**BUFFER ISSUE RESOLUTION DOCUMENT (BIRD)**

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**ISSUE TITLE:** *Interconnect Modeling Using IBIS-ISS*

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Terminal rules:

One or more Terminal subparameters may appear under a given [Begin Interconnect Model] keyword. At least one Terminal subparameter is required. Each Terminal record contains information on a terminal of an IBIS-ISS subckt (or Touchstone file).

The Terminal subparameter is followed by three arguments: Terminal\_number, Terminal\_ID and Terminal\_Location Terminal\_number shall be a positive non-zero integer and less than or equal to the number of terminals in the Number\_of\_Terminals argument. The same Terminal\_number shall not appear more than once for a given Interconnect Model. If any Terminals are not present for a given Interconnect Model, then those terminals are unused, and shall be terminated according to the Unused\_Terminal\_Termination\_ Rules.

Terminal\_ID is a string using either a [Pin] name, a Signal\_name, a Model\_name, or “Default”.

Terminal\_Location is a string, and shall have one of the values Pin\_A\_signal, Pad\_A\_signal, A\_signal, Pin\_Signal\_name, Pad\_Signal\_name, A\_Signal\_name, A\_puref, A\_pdref, A\_pcref, A\_gcref or A\_extref.

* Pin\_A\_signal indicates this terminal is the buffer A\_signal terminal connected to a specific pin, Terminal\_ID shall be a Pin\_name, Model\_name or Default.
* Pad\_A\_signal indicates this terminal is the buffer A\_signal terminal connected to a specific die pad, Terminal\_ID shall be a Pin\_name, Model\_name or Default.
* A\_signal indicates this terminal is the buffer A\_signal terminal, Terminal\_ID shall be a Pin\_name, Model\_name or Default.
* Pin\_Signal\_nameindicates that this terminal is connected to all pins that have Signal\_name Terminal\_ID. Terminal\_ID shall be a Signal\_name on a Pin that has Model\_name Power or GND. All pins that have Signal\_name Terminal\_ID are considered shorted together at the pin side of the package model.
* Pad\_Signal\_name indicates that this terminal is connected to all die pads that have Signal\_name Terminal\_ID. Terminal\_ID shall be a Signal\_name on a Pin that has Model\_name Power or GND. All die pads that have Signal\_name Terminal\_IDs are considered shorted together at the die pad side of the package model.
* A\_Signal\_name indicates that this terminal is connected to all buffer model terminals Pullup Reference, Power Reference, Power Clamp Reference, Ground Clamp Reference or External Reference (A\_puref, A\_pdref, A\_pcref, A\_gcref or A\_extref ) that have an Terminal\_ID containing a Signal\_name Terminal\_ID shall be a Signal\_name on a Pin that has Model\_name Power or GND. All Buffer Terminals that have Signal\_name Terminal\_ID are considered shorted together at the buffer side of the package model.
* A\_puref indicates this terminal connected to a specific buffer model pullup reference, Terminal\_ID shall be a Pin\_name, Model\_name or Default.
* A\_pdref indicates this terminal connected to a specific buffer model pulldown reference, Terminal\_ID shall be a Pin\_name, Model\_name or Default.
* A\_pcref indicates this terminal connected to a specific buffer model power clamp reference, Terminal\_ID shall be a Pin\_name, Model\_name or Default.
* A\_gcref indicates this terminal connected to a specific buffer model ground clamp reference, Terminal\_ID shall be a Pin\_name, Model\_name or Default.
* A\_extref indicates this terminal connected to a specific buffer model external reference, Terminal\_ID shall be a Pin\_name, Model\_name or Default.

ID shall be a Pin\_name, Signal\_name, Model\_name or Default.

Qualifiers may have the values Aggressor, Model\_name, Default, Inverting, Non-Inverting and Connection(n). Qualifiers are optional, there may be zero, one or several qualifiers on each Terminal record. Qualifiers may appear in any order.

* Aggressor, any Terminal may have the qualifier aggressor. It means that terminal does not have coupling from all aggressor sources, so can be treated as an aggressor and should not be treated as a victim. By default a connection is a Victim.
* Model\_name, means that the Terminal\_ID on this terminal is a Model\_name
* Default, means that the Terminal\_ID on this terminal shall be Default.
* A terminal cannot have both Default and Model\_name qualifiers.
* If a terminal is either qualifier Default or Model\_name then the terminal is considered a “Pre-Layout” terminal.
* If a “Pre-Layout” terminal is connected to a differential model, then the terminal shall use the following Terminal Locations
	+ - Pin\_A\_signal\_pos
		- Pad\_A\_signal\_pos
		- A\_signal\_pos
		- Pin\_A\_signal\_neg
		- Pad\_A\_signal\_neg
		- Pad\_A\_ neg \_pos
* All terminals that have the same Connection(n) (where n is a positive integer) are electrically connected. A single ended connection will have two terminals with Connection(n). A differential connection will have four terminals with Connection(n).` Connection(n) qualifiers are required if there are two or more Pre-Layout connections. Is a differential one connection or two connections (clarify).
* Special differential rules for Pullup Reference, Power Reference, Power Clamp Reference, Ground Clamp Reference and External Reference.
	+ There can be only one terminal for each Pullup Reference, Power Reference, Power Clamp Reference, Ground Clamp Reference and External Reference on a true differential [External Model]. These can be referenced by either the Non-Inverting or Inverting Pin\_name.
	+ There may be only one terminal for each Pullup Reference, Power Reference, Power Clamp Reference, Ground Clamp Reference and External Reference for each side of a legacy differential model that consists of two independent single ended models. These can be referenced by either the Non-Inverting or Inverting Pin\_name.
	+ There may be two terminals for each Pullup Reference, Power Reference, Power Clamp Reference, Ground Clamp Reference and External Reference for each side of a legacy differential model that consists of two independent single ended models.

Some examples with the new reserved words:

* DQ: (A1) (Post-Layout)
	+ Terminal 1 Pin A1
	+ Terminal 2 A\_signal A1
* DQS: (Post-Layout) There is a [Diff Pin] record “D1 D2 …”
	+ Terminal 1 Pin\_A\_signal D1
	+ Terminal 2 Pin\_A\_signal D2
	+ Terminal 3 A\_signal D1
	+ Terminal 4 A\_signal D2
* DQS: (Pre-Layout)
	+ Terminal 1 Pin\_A\_signal\_pos DQS Model\_name
	+ Terminal 2 Pin\_A\_signal\_neg DQS Model\_name
	+ Terminal 3 A\_signal\_pos DQS Model\_name
	+ Terminal 4 A\_signal\_neg DQS Model\_name
* VDD: Pins connected to board “bed spring” model, all buffer terminals connected to VDD shorted
	+ Terminal 1 Pin\_A\_signal P1
	+ Terminal 2 Pin\_A\_signal P2
	+ Terminal 3 Pin\_A\_signal P3
	+ Terminal 4 Pin\_A\_signal P4
	+ Terminal 5 Pin\_A\_signal P5
	+ Terminal 6 A\_Signal\_name VDD
* VDD: Interconnect between VDD Pins and individual buffer Pullup Reference.
	+ Terminal 1 Pin\_A\_signal P1
	+ Terminal 2 Pin\_A\_signal P2
	+ Terminal 3 Pin\_A\_signal P3
	+ Terminal 4 Pin\_A\_signal P4
	+ Terminal 5 Pin\_A\_signal P5
	+ Terminal 6 A\_puref A1
	+ Terminal 7 A\_puref A2
	+ Terminal 8 A\_puref A3
	+ Terminal 9 A\_puref D1