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BIRD ID#: 118.3  
ISSUE TITLE: Analog Parameter Assignments  
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DATE SUBMITTED: October 5, 2010  
DATE REVISED: November 8, 2010 March 23, 2011, March 27, 2012  
DATE ACCEPTED BY IBIS OPEN FORUM:

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STATEMENT OF THE ISSUE:

The "Parameters" subparameter of the [External Model] and [External Circuit] keywords contains a simple listing of the parameters of [External Model]s and [External Circuit]s without the capabilities of assigning any values to them. The expectation was that the EDA tool would provide a mechanism to the user to make the actual value assignments for these parameters. There are situations, however, when assigning values to these parameters from within the .ibs file would be highly desirable so that the assignments could be defined and/or kept together with the model.

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STATEMENT OF THE RESOLVED SPECIFICATIONS:

This BIRD is designed to be a close relative of BIRD 117. The assignment features described in this BIRD for the parameters listed under the Parameters subparameter are consistent with the assignment features described in BIRD 117 for the Converter\_Parameters, except that assignments for Parameters are optional while the assignments for Converter\_Parameters \*\*\*\* are required, and Converter\_Parameters may be assigned only numeric values.

\*\*\*\* The Parameters of the [External Circuit] and [External Model] keywords \*\*\*\* shall be optionally followed by an equal sign and a constant literal \*\*\*\* value and/or the root name of a parameter tree provided in the \*\*\*\* .ibs file or the root name of a parameter tree provided in a separate \*\*\*\* file, followed by an open and close parentheses enclosing the name of a \*\*\*\* parameter which is declared in that tree. When the constant numeric \*\*\*\* literal and the root name of a parameter tree are both present in such \*\*\*\* an assignment, the constant literal value shall serve as a default \*\*\*\* value for the assignment in case the assignment using the reserved \*\*\*\* word fails.

\*\*\*\* If the "Parameters" subparameter is part of an [External Model] \*\*\*\* keyword, and the corresponding [Model] contains an [Algorithmic Model] \*\*\*\* keyword, the EDA tool will first search for a parameter tree in the .ami file \*\*\*\* that is defined in this [Algorithmic Model] keyword. If the parameter tree is \*\*\*\* not found in that .ami file, or if the [Algorithmic Model] keyword doesn't \*\*\*\* exist in that [Model], or if the "Parameters" subparameter is part \*\*\*\* of an [External Circuit] keyword, the EDA tool will search for a parameter \*\*\*\* tree in the current .ibs file. If a match is not found, the EDA tool will \*\*\*\* next look for a match in an external .par file. If the matching parameter \*\*\*\* tree is located in an external .par file, the .par file must be located in the

\*\*\*\* same directory as the .ibs file. The file names of .par files must follow  
\*\*\*\* the rules for file names given in Section 3, GENERAL SYNTAX RULES AND  
GUIDELINES.

Multiple [External Model] or [External Circuit] Parameters may be listed  
\*\*\*\* on the same line with one assignment, in which case all of the  
parameters on that line will be assigned the same value.

If no assignments are made on the [External Model] or [External Circuit]  
Parameters line, the parameters will take on their default values as  
defined in the external model file referenced by [External Model] or  
[External Circuit] declarations. The EDA tool is expected to provide a  
mechanism for the user to make selections for multi-valued AMI parameters  
through GUI features.

\*\*\*\* To implement this concept, the IBIS specification shall be changed  
\*\*\*\* as outlined below. The page number references are with respect to  
\*\*\*\* the official IBIS v5.0 specification.

On pg. 107 replace the following lines:

```
|           Parameters:
|
|           Lists names of parameters that can be passed into an external
|           model file. Each Parameters assignment must match a name or
|           keyword in the external file or language. The list of
|           Parameters may span several lines by using the word Parameters
|           at the start of each line. The Parameters subparameter is
|           optional, and the external model must operate with default
|           settings without any Parameters assignments.
|
|           Parameter passing is not supported in SPICE. VHDL-AMS and
|           VHDL-A(MS) parameters are supported using "generic" names, and
|           Verilog-AMS and Verilog-A(MS) parameters are supported using
|           "parameter" names.
```

