



To: T10 Technical Committee
 From: Gary Lestage, Kyle Walczak and Kevin Marks - Dell, Inc.
 Date: May 7, 2006
 Subject: T10/06-182r0 - SMC-3: Diagnostic and statistics log pages for SMC

Revision History

Revision 0 (5/07/06) – Initial proposal

Related Documents

SCSI Media Changer Commands - 3 (T10/1730-D - SMC-3r01)

[New text to be added to SSC-3](#)

~~Text to be deleted from SSC-3~~

Editorial text

Overview

As part of the ISV feedback resolution and that Dell sees a need to standardize log pages that will allow for the collection of information required during field analysis and troubleshooting of media changer devices. This proposal is beneficial to those applications that report diagnostic information back via diagnostic software. Special code will no longer need to be written specific to the media changer device being used. This proposal defines an overall media changer device statistics log page, a per element device statistics log page and defines a media changer diagnostics log page that contains a collection of sense and diagnostics data.

Suggested Changes to SMC-3:

<< Add new row to Table 31 - Log page codes >>

Table 31 — Log page codes

Page Code	Description	Reference
....
XXh	Overall Media Changer Device Statistics log page	7.2.3
YYh	Per Element Media Changer Device Statistics log page	7.2.4
ZZh	Media Changer Diagnostic Data log page	7.2.5
....

<< Where XXh, YYh, ZZh are the assigned log pages. >>

7.2.3 Overall Media Changer Device Statistics log page

[The Overall Media Changer Device Statistics log page \(see table x\) defines data counters associated with utilization of the media changer device. Individual per element counters associated with specific elements are defined in the Per Element Media changer Device Statistics log page \(see 7.2.4\) A device server that implements the Overall Media Changer Device Statistics log page shall implement one or more of the defined parameters. Support for individual parameters in the Overall Media Changer Device Statistics log page is optional. All supported parameters shall be persistent across](#)

I T nexus loss, logical unit reset and power-on. The parameters shall not be set to zero or changed with the use of a LOG SELECT command.

Table x – Overall Media Changer Device Statistics log page

<u>Byte\Bit</u>	<u>7</u>	<u>6</u>	<u>5</u>	<u>4</u>	<u>3</u>	<u>2</u>	<u>1</u>	<u>0</u>	
<u>0</u>	<u>DS</u>	<u>SPF (0b)</u>	<u>PAGE CODE (XXh)</u>						
<u>1</u>	<u>SUBPAGE CODE (00h)</u>								
<u>2</u>	<u>(MSB)</u>		<u>PAGE LENGTH (n-3)</u>					<u>(LSB)</u>	
<u>3</u>									
	<u>Overall Media changer device statistics log parameters</u>								
<u>4</u>	<u>First overall media changer device statistics log parameter</u>								
	⋮								
<u>N</u>	<u>Last overall media changer device statistics log parameter</u>								

See SPC-4 for a description of the DS bit, SPF bit, PAGE CODE field, SUBPAGE CODE field and PAGE LENGTH field.

The overall media changer device statistics log parameter format is shown in table x+1.

Table x+1 – Overall media changer device statistics log parameter format

<u>Byte\Bit</u>	<u>7</u>	<u>6</u>	<u>5</u>	<u>4</u>	<u>3</u>	<u>2</u>	<u>1</u>	<u>0</u>	
<u>0</u>	<u>(MSB)</u>		<u>PARAMETER CODE</u>					<u>(LSB)</u>	
<u>1</u>									
<u>2</u>	<u>DU</u>	<u>Obsolete</u>	<u>TSD (0b)</u>	<u>ETC</u>	<u>TMC</u>	<u>FORMAT AND LINKING (00b)</u>			
<u>3</u>	<u>PARAMETER LENGTH (n-3)</u>								
<u>4</u>	<u>(MSB)</u>		<u>MEDIA CHANGER DEVICE STATISTICS DATA COUNTER</u>					<u>(LSB)</u>	
<u>N</u>									

The PARAMETER CODE field is defined in table x+2.

