

To: T10 Technical Committee  
From: Rob Elliott, HP (elliott@hp.com)  
Date: 21 November 2003  
Subject: 04-007r0 SES-2 SPC-3 Generation codes for Help Text and String pages

### **Revision history**

Revision 0 (21 November 2003) First revision

### **Related documents**

ses2r05 - SCSI Enclosure Services - 2 revision 5

### **Overview**

After incorporating the sub-enclosure annex into the main body of SES-2, a flaw becomes more obvious in the Help Text (page 03h) and String Out/String In (page 04h) diagnostic page definitions when sub-enclosures are used: they lack Generation Code fields. If Help Text or String In field is read after the sub-enclosure configuration changes, there is no notice of the change; the wrong help text or string could be returned for a sub-enclosure. If String Out is accessed after a change, there is no prevention from misdirecting the string to the wrong sub-enclosure.

One solution is to add a generation code at the end of the sub-enclosure versions of the Help Text list and the String In list. This would not match the format of other pages. String Out would not accommodate this solution.

Another solution is to redefine the existing pages, and expect software to read version descriptors from standard INQUIRY data to parse the pages correctly. For attached enclosure service processes, though, version descriptors (describing the SES process) are not available.

Another solution is to redefine the existing pages and add a bit to the Configuration page indicating the new format is being used. However, there are only two bits left in that page and again it depends on software to seek out the version information ahead of time.

Another solution is to obsolete the current pages and define new ones (as pages 0Bh and 0Ch) that include generation codes. When sub-enclosures are not present, there is not much of a problem with the existing pages.

A similar solution is to keep the current pages for the primary enclosure only (obsoleting the sub-enclosure fields in them) and define new pages (as pages 0Bh and 0Ch) that include generation codes and are designed for sub-enclosures. This is the cleanest and most compatible solution.

### **Suggested changes**

## **6 Parameters for enclosure services devices**

### **6.1 Diagnostic parameters**

#### **6.1.1 Diagnostic parameters overview**

This clause describes the diagnostic page structure and the diagnostic pages that are applicable to enclosure services devices and other device types that provide communications access to an enclosure services process. Each diagnostic page provides either control (outbound) or status (inbound) data transmission to or from the enclosure process.

The diagnostic page format is specified in SPC-3. All diagnostic pages have the diagnostic page header defined in SPC-3, including the PAGE CODE and PAGE LENGTH fields.

The PAGE CODE field identifies the diagnostic page being sent or requested. The page codes are defined in table 1.

Table 1 — Diagnostic page codes for enclosure service devices

Page code	Description	Control or status	Reference
00h	Supported Diagnostic Pages	Status	SPC-3
01h	Configuration diagnostic page	Status	6.1.2
02h	Enclosure Control diagnostic page	Control	6.1.3
	Enclosure Status diagnostic page	Status	6.1.4
03h	Help Text diagnostic page	Status	6.1.2
04h	String Out diagnostic page	Control	6.1.3
	String In diagnostic page	Status	6.1.4
05h	Threshold Out diagnostic page	Control	6.1.8
	Threshold In diagnostic page	Status	6.1.9
06h	Obsolete	N/A	
07h	Element Descriptor diagnostic page	Status	6.1.10
08h	Short Enclosure Status diagnostic page	Status	6.1.11
09h	Enclosure Busy diagnostic page	Status	6.1.12
0Ah	Device Element Status diagnostic page	Status	6.1.13
<a href="#">0Bh</a>	<a href="#">Sub-enclosure Help Text diagnostic page</a>	<a href="#">Status</a>	<a href="#">6.1.2</a>
<a href="#">0Ch</a>	<a href="#">Sub-enclosure String Out diagnostic page</a>	<a href="#">Control</a>	<a href="#">6.1.3</a>
	<a href="#">Sub-enclosure String In diagnostic page</a>	<a href="#">Status</a>	<a href="#">6.1.4</a>
<a href="#">0Dh-0Fh</a>	Reserved for SES	N/A	6.1
10h-1Fh	Vendor-specific SES diagnostic pages	N/A	6.1
20h-3Fh	Reserved (applies to all device type pages)	N/A	SPC-3
40h-7Fh	See specific device type for definition Reserved for the SES device type	N/A	SPC-3
80h-FFh	Vendor-specific pages	N/A	SPC-3

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Editor's Note 1: SPC-3 currently maintains a list of page codes in main text (7.1.1). 04-010 proposes it drop that list, but still maintain a list in annex C. Either way, SPC-3 needs to be add the two new page codes.

