

X3T9.2/87-45

To: ANSI Committee X3T9.2

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Subject: SCSI2 WORM and Erasable Optical Memory Devices Command Sets.

I am submitting a proposal to modify the existing SCSI2 sections for WORM and Erasable Optical Devices. The basic features proposed require the use of previously reserved bits in existing commands. We would also like to support Transfer Lengths in excess of 64K blocks. See attached documents for the details of this proposal.

12.2.1. READ Command

Peripheral Device Type: Write-Once Read-Multiple and Read-Only Direct Access
Operation Code Type: Mandatory

Table 12-9: READ Command

Bit	7	6	5	4	3	2	1	0
Byte	Operation Code (28h)							
0	Logical Unit Number				DPO	FUA	Reserved	RelAdr
1	(MSB)							
2								
3	Logical Block Address							
4								
5	(LSB)							
6	(MSB)							
7	Transfer Length							
8								
9	Vendor Unique				Reserved		Flag	Link

The READ command (Table 12-9) requests that the target transfer data to the initiator from the medium.

See section 6.2.4 for a description of the cache control bits (DPO and FUA).

See section 6.2.5 for a description of the relative address bit (RelAdr).

The logical block address specifies the logical block at which the read operation shall begin.

The transfer length specifies the number of contiguous logical blocks of data that shall be transferred. A transfer length of zero indicates that no data shall be transferred. This condition shall not be considered as an error. Any other value indicates the number of logical blocks that shall be transferred.

This command shall be terminated with a status of RESERVATION CONFLICT if any reservation access conflict (see 8.1.8) exists and no data shall be transferred.

If any of the following conditions occur, this command shall be terminated with a CHECK CONDITION status and, if extended sense is implemented, the sense key shall be set as indicated in the following table. This table does not provide an exhaustive enumeration of all conditions that may cause the CHECK CONDITION status.

Condition	Sense Key
Invalid logical block address	ILLEGAL REQUEST (see note 1)
Target reset or medium change since the last command from this initiator	UNIT ATTENTION
Overrun or other error that might be resolved by repeating the command	ABORTED COMMAND
Attempt to read a blank or previously unwritten block	BLANK CHECK (see note 2)

NOTES:

(1) The extended sense information bytes shall be set to the logical block address of the first invalid address.

(2) The extended sense information bytes shall be set to the logical block address of the first blank block encountered. The data read up to that block shall be transferred.

12.2.2. WRITE Command

Peripheral Device Type: Write-Once Read-Multiple
Operation Code Type: Mandatory

Table 12-10: WRITE Command

Bit	7	6	5	4	3	2	1	0
Byte								
0	Operation Code (2Ah)							
1	Logical Unit Number			DPO	FUA	AutoL	Delete	RelAdr
2	(MSB)							
3	Logical Block Address							
4								
5								
6	(LSB)							
7	(MSB)							
8	Transfer Length							
9	(LSB)							
9	Vendor Unique			Reserved			Flag	Link

The WRITE command (Table 12-10) requests that the target write the data transferred from the initiator to the medium.

See section 6.2.4 for a description of the cache control bits (DPO and FUA).

An auto link (AutoL) bit of one will disable the auto link function in the Unit. An auto link (AutoL) bit of zero will allow the device to perform Logical Block relocation if the block requested has previously been written.

A delete (Delete) bit of one will force the logical blocks specified to be deleted (overwritten) only. No data will be transferred from the initiator. A delete (Delete) bit of zero allows for a normal Write command to execute.

See section 6.2.5 for a description of the relative address bit (RelAdr).

The logical block address specifies the logical block at which the write operation shall begin.

The transfer length specifies the number of contiguous logical blocks of data that shall be transferred. A transfer length of zero indicates that no data shall be transferred. This condition shall not be considered as an error and no data shall be written. Any other value indicates the number of logical blocks that shall be transferred.

