about the current set media error level values used with read/write operations.

VCMELL - This log is the VERIFY CURRENT MEDIA ERROR LEVELS LOG. This log provides information about the current set verify media error level values. These levels are used by the optical disk device to provide an early warning informing to the host that the correction level exceeded the value for the related set level.

Set Media Error Levels (SMEL)

The SMEL command is used to set the Media Error levels that the optical disk device will use

for error recovery. These levels shall be used for reallocating sectors. If the ECC level of correction exceeds one or more of the set levels and the parameters WR or RE in the DMERP command are ON, the sector shall be reallocated to a spare sector. If the parameters WR or RE in the DMERP command are OFF the optical disk device will not reallocate the sector. In either of the above conditions, the optical disk device shall report that a set level was exceeded, indicating which one was exceeded, and whether the data were recovered or unrecovered.

Set Verify Media Error Levels (SVMEL)

The SVMEL command is used to set the Verify Media Error levels that the optical disk device will use for error recovery. These levels are used for obtaining an early warning of media errors that exceeded the level set by this command. The optical disk device will report that a set level was exceeded, indicating which one was exceeded and whether the data were recovered or unrecovered.

A.2.2 Application of SCSI-2 Commands for Optical Disk Devices

The purpose of this Section of MS 59 is to provide an implementation of a selected set of SCSI-2 commands. These commands from the SCSI-2 command set will allow the user to tailor the retrieval of media error information to the user's own needs. **This application of a selected set of SCSI-2 commands is only related to media error information and is to be used in conjunction with the SCSI-2 standard.**

Descriptions of the use of some of the commands from the SCSI-2 standard as pertaining to media error monitoring and reporting for optical disk devices are included in MS 59. **For other uses of these commands besides media error monitoring and reporting, the users are referred to the SCSI-2 standard.** The following are the SCSI-2 commands that are used in the MS 59 application:

FORMAT UNIT command

The FORMAT UNIT command is used to format the media. This command allows, as an option, to certify the media and create a Certification List which is retrievable as part of the information available through the READ DEFECT DATA Command.

LOG SELECT command

The LOG SELECT command is used to clear the Media Error Log page, which provides information about different media error indicators.

* For the Media Error Log (MEL) Page see Section 2.

- * For the Clear MEL Page see Section 3.

LOG SENSE command

The LOG SENSE command is used to retrieve the Media Error Log page.

- * For the Media Error Log (MEL) Page see Section 2.
- * For the Clear MEL Page see Section 3.

MODE SELECT command

The MODE SELECT Command and the Read-Write Error Recovery page are used to set new Media Error Levels different than the drive default values. When automatic reallocation is set, the set Media Error Level values are used by the optical disk device to reallocate sectors that have exceeded the ECC correction levels.

- * For the R/W Error Recovery Page see Section A.3
- * For the Verify Error Recovery Page see Section A.3

MODE SENSE command

The MODE SENSE command are used to retrieve the Media Error Levels in the Read-Write Error Recovery page, and the Verify Media Error Levels in the Verify Error Recovery page.

- * For the R/W Error Recovery Page see Section A.3
- * For the Verify Error Recovery Page see Section A.3

READ DEFECT DATA command and the PDL/SDL/WDL lists

The READ DEFECT DATA is used to retrieve information about bad sectors and sectors that have been reallocated.

READ LONG command

The READ LONG command is used to retrieve the uncorrected or corrected content of a sector including user data, ECC and others sector bytes.

REQUEST SENSE command, sense keys 01h or 03h and the related ASC and ASCQs.

The REQUEST SENSE Command is used to transfer sense data to the initiator. See X3T10 94/113r1, Tables 4, 5, 6, and 8; and A.3.2 and A.3.3 of this document.

VERIFY command

See A.3

WRITE AND VERIFY command

See A.3

A.3 R/W Error Recovery Page and Verify Error Recovery Page for Optical Disk Devices

A.3.1 Introduction

Two Mode pages are specified in MS59: (a) the Read-Write Error Recovery Page for Optical Disk Devices; and (b) the Verify Error Recovery Page for Optical Disk Devices.

These two pages are based on the R/W and Verify Error Recovery pages specified in the SCSI-2 standard for direct-access devices, but extended to specify additional media error level parameters.

Four Media Error Level parameters are specified in the Read-Write Error Recovery page (see Table A.1). Four Verify Media Error Level parameters are specified in the Verify Error Recovery page (see Table A.2). In addition both pages specify three Vendor specific parameters to leave the opportunity to vendors to add other media error levels not specified in MS59.

