To: T10 Technical Committee
From: Rob Elliott, HP (elliott@hp.com)
Date: 12 December 2007
Subject: 08-026r0 SES-2 Element control and status nomenclature

Revision history
Revision 0 (12 December 2007) First revision

Related documents
ses2r15 - SCSI Enclosure Services - 2 (SES-2) revision 15

Overview
The three-level nested fields in SES-2 concerning elements are confusing.

Suggested editorial changes include:

a) Remove the “Diagnostic page header” and “Generation code” sublabels from the Configuration diagnostic page. Those terms are not used.
b) Remove the “Enclosure descriptor header” and “Enclosure descriptor” sublabels from the Enclosure descriptor. The first is not used, and the second is confusing since the name of the whole table is the same as the subset
c) Move the element list portions of the Enclosure Control, Enclosure Status, Threshold Out, and Threshold In diagnostic into their own tables.
d) Layer the 3 levels of nested data structures like this:
   A) The outer layer is the “control descriptor list.” It contains one entry per type descriptor header.
   B) The middle layer is the “control descriptor.” It contains one “overall control element” and a list of individual entries (an “individual control element list”).
   C) The inner layer is the “control element.” It contains the core 4-byte data structure.
   D) The other building block terms are status element, threshold control element, and threshold status element

If the inner layer uses “element control descriptor”, the middle level is fine with “element control descriptor list” but the outer layer wants to be “element control descriptor list descriptor list.”

Suggested changes to SES-2

3.1.9 element: ~~An object related to an enclosure. The object can be~~ A portion of an enclosure that is controlled, interrogated, or described by the enclosure services process.

3.1.nn element type: The type or kind of element (see 3.1.9) (e.g., Array Device, Power Supply, or Cooling). See clause 7.

3.1.nn control element: A data structure used to access an element (see 3.1.9) via the Enclosure Control diagnostic page (see 6.1.3). See clause 7.

3.1.nn status element: A data structure used to access an element (see 3.1.9) via the Enclosure Status diagnostic page (see 6.1.4). See clause 7.

3.1.nn threshold control element: A data structure used to access an element (see 3.1.9) via the Threshold Out diagnostic page (see 6.1.8).

3.1.nn threshold status element: A data structure used to access an element (see 3.1.9) via the Threshold In diagnostic page (see 6.1.9).

3.1.nn type descriptor: A type descriptor header (see 3.1.nn) and corresponding type descriptor text (see 3.1.nn), if any, accessed via the Configuration diagnostic page (see 6.1.1).

3.1.nn type descriptor header: A data structure in the Configuration diagnostic page (see 6.1.1) defining a set of elements (see 3.1.nn) sharing the same element type (see 3.1.nn) and type descriptor text (see 3.1.nn), if any.

3.1.nn type descriptor text: An optional text string in the Configuration diagnostic page (see 6.1.1) describing the elements (see 3.1.nn) defined by a type descriptor (see 3.1.nn).

6 Parameters for enclosure services devices

6.1 Diagnostic parameters

6.1.1 Diagnostic parameters overview

This clause defines 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. Control pages are accessed with the SEND DIAGNOSTIC command; status pages are accessed with the RECEIVE DIAGNOSTIC RESULTS command.

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 5.

6.1.2 Configuration diagnostic page

6.1.2.1 Configuration diagnostic page overview

The Configuration diagnostic page returns a list of elements in an enclosure. This page shall be implemented if the device supports enclosure services and does not use the Short Enclosure Status diagnostic page (see 6.1.11). The element list shall include all elements with defined element status or controls and may list any other elements in the enclosure. The Configuration diagnostic page provides enclosure descriptor information and parameters. The Configuration diagnostic page optionally provides descriptive text that applications clients may use to identify elements in more detail.

The Configuration diagnostic page is read by the RECEIVE DIAGNOSTIC RESULTS command with a PCV bit set to one and a PAGE CODE field set to 01h. If the parameter list for a SEND DIAGNOSTIC command contains a PAGE CODE field set to 01h, the command shall be treated as having an invalid field error (see 4.5).

~~Table 1 provides an overview of the components of the Configuration diagnostic page.~~

Table 1 — Layout of Configuration diagnostic page

Component name	Description	Reference
~~Diagnostic page header~~	~~Describes diagnostic page~~	~~SPC-4~~
~~Generation code~~	~~Generation code~~	~~this subclause~~
~~Enclosure descriptor list~~	~~Describes subenclosure(s)~~	~~6.1.2.2~~
~~Type descriptor header list for Device elements and Array Device elements~~	~~Contains type descriptor headers for Device elements and Array Device elements (see 7.3.2 and 7.3.3) in the enclosure~~	~~6.1.2.3~~
~~Type descriptor header list for other elements~~	~~Identifies all other element types included in the enclosure~~	~~6.1.2.3~~
~~Type descriptor text list~~	~~Provides optional text descriptions for each element type in the enclosure~~	~~6.1.2.4~~

Table 2 defines the Configuration diagnostic page.

Table 2 — Configuration diagnostic page

Byte\Bit	7	6	5	4	3	2	1	0
~~Diagnostic page header~~								
0	PAGE CODE (01h)							
1	NUMBER OF SUBENCLOSURES							
2	(MSB)	PAGE LENGTH (n - 3)						
3								(LSB)
~~Generation code~~								
4	(MSB)	GENERATION CODE						
7								(LSB)
Enclosure descriptor list								
		Enclosure descriptor(s) (one per subenclosure)(see table 3 in 6.1.2.2)						
Type descriptor header list								
		Type descriptor header(s)(see table 4 in 6.1.2.3)						
Type descriptor text list								
		Type descriptor text(s) (one per type descriptor header)(see 6.1.2.4)						
n								

The PAGE CODE field is set to 01h.

The NUMBER OF SUBENCLOSURES field indicates the number of separate subenclosures included in the enclosure descriptor list, not including the primary subenclosure (i.e., a NUMBER OF SUBENCLOSURES field set to zero indicates there is only a primary subenclosure). The primary subenclosure shall be described by the first enclosure descriptor. Additional subenclosures shall be described in subsequent enclosure descriptors, and may be included in any order.

The PAGE LENGTH field contains the length in bytes of the diagnostic parameters that follow.

The GENERATION CODE field is a four-byte counter that shall be incremented by one by the primary enclosure services process every time the enclosure configuration is modified such that the Configuration diagnostic page changes. The counter shall not be changed by ~~status changes for elements~~changes in status elements already described by the Configuration diagnostic page. Changes in the Configuration diagnostic page may be caused by changes in the number or configuration of subenclosures. Enclosures that do not change in configuration may use a fixed value of zero for the GENERATION CODE field.

Standalone enclosure services processes shall establish a unit attention condition (see SAM-3 and SPC-3) for all I_T nexuses when there is a change in value of the GENERATION CODE field. The additional sense code for the unit attention condition shall be TARGET OPERATING CONDITIONS HAVE CHANGED. The unit attention condition shall be cleared for all I_T nexuses without being reported if a RECEIVE DIAGNOSTIC RESULTS command is processed that requests a Configuration diagnostic page (i.e., the PAGE CODE field set to 01h).

