

memorandum



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To INCITS T10 Committee From Curtis Ballard, HP Subject Report Volume Information

Date
[29 August](#), 2008

Revision History

Revision 0 – Initial document

Revision 1 – Changes from May 2008 Face to Face

[Revision 2 – Filled in all of the return data pages to return values as decided at the face to face meetings.](#)

Related Documents

[smc3r11](#) – SCSI Media Changer Commands - 3 revision 11

spc3r23 – SCSI Primary Commands -3 revision 23

Background

This command is a companion to 08-066, Report Element Information. Full background is available in that proposal.

This document proposes the second half of a change to SMC-3 that creates two new media changer commands, "REPORT ELEMENT INFORMATION" and "REPORT VOLUME INFORMATION" which will provide an alternate method to retrieve all of the information currently returned by "READ ELEMENT STATUS". These new commands will provide a mechanism that allows for easier extension in the future and allows selective or all inclusive retrieval of the data. Following the standardization of these commands "READ ELEMENT STATUS" may be deprecated.

The "REPORT VOLUME INFORMATION" command specified in this proposal reports data pages containing information about a volume in a medium changer element. Using the page code mechanism to select information pages about an element allows an application client to select only the information it needs at the time and to get back only that information rather than the monolithic data block used by Read Element Status. By using this command an application client can determine information about a volume in a medium changer element.

The Read Element Status mechanism for specifying a starting element address and number of elements is leveraged for this command as well as the element type filter to allow requesting information on a single element or range of elements of a specific type or all elements of all types.

In the May 2008 meeting the working group suggested that a new command or page should be defined that will report static information about a volume type capability so this version removes characteristics that would be common for all volumes of a given type.

In the proposed changes that follow, new text appears in [blue](#) or [purple](#), deleted text appears in ~~red-strikeout~~, and editorial comments appear in [green](#).

Proposed Changes to SMC-3

Changes to 3.1:

3.1.x Mounted: mounted is a state of a volume where the volume is in a data transfer device element and the data transfer device is physically capable of processing commands that cause the media in the volume to be moved.

Changes to 6.1:

Table 6 has the following addition (the entire table is not reproduced here):

Command	Operation Code	Type	Reference
REPORT VOLUME INFORMATION	9Eh/11h ^a	O	6.x

Changes to 6.2:

Table 7 has the following addition (the entire table is not reproduced here):

REPORT ELEMENT INFORMATION (CDATA = 0)	<u>Conflict</u>	<u>Conflict</u>	<u>Conflict</u>	Allowed	<u>Conflict</u>	<u>Conflict</u>
REPORT ELEMENT INFORMATION (CDATA = 1)	<u>Allowed</u>	<u>Allowed</u>	<u>Allowed</u>	<u>Allowed</u>	<u>Allowed</u>	<u>Allowed</u>

New sub-clause 6.x:

(Note: existing sub-clauses 6.x and above shift to become 6.x+1 and above with the addition of this new sub-clause)

6.x REPORT VOLUME INFORMATION command

6.x.1 REPORT VOLUME INFORMATION command introduction

The REPORT VOLUME INFORMATION command (see table y) requests information pages that describe a volume or a set of volumes.

Table y – REPORT VOLUME INFORMATION command

Bit Byte	7	6	5	4	3	2	1	0
0	OPERATION CODE (9Eh)							
1	Reserved			SERVICE ACTION (11h)				
2	PAGE CODE							
3	CDATA	Reserved	VOLUME ADDRESS TYPE		Reserved	MEDIUM TYPE		
4	(MSB)	VOLUME TYPE						(LSB)
5	(MSB)	FIRST VOLUME ADDRESS						(LSB)
6	(MSB)	NUMBER OF VOLUMES						(LSB)
7	(MSB)							
8	(MSB)	ALLOCATION LENGTH						
9	(MSB)							(LSB)
10	(MSB)							
11								
12								
13								(LSB)
14	Reserved							
15	CONTROL							

See SPC-3 for the definition of the OPERATION CODE field and the SERVICE ACTION field. The OPERATION CODE and SERVICE ACTION fields shall be set to the values shown in table y.

