To: T10 Technical Committee
From: Rob Elliott, HP (elliott@hp.com)
Date: 5 March 2004
Subject: 04-031r1 SPC-3 SES-2 SBC-2 Miscellaneous diagnostic page topics

Revision history

Revision 0 (30 December 2003) First revision, called “Padding Supported Diagnostic Pages”
Revision 1 (5 March 2004) Changed to “Miscellaneous diagnostic page topics.” Eliminate support for multiple pages in the SEND DIAGNOSTIC parameter list and the RECEIVE DIAGNOSTIC RESULTS parameter data, which eliminates padding concerns. Added a slew of other minor issues.

Related documents

spc3r17 - SCSI Primary Commands - 3 revision 17
ses2r06 - SCSI Enclosure Services - 2 revision 6
sbc2r12 - SCSI Block Commands -2 revision 12
sff-8067 - 40-pin SCA-2 Connector w/Bidirectional ESI revision 3.2 (28 January 2004) (available from http://www.sffcommittee.org)

Overview

1. **Byte 1 reserved**. Byte 1 of the diagnostic page format is currently labeled Reserved. In reality, all the SES-2 diagnostic pages use that byte.

Proposal: Label byte 1 as page-code specific.

2. **RECEIVE DIAGNOSTIC RESULTS with PCV=0 behavior**. SCSI-2 defined that RECEIVE DIAGNOSTIC RESULTS returned the page with the page code specified in the previous SEND DIAGNOSTIC command.

Page 00h explicitly still works this way; if RECEIVE DIAGNOSTIC RESULTS with PCV=0 is processed after a SEND DIAGNOSTIC with PAGE CODE=00h (only the 4 byte header allowed), it returns the full Supported Diagnostic Pages diagnostic page (00h).

SPC-1 removed this general rule as it added the PAGE CODE VALID (PCV) bit and PAGE CODE field to RECEIVE DIAGNOSTIC RESULTS, letting specific pages be queried at any time. It left unclear the PCV=0 behavior.

The SES pages explicitly do not work in this manner; a previous SEND DIAGNOSTIC sending any SES page has no effect on a subsequent RECEIVE DIAGNOSTIC RESULTS with PCV=0. A SEND DIAGNOSTIC for a read-only page like Configuration page 01h is an error, not a request to return the page. RECEIVE DIAGNOSTIC RESULTS with PCV=1 can retrieve any SES page at any time.

It is unclear whether the SBC-2 Translate Address In/Out (40h) and Device Status In/Out (41h) pages operate like page 00h or the SES pages. Translate Address probably acts like page 00h, since it was defined in SCSI-2. Device Status, introduced in SPC-1, could have either behavior.

Proposal: Make Translate Address work as in SCSI-2 - remember the previous SEND DIAGNOSTIC request for it.

Proposal: Obsolete the Device Status page (which was used for spindle synchronization).

3. **Sending multiple pages**. SEND DIAGNOSTIC supports writing more than one diagnostic page at once; the parameter list is a series of pages, each starting with a common header including the page code and page length. This behavior was not possible in SCSI-2 and does not seem to be used in practice. In particular, this would mean you could send page 00h and page 40h and expect a the target to return both pages concatenated together.

Concatenating pages that are not multiples of 4 bytes long, although certainly legal, tends to expose errors in hardware designs. It is prudent to avoid doing so when possible. Page 00h is often not a multiple of 4 bytes, since it just contains a list of supported page codes (one byte each) - an odd number of supported pages results in an odd page length.

Proposal: Only allow one diagnostic page to be accessed at a time.

4. **Remember Supported Diagnostic Pages request through multiple RECIVE DIAGNOSTIC RESULTS**. If a SEND DIAGNOSTIC is run with page 00h, then one or more RECEIVE DIAGNOSTIC RESULTS is run

with PCV=1, then a RECEIVE DIAGNOSTIC RESULTS with PCV=0 is run, is it still expected to get the Supported Diagnostic Pages page?

Proposal: Remember the last SEND DIAGNOSTIC RESULTS page number until reset.