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### 6.1.2 Help Text diagnostic page

The Help Text diagnostic page contains a string of characters from the [primary sub-enclosure](#) that describes the present state of the enclosure and provides text indicating what corrective actions, if any, are desirable to bring the enclosure to its fully operational state. The Help Text diagnostic page is intended to allow the writing of enclosure independent application clients that return enclosure specific text describing the state of the enclosure and explaining enclosure dependent corrective actions that may be required. The page is optional. The language and character set of the help text are defined by the Language element (see 7.3.18). [This page does not support sub-enclosures; the Sub-enclosure Help Text diagnostic page \(see 6.1.xx\) does.](#)

The Help Text diagnostic page is read by the RECEIVE DIAGNOSTIC RESULTS command. If a PAGE CODE of 03h is transmitted using a SEND DIAGNOSTIC command, the command shall be treated as having an invalid field error (see 4.5).

Table 2 describes the Help Text diagnostic page.

**Table 2 — Help Text diagnostic page**

Byte\Bit	7	6	5	4	3	2	1	0
0	PAGE CODE (03h)							
1	<del>NUMBER OF SUB-ENCLOSURES</del> ZERO (00h)							
2	(MSB)	PAGE LENGTH (n-3)						(LSB)
3								
4	Help text							
n								

~~The NUMBER OF SUB-ENCLOSURES field specifies the number of separate sub-enclosure help texts that are included, not including the primary sub-enclosure. The NUMBER OF SUB-ENCLOSURES value shall be the same as the number of sub-enclosures value in the Configuration diagnostic page.~~

The ZERO field is set to 00h.

~~If the NUMBER OF SUB-ENCLOSURES field is set to 00h, t~~he format of the help text is described in table 3.

**Table 3 — Help Text if NUMBER OF SUB-ENCLOSURES is set to 00h**

Byte\Bit	7	6	5	4	3	2	1	0
0	ENCLOSURE HELP TEXT							
m								

The ENCLOSURE HELP TEXT field contains text describing what corrective actions should be performed on the enclosure to change it from its present state to a fully operational state. The text shall use the language and character set specified by the Language element (see 7.3.18).

The format of the sub-enclosure help text is described in table 4.

**Table 4 — Sub-enclosure help text format**

Byte\Bit	7	6	5	4	3	2	1	0
0	Reserved							
1	SUB-ENCLOSURE IDENTIFIER							
2	(MSB)	SUB-ENCLOSURE HELP TEXT LENGTH						(LSB)
3								
4	SUB-ENCLOSURE HELP TEXT							
m								

The SUB-ENCLOSURE IDENTIFIER field indicates the sub-enclosure identifier to which the help text applies.

The SUB-ENCLOSURE HELP TEXT LENGTH field indicates the number of bytes in the SUB-ENCLOSURE HELP TEXT field. If a sub-enclosure has no help text, the SUB-ENCLOSURE HELP TEXT LENGTH field shall contain zero.

The SUB-ENCLOSURE HELP TEXT field contains text describing what corrective actions should be performed on the sub-enclosure to change it from its present state to a fully operational state. The text shall use the

language and character set specified by the Language element (see 7.3.18). The first SUB-ENCLOSURE HELP TEXT field shall be for the primary sub-enclosure; SUB-ENCLOSURE HELP TEXT fields for the remaining sub-enclosures may follow in any order.

### 6.1.3 String Out diagnostic page

The String Out diagnostic page transmits an enclosure dependent binary string from the application client to the enclosure services process. The string may contain bits describing indicator states, text or graphic display information, or control information outside the context of the enclosure elements defined in the Configuration diagnostic page (see 6.1.2).

[This page does not support sub-enclosures; the Sub-enclosure String Out diagnostic page \(see 6.1.xx\) does.](#)

The format is vendor specific. For standalone enclosure services processes, an application client may select the format of the string using the manufacturer name and mode from the standard INQUIRY data (see SPC-3) or using the enclosure header information in the Configuration diagnostic page. For attached enclosure services processes, an application client should select the format of the string using the enclosure header information in the Configuration diagnostic page.

The request for a page using the RECEIVE DIAGNOSTIC RESULTS command with PAGE CODE 04h is defined as the request for a String In diagnostic page (see 6.1.4).

Table 5 describes the String Out diagnostic page transmitted using the SEND DIAGNOSTIC command.

