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X3T9.2/88-006

To: X3T9.2 Committee (SCSI)

From: James McGrath (Quantum)

Subject: First Draft of LOG SELECT/SENSE commands

The following is a rough first draft that is not to be taken seriously as a proposal. It is simply reported to the committee as a mark of work in progress, and to solicit early feedback.

## X.Y LOG SELECT

Table X.Y-1: LOG SELECT CDB

Bit Byte	7	6	5	4	3	2	1	0
0	Operation Code (15h)							
1	Logical Unit Number			Source			Destination	
2	Reserved		Page Code ( __h)					
3	Reserved							
4	Reserved							
5	(MSB)							
6	<i>Reserved</i>							
7	<del>Parameter List Length</del> <i>2-byte?</i>							
8								
9	(LSB)							
	Control Byte							

The LOG SELECT command provides a means for the initiator to manage statistical information maintained by the device about the device or attached logical units.

{The page format (PF) bit is not supported. This is as per current proposals regarding the PF bit. All pages must be paged.}

The Source field specifies the source of the data that is to be stored.

The Destination field specifies the destination of the data that is to be stored.

The page code field specifies which page to select. {Explanation: Page codes are not defined in this proposal.}

The parameter list length field specifies the length in bytes of the LOG SELECT parameter list that shall be transferred from the initiator to the target. A parameter list length of zero indicates that no data shall be transferred. This condition shall not be considered as an error. A parameter list length that results in the truncation of any page header shall cause the target to terminate the command with CHECK CONDITION status, with a sense key of ILLEGAL REQUEST, and the additional sense code set to INVALID FIELD IN COMMAND DESCRIPTOR BLOCK.

### X.Y.1 Possible Sources of Data

The Source field of byte 1 of the command descriptor block specifies the source of the data that is to be stored.

Bit 4	Bit 3	Bit 2	
1	0	0	provided in DATA OUT phase
0	0	0	default parameters of the page
0	0	1	saved parameters of the page
0	1	0	current parameters of the page
0	1	1	default threshold parameters of the page
1	0	1	reserved (not defined)
1	1	0	reserved (not defined)
1	1	1	reserved (not defined)

Where the page is specified by the Page Code field.

{Explanation: The proposal can be simplified by eliminating the Source field, since the initiator can accomplish everything it needs to do with combinations of LOG SELECT and LOG SENSE.}

### X.Y.2 Possible Destinations of Data

The Destination field of byte 1 of the command descriptor block specifies the destination of the data that is to be stored.

Bit 1	Bit 0	
0	0	current parameters of the page
0	1	saved and current parameters of the page
1	0	threshold parameters of the page
1	1	saved parameters of the page

Where the page is specified by the Page Code field.

{Explanation: The bits do not have bit significant values, to allow for greatest compatibility with the current use of the SP bit. Bit significance can be restored if desired.}

The saved parameters are stored in non-volatile memory. Individual parameters may be savable or not savable. If the a page is specified that contains both savable and non-savable parameters, then any operation involving the savable parameters as either source or destination shall only be effected for those parameters which are savable. Non-savable parameters shall not be affected. In this instance it shall be legal to specify a page which contains no savable parameters, although no values shall be changed.

#### X.Y.3 Source provided by a DATA OUT phase

Any defined destination value shall be valid. The parameters sent during the DATA OUT phase can be identified by the page code value and the parameter headers. The corresponding destination parameters shall have their parameter control values and parameter values altered to the values sent during this phase. If a given parameter is not specified during the DATA OUT phase, then the corresponding destination parameter control values and parameter values shall not change.

If the initiator attempts to change any parameter that is not changeable as reported by the target (via the LOG SENSE command), the target shall terminate the command with CHECK CONDITION status, the sense key set to ILLEGAL REQUEST, and the additional sense code set to INVALID FIELD IN PARAMETER LIST.

If the initiator attempts to change any parameter control value or parameter value to a value which is invalid as reported by the target (via the LOG SENSE command), the target shall terminate the command with CHECK CONDITION status, the sense key set to ILLEGAL REQUEST, and the additional sense code set to INVALID FIELD IN PARAMETER LIST.

However, if the initiator sends a value for a parameter that is outside the range supported by the target and rounding is implemented for that parameter, the target may either:

- (1) round the value to an acceptable value and terminate the command,
- (2) terminate the command with CHECK CONDITION status, the sense key set to ILLEGAL REQUEST, and the additional sense code set to Invalid Field In Parameter List.

#### X.Y.4 Source provided by Saved, Current, Default, or Default Threshold parameters

If the source value is saved, current, default, or default threshold then any defined destination value shall be valid.

