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To: T10 Technical Committee
From: Bill Galloway
Subj: Synchronous ATN Timing

The setup time for ATN has been inadvertently changed from SPI-2 to SPI-3. This proposal moves the timing back closer to SPI-2 but not all of the way back. In SPI-2 the ATN setup time is at least two system deskew delays before the negation of ACK. In SPI-2 the system deskew delay varied with negotiated speed. In SPI-3 the system deskew delay remains constant.

The system deskew delay is used during Quick Arbitration, Selection, Reselection, Asynchronous Information Transfer, Bus turnaround, SCAM, Arbitration Fairness, and ATN Condition. Only the ATN Condition should vary by negotiated speed.

The existing SPI-3 definition for system deskew delay should remain the same. New times should be defined for the ATN Condition. These times should follow the new CRC times where appropriate. This table provides the old times for reference and proposes new numbers.

Old Times	Async	Fast-5	Fast-10	Fast-20	Fast-40	Fast-80
SPI-3 Transmit Setup Time (ST)	49ns	23ns	23ns	11,5ns	9,25ns	NA
Calculated Skew (ST)	*?*	*8ns*	*8ns*	*5ns*	*4,5ns*	*NA*
SPI-3 Receive Setup Time (ST)	?	15ns	15ns	6,5ns	4,75ns	NA
SPI-3 Transmit Setup Time (DT)	NA	NA	37ns	18,5ns	9,25ns	4,8ns
Calculated Skew (DT)	*NA*	*NA*	*12ns*	*7ns*	*4,5ns*	*3,35ns*
SPI-3 Receive Setup Time (DT)	NA	NA	25ns	11,5ns	4,75ns	1,45ns
SPI-3 CRC Transmit Setup Time (DT)	NA	NA	47ns	28,5ns	19,25ns	14,8ns
Calculated Skew (DT)	*NA*	*NA*	*12ns*	*7ns*	*4,5ns*	*3,35ns*
SPI-3 CRC Receive Setup Time (DT)	NA	NA	35ns	21,5ns	14,75ns	11,45ns
SPI-2 ATN Setup	90ns	90ns	40ns	30ns	16ns	NA
SPI-3 ATN Setup	90ns	90ns	90ns	90ns	90ns	90ns
New Times						
New ATN Transmit Setup Time (ST)	90ns	33ns	33ns	21,5ns	19.25ns	NA
Calculated Skew (ST)	*?*	*16ns*	*16ns*	*13ns*	*12,5ns*	*NA*
New ATN Receive Setup Time (ST)	?	17ns	17ns	8,5ns	6,75ns	NA
New ATN Transmit Setup Time (DT)	NA	NA	47ns	28,5ns	19,25ns	14,8ns
Calculated Skew (DT)	*NA*	*NA*	*20ns*	*15ns*	*12,5ns*	*11,35ns*
New ATN Receive Setup Time (DT)	NA	NA	27ns	13,5ns	6,75ns	3,45ns

Add new paragraphs to 9.1 Timing description

9.1.x ATN Transmit setup
The minimum time provided by the transmitter between the transition of the ATN signal and the negation of the ACK signal.

9.1.x ATN Receive setup
The minimum time required at the receiver between the transition of the ATN signal and the negation of the ACK signal to recognize the assertion or negation of an Attention Condition.

11.1.2.2 Quick arbitration method protocol
Change last sentence of second paragraph to:

If an initiator receives a QA REQUEST message from a target with which it has not negotiated the use of quick arbitration, then the initiator shall assert the ATN signal at least an ATN Transmit Setup Time before the ACK signal is negated for the QA REQUEST message, and shall report MESSAGE REJECT on the following MESSAGE OUT phase.

11.1.5.2.2.3 CRC protected pad field and CRC field DT data transfer to initiator
Change first sentence next to last paragraph to:

If the received CRC and computed CRC do not match (i.e. a CRC error is detected), or if an improperly formatted data group is transferred, then the initiator shall establish an attention condition (see 11.2.1) by asserting the ATN signal at least an ATN Transmit Setup Time before the ACK signal is negated for the last bytes of the CRC field.

11.1.9.2.1 MESSAGE OUT phase exception condition handling
Change last sentence of first paragraph to:

When resending more than one message byte, the initiator shall assert the ATN signal at least an ATN Transmit Setup time prior to asserting the ACK signal on the first byte and shall maintain the ATN signal asserted until the last byte is sent as described in 11.2.1.

11.2.1 Attention condition
Change first sentence of third paragraph to:

The initiator shall negate the ATN signal at least an ATN Transmit Setup time before asserting the ACK signal while transferring the last byte of the messages indicated with a Yes in tables 46, 60, and 65.

Change first sentence of fourth paragraph to:

The initiator shall assert the ATN signal at least an ATN Transmit Setup time before negating the ACK signal for the last byte transferred in a bus phase for the attention condition to be honored before transition to a new bus phase.

12.7.2.6 MESSAGE PARITY ERROR
Change first sentence of second paragraph to:

In order to indicate its intentions of sending this message, the initiator shall assert the ATN signal at least an ATN Transmit setup time prior to its negation of the ACK signal for the REQ/ACK handshake of the message byte that has the parity error.

12.7.2.7 MESSAGE REJECT
Change first sentence of second paragraph to:

In order to indicate its intentions of sending this message, the initiator shall assert the ATN signal at least an ATN Transmit Setup time prior to its release of the ACK signal for the REQ/ACK handshake of the message byte that is to be rejected.

12.7.2.10.2 Initiator initiated PARALLEL PROTOCOL REQUEST negotiation
Change clause b of fourth paragraph to:

b) the target does not detect an assertion of the ATN signal at least an ATN Receive Setup time before the ACK signal is negated on the last byte of the PARALLEL PROTOCOL REQUEST message.

12.7.2.14.2 Initiator initiated SDTR negotiation
Change clause b of fourth paragraph to:

b) the target does not detect an assertion of the ATN signal at least an ATN Receive Setup time before the ACK signal is negated on the last byte of the SDTR message.

12.7.2.17.2 Initiator initiated WDTR negotiation
Change clause b of fourth paragraph to:

b) the target does not detect an assertion of the ATN signal at least an ATN Receive Setup time before the ACK signal is negated on the last byte of the WDTR message.