Application clients accessing an attached enclosure services process should verify that the value of the GENERATION CODE field has not unexpectedly changed, since no unit attention condition is established by the device server.

The enclosure descriptor list contains an enclosure descriptor (see 6.1.2.2) for the primary subenclosure and each additional subenclosure, if any. The first enclosure descriptor shall describe the primary subenclosure. Subsequent enclosure descriptors shall describe the additional subenclosures, and may be in any order.

The type descriptor header list is defined in 6.1.2.3.

The type descriptor text list is defined in 6.1.2.4.

NOTE 1 - The type descriptor text list follows the complete type descriptor header list (i.e., after all type descriptor headers).

6.1.2.2 Enclosure descriptor ~~list~~

Table 3 defines the enclosure descriptor.

Table 3 — Enclosure descriptor

Byte\Bit	7	6	5	4	3	2	1	0
~~Enclosure descriptor header~~								
0	Reserved	RELATIVE ENCLOSURE SERVICE PROCESS IDENTIFIER			Reserved	NUMBER OF ENCLOSURE SERVICE PROCESSES		
1	SUBENCLOSURE IDENTIFIER							
2	NUMBER OF ~~ELEMENT~~ TYPE DESCRIPTOR HEADERS							
3	ENCLOSURE DESCRIPTOR LENGTH (m - 3)							
Enclosure descriptor								
4	ENCLOSURE LOGICAL IDENTIFIER							
11								
12	ENCLOSURE VENDOR IDENTIFICATION							
19								
20	PRODUCT IDENTIFICATION							
35								
36	PRODUCT REVISION LEVEL							
39								
40	Vendor-specific enclosure information							
m								

The RELATIVE ENCLOSURE SERVICE PROCESS IDENTIFIER field identifies the enclosure service process relative to other enclosure service processes in the enclosure. A value of 0h is reserved.

The NUMBER OF ENCLOSURE SERVICE PROCESSES field indicates the number of enclosure service processes supported by the enclosure. A value of 0h means the number is not known.

The SUBENCLOSURE IDENTIFIER indicates which subenclosure is being described by this enclosure descriptor. The primary subenclosure shall assign, in a vendor-specific manner, a fixed value for each subenclosure for all SES diagnostic pages associated with a given configuration. The subenclosure identifier assignments may change if the configuration changes.

The NUMBER OF ~~ELEMENT~~ TYPE DESCRIPTOR HEADERS field indicates the number of type descriptor headers in the Configuration diagnostic page with this subenclosure identifier. The total number of type descriptor headers is equal to the sum of the contents of the NUMBER OF ELEMENT TYPE DESCRIPTOR HEADERS fields for the primary subenclosure and all of the subenclosures.

The ENCLOSURE DESCRIPTOR LENGTH field indicates the number of bytes contained in the enclosure descriptor. The value shall be a multiple of four, having allowed values between 36 and 252. The ENCLOSURE DESCRIPTOR

LENGTH includes the length of the ENCLOSURE LOGICAL IDENTIFIER field, the ENCLOSURE VENDOR IDENTIFICATION field, the PRODUCT IDENTIFICATION field, the PRODUCT REVISION LEVEL field, and any vendor specific enclosure information.

The ENCLOSURE LOGICAL IDENTIFIER field contains a unique logical identifier for the subenclosure. It shall use an 8-byte NAA identifier, the format of which is defined in SPC-3 vital product data (see SPC-3). The ENCLOSURE LOGICAL IDENTIFIER shall be unique to the enclosure and may be different from the world wide name of the logical unit providing the enclosure services.

The ENCLOSURE VENDOR IDENTIFICATION field contains the identification string for the vendor of the subenclosure in the same format as specified for the vendor identification field of the standard INQUIRY data (see SPC-3). The ENCLOSURE VENDOR IDENTIFICATION may be different from the vendor identification of the logical unit providing the enclosure services.

The PRODUCT IDENTIFICATION field contains the product identification string for the subenclosure in the same format as specified for the product identification field of the standard INQUIRY data (see SPC-3). The PRODUCT IDENTIFICATION field may be different from the product identification of the device providing the enclosure services.

The PRODUCT REVISION LEVEL field shall contain the product revision level string for the subenclosure in the same format as specified for the product revision level field of the standard INQUIRY data (see SPC-3). The PRODUCT REVISION LEVEL may be different from the product revision level of the device providing the enclosure services.

The VENDOR-SPECIFIC ENCLOSURE INFORMATION field is optional.

6.1.2.3 Type descriptor header list

The TYPE DESCRIPTOR HEADER field indicates the element type being described, the number of such elements, the subenclosure where the elements are located, and the length of an optional text describing the element type. The format of the TYPE DESCRIPTOR HEADER is shown in table 4.

The elements of an enclosure shall be listed in the same order in:

a) the type descriptor header list and type descriptor text list (see 6.1.2.4) of the Configuration diagnostic page;
b) the Enclosure Control diagnostic page (see 6.1.3);
c) the Enclosure Status diagnostic page (see 6.1.4);
d) the Threshold Out diagnostic page (see 6.1.5); and
e) the Threshold In diagnostic page (see 6.1.6).

Editor's Note 1: The preceding list belongs in a model section since it affects multiple pages.

The type descriptor header list shall contain type descriptor headers ~~Elements shall be listed~~ in ~~this~~the following order, regardless of their subenclosure identifiers:

1) Type descriptor headers for Device elements and Array Device elements (i.e., all those elements defining SCSI devices); and
2) Type descriptor headers for e~~E~~lements of of other types.

Type descriptor headers for elements other than Device elements and Array Device elements may be listed in any order ~~in the Configuration diagnostic page~~. ~~The type descriptor text list shall be placed after the type descriptor header list (i.e., after all type descriptor headers).~~

Table 4 — Type descriptor header format

Byte\Bit	7	6	5	4	3	2	1	0
0	ELEMENT TYPE							
1	NUMBER OF POSSIBLE ELEMENTS							
2	SUBENCLOSURE IDENTIFIER							
3	TYPE DESCRIPTOR TEXT LENGTH							

The ELEMENT TYPE field in the type descriptor header indicates the element type being described in the header. The list of element types is shown in table 58.

More than one type descriptor header may contain a given ELEMENT TYPE value. As an example, there may be two power supplies that provide +12 volts, and five power supplies that provide +5 volts. In this case, a separate TYPE DESCRIPTOR HEADER may be used for the +12 volt power supplies and for the +5 volt power supplies.