5. **RECEIVE DIAGNOSTIC RESULTS before SEND DIAGNOSTIC**. If a RECEIVE DIAGNOSTIC RESULTS is run with PCV=0 before any SEND DIAGNOSTIC is run, what is the result? A CHECK CONDITION status, or a page with the standard header only but a page length of 0, or no data at all?

Proposal: Return zero bytes of data.

6. **Translate Address In before Translate Address Out**. If a RECEIVE DIAGNOSTIC RESULTS is run with PCV=1 requesting the Translate Address In page, but the SEND DIAGNOSTIC for Translate Address Out was never sent, what is returned?

Proposal: Return page with 4 byte header with PAGE LENGTH field set to 0000h.

7. **Remember Translate Address request through multiple SEND DIAGNOSTICS.** If a RECEIVE DIAGNOSTIC RESULTS is run with PCV=1 requesting the Translate Address In page, but other pages have been sent with SEND DIAGNOSTIC since the Translate Address Out page was sent, is it still required to return the page corresponding to the last Translate Address Out page? Or do they have to be back-to-back?

Proposal: Return the last translation results (remember them until a new Translate Address Out or reset).

Suggested changes to SPC-3

6.18 RECEIVE DIAGNOSTIC RESULTS command

The RECEIVE DIAGNOSTIC RESULTS command (see table 134) either requests that data be sent to the application client ~~after completion of a~~ data-in buffer based on the most recent SEND DIAGNOSTIC command (see 6.26) or requests that a specified diagnostic page be sent to the application client data-in buffer. ~~If optional diagnostic page formats are supported and the PCV bit is set to one, the PAGE CODE field specifies the format of the returned data, and there is no relationship to a previous SEND DIAGNOSTIC command~~.

Table 1 — RECEIVE DIAGNOSTIC RESULTS command

Byte\Bit	7	6	5	4	3	2	1	0
0	OPERATION CODE (1Ch)							
1	Reserved							PCV
2	PAGE CODE							
3	(MSB)	ALLOCATION LENGTH						
4								(LSB)
5	CONTROL							

A page code valid (PCV) bit set to zero ~~indicates~~specifies that the most recent SEND DIAGNOSTIC command shall define the data returned by this command. If no SEND DIAGNOSTIC command has been processed that defines any parameter data to return, the RECEIVE DIAGNOSTIC RESULTS command shall return zero bytes of parameter data. ~~Optionally, a~~ A PCV bit set to one ~~indicates~~specifies that the contents of the PAGE CODE field shall define the data returned by this command. Page code values are defined in 7.1 or in another command set standard (see 3.1.17).

NOTES

NOTE 1 Logical units compliant with previous versions of this standard may transfer more than one diagnostic page in the parameter data if the PCV bit is set to zero and the previous SEND DIAGNOSTIC command sent more than one diagnostic page in the parameter list.

NOTE 2 To ensure that the diagnostic command information is not destroyed by a command sent from another initiator port the logical unit should be reserved.

NOTE 3 Although diagnostic software is generally device-specific, this command and the SEND DIAGNOSTIC command provide a means to isolate the operating system software from the device-specific diagnostic software. The operating system may remain device-independent.

See 7.1 for RECEIVE DIAGNOSTIC RESULTS diagnostic page format definitions.

6.26 SEND DIAGNOSTIC command

The SEND DIAGNOSTIC command (see table 156) requests the device server to perform diagnostic operations on the target, on the logical unit, or on both. Targets that support this command shall implement, at a minimum, the default self-test feature (i.e., the SELFTEST bit equal to one and a parameter list length of zero). ~~When the SELFTEST bit is set to zero and the SELF-TEST CODE field contains 000b, this command is usually followed by a RECEIVE DIAGNOSTIC RESULTS (see 6.18) command.~~

Editor's Note 1: That "usually" is not true for enclosure pages, the most widely used pages.

Table 2 — SEND DIAGNOSTIC command

Byte\Bit	7	6	5	4	3	2	1	0
0	OPERATION CODE (1Dh)							
1	SELF-TEST CODE			PF	Reserved	SELFTEST	DEVOFFL	UNITOFFL
2	Reserved							
3	(MSB)	PARAMETER LIST LENGTH						
4								(LSB)
5	CONTROL							

...

