



To: T10 Technical Committee  
 From: Gary Lestage, Kyle Walczak and Kevin Marks - Dell, Inc.  
 Date: March 7, 2006  
 Subject: T10/05-213r5 - SSC-3: Device Statistics log page for SSC-3 and Tape Diagnostic Data log page

### **Revision History**

Revision 0 (06/19/05) – Initial proposal

Revision 1 (08/04/05) – Changes based on July '05 SSC-3 WG Comments

- Migrated the Device statistics log page from ADC to SSC-3 and added the additional counters from original proposal.
- Removed clean status parameter code – will be covered by a proposal from Kevin Butt@IBM.
- Change MMH to POR for last emergency/reset eject counter
- Changed Nth sense to parameter code based and made it the only parameter format on the Tape diagnostics log page
- Added OP code/service action, media id number and vendor specific space to the tape diagnostics data log page
- Change MEDIUM-TYPE CODE to MEDIUM TYPE in SSC-3 mode page section 8.3.1

Revision 2 (10/21/05) – Changes based on September '05 SSC-3 WG Comments

- Added two more last clean counter entries.
- Updated Table 52 (was 51 in rev c).
- Added completed operation to cleaning statistics entries.
- Add tape alert code to over temperature condition statistics entry.
- Removed DU(0) from the device statistics log page parameter.
- Moved MEDIUM TYPE in the Medium type parameter format to byte 3.
- Clarified diagnostic page parameters for deferred errors.
- Added sense key = aborted commands for tape diagnostic log page entries.
- Added note for forced reset / emergency eject parameter.a

Revision 3 (1/03/06) - Changes based on November '05 SSC-3 WG Comments

- Add timestamp and timestamp origin to the tape diag page log parameter
- Updated Parameter 000Bh and change description/removed note.
- Removed requirement of uniqueness for item 3 for MEDIUM ID NUMBER
- Added DENSITY CODE to the Medium type parameter format
- Reworded when errors are reported
- Added a repeat bit to indicate repeat entries without filling log
- Corrected Media vs. Medium in various areas

Revision 4 (1/15/06) - Changes based on January '06 SSC-3 WG Comments

- Fixed multiple when/if usages
- Reworded usage of REPEAT bit model
- Reworded REPEAT bit field definitions
- Fix wording for describing opcode and service action in Diag parameter
- Updated Log page format to SPC-4(i.e. format and linking field, subpage, SPF, DS)

Revision 5 (4/07/06) - Changes based on March '06 SSC-3 WG Comments

- Changed most parameters in Diag page to when command terminated with check condition status.
- Fixes repeat bit mapping again.

**Related Documents**

SCSI Stream Commands - 3 (T10/1611-D - SSC-3r01e)

SCSI Primary Commands - 4 (T10/1729-D - SPC-4r03)

[New text to be added to SSC-3](#)~~[Text to be deleted from SSC-3](#)~~**Overview**

Dell sees a need to standardize log pages that will allow for the collection of information required during field analysis and troubleshooting of tape devices. This requirement 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 tape drive being used. This proposal brings the Device statistics log page from ADC in to SSC-3 and expands the parameter code contents and defines a new Tape Diagnostics log page that contains a collection of sense and diagnostics data.

**Suggested Changes to SSC-3:**[New text notated in [blue](#)]Add new row to **Table 52 - Log page codes****Table 52 — Log page codes**

Page Code	Description	Support	Reference
....	....	....	....
<a href="#">14h</a>	<a href="#">Device Statistics log page</a>	<a href="#">O</a>	<a href="#">8.2.X</a>
....	....	....	....
<a href="#">XXh</a>	<a href="#">Tape Diagnostic Data log page</a>	<a href="#">O</a>	<a href="#">8.2.Y</a>
....	....	....	....

[where XXh is the assigned log page.]

**[8.2.X Device Statistics log page](#)****[8.2.X.1 Device Statistics log page overview](#)**

[The Device Statistics log page \(see table x\) defines data counters associated with utilization of the tape device. A device server that implements the Device Statistics log page shall implement one or more of the defined parameters. Support for the individual parameters in the 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 – 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 (14h)</u>					
<u>1</u>	<u>SUBPAGE CODE (00h)</u>							
<u>2</u>	<u>(MSB)</u>							
<u>3</u>	<u>PAGE LENGTH (n-3)</u>							<u>(LSB)</u>
	<u>Device statistics log parameters</u>							
<u>4</u>	<u>First device statistics log parameter</u>							
	⋮							
<u>N</u>	<u>Last 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.

Table x+1 defines the Device Statistics log page parameter codes.

