



A Tale of Two Parsers

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Presentation Topics

- ibischk5
 - Operation
 - Spread sheet for messages
 - Some new checks
 - Future
- tschk2
 - Operation
 - Messages
- Lessons and Conclusions



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“ibischk5” Parser

- Ibischk5, Version 5.0.7
 - Free executables: <http://www.eda.org/ibis/ibischk5/>
 - Supports IBIS Version 5.0 (ratified 2008)
 - Algorithmic model interface for Serdes analysis
 - Power delivery system SSO and gate modulation
 - EMI parameters
 - Other – (area based thresholds)
- Checks all [IBIS Ver]s of IBIS files
 - (1.1, 2.1, 3.2, 4.2, 5.0)
- Over \$117,000 of contracted work since 1993
- Supports .ibs, .pkg, .ebd, and .ami formats
 - directly or through linkages from top level file



New 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



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1155 Unique Message Strings

http://www.eda.org/ibis/ibischk5/ibischk5_messages_draft1.xlsx

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 [Add 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



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Message Columns

(for documentation and sorting)

- **Number** (printed message number)
- **Symbol in Code** (by module grouping)
 - Example: **ALGMODERR_25** (message 25 of 36 AMI module messages)
- **Message String** (all unique message strings)
- **Parameters** (if applicable for printed % arguments)
 - For line numbers, keywords, subparameters, etc.
- **Comment** (brief description, 732/1155 filled in to date)
- **Category** (Error, Warning Notes, Caution, Unused, etc.)
- **Classification** (E, W, N, C added for easier sorting)



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Recent ibischk5 Fixes

- dV of [Ramp] dV/dt_r, dV/dt_f Caution checks
 - BUG104, BUG123, BUG130 (case-sensitivity crash)
 - Can be used to find the exact dV values based on I-V tables and specified ramp load conditions
 - Calculated value reported if wrong value entered
- [Model Spec] timing test load entries
 - BUG122 for waveform crossing Vmeas test
- [ISSO PU] and [ISSO PD] table entry mismatches
 - BUG115, BUG116
- [Composite Current] alignment test
 - BUG129 time alignment test (Error to Caution)



Bug List for Filed BUG Reports

<http://www.eda.org/ibis/bugs/ibischk/>

IBIS: IBISCHK Parser Issue Reports (BUGs) - Mozilla Firefox

File Edit View History Bookmarks Tools Help

http://eda.org/ibis/bugs/ibischk/index.html

Most Visited Getting Started Latest Headlines

IBIS: IBISCHK Parser Issue Reports (...)

IBISCHK Parser Issue Reports (BUGs)

ID#	Title	Requester	Date Submitted	Severity	Priority	Status	Date Closed
130	Program Closure with Case Sensitive Errors in Ramp Subparameters	Lance Wang, IO Methodology, Randy Wolff, Micron Technology, Bob Ross, Teraspeed Consulting Group	October 14, 2011	(SEVERE)	(HIGH)	(CLOSED)	(October 28, 2011)
129	Identical [Composite Current] points erroneously required	Lance Wang	7/21/2011	MODERATE	MEDIUM	CLOSED	October 7, 2011
128	Repetition of Reserved Parameters and Model Specific Sections Not Checked	Bob Ross, Teraspeed Consulting Group	March 29, 2011	ANNOYING	MEDIUM	OPEN	
127	IBIS-AMI Fatal Error with Root Parameter Spurious Text	Bob Ross, Teraspeed Consulting Group	March 13, 2011	SEVERE	HIGH)	OPEN	
126	Illegal Text After IBIS-AMI Parameters Not Reported	Walter Katz, SiSoft and Bob Ross, Teraspeed Consulting Group	March 9, 2011	MODERATE	HIGH	OPEN	
125	Missing Basic Checks on .ami Files	Walter Katz, SiSoft and Bob Ross, Teraspeed Consulting Group	January 6, 2011	MODERATE	HIGH	OPEN	
124	Erroneous Whitespace Requirement in .ami Files	Curtis Clark, Ansys, Inc.	January 4, 2011	MODERATE	MEDIUM	OPEN	
123	Wrong Cautions for [Ramp] dV	PRABHAT RANJAN, STMicroelectronics Pvt Ltd	December 14, 2010	MODERATE	MEDIUM	CLOSED	March 17, 2011
122	[Model Spec] Vref and Rref Values Ignored in Timing Load Check	Sergey Nikonchuk, Andrey Babintsev - Freescale Semiconductor Inc.	October 9, 2010	MODERATE	MEDIUM	CLOSED	October 7, 2011
121	Broken Missing [Component] Test	Atul Agarwal, Adept Software Avenues	September 1, 2010	SEVERE	MEDIUM	CLOSED	November 5, 2010
120	Unusual [Model Selector] Caution	Bob Ross, Teraspeed Consulting Group	July 27, 2010	ENHANCEMENT	LOW	NOT A BUG	
119	Waveform Test Missing Results with Version 4.2.1 and Beyond	Bob Ross, Teraspeed Consulting Group	July 5, 2010	SEVERE	MEDIUM	CLOSED	November 5, 2010
118	Vmeas Check with Version 4.2.1 and Beyond Failure	Bob Ross, Teraspeed Consulting Group	July 5, 2010	SEVERE	MEDIUM	CLOSED	November 5, 2010
117	Debug Error with Missing Pin Numbers and Other Conditions	Bob Ross, Teraspeed Consulting Group and Arpad Muranyi, Mentor Graphics	June 3, 2010	SEVERE	MEDIUM	CLOSED	February 13, 2011
116	[ISSO_PU] and [ISSO_PD] Mismatch Checks Insufficient Resolution	Sergey Nikonchuk, Andrey Babintsev - Freescale Semiconductor Inc.	April 22, 2010	SEVERE	MEDIUM	CLOSED	March 17, 2011
115	[ISSO_PU] and [ISSO_PD] Mismatch Checks Insufficient Resolution	Sergey Nikonchuk, Andrey Babintsev - Freescale Semiconductor Inc.	April 22, 2010	SEVERE	HIGH	CLOSED	March 17, 2011