The NUMBER OF POSSIBLE ELEMENTS field in the type descriptor header indicates the number of elements of the indicated type that it is possible to install in the enclosure. The actual number of elements installed may be smaller than the number that the configuration is capable of accepting. ~~The NUMBER OF POSSIBLE ELEMENTS field may be zero, indicating that only the OVERALL CONTROL, OVERALL STATUS, or OVERALL THRESHOLD field is present in the applicable control, status, or threshold page, but that individual ELEMENT CONTROL, ELEMENT STATUS, or ELEMENT THRESHOLD fields are absent~~ If the NUMBER OF POSSIBLE ELEMENTS field is set to zero, there are one overall element and no individual elements corresponding to the element type descriptor (see 6.1.3, 6.1.4, 6.1.5, and 6.1.6). The maximum number of elements referenced by a single type descriptor header shall be 255.

The SUBENCLOSURE IDENTIFIER field in the type descriptor header contains a vendor specific identifier for the enclosure where the elements described by this type descriptor reside. Type descriptors describing elements in a subenclosure shall have the subenclosure identifier value contained in the enclosure descriptor for that subenclosure. For an enclosure services process that is directly accessed by an application client, the SUBENCLOSURE IDENTIFIER field shall be set to 00h. Such an enclosure is defined as a primary subenclosure.

The TYPE DESCRIPTOR TEXT LENGTH field in the type descriptor header contains the length in bytes of the type descriptor text string for the corresponding element. Each vendor specific element type shall have a TYPE DESCRIPTOR TEXT LENGTH field that is set to a nonzero value and shall have type descriptor text adequate to identify the element to an application client. Other element types may have a TYPE DESCRIPTOR TEXT LENGTH field set to zero.

6.1.2.4 Type descriptor text list

The type descriptor text is an optional text string from zero to 255 bytes for each type descriptor header (see 6.1.2.3). The text string, if it has a length greater than zero, may contain any descriptive information about the element type that may be useful to an application client that is displaying the configuration of the enclosure.

The type descriptor text list shall contain type descriptor texts ~~shall be placed~~ in the same order as the type descriptor headers, except that type descriptor texts of zero length shall be omitted.

Examples of information that may be included in the type descriptor text include the manufacturer's part number for a replacement element, a brief description of the element and its properties, or instructions about configuration limitations and redundancy requirements of the elements of that type.

The type descriptor text uses the character encoding and language specified by the Language element (see 7.3.18).

6.1.3 Enclosure Control diagnostic page

~~The Enclosure Control diagnostic page provides control information to each of the elements identified by the Configuration diagnostic page. In addition, a separate control field is provided for the collection of elements of the same type as defined by each type descriptor header. The data allows the application client to control many functions within the addressed enclosure.~~

~~The Enclosure Control diagnostic page contains an OVERALL CONTROL field for each element type described by a type descriptor header in the Configuration diagnostic page (see 6.1.2), and an ELEMENT CONTROL field for each of the elements of that type that have been allowed for by the NUMBER OF POSSIBLE ELEMENTS field of the Configuration diagnostic page. The list of fields shall be in the order defined by the Configuration diagnostic page. The relationship between the order of the ELEMENT CONTROL fields and the physical location of the element within the enclosure is vendor specific. The relationship may be described by the descriptor fields of the Configuration diagnostic page, by the descriptors in the Element Descriptor diagnostic page (see 6.1.10), or by external references. The relationship shall not change unless the generation code is incremented (see 6.1.2).~~

The Enclosure Control diagnostic page provides access to the control elements identified by the Configuration diagnostic page.

The Enclosure Control diagnostic page shall be implemented if the device supports enclosure services and does not use the Short Enclosure Status diagnostic page (see 6.1.11). The Enclosure Control diagnostic page is written by the SEND DIAGNOSTIC command. A RECEIVE DIAGNOSTIC RESULTS command with a PCV bit set to one and a page code field set to 02h is defined as the request to read the Enclosure Status diagnostic page (see 6.1.4).

Table 10 defines the Enclosure Control diagnostic page.

Table 10 — Enclosure Control diagnostic page

Byte\Bit	7	6	5	4	3	2	1	0
0	PAGE CODE (02h)							
1	Reserved				INFO	NON-CRIT	CRIT	UNRECOV
2	(MSB)							
3	PAGE LENGTH (n - 3)							(LSB)
4	(MSB)							
7	GENERATION CODE							(LSB)
~~Overall and element control by type list~~Control descriptor list								
8	Control descriptor (first)(see table 10)							
x								
...								
y	Control descriptor (last)(see table 10)							
n								
~~8~~	~~OVERALL CONTROL (first element type)~~							
~~11~~								
~~12~~	~~ELEMENT CONTROL (first element of first element type)~~							
~~15~~								
~~...~~								
~~(4 bytes)~~	~~ELEMENT CONTROL (last element of first element type)~~							
~~(4 bytes)~~	~~OVERALL CONTROL (second element type)~~							
~~(4 bytes)~~	~~ELEMENT CONTROL (first element of second element type)~~							
~~...~~								
~~n - 3~~	~~ELEMENT CONTROL (last element of last element type)~~							
~~n~~								

The PAGE CODE field is set to 02h.

The INFO, NON-CRIT, CRIT, and UNRECOV bits are mandatory and may be set to one in the enclosure by the application client when the application client has detected that one or more of the elements in the enclosure are not operating normally.

An INFO (informational condition) bit set to one specifies that the application client is detecting an informational condition (see 3.1.16). An INFO bit set to zero has no effect.

A NON-CRIT (noncritical condition) bit set to one specifies that the application client is detecting a noncritical condition (see 3.1.20). A NON-CRIT bit set to zero specifies that the application client is not detecting a noncritical condition. If the enclosure services process has independently determined that a noncritical condition is present, a request from the application client to set the NON-CRIT bit to zero shall be ignored by the enclosure services process.

A CRIT (critical condition) bit set to one specifies that the application client is detecting a critical condition (see 3.1.6). A CRIT bit set to zero specifies that the application client is not detecting a critical condition. If the enclosure services process has independently determined that a critical condition is present, a request from the application client to set the CRIT bit to zero shall be ignored by the enclosure services process.

An UNRECOV (unrecoverable condition) bit set to one specifies that the application client is detecting an unrecoverable condition (see 3.1.31). An UNRECOV bit set to zero specifies that the application client is not detecting an unrecoverable condition. If the enclosure services process has independently determined that an unrecoverable condition is present, a request from the application client to set the UNRECOV bit to zero shall be ignored by the enclosure services process.

The PAGE LENGTH field specifies the length in bytes of the diagnostic parameters that follow.

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 ~~OVERALL CONTROL and ELEMENT CONTROL fields~~control elements, 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 Enclosure Control diagnostic page.