The PAGE CODE field specifies the volume information page requested (see table y+1) by the application client. If the device server detects a PAGE CODE field set to an unsupported value, then it shall terminate the command with CHECK CONDITION status, with the sense key set to ILLEGAL REQUEST, and the additional sense code set to INVALID FIELD IN CDB.

Table y + 1: Volume Information Page Codes

Page code	Definition	Reference	Support
00h	Supported volume information pages	6.x.2	Mandatory
01h	Volume static information	6.x.3	Mandatory
02h	Volume state	6.x.4	Mandatory
03h	Volume tag information	6.x.5	Optional
04h	Volume bus identifier	6.x.6	Optional
05h-7Eh	Reserved		
7Fh	Return all supported pages	6.x.6	Optional
80h-FFh	Vendor specific		

If the cached data (CDATA) bit is set to one, then the device server shall return the requested volume information page using cached volume information without causing device motion. If the CDATA bit is set to zero, then the device server may cause device motion to validate the volume information (e.g., perform an inventory scan or other actions). If the CDATA bit is set to zero and device motion is required to report a requested volume information page, but the media changer is not capable of

performing the device motion, then the device server shall terminate the command with CHECK CONDITION status, with the sense key set to NOT READY₂ and the additional sense code shall specify the reason for NOT READY. If the CDATE bit is set to one and the device server does not have the cached volume information required to report a requested volume information page, then the device server shall terminate the command with CHECK CONDITION status, with the sense key set to NOT READY and the additional sense code shall specify the reason for NOT READY. Support for the CDATE bit set to one and the CDATE bit set to zero is mandatory.

The VOLUME ADDRESS TYPE field specifies the format of the value in the FIRST VOLUME ADDRESS FIELD. See table y+2 for the VOLUME ADDRESS TYPE field values.

Table y + 2: VOLUME ADDRESS TYPE field values

Address type	Description
00b	Element Address
01b	Volume Index (see 6.x.x)
10b – 11b	Reserved

The MEDIUM TYPE field specifies the type(s) of medium selected for reporting by this command. The medium type codes are defined in table 26.

The VOLUME TYPE field specifies the volume type code (see 5.4) and volume type qualifier (see 5.4) selected for reporting by this command.

The FIRST VOLUME ADDRESS field specifies the address of the first volume to report using the address type specified in the VOLUME ADDRESS TYPE field. Only volumes with a medium type code selected by the MEDIUM TYPE CODE field, a volume type selected by the VOLUME TYPE field, and a volume address numerically greater than or equal to the value specified in the FIRST VOLUME ADDRESS field shall be reported. If the PAGE CODE field is set to 00h (i.e., Supported Element Information Pages), then the STARTING ELEMENT ADDRESS field shall be ignored.

The NUMBER OF VOLUMES field specifies the maximum number of volumes to be reported. Pages shall only be reported for defined volume addresses. Undefined volume addresses shall not be reported and shall not be counted in the number of volumes reported. If the PAGE CODE field is set to 00h (i.e., Supported Element Information Pages), then the NUMBER OF VOLUMES field shall be ignored.

Volumes selected by the STARTING VOLUME field and the NUMBER OF VOLUMES field shall be reported once per volume in ascending order by volume address.

See SPC-3 for the definition of the ALLOCATION LENGTH field. If any of the descriptors are truncated because of the allocation length this shall not be considered an error.

See SAM-3 for a description of the CONTROL byte.

6.x.2 Supported volume information Pages

The Supported volume information pages volume information page (see table y + 3) returns the list of volume information pages supported by the device server for the volume specified by the VOLUME TYPE field in the REPORT VOLUME INFORMATION command. If all volume types are specified, then the device server shall return one supported pages descriptor for each volume type.

Table y + 3: Supported volume information pages

Bit Byte	7	6	5	4	3	2	1	0
0	PAGE CODE (00h)							
1	Reserved							
:								
5								
6	(MSB)	PAGE LENGTH (n-7)						(LSB)
7								
	Supported pages descriptors							
8	First supported pages descriptor (see table y + 4)							
	:							
	:							
	:							
n	Last supported pages descriptor (see table y + 4)							

The PAGE CODE field shall be set to the value shown in table y+3.

