Date: October 31, 2003

To: T10 Committee (SCSI)

From: Jim Coomes (Seagate)

Subject:SBC 32 Byte Commands for End-to-End Data Protection

1 Revision

rev 4- Added Write Same 32 byte command. Rewrite of the command field descritions to direct the checking requirements back to the 10 byte version of the commands.

rev 3- Added 32 byte Verify and Write And Verify command.

rev 2 - This revision changed text in proposal 03-176r6 for the RDPROTECT field, Table Footnote c and the WRPROTECT field, Table Footnote c. Editorial convention was corrected for “a bit set to one”

rev 1 -This revision changes the RELADR field in the proposed commands to reserved, RDPROTECT and WRPROTECT field descriptions to reference 03-176r5 and qualifies DATA BLOCK APPLICATION TAG checking with the RDPROTECT and WRPROTECT fields.

2 Overview

There is a need to provide the initial value of the DATA BLOCK REFERENCE TAG proposed in 03-365rX on a command by command basis. One use case is in a configuration where a controller (e.g., a RAID) remaps the LBA to a different LBA space on a physical LUN. By passing the initial value of the DATA BLOCK REFERENCE TAG in the command to the LUN, the original data protection block may be passed through the controller to the LUN and checked. This function provides end to end protection in the remapping case.

To provide the space for the initial DATA BLOCK REFERENCE TAG and maintain 8 byte LBA space, 32 byte formats are proposed for read and write operations.

This proposal additionally provides a mechanism to enable device server checking ot the DATA BLOCK APPLICATION TAG in the protection information.

Changes to document 03-365r0

Page 3,

The DATA BLOCK REFERENCE TAG field is an incrementing value associated with ~~set to the least significant four bytes of the logical block address to which~~ the data block ~~is associated~~. For commands that do not include an INITIAL DATA BLOCK REFERENCE TAG field, the first data block transmitted shall contain the least significant four bytes of the logical block address contained in the LOGICAL BLOCK ADDRESS field of the command associated with the data being transferred. For commands that include an INITIAL DATA BLOCK REFERENCE TAG field, the first data block transferred shall contain the DATA BLOCK REFERENCE TAG equal to the value in the command. Each subsequent data block’s DATA BLOCK REFERENCE TAG field shall contain the data block reference tag of the previous data block plus one. The contents of the DATA BLOCK REFERENCE TAG field shall not be used to generate or check the CRC contained in the DATA BLOCK GUARD FIELD.

Page 9 and 10, Table 6, RDPROTECT field, Table Footnote c

The device server may check the data block application tag if it has knowledge of the contents of the DATA BLOCK APPLICATION TAG field. This knowledge may be acquired by use of a READ (32) command or by a method not defined by this standard.

Page 15 and 16, Table 12, VRPROTECT field, Table Footnote c

c The device server may check the data block application tag if it has knowledge of the contents of the DATA BLOCK APPLICATION TAG field. This knowledge may be acquired by use of a VERIFY (32) command or by a method not defined by this standard.

Page 18, Table 14, VRPROTECT field, Table Footnote c

c The device server may check the data block application tag if it has knowledge of the contents of the DATA BLOCK APPLICATION TAG field. This knowledge may be acquired by use of a VERIFY (32) command or by a method not defined by this standard.

Page 19, Table 15, VRPROTECT field, Table Footnote c

c The device server may check the data block application tag if it has knowledge of the contents of the DATA BLOCK APPLICATION TAG field. This knowledge may be acquired by use of a VERIFY (32) command or by a method not defined by this standard.

Page 22, Table 17 . WRPROTECT field, Table Footnote c

c The device server may check the data block application tag if it has knowledge of the contents of the DATA BLOCK APPLICATION TAG field. This knowledge may be acquired by use of a WRITE (32) command or by a method not defined by this standard.