A page format (PF) bit set to one specifies that the SEND DIAGNOSTIC parameters and any parameters returned by a following RECEIVE DIAGNOSTIC RESULTS command with the PCV bit set to zero shall ~~conform to the diagnostic page structure as specified in this standard. See 7.1 for the definition of diagnostic pages~~contain a single diagnostic page as defined in 7.1.

NOTE 4 Logical units compliant with previous versions of this standard may transfer more than one diagnostic page in the SEND DIAGNOSTIC command's parameter list and by doing so may request that more than one diagnostic page be transmitted in the RECEIVE DIAGNOSTIC RESULTS command's parameter data.

A PF bit set to zero ~~indicates~~specifies that all SEND DIAGNOSTIC parameters are vendor specific. If the content of the PARAMETER LIST LENGTH field is zero and the SEND DIAGNOSTIC command will not be followed by a corresponding RECEIVE DIAGNOSTIC RESULTS command with the PCV bit set to zero, then the PF bit shall be set to zero. The implementation of the PF bit is optional.

The PARAMETER LIST LENGTH field specifies the length in bytes of the parameter list that shall be transferred from the application client data-out buffer to the device server. A parameter list length of zero indicates that no data shall be transferred. This condition shall not be considered an error. If the specified parameter list length results in the truncation of ~~one or more~~ the diagnostic page~~s~~ (PF bit set to one) the device server shall return CHECK CONDITION status with a sense key of ILLEGAL REQUEST and an additional sense code of INVALID FIELD IN CDB.

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NOTE 5 To ensure that the diagnostic command information is not destroyed by a command sent from another initiator port, ~~either the SEND DIAGNOSTIC command should be linked to the RECEIVE DIAGNOSTIC RESULTS command or~~ the logical unit should be reserved.

7.1 Diagnostic parameters

7.1.1 Diagnostic page format and page codes for all device types

This subclause describes the diagnostic page structure and the diagnostic pages that are applicable to all SCSI devices. Diagnostic pages specific to each device type are described in the command standard (see 3.1.17) that applies to that device type.

A SEND DIAGNOSTIC command with a PF bit set to one specifies that the SEND DIAGNOSTIC parameter list consists of ~~zero or more~~ a single diagnostic page~~s~~ and that the data returned by the subsequent RECEIVE DIAGNOSTIC RESULTS command, if its PCV bit is set to zero, shall use the diagnostic page format defined in table 170. A RECEIVE DIAGNOSTIC RESULTS command with a PCV bit set to one specifies that the device server return a diagnostic page using the format defined in table 170.

Table 3 — Diagnostic page format

Byte\Bit	7	6	5	4	3	2	1	0
0	PAGE CODE							
1	~~Reserved~~Page code specific							
2	(MSB)	PAGE LENGTH (n - 3)						
3								(LSB)
4	Diagnostic parameters							
n								

Editor's Note 2: Byte 1 was labeled wrong before. SES was already putting a variety of fields in byte 1, so it should not be marked Reserved.

Each diagnostic page defines a function or operation that the device server shall perform as a result of a SEND DIAGNOSTIC command or the information being returned as a result of a RECEIVE DIAGNOSTIC RESULTS command with the PCV bit equal to one. The diagnostic page contains a page header followed by the data that is formatted according to the page code specified.

~~Device servers that implement diagnostic pages are only required to accept a single diagnostic page per command.~~

~~The PAGE CODE field identifies which diagnostic page is being sent as a result of a SEND DIAGNOSTIC command, requested as a result of a RECEIVE DIAGNOSTIC RESULTS command with the PCV bit equal to one, or returned as a result of a RECEIVE DIAGNOSTIC RESULTS parameter data. The page codes are defined in table 171.~~

The PAGE CODE field identifies the diagnostic page (see table 4).

