X3T9.2/92-168R1

Quantum

EXTERNAL MEMO

X3T9.2/92-~~147~~168R1

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SUBJ.: ATA Download Microcode Command

Background

This is a follow up on my public review comment on the need for a download microcode command in the ATA standard to mirror the functionality provided by SCSI-2.

- **Address space**: Normally an AT command has a transfer length of up to 128 KBytes. The standard could make allowance for code space which is greater than this amount. A longer transfer length can be generated through use of other bits, e.g. the sector register. While this can be done by defining segments of 128 KBytes each, and updating segments individually, it can also be done by simply concatenating the additional 8 bits to make a 16 bit (32 MByte) code space.

  The latter is my proposal, mirroring the 16 bit transfer length provided for SCSI.

- **When Change Takes Effect**: using a single 16 bit address space allows us to update code in a single command. Thus the update can become effective when the update command is successfully completed, as in SCSI. Since we have a single "initiator," there is no possibility of the code being updated without the host being aware of the change.

- **Saving Microcode**: A change can be saved to disk and become the default code for all subsequent time if another bit is set. The Features register is used to indicate whether the change should be saved or not.

- **Multiple Saved Microcodes**: Some customers have requested the capability to choose among a set of possible microcode revisions (e.g. to resolve system specific compatibility requirements). Rather than requiring that microcode be shipped on floppies with all drives, the code can be stored in reserved areas in the drive.

  A capability is needed to update these revisions and select between them. This is provided through a combination of the cylinder and feature registers.

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With the exception of the multiple saved microcodes, this command would provide the same functionality of SCSI. Additional functions, such as integrity checking of the new code, would still be provided in a vendor unique manner (e.g. through incorporating a checksum in the downloaded code, along with some embedded header information the identifies the drive model and revision levels for which the code works).

While this command does not cover all the features a specific vendor might include in such a command, it need not do so. Only functions required to communicate between the host and drive need appear in the standard. Vendor unique performance/integrity enhancements are, as usual, outside the scope of the standard.

Specific Changes Required (Based on ATA Rev 3.1)

I Insert the boldface line in table 8-2:

TABLE 8-2: REGISTER CONTENTS

	Error Register					Status Register				
	BBK	UNC	IDNF	ABRT	TK0NF	AMNF	DRDY	DWF	DSC	CORR	ERR
Acknowledge Media Chge				V							
Boot - Post-Boot				V							
Boot - Pre-Boot				V							
Check Power Mode				V			V	V	V		V
Door Lock			V	V			V				
Door Unlock				V							
Download Microcode				V							
Execute Drive Diags	See 9.7										V

II Insert the boldface line in table 9-1:

TABLE 9-1: COMMAND CODES AND PARAMETERS - Part 1 of 2

Class			Command Code	Parameters Used FR	SC	SN	CY	DH
1	Acknowledge Media Chge	O	DBh					D
1	Boot - Post-Boot	O	DCh					D
1	Boot - Pre-Boot	O	DDh					D
1	Check Power Mode	O	98h E5h		y			D
1	Door Lock	O	DEh					D
1	Door Unlock	O	DFh					D
3	**Download Microcode**	O	D0h	y	y	y	y	D
1	Execute Drive Diagnostic	M	90h					D*

III Insert the following section:

9.7 Download Microcode

This command enables the host to alter the drive's microcode. See 10.2 for the protocol.

The head bits of the Drive/Head register shall always be set to zero. The Sector register shall be used to extend the Sector Count register, creating an effective sector count 16 bits long. This allows up to 32 MB of microcode to be downloaded.

The Cylinder High and Low registers shall normally be set to zero. However, if a vendor wishes to maintain multiple revisions of microcode, then these registers may be use to select between the microcode revisions.

The value of the Features register shall be used to determine the time the update takes effect, whether it is saved for future use, and how to manage more than one revision of microcode at a time:

Replace Current (bit 0) - if set, then the specified microcode becomes the current operating microcode upon successful completion of the command.

Replace Default (bit 1) - if set, then the specified microcode becomes default microcode. The drive shall default to this microcode upon power on and reset conditions.

Save (bit 2) - if set, then the specified microcode is saved to non-volatile memory.

Retrieve (bit 3) - if set, then the specified microcode is made the current and/or default code according to bits 0 and 1. Note that any data transferred to the drive is ignored.

Bite 2 and 3 cannot both be set at the same time

Table 9-?: Feature register values for Download Microcode

Bit 3	2	1	0	Operation
0	0	0	0	no-op
0	0	0	1	download is for immediate, temporary use
0	0	1	x	no-op
0	1	0	0	save downloaded code for future reference by value of cyl
0	1	0	1	save downloaded code for future reference by value of cyl and use immediately
0	1	1	0	save downloaded code for future reference by value of cyl and specify it as the default for future use
0	1	1	1	save downloaded code for future reference by value of cyl and specify it as the default for immediate and future use
1	0	0	0	no-op
1	0	0	1	retrieve saved code by value of cyl and use immediately
1	0	1	0	retrieve saved code by value of cyl and specify it as the default for future use
1	0	1	1	retrieve saved code by value of cyl and specify it as the default for immediate and future use
1	1	x	x	no-op

Note: in some implementations the default microcode may not be immediately available (e.g. may be stored on disk). However, it shall become effective before any media access command can be successfully executed.

IV Add the Download Microcode command to PIO Data Out Commands:

10.2 PIO Data Out Commands

This class includes:

- **Download Microcode**
- Format
- Write Buffer
- Write Long
- Write Sector(s)