



# IBIS Parser Update

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(presented by Anders Ekholm, Ericsson)

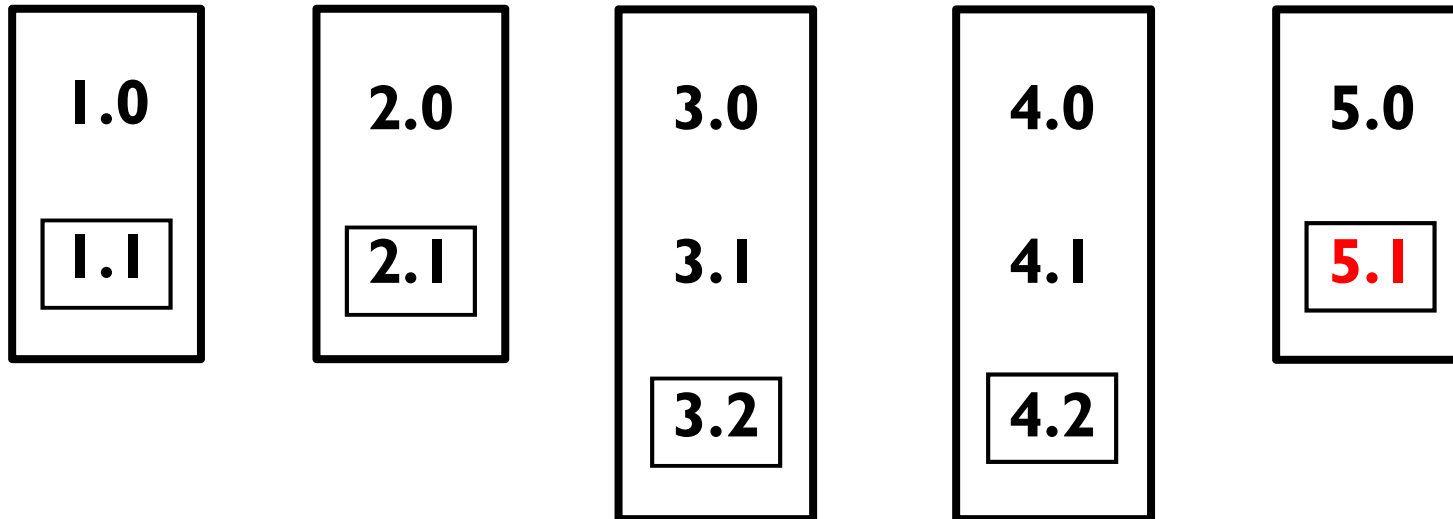


# Outline, Specifications and Parsers

- IBIS through Version 5.1
  - **ibischk5**
- Touchstone Version 2.0
  - **tschk2**
- Conclusions



# Valid IBIS Versions and Latest ibischk Versions



**ibis\_chk**   **ibischk2**   **ibischk3**   **ibischk4**   **ibischk5**

**V1.1a**   **V2.1.17**   **V3.2.9**   **V4.2.2**   **V5.1.2**



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# IBIS Parser Major Version Logic

- Subversions upgraded to **last** major version
  - **V5.1** upgrades V5.0
  - **V4.2** upgraded V4.0 and V4.1
  - **V3.2** upgraded V3.0 and V3.1
  - **V2.1** upgraded V2.0
  - **V1.1** upgraded V1.0
- **V5.1** checks **V1.1**, **V2.1**, **V3.2**, **V4.2**, and **V5.1** levels for features and corrections



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# Downward Compatibility

- Current IBIS **downward compatible** with all earlier features and syntax
  - Prior EDA implementations supported
  - Existing models remain valid
  - Specification includes all features
  - Earlier specification mistakes corrected
- Specification well tested and corrected



# IBIS-AMI Version Exception

- IBIS-AMI subversions supported by the **.ami** format
- **AMI\_Version** required for “5.1” files and **later**
  - First Reserved Parameter
  - Use\_Init\_Output **not legal**
- **Omission of AMI\_Version implies “5.0” level**
  - Use\_Init\_Output **legal**
  - **All other AMI\_Version “5.1” rules apply**
- Later AMI\_Version levels will have more features and possible deprecation at the subversion level
- Later Specification will track all subversion changes



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# “ibischk5” Parser

- Ibischk5, Version 5.1.2
  - Free executables:  
<http://www.eda.org/ibis/ibischk5/>
  - Bug reports:  
<http://www.eda.org/ibis/bugs/ibischk/>
- Checks all [IBIS Ver]s of IBIS files
- Over \$117,000 of contracted work since 1993
- Supports .ibs, .pkg, .ebd, and .ami formats
  - directly or through higher level linkages



# Flags in ibischk5

```
Usage: ibischk5      <IBS filename>
      : ibischk5  -ebd <EBD filename>
      : ibischk5  -pkg <PKG filename>
      : ibischk5  -ami <AMI filename>
Usage: ibischk5  -caution -numbered      <IBS filename>
      : ibischk5  -caution -numbered -ebd <EBD filename>
      : ibischk5  -caution -numbered -pkg <PKG filename>
      : ibischk5  -caution -numbered -ami <AMI filename>
```

The flags prior to the file name can be in any order, and the -caution and/or -numbered flags are optional.

