

To: T10 Technical Committee  
From: Rob Elliott, HP (elliott@hp.com)  
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Subject: 03-387r0 SPC-3 SBC-2 Data protection usage detection

### **Revision history**

Revision 0 (1 November 2003) First revision

### **Related documents**

spc3r15 - SCSI Primary Commands - 3 revision 15  
sbc2r10 - SCSI Block Commands - 2 revision 10  
03-365 SPC-3 SBC-2 End-to-end data protection (George Penokie)

### **Overview**

03-365 defines data protection for block devices. It adds a two-bit PROTECT field to standard INQUIRY data indicating if the media has been formatted with protection information or not.

This introduces a few problems, especially for tapes:

- a) Standard INQUIRY data doesn't normally change more than once after a reset. With the PROTECT field, a unit attention can now be created whenever a FORMAT UNIT completes.
- b) Standard INQUIRY data is normally not dependent on the media. With the PROTECT field, a unit attention can now be created whenever media is changed. The media serial number feature (01-027) was moved away from an INQUIRY VPD page because of this (May 2001).
- c) Standard INQUIRY data is rather full and should avoid hosting device type-specific fields.
- d) Tapes with data protection support are probably not going to be "formatted to include protection information." They will likely store a bit indicating whether protection information is in use on-the-fly on a file-by-file or partition-by-partition basis. The proposed values won't apply very well.
- e) Tapes will probably require a mode page to enable/disable inclusion of protection information to instead of modifying the FORMAT UNIT command (which suffices for disks).

The usual way a read-only but changing parameter is reported is in a log page. There is already a Format Status log page defined to reflect changes in the media based on the FORMAT UNIT command. If the PROTECT value changes, the additional sense code for the unit attention condition would be LOG PARAMETERS CHANGED rather than INQUIRY DATA HAS CHANGED.

Another good location would be in the READ CAPACITY data; unfortunately, there are no reserved bits available in the read capacity data structures.

A single bit in INQUIRY indicating whether the data protection feature is supported by the device server but not reporting anything medium-dependent, on the other hand, wouldn't be a problem.

### **Proposal**

Move the media-specific part of the PROTECT field into the Format Status log page defined in SBC-2. Optionally keep a one-bit protect field in INQUIRY data indicating device server support.

### **Suggested changes to SPC-3 Option A: delete the PROTECT field altogether**

#### **6.4.2 Standard INQUIRY data**

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[\[Remove the field from Standard INQUIRY data table\]](#)

~~The PROTECT field is defined in table 39.~~

**Table 1 — Protect field**

Value	Description
00b	<del>This logical unit does not support protection information (see SBC-2).</del>
01b	<del>This logical unit supports protection information but the medium has not been formatted to include protection information.</del>
10b	<del>Reserved</del>
11b	<del>The medium for this logical unit has been formatted to include protection information with each logical block.</del>

**Suggested changes to SPC-3 Option B: change the PROTECT field to one bit**

#### 6.4.2 Standard INQUIRY data

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[\[Change the field to one bit from Standard INQUIRY data table\]](#)

~~The PROTECT field is defined in table 39.~~

**Table 2 — Protect field**

Value	Description
00b	<del>This logical unit does not support protection information (see SBC-2).</del>
01b	<del>This logical unit supports protection information but the medium has not been formatted to include protection information.</del>
10b	<del>Reserved</del>
11b	<del>The medium for this logical unit has been formatted to include protection information with each logical block.</del>

[A PROTECT bit of one indicates the device server supports protection information \(see SBC-2\) \[and eventually SSC-3, OSD, etc.\]. A PROTECT bit of zero indicates the device server does not support protection information.](#)

#### **Suggested changes to SBC-2**

#### **4.5 Protection information model (new section per 03-365)**

##### **4.5.1 Protection information overview**

This data protection model provides for protection of the data while it is being transferred between a sender and a receiver. Protection information is generated at the application layer and may be checked by any object along the I\_T\_L nexus. Once received, protection information is retained (e.g., write to media, store in non-volatile memory, recalculate on read back) by the device server until overwritten (e.g., power loss, hard reset, logical unit reset, and I\_T nexus loss have no effect on the retention of protection information).