~~The OVERALL CONTROL field for each element type has the same format as the corresponding ELEMENT CONTROL field. There is exactly one OVERALL CONTROL field for each type descriptor header in the Configuration diagnostic page (see table 2). The OVERALL CONTROL field provides control for all elements described in the ELEMENT CONTROL fields. Control values may be applied using either the OVERALL CONTROL field or the ELEMENT CONTROL field. Except as required by the enclosure services process, requests in the ELEMENT CONTROL field shall override requests in the OVERALL CONTROL field.~~

~~Following the OVERALL CONTROL field, there shall be one ELEMENT CONTROL field for each of the possible elements identified by the NUMBER OF POSSIBLE ELEMENTS field in the corresponding TYPE DESCRIPTOR HEADER. Each ELEMENT CONTROL field optionally contains control information for the element. Each element type has a standard fixed format for its control field. The general format for an ELEMENT CONTROL field is defined by table 59 of 7.2.1.~~

The control descriptor list contains a control descriptor for each type descriptor header in the Configuration diagnostic page (see 6.1.2).

Table 10 defines the control descriptor.

Table 10 — Control descriptor

Byte\Bit	7	6	5	4	3	2	1	0
0	Overall control element (see table 59 in 7.2.1)							
3								
Individual control element list								
4	Individual control element (first) (see table 59 in 7.2.1)							
7								
...								
m - 4	Individual control element (last) (see table 59 in 7.2.1)							
m								

The overall control element provides control for all the elements corresponding to the type descriptor header. The general format for the overall control element is defined by table 59 of 7.2.1.

The individual control element list contains an individual control element for each of the possible elements identified by the NUMBER OF POSSIBLE ELEMENTS field in the corresponding type descriptor header. Each control element contains control information for the element. The general format for the individual control element is defined by table 59 of 7.2.1.

Individual control elements override the overall control element as defined in table 11.

Table 11 — Control element processing

Individual control element SELECT bit	Overall control element SELECT bit	Description
0	0	The enclosure services process shall not change the element
	1	The enclosure services process shall change the element based on the overall control element
1	0	The enclosure services process shall change the element based on the individual control element
	1	The enclosure services process shall change the element based on the individual control element

6.1.4 Enclosure Status diagnostic page

~~The Enclosure Status diagnostic page returns status information for each of the elements identified by the Configuration diagnostic page (see 6.1.2). In addition, an OVERALL STATUS field is provided to collect information about the collection of elements of the same type defined by each TYPE DESCRIPTOR HEADER. The information provides the status about many functions within the addressed enclosure.~~

~~The Enclosure Status diagnostic page returns an OVERALL STATUS field for each element type described by a TYPE DESCRIPTOR HEADER in the Configuration diagnostic page and an ELEMENT STATUS field for each of the elements of that type that have been allowed for by the NUMBER OF POSSIBLE ELEMENTS field in the Configuration diagnostic page. The fields shall be in the order defined by the Configuration diagnostic page. The relationship between the order of the ELEMENT STATUS fields and the physical location of the element within the enclosure is vendor specific. The relationship may be described by the descriptor fields of the Configuration diagnostic page, by the descriptors in the Element Descriptor diagnostic page, or by external references. The relationship shall not change unless the GENERATION CODE field is incremented.~~

The Enclosure Status diagnostic page provides access to the status elements identified by the Configuration diagnostic page.

This page shall be implemented if the device supports enclosure services and does not use the Short Enclosure Status diagnostic page (see 6.1.11). The Enclosure Status diagnostic page is read by the RECEIVE DIAGNOSTIC RESULTS command with a PCV bit set to one and a PAGE CODE field set to 02h. The transmission of a page using the SEND DIAGNOSTIC command with a page code field set to 02h is defined as the transmission of an Enclosure Control diagnostic page (see 6.1.3).

Table 12 defines the Enclosure Status diagnostic page.

Table 12 — Enclosure Status diagnostic page

Byte\Bit	7	6	5	4	3	2	1	0
0	PAGE CODE (02h)							
1	Reserved			INVOP	INFO	NON-CRIT	CRIT	UNRECOV
2	(MSB)	PAGE LENGTH (n - 3)						
3								(LSB)
4	(MSB)	GENERATION CODE						
7								(LSB)
~~Overall and element status by type list~~Status descriptor list								
8		Status descriptor (first)(see table 13)						
x								
...								
y		Status descriptor (last)(see table 13)						
n								
~~8~~		~~OVERALL STATUS (first element type)~~						
~~11~~								
~~12~~		~~ELEMENT STATUS (first element of first element type)~~						
~~15~~								
~~...~~								
~~(4 bytes)~~		~~ELEMENT STATUS (last element of first element type)~~						
~~(4 bytes)~~		~~OVERALL STATUS (second element type)~~						
~~(4 bytes)~~		~~ELEMENT STATUS (first element of second element type)~~						
~~...~~								
~~n - 3~~		~~ELEMENT STATUS (last element of last element type)~~						
~~n~~								

The PAGE CODE field is set to 02h.

The INVOP, INFO, NON-CRIT, CRIT, and UNRECOV bits are mandatory. The bits may be read with an allocation length greater than 1 and may be examined by an enclosure polling procedure to determine if events have occurred that require reading the complete page. The bits are set independently and may be set in any combination. The bits may be set by either the enclosure services process or with the Enclosure Control diagnostic page.

The INVOP (Invalid operation requested) bit shall be set to one if an invalid field error has occurred (e.g., an Enclosure Control diagnostic page with an invalid format has previously been transmitted to the enclosure services process and an application client has not already been informed of the error) and the SEND DIAGNOSTIC command was not terminated with CHECK CONDITION status to notify the application client of the error.

Each time the INVOP bit is set to one:

a) standalone enclosure service processes shall set the INVOP bit to one the first time they return the Enclosure Status diagnostic page to the same I_T nexus that transmitted the invalid control page and shall set the INVOP bit to zero for subsequent requests; and
b) attached enclosure services processes shall set the INVOP bit to one the first time they return the Enclosure Status diagnostic page to any application client and shall set the INVOP bit to zero for subsequent requests.

An Invalid Operation Reason element may be included in the element list. If the INVOP bit is set to zero and an Invalid Operation Reason element (see 7.3.12) is included, the Invalid Operation Reason element shall be ignored.

An INFO (information) bit set to one indicates that one or more information conditions (see 3.1.16) have been detected by the enclosure services process or specified by an application client with the Enclosure Control diagnostic page. Each time the INFO bit is set to one by any mechanism:

a) standalone enclosure services processes (see 4.1.2) shall set the INFO bit set to one the first time they return the Enclosure Status diagnostic page to each I_T nexus and shall set the INFO bit to zero for subsequent requests; and
b) attached enclosure services processes (see 4.1.3) shall set the INFO bit set to one the first time they return the Enclosure Status diagnostic page to any application client and may set the INFO bit to zero for subsequent requests.

An INFO bit shall be set to one once as an indication to the application client that an information condition is available and not set to one again until a new information condition occurs.

A NON-CRIT (noncritical condition) bit set to one indicates that one or more noncritical conditions (see 3.1.20) have been detected by the enclosure services process or specified by an application client with the Enclosure Control diagnostic page. A NON-CRIT bit set to zero indicates that both the following conditions are met:

a) all noncritical conditions have been corrected in the enclosure; and
b) an application client has set the NON-CRIT bit to zero in the Enclosure Control diagnostic page.