The value in the PAGE LENGTH field indicates the length in bytes of the supported pages descriptors that follow. If the descriptors are truncated because of the allocation length, then the PAGE LENGTH field shall not be affected.

One supported pages descriptor shall be returned for each selected volume type. Supported pages descriptors shall be returned in ascending order by VOLUME TYPE code.

Comment: It may not make sense to return a list of supported pages by volume type since this command doesn't have a lot of optional pages that may vary by volume type but it will depend on what we decide to do with the volume type concept and if we want to future proof to allow the possibility of mixed media libraries with very different volume types (maybe mixed optical and tape media) and some potential new pages defined in the future that may describe characteristics unique to a particular volume type.

Comment 2: It has been recommended that this be a list of supported optional pages. That would be more efficient but I'm not aware of precedence for a supported pages page that doesn't list all supported pages.

Table y + 4: Supported pages descriptor

Bit Byte	7	6	5	4	3	2	1	0
0	VOLUME TYPE CODE							
1	Reserved							
2	(MSB)	PAGE CODE LIST LENGTH (n-3)						
3								(LSB)
4	Supported <u>volume</u> information page code list							
n								

The VOLUME TYPE CODE field shall contain the volume type code (see 5.4) for the volume type that supports the following list of pages.

The value in the PAGE CODE LIST LENGTH field is the length in bytes of the supported volume information page code list. If the descriptor is truncated because of the allocation length, then the PAGE CODE LIST LENGTH field shall not be affected.

The supported volume information page code list contains a list of volume information page codes (see table y + 2) implemented by the logical unit for the specified volume type code in ascending order beginning with page code 00h.

Comment: There has been a suggestion that the above term "implemented by the logical unit" be changed to device server which seems better but SPC4 has 11 occurrences of logical unit to 3 occurrences of device server. Which would the group prefer?

6.x.3 Volume static information

The volume static information volume information page (see table y + 5) returns a set of volume characteristics that will not change without a format of the medium.

Table y + 5: Volume static information page

Bit Byte	7	6	5	4	3	2	1	0
0	PAGE CODE (01h)							
1	Reserved							
2	(MSB)		DESCRIPTOR LENGTH				(LSB)	
3								
4								
5								
6	(MSB)		PAGE LENGTH (n-9)				(LSB)	
9								
	Volume static information descriptors							
10	First volume static information descriptor (see table y + 6)							
	:							
	:							
n	Last volume static information descriptor (see table y + 6)							

The PAGE CODE field shall be set to the value shown in table y + 5.

The DESCRIPTOR LENGTH field shall contain the length of each volume static information descriptor. The DESCRIPTOR LENGTH shall be a multiple of 4. The volume static information descriptors shall be zero padded.

The value in the PAGE LENGTH field is the length in bytes of the volume static information descriptors that follow. If the descriptors are truncated because of the allocation length, then the PAGE LENGTH field shall not be affected.

One volume static information descriptor shall be returned for each selected volume. Volume static information descriptors shall be returned in ascending order by element address.

Table y + 6: volume static information descriptor

Bit Byte	7	6	5	4	3	2	1	0
0	Reserved		SIGU	VSLBE	VSMAMA	MEDIUM TYPE		
1	Reserved				VSNV	BCV	EAV	INVALID
2	(MSB) _____							
3	VOLUME INDEX _____							
4	(MSB) _____							
5	ELEMENT ADDRESS _____							
6	VOLUME TYPE CODE _____							
7	VOLUME QUALIFIER CODE _____							
8	Reserved							
15	Reserved							
16	Barcode							
47	Barcode							
48	VOLUME SERIAL NUMBER							
79	VOLUME SERIAL NUMBER							

A serial number is globally unique (SIGU) bit set to one indicates that the value reported in the VOLUME SERIAL NUMBER field is globally unique. A SIGU bit set to zero indicates that the value reported in the VOLUME SERIAL NUMBER field is not globally unique.

A volume supports logical block encryption (VSLBE) bit set to one indicates that the volume supports encrypting and decrypting the data within logical blocks (see SSC-3). A VSLBE bit set to zero indicates that the volume does not support encrypting and decrypting the data within logical blocks.

