

**Proposed
Draft**

**Serial ATA
International Organization**

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**Serial ATA Revision 3.2 Technical Proposal 068
Title : Clarification of the FPDMA state machine
and error reporting**

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Introduction

SATA devices report errors in either the Register Device to Host FIS (RDH FIS) or in the Set Device Bits – Device to Host FIS (SDB FIS). If an FPDMA QUEUED command is judged to be “malformed,” then those command parameter errors are reported in the RDH FIS. Malformed commands are handled in the FPDMA Queued state machine transition DFPDMAQ1:2, as described in SATA-IO 3.2 subclause 11.15:

A command may be considered malformed as a result of any of its parameters being invalid, including the use of a TAG value that corresponds to an existing TAG value for a pending command.

This will cause the state machine to enter the DFPDMAQ12: BrokenHost_ClearBusy state, where the device transmits a RDH FIS with ERR set to one in the Status field, Interrupt bit set to one, BSY bit cleared to zero, DRQ bit cleared to zero, and ATA error code set to one in the Error field.

Devices employing hardware acceleration of FPDMA QUEUED commands must be able to evaluate the validity of command parameters quickly in order to return an RDH FIS promptly. However in a zoned device, some commands require a complicated analysis of zone IDs, LBAs, etc.; in many cases this analysis would be very expensive to perform in hardware.

We believe that the “may” in subclause 11.15’s statement “... command may be considered malformed ...” does not mean that DFPDMAQ1: AddCommandToQueue is the *only* state in which a malformed command may be detected, and it *is* permissible to defer checking of some parameters until after the RDH FIS has been sent.

Thus if a command parameter error is detected later – presumably while the device is in the DIO: Device_idle state – then transition DIO:6 takes the device to the DFPDMAQ11: ERROR state, where the SDB FIS is sent.

This does not require a technical change to the standard.

The clarification proposed is to add:

- a) a parenthetical phrase to the state table entry for transition DFPDMAQ1:2 indicating that a malformed command may not be detected; and
- b) a note to the paragraph explaining transition DFPDMAQ1:2 explaining further.

The author is uncertain whether a note in the description of one transition is allowed to refer to another transition, so alternative versions of the note are offered below.

Thanks to Ralph Weber, Joe Breher, et al. for their assistance in preparing this proposal.

[editor note: Existing text is black. New text is marked as underlined in blue color. Material to be deleted is ~~red with strikethrough markings~~.

Changes to Serial ATA 3.2

11 Device command layer protocol

...

11.15 FPDMA QUEUED command protocol

...

DFPDMAQ1: AddCommandToQueue	Append command to internal device command queue and store TAG value.		
1. Device successfully en-queued the command	→	DFPDMAQ2: ClearInterfaceBsy	
2. Command malformed Malformed command detected	→	DFPDMAQ12: BrokenHost_ClearBusy	

...

Figure 332 – Device command layer FPDMA queued state machine

...

Transition DFPDMAQ1:2, if the device determines that the received command is malformed, an error has occurred and the device shall transition to the DFPDMAQ12: BrokenHost_ClearBusy state. A command may be considered malformed as a result of any of its parameters being invalid, including the use of a TAG value that corresponds to an existing TAG value for a pending command.

[Note xx](#) – Complete command parameter validation may not be possible when the device is in DFPDMAQ1: AddCommandToQueue state. In these cases, complete parameter validation occurs while the device is in DI0: Idle state (see 11.3).