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Technical Information Bulletin for Information Technology - Procedures for Logging Operations

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Abstract

This technical information bulletin provides an interpretation of the use of the LOG SELECT and LOG SENSE commands contained in American National Standard X3.131-1994, Small Computer System Interface-2 (SCSI-2). This additional information is provided to gain a more uniform implementation of the SCSI-2 logging functions.

Technical Information Bulletin

This interpretation is issued in response to questions which have been raised regarding certain specifications contained in the content of:

ANSI X3.131-1994, Small Computer System Interface - 2

This interpretation was prepared by Technical Committee X3T10, which is responsible for the maintenance of that standard, and was authorized for release by Accredited Standards Committee X3 in order to provide clarifications as quickly as possible in response to questions raised.

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Foreword

This document provides guidance in the use of the LOG SELECT and LOG SENSE commands contained in American National Standard X3.131-1994, Small Computer System Interface-2 (SCSI-2). This document does not replace the descriptions in SCSI-2 and is not intended to conflict with SCSI-2. The purpose of this document is to provide more information to gain a more uniform implementation of the SCSI-2 logging functions.

This technical information bulletin was developed by Technical Committee X3T10 of Accredited Standards Committee X3 during 1990-1992. The approval process started in 1992 but could not be completed until the publication of X3.131-1994.

Requests for interpretation, suggestions for improvement and addenda, or defect reports are welcome. They should be submitted to the X3 Secretariat, Information Technology Industry Council, 1250 Eye Street, NW, Suite 200, Washington, DC 20005-3922.

This technical information bulletin was processed and approved by Accredited Standards Committee X3, Information Technology. Committee approval of the technical information bulletin does not necessarily imply that all committee members voted for approval.

Introduction

This technical information bulletin provides a non-normative interpretation of use of the logging parameters. This technical information bulletin, while reflecting the opinion of the Technical Committee which developed the standard, is intended solely as supplementary information to users of the standard. The standard, ANS X3.131-1994 as approved through the publication and voting procedures of the American National Standards Institute, is not altered by this technical information bulletin. Any subsequent revision to the base standard may or may not reflect the contents of this TIB.

Clause 1 defines the scope of this interpretation
Clause 2 specifies the references
Clause 3 defines the definitions, symbols and abbreviations
Clause 4 contains request for interpretation
Clause 5 contains the interpretation as it applies to the LOG SENSE command
Clause 6 contains the interpretation as it applies to logging operations

Information Technology - Procedures for Logging Operations

1. Scope

This technical information bulletin provides an interpretation of the use of the LOG SELECT and LOG SENSE commands contained in SCSI-2. This additional information is provided to gain a more uniform implementation of the SCSI-2 logging functions. See clause 4 for the reason this TIB is published.

2. Normative references

The following standard is the reference for this technical information bulletin.

ANS X3.131-1994, Small Computer System Interface - 2 (SCSI-2).

3. Definitions, symbols and abbreviations

3.1 Definitions

For purposes of this technical information bulletin the following definitions apply.

3.1.1. list parameter: a parameter value which consists of a string of ASCII graphic codes.

3.1.2. log page: a page made up of one or more log parameters.

3.1.3. log parameter: log information which is made up of a parameter code, a parameter control byte, and a parameter value.

3.1.4. parameter code: a unique identifier which is used to distinguish between the different log parameters within a single log page.

3.1.5. parameter control byte: a parameter used to tell the target how to update, save, use thresholds, determine format, etc. of the parameter value.

3.1.6. parameter pointer field: a field that contains a parameter code.

3.1.7. parameter value: a counter, cumulative, threshold, or ASCII value.

3.2 Symbols and abbreviations

NV - not valid

x - the value of the bit or field is not relevant

4. Request for interpretation

In the descriptions of the LOG SENSE command, LOG SELECT command, and the log parameters there are areas which are confusing or are not well defined.

For example:

- The LOG SENSE command (Section 7.2.7 of SCSI-2) does not give a clear picture of what is returned to the initiator for given bit patterns of PPC, PC, SP, DS, and LP (LP and DS are bits in the log parameter control byte).
- The LOG SELECT command (Section 7.2.6 of SCSI-2) does not indicate how to setup the command descriptor block when the initiator is sending list parameters to the target.

In the log parameters (Section 7.3.2) the descriptions of the bits in byte(2) of the log parameters does not completely describe what to do when the logs become full. There is also a reference to 'exception conditions'

but is not made clear as to what 'exception conditions' are. There is a cross-reference to 7.3.3.1 in SCSI-2 which implies that section will explain what 'exception conditions' are, but that section only references back to section 7.3.2 SCSI-2.

Also, it is not clear what the target should do given the various ways the exception conditions can occur. Nor is it clear what the target should do if the initiator ignores the exception condition.

5. LOG SENSE command

The LOG SENSE command may be used to do two functions: allow the target to save the log parameters in a log page to non-volatile storage; allow the initiator to receive the value of the log parameters for a given log page.

