Proposed Draft

Serial ATA International Organization

Version 1.0
June 27,2007

Serial ATA Revision 2.6 ECN 017
Title : OOB Burst/Gap Duration Clarification

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Document History

Version	Date	Comments
0	April 30,2007	Initial release.
1	June 7, 2007	Rewrote Problem Statement to clarify 3 separate issues. Updated wording of +/-100mV thresholds per Phy WG feedback from June 6, 2007 call. Also updated Figure 1 picture to change cursor positions shown. Changed proposed text color scheme from red to blue to follow ECN guidelines.
2	June 27, 2007	Simplified Problem Statement per C. Hill's suggestions. Fixed color scheme to concur with ECN guidelines.
1.0	June 27, 2007	Phy WG approval

1 Introduction

Problem Statement : This ECN serves to address three distinct issues, all related to specifications surrounding OOB burst characteristics:

1) Clarity of OOB TX burst/gap length conformance range values:

The present definitions for transmit COMINIT/RESET/WAKE burst lengths and COMINIT/WAKE gap lengths (7.2.2.7.3, 7.2.2.7.4, and 7.2.2.7.5) are inconsistently defined with respect to the receiver COMWAKE and COMINIT Gap Detection Window specifications (see 7.2.2.7.6 and 7.2.2.7.7), in terms of units, resulting in multiple interpretations.

2) Clarity of measurement points used to delineate edges of bursts/gaps:

The TX burst/gap length definitions of 7.2.2.7.3, 7.2.2.7.4, and 7.2.2.7.5 yield different values for a +100mV or –100mV reference level.

3) Clarity regarding the definition of 'UI_{OOB}' (UI During OOB Signaling):

There are multiple interpretations of the UI_{OOB} specification of section 7.2.2.7.2 regarding the defined requirement (Gen1 rate +/- 3%) over the interval.

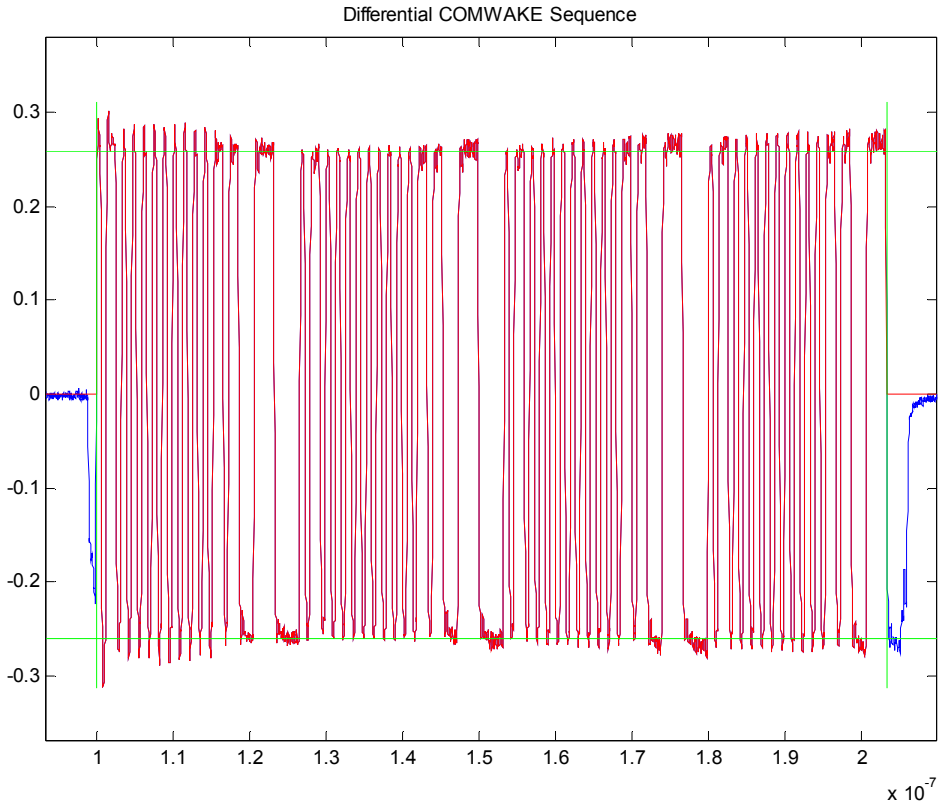

Figure 1: Captured OOB burst showing +100mV and –100mV burst width asymmetry. (Bits in blue are not included in width if +100mV threshold is used.)

Solution : Three solutions are proposed, one for each of the separate issues defined in the Problem Statement above:

1) Clarity of OOB burst/gap length conformance range values:

Solution: Modify Table 32 to provide the TX burst/gap conformance ranges in ns (using the UI_{OOB} range limits as a basis).

The proposed TX burst/gap range values in ns would then be:

	Min	Nominal	Max
UI_{OOB} limits (existing)	646.67ps	666.67ps	686.67ps
INIT/WAKE Burst length (160*UI_{OOB})	103.5ns	106.7ns	109.9ns
INIT Gap length (480*UI_{OOB})	310.4ns	320.0ns	329.6ns
WAKE Gap length (160*UI_{OOB})	103.5ns	106.7ns	109.9ns

2) Clarity of measurement points used to delineate edges of bursts/gaps:

Solution: Clarify 7.2.2.7.3, 7.2.2.7.4, and 7.2.2.7.5 to indicate +/-100mV reference voltage levels for determining the first/last edge crossing times.

3) Clarity regarding the definition of 'UI$_{OOB}$' (UI During OOB Signaling):

Solution: Modify 7.2.2.7.2 to indicate an averaged bit rate measurement, rather than an explicit requirement for each UI contained in the OOB burst.

