To: INCITS T10 Committee

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Date: 9 November 2005

Document: T10/05-317r3

Subject: SMC-3, SPC-4, SBC-3, and SSC-3: Remove Attached Media Changer model

1 Revision History

Revision 0:
Posted to the T10 web site on 24 August 2005.

Revision 1:
Added changes to SPC-4 PREVENT ALLOW MEDIUM REMOVAL command. Posted to the T10 web site on 7 September 2005.

Revision 2:
Updated based on comments received from Rob Elliott of HP. Posted to the T10 web site on 2 November 2005.

Revision 3:
Updated based on comments at the T10 meeting, November 2005. Posted to the T10 web site on 9 November 2005.

2 General

In SMC-3 many new commands and features have been added and are planned to be added in the next few months. These features allow the applications to better understand and control the media changer. The attached media changer model in SMC generally does not have access to these new commands and features.

Rather than attempting to expand the scope of this legacy model of media changer, the SMC-3 working group has decided to obsolete this model. Devices that wish to support this model can still do so by complying with SMC-2. However, by making this model obsolete, the SMC-3 wishes to discourage its use in future development in favor of a separate logical unit supporting the SMC-3 standard to control media changers of this type.

This proposal addresses the changes to be made in SMC-3 to remove the attached media changer model from the standard. It also contains a section proposing changes in SPC-4 INQUIRY data MChngr bit description and a model clause that clarifies it, since this bit is used to indicate the presence of an attached media changer.

3 Changes to SMC-3

3.1   Abstract

This standard defines the SCSI commands and model for ~~independent~~ media changer devices ~~and attached media changer functions integrated into other SCSI devices~~.

3.2   Forward

The SCSI Media Changer Commands - 3 (SMC-3) standard specifies the commands and external behavioral characteristics of a device server that declares itself a medium changer in the PERIPHERAL DEVICE TYPE field of the INQUIRY command response data. ~~This standard also specifies the behavior of the attached media changer commands available when the MCHNGR bit is set to one in INQUIRY command response data.~~

3.3   Clause 1, Scope

Add the following:

This standard makes obsolete the following concepts from previous standards:

a) The attached medium changer model.

3.4   Clause 3, Definitions

~~3.1.3 attached media changer: A media changer that accepts commands issued to the same logical unit as a SCSI device that is not a media changer.~~

3.5   Clause 4, Overview

~~The attached media changer model permits a subset of the functions of an independent changer to be incorporated directly into a data transfer device. Only one data transfer element is permitted. In this case, only one logical unit is used to access all functions.~~

3.6   Clause 5.1

Search through the document for all instances of the term "independent media changer" and removing the word "independent".

3.7   Clause 5.2

~~5.2 Attached media changer~~

~~An attached media changer is part of a device server that sets the MCHNGR bit to one in its standard INQUIRY data (see SPC-2). Attached media changers respond to the same LUN as a data transfer device that is not a media changer. In an attached media changer, the PERIPHERAL DEVICE TYPE field of standard INQUIRY data returns the type of the data transfer device.~~

~~Two media changer commands, READ ELEMENT STATUS ATTACHED and MOVE MEDIUM ATTACHED are added to the command set of the data transfer device. The other commands available depend on the model for the data transfer device.~~

3.8   Clause 5.3.2 Medium transport element

~~Attached media changer devices shall have only one medium transport element. In an attached changer, element address zero is reserved for the medium transport element.~~

3.9   Clause 5.3.5 Data transfer element

A data transfer element address may be a source or destination address in a MOVE MEDIUM command or the optional EXCHANGE MEDIUM command. Data transfer elements may or may not provide independent storage of a unit of media, see the Device Capabilities mode page (7.3.2). ~~Attached media changers shall have only one data transfer element.~~

3.10   Clause 6.1 Summary of commands for independent media changers

Remove the word "independent" from the subclause title.

Add as either a footnote to Table 3 or a paragraph following the table:

The following operation codes are obsolete: A7h (i.e., MOVE MEDIUM ATTACHED) and B4h (i.e., READ ELEMENT STATUS ATTACHED).

