**BUFFER ISSUE RESOLUTION DOCUMENT (BIRD)**

**BIRD NUMBER: 197.7**

**ISSUE TITLE:** New AMI Reserved Parameter DC\_Offset

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**DATE ACCEPTED:** February 21, 2020

**DEFINITION OF THE ISSUE:**

AMI modeling is now being applied to NRZ single-ended channels (e.g. DDR5). The current input to AMI\_Init is an Impulse Response. This forces all AMI simulations to be centered around the mid-level of the signal of a single-ended port. A receiver (Rx) DLL may need to know the input single-ended voltage levels (e.g. to handle saturation in a DFE summer). This BIRD proposes one new AMI Reserved Parameter DC\_Offset to address these issues.

**SOLUTION REQUIREMENTS:**

The IBIS specification must meet these requirements:

Table 1: Solution Requirements

|  |  |
| --- | --- |
| Requirement | Notes |
| 1. Allow the Rx model to recover the single-ended signal at the Rx input.
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**SUMMARY OF PROPOSED CHANGES:**

Add new AMI Reserved Parameter DC\_Offset

**PROPOSED CHANGES:**

*Parameter:* **DC\_Offset**

*Required:* No, and illegal before AMI\_Version 7.1

*Direction:* Rx

*Descriptors:*

Usage:                   In

Type:                     Float

Format:                 Value

Default:                 <numeric\_literal>

Description:<string>

*Definition:* The input value of DC\_Offset is the mean value of the steady state high and low voltages of the analog channel step response at the Rx pad.

*Usage Rules:* If the impulse response was generated by differentiating the analog channel step response, then the input value of DC\_Offset should be the same as the average of the step response initial and final voltages.

It is assumed that the waveform input to the Rx AMI\_GetWave function is the physical Rx input waveform minus the input value of this DC\_Offset. The Rx AMI\_GetWave function may choose to reconstruct the physical input waveform by adding the input value of DC\_Offset to the input waveform.

The Rx AMI\_GetWave output waveform returned by the AMI model shall swing around zero volts.

*Other Notes:*

The EDA tool ignores the DC\_Offset value specified in the .ami file. It is the responsibility of the EDA tool to determine the input value of DC\_Offset.  The EDA tool may use any method to do this. The EDA tool may use any method to do this. The EDA tool may use the input value of DC\_Offset to post process data returned by the AMI model to graphically compare the waveform output of Rx AMI\_GetWave to the input waveform without the DC\_Offset subtracted.

* 1. For the example below, assume that the EDA tool determines the DC\_Offset Value is 0.1 V and then passes it to the executable model
	2. Rx AMI\_GetWave returns the output waveform in the range from -0.5 V to 0.5 V
	3. The EDA tool may shift the output waveform by the DC\_Offset Value of 0.1 V to a range from -0.4 V to 0.6 V

*Example:*

DC\_Offset (Usage In) (Type Float) (Value 0.0)

(Description “The EDA tool is responsible for determining the input value sent to the executable model.”)

**BACKGROUND INFORMATION/HISTORY:**

Typographical updates made in BIRD197.1, based on feedback from Open Forum and ATM review.

BIRD197.2 contains additional editorial changes.

BIRD197.3 contains editorial changes to the verbiage related to the usage of the words “single-ended”.

BIRD197.4 changes the DC\_Offset Usage from In to In or InOut. NRZ\_Threshold parameter is added.

BIRD197.5 changes the DC\_Offset Usage from In or InOut to In. NRZ\_Threshold parameter is removed.

BIRD197.6 has some editorial additions regarding the example and Other Notes.

BIRD197.7 has more editorial corrections to the example and Other Notes.