Table x+2 – Overall media changer device statistics log parameter codes

Parameter Code	Description
0000h	Total Number Of Moves
0001h	Total Number of Picks
0002h	Total Number of Pick Retries
0003h	Total Number of Places
0004h	Total Number of Place Retries
0005h	Total Number of Scans
0006h	Total Number of Scans Retries
0007h	Medium Transport Hard Errors
0008h	Medium Transport Soft Errors
0009h	Medium Transport X Axis Translation Hard Error
000Ah	Medium Transport X Axis Translation Soft Error
000Bh	Medium Transport Y Axis Translation Hard Error
000Ch	Medium Transport Y Axis Translation Soft Error
000Dh	Medium Transport Z Axis Translation Hard Error
000Eh	Medium Transport Z Axis Translation Soft Error
000Fh	Medium Transport Rotational Translation Hard Error
0010h	Medium Transport Rotational Translation Soft Error
0011h	Medium Transport Inversion Translation Hard Error
0012h	Medium Transport Inversion Translation Soft Error
0012h-7FFFh	Reserved
8000h – FFFFh	Vendor specific

See SPC-4 for descriptions of the DU bit, TSD bit, ETC bit, TMC field and FORMAT AND LINKING field. The TSD bit and FORMAT AND LINKING field shall be set to the values shown in table x+1.

The PARAMETER LENGTH field indicates the number of bytes in the MEDIA CHANGER DEVICE STATISTICS DATA COUNTER field that follows.

The DEVICE STATISTICS DATA COUNTER field contains the value of the requested data counter.

7.2.4 Per Element Media Changer Device Statistics log page

The Per Element Media Changer Device Statistics log page (see table x) defines data counters associated with elements of media changer device. A device server that implements the Per Element Media Changer Device Statistics log page shall implement one parameter for each element in the media changer device. All parameters shall be persistent across I_T nexus loss, logical unit reset and

power-on. The parameters shall not be set to zero or changed with the use of a LOG SELECT command.

Table y – Per Element Media Changer Device Statistics log page

Byte/Bit	7	6	5	4	3	2	1	0
0	DS	SPF (0b)	PAGE CODE (XXh)					
1	SUBPAGE CODE (00h)							
2	(MSB)	PAGE LENGTH (n-3)						(LSB)
3								
Per Element Media changer device statistics log parameters								
4	First per element media changer device statistics log parameter							
	⋮							
N	Last per element media changer device statistics log parameter							

See SPC-4 for a description of the DS bit, SPF bit, PAGE CODE field, SUBPAGE CODE field and PAGE LENGTH field.

The per element media changer device statistics log parameter format is shown in table y+1.

Table y+1 – Per element media changer device statistics log parameter format

Byte/Bit	7	6	5	4	3	2	1	0
0	(MSB)	PARAMETER CODE (element address)						(LSB)
1								
2	DU	Obsolete	TSD (0b)	ETC(0b)	TMC (00b)	FORMAT AND LINKING (11b)		
3	PARAMETER LENGTH (n-3)							
4	(MSB)	TOTAL NUMBER OF PLACES						(LSB)
7								
8	(MSB)	TOTAL NUMBER OF PLACE RETRIES						(LSB)
11								
12	(MSB)	TOTAL NUMBER OF PICKS						(LSB)
15								
16	(MSB)	TOTAL NUMBER OF PICK RETRIES						(LSB)
19								
20	(MSB)	TOTAL NUMBER OF SCANS						(LSB)
23								
24	(MSB)	TOTAL NUMBER OF SCAN RETRIES						(LSB)
27								

The PARAMETER CODE field contains the element address for the statistics counters being returned.

See SPC-4 for descriptions of the DU bit, TSD bit, ETC bit, TMC field and FORMAT AND LINKING field. The TSD bit, ETC bit, TMC field and FORMAT AND LINKING field shall be set to the values shown in table y+1.

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

The TOTAL PLACES field contains the total number of medium (e.g., cartridge) place operations to the element address indicated in the PARAMETER CODE field.

The TOTAL PLACE RETRIES field contains the total number of retried medium (e.g., cartridge) place operations to the element address indicated in the PARAMETER CODE field.

The TOTAL PICKS field contains the total number of medium (e.g., cartridge) pick operations from the element address indicated in the PARAMETER CODE field.

The TOTAL PICK RETRIES field contains the total number of retried medium (e.g., cartridge) pick operations from the element address indicated in the PARAMETER CODE field.