A CRIT (critical condition) bit set to one indicates that one or more critical conditions (see 3.1.6) have been detected by the enclosure services process or specified by an application client with the Enclosure Control diagnostic page. A CRIT bit set to zero indicates that both the following conditions are met:

a) all critical conditions have been corrected in the enclosure; and
b) an application client has set the CRIT bit to zero in the Enclosure Control diagnostic page.

An UNRECOV (unrecoverable condition) bit set to one indicates that one or more unrecoverable conditions (see 3.1.31) have been detected by the enclosure services process or specified by an application client with the Enclosure Control diagnostic page. An UNRECOV bit set to zero indicates that both the following conditions are met:

a) all unrecoverable conditions have been corrected in the enclosure; and
b) an application client has set the UNRECOV bit to zero in the Enclosure Control diagnostic page.

The PAGE LENGTH field indicates the length in bytes of the diagnostic parameters that follow.

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

~~The OVERALL STATUS field for each element type has the same format as the corresponding ELEMENT STATUS field. There is exactly one OVERALL STATUS field for each TYPE DESCRIPTOR HEADER in the Configuration diagnostic page. The OVERALL STATUS optionally indicates a summary of the status for all of the elements of that type. The OVERALL STATUS also may be used to indicate the status of those elements whose individual status is not available, but that do have a measurable overall status.~~

~~An example of an enclosure that uses the OVERALL STATUS field is an enclosure with three temperature sensors. If the enclosure only reports the average of the three sensors, the OVERALL STATUS field contains the temperature information. If the enclosure reports the output of each sensor separately, the ELEMENT STATUS~~

~~fields contain the information. Both the OVERALL STATUS field and the ELEMENT STATUS field may contain information.~~

~~Zero or more ELEMENT STATUS fields are provided immediately after the OVERALL STATUS field for that element type. The number of ELEMENT STATUS fields shall be equal to the NUMBER OF POSSIBLE ELEMENTS specified by the corresponding TYPE DESCRIPTOR HEADER in the Configuration diagnostic page. Each ELEMENT STATUS field optionally indicates the status for the particular element. The general format for an ELEMENT STATUS field is defined by table 60 and by 7.3.~~

The status descriptor list contains a status descriptor for each type descriptor header in the Configuration diagnostic page (see 6.1.2).

Table 13 defines the status descriptor.

Table 13 — Status descriptor

Byte\Bit	7	6	5	4	3	2	1	0
0	Overall status element (see table 60 in 7.2.1)							
3								
Individual status element list								
4	Individual status element (first)(see table 60 in 7.2.1)							
7								
...								
m - 4	Individual status element (last)(see table 60 in 7.2.1)							
m								

The overall status element provides summary status for all the elements described by the type descriptor header and may provide status for elements whose individual status is not available. The general format for the overall status element is defined by table 60 of 7.2.1.

The individual status element list contains an individual status element for each of the possible elements identified by the NUMBER OF POSSIBLE ELEMENTS field in the corresponding type descriptor header..

Each individual status element optionally contains status information for the element. The general format for the individual status element is defined by table 60 of 7.2.1.

Individual status elements override the overall status element (e.g., an enclosure with three temperature sensors may report the average of the three sensors in the overall status element and/or may report the individual sensor values in the individual status elements). Both the overall status element and the element status element may contain information (e.g., the overall status element contains the average and the individual status elements contain the specific individual values).

6.1.5 Threshold Out diagnostic page

The Threshold Out diagnostic page is transmitted to the enclosure services process to establish threshold values for those elements that have limited sensing capability (e.g., voltage sensors, current sensors, and temperature sensors).

The Threshold Out diagnostic page is written by the SEND DIAGNOSTIC command. A RECEIVE DIAGNOSTIC RESULTS command with a PCV bit set to one and a PAGE CODE field set to 05h is defined as the request to read the Threshold In diagnostic page (see 6.1.6).

Table 14 defines the Threshold Out diagnostic page. Implementation of this page is optional.

Table 14 — Threshold Out diagnostic page

Byte\Bit	7	6	5	4	3	2	1	0
0	PAGE CODE (05h)							
1	Reserved							
2	(MSB)			PAGE LENGTH (n - 3)				
3								(LSB)
4	(MSB)			GENERATION CODE				
7								(LSB)
~~Overall and element threshold by type list~~Threshold control descriptor list								
8				Threshold control descriptor (first)(see table 15)				
x								
...								
y				Threshold control descriptor (last)(see table 15)				
n								
~~8~~				~~OVERALL THRESHOLD (first element type)~~				
~~11~~								
~~12~~				~~ELEMENT THRESHOLD (first element of first element type)~~				
~~15~~								
~~...~~								
~~(4 bytes)~~				~~ELEMENT THRESHOLD (last element of first element type)~~				
~~(4 bytes)~~				~~OVERALL THRESHOLD (second element type)~~				
~~(4 bytes)~~				~~ELEMENT THRESHOLD (first element of second element type)~~				
~~...~~								
~~n - 3~~				~~ELEMENT THRESHOLD (last element of last element type)~~				
~~n~~								

The PAGE CODE field is set to 05h.

The PAGE LENGTH field specifies the length in bytes of the diagnostic parameters that follow.

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 OVERALL THRESHOLD and ELEMENT THRESHOLD fields, 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 Threshold Out diagnostic page.

The OVERALL THRESHOLD field for each element type has the same format as the corresponding ELEMENT THRESHOLD field. There is exactly one OVERALL THRESHOLD field for each TYPE DESCRIPTOR HEADER in the Configuration diagnostic page (see table 2). The OVERALL THRESHOLD field provides threshold control for all elements described in the ELEMENT THRESHOLD fields. Threshold values may be applied using either the

OVERALL THRESHOLD field or the ELEMENT THRESHOLD field. Except as required by the enclosure services process, requests in the ELEMENT THRESHOLD field should override requests in the OVERALL THRESHOLD field.

Following the OVERALL THRESHOLD field, there shall be one ELEMENT THRESHOLD field for each of the possible elements identified by the NUMBER OF POSSIBLE ELEMENTS field in the corresponding TYPE DESCRIPTOR HEADER. The ELEMENT THRESHOLD field shall contain threshold information for the element.

The threshold control descriptor list contains a threshold control descriptor for each type descriptor header in the Configuration diagnostic page (see 6.1.2).

Table 15 defines the threshold control descriptor.

Table 15 — Threshold control descriptor

Byte\Bit	7	6	5	4	3	2	1	0
0	Overall threshold control element (see table 16)							
3								
Individual threshold control element list								
4	Individual threshold control element (first)(see table 16)							
7								
...								
m - 4	Individual threshold control element (last)(see table 16)							
m								

The overall threshold control element provides shared threshold control for all the elements described by the type descriptor header. The general format for the overall threshold control element is defined by table 16.

The individual threshold control elements list contains an individual threshold control element for each of the possible elements identified by the NUMBER OF POSSIBLE ELEMENTS field in the corresponding type descriptor header.