This command shall be terminated with a status of RESERVATION CONFLICT if any reservation access conflict (see 8.1.8) exists and no data shall be written.

If any of the following conditions occur, this command shall be terminated with a CHECK CONDITION status and, if extended sense is implemented, the sense key shall be set as indicated in the following table. This table does not provide an exhaustive enumeration of all conditions that may cause the CHECK CONDITION status.

Condition	Sense Key
Invalid logical block address	ILLEGAL REQUEST (see note 1)
Target reset or medium change since the last command from this initiator	UNIT ATTENTION
Overrun or other error that might be resolved by repeating the command	ABORTED COMMAND
Attempt to write a previously written block and blank checking is enabled (see 12.1.3)	BLANK CHECK (see note 2)

NOTES:
 (1) The extended sense information bytes shall be set to the logical block address of the first invalid address.
 (2) The extended sense information bytes shall be set to the logical block address of the first non-blank block encountered.

12.2.3. WRITE AND VERIFY Command

Peripheral Device Type: Write-Once Read-Multiple
 Operation Code Type: Optional

Table 12-11: WRITE AND VERIFY Command

Bit	7	6	5	4	3	2	1	0
Byte	Operation Code (2Eh)							
0								
1	Logical Unit Number			DPO	FUA	Autol	BytChk	RelAdr
2	(MSB)							
3								
4	Logical Block Address							
5								
6	(MSB)							
7	Transfer Length							
8								
9	Vendor Unique			Reserved			Flag	Link

The WRITE AND VERIFY command (Table 12-11) requests that the target write the data transferred from the initiator to the medium and then verify that the data is correctly written.

See section 6.2.4 for a description of the cache control bits (DPO and FUA).

An auto link (Autol) bit of one will disable the auto link function in the Unit. An auto link (Autol) bit of zero will allow the device to perform Logical Block relocation if the block requested has previously been written.

A byte check (BytChk) bit of zero causes the verification to be simply a medium verification (CRC, ECC, etc). A BytChk bit of one causes a byte-by-byte compare of data written to the peripheral device and the data transferred from the initiator. If the compare is unsuccessful, the command shall be terminated with a CHECK CONDITION status and the sense key shall be set to MISCOMPARE.

See section 6.2.5 for a description of the relative address bit (RelAdr).

The logical block address specifies the logical block at which the write operation shall begin.

The transfer length specifies the number of contiguous logical blocks of data that shall be transferred. A transfer length of zero indicates that no logical blocks shall be transferred. This condition shall not be considered as an error and no data shall be written. Any other value indicates the number of logical blocks that shall be transferred.

12.2.4. VERIFY Command

Peripheral Device Type: Write-Once Read-Multiple and
Read-Only Direct Access
Operation Code Type: Optional

Table 12-12: VERIFY Command

Bit Byte	7	6	5	4	3	2	1	0
0	Operation Code (2Fh)							
1	Logical Unit Number			DPO	FUA	BlkVfy	BytChk	RelAdr
2	(MSB)							
3								
4	Logical Block Address							
5								
6	(MSB)							
7	Verification Length							
8								
9	Vendor Unique			Reserved			Flag	Link

The VERIFY command (Table 12-12) requests that the target verify the data on the medium.

See section 6.2.4 for a description of the cache control bits (DPO and FUA).

A blank verify (BlkVfy) bit of one causes a verification that the blocks are blank.

A byte check (BytChk) bit of zero causes the verification to be simply a medium verification (CRC, ECC, etc). A BytChk bit of one causes a byte-by-byte compare of the data on the medium and the data transferred from the initiator. The data shall be transferred as it would be for a WRITE command. If the compare is unsuccessful, the command shall be terminated with a CHECK CONDITION status and the sense key shall be set to MISCOMPARE.

See section 6.2.5 for a description of the relative address bit (RelAdr).

The logical block address specifies the logical block at which the verify operation shall begin.

