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Subject: SCSI ATN Timing Sort of Proposal for SPI-3

The last working group concluded that ATN should have 10 ns additional setup and hold time compared to data bits. Consequently the following changes are proposed to SPI-3.

In the orphan paragraphs of Clause 9 move the system deskew delay from table 30 to table 31 and to Table 32. For table 31 use the SPI-2 values (i.e., 45 ns; 45 ns; 20 ns; 15 ns; and 8 ns). For table 32 use 45 ns; 29 ns; 20 ns; and 15 ns. **Proposer's Note: I am uncomfortable with this portion of the change. The use of system deskew delay was not well understood by some implementers. Note that the SPI-2 Fast 20 and Fast 40 system skew delays were equal to the setup time without any of the working groups desire (now) for 10 ns larger than setup time due to the extra skew outside the data bus. The other source of discomfort is that the function of the system deskew delay is independent of the negotiated or to be negotiated data rates. It may be better to leave these tables as they are and instead to add a separate ATN to ACK negated skew delay for the ATN used to indicate a data CRC error and a data phase parity error. I have forgotten why the working group concluded in new designs (SPI-3 compliant) at least 45 ns could not be used at all times.**

In 11.1.5 I think "The initiator requests a MESSAGE OUT phase by asserting the ATN signal, while the target causes the BUS FREE phase by releasing the MSG, C/D, I/O, and BSY signals." Should instead be "The initiator requests a MESSAGE OUT phase by asserting the ATN signal. ~~while~~ The target causes the BUS FREE phase by releasing the MSG, C/D, I/O, and BSY signals."

In 11.1.5.2.2.3 change "If 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 before the ACK signal is negated for the last bytes of the CRC field." to "If 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 a system deskew delay before the ACK signal is negated for the last bytes of the CRC field."

In 11.1.9.2 MESSAGE OUT phase change “The target shall handshake byte(s) in this phase until the ATN signal is negated, except when rejecting a message.” to “The target shall handshake byte(s) in this phase until and including the ATN signal is negated first ACK signal is asserted following the negation of ATN, except when rejecting a message. The initiator shall indicate the last byte(s) of the message to be transferred by negating the ATN signal at least a System Deskew Delay before the corresponding ACK signal is asserted.”

In 11.1.9.2.1 MESSAGE OUT phase exception condition handling change “If the target detects one or more parity error(s) on the message byte(s) received, it may indicate its desire to retry the message(s) by asserting the REQ signal after detecting the ATN signal has gone false and prior to changing to any other phase. The initiator, upon detecting this condition, shall resend all of the previous message byte(s) in the same order as previously sent during this phase. When resending more than one message byte, the initiator shall assert the ATN signal at least two system deskew delays 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.” to “If the target detects one or more parity error(s) on the message byte(s) received, it may ~~indicate its desire to retry the message(s)~~ request that the message(s) be retried by asserting the REQ signal after detecting the ATN signal has gone false and prior to changing to any other phase. The initiator, upon detecting this condition, shall resend all of the previous message byte(s) in the same order as previously sent during this phase. When resending more than one message byte, the initiator shall assert the ATN signal at least two system deskew delays 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.”

Proposer’s Note: Why two system deskew delays rather than one?

In 11.1.11.1 DT DATA IN phase information unit transfer exception condition handling change “If the initiator detects a parity error on any byte or a CRC error in any information unit it receives while in the DT DATA IN phase the initiator shall create an attention condition by asserting the ATN signal before the ACK signal is released for the last byte of CRC.” to “If the initiator detects a parity error on any byte or a CRC error in any information unit it receives while in the DT DATA IN phase the initiator shall create an attention condition by asserting the ATN signal at least a System Deskew Delay before the ACK signal is ~~released~~ negated for the last byte of CRC.”

In 11.2.1 Attention condition change “The initiator creates the attention condition by asserting ATN at any time except during the ARBITRATION or BUS FREE phases.” to “The initiator creates the attention condition by asserting ATN ~~at any time~~ during any phase except during the ARBITRATION or BUS FREE phases.”

“The initiator shall negate the ATN signal at least two system deskew delays before asserting the ACK signal while transferring the last byte of the messages indicated with a Yes in tables 46, 60, and 65. If the target detects that the initiator failed to meet this requirement, then the target shall go to BUS FREE phase (see 11.1.1).” **Proposer’s Note: Why two system deskew delays rather than one? Table 60 has no “Yes”. Perhaps the reference is valid in case a later change added a YES. Regarding Table 65 why does Clear Task Set require negating ATN at least two system deskew delays before asserting ACK when Clear ACA does not? There are a lot of “becomes true” statements. Is it correct and is it clear that “becomes true” means assertion is at least a system deskew delay before asserting ACK ? This clause also has several “immediately”. Should “immediately” be quantified? Note 35 should be a requirement rather than a note.**