Table A.1 - Media Error Levels

Number of Bytes in Error per Codeword
Number of Bytes in Error per Sector
Number of bad IDs
Number Missing ReSync (*)

Table A.2 -Verify Media Error Levels

Verify Number of Bytes in Error per Codeword
Verify Number of Bytes in Error per Sector
Verify Number of bad IDs
Verify Number Missing ReSync (*)

Note (*) in case the medium does not use ReSynchs this level is N/A and the parameter in the R/W and Verify Pages shall be FFh.

A.3.2 The R/W Error Recovery Page for Optical Disk Devices

The Read-Write Error Recovery page for optical disk devices specified in MS59 is shown in Table A.3.

When one of the Media Error levels (Table A.3, bytes 12 - 35) is exceeded during a read or write operation, MS 59 specifies that the optical disk device shall return a CHECK CONDITION status with the appropriate sense key . If the AWRE bit or the ARRE bit is set to 1, the defective sector(s) shall be reallocated.

MS 59 also specifies that the optical disk device shall return the sense key RECOVERED ERROR (01h) if the PER bit was set to one, if the reallocation was ON (AWRE or ARRE bit ON), and the drive was able to reassign the sector. If the drive was unable to reassign the sector or the reallocation was OFF, the sense key shall be MEDIUM ERROR (03h). See Tables 4, 5, and 6 of X3T10 94/113r1. The user may retrieve Additional Sense Codes and Additional Sense Code Qualifiers with the REQUEST SENSE command.

MS 59 also specifies that when one of the Media Error levels (shown in Table A.1 and Table A.3, bytes 12 - 35) is exceeded during the write operation of a WRITE AND VERIFY command, the optical disk device shall return a CHECK CONDITION status with the appropriate sense key, ASC and ASCQ.

Table A.3 - Read-Write Error Recovery Page for Optical Disk Devices

Bit Byte	7	6	5	4	3	2	1	0
0	PS	Reserved	Page Code (01h)					
1	Page Length							
2	AWRE	ARRE	TB	RC	EER	PER	DTE	DCR
3	Read Retry Count							
4	Correction Span							
5	Head Offset Count							
6	Data Strobe Offset Count							
7	Reserved							
8	Write Retry Count							
9	Reserved							
10	(MSB)	Recovery Time Limit						(LSB)
11								
12 - 17	Number of Bytes in Error per Codeword							
18 - 23	Number of Bytes in Error per Sector							
24 - 29	Number of Bad IDs							
30 - 35	Number of Missing Resync							
36 - 51	Vendor Specific							
52 - 67	Vendor Specific							
68 - 83	Vendor Specific							

A.3.3 The Verify Error Recovery Page for Optical Disk Devices

MS59 specifies that the VERIFY command shall use a media error monitoring criteria that is more demanding than the criteria used by the drive during normal read and write. This more demanding criteria shall make sure that the data can be read under this condition. MS 59 specifies that the more demanding criteria shall set the levels shown in the Verify Error Recovery page shown below (bytes 12 - 35).

When a Verify Media Error Level (bytes 12 -35) is exceeded during a VERIFY command, the optical disk device shall return a CHECK CONDITION status with the appropriate sense key, ASC and ASCQ (see Table 8 of X3T10 94/113r1).

Table A.4 - Verify Error Recovery Page for Optical Disk Devices

Bit	7	6	5	4	3	2	1	0
0	PS	Reserved	Page Code (07h)					
1	Parameter Length							
2	Reserved				EER	PER	DTE	DCR
3	Verify Retry Count							
4	Verify Correction Span							
5	Reserved							
6	Reserved							
7	Reserved							
8	Reserved							
9	Reserved							
10	(MSB)	Verify Recovery Time Limit						(LSB)
11								
12 - 17	Verify Number of Bytes in Error per Codeword							
18 - 23	Verify Number of Bytes in Error per Sector							
24 - 29	Verify Number of Bad IDs							
30 - 35	Verify Number of Missing Resync							
36 - 51	Vendor Specific							
52 - 67	Vendor Specific							
68 - 83	Vendor Specific							

MS59 also specifies that the verify operation of the WRITE AND VERIFY command shall use a media error monitoring criterion that is more demanding than the criterion used by the drive during normal read and write. This more demanding criterion shall make sure that the data can be read under this condition. The more demanding criterion shall set the Verify Media Error

levels shown in Table A.4, bytes 12 - 35. MS 59 specifies that when a Verify Media Error Level (Table A.4, bytes 12 - 35) is exceeded during the verify operation of a WRITE AND VERIFY command, the optical disk device shall return a CHECK CONDITION status with the appropriate sense key, ASC and ASCQ (see Table 8 of X3T10 94/113r1).