If the media changer device contains a volume tag reader, then the TOTAL SCANS field contains the total number of scan operations at the element address indicated in the PARAMETER CODE field, when a volume tag reader is present.

If the media changer device contains a volume tag reader, then the TOTAL SCAN RETRIES field contains the total number of retried scan operations at the element address indicated in the PARAMETER CODE field.

7.2.5 Media changer Diagnostic Data log page

The Media Changer Diagnostic Data log page (see table z) provides for a number of error-event records using the list parameter format. Each error-event record contains diagnostic information for a single error type encountered by the media changer device including data counters associated with the error event, sense data, operation code/service action, pick, place, scan statistics and source/destination element addresses of move type operations etc. The Media Changer Diagnostic Data log page may be used to aid in field analysis and repair.

The Media Changer Diagnostic Data log page shall only include parameter entries for commands that terminated with a CHECK CONDITION status having the sense key set to HARDWARE ERROR or ABORTED COMMAND. <<Should I add NOT READY?>>

The parameter code value associated with an error-event indicates the relative time at which a command terminated with a CHECK CONDITION status. A lower parameter code indicates that the command terminated with a CHECK CONDITION status at a more recent time. The parameter code values returned shall be numbered consecutively from 0000h (i.e., the most recent) up to n , where n is the number of current parameter entries. The number of supported parameter entries, n , is vendor specific.

In each parameter entry (see table z+1) if the REPEAT bit is set to zero, then the parameter entry represents only one occurrence of the sense key and additional sense code indicated in the parameter entry. If the REPEAT bit is set to one, then the parameter entry represents multiple consecutive occurrences of sense key and additional sense code indicated in the parameter entry. If the REPEAT bit is set to one in the parameter entry, then other fields in the parameter entry shall be set to the values when the first of the consecutive occurrences of the sense key and additional sense code occurred.

All parameter codes shall be persistent across I_T nexus losses, logical unit resets, and power-on. The parameter entries shall not be set to zero or changed with the use of a LOG SELECT command.

Table z - Media Changer Diagnostic Data log page

<u>Byte\Bit</u>	<u>7</u>	<u>6</u>	<u>5</u>	<u>4</u>	<u>3</u>	<u>2</u>	<u>1</u>	<u>0</u>	
<u>0</u>	<u>DS</u>	<u>SPF (0b)</u>	<u>PAGE CODE (XXh)</u>						
<u>1</u>	<u>SUBPAGE CODE (00h)</u>								
<u>2</u>	<u>(MSB)</u>		<u>PAGE LENGTH (n-3)</u>					<u>(LSB)</u>	
<u>3</u>									
<u>Media changer diagnostic data log parameters</u>									
<u>4</u>	<u>First media changer diagnostic data log parameter (see table z+1)</u>								
	⋮								
<u>n</u>	<u>Last media changer diagnostic data log parameter (see table z+1)</u>								

See SPC-4 for a description of the DS bit, SPF bit, PAGE CODE field, SUBPAGE CODE field and PAGE LENGTH field.

The media changer diagnostic data log parameter format is shown in table z+1.