Each individual threshold control element optionally contains threshold control information for the element. The general format for the individual threshold control element is defined by table 16.

~~The OVERALL THRESHOLD field and the ELEMENT THRESHOLD field have the format specified in table 16~~Table 16 defines the threshold control element.

Table 16 — ~~OVERALL THRESHOLD and the ELEMENT THRESHOLD fields for Threshold Out diagnostic page~~Threshold control element

Byte\Bit	7	6	5	4	3	2	1	0
0	HIGH CRITICAL THRESHOLD							
1	HIGH WARNING THRESHOLD							
2	LOW WARNING THRESHOLD							
3	LOW CRITICAL THRESHOLD							

The HIGH CRITICAL THRESHOLD field recommends a value for the actual high critical threshold.

The HIGH WARNING THRESHOLD field recommends a value for the actual high warning threshold.

The LOW WARNING THRESHOLD field recommends a value for the actual low warning threshold.

The LOW CRITICAL THRESHOLD field recommends a value for the actual low critical threshold.

All threshold fields are advisory. The enclosure services process shall ignore the contents of the threshold field for those elements that have no value to be compared with a threshold and for those elements that do not implement the threshold function. For those elements that have a sensor value to compare with a threshold,

the enclosure services process may accept the fields transmitted in the overall threshold or the element threshold, may set the actual thresholds to a more appropriate value, or may ignore the contents of any or all of the threshold fields. An OVERALL THRESHOLD field or ELEMENT THRESHOLD field with all four thresholds having a value of zero shall be ignored. Any zero value in a field in an OVERALL THRESHOLD field or ELEMENT THRESHOLD field shall be ignored.

Table 58 of clause 7 lists those element fields that contain fields subject to thresholds and provides references to the clauses that specify the units and meanings of the thresholds. As an example, voltage sensor elements provide a threshold based on the allowable percentage variation in the sensed voltage. The threshold value is defined in 7.3.20 as a percentage of the nominal voltage in units of 0,5 %. A HIGH CRITICAL THRESHOLD field value of 14 specifies that a critical condition shall be indicated when the voltage is 7 % over the nominal maximum supply voltage, while a LOW WARNING THRESHOLD field value of 10 specifies that a noncritical condition shall be indicated when the voltage is 5 % under the nominal minimum supply voltage.

When the value of a sensed parameter increases above the actual high critical threshold value or falls below the actual low critical threshold value, a critical condition is indicated to the application client by one of the mechanisms defined in 4.6. For those devices that use CHECK CONDITION to indicate enclosure failures (see 4.6.4), the command shall be terminated and the sense key shall be set to HARDWARE ERROR and the additional sense code shall be set to ENCLOSURE FAILURE.

When the value of a sensed parameter increases above the actual high warning threshold value or falls below the actual low warning threshold value, a noncritical condition is indicated to the application client by one of the mechanisms defined in 4.6. For those devices that use CHECK CONDITION to indicate enclosure failures (see 4.6.4), the command shall be completed and the sense key shall be set to RECOVERED ERROR and the additional sense code shall be set to WARNING – ENCLOSURE DEGRADED.

6.1.6 Threshold In diagnostic page

The Threshold In diagnostic page is transmitted from the enclosure services process to the application client to report the actual threshold values for those elements that have limited sensing capability, for example voltage sensors, current sensors, and temperature sensors.

The Threshold In diagnostic page is read by the RECEIVE DIAGNOSTIC RESULTS command with a PCV bit set to one and a PAGE CODE field set to 05h. The transmission of a page using the SEND DIAGNOSTIC command with a PAGE CODE field set to 05h is defined as the transmission of a Threshold Out diagnostic page (see 6.1.5).

Table 17 defines the Threshold In diagnostic page. Implementation of this page is optional.

Table 17 — Threshold In diagnostic page

Byte\Bit	7	6	5	4	3	2	1	0
0	PAGE CODE (05h)							
1	Reserved			INVOP	Reserved			
2	(MSB)			PAGE LENGTH (n - 3)				
3								(LSB)
4	(MSB)			GENERATION CODE				
7								(LSB)
~~Overall and element threshold by type list~~Threshold status descriptor list								
8				Threshold status descriptor (first)(see (see table 18)				
x								
...								
y				Threshold status descriptor (last)(see table 18)				
n								
~~8~~				~~OVERALL THRESHOLD (first element type)~~				
~~11~~								
~~12~~				~~ELEMENT THRESHOLD (first element of first element type)~~				
~~15~~								
~~...~~								
~~(4 bytes)~~				~~ELEMENT THRESHOLD (last element of first element type)~~				
~~(4 bytes)~~				~~OVERALL THRESHOLD (second element type)~~				
~~(4 bytes)~~				~~ELEMENT THRESHOLD (first element of second element type)~~				
~~...~~								
~~n - 3~~				~~ELEMENT THRESHOLD (last element of last element type)~~				
~~n~~								

The PAGE CODE field is set to 05h.

The INVOP (INvalid operation requested) bit shall be set to one if a Threshold Out diagnostic page with an invalid format has previously been transmitted to the enclosure services process and an application client has not already been informed of the error if the SEND DIAGNOSTIC command sending the invalid Threshold Out diagnostic page was not terminated with CHECK CONDITION status to notify the application client of the error.

Each time the INVOP bit is set to one:

a) standalone enclosure service processes shall set the INVOP bit to one the first time they return the Threshold In diagnostic page to the same I_T nexus that transmitted the invalid control page and shall set the INVOP bit to zero for subsequent requests; and

b) attached enclosure services processes shall set the INVOP bit to one the first time they return the Threshold In diagnostic page to any application client and shall set the INVOP bit to zero for subsequent requests.

An Invalid Operation Reason element may be included in the element list. If the INVOP bit is set to zero and an Invalid Operation Reason element (see 7.3.12) is included, the Invalid Operation Reason element shall be ignored.

The PAGE LENGTH field indicates the length in bytes of the diagnostic parameters that follow.

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

~~The OVERALL THRESHOLD field for each element type has the same format as the corresponding ELEMENT THRESHOLD field. There is exactly one OVERALL THRESHOLD field for each TYPE DESCRIPTOR HEADER in the Configuration diagnostic page (see table 2). The OVERALL THRESHOLD optionally contains a summary of the threshold values for all of the elements of that type. The OVERALL THRESHOLD also may be used to contain the threshold values for those elements whose individual threshold values are not available, but that do have threshold values.~~

~~Following the OVERALL THRESHOLD field, there shall be one ELEMENT THRESHOLD field for each of the possible elements identified by the NUMBER OF POSSIBLE ELEMENTS field in the corresponding TYPE DESCRIPTOR HEADER. Each ELEMENT THRESHOLD field optionally contains the actual threshold information for the element.~~

The threshold status descriptor list contains a threshold status descriptor for each type descriptor header in the Configuration diagnostic page (see 6.1.2).

Table 18 defines the threshold status descriptor.