Change “The initiator shall keep the ATN signal asserted if more than one byte is to be transferred. The initiator may negate the ATN signal at any time except it shall not negate the ATN signal while the ACK signal is asserted during a MESSAGE OUT phase. Normally, the initiator negates the ATN signal while the REQ signal is true and the ACK signal is false during the last REQ/ACK handshake of the MESSAGE OUT phase.” to “The initiator shall keep the ATN signal asserted during a MESSAGE OUT phase if more than one byte is to be transferred. The initiator ~~may~~ shall negate the ATN signal at ~~any time except it shall not negate the ATN signal while~~ at least a system deskew delay before asserting the ACK signal is asserted for the last byte (s) transferred during a MESSAGE OUT phase. ~~Normally, the initiator negates the ATN signal while the REQ signal is true and the ACK signal is false during the last REQ/ACK handshake of the MESSAGE OUT phase.~~”

In 12.1 SPI information unit sequences is it understood that “During a read operation the initiator should assert the ATN signal on a parity error or CRC error and not move the data pointers.” implicitly includes the timing requirements of 11.1.5 clauses?

In 12.7.1.1 Message protocol rules is it understood that “The initiator is required to end the MESSAGE OUT phase (by negating ATN) when it sends certain messages identified in tables 46, 60, and 65.” implicitly includes the timing requirements of 11.1.5 clauses?

In 12.7.2.1 CONTINUE TASK is it understood that “An initiator that gets rejected should assert the ATN signal and send an ABORT TAG message on the resulting MESSAGE OUT phase.” implicitly includes the timing requirements of 11.1.5 clauses?

In 12.7.2.6 MESSAGE PARITY ERROR change “In order to indicate its intentions of sending this message, the initiator shall assert the ATN signal prior to its release of the ACK signal for the REQ/ACK handshake of the message byte that has the parity error.” to “In order To indicate its intentions of sending this message, the initiator shall assert the ATN signal at least a system deskew delay prior to its release of negating the ACK signal for the REQ/ACK handshake of the message byte that has the parity error.”

Make the analogous change in 12.7.2.7 MESSAGE REJECT.

In 12.7.2.10.1 Target initiated PARALLEL PROTOCOL REQUEST negotiation change “Prior to releasing the ACK signal on the last byte of the PARALLEL PROTOCOL REQUEST message from the target, the initiator shall assert the ATN signal and respond with its PARALLEL PROTOCOL REQUEST message, MESSAGE PARITY ERROR message, or with a MESSAGE REJECT message.” to “The initiator shall assert the ATN signal at least a system deskew delay prior to releasing negating the ACK signal on the last byte of the PARALLEL PROTOCOL REQUEST message from the target, the initiator shall assert the ATN signal and respond with its PARALLEL PROTOCOL REQUEST message, MESSAGE PARITY ERROR message, or with a MESSAGE REJECT message.”

In 12.7.2.10.2 Initiator initiated PARALLEL PROTOCOL REQUEST negotiation change “If the initiator recognizes that PARALLEL PROTOCOL REQUEST negotiation is required, it asserts the ATN signal and sends a PARALLEL PROTOCOL REQUEST message to begin the negotiating process.” to “If the initiator recognizes that a PARALLEL PROTOCOL REQUEST negotiation is required, it shall asserts the ATN signal as specified in 11.2.1 and sends transfer a PARALLEL PROTOCOL REQUEST message to begin the negotiating process.”

Change “If the initiator does not support the target’s responding PARALLEL PROTOCOL REQUEST message’s values the initiator shall assert ATN and the first message shall be a MESSAGE REJECT message.” to “If the initiator does not support the target’s responding PARALLEL PROTOCOL REQUEST message’s values the initiator shall assert ATN a system deskew delay prior to the negation of ACK for the last byte(s) of the PARALLEL PROTOCOL REQUEST message and the first message out shall be a MESSAGE REJECT message.”

In “12.7.2.14.1 Target initiated SDTR negotiation change “Prior to releasing the ACK signal on the last byte of the SDTR message from the target, the initiator shall assert the ATN signal and respond with its SDTR message, MESSAGE PARITY ERROR message, or with a MESSAGE REJECT message.” to “At least a system deskew delay prior to releasing negating the ACK signal on for the last byte of the SDTR message from the target, the initiator shall assert the ATN signal and respond with its SDTR message, MESSAGE PARITY ERROR message, or with a MESSAGE REJECT message during the resultant message out.”

In 12.7.2.14.2 Initiator initiated SDTR negotiation make the analogous changes as in 12.7.2.10.2.

Regarding 12.7.2.15 TARGET TRANSFER DISABLE I thought this message had been made obsolete. If not, it needs the same timing changes as above.

In 12.7.2.17.1 Target initiated WDTR negotiation make the analogous changes as in 12.7.2.10.2.

In 12.7.3 Task attribute messages change “If a target attempts to reconnect using an invalid tag, then the initiator should assert the ATN signal. After the corresponding MESSAGE OUT phase the initiator shall respond with an ABORT TASK message.” to “If a target attempts to reconnect using an invalid tag, then the initiator should assert the ATN signal at least a system deskew delay prior to negating ACK for the last byte(s) transferred during the MESSAGE IN phase. ~~After~~ During the corresponding resultant MESSAGE OUT phase the initiator shall ~~respond with~~ transfer an ABORT TASK message.”

Does 12.8.2 Incorrect initiator connection require the ATN timing corrections or is it implicit?

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