**Table x+1 – Device Statistics log parameter codes**

<b><u>Parameter Code</u></b>	<b><u>Description</u></b>	<b><u>Reference</u></b>
<a href="#">0000h</a>	<a href="#">Lifetime media loads</a>	<a href="#">8.2.X.2</a>
<a href="#">0001h</a>	<a href="#">Lifetime cleaning operations</a>	<a href="#">8.2.X.2</a>
<a href="#">0002h</a>	<a href="#">Lifetime power on hours</a>	<a href="#">8.2.X.2</a>
<a href="#">0003h</a>	<a href="#">Lifetime media motion (head) hours</a>	<a href="#">8.2.X.2</a>
<a href="#">0004h</a>	<a href="#">Lifetime meters of tape processed</a>	<a href="#">8.2.X.2</a>
<a href="#">0005h</a>	<a href="#">Lifetime media motion (head) hours when incompatible media was last loaded</a>	<a href="#">8.2.X.2</a>
<a href="#">0006h</a>	<a href="#">Lifetime power on hours when the last temperature condition occurred (TapeAlert code 24h)</a>	<a href="#">8.2.X.2</a>
<a href="#">0007h</a>	<a href="#">Lifetime power on hours when the last power consumption condition occurred (TapeAlert code 1Ch)</a>	<a href="#">8.2.X.2</a>
<a href="#">0008h</a>	<a href="#">Media motion (head) hours since last successful cleaning operation</a>	<a href="#">8.2.X.2</a>
<a href="#">0009h</a>	<a href="#">Media motion (head) hours since 2<sup>nd</sup> to last successful cleaning operation</a>	<a href="#">8.2.X.2</a>
<a href="#">000Ah</a>	<a href="#">Media motion (head) hours since 3<sup>rd</sup> to last successful cleaning operation</a>	<a href="#">8.2.X.2</a>
<a href="#">000Bh</a>	<a href="#">Lifetime power on hours when the last operator initiated forced reset and/or emergency eject occurred</a>	<a href="#">8.2.X.2</a>
<a href="#">000Ch – 0FFFh</a>	<a href="#">Reserved</a>	
<a href="#">1000h</a>	<a href="#">Media motion (head) hours for each medium type</a>	<a href="#">8.2.X.3</a>
<a href="#">1001h-7FFFh</a>	<a href="#">Reserved</a>	
<a href="#">8000h – FFFFh</a>	<a href="#">Vendor specific</a>	

[Parameter codes corresponding to values of time shall be reported in hours and rounded up to the next whole hour.](#)

#### **8.2.X.2 Device statistics data counter log parameter**

[The device statistics data counter log parameter format is shown in table x+2.](#)

**Table x+2 – Device statistics data counter log parameter format**

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

The PARAMETER CODE field is defined in table x+1.

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+2.

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

The DEVICE STATISTICS DATA COUNTER field is the value of the data counter associated with the parameter code.

### **8.2.X.3 Medium type log parameter**

The medium type log parameter format is shown in table x+3.

**Table x+3 – Medium type log parameter format**

Byte\Bit	7	6	5	4	3	2	1	0
0	(MSB) <u>PARAMETER CODE (1000h)</u>							(LSB)
1								(LSB)
2	DU (0b)	Obsolete	TSD (0b)	ETC (0b)	TMC (00b)	FORMAT AND LINKING (11b)		
3	<u>PARAMETER LENGTH (n-3)</u>							
	<u>Medium type parameters</u>							
4	First medium type parameter (see table x+4)							
	⋮							
N	Last medium type parameter (see table x+4)							

The PARAMETER CODE field shall be set to 1000h to indicate the Medium type log parameter.

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 x+3.

The PARAMETER LENGTH field indicates the number of bytes in the medium type parameters that follow.

The medium type parameter format is shown in table x+4.

**Table x+4 - Medium type 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>Reserved</u>							
<u>1</u>								
<u>2</u>	<u>DENSITY CODE</u>							
<u>3</u>	<u>MEDIUM TYPE</u>							
<u>4</u>	<u>(MSB)</u>	<u>MEDIA MOTION HOURS</u>						
<u>7</u>								<u>(LSB)</u>

The DENSITY CODE field contains the value returned in the general mode parameter block descriptor (see SPC-4).

The MEDIUM TYPE field contains the value returned in the mode parameter header (see SPC-4). The values returned in the MEDIUM TYPE field is vendor specific for sequential-access devices.

The MEDIA MOTION HOURS field contains the number of media motion (head) hours for the type of medium specified by the combination of the MEDIUM TYPE field and DENSITY CODE field.

### **8.2.Y Tape Diagnostic Data log page**

The Tape Diagnostic Data log page (see table y) 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 device including data counters associated with the error event, sense data, operation code/service action and medium type with associated media motion hours, etc. The Tape Diagnostic Data log page may be used to aid in field analysis and repair.

The Tape Diagnostic Data log page shall only include parameter entries for commands that terminated with a CHECK CONDITION status having the sense key set to MEDIUM ERROR, HARDWARE ERROR or ABORTED COMMAND.