SBC-2 additions

2.0.1 READ (32) Command

The READ (32) command (see table 1) requests that the device server transfer data to the application client. The most recent data value written in the addressed logical block shall be returned

Table 1 — READ (32) command

Byte\Bit	7	6	5	4	3	2	1	0
0	OPERATION CODE (7Fh)							
1	CONTROL							
2	Reserved							
6								
7	ADDITIONAL CDB LENGTH (18h)							
8	(MSB)			SERVICE ACTION (TBDh)				
9								(LSB)
10	Reserved	RDPROTECT		DPO	FUA	Reserved		
11	Reserved							
12	(MSB)			LOGICAL BLOCK ADDRESS				
19								(LSB)
20	(MSB)			INITIAL DATA BLOCK REFERENCE TAG				
23								(LSB)
24	(MSB)			DATA BLOCK APPLICATION VALUE ~~TAG~~				
25								(LSB)
26	(MSB)			DATA BLOCK APPLICATION TAG MASK				
27								(LSB)
28	(MSB)			TRANSFER LENGTH				
31								(LSB)

The INITIAL DATA BLOCK REFERENCE TAG field contains the value of the DATA BLOCK REFERENCE TAG expected on the first logical block of the range of logical blocks for this command. See the READ (10) command (see 5.2.8) for a description of the checking enables and requirements.

The DATA BLOCK APPLICATION VALUE field contains a value that is expected in the DATA BLOCK APPLICATION TAG in the protection information of logical blocks for this command.

The DATA BLOCK APPLICATION MASK field contains a value that is a bit mask for enabling the checking of the DATA BLOCK APPLICATION TAG in the protection information for each logical block of the range of logical blocks for this command. A DATA BLOCK APPLICATION TAG MASK bit set to one enables the checking of the corresponding bit in the DATA BLOCK APPLICATION VALUE field with the DATA BLOCK APPLICATION TAG in the protection information of logical blocks for this command when checking is enabled by the RDPROTECT field. See the READ (10) command (see 5.2.8) for a description of the checking enables and requirements.

See 4.2.1.8 for reservation requirements for this command. See the READ (10) command (see 5.2.8) for a description of the other fields in this command.

~~The RDPROTECT field is defined in the description for READ (10) in 03-365r0.~~

~~The INITIAL DATA BLOCK REFERENCE TAG field contains the value of the DATA BLOCK REFERENCE TAG expected on the first data block requested by the command. The device server may compare the DATA BLOCK REFERENCE TAG read from the medium with this value as enabled by the RDPROTECT field in this command.~~

~~The DATA BLOCK APPLICATION TAG field contains a value that is expected in the protection information transferred by this command. If the APP_TAG_OWN bit set to one, the device server may compare the DATA BLOCK APPLICATION TAG read from the medium with this value as enabled by the RDPROTECT field and the DATA BLOCK APPLICATION TAG MASK. If the APP_TAG_OWN bit set to zero, the device server shall ignore the DATA BLOCK APPLICATION TAG field.~~

~~The DATA BLOCK APPLICATION MASK field contains a value that is a bit mask for enabling the checking of the DATA BLOCK APPLICATION TAG in the protection information for each data block transferred by this command. A DATA BLOCK APPLICATION TAG MASK bit set to one enables the checking of the corresponding bit in the DATA BLOCK APPLICATION TAG field with the DATA BLOCK APPLICATION TAG read from the medium.~~

2.0.2 WRITE (32) command

The WRITE (32) command (see table 2) requests that the device server write the data transferred from the application client to the medium ~~returned~~

Table 2 — WRITE (32) command

Byte\Bit	7	6	5	4	3	2	1	0
0	OPERATION CODE (7Fh)							
1	CONTROL							
2	Reserved							
6								
7	ADDITIONAL CDB LENGTH (18h)							
8	(MSB)			SERVICE ACTION (TBDh)				
9								(LSB)
10	Reserved	WRPROTECT		DPO	FUA	Reserved		
11	Reserved							
12	(MSB)			LOGICAL BLOCK ADDRESS				
19								(LSB)
20	(MSB)			INITIAL DATA BLOCK REFERENCE TAG				
23								(LSB)
24	(MSB)			DATA BLOCK APPLICATION VALUE ~~TAG~~				
25								(LSB)
26	(MSB)			DATA BLOCK APPLICATION TAG MASK				
27								(LSB)
28	(MSB)			TRANSFER LENGTH				
31								(LSB)

