

X3T9.2/88-094R0

TO : Members of the X3T9.2 committee

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SUBJECT : Modifications To The Media Changer Command Set

I would like to propose some changes to the SCSI-2 specification for Medium Changers. Listed below are the proposed changes and an explanation of why the change is needed. The following pages show the detail of how the changes would be implemented.

- 1) Add "Allocation Length" field to the CDB for the Read Element Status command. This is cleanup item to make Read Element Status consistent with other SCSI commands.
- 2) Add functionality to the Read Element Status command that would provide information to the Initiator on the assignment of Data Transfer Element addresses to SCSI ID's and LUN's. My proposed change would require that the length of the data mask for Data Transfer Elements be increased to supply SCSI ID and LUN information. This is a cleanup item to provide functionality that was needed in The Media Changer command set.
- 3) Add a Seek To Element command. This would be an optional command that could increase performance for a host. This command is similiar in function to a seek command for direct access type devices.
- 4) Add a Initialize Element Status command. This would be an optional command that would cause the Media Changer to check all elements for media and any other status relevent to that element. The intent of this command is to enable the host to get a quick response from the Read Element Status command. It would be useful to issue this command after a powerfail, or if media has been changed by an operator, or if configurations have been changed.
- 5) I would like to propose a definition for additional sense codes and additional sense code qualifier. I have not assigned numbers to these new codes.

1) Change the Read Element Status CDB as shown below:

Table 16-x: READ ELEMENT STATUS Command

Bit Byte	7	6	5	4	3	2	1	0
0	Operation Code (38h)							
1	Logical Unit Number				Reserved			
2	(MSB)							
3	Starting Element Address							(LSB)
4	(MSB)							
5	Number of Element							(LSB)
6	Reserved							
7	(MSB)							
8	Allocation Length							(LSB)
9	Control Byte							

2) Change the Element Type Code table as shown below:

Table 16-x: Element Type Code

Code	Description	Data Length
0h	Unused address	1h
1h	Storage element	1h
2h	Input/Output element	1h
3h	Medium transport element	4h
4h	Data transfer element	8h
5h -Fh	Reserved	

2) Change the Data Mask for Data Transfer types as shown below:

16.x.x.x. Data Transfer Element Address

Table 16-xx: Data Mask - Type Code 4h

Bit	7	6	5	4	3	2	1	0
0	Vendor Unique		Reserved		Access	Error	Reserved	Full
1	Scsi ID			Not This Bus	ID/LUN Valid	LUN		
2	(MSB)							
3	Source Element Address							
	(LSB)							
4	Vendor Unique						Source Valid	Invert
5	Vendor Unique							
6	Vendor Unique							
7	Vendor Unique							

The Scsi ID and LUN map the logical element address of a Data Transfer element to a physical Scsi ID and LUN. Sending this information is optional. If the auto changer does not have access to this information then the ID/LUN Valid bit shall be set to zero.

If the Not This Bus bit is set to "0" then the Scsi Id and LUN of the Data Transfer Element is on the same Scsi Bus as the Medium Changer.

If the Not This Bus bit is set to "1" then the Scsi ID and LUN of the Data Transfer Element is not on the same Scsi Bus as the Medium Changer. The Data Transfer Element may be on another Scsi Bus or on a different type of interface altogether. The determination of where the Data Transfer element is shall be vendor unique.

The Source Element Address indicates the element address that media was moved from if the Data Transfer element is full. The Invert bit indicates whether the media was inverted during the move to the Data Transfer element. If the Medium Changer cannot supply this information or if the information is not valid at the time of the Read Element Status command then the Source Valid bit shall be set to "0"

3) Add a Seek To Element command as shown below

Table 16-xx: SEEK TO ELEMENT Command

Bit Byte	7	6	5	4	3	2	1	0
0	Operation Code (??h)							
1	Logical Unit Number			Reserved				
2	(MSB)							
3	Tranport Element Address							(LSB)
4	(MSB)							
5	Destination Element Address							(LSB)
6	Reserved							
7	Reserved							
8	Reserved							Invert
9	Control Byte							

The Seek To Element command will position the transport element specified in front of the destination element specified. If the Media Changer supports rotation of media then a "1" in the Invert bit field specifies the transport element to be inverted or rotated before positioning in front of the destination element.

4) Add a Initialize Element Status Command as shown:

Table 16-x: INITIALIZE ELEMENT STATUS Command

Bit Byte	7	6	5	4	3	2	1	0
0	Operation Code (01h)							
1	Logical Unit Number			Reserved				
2	Reserved							
3	Reserved							
4	Reserved							
5	Control Byte							

The Initialize Element Status command will cause the Medium Changer to check all elements for media and any other status relevant to that element. The intent of this command is to enable the host to get a quick response from the Read Element Status command. It would be useful to issue this command after a powerfail, or if media has been changed by an operator, or if configurations have been changed.

X3T9.2/88-094R0

5) Additional Sense Codes for Auto Changer Devices.

Sense Key NOT READY (2h)

Byte #	Byte #	Description
12	13	
04	00	Medium Changer not ready
05	00	Medium Changer not selected
06	00	Door is open

Sense Key HARDWARE ERROR (4h)

Byte #	Byte #	Description
12	13	
??	??	Unable to complete Move or Exchange Medium

Sense Key ILLEGAL REQUEST (5h)

Byte #	Byte #	Description
12	13	
??	??	Element is full
??	??	Element is empty
??	??	Element is reserved
??	??	Prevent Media Removal is enabled

Sense Key UNIT ATTENTION (6h)

Byte #	Byte #	Description
12	13	
28	0	Medium Changed
28	1	Mail Slot Changed
28	2	Magazine Changed
28	3	Door was opened
29	0	Power on, Reset, Bus Device Reset
2A	0	Mode Select parameters changed
??	??	Configuration change