



Cygnets Systems

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TO: Automatic Medium Changer Sub-Committee,  
Working Group, and  
Accredited Standards Committee X3T9.2

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SUBJ: Additions to the Automatic Medium Changer proposal.

Attached for your review is the MEDIUM SELECT command for Automatic Medium Changers. Also included is the appropriate page for the MODE SELECT command.

Note that the Keyset bit in command byte two has been changed from our original discussions. It is now used as the means by which an initiator may change the target's copy of the Retrieval Key. The target (the Automatic Medium Changer) will not be allowed to write on any of the media in the Automatic Medium Changer using the Medium Select command.

The initiator does reading and all the writing to the medium selected by the Medium Select command and virtual LUN using the Class 1 READ and WRITE commands.

Automatic Medium Changers  
MEDIUM SELECT Command.

Bit Byte	7	6	5	4	3	2	1	0
0	Operation Code (A7h)							
1	Logical Unit Number			Reserved				
2	Verify	Import	Export	Keyset	Lock	Mount	Reserved	
3	Retrieval Key (msb)							
4	Retrieval Key							
5	Retrieval Key							
6	Retrieval Key							
7	Retrieval Key							
8	Retrieval Key							
9	Retrieval Key							
10	Retrieval Key (lsb)							
11	Vendor Unique		Reserved			Flag	Link	

The MEDIUM SELECT command requests the target to perform some action as specified in byte two of the command block.

The Logical Unit Number (LUN) is a "Virtual Logical Unit Number" from 0-7. Virtual Logical Unit Numbers may or may not correspond to a real physical data transfer element. Virtual Logical Unit Numbers may be reserved before attempting to assign a Retrieval Key to it.

Retrieval Keys are utilized to identify a piece of medium within an automatic medium changer. The Retrieval Key may or may not be contained on the physical medium. Retrieval Keys are restricted to 8 bytes. When an unknown Retrieval Key is specified, the target returns a CHECK CONDITION status with the sense key set to ILLEGAL REQUEST.

254 Verify signifies that the Retrieval Key is contained on the medium. The target reads the Retrieval Key from the medium in the area specified by the Mode Select command (page 1D). When Verify is set and the Retrieval Key on the medium does not match the Retrieval Key specified in the command block, the target returns a CHECK CONDITION status with the sense key set to ILLEGAL REQUEST.

Import signifies the medium is to be placed into the I/O element for insertion into the automatic medium changer. The import bit has higher precedence than the export bit.

Implementers note: If double sided medium is imported, two linked Medium Select commands should be issued so that the Retrieval Keys are associated with the same physical piece of medium. If Verify is not specified, the target will associate the first Retrieval Key with one side of the medium and associate the second Retrieval Key with the other side of the medium. If only one Medium Select command is used to import a piece of double sided medium, only the side containing the Retrieval Key specified in the command block will be associated with the medium and the other side will not be accessible until the physical medium is exported

and then imported again with two linked Medium Select commands and appropriate Retrieval Keys.

Export signifies the medium is to be placed into the I/O element for removal from the automatic medium changer. The Export bit unlocks, unmounts and places the physical medium into the I/O element provided the same Retrieval Key (or keys associated with the same physical medium) is not in use by another LUN. When the same physical medium is associated with another LUN, the target returns a CHECK CONDITION status with the sense key set to ILLEGAL REQUEST.

Keyset signifies that the Retrieval Key in the command block is to be associated with the medium in the specified virtual LUN. The medium must be currently mounted on a virtual LUN. If the virtual LUN in the command block does not currently have a Retrieval Key associated with it (ie. mounted), the target returns a CHECK CONDITION status with the sense key set to ILLEGAL REQUEST.

Implementers note: The Keyset bit is the way in which the target is commanded to change its internal association of a Retrieval Key with a side of a piece of medium. The new Retrieval Key contained in the command block is associated with the medium as specified by the LUN. This is necessarily a two step process consisting of mounting the desired medium using the Mount bit with the old Retrieval Key and a LUN and then using the Keyset bit with the new Retrieval Key and the same LUN.

Lock signifies the medium associated with the Retrieval Key is to be placed into and retained in a data transfer element as specified by the LUN. The medium is retained in the data transfer element until another Medium Select command is received that disassociates the Retrieval Key from the LUN or does not have the Lock bit set for the same Retrieval Key. When the limit of locked data transfer elements is reached, the target returns a CHECK CONDITION status with the sense key set to ILLEGAL REQUEST. The Lock bit implies a Mount.

Mount signifies the Retrieval Key is to be associated with the LUN address. Any previous association with a Retrieval Key and Lock order is invalidated. When Mount is not specified it signifies the Retrieval Key is to be disassociated with the Logical Unit Number. The physical medium may be moved to a storage element if it is in a data transfer element. A Mount is implied by the Lock bit.

The following table shows all possible combinations of the six bits in byte two of the command block and the action taken. Note the hierarchy and associativity of the bits. For instance, Lock implies a mount and Import has precedence over Export.

Verify	Import	Export	Keyset	Lock	Mount	Action
0	0	0	0	0	0	unmount
0	0	0	0	0	1	mount
0	0	0	0	1	X	mount and lock
0	0	0	1	X	X	change key
0	0	1	X	X	X	export
0	1	X	X	0	0	import
0	1	X	X	0	1	import and mount
0	1	X	X	1	X	import, lock and mount
1	0	0	0	0	0	verify and unmount
1	0	0	0	0	1	mount and verify
1	0	0	0	1	X	mount, lock and verify
1	0	0	1	X	X	change key and verify
1	0	1	X	X	X	verify and export
1	1	X	X	0	0	import and verify
1	1	X	X	0	1	import, mount and verify
1	1	X	X	1	X	import, lock, mount and verify

X - Don't Care .

Automatic Medium Changers

MODE SELECT

Retrieval Key Parameters (Page Code 1Dh)

Bit Byte	7	6	5	4	3	2	1	0
0	Reserved		Page Code (1Dh)					
1	Parameter Length							
2	Retrieval Key Logical Block Address (MSB)							
3	Retrieval Key Logical Block Address							
4	Retrieval Key Logical Block Address							
5	Retrieval Key Logical Block Address (LSB)							
6	Retrieval Key Offset (MSB)							
7	Retrieval Key Offset (LSB)							
8	Reserve							
9	Reserve							

The **Parameter Length** is the total number of Retrieval Key Logical Block Address / Retrieval Key Offset pairs. A Retrieval Key Logical Block Address / Retrieval Key Offset pair contains 8 bytes. A Parameter Length of zero signifies a list of 256 Logical Block Address / Retrieval Key Offset pairs.

The **Retrieval Key Logical Block Address** is the logical block address of the retrieval key. This is the logical address which is used to access the retrieval key.

The **Retrieval Key Offset** is the byte offset into the Retrieval Key Logical Block Address at which the eight byte Retrieval Key will be found.

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