Table 18 — Threshold status descriptor

Byte\Bit	7	6	5	4	3	2	1	0
0	Overall threshold status element (see table 19)							
3								
Individual threshold status element list								
4	Individual threshold status element (first)(see table 19)							
7								
...								
m - 4	Individual threshold status element (last)(see table 19)							
m								

The overall threshold status element provides shared threshold status for all the elements described by the type descriptor header. The general format for the overall threshold status element is defined by table 19.

The individual threshold status elements list contains an individual threshold status element for each of the possible elements identified by the NUMBER OF POSSIBLE ELEMENTS field in the corresponding type descriptor header.

Each individual threshold status element optionally contains threshold status information for the element. The general format for the individual threshold status element is defined by table 19.

~~The OVERALL THRESHOLD field and the ELEMENT THRESHOLD field have the format specified in table 19~~Table 19 defines the threshold status element.

Table 19 — ~~OVERALL THRESHOLD and ELEMENT THRESHOLD fields for Threshold In diagnostic page~~Threshold status element

Byte\Bit	7	6	5	4	3	2	1	0
0	HIGH CRITICAL THRESHOLD							
1	HIGH WARNING THRESHOLD							
2	LOW WARNING THRESHOLD							
3	LOW CRITICAL THRESHOLD							

The HIGH CRITICAL THRESHOLD field indicates the value at which the enclosure indicates a critical condition if a higher value is detected by the sensor element. A value of zero indicates that the sensor element does not test a high critical threshold.

The HIGH WARNING THRESHOLD field indicates the value at which the enclosure indicates a noncritical condition if the sensor element detects a value higher than the specified threshold value. A value of zero indicates that the sensor element does not test a high warning threshold.

The LOW WARNING THRESHOLD field indicates the value at which the enclosure indicates a noncritical condition if the sensor element detects a value lower than the specified threshold value. A value of zero indicates that the sensor element does not test a low warning threshold.

The LOW CRITICAL THRESHOLD field indicates the value at which the enclosure indicates a critical condition if the sensor element detects a value lower than the specified threshold value. A value of zero indicates that the sensor element does not test a low critical threshold.

The threshold values represent the values that the enclosure is using at the time the Threshold In diagnostic page is returned.

Each 8-bit threshold value shall have the definition specified by the text describing the corresponding element field. As an example, voltage sensor elements measure voltage in units of 10 millivolts. The threshold value is defined by 7.3.20 as a percentage of the nominal voltage in units of 0,5 %. A HIGH CRITICAL THRESHOLD field value of 14 indicates that a critical condition is indicated when the voltage is 7 % over the nominal maximum supply voltage, while a LOW WARNING THRESHOLD field value of 10 indicates that a noncritical condition is indicated when the voltage is 5 % under the nominal minimum supply voltage.

7 Control and status element ~~Element~~ definitions

7.1 Control and status element ~~Element~~ definitions overview

This clause contains the format definitions for the ~~OVERALL CONTROL and ELEMENT CONTROL fields~~control elements in the Enclosure Control diagnostic page (see 6.1.3) and the ~~OVERALL STATUS and ELEMENT STATUS fields~~status elements in the Enclosure Status diagnostic page (see 6.1.4). The field formats generally are different for different element types and are described in 7.3. Field format definitions common to all element types and specific to different element types are described in 7.2.2 and 7.2.3.

The definition of the ~~OVERALL THRESHOLD and ELEMENT THRESHOLD fields~~threshold control elements for the Threshold Out diagnostic page (see 6.1.8) and the threshold status elements for the Threshold In diagnostic page (see 6.1.9) are defined in 7.3 for those elements supporting threshold values.

Table 57 ~~lists~~defines the elements and their ~~ELEMENT TYPE~~element type codes~~, and indicates which elements accept the DISABLE bit in their COMMON CONTROL field (see 7.2.2) and may support the DISABLED bit in their COMMON STATUS field (see 7.2.3), and which elements contain a value subject to comparison with a threshold~~.

Table 57 — Element type codes

~~Type~~ Element type code	~~Type of element~~Name	Disable support	Threshold	Reference
00h	Unspecified	no	none	7.3.1
01h	Device	no	none	7.3.2
02h	Power Supply	no	none	7.3.4
03h	Cooling	no	none	7.3.5
04h	Temperature Sensor	yes	temperature	7.3.6
05h	Door Lock	no	none	7.3.7
06h	Audible Alarm	yes	none	7.3.8
07h	Enclosure Services Controller Electronics	no	none	7.3.9
08h	SCC Controller Electronics	no	none	7.3.10
09h	Nonvolatile Cache	no	none	7.3.11
0Ah	Invalid Operation Reason	no	none	7.3.12
0Bh	Uninterruptible Power Supply	no	battery status	7.3.13
0Ch	Display	no	none	7.3.14
0Dh	Key Pad Entry	no	none	7.3.15
0Eh	Enclosure	no	none	7.3.16
0Fh	SCSI Port/Transceiver	no	none	7.3.17
10h	Language	no	none	7.3.18
11h	Communication Port	no	none	7.3.19
12h	Voltage Sensor	yes	% voltage	7.3.20
13h	Current Sensor	yes	% current	7.3.21
14h	SCSI Target Port	no	none	7.3.22
15h	SCSI Initiator Port	no	none	7.3.23
16h	Simple Subenclosure	no	none	7.3.24
17h	Array Device	no	none	7.3.3
18h	SAS Expander	no	none	7.3.25
19h	SAS Connector	no	none	7.3.26
1Ah - 7Fh	Reserved			
80h - FFh	Vendor-specific			

[a] A “disable support” value of yes means the DISABLE bit is supported in the COMMON CONTROL field of the control element (see 7.2.3).

[b] The “threshold” value indicates the value, if any, that is subject to comparison with the threshold specified by the threshold control element and indicated by the threshold status element.

7.2 ~~Formats for status and control fields~~Control elements and status elements

7.2.1 ~~Formats for status and control fields~~Control elements and status elements overview

7.2.2 and 7.2.3 specify the general format for the ~~ELEMENT CONTROL and OVERALL CONTROL fields (i.e., control fields)~~elements in the Enclosure Control diagnostic page (see 6.1.3) and for the ~~ELEMENT STATUS and OVERALL STATUS fields (i.e., status fields)~~elements in the Enclosure Status diagnostic page (see 6.1.4).

Unless otherwise specified, all status and control bits are optional. The enclosure is not required to return any optional status bit to the application client. The enclosure is not required to act on any optional control bit. All control bits are advisory and may be ignored or overridden to maintain a proper operating environment in the enclosure.

7.2.2 ~~Format for all control fields~~Control elements

~~The format for the ELEMENT CONTROL and OVERALL CONTROL fields (i.e., control field) for all element types is shown in table 58~~Table 58 defines the format of the control element..