Table 4 — Diagnostic page codes

Page Code	Diagnostic Page Name	Reference
00h	Supported Diagnostic Pages	7.1.2
01h	Configuration	SES
02h	Enclosure Status/Control	SES
03h	Help Text	SES
04h	String In/Out	SES
05h	Threshold In/Out	SES
06h	Array Status/Control	SES
07h	Element Descriptor	SES
08h	Short Enclosure Status	SES
09h	Enclosure Busy	SES-2
0Ah	Device Element Status	SES-2
0Bh - 1Fh	Reserved for SES	SES-2
20h- 3Fh	Pages that apply to all device types	
40h - 7Fh	See specific device type for definition	
80h - FFh	Vendor specific	

The PAGE LENGTH field ~~specifies~~ contains the length in bytes of the diagnostic parameters that follow this field. If the application client sends a SEND DIAGNOSTIC command with a parameter list containing a PAGE LENGTH field ~~page length~~ that results in the truncation of any parameter, the device server shall terminate the command with CHECK CONDITION status. The sense key shall be set to ILLEGAL REQUEST with the additional sense code set to INVALID FIELD IN PARAMETER LIST.

The diagnostic parameters are defined for each diagnostic page code. The diagnostic parameters within a diagnostic page may be defined differently in a SEND DIAGNOSTIC command than in a RECEIVE DIAGNOSTIC RESULTS command.

Suggested changes to SES-2

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 18.

Table 5 — 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
0Bh	Sub-enclosure Help Text diagnostic page	Status	6.1.2
0Ch	Sub-enclosure String Out diagnostic page	Control	6.1.3
	Sub-enclosure String In diagnostic page	Status	6.1.4
0Dh-0Fh	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

The Supported Diagnostic Pages diagnostic page specified in SPC-3 contains a list of all diagnostic page codes implemented by the device server in ascending order beginning with page code 00h. If the device is capable of accessing a diagnostic function or enclosure function that may temporarily or permanently be unavailable to the device, the PAGE CODE associated with that information shall be included in the list. The unavailability of the resources necessary to transfer a page shall not result in an error until a diagnostic command that requests the transfer of an enclosure service page is executed. Non-enclosure services devices supporting access to an enclosure services process (see 4.1.3) shall direct diagnostic pages 10h-1Fh to the enclosure services device and shall include page codes 00h-1Fh in the Supported Diagnostic Pages list.

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 6.1.14). 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 a PAGE CODE field set to 01h is transmitted using~~ 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).

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6.1.3 Enclosure Control diagnostic page

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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 6.1.14). The ~~control~~ Enclosure Control page is transmitted by the SEND DIAGNOSTIC command. The request of a page using the RECEIVE DIAGNOSTIC RESULTS command with a PCV bit set to one and ~~using~~ a PAGE CODE field set to 02h is defined as the request for an Enclosure Status diagnostic page (see 6.1.4).

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6.1.4 Enclosure Status diagnostic page

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This page shall be implemented if the device supports enclosure services and does not use the Short Enclosure Status diagnostic page (see 6.1.14). The ~~status~~ Enclosure Status 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).

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6.1.5 Help Text diagnostic page

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The Help Text 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 03h ~~is transmitted using a SEND DIAGNOSTIC command~~, the command shall be treated as having an invalid field error (see 4.5).

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6.1.6 Sub-enclosure Help Text diagnostic page

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The Sub-enclosure Help Text 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 0Bh ~~is transmitted using a SEND DIAGNOSTIC command~~, the command shall be treated as having an invalid field error (see 4.5).

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6.1.7 String Out diagnostic page

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The request for a page using the RECEIVE DIAGNOSTIC RESULTS command with a PCV bit set to one and ~~with~~ a PAGE CODE field set to 04h is defined as the request for a String In diagnostic page (see 6.1.9).

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6.1.8 Sub-enclosure String Out diagnostic page

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The request for a page using the RECEIVE DIAGNOSTIC RESULTS command with a PCV bit set to one and ~~with~~ a PAGE CODE field set to 0Ch is defined as the request for a Sub-enclosure String In diagnostic page (see 6.1.10).

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6.1.9 String In diagnostic page

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The String 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 04h. The transmission of a page using the SEND DIAGNOSTIC command with a PAGE CODE field set to 04h is defined as the transmission of a String Out diagnostic page (see 6.1.7).