**Table 5 — String Out diagnostic page**

Byte\Bit	7	6	5	4	3	2	1	0	
0	PAGE CODE (04h)								
1	<del>SUB-ENCLOSURE IDENTIFIER</del> <u>Obsolete</u>								
2	(MSB)	PAGE LENGTH (n-3)							
3							(LSB)		
4	<del>Vendor-specific bytes</del> <u>String Out data</u>								
n									

~~The SUB-ENCLOSURE IDENTIFIER field specifies a vendor-specific identifier for the sub-enclosure to which the application client wants the vendor-specific bytes sent. The SUB-ENCLOSURE IDENTIFIER value shall match a SUB-ENCLOSURE IDENTIFIER value found in the Configuration diagnostic page, or the enclosure services process shall report an invalid field error (see 4.5).~~

The ~~vendor-specific bytes~~ String Out data shall contain the vendor-specific information to be transferred from the application client to the enclosure services process of the ~~specified~~ primary sub-enclosure.

### 6.1.4 String In diagnostic page

The String In diagnostic page transmits ~~sub-enclosure dependent~~ binary string(s) from the enclosure services process of the primary sub-enclosure to the application client. The strings may contain bits describing keyboard states, switch states, or the content of other information provided through or by the primary sub-enclosure to the application client.

[This page does not support sub-enclosures; the Sub-enclosure String Out diagnostic page \(see 6.1.xx\) does.](#)

The format of each string is vendor specific. For standalone enclosure services processes, an application client may determine the format of the string using the manufacturer name and mode from the standard INQUIRY data (see SPC-3) or using the enclosure header information in the Configuration diagnostic page (see 6.1.2). For attached enclosure services processes, an application client should select the format of the string using the enclosure header information in the Configuration diagnostic page.

The transmission of a page using the SEND DIAGNOSTIC command with PAGE CODE 04h is defined as the transmission of a String Out diagnostic page (see 6.1.3). Table 6 describes the String In diagnostic page received using the RECEIVE DIAGNOSTIC RESULTS command.

**Table 6 — String In diagnostic page**

Byte\Bit	7	6	5	4	3	2	1	0
0	PAGE CODE (04h)							
1	<del>NUMBER OF SUB-ENCLOSURES</del> ZERO (00h)							
2	(MSB)	PAGE LENGTH (n-3)						(LSB)
3								
4	String In data							
n								

~~The NUMBER OF SUB-ENCLOSURES field specifies the number of separate sub-enclosure string in data values that are included, not including the primary sub-enclosure. The NUMBER OF SUB-ENCLOSURES value shall be the same as the number of sub-enclosures value in the Configuration diagnostic page.~~

The ZERO field is set to 00h.

~~If the NUMBER OF SUB-ENCLOSURES field is set to 00h, t~~he format of the string in data is described in table 7.

**Table 7 — String In data if NUMBER OF SUB-ENCLOSURES is set to 00h**

Byte\Bit	7	6	5	4	3	2	1	0
0	ENCLOSURE STRING IN DATA							
m								

The ENCLOSURE STRING IN field shall contain the vendor specific information to be transferred from the enclosure services process [of the primary sub-enclosure](#) to the application client.

### 6.1.5 [Sub-enclosure](#) Help Text diagnostic page

The [Sub-enclosure](#) Help Text diagnostic page contains a string of characters from the enclosure that describes the present state of the enclosure and provides text indicating what corrective actions, if any, are desirable to bring the enclosure to its fully operational state. The [Sub-enclosure](#) Help Text diagnostic page is intended to allow the writing of enclosure independent application clients that return enclosure specific text describing the state of the enclosure and explaining enclosure dependent corrective actions that may be required. The page is optional. The language and character set of the help text are defined by the Language element (see 7.3.18).

The [Sub-enclosure](#) Help Text diagnostic page is read by the RECEIVE DIAGNOSTIC RESULTS command. If a PAGE CODE of 0Bh is transmitted using a SEND DIAGNOSTIC command, the command shall be treated as having an invalid field error (see 4.5).

Table 2 describes the [Sub-enclosure](#) Help Text diagnostic page.

**Table 8 — Sub-enclosure Help Text diagnostic page**

Byte\Bit	7	6	5	4	3	2	1	0
0	PAGE CODE (0Bh)							
1	NUMBER OF SUB-ENCLOSURES							
2	(MSB)	PAGE LENGTH (n-3)						(LSB)
4	(MSB)	<a href="#">GENERATION CODE</a>						(LSB)
8	Help text							
n								

[The GENERATION CODE field contains the same value as the GENERATION CODE field in the Configuration diagnostic page \(see 6.1.2\).](#)

The NUMBER OF SUB-ENCLOSURES field specifies the number of separate sub-enclosure help texts that are included, not including the primary sub-enclosure. The NUMBER OF SUB-ENCLOSURES value shall be the same as the number of sub-enclosures value in the Configuration diagnostic page.