3.11   Clause 6.2 Summary of commands for attached media changers

~~**6.2 Summary of commands for attached media changers**~~

~~Attached media changers shall support the READ ELEMENT STATUS ATTACHED and MOVE MEDIUM ATTACHED commands (see table 4) in addition to the commands defined by the data transfer device type. Attached media changers shall not support other media changer commands (e.g. EXCHANGE MEDIUM).~~

~~**Table 4 — Commands for attached media changers**~~

~~Command name~~	~~Operation Code~~	~~Type~~	~~Subclause~~
~~MOVE MEDIUM ATTACHED~~	~~A7h~~	~~M~~	~~6.7~~
~~MOVE MEDIUM~~	~~A5h~~	~~S~~	~~6.7~~
~~READ ELEMENT STATUS ATTACHED~~	~~B4h~~	~~M~~	~~6.10~~
~~READ ELEMENT STATUS~~	~~B8h~~	~~S~~	~~6.10~~
~~Key:~~	~~M - command implementation is mandatory.~~ ~~O - command implementation is optional.~~ ~~S - optional operation codes for use by sequential devices only.~~		

~~Sequential devices, (data transfer device type 1) may also use operation codes A5h for MOVE MEDIUM and B8h for READ ELEMENT STATUS.~~

3.12 Clause 6.3 Commands allowed in the presence of various reservations

In Table 5, remove the rows for the MOVE MEDIUM ATTACHED, READ ELEMENT STATUS ATTACHED CURDATA=0, and READ ELEMENT STATUS ATTACHED CURDATA=1 commands.

3.13 Clause 6.7 MOVE MEDIUM commands

6.7 MOVE MEDIUM command~~s~~

The MOVE MEDIUM ~~and MOVE MEDIUM ATTACHED~~ command~~s~~ (see table 9) request~~s~~ that the device server move a volume from a source element to a destination element. Support for the MOVE MEDIUM command is mandatory ~~for independent media changers~~. ~~Support for the MOVE MEDIUM ATTACHED command is mandatory for attached media changers.~~

Table 9 — MOVE MEDIUM ~~and MOVE MEDIUM ATTACHED~~ command

Bit Byte	7	6	5	4	3	2	1	0
0	OPERATION CODE (A5h)							
1	Reserved							
2	(MSB)		MEDIUM TRANSPORT ADDRESS					
3								(LSB)
4	(MSB)		SOURCE ADDRESS					
5								(LSB)
6	(MSB)		DESTINATION ADDRESS					
7								(LSB)
8	Reserved							
9	Reserved							
10	Reserved							INVERT
11	Control							

~~The MOVE MEDIUM OPERATION CODE for an independent media changer shall be A5h. An attached media changer shall use OPERATION CODE A7h for the MOVE MEDIUM ATTACHED command. Attached changers connected to a sequential data transfer device are also permitted to implement OPERATION CODE A5h as the MOVE MEDIUM ATTACHED command.~~

The MEDIUM TRANSPORT ADDRESS field specifies the medium transport element that is to be used in executing this command. ~~Attached media changers shall set this field to zero. Independent changers may set this field to zero to specify~~ A value of zero specifies the default medium transport element. If the address specified has not been assigned or has been assigned to an element other than a medium transport element, the device server hall return CHECK CONDITION status. The sense key shall be ILLEGAL REQUEST and the additional sense code INVALID ELEMENT ADDRESS.

The Device Capabilities mode page (see 7.3.2), provides a matrix with the supported source element or destination element combinations for the MOVE MEDIUM ~~and MOVE MEDIUM ATTACHED~~ command~~s~~.

3.14   Clause 6.10 READ ELEMENT STATUS commands

6.10 READ ELEMENT STATUS commands

6.10.1 READ ELEMENT STATUS introduction

The READ ELEMENT STATUS ~~and READ ELEMENT STATUS ATTACHED~~ commands~~s~~ (see table 12) requests~~s~~ that the device server report the status of its internal elements to the application client. Support for the READ ELEMENT STATUS command is mandatory ~~for independent media changers~~. ~~Support for the READ ELEMENT STATUS ATTACHED command is mandatory for attached media changers.~~

Table 12 — READ ELEMENT STATUS ~~& READ ELEMENT STATUS ATTACHED~~ command

Bit Byte	7	6	5	4	3	2	1	0
0	OPERATION CODE (B8h)							
1	Reserved			VOLTAG	ELEMENT TYPE CODE			
2	(MSB)	STARTING ELEMENT ADDRESS						
3								(LSB)
4	(MSB)	NUMBER OF ELEMENTS						
5								(LSB)
6	Reserved						CURDATA	DVCID
7		ALLOCATION LENGTH						
8								
9								
10	Reserved							
11	Control							

~~The READ ELEMENT STATUS OPERATION CODE for an independent media changer shall be B8h. An attached media changer shall use OPERATION CODE B4h for the READ ELEMENT STATUS ATTACHED command. Attached changers connected to a sequential data transfer device may also implement OPERATION CODE B8h as the READ ELEMENT STATUS ATTACHED command.~~

3.15   Clause 6.10.2 Element status data

The data returned by the READ ELEMENT STATUS ~~or READ ELEMENT STATUS ATTACHED~~ command is defined in table 14 and through . Element status data consists of an eight-byte header (see table 14), followed by zero or more element status pages.