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6.1.10 Sub-enclosure String In diagnostic page

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The Sub-enclosure String 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 0Ch. The transmission of a page using the SEND DIAGNOSTIC command with a PAGE CODE field set to 0Ch is defined as the transmission of a Sub-enclosure String Out diagnostic page (see 6.1.8).

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6.1.11 Threshold Out diagnostic page

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The Threshold Out diagnostic page is transmitted by the SEND DIAGNOSTIC command. The request for a page using the RECEIVE DIAGNOSTIC RESULTS command with a PCV bit set to one and ~~with~~ a PAGE CODE field set to 05h is defined as the request for a Threshold In diagnostic page (see 6.1.12).

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6.1.12 Threshold In diagnostic page

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~~The Threshold In diagnostic page is transmitted by the RECEIVE DIAGNOSTIC RESULTS command.~~ The String 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 6.1.11).

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6.1.13 Element Descriptor diagnostic page

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The Element Descriptor diagnostic page is read by the RECEIVE DIAGNOSTIC RESULTS command with a PCV bit set to one and a PAGE CODE field set to 07h. If the parameter list for a SEND DIAGNOSTIC command contains a PAGE CODE field set to 07h~~ is transmitted using a SEND DIAGNOSTIC command~~, the command shall be treated as having an invalid field error (see 4.5).

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6.1.16.1 Device Element Status diagnostic page overview

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The Device Element 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 0Ah. If the parameter list for a SEND DIAGNOSTIC command contains a PAGE CODE field set to 0Ah~~ is transmitted using a SEND DIAGNOSTIC command~~, the command shall be treated as having an invalid field error (see 4.5).

Suggested changes to SBC-2

6.1.2 Defect list formats

6.1.2.1 Defect list formats overview

This subclause describes the defect list formats used in the FORMAT UNIT command, the READ DEFECT DATA commands (see 5.14 and 5.15), and the Translate Address diagnostic pages (see 6.1.2 and 6.1.3) of the SEND DIAGNOSTIC and RECEIVE DIAGNOSTIC RESULTS commands.

The format type of a defect descriptor is specified with:

a) the DEFECT LIST FORMAT field in the CDB, for the FORMAT UNIT and READ DEFECT DATA commands;
b) the SUPPLIED FORMAT field, for the Translate Address diagnostic pages; or
c) the TRANSLATE FORMAT field, for the Translate Address diagnostic pages.

Table 6 defines the types of defect descriptors.

Table 6 — Defect descriptor formats

Format type	Description	Reference
000b	Short block format defect descriptor	6.1.2.2
011b	Long block format defect descriptor	6.1.2.3
100b	Bytes from index format defect descriptor	6.1.2.4
101b	Physical sector format defect descriptor	6.1.2.5
110b	Vendor-specific	
All others	Reserved	

6.1.2.2 Short block format defect descriptor

A format type of 000b specifies the short block format defect descriptor defined in table 7.

Table 7 — Short block format defect descriptor (000b)

Byte\Bit	7	6	5	4	3	2	1	0
0	(MSB)	DEFECTIVE BLOCK ADDRESS						
3								(LSB)

The DEFECTIVE BLOCK ADDRESS field contains a four-byte vendor-specific defective block address that contains the defect. It is not the same as the LBA.

Editor's Note 3: These formats are used by FORMAT UNIT, READ DEFECT DATA, and the Translate Address diagnostic pages. SCSI-2 implied this was an LBA. sbc-r02 added this comment: "Use of the Block format is not recommended since the address has no standard meaning after a defect has been reassigned. obsolete?" sbc-r04 resolved that into "Use of the Block format is vendor-specific." Based on an editing meeting, this was changed in sbc2r12 to the "vendor-specific defective block address" and "not the same as the LBA". I now don't think that is correct, given the sbc-r02 change history and the Translate Address page usage of this format. READ DEFECT DATA cannot return a defect as an LBA, because a real LBA exists. It can return a fake LBA above the capacity, though. Translate Address needs to work off real and fake LBAs, as does FORMAT UNIT.