If the NUMBER OF SUB-ENCLOSURES field is set to 00h, the format of the help text is described in table 3.

**Table 9 — Help Text if NUMBER OF SUB-ENCLOSURES is set to 00h**

Byte\Bit	7	6	5	4	3	2	1	0
0	ENCLOSURE HELP TEXT							
m								

The ENCLOSURE HELP TEXT field contains text describing what corrective actions should be performed on the enclosure to change it from its present state to a fully operational state. The text shall use the language and character set specified by the Language element (see 7.3.18).

If the NUMBER OF SUB-ENCLOSURES field is not set to 00h, the format of the help text is described in table 12.

**Table 10 — Help Text if NUMBER OF SUB-ENCLOSURES is not set to 00h**

Byte\Bit	7	6	5	4	3	2	1	0
0	Sub-enclosure help text (primary sub-enclosure)							
m								
	Sub-enclosure help text list							
m + 1	Sub-enclosure help text							
x								
	...							
y + 1	Sub-enclosure help text							
z								

The format of the sub-enclosure help text is described in table 4.

**Table 11 — Sub-enclosure help text format**

Byte\Bit	7	6	5	4	3	2	1	0
0	Reserved							
1	SUB-ENCLOSURE IDENTIFIER							
2	(MSB)	SUB-ENCLOSURE HELP TEXT LENGTH						(LSB)
3								
4	SUB-ENCLOSURE HELP TEXT							
m								

The SUB-ENCLOSURE IDENTIFIER field indicates the sub-enclosure identifier to which the help text applies.

The SUB-ENCLOSURE HELP TEXT LENGTH field indicates the number of bytes in the SUB-ENCLOSURE HELP TEXT field. If a sub-enclosure has no help text, the SUB-ENCLOSURE HELP TEXT LENGTH field shall contain zero.

The SUB-ENCLOSURE HELP TEXT field contains text describing what corrective actions should be performed on the sub-enclosure to change it from its present state to a fully operational state. The text shall use the language and character set specified by the Language element (see 7.3.18). The first SUB-ENCLOSURE HELP TEXT field shall be for the primary sub-enclosure; SUB-ENCLOSURE HELP TEXT fields for the remaining sub-enclosures may follow in any order.

**6.1.6 Sub-enclosure String Out diagnostic page**

The [Sub-enclosure](#) String Out diagnostic page transmits an enclosure dependent binary string from the application client to the enclosure services process. The string may contain bits describing indicator states, text or graphic display information, or control information outside the context of the enclosure elements defined in the Configuration diagnostic page (see 6.1.2).

The format is vendor specific. For standalone enclosure services processes, an application client may select the format of the string using the manufacturer name and mode from the standard INQUIRY data (see SPC-3) or using the enclosure header information in the Configuration diagnostic page. For attached enclosure services processes, an application client should select the format of the string using the enclosure header information in the Configuration diagnostic page.

The request for a page using the RECEIVE DIAGNOSTIC RESULTS command with PAGE CODE 04h is defined as the request for a String In diagnostic page (see 6.1.4).

Table 5 describes the [Sub-enclosure](#) String Out diagnostic page transmitted using the SEND DIAGNOSTIC command.

**Table 12 — Sub-enclosure String Out diagnostic page**

Byte\Bit	7	6	5	4	3	2	1	0
0	PAGE CODE (04h)							
1	SUB-ENCLOSURE IDENTIFIER							
2	(MSB)	PAGE LENGTH (n-3)						(LSB)
3								
<a href="#">4</a>	<a href="#">(MSB)</a>	<a href="#">GENERATION CODE</a>						<a href="#">(LSB)</a>
<a href="#">7</a>								
<a href="#">8</a>	<del>Vendor specific</del> <a href="#">String Out data</a>							
n								

The SUB-ENCLOSURE IDENTIFIER field specifies a vendor-specific identifier for the sub-enclosure to which the application client wants the ~~vendor-specific bytes~~ [String Out data](#) sent. The SUB-ENCLOSURE IDENTIFIER value shall match a SUB-ENCLOSURE IDENTIFIER value found in the Configuration diagnostic page, or the enclosure services process shall report an invalid field error (see 4.5).