Comment: can we reference SSC-3 for logical blocks or do we need to pull that definition into here since the DTD may not be a tape device?

A volume supports medium auxiliary memory attributes (VSMAMA) bit set to one indicates that the volume supports medium auxiliary memory attributes (see SPC-3). A VSMAMA bit set to zero indicates that the volume does not support medium auxiliary memory attributes. If a volume supports medium auxiliary attributes, then an application client may access the medium auxiliary attributes when the volume is in a data transfer device that supports the READ ATTRIBUTE command (see SPC-3) and the WRITE ATTRIBUTE command (see SPC-3).

See 6.x.1 for the definition of the MEDIUM TYPE field.

A volume serial number valid (VSNV) bit set to one indicates that the value in the VOLUME SERIAL NUMBER field is valid. A VSNV bit set to zero indicates that the value in the VOLUME SERIAL NUMBER field is not valid.

A barcode valid (BCV) bit set to one indicates that the value in the BARCODE field is valid. A BCV bit set to zero indicates that the value in the BARCODE field is not valid.

An element address valid (EAV) bit set to one indicates that the value reported in the ELEMENT ADDRESS field is valid. An EAV bit set to zero indicates that the value reported in the ELEMENT ADDRESS field is not valid.

See 6.x.5 for the definition of the INVALID bit and the VOLUME INDEX field.

Comment: Can we reference a field described in another command safely or should that be moved to a model clause?

The ELEMENT ADDRESS field indicates the address of the element that contains the volume being reported. The ELEMENT ADDRESS field is not part of the static information and is used to provide a way to identify the volume being reported in libraries that do not support the VOLUME INDEX field. This field is valid only if the EAV bit is set to one.

The VOLUME TYPE CODE field indicates the volume type (see 5.4) of the volume being reported.

The VOLUME QUALIFIER CODE field indicates the volume qualifier (see 5.4) of the volume being reported.

The **BARCODE** field contains 32 bytes of left-aligned ASCII data (see SPC-3) identifying the barcode of the volume. If the barcode value is not known, then the device server shall return ASCII spaces (20h) in this field. This field is valid only if the **BCV** bit is set to one.

The **VOLUME SERIAL NUMBER** field contains 32 bytes of left-aligned ASCII data (see SPC-3) identifying the serial number of the volume. If the volume serial number value is not known, then the device server shall return ASCII spaces (20h) in this field. This field is valid only if the **MSNV** bit is set to one.

6.x.4 Volume state

The volume state information page (see table y + 7) returns the current state of a set of volume characteristics that may change.

Table y + Z: Volume state page

Bit Byte	7	6	5	4	3	2	1	0
0	PAGE CODE (02h)							
1	Reserved							
2	(MSB)				DESCRIPTOR LENGTH			
3					(LSB)			
4					Reserved			
5								
6	(MSB)				PAGE LENGTH (n-9)			
9					(LSB)			
	Volume state descriptors							
10	First volume state descriptor (see table y + 8)							
	⋮							
n	Last volume state descriptor (see table y + 8)							

The **PAGE CODE** field shall be set to the value shown in table y + Z.

The **DESCRIPTOR LENGTH** field shall contain the length of each volume state information descriptor. The **DESCRIPTOR LENGTH** shall be a multiple of 4. The volume state information descriptors shall be zero padded.

The value in the **PAGE LENGTH** field is the length in bytes of the volume state information descriptors that follow. If the descriptors are truncated because of the allocation length, then the **PAGE LENGTH** field shall not be affected.

One volume state information descriptor shall be returned for each selected volume. Volume state information descriptors shall be returned in ascending order by element address.

Table y + 8: volume state information descriptor

<u>Bit</u> <u>Byte</u>	<u>7</u>	<u>6</u>	<u>5</u>	<u>4</u>	<u>3</u>	<u>2</u>	<u>1</u>	<u>0</u>
<u>0</u>	<u>ELEMENT ADDRESS</u>							<u>(MSB)</u>
<u>1</u>								<u>(LSB)</u>
<u>2</u>	<u>WRITE PROTECT</u>		<u>MOUNTED</u>		<u>CED</u>		<u>CAE</u>	
<u>3</u>	Reserved			<u>INVERT</u>	<u>SEAV</u>	<u>ECV</u>	<u>NCR</u>	<u>MBE</u>
<u>4</u>	<u>SOURCE STORAGE ELEMENT ADDRESS</u>							<u>(MSB)</u>
<u>5</u>								<u>(LSB)</u>
<u>6</u>	Reserved							
<u>7</u>								

The ELEMENT ADDRESS field indicates the element address of the media changer element that contains the volume being reported.