6.1.2.3 Long block format defect descriptor

A format type of 011b specifies the long block format defect descriptor defined in table 8.

Table 8 — Long block format defect descriptor (011b)

Byte\Bit	7	6	5	4	3	2	1	0
0	(MSB)	DEFECTIVE BLOCK ADDRESS						
7								(LSB)

The DEFECTIVE BLOCK ADDRESS field contains an eight-byte vendor-specific defective block address that contains the defect. It is not the same as the LBA.

6.1.2.4 Bytes from index format defect descriptor

A format type of 100b specifies the bytes from index defect descriptor defined in table 9. This descriptor specifies the location of a defect that is no more than eight bytes long.

Table 9 — Bytes from index format defect descriptor (100b)

Byte\Bit	7	6	5	4	3	2	1	0
0	(MSB)	CYLINDER NUMBER OF DEFECT						
2								(LSB)
3	HEAD NUMBER OF DEFECT							
4	(MSB)	DEFECT BYTES FROM INDEX						
7								(LSB)

The CYLINDER NUMBER OF DEFECT field contains the cylinder number of the defect.

The HEAD NUMBER OF DEFECT field contains the head number of the defect.

The DEFECT BYTES FROM INDEX field contains the number of bytes from the index to the defect.

The defect descriptors shall be in ascending order. The cylinder number of the defect is the most significant part of the address and the defect bytes from index is the least significant part of the address. More than one logical block may be affected by each defect. A DEFECT BYTES FROM INDEX field set to FFFFFFFFh specifies that the entire track shall be considered defective.

Editor’s Note 4: This format didn’t grow to support 8-byte LBAs. Should it be obsoleted or a new format defined?

6.1.2.5 Physical sector format defect descriptor

A format type of 101b specifies the physical sector defect descriptor defined in table 10. This descriptor specifies the location of a defect that is the length of a sector.

Table 10 — Physical sector format defect descriptor (101b)

Byte\Bit	7	6	5	4	3	2	1	0
0	(MSB)			CYLINDER NUMBER OF DEFECT				
2								(LSB)
3				HEAD NUMBER OF DEFECT				
4	(MSB)			DEFECT SECTOR NUMBER				
7								(LSB)

The CYLINDER NUMBER OF DEFECT field contains the cylinder number of the defect.

The HEAD NUMBER OF DEFECT field contains the head number of the defect.

The DEFECT SECTOR NUMBER field contains the sector number of the defect.

The defect descriptors shall be in ascending order. The cylinder number of the defect is the most significant part of the address and the defect's sector number is the least significant part of the address. More than one logical block may be affected by each defect descriptor. A DEFECT SECTOR NUMBER field set to FFFFFFFFh specifies that the entire track shall be considered defective.

Editor's Note 5: This format didn't grow to support 8-byte LBAs. Should it be obsoleted or a new format defined?

6.2 Diagnostic parameters

6.2.1 Diagnostic parameters overview

This subclause defines the descriptors and pages for diagnostic parameters used with direct-access devices. The diagnostic page codes for direct-access devices are defined in table 11.

Table 11 — Diagnostic page codes

Diagnostic page code	Description	Reference
00h	Supported diagnostic pages	SPC-3
01h - 1Fh	SCSI enclosure services diagnostic pages	SES-2
20h - 3Fh	Diagnostic pages assigned by SPC-3	SPC-3
40h	Translate Address Output diagnostic page	
40h	Translate Address Input diagnostic page	
41h	Obsolete	
~~41h~~	~~Device Status Input diagnostic page~~	
42h - 7Fh	Reserved for this standard	
80h - FFh	Vendor-specific diagnostic pages	

6.2.2 Translate Address Output diagnostic page

The Translate Address diagnostic pages allow the application client to translate an address in one of the forms supported by the FORMAT UNIT command (see 5.3) - a block address, a physical sector address, or a physical bytes from index address - into any one of the other formats. The address to be translated is passed to the device server with the SEND DIAGNOSTIC command and the results are returned to the application client by the RECEIVE DIAGNOSTIC RESULTS command. The format of the Translate Address Output diagnostic page sent with SEND DIAGNOSTIC is shown in table 12. The translated address is returned in the Translate Address Input diagnostic page (see table 13).