All parameters in the specified page shall be affected. The corresponding destination parameters shall have their parameter control values and parameter values altered to the values specified in the source.

If the initiator attempts to change any parameter that is not changeable as reported by the target (via the LOG SENSE command), the target shall terminate the command with CHECK CONDITION status, the sense key set to ILLEGAL REQUEST, and the additional sense code set to INVALID FIELD IN COMMAND DESCRIPTOR BLOCK.

If the initiator attempts to change any parameter value to a value which is invalid as reported by the target (via the LOG SENSE command), the target shall terminate the command with CHECK CONDITION status, the sense key set to ILLEGAL REQUEST, and the additional sense code set to INVALID FIELD IN COMMAND DESCRIPTOR BLOCK.

#### X.Y.5 Page Structure

The format of the LOG SELECT/SENSE data consists of zero or more variable-length pages. Each page starts with a 4-byte header followed by one or more variable-length parameters associated with that page. The 4-byte header is illustrated in Figure X.Y-2.

Table X.Y-2: SELECT LOG Page Structure

Bit Byte	7	6	5	4	3	2	1	0
0	Reserved		Page Code (___h)					
1	(MSB)							
2	Page Length (n)							
3	(LSB)							
4	Page-Specific Parameters							
n + 3								

The page code field identifies which page of data is being transferred.

{Explanation: the Page Code and Reserved fields are there to maintain compatibility with MODE SELECT/SENSE. Note that the addition of Parameter Codes allows us to live with the relatively small number of possible pages by vastly expanding the potential parameter space.}

The page parameter length field defines the length, in bytes, of the page-specific parameters. This length does not include bytes zero through three.

{Explanation: the Page Length is 3 bytes long in response to Steve Goldman's concerns expressed in Tampa. It also allows us to accommodate a page containing the maximum number of parameters of maximum length.}

The page-specific parameters are defined within the appropriate page definitions.

#### X.Y.6 Parameter Structure

The format of the LOG SELECT/SENSE pages consists of zero or more variable-length parameters. Each parameter starts with a 4-byte header followed by one or more bytes of parameter value for that parameter. The 4-byte header is illustrated in Figure X.Y-3.

Table X.Y-3: SELECT LOG Parameter Structure

Bit Byte	7	6	5	4	3	2	1	0
0	(MSB)							
1	Parameter Code (p)							
2	Active	Savable	Threshold	Operation			Parameter Type	
3	Parameter Length (n)							
4								
n + 3	Parameter Value Bytes							

The parameter code field identifies the parameter for which data is being transferred. {Explanation: a parameter is uniquely defined by the combination of page code and parameter code.}

{Explanation: the parameter code is two bytes to allow for such functions as keeping a seek counter for each possible seek length (in cylinders).}

The active field is a control variable. If it is set to zero then the parameter is not to be updated by the target in response to the gathering of new statistical data. If it is set to one then the parameter is to be updated by the target in response to the gathering of new statistical data.

The savable field is a control variable. If it is set to zero then the parameter is not savable. If it is set to one then the parameter is savable. {Explanation: the initiator may want to selectively enable or disable savability for different types of statistics gathering.}

The thresholdable field is a control variable. If it is set to zero then the parameter cannot have a corresponding threshold. If it is set to one then the parameter can have a threshold value. {Explanation: the initiator may want to selectively enable or disable thresholdability for different types of statistics gathering.}

The operation field is a control variable. It defines the binary relationship between the current and threshold values of the parameter under which the threshold is breached. If the target detects such a breach, then this shall be flagged to all initiators by posting a UNIT ATTENTION condition, with sense code Threshold Breached in LOG.

Bit 7	Bit 6	Bit 5	
0	0	0	current > threshold
0	0	1	current < threshold
0	1	0	current = threshold
0	1	1	reserved
1	0	0	current <= threshold
1	0	1	current >= threshold
1	1	0	current <> threshold
1	1	1	reserved

{Explanation: you can set up a threshold range by defining two different parameters to track the same statistic, and then define different threshold values for each of them.}

The parameter type field is a control variable. If it is set to zero then the parameter value is a counter. If it is set to one then the parameter value is simply a list of bytes. Parameter Type field values of two and three are reserved.

The parameter length field defines the length, in bytes, of the parameter value. This length does not include bytes zero through three.

The meaning of the parameter values are defined within the appropriate parameter definitions.

{Should we require that parameters and/or pages be sent in a certain (ascending) order?}

#### X.Y.7 Counter Parameters

The following rules apply for counter parameters.