- **-ami** for <file\_name>.ami (algorithmic model interface control file)
- **-numbered** for numbered **E**rror, **W**arning, **N**otes and **C**autions messages



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# ibischk5 {-numbered} -ami file4.ami

```
Checking file4.ami for IBIS 5.0 Compatibility...
```

```
ERROR - Illegal Usage value A specified for Param1  
ERROR - Illegal Type value B specified for Param1  
ERROR - Illegal Format value C specified for Param1  
ERROR - No Reserved_Parameters found
```

```
Errors : 4
```

```
File Failed
```

```
Checking file4.ami for IBIS 5.0 Compatibility...
```

```
E4627 - Illegal Usage value A specified for Param1  
E4627 - Illegal Type value B specified for Param1  
E4627 - Illegal Format value C specified for Param1  
E4622 - No Reserved_Parameters found
```

```
Errors : 4
```

```
File Failed
```



# Message Number File Being Updated (Over 1150 unique message strings)

| 1  | Number | Symbol in Code | Message string  | Parameters                       | Comment   | Category                           | Classification |
|----|--------|----------------|---|----------------------------------|---|------------------------------------|----------------|
| 2  | 100    | MDL_ERR_0      | Unable to Allocate Memory: %s %d  | filename, line number            | The code failed to allocate memory in <filename> at <linenumber>                              | Internal Error                     | E              |
| 3  | 101    | MDL_ERR_1      | Unable to get IBIS structure  |                                  | Program data structures are corrupt   | Internal Error                     | E              |
| 4  | 102    | MDL_ERR_2      | Orphan Model keyword.   |                                  | Model keyword found but not within a Model declaration  | Error with IBIS file Line number   | E              |
| 5  | 103    | MDL_ERR_3      | Illegal Digital Port <%s> (not allowed in SPICE Ports section)  | portname                         | Improper use of Digital port <portname>   | Error with IBIS file Line number   | E              |
| 6  | 104    | MDL_ERR_4      | D_switch not allowed with (D_drive,D_receive,or D_enable) in  |                                  | Improper use of D_switch  | Error with IBIS file Line number   | E              |
| 7  | 105    | MDL_ERR_5      | %s not allowed with D_switch in Ports/A2D/D2A Section   |                                  |   | Error with IBIS file Line number   | E              |
| 8  | 106    | MDL_ERR_6      | Reserved Digital Port <%s> used as  | portname                         | Improper use of Reserved Digital port <portname>  | Error with IBIS file Line number   | E              |
| 9  | 107    | MDL_ERR_7      | Orphan data line keyword.   |                                  | A Model related data line was found where none was expected                                   | Error with IBIS file Line number   | E              |
| 10 | 108    | MDL_ERR_8      | TTgnd Typical value should be > 0   |                                  | Improper TTgnd typical value  | Error with IBIS file Line number   | E              |
| 11 | 109    | MDL_ERR_9      | TTgnd Min value should be > 0   |                                  | Improper TTgnd minimum value  | Error with IBIS file Line number   | E              |
| 12 | 110    | MDL_ERR_10     | TTgnd Max value should be > 0   |                                  | Improper TTgnd maximum value  | Error with IBIS file Line number   | E              |
| 13 | 111    | MDL_ERR_11     | TTgnd typ value is not in between   |                                  | Improper range for TTgnd  | Warning                            | W              |
| 14 | 112    | MDL_ERR_12     | TTpower Typical value should be > 0   |                                  | Improper TTPower typical value  | Error with IBIS file Line number   | E              |
| 15 | 113    | MDL_ERR_13     | TTpower Min value should be > 0   |                                  | Improper TTPower minimum value  | Error with IBIS file Line number   | E              |
| 16 | 114    | MDL_ERR_14     | TTpower Max value should be > 0   |                                  | Improper TTPower maximum value  | Error with IBIS file Line number   | E              |
| 17 | 115    | MDL_ERR_15     | TTpower typ value is not in between   |                                  | Improper range for TTPower  | Warning                            | W              |
| 18 | 116    | MDL_ERR_16     | [Model Spec] should be specified immediately after all the subparameters of a model and   |                                  | Improper positioning of [Model Spec]  | Error with IBIS file Line number   |                |
| 19 | 117    | MDL_ERR_17     | [Receiver Thresholds] should not be specified for model type %s   | modeltype                        | Receiver thresholds are not allowed for a <modeltype> which is not an Input or I/O model type | Warning with IBIS file Line number | W              |
| 20 | 118    | MDL_ERR_18     | [Add Submodel] should be specified before other keywords for a model  |                                  | Improper positioning of [Ad Submodel]   | Error with IBIS file Line number   | E              |
| 21 | 119    | MDL_ERR_19     | %s Already Defined For Model '%s'   | sub parameter/keyword, modelName | A model <sub-parameter or keyword> was already defined for <modelName>                        | Error with IBIS file Line number   | E              |
| 22 | 120    | MDL_ERR_20     | [Receiver Thresholds] should be specified immediately after all the subparameters of a model and before the other keywords of a |                                  | Improper positioning of [Receiver Thresholds] keyword   | Error with IBIS file Line number   | E              |
| 23 | 121    | MDL_ERR_21     | Expecting Keyword. Invalid Line   |                                  | An invalid line was found where a keyword was expected  | Error with IBIS file Line number   | E              |