Table z+1 – Media changer diagnostic data log parameter format

<u>Byte\Bit</u>	<u>7</u>	<u>6</u>	<u>5</u>	<u>4</u>	<u>3</u>	<u>2</u>	<u>1</u>	<u>0</u>
<u>0</u>	<u>(MSB)</u> PARAMETER CODE							
<u>1</u>	<u>(LSB)</u>							
<u>2</u>	<u>DU (0b)</u>	<u>Obsolete</u>	<u>TSD (0b)</u>	<u>ETC (0b)</u>	<u>TMC (00b)</u>	<u>FORMAT AND LINKING (11b)</u>		
<u>3</u>	<u>PARAMETER LENGTH (n-3)</u>							
<u>4</u>	<u>Reserved</u>							
<u>5</u>	<u>REPEAT</u>	<u>Reserved</u>				<u>SENSE KEY</u>		
<u>6</u>	<u>ADDITIONAL SENSE CODE</u>							
<u>7</u>	<u>ADDITIONAL SENSE CODE QUALIFIER</u>							
<u>8</u>	<u>(MSB)</u>							
<u>11</u>	<u>VENDOR SPECIFIC CODE QUALIFIER</u>							
<u>12</u>	<u>(MSB)</u>							
<u>15</u>	<u>PRODUCT REVISION LEVEL</u>							
<u>16</u>	<u>(MSB)</u>							
<u>19</u>	<u>TOTAL NUMBER OF MOVES</u>							
<u>20</u>	<u>(MSB)</u>							
<u>23</u>	<u>TOTAL NUMBER OF PICKS</u>							
<u>24</u>	<u>(MSB)</u>							
<u>27</u>	<u>TOTAL NUMBER OF PICK RETRIES</u>							
<u>28</u>	<u>(MSB)</u>							
<u>31</u>	<u>TOTAL NUMBER OF PLACES</u>							
<u>32</u>	<u>(MSB)</u>							
<u>35</u>	<u>TOTAL NUMBER OF PLACE RETRIES</u>							
<u>36</u>	<u>(MSB)</u>							
<u>39</u>	<u>TOTAL NUMBER OF SCANS</u>							
<u>40</u>	<u>(MSB)</u>							
<u>43</u>	<u>TOTAL NUMBER OF SCAN RETRIES</u>							
<u>44</u>	<u>OPERATION CODE</u>							
<u>45</u>	<u>Reserved</u>				<u>SERVICE ACTION</u>			
<u>46</u>	<u>(MSB)</u>							
<u>47</u>	<u>MEDIUM TRANSPORT ADDRESS</u>							
<u>48</u>	<u>(MSB)</u>							
<u>49</u>	<u>SOURCE ADDRESS</u>							
<u>50</u>	<u>(MSB)</u>							
<u>51</u>	<u>DESTINATION ADDRESS</u>							
<u>52</u>	<u>(MSB)</u>							
<u>:</u>	<u>VOLUME IDENTIFIER</u>							
<u>:</u>	<u>(LSB)</u>							
<u>83</u>	<u>Reserved</u>				<u>TIMESTAMP ORIGIN</u>			
<u>84</u>	<u>Reserved</u>							
<u>85</u>	<u>TIMESTAMP</u>							
<u>86</u>	<u>Vendor specific</u>							
<u>91</u>	<u>Vendor specific</u>							
<u>92</u>	<u>Vendor specific</u>							
<u>n</u>	<u>Vendor specific</u>							

See SPC-4 for descriptions of the DU bit, TSD bit, ETC bit, TMC field and FORMAT AND LINKING field. These fields shall be set to the values shown in table z+1.

The PARAMETER LENGTH field indicates the number of bytes in the media changer diagnostic data log parameter data that follows.

The REPEAT bit if set to one indicates that the sense key and additional sense code were reported two or more times consecutively and only one parameter entry was created for the multiple consecutive error-events. The REPEAT bit if set to zero indicates that the sense key and additional sense code at the time the CHECK CONDITION status was reported was different from the previously reported CHECK CONDITION status.

See SPC-4 for descriptions of the SENSE KEY field, ADDITIONAL SENSE CODE field, and ADDITIONAL SENSE CODE QUALIFIER field. The SENSE KEY field, ADDITIONAL SENSE CODE field, and ADDITIONAL SENSE CODE QUALIFIER field shall contain the sense key and additional sense code values of the command that terminated with the CHECK CONDITION status.

The VENDOR SPECIFIC CODE QUALIFIER field is vendor specific. The VENDOR SPECIFIC CODE QUALIFIER may provide additional diagnostics information related to the command that terminated with the CHECK CONDITION status.

See SPC-4 for the descriptions of the PRODUCT REVISION LEVEL field. The PRODUCT REVISION LEVEL field shall contains the product revision level at the time the command terminated with the CHECK CONDITION status.

The TOTAL NUMBER OF MOVES field contains the total number of moves from all elements at the time the command terminated with the CHECK CONDITION status. The TOTAL NUMBER OF MOVES field is equivalent to the value contained in the Overall Media Changer Device Statistics log page with a parameter code of 0000h at the time the command terminated with the CHECK CONDITION status.

The TOTAL NUMBER OF PICKS field contains the total number of picks from all elements at the time the command terminated with the CHECK CONDITION status. The TOTAL NUMBER OF PICKS field is equivalent to the value contained in the Overall Media Changer Device Statistics log page with a parameter code of 0001h at the time the command terminated with the CHECK CONDITION status.

