To: T10 Membership
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Subject: SSC Proposal to Support Partial Loading & Unloading (T10/99-263r0)
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This is a proposal to modify the SSC Load/Unload command to allow loading a cartridge into a drive without threading the tape and to unthread the tape without ejecting the cartridge.

The Case for Splitting Load

Some tape technologies – 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.

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. Since 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.

The Proposal

Splitting of the Load and Unload operations can be accomplished either by specifying a new command or by modifying an existing one. This proposal is to do the latter.

This proposal suggests that a reserved bit in byte 4 of the LOAD UNLOAD CDB be defined to cause the drive to prepare the cartridge for ejection without actually ejecting it or to load the cartridge without preparing it for access. Specifically, bit 3 will be named HOLD. When the LOAD bit is zero and HOLD is one, the cartridge will be held in the drive. When the LOAD bit is one and HOLD is one, the cartridge will be loaded but not threaded. When the HOLD bit is zero, the cartridge will be handled according to the current command specification.

Following is the modification to Table 9 of the SSC specification and of the relevant text. Changes and additions are shown in red.

Table 9 -- LOAD UNLOAD Command

Bit Byte	7	6	5	4	3	2	1	0
0	Operation Code (1Bh)							
1	Reserved							IMMED
2	Reserved							
3	Reserved							
4	Reserved				HOLD	EOT	RETEN	LOAD
5	Control							

If the LOAD bit is set to one and the HOLD bit is set to zero, the medium in the logical unit shall be loaded and positioned to the beginning-of-partition zero. If the LOAD bit is zero and the HOLD bit is zero, the medium in the logical unit shall be positioned for removal at the extreme position along the medium specified by the EOT bit. Following successful completion of an unload operation, the device server shall return CHECK CONDITION status with the sense key set to NOT READY for all subsequent medium-access commands until a new volume is mounted or a load operation is successfully completed.

If the LOAD bit is set to one and the HOLD bit is set to one and the medium has not been moved into the logical unit, then the medium shall be moved in, but not positioned for access. If the LOAD bit is zero and the HOLD bit is zero, the medium shall be positioned as specified by the RETEN and EOT bits or shall be unthreaded (whichever is appropriate for the medium type) but shall not be ejected.

An Alternative

If a modification of the Load Unload command is not acceptable, a new command ("HOLD MEDIUM" ?) could be created instead.