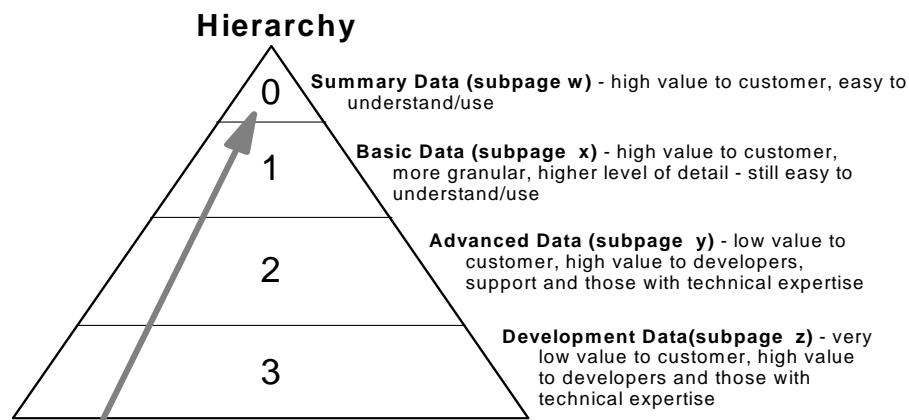


**To: INCITS Technical Committee T10**  
**From: Kevin Butt, IBM**  
**Date: May 10, 2006 3:02 pm**  
**Document: T10/06-113r2**  
**Subject: SPC-4: Log Parameter Subpages**

## Revisions

1. 04-389r6 and previous - Please see 04-389r6.
2. 06-113r0 - During the July 2005 CAP WG I took notes and modified 04-389r6. At this point this proposal was shelved until the other proposals spurned to clarify the Log pages were worked on. After they were finished, I asked Ralph for the source for the Log Page portions of SPC-4 and started over with that as my base. This is the outcome of that.
3. 06-113r1 Incorporated changes suggested in CAP WG Mar 8, 2006.
4. 06-113r2 Incorporated changes made in CAP WG May 10, 2006 that was approved as 06-113r1 as modified.

## Introduction



Filters used to select from various sets of criteria. The level of hierarchy is one of the criteria.

e.g. bits 7-6 select criteria 1; bits 5-4 select criteria 2; bits 3-0 select criteria 3.

Some of our products make extensive use of Log Pages. Currently there are only 15 Vendor-Reserved log pages available. We are already using 13 of those and have plans to use more in the future. Additionally, we would like to be able to have a hierarchical structure or filtering structure available in log pages. We would like to extend Log Pages to use subpage codes like already exists in Mode pages. This will increase the number of log pages available and allow us to use a filter mechanism on the subpage to specify a specific hierarchy of what we return. That is, we would like to have a large set of parameters. Depending on the subpage selected, we would return a specific level of parameters. The parameter definition and value would be the same in different subpages. While this commonality of parameter definitions and value are not necessary for this proposal it is mentioned to give background on the purpose of this proposal. Also, we could use the same parameter value in different subpages that have different meanings.

While these pages are vendor-specific, the log page format is not necessarily vendor-specific, and we believe that these modifications are better done by modifying the standard.

Additionally, we would like to extend Log Select to have a page code and subpage code fields in the CDB to allow for resetting all counters in that one page/subpage combination.

### 6.5 LOG SELECT command

The LOG SELECT command (see table 91) provides a means for an application client to manage statistical information maintained by the SCSI target device about the SCSI target device or its logical units. Device servers that implement the LOG SELECT command shall also implement the LOG SENSE command. Structures in the form of log parameters within log pages are defined as a way to manage the log data. The LOG SELECT command provides for sending zero or more log pages via the Data-Out Buffer. This standard defines the format of the log pages but does not define the conditions and events that are logged.

**Table 91 — LOG SELECT command**

Bit Byte	7	6	5	4	3	2	1	0	
0	OPERATION CODE (4Ch)								
1	Reserved						PCR	SP	
2	PC		PAGE CODE						
3	SUBPAGE CODE								
4	Reserved								
6	Reserved								
7	(MSB)	PARAMETER LIST LENGTH						(LSB)	
8	PARAMETER LIST LENGTH								
9	CONTROL								

The values in the parameter code reset (PCR) bit, the save parameters (SP) bit, and the page control (PC) field specify actions that a SCSI target device performs after receiving a LOG SELECT command.