The TOTAL NUMBER OF PICK RETRIES field contains the total number of pick retries from all elements at the time the command terminated with the CHECK CONDITION status. The TOTAL NUMBER OF PICK RETRIES field is equivalent to the value contained in the Overall Media Changer Device Statistics log page with a parameter code of 0002h at the time the command terminated with the CHECK CONDITION status.

The TOTAL NUMBER OF PLACES field contains the total number of places to all elements at the time the command terminated with the CHECK CONDITION status. The TOTAL NUMBER OF PLACES field is equivalent to the value contained in the Overall Media Changer Device Statistics log page with a parameter code of 0003h at the time the command terminated with the CHECK CONDITION status.

The TOTAL NUMBER OF PLACE RETRIES field contains the total number of place retries to all elements at the time the command terminated with the CHECK CONDITION status. The TOTAL NUMBER OF PLACE RETRIES field is equivalent to the value contained in the Overall Media Changer Device Statistics log page with a parameter code of 0004h at the time the command terminated with the CHECK CONDITION status.

The TOTAL NUMBER OF SCANS field contains the total number of scans for all elements at the time the command terminated with the CHECK CONDITION status. The TOTAL NUMBER OF SCANS field is equivalent to the value contained in the Overall Media Changer Device Statistics log page with a parameter code of 0005h at the time the command terminated with the CHECK CONDITION status. If the media changer device does not contain a volume tag reader (i.e., the Volume Tag Reader

Present (VTRP) bit in the Device Capabilities mode page is set to zero), then the TOTAL NUMBER OF SCANS field should be set to zero.

The TOTAL NUMBER OF SCAN RETRIES field contains the total number of scan retries for all elements at the time the command terminated with the CHECK CONDITION status. The TOTAL NUMBER OF SCAN RETRIES field is equivalent to the value contained in the Overall Media Changer Device Statistics log page with a parameter code of 0006h at the time the command terminated with the CHECK CONDITION status. If the media changer device does not contain a volume tag reader (i.e., the Volume Tag Reader Present (VTRP) bit in the Device Capabilities mode page is set to zero), then the TOTAL NUMBER OF SCAN RETRIES field should be set to zero.

See SPC-4 for descriptions of the OPERATION CODE field and SERVICE ACTION field. The OPERATION CODE field and SERVICE ACTION field if applicable contain the operation code and service action of the command that terminated with the CHECK CONDITION status.

If the command indicated by the OPERATION CODE field and SERVICE ACTION field if applicable requires motion by a medium transport element (e.g., MOVE MEDIUM), then:

- a) the MEDIUM TRANSPORT ADDRESS field contains the element address of the medium transport involved in the motion related command at the time the command terminated with the CHECK CONDITION status;
- b) the SOURCE ADDRESS field contains the element address which the medium transport was at prior to the time the command terminated with the CHECK CONDITION status (i.e., the position of the robotics prior to moving to the element address required by the command.) If the element address defined by the SOURCE ADDRESS field is not known, the SOURCE ADDRESS field should be set to zero; and
- c) the DESTINATION ADDRESS field contains the element address which the medium transport was moving to prior to the time the command terminated with the CHECK CONDITION status (i.e., the element address the robotics was moving to as required by the command.)

If the command indicated by the OPERATION CODE field and SERVICE ACTION field if applicable did not require motion by a medium transport element(e.g., MOVE MEDIUM), then the MEDIUM TRANSPORT ADDRESS field, SOURCE ADDRESS field and DESTINATION ADDRESS field should be set to zero.

The VOLUME IDENTIFIER field contains the volume identifier from the volume tag information (see 5.4.3) If the media changer device does not contain a volume tag reader (i.e., the Volume Tag Reader Present (VTRP) bit in the Device Capabilities mode page is set to zero), then the VOLUME IDENTIFIER field should be filled with ASCII space characters (i.e., 20h).

See SPC-4 for descriptions of the TIMESTAMP ORIGIN and TIMESTAMP fields. The TIMESTAMP ORIGIN field and TIMESTAMP field contain the timestamp origin and timestamp maintained by the device server at the time the command terminated with the CHECK CONDITION status. If a timestamp is not supported by the device server, the TIMESTAMP ORIGIN and TIMESTAMP fields shall be set to zero.