# Recent ibischk5 Version 5.1.2

- Major IBIS-AMI syntax implementation
  - IBIS Version 5.1 – rules clarified and CHECKED
  - Table-syntax defined and now parsed
  - **Major Errors now detected** (versus not being checked in the older Version 5.0.7)
- 23 BIRDs on IBIS and IBIS-AMI syntax
- 13 BUG reports on file testing for specification compliance closed through BUG138
- Source code checked with 44 new test files since V5.0.7
- Unfortunately, some new BUGs may be discovered with more usage



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# “tschk2” Parser

- Checks Touchstone Version 1.0 (TS1) and Version 2.0 (TS2)
  - Error and Warning numbers
  - Free executables: <http://www.eda.org/ibis/tschk2/>
- Converts TS1 to TS2, TS2 to TS1 where practical with **-canonical\*** flags
- Provides comment headers and real, imaginary format (RI) with **-describe** flag
- Source code package includes 440+ test cases
- C++, well documented
- Only one mixed mode BUG found so far



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# tschk2 {-canonical\*} FILE

- **{-canonical | -canonical-v2}**
  - **TS1, TS2 → TS2**
  - Provides number of ports, frequencies and other information
  - Un-normalizes TS1 Y-, Z-, G- and H-parameters and effective noise resistance
- **{-canonical-v1}**
  - **TS1, TS2 → TS1** where practical
  - Applies column formatting rules and 2-port 2I\_I2 ordering
  - Normalizes TS2 Y-, Z-, G- and H-parameters and effective noise resistance
  - No mixed mode or selectable reference resistance processing



# 7 | tschk2 Messages

Touchstone2: Notes on error and warning messages - Mozilla Firefox

File Edit View History Bookmarks Tools Help

file:///C:/Users/bob/Desktop/asian\_ross\_present/touchstone2-2.0.0/doc/cxx\_classes/messages.html

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Touchstone2: Notes on error and wa...

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## Notes on error and warning messages

### FILE\_ERROR\_CATEGORY (1000)

Errors in opening or reading the Touchstone file.

- FILE\_NOT\_FOUND (1001) - Raised when the file cannot be opened through the path provided. Also raised when the filename is empty.
- UNREADABLE\_FILE (1002) - Raised when the file is found, but cannot be opened for reading.
- EMPTY\_FILE (1003) - Raised when the file is found to be empty.

### FORMAT\_ERROR\_CATEGORY (2000)

Errors in the structure of the Touchstone file format.

