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ATA Device Segmentation

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1. Purpose

The purpose of this new group of commands is to allow the host to define a series of private data segments which are not addressed by the normal Read/Write commands. This allows BIOS, Device Driver and OS firmware/software vendors to place data on the device which is protected from applications that do not know about these new commands. In effect this creates a new way for the host to store non-volatile system information.

2. Overview

Segment commands allow the host to allocate new, independent , areas on the device to store data called segments. These segments are allocated from a pool with a minimum of 2048 *private* sectors which the device does not report as available for *public* storage.

When the host requires a new segment, it shall first allocate space for the segment. The drive shall make the allocation and respect this allocation across all forms of reset, until the host issues a deallocate command. When the host issues a deallocate command the device shall return the space to the *private* area. Once the segment has been allocated the host may issue Read/Write segment commands to access this segmented area.

The segment management services, comprised of allocate and deallocate, must preserve existing segment numbers. This means that deallocate can create holes in the segment number assignment map. The allocate command must also provide an unused segment number without changing the existing assignment map. Consequently, segment numbers may not be assigned in a sequential manner.

3. Changes to Identify Device Information

Identify Device shall report that the drive supports Segmentation and how many segments are defined. Word 53 bit 2 shall be set to 1 if the device supports segmentation. If the device supports segmentation, word 82 reports the number of currently defined segments, and word 83 reports the number of free sectors in the *private* area.

4. New Commands

There are 4 new commands required to support segmentation:

- Allocate Segment. This shall be issued before data can be stored in a segment
- Deallocate Segment. This shall be issued to return the space a segment occupies to public access
- Read Segment. Allows the host to read the data in a segment
- Write Segment. Allows the host to write data in a segment

4.1 Allocate Segment

Command Code -

Protocol - Non-Data Transfer

Inputs - The number of sectors requested is specified in LBA (27:0)

Normal Outputs - The segment number is returned in the Sector Count register.

Error Outputs - If the devices is unable to allocate the new segment because the device is out of *private* space, or 255 segments have already been defined, an aborted command shall be generated.

Perquisites - None

Description - The Allocate Segment command allocates a new segment from the *private* storage area. The space for this segment shall be subtracted from word 83 and the number of segments shall be incremented by 1, in the ID Device Information. Segment allocations shall be retained across all forms of reset. The only way to return the space allocated to segment to the *private* storage area is for the host to issue a deallocate command. The device shall initialize the first word of the segment to contain the segment length in sectors. The segment number is returned in the Sector Count register. This number will *never* be changed by the device. The segment number can be reused after a Deallocate command is issued. Segment #0 is reserved and will *never* be returned by Allocate Segment.

4.2 Deallocate Segment

Command Code -

Protocol - Non-Data Transfer

Inputs - The Sector Count register shall be set to the segment number

Normal Outputs - None

Error Outputs - The device returns an aborted command if the number in the sector count register does not point to a valid segment.

Perquisites - Allocate Segment.

Description - The Deallocate Segment command returns a segment to the *private* storage area. The space for this segment shall be added to word 83 and the number of segments shall be decremented by 1, in the ID Device Information. This command does not change the segment number usage map. The result of Deallocate Segment can be holes in the segment number allocation map. Once a segment number is deallocated, allocate segment can re-assign the value to a new segment.

4.3 Read Segment

Command Code -

Protocol - PIO Data In

Inputs - The Feature register shall be set to the segment number. LBA (27:0) is the starting sector number. The Sector Count register is the number of sectors requested.

Normal Outputs - Number of sectors to transfer is placed in LBA (27:0). The Sector Count register contains the next segment number in use.

Error Outputs - This follows the same conventions as the Read Buffer command. If the Feature Register contains an invalid Segment number this command is aborted.

Perquisites - Allocate Segment.

Description - The Read Segment command transfers the Segment specified in the Feature Register to the host. An Interrupt is generated when the data is available and the number of sectors to transfer is placed in LBA (27:0). Interrupts shall follow the normal conventions for HDD Multiple in this type of transfer. If Read Segment is invoked with a Feature Register of 0, the data for the first defined segment is returned. Subsequent segments can be found by using the value returned in the Feature Register. When no more segment numbers are defined, the Sector Count register is set to 0 by the device. If the host requests more sectors than are defined for the current segment, the **actual** number of remaining sectors is returned in LBA (27:0), and the device will only return the number of sectors specified in LBA (27:0).

4.4 Write Segment

Command Code -

Protocol - PIO Data Out

Inputs - The Feature Register shall be set to the segment number. LBA (27:0) is the starting sector number. The Sector Count Register is the number of sectors to write.

Normal Outputs - Number of sectors to transfer is placed in LBA (27:0)

Error Outputs - This follows the same conventions as the Write Buffer command. If the Feature Register contains an invalid Segment number this command is aborted.

Perquisites - Allocate Segment.

Description - The Write Segment command transfers the Segment specified in the Feature Register from the host to the device. Interrupts shall follow the normal conventions for HDD Multiple for this type of transfer.

5. Segment Data Format

Each segment shall implement the format described below. The Allocate Segment command places the length of the segment in sectors at offset 0. The host shall place the true size of the data, in bytes, as a DWORD at offset 2.

Offset	Size	Description
0	Word	Sector Count
2	Double Word	Number of bytes used by this segment
6	32 Bytes	Zero filled string Identifying this segment
38.. (Value at offset 2)		Host defined data space
(Value at offset 2)+1..?		Unused space