The verification length specifies the number of contiguous logical blocks of data or blanks that shall be verified. A verification length of zero indicates that no logical blocks shall be verified. This condition shall not be considered as an error. Any other value indicates the number of logical blocks that shall be verified.

15.2.1. READ Command

Peripheral Device Type: Optical Memory Devices
Operation Code Type: Mandatory

Table 15-14: READ Command

Bit Byte	7	6	5	4	3	2	1	0
0	Operation Code (28h)							
1	Logical Unit Number			DPO	FUA	Reserved		RelAdr
2	(MSB)							
3								
4	Logical Block Address							
5								
6	(MSB)							
7	Transfer Length							
8								
9	Vendor Unique			Reserved			Flag	Link

The READ command (Table 15-14) requests that the target transfer data to the initiator from the medium.

See section 6.2.4 for a description of the cache control bits (DPO and FUA).

See section 6.2.5 for a description of the relative address bit (RelAdr).

The logical block address specifies the logical block at which the read operation shall begin.

The transfer length specifies the number of contiguous logical blocks of data that shall be transferred. A transfer length of zero indicates that no data shall be transferred. This condition shall not be considered as an error. Any other value indicates the number of logical blocks that shall be transferred.

This command shall be terminated with a status of RESERVATION CONFLICT if any reservation access conflict (see 8.1.8) exists and no data shall be transferred.

If any of the following conditions occur, this command shall be terminated with a CHECK CONDITION status and, if extended sense is implemented, the sense key shall be set as indicated in the following table. This table does not provide an exhaustive enumeration of all conditions that may cause the CHECK CONDITION status.

Condition	Sense Key
Invalid logical block address	ILLEGAL REQUEST (see note 1)
Target reset or medium change since the last command from this initiator	UNIT ATTENTION
Overrun or other error that might be resolved by repeating the command	ABORTED COMMAND
Attempt to read a blank or previously unwritten block	BLANK CHECK (see note 2)

NOTES:

(1) The extended sense information bytes shall be set to the logical block address of the first invalid address.

(2) The extended sense information bytes shall be set to the logical block address of the first blank block encountered. The data read up to that block shall be transferred.

15.2.2. WRITE Command

Peripheral Device Type: Optical Memory Devices
Operation Code Type: Mandatory

Table 15-15: WRITE Command

Bit	7	6	5	4	3	2	1	0
Byte	Operation Code (2Ah)							
0	Logical Unit Number				DPO	FUA	AutoEr	Erase
1	(MSB)				RelAdr			
2	Logical Block Address							
3								
4								
5	(LSB)							
6	(MSB)							
7	Transfer Length							
8	(LSB)							
9	Vendor Unique				Reserved		Flag	Link

The WRITE command (Table 15-15) requests that the target write the data transferred from the initiator to the medium.

See section 6.2.4 for a description of the cache control bits (DPO and FUA).

An auto erase disable (AutoEr) bit of one will inhibit the erase function prior to the writing of the logical blocks specified. An auto erase disable (AutoEr) bit of zero allows the device to perform an erase function if required.

An erase (Erase) bit of one will force the logical blocks specified to be erased only. No data will be transferred from the initiator. An erase (Erase) bit of zero allows for a normal Write command to execute.

See section 6.2.5 for a description of the relative address bit (RelAdr).

The logical block address specifies the logical block at which the write operation shall begin.

The transfer length specifies the number of contiguous logical blocks of data that shall be transferred. A transfer length of zero indicates that no data shall be transferred. This condition shall not be considered as an error and no data shall be written. Any other value indicates the number of logical blocks that shall be transferred.

This command shall be terminated with a status of RESERVATION CONFLICT if any reservation access conflict (see 8.1.8) exists and no data shall be written.

If any of the following conditions occur, this command shall be terminated with a CHECK CONDITION status and, if extended sense is implemented, the sense key shall be set as indicated in the following table. This table does not provide an exhaustive enumeration of all conditions that may cause the CHECK CONDITION status.