The WRITE PROTECT field indicates whether the volume is write protected. See table y+9 for the WRITE PROTECT field values.

Table y + 9: WRITE PROTECT field values

<u>WRITE PROTECT</u>	<u>Description</u>
<u>00b</u>	<u>Unknown</u>
<u>01b</u>	<u>The device server has detected that the last data transfer device reported that the volume was write protected. If the write protection was temporary, then the volume may not be write protected when it is loaded into another data transfer device.</u>
<u>10b</u>	<u>The device server has detected that the last data transfer device reported that the volume was not write protected.</u>
<u>11b</u>	<u>Reserved</u>

The MOUNTED field indicates whether the volume is mounted (see 3.1.X). See table y+10 for the MOUNTED field values.

Table y + 10: MOUNTED field values

<u>MOUNTED</u>	<u>Description</u>
<u>00b</u>	<u>Unknown</u>
<u>01b</u>	<u>The volume is mounted.</u>
<u>10b</u>	<u>The volume is not mounted</u>
<u>11b</u>	<u>Reserved</u>

The contains encrypted data (CED) field indicates whether the volume contains at least one encrypted logical block (see SSC-3). See table y+11 for the CED field values.

Table y + 11: CED field values

<u>CED</u>	<u>Description</u>
<u>00b</u>	<u>Unknown</u>
<u>01b</u>	<u>The volume contains at least one encrypted logical block.</u>
<u>10b</u>	<u>The volume does not contain any encrypted logical blocks.</u>
<u>11b</u>	<u>Reserved</u>

The configured to allow encryption (CAE) field indicates whether the volume is configured to allow encrypting and decrypting of the data within logical blocks. See table y+12 for the CAE field values.

Table y + 12: CAE field values

<u>CAE</u>	<u>Description</u>
<u>00b</u>	<u>Unknown</u>
<u>01b</u>	<u>The volume does not support encrypting and decrypting of the data within logical blocks.</u>
<u>10b</u>	<u>The volume is configured to allow encrypting and decrypting of the data within logical blocks.</u>
<u>11b</u>	<u>The volume is configured to prohibit encrypting and decrypting of the data within logical blocks.</u>

An INVERT bit set to one indicates that the volume has been inverted by MOVE MEDIUM or EXCHANGE MEDIUM operations since it was last in the SOURCE STORAGE ELEMENT ADDRESS. An INVERT bit set to zero indicates that the volume has not been inverted by MOVE MEDIUM or EXCHANGE MEDIUM operations since it was last in the SOURCE STORAGE ELEMENT ADDRESS

A source element address valid (SEAV) bit set to one indicates that the SOURCE STORAGE ELEMENT ADDRESS field is valid. A SEAV bit set to zero indicates that the SOURCE STORAGE ELEMENT ADDRESS field is not valid.

An expired cleaning volume (ECV) bit set to one indicates that the device server has detected that the volume is an expired cleaning volume. An ECV bit set to zero indicates that the device server has not detected that the volume is an expired cleaning volume or that the device server does not support detection of expired cleaning volumes. How the device server detects that the volume is an expired cleaning volume is beyond the scope of this standard.

A no capacity remaining (NCR) bit set to one indicates that the device server has detected that the volume has passed a device server determined capacity threshold (e.g., the data transfer device includes an SSC-3 compliant device server and the logical position has passed the early warning position). A no capacity remaining (NCR) bit set to zero indicates that the device server has not detected that the volume has passed a device server determined capacity threshold or that the device server does not support capacity detection.

A may be exported (MBE) bit set to one indicates that the volume may be exported (i.e., moved to an import/export element). A MBE bit set to zero indicates that the volume may not be exported.