Table 12 — Translate Address Output diagnostic page

Byte\Bit	7	6	5	4	3	2	1	0
0	PAGE CODE (40h)							
1	Reserved							
2	(MSB)	PAGE LENGTH (000Ah)						
3								(LSB)
4	Reserved					SUPPLIED FORMAT		
5	Reserved					TRANSLATE FORMAT		
6	(MSB)	ADDRESS TO TRANSLATE						
13								(LSB)

The SUPPLIED FORMAT field specifies the format of ADDRESS TO TRANSLATE field. Valid values for this field are defined in the DEFECT LIST FORMAT field of the FORMAT UNIT command (see 5.3). If the device server does not support the requested format it shall terminate the SEND DIAGNOSTIC command with CHECK CONDITION status. The sense key shall be set to ILLEGAL REQUEST and the additional sense code shall be set to INVALID FIELD IN PARAMETER LIST.

The TRANSLATE FORMAT field specifies the format the device server shall use for the result of the address translation. Valid values for this field are defined in the DEFECT LIST FORMAT field of the FORMAT UNIT command. If the device server does not support the specified format it shall terminate the command with CHECK CONDITION status, with a sense key set to ILLEGAL REQUEST and an additional sense code set to INVALID FIELD IN PARAMETER LIST.

The ADDRESS TO TRANSLATE field contains a single address the application client is requesting the device server to translate. The format of this field depends on the value in the SUPPLIED FORMAT field. The formats are described in 5.3.3. If the ~~short~~ long block format defect descriptor is specified: ~~, the block address shall be in the first four bytes of the field with the remaining bytes set to zero for four byte addresses and in the ADDRESS TO TRANSLATE field for eight byte addresses.~~

a) for 4-byte block addresses, the first four bytes of the ADDRESS TO TRANSLATE field shall contain the block address and the remaining four bytes shall each be set to 00h;
b) for 8-byte block addresses, the ADDRESS TO TRANSLATE field shall contain the block address.

Editor’s Note 6: The reference to “short” above was wrong; it wouldn’t care about padding.

Editor’s Note 7: See comments in defect list section about real and fake LBAs

6.2.3 Translate Address Input diagnostic page

Table 13 defines the Translate Address Input diagnostic page retrieved with RECEIVE DIAGNOSTIC RESULTS after the Translate Address Output diagnostic page has been sent with SEND DIAGNOSTIC.

Table 13 — Translate Address Input diagnostic page

Byte\Bit	7	6	5	4	3	2	1	0
0	PAGE CODE (40h)							
1	Reserved							
2	(MSB)	PAGE LENGTH (n - 3)						
3								(LSB)
4	Reserved					SUPPLIED FORMAT		
5	RAREA	ALTSEC	ALTTRK	Reserved		TRANSLATED FORMAT		
	Translated address(es)							
6	(MSB)	TRANSLATED ADDRESS 1						
13								(LSB)
	...							
n - 7	(MSB)	TRANSLATED ADDRESS x (if required)						
n								(LSB)

The Translate Address Input diagnostic page contains a four-byte page header that specifies the page code and length followed by two bytes that describe the translated address followed by zero or more translated address(s).

The PAGE LENGTH field contains the number of parameter bytes that follow. If a Translate Address Output diagnostic page has not yet been processed, the PAGE LENGTH field shall be set to 0000h.

The SUPPLIED FORMAT field contains the value from the ~~SEND DIAGNOSTIC command~~ SUPPLIED FORMAT field in the previous Translate Address Output diagnostic page (see 6.1.2).

A reserved area (RAREA) bit set to zero indicates that no part of the translated address falls within a reserved area of the medium. A RAREA bit set to one indicates that all or part of the translated address falls within a reserved area of the medium (e.g., speed tolerance gap, alternate sector, vendor reserved area, etc.). If the entire translated address falls within a reserved area, the device server may not return a translated address.