Condition	Sense Key
Invalid logical block address	ILLEGAL REQUEST (see note 1)
Target reset or medium change since the last command from this initiator	UNIT ATTENTION
Overrun or other error that might be resolved by repeating the command	ABORTED COMMAND
Attempt to write a previously written block and blank checking is enabled (see _____.)	BLANK CHECK (see note 2)
Attempt to write on read only medium or attempt to write on write protected medium.	DATA PROTECT

NOTES:

(1) The extended sense information bytes shall be set to the logical block address of the first invalid address.

(2) The extended sense information bytes shall be set to the logical block address of the first non-blank block encountered.

15.2.3. WRITE AND VERIFY Command

Peripheral Device Type: Optical Memory Devices
Operation Code Type: Optional

Table 15-16: WRITE AND VERIFY Command

Bit	7	6	5	4	3	2	1	0
Byte	Operation Code (2Eh)							
0								
1	Logical Unit Number			DPO	FUA	AutoEr	BytChk	RelAdr
2	(MSB)							
3								
4	Logical Block Address							
5								
6	(MSB)							
7	Verification Length							
8								
9	Vendor Unique			Reserved			Flag	Link

The WRITE AND VERIFY command (Table _____.) requests that the target write the data transferred from the initiator to the medium and then verify that the data is correctly written.

See section 6.2.4 for a description of the cache control bits (DPO and FUA).

An auto erase disable (AutoEr) bit of one will inhibit the erase function prior to the writing of the logical blocks specified. An auto erase disable (AutoEr) bit of zero allows the device to perform an erase function if required.

A byte check (BytChk) bit of zero causes the verification to be simply a medium verification (CRC, ECC, etc). A BytChk bit of one causes a byte-by-byte compare of data written to the peripheral device and the data transferred from the initiator. If the compare is unsuccessful, the command shall be terminated with a CHECK CONDITION status and the sense key shall be set to MISCOMPARE.

See section 6.2.5 for a description of the relative address bit (RelAdr).

The logical block address specifies the logical block at which the write operation shall begin.

The transfer length specifies the number of contiguous logical blocks of data that shall be transferred. A transfer length of zero indicates that no logical blocks shall be transferred. This condition shall not be considered as an error and no data shall be written. Any other value indicates the number of logical blocks that shall be transferred.

15.2.4. VERIFY Command

Peripheral Device Type: Optical Memory Devices
Operation Code Type: Optional

Table 15-17: VERIFY Command

Bit	7	6	5	4	3	2	1	0
Byte	Operation Code (2Fh)							
0								
1	Logical Unit Number			DPO	FUA	BlkVfy	BytChk	RelAdr
2	(MSB)							
3								
4	Logical Block Address							
5								
6	(MSB)							
7	Verification Length							
8								
9	Vendor Unique			Reserved			Flag	Link

The VERIFY command (Table ___) requests that the target verify the data on the medium.

See section 6.2.4 for a description of the cache control bits (DPO and FUA).

A blank verify (BlkVfy) bit of one causes a verification that the blocks are blank.

A byte check (BytChk) bit of zero causes the verification to be simply a medium verification (CRC, ECC, etc). A BytChk bit of one causes a byte-by-byte compare of the data on the medium and the data transferred from the initiator. The data shall be transferred as it would be for a WRITE command. If the compare is unsuccessful, the command shall be terminated with a CHECK CONDITION status and the sense key shall be set to MISCOMPARE.

See section 6.2.5 for a description of the relative address bit (RelAdr).

The logical block address specifies the logical block at which the verify operation shall begin.

The verification length specifies the number of contiguous logical blocks of data or blanks that shall be verified. A verification length of zero indicates that no logical blocks shall be verified. This condition shall not be considered as an error. Any other value indicates the number of logical blocks that shall be verified.

141