Table 1 lists the definitions of the LOG SENSE command descriptor block fields:

Table 1 - LOG SENSE fields

PPC Bit	SP Bit	PC Field	Description
0	-	--	Indicates that the log parameter requested from the target begin with the parameter code specified by the parameter pointer field in ascending order of parameter codes from the specified log page.
1	-	--	Indicates that the target return a log page consisting only of the log parameters in which a log parameter value has changed since the last LOG SELECT or LOG SENSE command. The target returns only those log parameters following the parameter pointer field.
-	0	--	Indicates the target performs the specified LOG SENSE command and does not save any log parameters.
-	1	--	Indicates that the target performs the specified LOG SENSE command and saves all log parameters identified as savable by the DS bit to a non-volatile vendor-specific location if allowed. (Table 3 specifies the interaction between the SP and DS bits.)
-	-	00	Indicates the target returns the current threshold values.
-	-	01	Indicates the target returns the current cumulative values.
-	-	10	Indicates the target returns the default threshold values.
-	-	11	Indicates the target returns the default cumulative values.

Table 2 lists the possible parameter values that may be returned:

Table 2 - Returned parameter values

LOG SENSE fields		Log page parameter control byte value	Target action
PPC bit	PC field	LP bit	Parameter values returned to the initiator
0	00	0	Returns all current threshold values starting with the specified parameter pointer.
0	01	0	Returns all current cumulative values starting with the specified parameter pointer.
0	10	0	Returns all default threshold values starting with the specified parameter pointer.
0	11	0	Returns all default cumulative values starting with the specified parameter pointer.
1	00	0	Returns only the current threshold values which have changed starting with the specified parameter pointer.
1	01	0	Returns only the current cumulative values which have changed starting with the specified parameter pointer.
1	10	0	Returns only the default threshold values which have changed starting with the specified parameter pointer.
1	11	0	Returns only the default cumulative values which have changed starting with the specified parameter pointer.
0	xx	1	Returns all the list parameters starting with the specified parameter pointer.
1	xx	1	Returns only the list parameters which have changed starting with the specified parameter pointer.

Table 3 lists the possible save options for the LOG SENSE command. The listed options define the save operations which occur as a direct result of the LOG SENSE command. Further save operations are a function of the TSD bit in the log parameter control byte.

Table 3 - LOG SENSE save options

LOG SENSE fields		Log page parameter control byte value		Target action
SP bit	PC field	DS bit	LP bit	
0	xx	x	x	Do not save any of the log parameters into non-volatile storage.
1	00	0	0	Save all the current threshold values of the selected log page into non-volatile storage.
1	01	0	0	Save all the current cumulative values of the selected log page into non-volatile storage.
1	10	0	0	Save all the default threshold values of the selected log page into non-volatile storage.
1	11	0	0	Save all the default cumulative values of the selected log page into non-volatile storage.
1	xx	0	1	Save all the current list parameter values of the selected log page into non-volatile storage.
1	xx	1	x	Do not save any of the log parameters into non-volatile storage.

6. LOG SELECT command

Table 4 lists the definitions of the LOG SELECT command descriptor block fields:

Table 4 - LOG SELECT fields

PCR bit	SP bit	PC field	List length	Description
0	-	--	-	Indicates that the log parameters are not be reset.
1	x	xx	0000h	Indicates the target sets all implemented parameter values to the target-defined default values.
1	x	xx	GT 0	An illegal condition.
-	0	--	-	Indicates the target does not save any of the log parameters.
-	1	--	-	Indicates that after performing the specified LOG SELECT operation the target saves to non-volatile memory all savable log parameters. (See table 5 to determine the interaction between the SP and DS bits.)
-	-	00	-	Indicates the initiator sends threshold values.
-	-	01	-	Indicates the initiator sends cumulative values.
	-	10	-	Indicates the initiator sends default threshold values.
	-	11	-	Indicates the initiator sends default cumulative values.

Table 5 lists the save options for the LOG SELECT command. All the log parameters selected for saving are saved to non-volatile storage after the target performs the specified LOG SELECT operation. Further save operations are a function of the TSD bit in the log parameter control byte.

Table 5 - LOG SELECT save options

LOG SELECT fields		Log page parameter control byte value		Target action
SP bit	PC field	DS bit	LP bit	
0	xx	x	x	Do not save any of the log parameters into non-volatile storage.
1	00	0	0	Save all the threshold values of the selected log page into non-volatile storage.
1	01	0	0	Save all the cumulative values of the selected log page into non-volatile storage.
1	10	0	0	Save all the default threshold values of the selected log page into non-volatile storage.
1	11	0	0	Save all the default cumulative values of the selected log page into non-volatile storage.
1	xx	0	1	Save all the list parameter values of the selected log page into non-volatile storage.
1	xx	1	x	Do not save any of the log parameters into non- volatile storage.