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 y+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 y - Tape 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>3</u>	<u>PAGE LENGTH (n-3)</u>						<u>(LSB)</u>	
	<u>tape diagnostic data log parameters</u>							
<u>4</u>	<u>First tape diagnostic data log parameter (see table y+1)</u>							
	⋮							
<u>n</u>	<u>Last tape diagnostic data log parameter (see table y+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 tape diagnostic data log parameter format is shown in table y+1.](#)

**Table y+1 – Tape 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>							
<u>1</u>	<u>PARAMETER CODE</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>Reserved</u>							
<u>6</u>	<u>DENSITY CODE</u>							
<u>7</u>	<u>MEDIUM TYPE</u>							
<u>8</u>	<u>(MSB)</u>							
	<u>LIFETIME MEDIA MOTION HOURS</u>							
<u>11</u>	<u>(LSB)</u>							
<u>12</u>	<u>Reserved</u>							
<u>13</u>	<u>REPEAT</u>	<u>Reserved</u>				<u>SENSE KEY</u>		
<u>14</u>	<u>ADDITIONAL SENSE CODE</u>							
<u>15</u>	<u>ADDITIONAL SENSE CODE QUALIFIER</u>							
<u>16</u>	<u>(MSB)</u>							
	<u>VENDOR SPECIFIC CODE QUALIFIER</u>							
<u>19</u>	<u>(LSB)</u>							
<u>20</u>	<u>(MSB)</u>							
	<u>PRODUCT REVISION LEVEL</u>							
<u>23</u>	<u>(LSB)</u>							
<u>24</u>	<u>Reserved</u>							
	<u>HOURS SINCE LAST CLEAN</u>							
<u>27</u>	<u>(LSB)</u>							
<u>28</u>	<u>OPERATION CODE</u>							
<u>29</u>	<u>Reserved</u>				<u>SERVICE ACTION</u>			
<u>30</u>	<u>Reserved</u>							
<u>31</u>	<u>Reserved</u>							
<u>32</u>	<u>(MSB)</u>							
<u>:</u>	<u>Reserved</u>							
<u>:</u>	<u>MEDIUM ID NUMBER</u>							
<u>:</u>	<u>Reserved</u>							
<u>63</u>	<u>(LSB)</u>							
<u>64</u>	<u>Reserved</u>				<u>TIMESTAMP ORIGIN</u>			
<u>65</u>	<u>Reserved</u>							
<u>66</u>	<u>Reserved</u>							
	<u>TIMESTAMP</u>							
<u>71</u>	<u>Reserved</u>							
<u>72</u>	<u>Reserved</u>							
	<u>Vendor specific</u>							
<u>n</u>	<u>Reserved</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 y+1.

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

The DENSITY CODE field contains the density code of the medium loaded at the time the command terminated with the CHECK CONDITION status. The DENSITY CODE field is the same value as returned in the general mode parameter block descriptor (see SPC-4). If no medium was loaded at the time the command terminated with the CHECK CONDITION status, then the DENSITY CODE field shall be set to 00h.



The MEDIUM TYPE field contains the type of medium loaded at the time the command terminated with the CHECK CONDITION status. The MEDIUM TYPE field is the same value as returned in the mode parameter header (see SPC-4). If no medium was loaded at the time the command terminated with the CHECK CONDITION status, then the MEDIUM TYPE field shall be set to 00h.

The LIFETIME MEDIA MOTION HOURS field contains the number of media motion (head) hours at the time the command terminated with the CHECK CONDITION status. The LIFETIME MEDIA MOTION HOURS field is equivalent to the value contained in the Device Statistics log page with a parameter code value of 0003h at the time the command terminated with the CHECK CONDITION status.

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 contain the product revision level at the time the command terminated with the CHECK CONDITION status.

The HOURS SINCE LAST CLEAN field contains the time in media motion (head) hours since the last successful cleaning at the time the command terminated with the CHECK CONDITION status. The HOURS SINCE LAST CLEAN field is equivalent to the value contained in the Device Statistics log page with a parameter code of 0008h at the time the command terminated with the CHECK CONDITION status.

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 medium was present at the time the command terminated with the CHECK CONDITION status, then the MEDIUM ID NUMBER field shall contain:

- 1)     The BARCODE field value contained in the medium auxiliary memory (see SPC-4);
- 2)     The MEDIUM SERIAL NUMBER field value contained in the medium auxiliary memory (see SPC-4); or
- 3)     A vendor specific value associated with the mounted medium.

If no medium was present at the time the command terminated with the CHECK CONDITION status, the MEDIUM ID NUMBER field shall be filled with 20h (ASCII space).

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.

### **8.3.1 Mode parameters overview**

This subclause defines the descriptors and pages for mode parameters used with sequential-access devices.

The mode parameter list, including the mode parameter header and mode block descriptor, are described in SPC-4~~3~~.

The ~~MEDIUM-TYPE-CODE~~ MEDIUM TYPE field in the mode parameter header is vendor-specific for sequential-access devices.

The value of the BLOCK LENGTH field in the mode parameter block descriptor shall be a multiple of four.

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