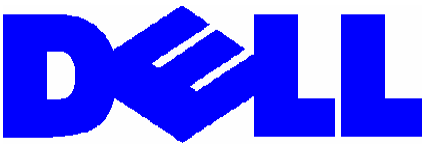

To: T10 Technical Committee
From: Gary Lestage, Kyle Walczak and Kevin Marks - Dell, Inc.
Date: March 1, 2006
Subject: T10/05-213r4 - SSC-3: Device Statistics log page for SSC-3 and Tape Diagnostic Data log page

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)

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
....	....	....	....
14h	Device Statistics log page	O	8.2.X
....	....	....	....
XXh	Tape Diagnostic Data log page	O	8.2.Y
....	....	....	....

[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

Byte\Bit	7	6	5	4	3	2	1	0
0	DS	SPF (0b)	PAGE CODE (14h)					
1	SUBPAGE CODE (00h)							
2	(MSB)	PAGE LENGTH (n-3)						
3								(LSB)
	Device statistics log parameters							
4	First device statistics log parameter							
	⋮							
N	Last 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.

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

Table x+1 – Device Statistics log parameter codes

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

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)	PARAMETER CODE						
1								(LSB)
2	DU	Obsolete	TSD (0b)	ETC	TMC		FORMAT AND LINKING (00b)	
3	PARAMETER LENGTH (n-3)							
4	(MSB)	DEVICE STATISTICS DATA COUNTER						
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)	PARAMETER CODE (1000h)						
1								(LSB)
2	DU (0b)	Obsolete	TSD (0b)	ETC (0b)	TMC (00b)		FORMAT AND LINKING (11b)	
3	PARAMETER LENGTH (n-3)							
	Medium type parameters							
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

Byte\Bit	7	6	5	4	3	2	1	0
0	Reserved							
1								
2	DENSITY CODE							
3	MEDIUM TYPE							
4	(MSB)							
7	MEDIA MOTION HOURS							(LSB)

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 DENISTY 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 in which a CHECK CONDITION status was reported 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 the error was reported. A lower parameter code indicates that the error-event was reported later in time (i.e., the parameter code for the error-event that was reported last has the lowest parameter code value returned for the log page.) The parameter code values returned shall be numbered consecutively from 0000h (i.e. the most recent error event) up to *n*, where *n* is the number of current parameter entries. The number of supported parameter entries, *n,* is vendor specific.

Each parameter entry (see table y+1) in the log page contains a REPEAT bit used to indicate that the device server reported the sense key, additional sense code and additional sense code qualifier contained in the parameter entry two or more times consecutively. In response to the LOG SENSE command, the device server shall return only one parameter entry with that parameter entry having the REPEAT bit set to one for multiple consecutive error-events that occurred, if the multiple consecutive error-events each returned the same sense key, additional sense code and additional sense code qualifier when reported (i.e., if multiple commands completed with a CHECK CONDITION status having the same sense key, additional sense code and additional sense code qualifier, only one parameter entry is returned having the REPEAT bit set to one, instead of a parameter entry for each consecutive error-event having the same sense key, additional sense code and additional sense code qualifier.) If the device server sets the REPEAT bit to one in a parameter entry, other fields in that parameter entry shall be set to the values when the first of the consecutive error-events were reported all having the same sense key, additional sense code and additional sense code qualifier.

If the log page contains *n* parameter entries, where *n* is equal to the maximum supported parameter entries, a new error-event shall cause the *n*th parameter entry to be removed from the log page and

parameter code values for the other parameter entries to be shifted up by one code value. The new error-event shall have a parameter code value set to 0000h.

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

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)						
3								(LSB)
	tape diagnostic data log parameters							
4	First tape diagnostic data log parameter (see table y+1)							
	⋮							
n	Last tape diagnostic data log parameter (see table y+1)							

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

Byte\Bit	7	6	5	4	3	2	1	0
0	(MSB)	PARAMETER CODE						
1								(LSB)
2	DU (0b)	Obsolete	TSD (0b)	ETC (0b)	TMC (00b)		FORMAT AND LINKING (11b)	
3	PARAMETER LENGTH (n-3)							
4	Reserved							
5								
6	DENSITY CODE							
7	MEDIUM TYPE							
8	(MSB)	LIFETIME MEDIA MOTION HOURS						
11								(LSB)
12	Reserved							
13	REPEAT	Reserved			SENSE KEY			
14	ADDITIONAL SENSE CODE							
15	ADDITIONAL SENSE CODE QUALIFIER							
16	(MSB)	VENDOR SPECIFIC CODE QUALIFIER						
19								(LSB)
20	(MSB)	PRODUCT REVISION LEVEL						
23								(LSB)
24		HOURS SINCE LAST CLEAN						
27								(LSB)
28	OPERATION CODE							
29	Reserved			SERVICE ACTION				
30	Reserved							
31								
32	(MSB)							
:		MEDIUM ID NUMBER						
:								
63								(LSB)
64	Reserved						TIMESTAMP ORIGIN	
65	Reserved							
66	TIMESTAMP							
71								
72	Vendor specific							
n								

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 CHECK CONDITION status was reported. 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 CHECK CONDITION status was reported, the DENSITY CODE field shall be set to 00h.

The MEDIUM TYPE field contains the type of medium loaded at the time the CHECK CONDITION status was reported. 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 CHECK CONDITION status was reported, 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 CHECK CONDITION status was reported. 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 CHECK CONDITION status was reported.

The REPEAT bit if set to one indicates that the sense key, additional sense code and additional sense code qualifier 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, additional sense code and additional sense code qualifier 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, additional sense code and additional sense code qualifier values of the command that was active when the CHECK CONDITION status was reported.

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

The HOURS SINCE LAST CLEAN field contains the time in media motion (head) hours since the last successful cleaning at the time the CHECK CONDITION status was reported. 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 CHECK CONDITION status was reported.

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 was active when the CHECK CONDITION status was reported.

The MEDIUM ID NUMBER field shall contain, if medium is present:

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

at the time the CHECK CONDITION status was reported. If no medium is present at the time the CHECK CONDITION status was reported, 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 CHECK CONDITION status was reported. 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.

….