with these lines:

```
|           Parameters:
|
|           Lists names of parameters that can be passed into an external
|*          model file. Each Parameters entry must match a name or
|           keyword in the external file or language. The list of
|           Parameters may span several lines by using the word Parameters
|           at the start of each line. The Parameters subparameter is
|           optional, and the external model must operate with default
|           settings without any Parameters assignments.
|
|           Parameter passing is not supported in SPICE. VHDL-AMS and
|           VHDL-A(MS) parameters are supported using "generic" names, and
|           Verilog-AMS and Verilog-A(MS) parameters are supported using
|*          "parameter" names. ISS parameters are supported for all ISS
|*          parameters which are defined on the subcircuit definition
|*          line.
|**
|*          Parameters are locally scoped under each [External Model]
|*          keyword, i. e. the same parameter under two different
|**         [External Model] will have independent values.
```

```

|*
|* The parameter(s) listed under the Parameters subparameter
|* may optionally be followed by an equal sign and a numeric,
|**** Boolean or string literal and/or the root name of a parameter
|**** tree that is followed by an open and close parentheses
|**** enclosing the name of a parameter in that tree. The parameter
|**** tree may be placed at the end of the .ibs file after the last
|**** [END] keyword, or an external parameter file. If the
|**** Parameters subparameter is part of an [External Model] keyword,
|**** and the corresponding [Model] contains an [Algorithmic Model]
|**** keyword, the EDA tool will first search for a parameter tree
|**** in the .ami file that is defined in this [Algorithmic Model]
|**** keyword. If the parameter tree is not found in that .ami file,
|**** or if the [Algorithmic Model] keyword doesn't exist in that
|**** [Model], or if the Parameters subparameter is part of an
|**** [External Circuit] keyword, the EDA tool will search for a
|**** parameter tree in the current .ibs file. If a match is not
|**** found, the EDA tool will next look for a match in an external
|**** .par file. If the matching parameter tree is located in an
|**** external .par file, the .par file must be located in the same
|**** directory as the .ibs file. The file names of .par files must
|**** follow the rules for file names given in Section 3, GENERAL
|**** SYNTAX RULES AND GUIDELINES.
|****
|**** When TreeRootName(ParameterName) and a constant numeric literal
|**** are both present in an assignment they must be separated by at
|**** least one white space. In this case, the EDA tool should attempt
|**** to make the assignment using TreeRootName(ParameterName) first.
|**** If that fails (for example due to not finding the parameter tree
|**** in any of the files or the or the parameter name in that tree)
|**** the numeric, Boolean or string literal shall be used for the
|**** assignment. When multiple parameters are listed on a single
|**** line with one assignment, all of the parameters on that line
|**** will be assigned the same value. String literals must be
|**** enclosed in double quotes.
|****
|* The EDA tool may provide additional means to the user to
|** assign values to Parameters. This may include the option
|** to override the values provided in the .ibs file, to allow
|** the user to make selections for multi-valued parameters in
|**** the parameter tree, or to provide values for uninitialized
|** Parameters.

```

On pg. 126 replace the following lines:

```

| Parameters:
|
| Lists names of parameters that can be passed into an external
| model file. Each Parameters assignment must match a name or
| keyword in the external file or language. The list of
| Parameters may span several lines by using the word Parameters
| at the start of each line. The Parameters subparameter is
| optional, and the external model must operate with default
| settings without any Parameters assignments.
|
| Parameter passing is not supported in SPICE. VHDL-AMS and
| VHDL-A(MS) parameters are supported using "generic" names, and
| Verilog-AMS and Verilog-A(MS) parameters are supported using

```

| "parameter" names.

with these lines:

```
|
| Parameters:
|
| Lists names of parameters that can be passed into an external
|* model file. Each Parameters entry must match a name or
| keyword in the external file or language. The list of
| Parameters may span several lines by using the word Parameters
| at the start of each line. The Parameters subparameter is
| optional, and the external model must operate with default
| settings without any Parameters assignments.
|
| Parameter passing is not supported in SPICE. VHDL-AMS and
| VHDL-A(MS) parameters are supported using "generic" names, and
| Verilog-AMS and Verilog-A(MS) parameters are supported using
|* "parameter" names. ISS parameters are supported for all ISS
|* parameters which are defined on the subcircuit definition
|* line.
|*
|* Parameters are locally scoped under each [External Circuit]
|* keyword, i. e. the same parameter under two different
|* [External Circuit] will have independent values.
|*
|* The parameter(s) listed under the Parameters subparameter
|**** may optionally be followed by an equal sign and a numeric,
|**** Boolean or string literal and/or the root name of a parameter
|**** tree that is followed by an open and close parentheses
|**** enclosing the name of a parameter in that tree. The parameter
|**** tree may be placed at the end of the .ibs file after the last
|**** [END] keyword, or an external parameter file. If the
|**** Parameters subparameter is part of an [External Model] keyword,
|**** and the corresponding [Model] contains an [Algorithmic Model]
|**** keyword, the EDA tool will first search for a parameter tree
|**** in the .ami file that is defined in this [Algorithmic Model]
|**** keyword. If the parameter tree is not found in that .ami file,
|**** or if the [Algorithmic Model] keyword doesn't exist in that
|**** [Model], or if the Parameters subparameter is part of an
|**** [External Circuit] keyword, the EDA tool will search for a
|**** parameter tree in the current .ibs file. If a match is not
|**** found, the EDA tool will next look for a match in an external
|**** .par file. If the matching parameter tree is located in an
|**** external .par file, the .par file must be located in the same
|**** directory as the .ibs file. The file names of .par files must
|**** follow the rules for file names given in Section 3, GENERAL
|**** SYNTAX RULES AND GUIDELINES.
|****
|**** When TreeRootName(ParameterName) and a constant numeric literal
|**** are both present in an assignment they must be separated by at
|**** least one white space. In this case, the EDA tool should attempt
|**** to make the assignment using TreeRootName(ParameterName) first.
|**** If that fails (for example due to not finding the parameter tree
|**** in any of the files or the or the parameter name in that tree)
|**** the numeric, Boolean or string literal shall be used for the
|**** assignment. When multiple parameters are listed on a single
|**** line with one assignment, all of the parameters on that line
|** will be assigned the same value. String literals must be
|** enclosed in double quotes.
```