The PARAMETER LIST LENGTH field specifies the length in bytes of the parameter list that shall be located in the Data-Out Buffer.

If the PARAMETER LIST LENGTH field contains a value other than zero, the actions that a SCSI target device performs after receiving a LOG SELECT command are determined by the values in the PCR bit, the SP bit, and the PC field as defined in 7.2.

If the PARAMETER LIST LENGTH field contains a value other than zero, the PAGE CODE field and SUBPAGE CODE fields shall be set to zero.

The PAGE CODE field and SUBPAGE CODE fields (see Table 92) are used to specify the log page or log pages to which Table 93 applies.

**Table 92 — Log Parameter Applicability**

PAGE CODE	SUBPAGE CODE	applicable log parameters
00h	00h	All log parameters of all log pages
00h - 3Fh	01h - FEh	All log parameters in the log page specified by PAGE CODE and SUBPAGE CODE fields
00h - 3Fh	FFh	All log parameters in the log pages with the specified PAGE CODE and all SUBPAGE CODE values
01h - 3Fh	00h	All log parameters in the log page specified by the value in the PAGE CODE field and a value of zero in the SUBPAGE CODE field.
<p>Note: This is the equivalent of resetting all parameters in a specific log page in a previous version of this standard (i.e. prior to subpages)</p>		

A PAGE CODE field set to zero with a SUBPAGE CODE field set to zero specifies that Table 92 applies to the log parameters of all log pages. A SUBPAGE CODE field set to 0xFF specifies that Table 92 applies to the log parameters of all log pages specified by the PAGE CODE field. A PAGE CODE field set to a non-zero value with the SUBPAGE CODE field set to a non-zero value specifies that Table 92 only applies to the log parameters of the log page specified by the PAGE CODE field and SUBPAGE CODE field.

A parameter list length of zero specifies that no log pages shall be transferred. This condition shall not be considered an error. Table 93 defines the meaning of the combinations of values for the PCR bit, the SP bit, and the PC field when the parameter list length is zero (i.e., when there is no parameter data being sent with the LOG SELECT command).

**Table 93 — PCR bit, SP bit, and PC field meanings when parameter list length is zero (part 1 of 2)**

PCR bit	SP bit	PC field	Description
0b	0b	0xb	This is not an error. The device server shall make no change to any current threshold values or any current cumulative values and shall not save any values to non-volatile media.
0b	1b	00b	The device server shall make no change to any current threshold values and shall process the optional saving of current threshold values as follows: a) If the device server implements saving of the current threshold values, the device server shall save all current threshold values to non-volatile media; or b) If the device server does not implement saving of the current threshold values, the device server shall terminate the command <sup>b</sup> .
0b	1b	01b	The device server shall make no change to any current cumulative values and shall process the optional saving of current cumulative values as follows: a) If the device server implements saving of the current cumulative values, the device server shall save all current cumulative values to non-volatile media; or b) If the device server does not implement saving of the current cumulative values, the device server shall terminate the command <sup>b</sup> .
<p><sup>a</sup> Vendor specific default threshold values and vendor specific default cumulative values may be zero.</p> <p><sup>b</sup> The command shall be terminated with CHECK CONDITION status, with the sense key set to ILLEGAL REQUEST, and the additional sense code set to INVALID FIELD IN CDB.</p>			

Table 93 — PCR bit, SP bit, and PC field meanings when parameter list length is zero (part 2 of 2)