- NO\_USEFUL\_CONTENT (2001) - Raised when the file is found to contain only comments and blank lines.
- NOT\_A\_TOUCHSTONE\_FILE (2002) - Raised when the file does not start in either the Touchstone v1 format or the Touchstone v2 format.
- INVALID\_CHARACTER (2003) - Raised when an invalid character is found in the file.
- EXPECTED\_NEWLINE (2004) - Raised when an end-of-line termination is expected.
- EXPECTED\_NEWLINE\_BEFORE\_EOF (2005) - Warning raised when the last line of the file is found to lack an end-of-line termination.
- EXPECTED\_WHITESPACE (2006) - Raised when a space or tab is expected.
- EXPECTED\_NUMERIC\_DATA (2007) - Raised when a real number is expected.
- EXPECTED\_INTEGER (2008) - Raised when an integer is expected.
- KEYWORD\_NOT\_AT\_FIRST\_COLUMN (2009) - Raised when whitespace is found on a line preceding a keyword.
- HASH\_MARK\_NOT\_AT\_FIRST\_COLUMN (2010) - Raised when whitespace is found on a line preceding a # mark.
- FREQUENCY\_NOT\_AT\_FIRST\_COLUMN (2011) - Raised when whitespace is found on a line preceding a frequency value.
- UNTERMINATED\_KEYWORD (2012) - Raised when a keyword is missing the closing bracket.
- UNSUPPORTED\_VERSION (2013) - Raised when an unsupported argument is found for the [Version] keyword.
- UNRECOGNIZED\_KEYWORD (2014) - Raised when an unrecognized keyword is found.
- INVALID\_KEYWORD\_IN\_V1\_FILE (2015) - Raised when a keyword is found in a Touchstone v1 file.
- INVALID\_NUMBER\_OF\_PORTS (2016) - Raised when the [Number of Ports] argument is not a positive integer.
- INVALID\_TWO\_PORT\_DATA\_ORDER\_KEYWORD (2017) - Raised when the [Two-Port Data Order] keyword is given for a file that does not describe 2-port data.
- MISSING\_TWO\_PORT\_DATA\_ORDER\_KEYWORD (2018) - Raised when the [Two-Port Data Order] keyword is not found in a file that describes 2-port data.
- EXPECTED\_TWO\_PORT\_DATA\_ORDER (2019) - Raised when an unrecognized argument is found for the [Two-Port Data Order] keyword.
- INVALID\_NUMBER\_OF\_FREQUENCIES (2020) - Raised when the [Number of Frequencies] argument is not a positive integer.
- INVALID\_NUMBER\_OF\_NOISE\_FREQUENCIES (2021) - Raised when the [Number of Noise Frequencies] argument is not a positive integer.
- WRONG\_NUMBER\_OF\_REFERENCE\_IMPEDANCES (2022) - Raised when the number of reference impedances does not match the number of ports.
- EXPECTED\_MATRIX\_FORMAT (2023) - Raised when an unrecognized argument is found for the [Matrix Format] keyword.
- EXPECTED\_MIXED\_MODE\_DESCRIPTOR (2024) - Raised when an invalid mixed-mode port descriptor is found.
- MIXED\_MODE\_ONLY\_FOR\_SYZ\_PARAMETERS (2025) - Raised when mixed-mode data is given for G- or H-parameter data.
- G\_PARAMETERS\_ONLY\_DEFINED\_FOR\_TWO\_PORTS (2026) - Raised when G-parameters are given for a file that does not describe 2-port data.
- H\_PARAMETERS\_ONLY\_DEFINED\_FOR\_TWO\_PORTS (2027) - Raised when H-parameters are given for a file that does not describe 2-port data.
- NOISE\_DATA\_ADVERTISED (2028) - Raised when [Number of Noise Frequencies] is given but no [Noise Data] is found.
- NOISE\_FREQUENCY\_EXCEEDS\_RANGE (2029) - Raised when the first noise-data frequency is greater than the largest network-data frequency.
- FOUND\_EXTRA\_LINES\_AT\_END (2030) - Raised when extra lines are found at the end of the file.

### OPTIONS\_FORMAT\_ERROR\_CATEGORY (2100)

Errors in Touchstone options line.

# Conclusions

- ibischk5 and tschk2 parsers - **officially** check files for specification compliance
- Parsers helps test specification rules for clarity and accuracy
- BUG process continues to improve the parsers and eliminate mistakes
- **Parsers are critical to IBIS success**





# Useful Links Under IBIS

## Home Page: [www.eda.org/ibis/](http://www.eda.org/ibis/)

[ver5.1/](#)  
[ibischk5/](#)

**IBIS Version 5.1** (August 24, 2012)  
**ibischk5 Version 5.1.2** (October 2012)

[touchstone\\_ver2.0/](#)  
[tschk2/](#)

**Touchstone Version 2.0** (April 24, 2009)  
**tschk2 Version 2.0.0** (December 2009)

[quality\\_ver2.0/](#)  
[ibis-iss\\_ver1.0/](#)

**IBIS Quality Specification** (Oct. 30, 2009)  
**Interconnect SPICE Subcircuit Specification**  
**Version 1.0** (October 7, 2011)

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[interconnect\\_wip/](#)  
[macromodel\\_wip/](#)  
[quality\\_wip/](#)

**Editorial Task Group** (wip)  
**Interconnect Task Group** (wip)  
**Advanced Technology Task Group** (wip)  
**Quality Task Group** (wip)

(wip: work in progress)