[The GENERATION CODE field shall have the value expected to be found in the GENERATION CODE field of the Configuration diagnostic page \(see 6.1.2\). To prevent the misinterpretation of the String Out data, the enclosure services process shall verify that the value of the GENERATION CODE field matches the generation code value known by the enclosure services process. If there is a mismatch, the application client shall be notified of an invalid field error \(see 4.5\) and the enclosure services process shall ignore the remainder of the String Out diagnostic page.](#)

The ~~vendor-specific bytes~~[String Out data](#) shall contain the vendor-specific information to be transferred from the application client to the enclosure services process of the specified sub-enclosure.

### 6.1.7 [Sub-enclosure String In diagnostic page](#)

The [Sub-enclosure String In](#) diagnostic page transmits sub-enclosure dependent binary string(s) from the enclosure services process to the application client. The strings may contain bits describing keyboard states, switch states, or the content of other information provided through or by the sub-enclosure to the application client.

The format of each string is vendor specific. For standalone enclosure services processes, an application client may determine the format of the string using the manufacturer name and mode from the standard INQUIRY data (see SPC-3) or using the enclosure header information in the Configuration diagnostic page (see 6.1.2). For attached enclosure services processes, an application client should select the format of the string using the enclosure header information in the Configuration diagnostic page.

The transmission of a page using the SEND DIAGNOSTIC command with PAGE CODE 04h is defined as the transmission of a [Sub-enclosure String Out](#) diagnostic page (see 6.1.3). Table 6 describes the String In diagnostic page received using the RECEIVE DIAGNOSTIC RESULTS command.

Table 13 — [Sub-enclosure String In diagnostic page](#)

Byte\Bit	7	6	5	4	3	2	1	0
0	PAGE CODE (04h)							
1	NUMBER OF SUB-ENCLOSURES							
2	(MSB)	PAGE LENGTH (n-3)						(LSB)
4	(MSB)	<a href="#">GENERATION CODE</a>						(LSB)
8	String In data							
n								

[The GENERATION CODE field contains the same value as the GENERATION CODE field in the Configuration diagnostic page \(see 6.1.2\).](#)

The NUMBER OF SUB-ENCLOSURES field specifies the number of separate sub-enclosure string in data values that are included, not including the primary sub-enclosure. The NUMBER OF SUB-ENCLOSURES value shall be the same as the number of sub-enclosures value in the Configuration diagnostic page.



If the NUMBER OF SUB-ENCLOSURES field is set to 00h, the format of the string in data is described in table 7.

**Table 14 — String In data if NUMBER OF SUB-ENCLOSURES is set to 00h**

Byte\Bit	7	6	5	4	3	2	1	0
0	ENCLOSURE STRING IN DATA							
m								

The ENCLOSURE STRING IN field shall contain the vendor specific information to be transferred from the enclosure services process to the application client.

If the NUMBER OF SUB-ENCLOSURES field is not set to 00h, the format of the string in data is described in table 17.

**Table 15 — String In data if NUMBER OF SUB-ENCLOSURES is not set to 00h**

Byte\Bit	7	6	5	4	3	2	1	0
0	Sub-enclosure string in data (primary sub-enclosure)							
m								
	Sub-enclosure string in data list							
m + 1	Sub-enclosure string in data							
x								
	...							
y + 1	Sub-enclosure string in data							
z								

The format of the sub-enclosure string in data is described in table 18.

**Table 16 — Sub-enclosure string in data format**

Byte\Bit	7	6	5	4	3	2	1	0
0	Reserved							
1	SUB-ENCLOSURE IDENTIFIER							
2	(MSB)	SUB-ENCLOSURE STRING IN DATA LENGTH						(LSB)
3								
4	SUB-ENCLOSURE STRING IN DATA							
m								

The SUB-ENCLOSURE IDENTIFIER field indicates the sub-enclosure identifier to which the string in data applies.

The SUB-ENCLOSURE STRING IN DATA LENGTH field indicates the number of bytes in the SUB-ENCLOSURE HELP TEXT field. If a sub-enclosure has no help text, the SUB-ENCLOSURE HELP TEXT LENGTH field shall contain zero.

The SUB-ENCLOSURE STRING IN DATA field shall contain the vendor specific information to be transferred from the enclosure services process to the application client. The first SUB-ENCLOSURE STRING IN DATA field shall be for the primary sub-enclosure; SUB-ENCLOSURE STRING IN DATA fields for the remaining sub-enclosures may follow in any order.