{Rules are similar to a mode select parameter that can increment to record events. More details in second draft.}

#### X.Z LOG SENSE

Table X.Z-1: LOG SENSE CDB

Bit Byte	7	6	5	4	3	2	1	0
0	Operation Code (15h)							
1	Logical Unit Number			Reserved		Parameter Face		
2	Reserved			Page Code (__h)				
3	Reserved							
4	Reserved							
5	(MSB)							
6								
7	Allocation Length							
8								
9	(LSB)							
	Control Byte							

The LOG SENSE command provides a means for the initiator to retrieve statistical information maintained by the device about the device or attached logical units. It is a complementary command to the LOG SELECT command.

{The page format (PF) bit is not supported. This is as per current proposals regarding the PF bit. All pages must be paged.}

The parameter face field specifies the type of data (current, saved, etc...) to be returned.

The page code field specifies which page to select. {Explanation: Page codes are not defined in this proposal.}

The allocation length field specifies the number of bytes that the initiator has allocated for returned LOG SENSE data. An allocation length of zero indicates that no LOG SENSE data shall be transferred. This condition shall not be considered as an error. Any other value indicates the maximum number of bytes that shall be transferred. The target shall terminate the DATA IN phase when allocation length bytes have been transferred or when all available LOG SENSE data have been transferred to the initiator, whichever is less.

#### X.Z.1 Parameter Faces

The parameter face field defines the type of parameter values to be returned. The parameter face field is defined in Table X.Z-2.

Table 7-27: Page Control Field

Bit 2	Bit 1	Bit 0	Type of Parameter Values	Section
0	0	0	Current Values	X.Z.2
0	0	1	Changeable Values	X.Z.3
0	1	0	Default Values	X.Z.4
0	1	1	Saved Values	X.Z.5
1	0	0	Threshold Values	X.Z.6
1	0	1	Changeable Threshold Values	X.Z.7
1	1	0	Default Threshold Values	X.Z.8
1	1	1	Reserved	



#### X.Z.2 Current Values

The current values returned are:

- 1) The parameters set in the last successful LOG SELECT command.
- 2) The saved values if a LOG SELECT command has not been executed since the last power-on or hard RESET condition.
- 3) The default values if saved values are not available or not supported.

As subsequently updated by further statistics gathering by the target.

#### X.Z.3 Changeable Values

The values requested shall be returned containing information that indicates which current fields are changeable by the initiator via the LOG SELECT. Parameters that are changeable shall be set to one. Parameters that are not changeable shall be set to zero. If any part of a field is changeable all bits in that field shall be set to one.

NOTE: An attempt to change a non-changeable field (via LOG SELECT) results in an error. See section (X.X.X).

#### X.Z.4 Default Values

The parameters requested shall be returned with the default parameter values set. Parameters not supported by the target shall be set to zero.

#### X.Z.5 Saved Values

The saved values returned are the parameters saved in the last successful LOG SELECT command. Parameters not supported by the target shall be set to zero. If saved values are not available 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 Save Parameters Not Supported.

#### X.Z.6 Threshold Values

The threshold values returned are the threshold parameters set in the last successful LOG SELECT command. Parameters not supported by the target shall be set to zero. If threshold values are not available 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 Threshold Parameters Not Supported.

#### X.Z.7 Changeable Threshold Values

The values requested shall be returned containing information that indicates which threshold fields are changeable by the initiator via the LOG SELECT. Parameters that are changeable shall be set to one. Parameters that are not changeable shall be set to zero. If any part of a field is changeable all bits in that field shall be set to one.

NOTE: An attempt to change a non-changeable field (via LOG SELECT) results in an error. See section (X.X.X).

#### X.Z.8 Default Threshold Values

The parameters requested shall be returned with the default threshold parameter values set. Parameters not supported by the target shall be set to zero.

#### X.Z.9 Initial Responses

After a power up condition or hard reset condition, the target shall respond in the following manner:

- (1) If default values are requested, report the default values.
- (2) If saved values are requested, report valid restored parameters, or restore the parameters and report them. If the saved parameters are not able to be accessed in non-volatile memory terminate the command with a CHECK CONDITION status and the sense key set to NOT READY. If saved parameters are not implemented respond as defined in section (X.X.X).
- (3) If current values are requested, and no current values have been created, the target may return either the default or saved parameters (if implemented), as defined above. If current values have been created, the current values shall be reported.
- (4) If threshold values are requested, report valid restored parameters, or restore the parameters and report them. If the threshold parameters are not able to be accessed in non-volatile memory terminate the command with a CHECK CONDITION status and the sense key set to NOT READY. If threshold parameters are not implemented respond as defined in section (X.X.X).