Table 58 — ~~ELEMENT CONTROL and OVERALL CONTROL fields~~Control element format

Byte\Bit	7	6	5	4	3	2	1	0
0	COMMON CONTROL							
	SELECT	PRDFAIL	DISABLE	RST SWAP	Reserved			
1	Element-type-specific control information							
3								

The COMMON CONTROL field contains those bits that may be used by any ~~OVERALL CONTROL or ELEMENT CONTROL field. The bits of the COMMON CONTROL field, SELECT, PRDFAIL, DISABLE, and RST SWAP, are defined below~~control element.

A SELECT bit set to one specifies that the enclosure services process should perform the control functions defined by the other bits in the ~~OVERALL CONTROL or ELEMENT CONTROL field~~control element. A SELECT bit set to zero specifies that the enclosure services process shall ignore all other bits in the ~~OVERALL CONTROL or ELEMENT CONTROL field~~control element. The SELECT bit allows specific ~~individual~~ elements to be selected for control operations.

A PRDFAIL (predicted failure) bit set to one specifies that the enclosure services process shall turn on the “predicted failure state” indicator, if any, for the element. A PRDFAIL bit set to zero specifies that the enclosure services process shall turn off the “predicted failure state” indicator, if any, for the element. The element is not required to implement the PRDFAIL bit or the “predicted failure state” indicator.

A DISABLE bit set to one specifies that the enclosure services process shall disable the element. A DISABLE bit set to zero specifies that the enclosure services shall allow normal operation of the element to resume. The interpretation of the disabled state is specific to the element. The DISABLE bit is defined for each element listed with disable support in table 57 (see 7.1).

A RST SWAP (reset swap) bit set to one specifies that the enclosure services process shall set the SWAP bit to zero in the status ~~field~~element one time, if the SWAP bit is set to one. A RST SWAP bit set to zero specifies that the enclosure services process shall not change the SWAP bit in the status element.

NOTE 2 - The DISABLE bit and the RST SWAP bit are not intended to be accessed as part of a read-modify-write procedure with the corresponding bits in the status ~~field~~element (see 7.2.3).

The element-type-specific control information is defined separately for each element type in 7.3. Control information containing conflicting bits may cause unpredictable behavior or may cause the enclosure services process to report an invalid field error (see 4.5).

7.2.3 ~~Format for all status fields~~Status elements

~~The format for the ELEMENT STATUS and OVERALL STATUS fields (i.e., status fields) for all element types is shown in table 59~~Table 59 defines the format of the status element..

Table 59 — ~~ELEMENT STATUS and OVERALL STATUS fields~~Status element format

Byte\Bit	7	6	5	4	3	2	1	0
0	COMMON STATUS							
	Rsvd	PRDFAIL	DISABLED	SWAP	ELEMENT STATUS CODE			
1	Element-type-specific status information							
3								

The COMMON STATUS field contains those bits that may be returned by any ~~OVERALL STATUS field or ELEMENT STATUS field. The bits of the COMMON STATUS field (i.e., the PRDFAIL, DISABLED, SWAP, and ELEMENT STATUS CODE fields) are defined below~~status element.

A PRDFAIL (predicted failure) bit set to one indicates that the element has the capability of predicting failure and that a failure has been predicted~~. The "predicted failure state" indicator may additionally be set by~~ or that the PRDFAIL bit was set to one in the corresponding control ~~field~~element. A PRDFAIL bit set to zero indicates that the "predicted failure state" indicator is turned off or is not implemented.

A DISABLED bit set to one indicates that the element has been disabled because the DISABLE bit was set to one in the control ~~field~~element (see 7.2.2). A DISABLED bit set to zero indicates that the element has not been disabled or that the disable function is not implemented. The DISABLED bit is defined for each element listed with disable support in table 57 (see 7.1).

A SWAP bit set to one indicates that an element has been removed and the same or another element has been inserted in the same location since the last time the RST SWAP control bit was set to one in the corresponding ~~COMMON CONTROL field~~control element (see 7.2.2). The SWAP bit is set to zero when the RST SWAP control bit is set in the control ~~field~~element and remains set to zero until a device has been both removed and inserted in the device slot. The SWAP bit provides an indication that an element's properties may have been changed without any change of configuration.

The ELEMENT STATUS CODE field is defined in table 60.

Table 60 — ELEMENT STATUS CODE field

Code	Name	Condition	Mandatory or optional
0h	Unsupported	Status detection is not implemented for this element.	Optional
1h	OK	Element is installed and no error conditions are known.	Mandatory
2h	Critical	Critical condition is detected.	Optional
3h	Noncritical	Noncritical condition is detected.	Optional
4h	Unrecoverable	Unrecoverable condition is detected.	Optional
5h	Not Installed	Element is not installed in enclosure.	Optional
6h	Unknown	Sensor has failed or element status is not available.	Optional
7h	Not Available	Element installed, no known errors, but the element has not been turned on or set into operation.	Optional
8h-Fh	Reserved		

In an overall status element, the enclosure services process shall set the ELEMENT STATUS CODE field to 0h if it does not implement overall status detection, or it shall set the ELEMENT STATUS CODE field to:

a) if there are no individual status elements, any value representing the overall status;
b) if there are one or more individual status elements and the ELEMENT STATUS CODE field is set to 0h (i.e., Unsupported) in each of the individual status elements, any value representing the overall status; and
c) if there are one or more individual status elements and the ELEMENT STATUS CODE field is not set to 0h (i.e., Unsupported) in each, the highest status of all the individual status element ELEMENT STATUS CODE field values according to the following order (e.g., if there are two Cooling elements where one reports 2h (i.e., Critical) and the other reports 1h (i.e., OK), then the overall element status returns 2h (i.e., Critical)):
   1) 4h (i.e., Unrecoverable);
   2) 2h (i.e., Critical);
   3) 3h (i.e., Noncritical);
   4) 6h (i.e., Unknown);
   5) 7h (i.e., Not Available);
   6) 5h (i.e, Not Installed);
   7) 0h (i.e, Unsupported); and
   8) 1h (i.e., OK).

The element-type-specific status information is defined separately for each element type in 7.3.

7.3 Field definitions for all element types

7.3.1 Unspecified element

The Unspecified element manages an unspecified part of the enclosure.

~~The format of the control field for the Unspecified element type is shown in table 61~~Table 61 defines the Unspecified control element.

Table 61 — Unspecified ~~element for control type diagnostic pages~~control element

Byte\Bit	7	6	5	4	3	2	1	0
0	COMMON CONTROL							
1	Reserved							
3								

The COMMON CONTROL field is specified in 7.2.2.

~~The format of the status field for an Unspecified element type is shown in table 62~~Table 62 defines the Unspecified status element.

Table 62 — Unspecified ~~element for status type diagnostic pages~~status element

Byte\Bit	7	6	5	4	3	2	1	0
0	COMMON STATUS							
1	Reserved							
3								

The COMMON STATUS field is specified in 7.2.3.

Editor's Note 2: Make similar editorial changes to all the remaining elements

7.3.2 Device element

...

For ~~the OVERALL STATUS field~~an overall status element, the SLOT ADDRESS field is vendor specific.

...