An alternate sector (ALTSEC) bit set to zero indicates that no part of the translated address is located in an alternate sector of the medium or that the device server is unable to determine this information. An ALTSEC bit set to one indicates that the translated address is physically located in an alternate sector of the medium. If the device server is unable to determine if all or part of the translated address is located in an alternate sector it shall set this bit to zero.

An alternate track (ALTTRK) bit set to zero indicates that no part of the translated address is located on an alternate track of the medium. An ALTTRK bit set to one indicates that part or all of the translated address is located on an alternate track of the medium or the device server is unable to determine if all or part of the translated address is located on an alternate track.

The TRANSLATED FORMAT field contains the value from the ~~Translate Address Output diagnostic page's~~ TRANSLATE FORMAT field in the previous Translate Address Output diagnostic page (see 6.1.2).

~~The~~ Each TRANSLATED ADDRESS field contains ~~the~~ an address~~(es)~~ the device server translated from the address supplied by the application client in the ~~SEND DIAGNOSTIC command~~ previous Translate Address Output diagnostic page. This field shall be in the format specified in the TRANSLATE FORMAT field. The different formats are described in 5.3.3. If the ~~short~~ long block format defect descriptor is specified: ~~, the block address~~

~~shall be in the first four bytes of the field and the remaining bytes shall be set to zero for four byte addesses and in the TRANSLATED FORMAT field for eight byte addresses.~~

a) for 4-byte block addresses, the first four bytes of the TRANSLATED ADDRESS field shall contain the block address and the remaining four bytes shall each be set to 00h;
b) for 8-byte block addresses, the TRANSLATED ADDRESS field shall contain the block address.

Editor's Note 8: The reference to "short" above was wrong; it wouldn't care about padding. This kind of field is where big-endian is inconvenient; the application must know the size of the data to parse the translated address field correctly. Perhaps it should just be an error to translate an address and not pick the corect translate format?

Editor's Note 9: See comments in defect list section about real and fake LBAs

If the returned data is in the ~~logical block~~ short block format, long block format, or physical sector format and the address to be translated covers more than one address after it has been translated (e.g., accounting for speed tolerance or multiple physical sectors within a single logical block or multiple logical blocks within a single physical sector) the device server shall return all possible addresses that are contained in the area specified by the address to be translated.

If the returned data is in bytes from index format, the device server shall return a pair of translated values for each of the possible addresses that are contained in the area specified by the ADDRESS TO TRANSLATE field. Of the pair of translated values returned, the first indicates the starting location and the second the ending location of the area.

~~6.2.4 Device Status Output diagnostic page~~

~~The Device Status diagnostic pages allow the application client to query the device regarding operational status of the device. The format of the Device Status Output diagnostic page sent with SEND DIAGNOSTIC is shown in table 14.~~

Table 14 — ~~Device Status Output diagnostic page~~

~~Byte\Bit~~	~~7~~	~~6~~	~~5~~	~~4~~	~~3~~	~~2~~	~~1~~	~~0~~
~~0~~	~~PAGE CODE (41h)~~							
~~1~~	~~Reserved~~							
~~2~~	~~(MSB)~~	~~PAGE LENGTH (0008h)~~						
~~3~~								~~(LSB)~~
~~4~~	~~Reserved~~							
~~11~~								

~~6.2.5 Device Status Input diagnostic page~~

~~The format of the Device Status Input diagnostic page retrieved with RECEIVE DIAGNOSTIC RESULTS is shown in table 15.~~

Table 15 — ~~Device Status Input diagnostic page~~

Byte\Bit	7	6	5	4	3	2	1	0
~~0~~	~~PAGE CODE (41h)~~							
~~1~~	~~Reserved~~							
~~2~~	~~(MSB)~~	~~PAGE LENGTH (n - 3)~~						
~~3~~								~~(LSB)~~
~~4~~	~~Reserved~~							
~~5~~								
~~6~~	~~Reserved~~				~~Obsolete~~			
~~7~~	~~Reserved~~					~~Obsolete~~		
~~8~~	~~Reserved~~							
~~47~~								
~~48~~	~~Vendor specific~~							
~~n~~								