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```
**|
**|      The EDA tool may provide additional means to the user to
**|      assign values to Parameters. This may include the option
**|      to override the values provided in the .ibs file, to allow
**|      the user to make selections for multi-valued parameters in
**|      the parameter tree, or to provide values for uninitialized
**|      Parameters.
```

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ANALYSIS PATH/DATA THAT LED TO SPECIFICATION

The following example illustrates the concept. Given that a [Model] in an .ibs file contains an [Algorithmic Model] keyword:

```
[Algorithmic Model]
Executable Windows_VisualStudio_32 GenericTx.dll GenericTx.ami
[End Algorithmic Model]
```

and that the "GenericTx.ami" parameter file contains the following declarations:

```
(Rterm (Usage Info)(Value 50.0)(Type Float)
  (Description "Termination resistance")
)
(Rdiff (Usage Info)(Value 100.0)(Type Float)
  (Description "Differential output resistance")
)
(Cdiff (Usage Info)(Value 1.5e-12)(Type Float)
  (Description "Differential Output Capacitance")
)
```

the Parameters under the [External Model] keyword may be assigned with the values in the GenericTx.ami parameter file the following way:

```
[External Model]
Language IBIS-ISS
|
| Corner corner_name file_name circuit_name (.subckt name)
Corner Typ AMIdriver.cir AMI_drv
|
| List of parameters
Parameters Rt_direct Rt_invert = AMIfile(Rterm)
*** Parameters Rdiff = AMIfile(Rdiff) 101
Parameters Ccomp_diff = AMIfile(Cdiff)
Parameters MyParam1 MyParam2 = 1.234
Parameters MyParam3 MyParam4
```

In this example, Rt\_direct and Rt\_invert are both assigned the value 50, \*\*\* Rdiff is assigned 100 as defined in the .ami parameter file if found, or \*\*\* 101 if not found. Myparam1 and Myparam2 are assigned 1.234, and MyParam3 and MyParam4 are left unassigned which means that they will assume their

default values as defined in the declaration of the [External Model].

If an .ami parameter is defined as a multi-valued parameter (Range, List, etc...) which must be resolved to a single value by a selection, the EDA tool may provide a GUI mechanism to the user to make a selection, or the default value of the .ami parameter shall be used for the simulation. The EDA tool may also provide mechanisms to make assignments to unassigned Parameters, or to override hard-coded assignments, or single valued .ami parameter assignments.

\*\* Please note that the reserved word "AMIfilename()" may only be used in the [External Model]'s Parameters and Converter\_Parameters (see BIRD 117) subparameters to reference .ami file parameters because such .ami file references cannot be resolved from the [External Circuit] keywords. This is because [External Circuit] is on the same scoping level as [Model] and therefore it is not associated with any [Algorithmic Model] keywords which reside under the [Model] keyword. For this reason the "AMIfilename()" syntax has no way to know what file to read when it is located under the [External Circuit] keyword.

\*\*  
\*\*\* BIRD 118 was flawed because it allowed the usage of the "AMIfilename()" syntax under [External Circuit] to reference .ami file parameters. BIRD 118.1 removed the possibility to use the reserved word "AMIfilename()" under [External Circuit] to eliminate that problem.

\*\*\* In BIRD 118.2 a modification was made to the rules of the reserved word AMIfilename(). The modification made provisions for the usage of a default value in case the assignment using the reserved word fails for some reason. These changes are marked by three asterisks at the beginning of each line.

\*\*\*\* In BIRD 118.3 the concept of AMIfilename() was generalized so that instead of referencing an .ami parameter file with the reserved word AMIfilename(), any parameter tree can be referenced by the root name of a parameter tree. The parameter tree may reside in the .ibs file, an .ami file, or a .par file. The search rules are patterned after the search rules defined for the package models in IBIS.

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ANY OTHER BACKGROUND INFORMATION:

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