

An Alternative to Proxy Interrupt

To: X3T13 Technical committee
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Subj: Proposal for an alternative to proxy interrupt
for command overlapping and queuing

Overview

During the course of the discussions about command overlapping and queuing there have been several issues identified with the use of PDIAG- for proxy interrupt. This document will offer an alternative scheme for device interrupt when overlapping and queuing commands are being used.

Constraints

This alternative scheme was developed assuming that there are several constraints on any modifications to the current overlapping proposal:

- 1) Based on input from host interface ASIC developers, any modifications to the current overlapping proposal **can not** include requirements for additional signal lines at either the host or the devices.
- 2) Any final overlapping proposal must be compatible with legacy systems and devices.
- 3) Any modifications to the current proposal should minimize the number of changes required to the protocol work that has been done.

Freedoms

In addition, this alternative scheme was developed assuming that there are several areas of freedom for any modifications to the current overlapping proposal:

- 1) Minor electrical changes (e.g.: the addition of a pull-down resistor on an interface signal line) can be recommended.
- 2) Minor changes to I/O cell definitions for hosts and/or devices can be recommended.
- 3) Minor changes in interface signal definitions can be recommended.

INTRQ for overlap commands

The signal line that is used as the device interrupt for all other ATA functions is INTRQ. This alternative scheme is based on extending the use of INTRQ for all device interrupts during overlapping and queuing, as well. The concept is that a device servicing an overlapped command (whether selected or not) would assert INTRQ as it would while in normal operation. However, rather than negating INTRQ when selected, the device could be set up through a SET FEATURES subcommand so that would tri-state INTRQ when not asserting that line.

This scheme would allow the devices to assert INTRQ as they would normally, either one device at a time or both simultaneously. The major change that would be required for this scheme is that the host would have to respond to the level of INTRQ and not just the edge of any transition on the line. In addition, this scheme also allows for the host to change the polarity of INTRQ.

To implement this scheme the following modifications are required:

- 1) If a positive polarity is required by the host, a 12.5Kohm pull-down resistor is added to the INTRQ line at the host. If a negative polarity is required by the host, a 1.25Kohm pull-up resistor is added on this line at the host.
- 2) Devices capable of supporting overlapping would either assert INTRQ to a high voltage level and deassert it to a tri-state condition, or assert INTRQ to a low voltage level and deassert it to a tri-state condition. This should not be difficult. All devices today must have the ability to set the driver for this line in all three states.
- 3) Two bits would have to be added to the IDENTIFY DEVICE data to indicate the polarities that are supported. These could be bits 11 and 12 in word 73 (the word currently used for other overlapping and queuing information).
- 4) There would be two new SET FEATURES subcommands: one to cause the device to assert INTRQ high and deassert to tri-state, and one to cause the device to assert INTRQ low and deassert to tri-state. The values proposed for Enable Proxy interrupt (5Fh) and Disable Proxy interrupt (DFh) could be used for these subcommands.
- 5) Most importantly, the host would have to monitor the state of INTRQ rather than looking for a transition. When two devices are asserting INTRQ and the status register of one device is read, INTRQ would still be asserted by the second device. The host would have to be aware that there was a pending overlap command to the second device, select that device, and read its status register.

PDIAG- for overlap commands

Since it is no longer needed for proxy interrupt, PDIAG- could be used along with the DMA RDY bit in the Status Register to provide the host with additional information about the state of the device that is not selected in order to try to minimize "bus hogging" (the DMA RDY bit is no longer needed since all overlap commands transfer data in the DMA mode). The unselected device could assert PDIAG- when it asserts INTRQ. The selected device could then set bit 5 in the Status Register at the next convenient time to indicate that the device that is not selected is asserting INTRQ as well.