The SOURCE STORAGE ELEMENT ADDRESS field provides the address of the last storage element this unit of media occupied. This field is valid only if the SEAV bit is set to one.

6.x.5 Volume tag information page

Table y + 13 shows the format of the Volume tag information page.

Table y +13: Volume tag information page

Bit Byte	7	6	5	4	3	2	1	0	
0	PAGE CODE (03h)								
1	Reserved								
2	(MSB)		DESCRIPTOR LENGTH						(LSB)
3									
4			Reserved						
5									
6	(MSB)		PAGE LENGTH (n-9)						(LSB)
9									
	Volume tag information descriptors								
10			First volume tag information descriptor (see table y + 15)						
n			Last volume tag information descriptor (see table y + 15)						

The PAGE CODE field shall be set to the value shown in table y + 14.

The DESCRIPTOR LENGTH field shall contain the length of each volume tag information descriptor. The DESCRIPTOR LENGTH shall be a multiple of 4. The volume tag information descriptors shall be zero padded.

The value in the PAGE LENGTH field is the length in bytes of the volume tag information descriptors that follow. If the descriptors are truncated because of the allocation length, then the PAGE LENGTH field shall not be affected.

One volume tag information descriptor shall be returned for each selected volume. Volume tag information descriptors shall be returned in ascending order by element address.

Table y + 15: volume tag information descriptor

Bit Byte	7	6	5	4	3	2	1	0
0	Reserved							
1	Reserved						EAV	INVALID
3	(MSB)	VOLUME INDEX						(LSB)
4								
5	(MSB)	ELEMENT ADDRESS						(LSB)
6								
7		Reserved						
8								
16		PRIMARY VOLUME TAG INFORMATION						
51								
52		ALTERNATE VOLUME TAG INFORMATION						
87								

An element address valid (EAV) bit set to one indicates that the value reported in the ELEMENT ADDRESS field is valid. An EAV bit set to zero indicates that the value reported in the ELEMENT ADDRESS field is not valid.

See 6.x.5 for the definition of the IVALID bit and the VOLUME INDEX field.

The ELEMENT ADDRESS field indicates the address of the element that contains the volume being reported. The ELEMENT ADDRESS field is not part of the static information and is used to provide a way to identify the volume being reported in libraries that do not support the VOLUME INDEX field. This field is only valid if the EAV bit is set to one.

The PRIMARY VOLUME TAG INFORMATION field and the ALTERNATE VOLUME TAG INFORMATION field provide identifying information for this volume (see 5.3).

6.x.6 Volume bus address

Table y + 14 shows the format of the Volume Bus Address page.

Table y + 14: Volume bus address page

Bit Byte	7	6	5	4	3	2	1	0
0	PAGE CODE (02h)							
1	Reserved							
:								
5								
6	(MSB)	PAGE LENGTH (n-9)						(LSB)
9								
	Volume bus address descriptors							
10	First volume bus address descriptor (see table y + 9)							
	⋮							
n	Last volume bus address descriptor (see table y + 9)							

The PAGE CODE field shall be set to the value shown in table y + 14.

The value in the PAGE LENGTH field is the length in bytes of the volume bus address descriptors that follow. If the descriptors are truncated because of the allocation length, then the PAGE LENGTH field shall not be affected.

Comment: This page can include information to help the application find where the volume is mounted. It would probably include information like the WWID of the DTD where the volume is mounted and may contain information about whether that DTD device believe it is connected to a transport and maybe information on the transport type if that is useful. It may make more sense to have this page with the element information for the element that contains this volume if this page is useful at all.

Comment 2: A suggestion has been made that this page be dropped. Is "on bus" useful and if so where would it go? It isn't strictly "volume" information since it is really about the data transfer device but that doesn't really fit in "element" information either. It was put here because it is "this volume is mounted at . . ." information.

6.x.6 Return All Supported Pages

If the Return All Supported Pages information page code is requested, then the device server shall return all of the pages supported by the volumes selected by the MEDIUM TYPE field in the CDB, the STARTING VOLUME field in the CDB and the VOLUME TYPE CODE field in the CDB in ascending order by page code (i.e. return all page code 01h pages followed by all page code 02h pages, etc).