**BUFFER ISSUE RESOLUTION DOCUMENT (BIRD)**

**BIRD NUMBER:** 183

**ISSUE TITLE:** [Model Data] Matrix Subparameter Terminology Correction

**REQUESTOR:**  Bob Ross, Teraspeed Labs

**DATE SUBMITTED:** August 30, 2016

**DATE REVISED:**

**DATE ACCEPTED:**  October 14, 2016

**DEFINITION OF THE ISSUE:**

Under [Define Package Model] keyword and the [Model Data] keyword selection, the keywords [Resistance Matrix], [Capacitance Matrix] and [Inductance Matrix] have three enumerated "format" arguments: Full\_matrix, Sparse\_matrix, and Banded\_matrix. They are incorrectly described as subparameters. This BIRD makes an editorial correction in terminology.

**SOLUTION REQUIREMENTS:**

The IBIS specification must meet these requirements:

**Table 1: Solution Requirements**

|  |  |
| --- | --- |
| **Requirement** | **Notes** |
| 1. For Full\_matrix, Banded\_matrix, and Sparse\_matrix, change the designation from subparameter to format arguments | These are not subparameters, nor follow subparameter conventions |
| 1. Correct the Keyword Hierarchy in Section 3 | Remove the subparameter entries Full\_matrix, Banded\_matrix, and Sparse\_matrix in two locations |

(Enumerate each requirement in the table above, adding rows as needed.)

**SUMMARY OF PROPOSED CHANGES:**

[Pin] keyword Usage Rules adds some editorial text and also adds a new rule listed below.

**Table 2: IBIS Keywords, Subparameters, AMI Reserved\_Parameters, and AMI functions Affected**

|  |  |  |
| --- | --- | --- |
| **Specification Item** | **New/Modified/Other** | **Notes** |
| [Resistance Matrix], [Capacitance Matrix], and [Inductance Matrix] | Modified | Remove the Sub-Params: line  Change the text where Full\_matrix, Banded\_matrix, or Sparse\_matrix "subparameter" is mentioned to enumerated format arguments  Note, "format" is used in the text for these keywords that are not shown in this BIRD |

**PROPOSED CHANGES:**

Change in the Section 3.1, pages 15 and 16 (two locations):

│ ├── **[Model Data]**

│ │ ├── **[Resistance Matrix]** Banded\_matrix, Sparse\_matrix,

│ │ │ │ Full\_matrix

│ │ │ ├── **[Bandwidth]**

│ │ │ └── **[Row]**

│ │ │

│ │ ├── **[Inductance Matrix]** Banded\_matrix, Sparse\_matrix,

│ │ │ │ Full\_matrix

│ │ │ ├── **[Bandwidth]**

│ │ │ └── **[Row]**

│ │ │

│ │ ├── **[Capacitance Matrix]** Banded\_matrix, Sparse\_matrix,

│ │ │ │ Full\_matrix

to:

│ ├── **[Model Data]**

│ │ ├── **[Resistance Matrix]**

│ │ │ ├── **[Bandwidth]**

│ │ │ └── **[Row]**

│ │ │

│ │ ├── **[Inductance Matrix]**

│ │ │ ├── **[Bandwidth]**

│ │ │ └── **[Row]**

│ │ │

│ │ ├── **[Capacitance Matrix]**

Change on page 46:

*Keywords:* **[Resistance Matrix]**, **[Inductance Matrix]**, **[Capacitance Matrix]**

*Required:* [Resistance Matrix] is optional. If it is not present, its entries are assumed to be zero. [Inductance Matrix] and [Capacitance Matrix] are required.

*Sub-Params:* Banded\_matrix, Sparse\_matrix, or Full\_matrix

*Description:* The subparameters mark the beginning of a matrix, and specify how the matrix data is formatted. See Figure 31.

*Usage Rules:* For each matrix keyword, use only one of the subparameters. After each of these subparameters, insert the matrix data in the appropriate format (these formats are described in detail below).

*Other Notes:* The resistance, inductance, and capacitance matrices are also referred to as “RLC matrices” within this specification.

When measuring the entries of the RLC matrices, either with laboratory equipment or field-solver software, currents are defined as ENTERING the pins of the package from the board (rule #11 in Section 3, “GENERAL SYNTAX RULES AND GUIDELINES”). The corresponding voltage drops are to be measured with the current pointing “in” to the “+” sign and “out” of the “-” sign.



**- Package Matrix Voltage Polarities and Current Directions**

It is important to observe this convention in order to get the correct signs for the mutual inductances and resistances.

*Example:*

[Resistance Matrix] Banded\_matrix

[Inductance Matrix] Sparse\_matrix

[Capacitance Matrix] Full\_matrix

RLC Matrix Notes:

For each [Resistance Matrix], [Inductance Matrix], or [Capacitance Matrix], a different format can be used for the data. The choice of formats is provided to satisfy different simulation accuracy and speed requirements.

to:

*Keywords:* **[Resistance Matrix]**, **[Inductance Matrix]**, **[Capacitance Matrix]**

*Required:* [Resistance Matrix] is optional. If it is not present, its entries are assumed to be zero. [Inductance Matrix] and [Capacitance Matrix] are required.

*Description:* The keywords mark the beginning of a matrix, and one of three format arguments (Full\_matrix, Banded\_matrix, or Sparse\_matrix described below) on the same line and specify how the matrix data is formatted. See Figure 31.

*Usage Rules:* For each matrix keyword, use only one of the enumerated formats. After each of these keywords, insert the matrix data in the appropriate format (these formats are described in detail below).

*Other Notes:* The resistance, inductance, and capacitance matrices are also referred to as “RLC matrices” within this specification.

When measuring the entries of the RLC matrices, either with laboratory equipment or field-solver software, currents are defined as ENTERING the pins of the package from the board (rule #11 in Section 3, “GENERAL SYNTAX RULES AND GUIDELINES”). The corresponding voltage drops are to be measured with the current pointing “in” to the “+” sign and “out” of the “-” sign.



**- Package Matrix Voltage Polarities and Current Directions**

It is important to observe this convention in order to get the correct signs for the mutual inductances and resistances.

*Example:*

[Resistance Matrix] Banded\_matrix

[Inductance Matrix] Sparse\_matrix

[Capacitance Matrix] Full\_matrix

RLC Matrix Notes:

For each [Resistance Matrix], [Inductance Matrix], or [Capacitance Matrix], a different format can be used for the data. The choice of formats is provided to satisfy different simulation accuracy and speed requirements.

**ANALYSIS PATH/DATA THAT LED TO SPECIFICATION:**

Full\_matrix, Banded\_matrix, and Sparse\_matrix are the only allowed enumerated arguments that follow the [\* Matrix] keywords on the same line. These arguments are referred to as "format" in the technical description that follows.

**ANY OTHER BACKGROUND INFORMATION:**

Michael Mirmak noticed this misuse of subparameters, and this BIRD proposes the corrections. There are too many changes and details to capture revisions as know\_issues.txt. Michael Mirmak could be listed as the primary author.