Background

1) Clarity of OOB TX burst/gap length conformance range values:

The receiver Gap Detection Window specification values are clearly and absolutely defined in nanoseconds, while the transmitter burst/gap specifications are defined in terms of the quantity "UI$_{OOB}$". Though UI$_{OOB}$ is defined in 7.2.2.7.2 and min/nominal/max ranges are provided in Table 32, extrapolation of the corresponding TX burst/gap range values in ns is implied, but not explicitly stated. For the purposes of conformance testing, it would be beneficial to provide the absolute TX gap/burst limit specifications in terms of ns, to provide consistency with the rest of the document, and eliminate the potential for varying and inconsistent interpretations to arise.

2) Clarity of measurement points used to delineate edges of bursts/gaps:

The TX burst/gap length definitions of 7.2.2.7.3, 7.2.2.7.4, and 7.2.2.7.5 refer to measurement of the burst lengths "from 100mV differential crosspoints" of the first and last edges of a burst. This definition is problematic, as it implies a *positive* 100mV reference level as written, when in practical instances, the burst widths may be measured differently if measured using a +100mV or –100mV reference level, due to the fact that the burst data can affect the burst such that the first and last edges are not always symmetric with respect to polarity, depending on the first/last data bits of the burst (see Figure 1 below.) Assuming the original intent of the specification was to measure **all** 160 presumed UI in the burst, the specification should be clarified to indicate *positive* and *negative* 100mV crossing levels for denoting the first and last edge crossing times of the burst.

3) Clarity regarding the definition of 'UI$_{OOB}$' (UI During OOB Signaling):

Inconsistent and varying interpretations of the UI$_{OOB}$ specification of section 7.2.2.7.2 exist, due to the lack of explicit specification as to whether *all* of the bits in the OOB burst must meet the defined requirement (Gen1 rate +/- 3%), or whether the specification is defined as an average data rate measurement intended to be performed over the entire burst. The intent is for an average data rate specification (e.g., to disqualify products that might erroneously transmit Gen2 signaling in their OOB bursts), rather than to disqualify products that, for various reasons, may have truncated (i.e., 'runt') bursts at the beginning or ends of the bursts (typically caused by a potentially asynchronous relationship between the burst start/stop points, and the underlying NRZ data signal comprising the OOB burst.) It is recommended that the UI$_{OOB}$ specification be amended to clarify this point.

2 Technical Specification Changes

7.2.2.7.2 UI During OOB Signaling (UI$_{OOB}$)

~~Operating~~ Average data rate during OOB burst transmission (at Gen1 rate +/- 3%).

7.2.2.7.3 COMINIT/COMRESET and COMWAKE Transmit Burst Length

~~Burst length in terms of UI$_{OOB}$ as measured from 100 mV differential crosspoints of first and last edges of a burst.~~

Burst length in ns, as measured from the first crossing point (+100mV or –100mV) of the burst to the last crossing point (+100mV or –100mV) of the burst.

7.2.2.7.4 COMINIT/COMRESET Transmit Gap Length

~~Gap length in terms of UI_{OOB} as measured from 100 mV differential crosspoints of last and first edges of bursts.~~
Gap length in ns, as measured from the last crossing point (+100mV or –100mV) of one COMINIT/COMRESET burst to the first crossing point (+100mV or –100mV) of the following COMINIT/COMRESET burst.

7.2.2.7.5 COMWAKE Transmit Gap Length

~~Gap length in terms of UI_{OOB} as measured from 100 mV differential crosspoints of last and first edges of bursts.~~
Gap length in ns, as measured from the last crossing point (+100mV or –100mV) of one COMWAKE burst to the first crossing point (+100mV or –100mV) of the following COMWAKE burst.

[Editor's Note: Also see modifications to Table 32, next page.]

Table 32 – OOB Specifications

Parameter	Units	Limit	Electrical Specification						Detail Cross-Ref Section	Meas. Cross-Ref Section
			Gen1i	Gen1m	Gen1x	Gen2i	Gen2m	Gen2x		
$V_{threshi}$ OOB Signal Detection Threshold	mVppd	Min	50		120	75		120	7.2.2.7.1	7.4.20
		Nom	100		-	125		-		
		Max	200		240	200		240		
UI_{OOB}, UI During OOB Signaling	ps	Min	646.67			~~646.67~~			7.2.2.7.2	-
		Nom	666.67			~~666.67~~				
		Max	686.67			~~686.67~~				
COMINIT/ COMRESET and COMWAKE Transmit Burst Length	ns	Min	103.5						7.2.2.7.3	7.4.21
		Nom	106.7							
		Max	109.9							
COMINIT/ COMRESET Transmit Gap Length	ns	Min	310.4						7.2.2.7.4	7.4.21
		Nom	320.0							
		Max	329.6							
COMWAKE Transmit Gap Length	ns	Min	103.5						7.2.2.7.5	7.4.21
		Nom	106.7							
		Max	109.9							
COMWAKE Gap Detection Windows	ns	May detect	35 ≤ T < 175			~~35 ≤ T < 175~~			7.2.2.7.6	7.4.21
		Shall detect	101.3 ≤ T ≤ 112			~~101.3 ≤ T ≤ 112~~				
		Shall not detect	T < 35 or T ≥175			~~T < 35 or T ≥175~~				
COMINIT/ COMRESET Gap Detection Windows	ns	May detect	175 ≤ T < 525			~~175 ≤ T < 525~~			7.2.2.7.7	7.4.21
		Shall detect	304 ≤ T ≤ 336			~~304 ≤ T ≤ 336~~				
		Shall not detect	T < 175 or T ≥ 525			~~T < 175 or T ≥ 525~~				

[Editor's Note: Suggestion is to remove crossed out sections above and extend the Gen1 values across the entire column width, as the limits in all cases are identical for Gen1 and Gen2.]