The INITIAL DATA BLOCK REFERENCE TAG field contains the value of the DATA BLOCK REFERENCE TAG expected on the first logical block of the range of logical blocks for this command. See the WRITE (10) command (see 5.2.31) for a description of the checking enables and requirements.

The DATA BLOCK APPLICATION VALUE field contains a value that is expected in the DATA BLOCK APPLICATION TAG in the protection information of logical blocks for this command.

The DATA BLOCK APPLICATION MASK field contains a value that is a bit mask for enabling the checking of the DATA BLOCK APPLICATION TAG in the protection information for each logical block of the range of logical blocks for this command. A DATA BLOCK APPLICATION TAG MASK bit set to one enables the checking of the corresponding bit in the DATA BLOCK APPLICATION VALUE field with the DATA BLOCK APPLICATION TAG in the protection information of logical blocks for this command when checking is enabled by the WRPROTECT field. See the WRITE (10) command (see 5.2.31) for a description of the checking enables and requirements.

See 4.2.1.8 for reservation requirements for this command. See the WRITE (10) command (see 5.2.31) for a description of the other fields in this command.

~~The WRPROTECT field is defined in the description for WRITE (10) in 03-365r0.~~

~~The INITIAL DATA BLOCK REFERENCE TAG field contains the value of the DATA BLOCK REFERENCE TAG expected on the first data block transferred by the command. The device server may compare the DATA BLOCK REFERENCE TAG received from the application client with this value as enabled by the WRPROTECT field in this command.~~

~~The DATA BLOCK APPLICATION TAG field contains a value that is expected in the protection information transferred by this command. If the APP_TAG_OWN bit set to one, the device server shall compare the DATA BLOCK APPLICATION TAG received from the application client with this value as enabled by the WRPROTECT field and the DATA BLOCK APPLICATION TAG MASK. If the APP_TAG_OWN bit set to zero, the device server shall ignore the DATA BLOCK APPLICATION TAG received from the application client.~~

~~The DATA BLOCK APPLICATION MASK field contains a value that is a bit mask for enabling the checking of the DATA BLOCK APPLICATION TAG in the protection information for each data block transferred by this command. A DATA BLOCK APPLICATION TAG MASK bit set to one enables the checking of the corresponding bit in the DATA BLOCK APPLICATION TAG field with the DATA BLOCK APPLICATION TAG received from the application client.~~

2.0.3 WRITE AND VERIFY (32) Command

The WRITE AND VERIFY (32) command (see table 3) requests that the device server write the data transferred from the application client to the medium and then verify that the data and protection information, if any, is correctly written. The data is only transferred once from the application client to the device server.

Table 3 — WRITE AND VERIFY (32) command

Byte\Bit	7	6	5	4	3	2	1	0
0	OPERATION CODE (7Fh)							
1	CONTROL							
2	Reserved							
6								
7	ADDITIONAL CDB LENGTH (18h)							
8	(MSB)	SERVICE ACTION (TBDh)						
9								(LSB)
10	Reserved	WRPROTECT		DPO	Reserved	EBP	BYTCHK	Reserved
11	Reserved							
12	(MSB)	LOGICAL BLOCK ADDRESS						
19								(LSB)
20	(MSB)	INITIAL DATA BLOCK REFERENCE TAG						
23								(LSB)
24	(MSB)	DATA BLOCK APPLICATION VALUE ~~TAG~~						
25								(LSB)
26	(MSB)	DATA BLOCK APPLICATION TAG MASK						
27								(LSB)
28	(MSB)	TRANSFER LENGTH						
31								(LSB)

The INITIAL DATA BLOCK REFERENCE TAG field contains the value of the DATA BLOCK REFERENCE TAG expected on the first logical block of the range of logical blocks for this command. See the WRITE AND VERIFY(10) command (see 5.2.34) for a description of the checking enables and requirements.