PCR bit	SP bit	PC field	Description
0b	xb	10b	The device server shall set all current threshold values to the vendor specific default threshold values <sup>a</sup> and shall not save any values to non-volatile media.
0b	xb	11b	The device server shall set all current cumulative values to the vendor specific default cumulative values <sup>a</sup> and shall not save any values to non-volatile media.
1b	0b	xxb	The device server shall: <ul style="list-style-type: none"> <li>1) Set all current threshold values to the vendor specific default threshold values<sup>a</sup>;</li> <li>2) Set all current cumulative values to the vendor specific default cumulative values<sup>a</sup>; and</li> <li>3) Not save any values to non-volatile media.</li> </ul>
1b	1b	00b	The device server shall process the optional saving of current threshold values as follows: <ul style="list-style-type: none"> <li>a) If the device server implements saving of the current threshold values, the device server shall: <ul style="list-style-type: none"> <li>1) Save all current threshold values to non-volatile media;</li> <li>2) Set all current threshold values to the vendor specific default threshold values<sup>a</sup>; and</li> <li>3) Set all current cumulative values to the vendor specific default threshold values<sup>a</sup>.</li> </ul> </li> <li>or</li> <li>b) If the device server does not implement saving of the current threshold values, the device server shall terminate the command<sup>b</sup>.</li> </ul>
1b	1b	01b	The device server shall process the optional saving of current cumulative values as follows: <ul style="list-style-type: none"> <li>a) If the device server implements saving of the current cumulative values, the device server shall: <ul style="list-style-type: none"> <li>1) Save all current threshold values to non-volatile media;</li> <li>2) Set all current threshold values to the vendor specific default threshold values<sup>a</sup>; and</li> <li>3) Set all current cumulative values to the vendor specific default threshold values<sup>a</sup>.</li> </ul> </li> <li>or</li> <li>b) If the device server does not implement saving of the current cumulative values, the device server shall terminate the command<sup>b</sup>.</li> </ul>
1b	1b	1xb	The device server shall: <ul style="list-style-type: none"> <li>1) Set all current threshold values to the vendor specific default threshold values<sup>a</sup>;</li> <li>2) Set all current cumulative values to the vendor specific default cumulative values<sup>a</sup>; and</li> <li>3) Not save any values to non-volatile media.</li> </ul>
<p><sup>a</sup> Vendor specific default threshold values and vendor specific default cumulative values may be zero.</p> <p><sup>b</sup> The command shall be terminated with CHECK CONDITION status, with the sense key set to ILLEGAL REQUEST, and the additional sense code set to INVALID FIELD IN CDB.</p>			

The current cumulative values may be updated by the device server or by the application client using the LOG SELECT command to reflect the cumulative number of events experienced by the logical unit. The current threshold values may only be modified by the application client via the LOG SELECT command.

NOTE 1 - Log pages or log parameters that are not available may become available at some later time (e.g., after the logical unit has become ready).

Additional information about the LOG SELECT command is in Annex A.

## 6.6 LOG SENSE command

The LOG SENSE command (see table 94) provides a means for the application client to retrieve statistical or other operational information maintained by the SCSI target device about the SCSI target device or its logical units. It is a complementary command to the LOG SELECT command.

**Table 94 — LOG SENSE command**

Bit Byte	7	6	5	4	3	2	1	0
0	OPERATION CODE (4Dh)							
1	Reserved						PPC	SP
2	PC		PAGE CODE					
3	SUBPAGE CODE							
4	Reserved							
5	(MSB)		PARAMETER POINTER				(LSB)	
6								
7	(MSB)		ALLOCATION LENGTH				(LSB)	
8								
9	CONTROL							

The parameter pointer control (PPC) bit controls the type of parameters requested from the device server:

- A PPC bit set to one specifies that the device server shall return a log page with parameter code values that have changed since the last LOG SELECT or LOG SENSE command. **If the PPC bit is set to one and the value of the SUBPAGE CODE field is set to FFh then the command shall be terminated with CHECK CONDITION status, with the sense key set to ILLEGAL REQUEST, and the additional sense code set to INVALID FIELD IN CDB.** The device server shall return only those parameter codes that are greater than or equal to the contents of the PARAMETER POINTER field in ascending order of parameter codes from the specified log page;
- A PPC bit set to zero specifies that the device server shall return those parameter codes that are greater than or equal to the contents of the PARAMETER POINTER field in ascending order of parameter codes from the specified log page; and
- A PPC bit set to zero and a PARAMETER POINTER field set to zero specifies that the device server shall return all available log parameters from the specified log page.

