**BUFFER ISSUE RESOLUTION DOCUMENT (BIRD)**

**BIRD NUMBER:** 206

**ISSUE TITLE:** Clarification of text “transition time”

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**DATE REVISED:**

**DATE ACCEPTED:** September 18, 2020

**DEFINITION OF THE ISSUE:**

The common definition of “transition time” is different from that used in the IBIS specification. Propose to replace text “transition time” with “threshold crossing time”.

**SOLUTION REQUIREMENTS:**

**SUMMARY OF PROPOSED CHANGES:**

Editorial change throughout the IBIS specification in replacing “transition time” with “threshold crossing time”.

This BIRD covers the following changes.

 1. Editorial change in the definition of Rx\_Clock\_Recovery\_Mean in replacing “transition time” with “threshold crossing time”.
 2. Editorial change in section 10.7 Modulation Parameters on usage of “zero crossing time”.

 3. Editorial change in the definition of PAM4\_UpperEyeOffset, PAM4\_CenterEyeOffset, PAM4\_LowerEyeOffset in replacing “transition time” with “threshold crossing time”.

**PROPOSED CHANGES:**

*Parameter:* **Rx\_Clock\_Recovery\_Mean**

*Required:* No, and illegal before AMI\_Version 6.0

*Direction:* Rx

*Descriptors:*

Usage:                   Info, Out, Dep

Type:                     Float, UI

Format:                 Value, List, Range, Corner, Increment, Steps

Default:                 <numerical\_literal>

Description:<string>

*Definition:* A static offset between the recovered clock and the point half way between the PDF

medians of consecutive edge **~~transition times~~ threshold crossing times**. Entries are assumed to be in units of seconds when

declared as Type Float.

*Usage Rules:*

*Other Notes:* Time is calculated as follows:

 *actual\_time= ideal\_time+ Rx\_Clock\_Recovery\_Mean*

where ideal\_time is half way between the median of the edge **~~transition times~~ threshold crossing times** of both sides of the eye.

*Example:*

(Rx\_Clock\_Recovery\_Mean (Usage Info) (Value 0.05) (Type UI)

(Description "Recovered Clock offset in UI.")

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**10.7 MODULATION RESERVED PARAMETERS**

Prior to AMI\_Version 6.1, AMI modeling supported only NRZ SerDes signaling. AMI\_Version 6.1 introduces support for PAM4 SerDes signaling. A SerDes waveform is periodically sampled to determine the value of the waveform between transitions. The time interval between these samples is the Unit Interval (UI), also referred to as bit\_time (the value passed into the AMI\_Init function), and symbol\_time. Symbol\_time is a more generic name since a single UI can either represent a bit in NRZ or two bits in PAM4. The clock\_times returned by AMI\_GetWave are edge **~~transition times~~ threshold crossing times**, and are ½ UI before the nominal sample times. **~~For NRZ, the mean edge transition time is close to the mean zero crossing time~~**~~.~~ For PAM4, the **~~zero crossing time~~ edge threshold crossing time** is only meaningful for transitions between symbols 0 and 3 and between symbols 1 and 2. **~~In summary, UI, bit\_time and symbol\_time are the same and correspond to the time between the waveform edges sampled at the receiver latch.~~ ~~For clock\_times, zero crossing time and edge transition time are the same and are defined as ½ UI before the times that the Rx latch is sampled.~~**

*Parameters:* **PAM4\_UpperEyeOffset, PAM4\_CenterEyeOffset, PAM4\_LowerEyeOffset**

*Required:* No, and illegal before AMI\_Version 6.1

*Direction:* Rx

*Descriptors*:

Usage: Info, InOut, Out, Dep

Type: Float, UI

Format: Value

Default: <numeric\_literal>

Description:<string>

*Definition:* Sampling clock offsets for Upper, Center and Lower PAM4 eyes

*Usage Rules:* Rx models provide a single set of sampling information returned that pertains to a nominal eye centered between consecutive edge **~~transition times~~ threshold crossing times** during PAM4 analysis. When the PAM4 Upper, Center and Lower eyes have a time shift with respect to the nominal eye, these parameters are used to define a sampling offset from the nominal eye.

When a positive value is declared, the latch in question will sample the waveform *after* the sample time for the nominal eye. When a negative value is declared, the latch in question will sample the waveform *before* the sample time for the nominal eye.

If these parameters are declared as Usage InOut or Out, the algorithmic model is expected to output values from the AMI\_Init and AMI\_GetWave call for the EDA tool to use during waveform and eye processing.

If the AMI Reserved Parameter Modulation is set to “PAM4” and these offset values are *not* declared, the EDA tool is expected to use a default value of 0.0 for each offset parameter not declared. The PAM4\_UpperEyeOffset, PAM4\_CenterEyeOffset and PAM4\_LowerEyeOffset parameters are ignored when the AMI Reserved Parameter Modulation is not declared or is declared and set to “NRZ”.

*Other Notes:* In Statistical analysis, offset from the center of the nominal eye shall include Rx\_Clock\_Recovery\_Mean and either the PAM4\_UpperEyeOffset, PAM4\_CenterEyeOffset and PAM4\_LowerEyeOffset. In Time Domain analysis, PAM4\_UpperEyeOffset, PAM4\_CenterEyeOffset and PAM4\_LowerEyeOffset shall be three independent corrections to the clock times. Specifically, the PAM4\_UpperEyeOffset and PAM4\_LowerEyeOffset are offsets from the nominal eye and not the PAM4\_CenterEyeOffset.

*Examples:*

(PAM4\_UpperEyeOffset (Usage Out) (Value 2.5e-12) (Type Float)

 (Description "The upper eye sampling offset.")

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(PAM4\_CenterEyeOffset (Usage Out) (Value 0.0) (Type Float)

 (Description "The center eye sampling offset.")

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(PAM4\_LowerEyeOffset (Usage Out) (Value 2.5e-12) (Type Float)

 (Description "The lower eye sampling offset.")

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**BACKGROUND INFORMATION/HISTORY:**