Table 6 lists the possible parameter values which can be controlled:

Table 6 - Controlled parameter values

PC Field	LP Bit	Updated parameter value usage
00	0	The parameter values for all the log parameters in the log page(s) sent to the target are used as threshold values, unless the LP bit is set.
01	0	The parameter values for all the log parameters in the log page(s) sent to the target are used as cumulative values, unless the LP bit is set.
10	0	The target sets the current threshold values to the default threshold values for all the log parameters specified in the log page(s) sent during a LOG SELECT command, unless the LP bit is set.
11	0	The target sets the current cumulative values to the default cumulative values for all the log parameters specified in the log page(s) sent during a LOG SELECT command, unless the LP bit is set.
xx	1	Replace the current list parameter with the list parameter sent to the target.

7. Exception conditions during logging

The logging operations can be setup to keep track of many different things. What those things are is left up to the imagination of the implementor. But what should be well defined is how a target informs the initiator when a log reaches a critical point thereby creating an exception condition. What follows is a description of how the target deals with these exception conditions.

Table 7 lists the definitions of the log page parameter control byte.

Table 7 - Log page parameter control byte definition

DU bit	DS bit	TSD bit	ETC bit	TMC field	LP bit	Description
0	-	-	-	--	-	Indicates that the target updates the log parameter value to reflect all events that should be noted by that log parameter.
1	-	-	-	--	-	Indicates that the target does not update the log parameter value except in response to a LOG SELECT command that specifies a new value the log parameter.
-	0	-	-	--	-	Indicates that the target supports saving for of the log parameter.
-	1	-	-	--	-	Indicates the target does not support saving of the log parameter in response to a LOG SELECT or LOG SENSE command.
-	-	0	-	--	-	Indicates that the target provides a target-defined method of saving log parameters.
-	-	1	-	--	-	Indicates that either the target does not provide a target-defined method for saving log parameters or the target- defined method has been disabled by the initiator.
-	-	-	0	--	-	Indicates that a comparison between the threshold value and the cumulative value is not performed.
-	-	-	1	--	-	Indicates that a comparison to the threshold value is performed whenever the cumulative value is updated.
-		-	-	00	-	Indicates the target informs the initiator on every update to the cumulative value.
-		-	-	01	-	Indicates the target informs the initiator every time the cumulative value is equal to the threshold value.
-	-	-	-	10	-	Indicates the target informs the initiator every time the cumulative value is not equal to the threshold value.
-	-	-	-	11	-	Indicates the target informs the initiator every time the cumulative value is greater than the threshold value.
-	-	-	-	--	0	Indicates the log parameter is a data counter.
-	-	-	-	--	1	Indicates the log parameter is a list parameter.

Table 8 is a description of how the target deals with exception conditions.

Table 8 - Exception condition handling

Log page parameter control byte fields				Control mode page	
DU bit	ETC bit	TMC field	LP bit	RLEC bit	Target action
x	x	xx	x	0	No logging activities will cause a contingent allegiance condition or a unit attention condition.
x	0	GT 0	1	x	An illegal condition.
x	1	xx	1	x	An illegal condition
0	1	xx	0	1	Follow pseudocode 1 (see 7.1)
0	0	NV	0	1	Follow pseudocode 2 (see 7.2)
0	0	00	1	1	Follow pseudocode 3 (see 7.3)
	x	xx	x	x	

7.1 Pseudocode 1

IF the threshold condition as defined by the TMC field is met:

a) IF there is an active I/O process
   a) complete the active I/O process
   b) If a contingent allegiance condition exists wait for it to be cleared
   END
b) issue a unit attention condition to all initiators that have set the RLEC bit to one
c) IF the unit attention condition is ignored
   a) continue normal operations until the threshold condition is met again
   END

END

7.2 Pseudocode 2

IF a log counter reaches its maximum value:

a) set DU to 1
b) IF there is no active I/O process
   a) wait until there is an active I/O process
   END
c) complete the active I/O process
d) IF no contingent allegiance condition exists
   a) create a contingent allegiance condition with a sense key of RECOVERED ERROR and sense code of LOG EXCEPTION, COUNT AT MAXIMUM
   END
e) Wait for the contingent allegiance condition to be cleared
f) IF the cause of the counter reaching maximum is not cleared by the initiator
   a) Do not create a contingent allegiance condition and do not increment the counter
   END

END

7.3 Pseudocode 3

IF the log of parameters is full:

a) place the new log parameter code value into the lowest parameter code value position (wrap-around the parameter codes)
b) IF there is no active I/O process
    a) wait until there is an active I/O process
    END
c) complete the active I/O process
d) IF no contingent allegiance condition exists
    a) create a contingent allegiance condition with a sense key of RECOVERED ERROR and an sense code of LOG EXCEPTION, LIST CODES EXHAUSTED
    END
e) wait for the contingent allegiance condition to be cleared
f) IF the cause of the log of parameters filling is not cleared by the initiator
    a) create a contingent allegiance condition every time an entry is placed into the log of parameters
    END

END