The DATA BLOCK APPLICATION VALUE field contains a value that is expected in the DATA BLOCK APPLICATION TAG in the protection information of logical blocks for this command.

The DATA BLOCK APPLICATION MASK field contains a value that is a bit mask for enabling the checking of the DATA BLOCK APPLICATION TAG in the protection information for each logical block of the range of logical blocks for this command. A DATA BLOCK APPLICATION TAG MASK bit set to one enables the checking of the corresponding bit in the DATA BLOCK APPLICATION VALUE field with the DATA BLOCK APPLICATION TAG in the protection information of logical blocks for this command when checking is enabled by the WRPROTECT field. See the WRITE AND VERIFY(10) command (see 5.2.34) for a description of the checking enables and requirements.

See 4.2.1.8 for reservation requirements for this command. See the WRITE AND VERIFY(10) command (see 5.2.34) for a description of the other fields in this command.

~~The INITIAL DATA BLOCK REFERENCE TAG field contains the value of the DATA BLOCK REFERENCE TAG expected on the first data block transferred by the command. The device server shall compare the DATA BLOCK REFERENCE~~

~~TAG received from the application client with this value as enabled by the WRPROTECT field in this command. The device server may compare the DATA BLOCK REFERENCE TAG read from the medium with this value.~~

~~The DATA BLOCK APPLICATION TAG field contains a value that is expected in protection information transferred by this command. If the APP_TAG_OWN bit set to one, the device server shall compare the DATA BLOCK APPLICATION TAG received from the application client with this value as enabled by the WRPROTECT field and the DATA BLOCK APPLICATION TAG MASK. If the APP_TAG_OWN bit set to zero, the device server shall ignore the DATA BLOCK APPLICATION TAG received from the application client.~~

~~The DATA BLOCK APPLICATION MASK field contains a value that is a bit mask for enabling the checking of the DATA BLOCK APPLICATION TAG in the protection information for each data block transferred by this command. A DATA BLOCK APPLICATION TAG MASK bit set to one enables the checking of the corresponding bit in the DATA BLOCK APPLICATION TAG field with the DATA BLOCK APPLICATION TAG received from the application client.~~

~~See 4.2.1.8 for reservation requirements for this command. See the WRITE AND VERIFY (10) command (see 4.5.31) for a description of the other bits and fields in this command.~~

2.0.4 VERIFY (32) Command

The VERIFY (32) command (see table 4) requests that the device server verify the data on the medium.

Table 4 — VERIFY (32) command

Byte\Bit	7	6	5	4	3	2	1	0
0	OPERATION CODE (7Fh)							
1	CONTROL							
2	Reserved							
6								
7	ADDITIONAL CDB LENGTH (18h)							
8	(MSB)	SERVICE ACTION (TBD)						
9								(LSB)
10	Reserved	VRPROTECT		DPO	Reserved	EBP	BYTCHK	Reserved
11	Reserved							
12	(MSB)	LOGICAL BLOCK ADDRESS						
19								(LSB)
20	(MSB)	INITIAL DATA BLOCK REFERENCE TAG						
23								(LSB)
24	(MSB)	DATA BLOCK APPLICATION VALUE ~~TAG~~						
25								(LSB)
26	(MSB)	DATA BLOCK APPLICATION TAG MASK						
27								(LSB)
28	(MSB)	TRANSFER LENGTH						
31								(LSB)

The INITIAL DATA BLOCK REFERENCE TAG field contains the value of the DATA BLOCK REFERENCE TAG expected on the first logical block of the range of logical blocks for this command. See the VERIFY (10) command (see 5.2.27) for a description of the checking enables and requirements.