NOTE 6 — The READ ELEMENT STATUS ~~and READ ELEMENT STATUS ATTACHED~~ commands~~s~~ may be issued with an ALLOCATION LENGTH of eight bytes in order to determine the ALLOCATION LENGTH required to transfer all the element status data specified by the command.

3.16   Clause 7.1 Diagnostic parameters

This subclause defines the descriptors and pages for diagnostic parameters used with independent media changer devices. ~~Attached media changers shall use the descriptors and pages defined for the data transfer device type.~~

3.17 Clause 7.2.1 Log page codes

This subclause defines the descriptors and pages for log parameters used with independent media changer devices. ~~Attached media changers shall use the descriptors and pages defined for the data transfer device type.~~

3.18 Clause 7.2.2 TapeAlert log page

Support for the TapeAlert log page (see table 30) is optional for independent media changers. If supported, the TapeAlert log page shall operate using the flag definitions in Annex A of this standard. ~~Attached media changers operating with an SSC-2 data transfer device that supports the TapeAlert page shall use the flags as defined in SSC-2.~~

3.19 Clause 7.3.1 Mode page codes

This subclause defines the descriptors and pages for mode parameters used with independent media changer devices. ~~Attached media changers shall only return pages and descriptors defined for the data transfer device type.~~

3.20 Clause 7.3.2 Device Capabilities mode page

The Device Capabilities mode page (see table 32) defines characteristics of the element types of an independent media changer. ~~Attached media changers shall not return this page.~~ This information may be employed by the application client to determine functions permitted by the MOVE MEDIUM and EXCHANGE MEDIUM commands.

3.21 Clause 7.3.3 Element Address Assignment mode page

The Element Address Assignment mode page (see table 34) is used to assign addresses to the elements of the independent media changer (MODE SELECT) and to report those assignments (MODE SENSE). This page also defines the number of each type of element present. ~~An attached media changer shall not return this page.~~

4 Changes to SPC-4

4.1   Clause 5.10 Removable medium devices with an attached medium changer

Remove this entire subclause.

4.2   Clause 6.4.2 Standard INQUIRY data

Change bit 3 in byte 6 in table 81 from MCHNGR to Obsolete

Remove the paragraph following the table that describes the MCHNGR bit.

4.3   Clause 6.13 PREVENT ALLOW MEDIUM REMOVAL command

Table 119 – PREVENT field

PREVENT	Description
00b	Medium removal shall be allowed ~~from both the data transport element and the attached medium changer, if any.~~
01b	Medium removal shall be prohibited ~~from the data transport element but allowed from the attached medium changer, if any~~.
10b [a]	~~Medium removal shall be allowed for the data transport element but prohibited for the attached medium changer.~~ Obsolete
11b [a]	~~Medium removal shall be prohibited for both the data transport element and the attached medium changer.~~ Obsolete
[a] ~~PREVENT values 10b and 11b are valid only when the RMB bit is set to one and the MCHNGR bit is set to one are both equal to one in the standard INQUIRY data (see 6.4.2).~~	

The prevention of medium removal shall begin when any application client issues a PREVENT ALLOW MEDIUM REMOVAL command with a PREVENT field of 01b ~~or 11b~~ (i.e., medium removal prevented). The prevention of medium removal for the logical unit shall terminate after:

a) One of the following occurs for each I_T nexus that previously had medium removal prevented:
      A) Receipt of a PREVENT ALLOW MEDIUM REMOVAL command with a PREVENT field of 00b ~~or 10b~~;
      B) An I_T nexus loss; or
b) A power on;
c) A hard reset; or
d) A ~~a~~ logical unit reset.

4.4   Appendix D

In Table D.2, change the values for the D and T columns for the opcodes MOVE MEDIUM ATTACHED and READ ELEMENT STATUS ATTACHED from "O" to "Z".

Remove clause D.3.2 titled "Additional operation codes for devices with the MCHNGR bit set to one" in its entirety.

5 Changes to SSC-3:

Remove the following commands from Table 13 and Table 20: A7h (i.e., MOVE MEDIUM ATTACHED) and B4h (READ ELEMENT STATUS ATTACHED).

Add as either a footnote to these tables or a paragraph following the tables:

The following operation codes are obsolete: A7h (i.e., MOVE MEDIUM ATTACHED) and B4h (i.e., READ ELEMENT STATUS ATTACHED).

Alternately, the command names for these opcodes can be changed to "Obsolete" and their type changed to Z.

6 Changes to SBC-3:

Remove the following commands from Table 10: A7h (i.e., MOVE MEDIUM ATTACHED) and B4h (READ ELEMENT STATUS ATTACHED). Also remove footnote "f" from the table.

Add the following commands to the list of obsolete command in the footnotes for Table 10: A7h (MOVE MEDIUM ATTACHED) and B4h (READ ELEMENT STATUS ATTACHED).