Saving parameters is an optional function of the LOG SENSE command. If the logical unit does not implement saving log parameters and if the save parameters (SP) bit is set to one, then the command shall be terminated with CHECK CONDITION status, with the sense key set to ILLEGAL REQUEST, and the additional sense code set to INVALID FIELD IN CDB.

An SP bit set to zero specifies the device server shall perform the specified LOG SENSE command and shall not save any log parameters. If saving log parameters is implemented, an SP bit set to one specifies that the device server shall perform the specified LOG SENSE command and shall save all log parameters identified as saveable by the DS bit (see 7.2) to a nonvolatile, vendor specific location.

The page control (PC) field (see table 207 in 7.2.1) specifies which log parameter values are to be returned.

The parameter values returned by a LOG SENSE command are determined as follows:

- a) The specified parameter values at the last update (i.e., in response to a LOG SELECT or LOG SENSE command or done automatically by the device server for cumulative values);
- b) The saved values, if saved parameters are implemented and an update has not occurred since the last logical unit reset; or
- c) The default values, if saved values are not available or not implemented and an update has not occurred since the last logical unit reset.

The PAGE CODE field and SUBPAGE CODE field specify ~~specifies~~ which log page of data is being requested (see 7.2). If the log page ~~specified by the page code and subpage code combination~~ ~~code~~ is reserved or not implemented, the command shall be terminated with CHECK CONDITION status, with the sense key set to ILLEGAL REQUEST, and the additional sense code set to INVALID FIELD IN CDB.

The PARAMETER POINTER field allows the application client to request parameter data beginning from a specific parameter code to the maximum allocation length or the maximum parameter code supported by the logical unit, whichever is less. If the value of the PARAMETER POINTER field is larger than the largest available parameter code known to the device server for the specified log page, the command shall be terminated with CHECK CONDITION status, with the sense key set to ILLEGAL REQUEST, and the additional sense code set to INVALID FIELD IN CDB.

The ALLOCATION LENGTH field is defined in 4.3.4.6.

Log parameters within the specified log page shall be transferred in ascending order according to parameter code.

Additional information about the LOG SENSE command is in Annex C.

## 7.2 Log parameters

### 7.2.1 Log page structure and page codes for all device types

This subclause describes the log page structure and the log pages that are applicable to all SCSI devices. Log pages specific to each device type are described in the command standard (see 3.1.17) that applies to that device type. The LOG SELECT command (see 6.5) supports the ability to send zero or more log pages. The LOG SENSE command (see 6.6) returns a single log page specified by the combination of the PAGE CODE field and SUBPAGE CODE field of the CDB.

Each log page begins with a four-byte page header followed by zero or more variable-length log parameters defined for that log page. The log page format is defined in table 205.

**Table 205 — Log page format**

Bit Byte	7	6	5	4	3	2	1	0
0	DS	SPF	PAGE CODE					
1	SUBPAGE CODE							
2	(MSB)							
3	PAGE LENGTH (n-3)						(LSB)	
Log parameter(s)								
4	Log parameter (First)							
x+3	(Length x)							
.								
.								
n-y+1	Log parameter (Last)							
n	(Length y)							

For the LOG SENSE command (see 6.6), the DS bit indicates whether log parameters in this log page are saved when the SP bit is set to one in the CDB. If the DS bit is set to zero, the log parameters are saved when the SP bit is set to one. If the DS bit is set to one, the log parameters are not saved. For the LOG SELECT command (see 6.5), the disable save (DS) bit operates in conjunction with the parameter code reset (PCR) bit, the save parameters (SP) bit, the page control (PC) field, and the PARAMETER LIST LENGTH field in the CDB.

If the subpage format (SPF) bit is set to zero, then the SUBPAGE CODE field shall contain 00h. If the SPF bit is set to one, then the SUBPAGE CODE field shall contain a value between 01h and FFh.

The PAGE CODE field contains the number of the log page that is being transferred.

The SUBPAGE CODE field contains the subpage number of the log page that is being transferred.

If an application client specifies values in the PAGE CODE field and SUBPAGE CODE field for a log page that is reserved or not implemented by the logical unit, then the device server shall terminate the LOG SELECT command with CHECK CONDITION status, with the sense key set to ILLEGAL REQUEST, and the additional sense code set to INVALID FIELD IN PARAMETER LIST.