[\[If a one-bit PROTECT field is kept, add this:\]](#)

[Support for protection information shall be indicated in the PROTECT field of standard INQUIRY data \(see SPC-3\).](#)

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##### **4.5.9 FORMAT UNIT command**

##### **4.5.9.1 FORMAT UNIT command overview**

The FORMAT UNIT command (see table 3) formats the medium into application client addressable logical blocks per the application client defined options. In addition, the medium may be certified and control structures may be created for the management of the medium and defects. The degree that the medium is altered by this command is vendor-specific.

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[the next paragraph is added by 03-365]

A format protection information (FMTPINFO) bit of specifies that the device server shall format the medium to the block length specified in the mode parameter block descriptor of the Mode parameter header (see x.x.x). A FMTPINFO bit of one specifies that the device server shall format the medium block length specified in the mode parameter block descriptor of the Mode parameter header plus eight (e.g., if the block length equals 512 the formatted block length is 520). A successful format ~~with protection information (see 4.5.2) shall cause the PROTECT field in the standard INQUIRY data (see SPC-3) to be changed resulting in a unit attention-condition that changes whether protection information is included shall be reported in the PROTECTION INFORMATION PRESENT field in the Format Status log page (see 6.1.2.2).~~

### 6.1.2.2 Format Status log page

The Format Status log page (log page code 08h) captures the state of the block device since the most recent successful FORMAT UNIT command (see 5.2.2) was completed. Additionally, this log page provides Defect Management information for the device server. Table 3 defines the parameter codes for the Format Status log page.

**Table 3 — Format Status log page parameter codes**

Parameter code	Description
0000h	Format DATA OUT
0001h	Grown defects during certification
0002h	Total blocks reallocated during format
0003h	Total new blocks reallocated
0004h	Power on minutes since format
<a href="#">0005h</a>	<a href="#">Protection information present</a>
0005h - 7FFFh	Reserved
8000h - FFFFh	Vendor-specific parameters

Event counts are returned as a result of the LOG SENSE command. LOG SELECT shall not pre-set (a value other than zero) for any of the event counts listed in table 3. Attempts to change these event counts by issuing a LOG SELECT with these fields set to non-zero values is not considered an error and shall have no effect on the saved values.

All of the log parameters described above shall be reported as the value -1 (FFh in all bytes of the log parameter) if the most recent FORMAT UNIT command failed. Individual log parameters described above shall be reported as the value -1 if no such information is available.

The FORMAT DATA OUT field contains the entire data-out buffer transfer of the most recently successful FORMAT UNIT operation completed. This includes the DEFECT LIST HEADER (4 bytes), the initialization pattern descriptor(s) if any (variable number of bytes), and the defect descriptor(s) if any (variable number of bytes). Refer to 5.2.2.2 for details about these fields.

The GROWN DEFECTS DURING CERTIFICATION field is a count of the number of defects detected as a result of performing Certification during execution of a FORMAT UNIT command. This count reflects only those defects detected and replaced that were not already part of the PLIST or GLIST. If a Certification pass was not performed this field shall be returned with a zero value.

The TOTAL BLOCKS REALLOCATED DURING FORMAT field is a count of the total number of blocks that have been reallocated since the completion of the last successful FORMAT UNIT command.

The POWER ON MINUTES SINCE FORMAT field represents the unsigned number of usage minutes (power applied regardless of power state) that have elapsed since the most recently successful FORMAT UNIT command.

The PROTECTION INFORMATION PRESENT field is one if the medium was formatted with protection information (i.e., the FMTPINFO field was set to one in the FORMAT UNIT command) and zero if the medium was formatted without protection information (i.e., the FMTPINFO field was set to one in the FORMAT UNIT command). If there is no PROTECTION INFORMATION PRESENT field, the medium was formatted without protection information.

Upon receiving the FORMAT UNIT command, the device server should set all fields within the Format Status log page to reflect no such information being available. Only upon successful completion of the FORMAT UNIT command should the device server update the affected fields.

The target save disable (TSD) bit is always returned as 0 to indicate that the device server shall provide an implicit saving frequency.

NOTE 1 - Removable media device servers may save log page information with the media in a vendor-specific manner and location.