The DATA BLOCK APPLICATION VALUE field contains a value that is expected in the DATA BLOCK APPLICATION TAG in the protection information of logical blocks for this command.

The DATA BLOCK APPLICATION MASK field contains a value that is a bit mask for enabling the checking of the DATA BLOCK APPLICATION TAG in the protection information for each logical block of the range of logical blocks for this command. A DATA BLOCK APPLICATION TAG MASK bit set to one enables the checking of the corresponding bit in the DATA BLOCK APPLICATION VALUE field with the DATA BLOCK APPLICATION TAG in the protection information of logical blocks for this command when checking is enabled by the VRPROTECT field. See the VERIFY (10) command (see 5.2.27) for a description of the checking enables and requirements.

See 4.2.1.8 for reservation requirements for this command. See the VERIFY (10) command (see 5.2.27) for a description of the other fields in this command.

~~The INITIAL DATA BLOCK REFERENCE TAG field contains the value of the DATA BLOCK REFERENCE TAG expected on the first data block transferred by the command. When BYTCHK IS set to a one and checking of DATA BLOCK REFERENCE TAG is enabled by the VRPROTECT field device server shall compare the DATA BLOCK REFERENCE TAG received from the application client with this value. The device server may compare the DATA BLOCK REFERENCE TAG read from the medium with this value.~~

~~The DATA BLOCK APPLICATION TAG field contains a value that is expected in the protection information transferred by this command. If the APP_TAG_OWN bit set to one, the device server shall compare the DATA BLOCK APPLICATION TAG received from the application client with this value as enabled by the WRPROTECT field and the DATA BLOCK APPLICATION TAG MASK. If the APP_TAG_OWN bit set to zero, the device server shall ignore the DATA BLOCK APPLICATION TAG received from the application client.~~

~~The DATA BLOCK APPLICATION MASK field contains a value that is a bit mask for enabling the checking of the DATA BLOCK APPLICATION TAG in the protection information for each data block transferred by this command. A DATA BLOCK APPLICATION TAG MASK bit set to one enables the checking of the corresponding bit in the DATA BLOCK APPLICATION TAG field with the DATA BLOCK APPLICATION TAG received from the application client.~~

~~See 4.2.1.8 for reservation requirements for this command. See the VERIFY (10) command (see 4.5.24) for a description of the other fields in this command.~~

2.0.5 WRITE SAME (32) Command

The WRITE SAME (32) command (see table 5) requests that the device server write the single block of data transferred by the application client to the medium multiple times to consecutive multiple logical blocks.

Table 5 — WRITE SAME (32) command

Byte\Bit	7	6	5	4	3	2	1	0
0	OPERATION CODE (7Fh)							
1	CONTROL							
2	Reserved							
6								
7	ADDITIONAL CDB LENGTH (18h)							
8	(MSB)							
9	SERVICE ACTION (TBD)							(LSB)
10	Reserved	WRPROTECT		Reserved		PBDATA	LBDATA	Reserved
11	Reserved							
12	(MSB)							
19	LOGICAL BLOCK ADDRESS							(LSB)
20	(MSB)							
23	INITIAL DATA BLOCK REFERENCE TAG							(LSB)
24	(MSB)							
25	DATA BLOCK APPLICATION VALUE							(LSB)
26	(MSB)							
27	Reserved							(LSB)
28	(MSB)							
31	TRANSFER LENGTH							(LSB)

The INITIAL DATA BLOCK REFERENCE TAG field contains the value of the DATA BLOCK REFERENCE TAG expected first logical block of the range of logical blocks for this command. See the WRITE SAME (10) command (see 5.2.38) for a description of the checking enables and requirements.

The DATA BLOCK APPLICATION VALUE field contains a value for the DATA BLOCK APPLICATION TAG in the protection information of logical blocks for this command. See the WRITE SAME (10) command (see 5.2.38) for a description of the checking enables and requirements.

See 4.2.1.8 for reservation requirements for this command. See the WRITE SAME (10) command (see 5.2.38) for a description of the other fields in this command.