

BIRD 159 Discussion

IBIS-ATM teleconference

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Background

- **BIRD 159** was submitted on March 14, 2013 based on a short email conversation on the IBIS-ATM email reflector
- **The original posting from Arpad contained the following text:**

We ran into an Rx AMI model which produces an output from its GetWave function that is not centered around the horizontal axis. This raises a question about Rx_Receiver_Sensitivity which defines an offset around a threshold line.

Is the threshold assumed to be 0 V, i.e. the horizontal axis, or can it be anything? If it is anything, how do we know what it is? I didn't find a definition for this in the specification. Am I missing something?

- **Reply from Mike Steinberger:**

You pose an interesting question that we hadn't considered before.

First of all, I suggest that we do not assume that the DC value of the model output is the threshold value. There are a whole lot of different ways that that assumption could get violated. For example, a PRBS7 data pattern will produce a DC offset that is not the decision threshold.

To date, we've always assumed that the received signal is differential, and so the threshold should be zero. You are quite correct, however, that we never stated this assumption, and there is no absolute reason why this assumption has to be valid. This assumption does happen to be valid for most receiver designs, and any differential receiver with a nonzero threshold will be sub-optimal. However, that doesn't mean it can't happen.

It is true that there will be an on-chip variation (OCV) of the actual decision threshold, and we've generally lumped that in with the receiver sensitivity.

I suggest that we define a new Reserved parameter Rx_Receiver_Threshold, and make its default value zero. That would mean that all models published to date remain compatible and use the unstated assumption we've made to date, and new models can be more accurate when they have an offset threshold.

From a private correspondence with Walter

- **The words in the IBIS specification are to be interpreted in an absolute sense (pg. 190 in v5.1):**

In the example below, 100 mV (above +100 mV or below -100 mV is needed to ensure the signal is sampled correctly).

- **i.e., the signal has to be above the value or below the negative of the value provided in Rx_Receiver_Sensitivity to be sampled error free**
- **Is this interpretation clear to everyone reading the specification?**
- **This interpretation does NOT support AMI models which return a waveform that is NOT centered around the horizontal axis. Are such models “bad”, “illegal”, or OK? (pg. 123):**

The [Algorithmic Model] always processes a single waveform regardless **whether the model is single ended or differential**. When the model is differential, the waveform passed to the [Algorithmic Model] must be a difference waveform.

Does AMI support single ended modeling?

- **Are the words on pg. 123 and 169 in agreement?**

The [Algorithmic Model] always processes a single waveform regardless **whether the model is single ended or differential**. When the model is differential, the waveform passed to the [Algorithmic Model] must be a difference waveform.

It is assumed that the electrical interface to either the driver or the receiver is differential. Therefore, the sample values are assumed to be differential voltages centered nominally around zero volts. The algorithmic model's logic threshold may be non-zero, for example to model the differential offset of a receiver; however that offset will usually be small compared to the input or output differential voltage.

The output waveform is expected to be the waveform at the decision point of the receiver (that is, the point in the receiver where the choice is made as to whether the data bit is a "1" or a "0"). It is understood that for some receiver architectures, there is no one circuit node which is the decision point for the receiver. In such a case, the output waveform is expected to be the equivalent waveform that would exist at such a node were it to exist.

Another verbiage problem:

- **the term "output waveform" is not defined, could be the output of **Tx** AMI_GetWave or **Rx** AMI_GetWave, however the text seems to refer to the latter**

Questions to be answered

- **Does AMI support single ended modeling?**
 - **If yes, is it OK to require that the output (of Rx AMI_GetWave) should be centered around the horizontal axis?**
 - **If not, we should remove the words about single ended waveforms on pg. 123 which seem to allow it**
- **Is the definition of Rx_Receiver_Sensitivity clear?**
 - **Answer in meeting discussion: Yes**
- **Do we need to continue working on BIRD 159 or should it be withdrawn or voted down?**
 - **Answer in meeting discussion: Send recommendation to Open Forum to vote it down**