

To: T10 Membership
From: Paul Suhler, Seagate Technology
Subject: Proposal for SPC Support for Partial Loading & Unloading (T10/99-347r0)
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1 General

This document proposes changes to the SCSI Primary Commands standard to provide support in removable medium devices for accessing Medium Auxiliary Memory (MAM) without the overhead of making the device ready for access to the primary medium. There are three components to this proposal: new definitions, a new field in the Control mode page, and two new ASC/ASCQ combinations.

This document is based upon a discussion in the SCSI working group on 3 November 1999.

2 Justification

2.1 THE CASE FOR SPLITTING LOAD

Some tape technologies – e.g., AIT and LTO – use cartridges equipped with Medium Auxiliary Memory (MAM), a non-volatile memory used to record medium identification and usage information. This is typically accessed via an RF interface and does not require reading the tape itself. In a library not equipped with a mobile MAM reader, it is necessary to load the cartridge into the drive to read the MAM via the drive's MAM reader.

The current Load command will not only move the cartridge into the drive, but will also prepare the tape for access by threading, adjusting tension, etc. This takes much longer than is required to read the MAM, greatly increasing the time to scan a series of cartridges.

By issuing one command to move the cartridge into the drive and another to prepare the tape for access, the drive operation becomes much more flexible and avoids unnecessary delays.

2.2 THE CASE FOR SPLITTING UNLOAD

It is a requirement of some tape library systems that preparation of a tape cartridge for ejection be done separately from the actual ejection. These devices require that the robot arm (medium transport element – MTE – in SMC terminology) must be positioned at the drive before the command to eject the cartridge is issued. It currently must wait there throughout the process of preparing the tape for ejection. For dual-reel media, this preparation may include retensioning and/or positioning to BOT or EOT; for single-reel media, this preparation means unthreading the tape and winding the tape leader into the cartridge.

The difficulty with the present LOAD UNLOAD command is that it specifies both unthreading and ejection, with no way to separate the two operations. Workarounds include having the MTE wait at the drive throughout the entire process, or implementing a vendor-unique unthread operation usually commanded over the drive's serial interface.

By issuing one command to prepare the cartridge for ejection and another to perform the actual ejection, the MTE can service other requests while the tape is prepared for ejection. Only when

the tape is actually ready to be ejected will the MTE be moved to the drive. The sequence would be:

1. Issue modified Unload; cartridge is prepared for ejection.
2. Move MTE to drive.
3. Issue standard Load; cartridge is immediately ejected.
4. Move medium to desired location.

3 Proposed Changes

A change to the SSC LOAD UNLOAD command has been accepted by the SSC working group. To make use of this command's new features, the following changes are required in SPC. Changes are indicated in red.

3.1 DEFINITIONS

Add the following definitions:

Auxiliary Memory: A memory component that is accessible to the Device Server. This memory is usually non-volatile and independent of the main function of the device server.

Medium Auxiliary Memory: An Auxiliary Memory residing on a medium, for example, a tape cartridge.

3.2 AUTOLOAD CONTROL

3.2.1 Discussion

When a medium is inserted into a drive, many drives simply load the cartridge and prepare the medium for access. However, some customers do not want this. Given the above discussion of loading and unloading to a MAM-accessible point, there are three options:

1. Do not load; wait for Load command..
2. Load only until MAM is accessible.
3. Load until primary medium is ready. This is the usual behavior for stand-alone drives.

The current device's behavior should be readable and settable via a mode page in SPC, as this behavior would apply to at least three different command sets. The default behavior could be specified via external jumpers or by NVRAM configuration at manufacturing time.

3.2.2 Proposal

Add a three-bit field named "AUTOLOAD MODE" to the Control Mode Page:

Table 158 -- Control Mode Page

Bit	7	6	5	4	3	2	1	0
Byte	PS	Reserved	PAGE CODE (0Ah)					
	PAGE LENGTH (0Ah)							

2	TST			Reserved			GLTSD	RECL
3	QUEUE ALGORITHM MODIFIER				Reserved	QErr		DQue
4	Reserved	RAC	Reserved		SWP	RAERP	UAAERP	EAERP
5	Reserved					AUTOLOAD MODE		
6	MSB	READY AER HOLDOFF PERIOD						LSB
7								
8	MSB	BUSY TIMEOUT PERIOD						LSB
9								
10	MSB	EXTENDED SELF-TEST COMPLETION TIME						LSB
11								

Add the following paragraph and table immediately before the paragraph describing the READY AER HOLDOFF PERIOD field. (This will require renumbering of subsequent tables.)

For by a removable medium device server, the AUTOLOAD MODE field specifies the action taken when a medium is inserted into the device. For devices other than removable medium devices, the value of this field shall be 000b and the field shall not be modifiable.

Table 162 -- Autoload mode field

Value	Definition
000b	Medium shall be loaded until it is ready for access.
001b	Medium shall be loaded until the medium auxiliary memory is accessible.
010b	Medium shall not be loaded.
011b - 111b	Reserved

3.3 STATUS REPORTING

3.3.1 Discussion

There are two conditions which need to be reported. One is when the medium is inserted and not loaded, as per Autoload Mode 2, the other is when the MAM becomes accessible, as per Autoload Mode 1. In both cases, the device can be addressed, so a sense Key of Not Ready is inappropriate according to SPC. Therefore, both of these conditions should use sense key Unit Attention.

3.3.2 Proposal

Add the following two lines to Tables 113 and C.1, "ASC and ASCQ Assignments":

ASC	ASCQ	D	T	L	P	W	R	S	O	M	C	A	E	B	K	Description
3Fh	10h	D	T			W	R		O	M				B		MEDIUM LOADABLE
3Fh	11h	D	T			W	R		O	M				B		MEDIUM AUXILIARY MEMORY ACCESSIBLE