If the PARAMETER LIST LENGTH field in a LOG SELECT CDB contains zero, the meanings for the PCR bit, SP bit, and PC field are defined in 6.5.

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EDITORS NOTE 1 - Deleted 4 pages that had no changes

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If the application client sends a log parameter value that is outside the range supported by the logical unit, and rounding is implemented for that parameter, the device server may either:

- a) Round to an acceptable value and terminate the command as described in 5.4; or
- b) Terminate the command with CHECK CONDITION status, with the sense key set to ILLEGAL REQUEST, and the additional sense code set to INVALID FIELD IN PARAMETER LIST.

If the parameter data for one LOG SELECT command contains more than one log page and the log pages are not in ascending order by page code value **then subpage code value**, then the device server shall terminate the command with CHECK CONDITION status, with the sense key set to ILLEGAL REQUEST, and the additional sense code set to INVALID FIELD IN PARAMETER LIST.

If the parameter data for one LOG SELECT command contains more than one log parameter in any one log page and the log parameters are not in ascending order by parameter code value, then the device server shall terminate the command with CHECK CONDITION status, with the sense key set to ILLEGAL REQUEST, and the additional sense code set to INVALID FIELD IN PARAMETER LIST.

NOTE 2 - Application clients should send LOG SENSE commands prior to sending LOG SELECT commands to determine supported log pages and page lengths.

The SCSI target device may provide independent sets of log parameters for each logical unit or for each combination of logical units and I\_T nexuses. If the SCSI target device does not support independent sets of log parameters and any log parameters are changed that affect other I\_T nexuses, then the device server shall establish a unit attention condition (see SAM-4) for the initiator port associated with every I\_T nexus except the I\_T nexus on which the LOG SELECT command was received, with the additional sense code set to LOG PARAMETERS CHANGED.



The page code assignments for the log pages are listed in table 212.

**Table 212 — Log page codes**

Page Code	Subpage Code	Log Page Name	Reference
0Fh	00h	Application Client	7.2.2
01h	00h	Buffer Over-Run/Under-Run	7.2.3
2Fh	00h	Informational Exceptions	7.2.5
0Bh	00h	Last <i>n</i> Deferred Errors or Asynchronous Events	7.2.6
07h	00h	Last <i>n</i> Error Events	7.2.7
06h	00h	Non-Medium Error	7.2.8
18h	00h	Protocol Specific Port	7.2.9
03h	00h	Read Error Counter	7.2.4
04h	00h	Read Reverse Error Counter	7.2.4
10h	00h	Self-Test Results	7.2.10
0Eh	00h	Start-Stop Cycle Counter	7.2.11
00h	00h	Supported Log Pages	7.2.12
01h - 3Fh	FFh	Supported Subpages	
00h	FFh	Supported Log Pages and Subpages	
0Dh	00h	Temperature	7.2.13
05h	00h	Verify Error Counter	7.2.4
02h	00h	Write Error Counter	7.2.4
08h - 0Ah	00h - FEh	Reserved (may be used by specific device types)	
0Ch	00h - FEh	Reserved (may be used by specific device types)	
11h - 17h	00h - FEh	Reserved (may be used by specific device types)	
19h - 2Eh	00h - FEh	Reserved (may be used by specific device types)	
3Fh	00h - FEh	Reserved	
30h - 3Eh	00h - FEh	Vendor specific	
<del>08h - 0Ah</del>	<del>00h - FFh</del>	<del>Reserved (may be used by specific device types)</del>	
<del>0Ch</del>	<del>00h - FFh</del>	<del>Reserved (may be used by specific device types)</del>	
<del>11h - 17h</del>	<del>00h - FFh</del>	<del>Reserved (may be used by specific device types)</del>	
<del>19h - 2Eh</del>	<del>00h - FFh</del>	<del>Reserved (may be used by specific device types)</del>	
<del>3Fh</del>	<del>00h - FFh</del>	<del>Reserved</del>	
<del>30h - 3Eh</del>	<del>00h - FFh</del>	<del>Vendor specific</del>	
All page code and subpage code combinations not shown in this table are reserved. Annex D contains a listing of log pages codes and subpage codes in numeric order.			

Additional information about the LOG SELECT command is in Annex C.

### 7.2.12 Supported Log Pages log page

The Supported Log Pages log page (see table 213) returns the list of log pages implemented by the logical unit. Logical units that implement the LOG SENSE command shall implement this log page.

The DS bit, SPF bit, PAGE CODE field, SUBPAGE CODE field, and PAGE LENGTH field are described in 7.2.1.

**Table 213 — Supported log pages**

Bit Byte	7	6	5	4	3	2	1	0	
0	DS	SPF (0b)	PAGE CODE (00h)						
1	SUBPAGE CODE (00h)								
2	(MSB)		PAGE LENGTH (n-3)						(LSB)
3									
4	SUPPORTED PAGE LIST								
n									

This log page is not defined for the LOG SELECT command. This log page returns the list of supported log pages for the specified logical unit.

The PAGE LENGTH field indicates the length in bytes of the following supported log page list.

The SUPPORTED PAGE LIST field shall contain a list of all log page codes with a subpage code value of zero implemented by the logical unit in ascending order beginning with page code 00h.

The format of an entry in the supported page list is shown in Table 214.

**TABLE 214. Supported page list entry**

Bit Byte	7	6	5	4	3	2	1	0
0	Reserved		PAGE CODE					

The page code field contains the page code.

**7.2.13 Supported Log Pages and Subpages**

The Supported Log Pages and Subpages log page (see Table 215) returns the list of all page codes and subpage codes implemented by the logical unit. This log page is optional. If log subpages are supported this page shall be

**TABLE 215. Supported Log Pages and Subpages**

Bit Byte	7	6	5	4	3	2	1	0	
0	DS	SPF(1b)	PAGE CODE (00h)						
1	SUBPAGE CODE (FFh)								
2	(MSB)		PAGE LENGTH (n-3)						(LSB)
3									
4	SUPPORTED PAGE LIST								
n									

supported.

The DS bit, SPF bit, PAGE CODE field, SUBPAGE CODE field, and PAGE LENGTH field are described in 7.2.1.

This log page is not defined for the LOG SELECT command.

The PAGE LENGTH field indicates the length in bytes of the supported page list.

The SUPPORTED PAGE LIST field shall contain a list of all log page codes implemented by the logical unit in ascending order sorted by PAGE CODE then SUBPAGE CODE value.

The format of an entry in the supported page list is shown in Table 216.

**TABLE 216. Supported page list entry**

Bit Byte	7	6	5	4	3	2	1	0
0	Reserved		PAGE CODE					
1	SUBPAGE CODE							

The PAGE CODE field contains the number of the log page.

The SUBPAGE CODE field contains the subpage number of the log page.

**7.2.14 Supported Subpages**

The Supported Subpages log page (see Table 217) returns the list of all subpage codes of the specified page code that are implemented by the logical unit. ~~This log page is optional.~~ If log subpages are supported this page shall be supported.

**TABLE 217. Supported Subpages**

Bit Byte	7	6	5	4	3	2	1	0
0	DS	SPF(1b)	PAGE CODE					
1	SUBPAGE CODE (FFh)							
2	(MSB)	PAGE LENGTH (n-3)						(LSB)
3								
4	SUPPORTED PAGE LIST							
n								

The DS bit, SPF bit, PAGE CODE field, SUBPAGE CODE field, and PAGE LENGTH field are described in 7.2.1.

The PAGE CODE field contains the number of the log page for the log pages.

NOTE 3 - Note: The page code value is the same in the page header and in each descriptor in the supported page list.

The PAGE LENGTH field indicates the length in bytes of the following supported log page list.

The SUPPORTED PAGE LIST field shall contain a list of all log page codes of the specified page code implemented by the logical unit in ascending order sorted by PAGE CODE then SUBPAGE CODE value.

The format of an entry in the supported page list is shown in Table 218.

TABLE 218. Supported page list entry

Bit Byte	7	6	5	4	3	2	1	0
0	Reserved		PAGE CODE					
1	SUBPAGE CODE							

The PAGE CODE field contains the number of the log page.

The SUBPAGE CODE field contains the subpage number of the log page.