Done

Start

6:43 PM

ibischk History

- Licenses since 1993
 - ibis_chk Version 1.1 20
 - ibischk2 Version 2.1 26
 - ibischk3 Version 3.2 18
 - ibischk4 Version 4.2 17
 - ibischk5 Version 5.0 15 (to date)
- Currently \$2,500 for company license
- Pays for parser fixes and contracted development
- Broken tests fixed quickly
 - Eight ibischk5 releases (5.0.0 through 5.0.7)
 - Fragile areas and complex interactions



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ibischk5 Version 5.1.0 Plan

(BIRDS impacting parser)

- 4 BIRDS for standard IBIS improvements
 - BIRD113.3 - [Model Spec] Weak_R, Weak_I, Weak_V
 - BIRD133.1 - [C Comp Corner], C_comp* under [Model]
 - BIRD141 - Remove [Composite Current] time alignment rule and BUG129 Caution message
 - BIRD148 - Add Error for [Algorithmic Model] for Terminators, Series, and Series_switch models
- 11 BIRDS for IBIS-AMI *.ami file improvements
 - BIRD126 - Add AMI_Version parameter for “5.1”
 - BIRD 120.1 - Remove Use_Init_Output parameter for “5.1”
 - Many rule relaxations, new restrictions, clarifications
 - Description optional, remove 120 character limit
 - Default rules, parameter_name rules
 - **Otherwise, AMI_Version “5.0” follows “5.1” rules**



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IBIS Version Policy

- IBIS sub-versions for development and refinement
 - Final major sub-version used for all other sub-versions
 - E.g., [IBIS Ver] 4.0, 4.1 follow the 4.2 rules for parser
- Major version difference (to be updated):
<http://www.eda.org/ibis/summits/sep07b/>
 - [ross_4_2_evol.pdf](#)
 - [ross_4_2_tree.txt](#)
 - IBIS upward compatible with version number increases
 - E.g., 3.2 to 4.2 legal and may result in more complete check
 - Broken checks can be detected and fixed
- Simplifies parser advances, costs, maintenance and model usability for tools



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IBIS-AMI Sub-Version Plan

- Sub-version changes maintained and **cumulatively** documented (with “5.1” and above)
 - Identifies specification changes
 - Identifies tool support changes
- **One** reference document - Latest Specification
- **One** parser - Latest parser captures **all** sub-version details
- Carefully review all sub-version releases – mistakes costly
- Upgrading *.ami file to higher version number may not always work without updates



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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, Doxygen based.
- Thanks to contractor Agilent Technologies



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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



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tschk2 {-describe} FILE (header comments, RI format)

[Network Data]

! freq	S11re	S11im	S12re	S12im	S13re	S13im	S14re	S14im
	S15re	S15im	S16re	S16im				
!	S21re	S21im	S22re	S22im	S23re	S23im	S24re	S24im
	S25re	S25im	S26re	S26im				
!	S31re	S31im	S32re	S32im	S33re	S33im	S34re	S34im
	S35re	S35im	S36re	S36im				
!	S41re	S41im	S42re	S42im	S43re	S43im	S44re	S44im
	S45re	S45im	S46re	S46im				
!	S51re	S51im	S52re	S52im	S53re	S53im	S54re	S54im
	S55re	S55im	S56re	S56im				
!	S61re	S61im	S62re	S62im	S63re	S63im	S64re	S64im
	S65re	S65im	S66re	S66im				

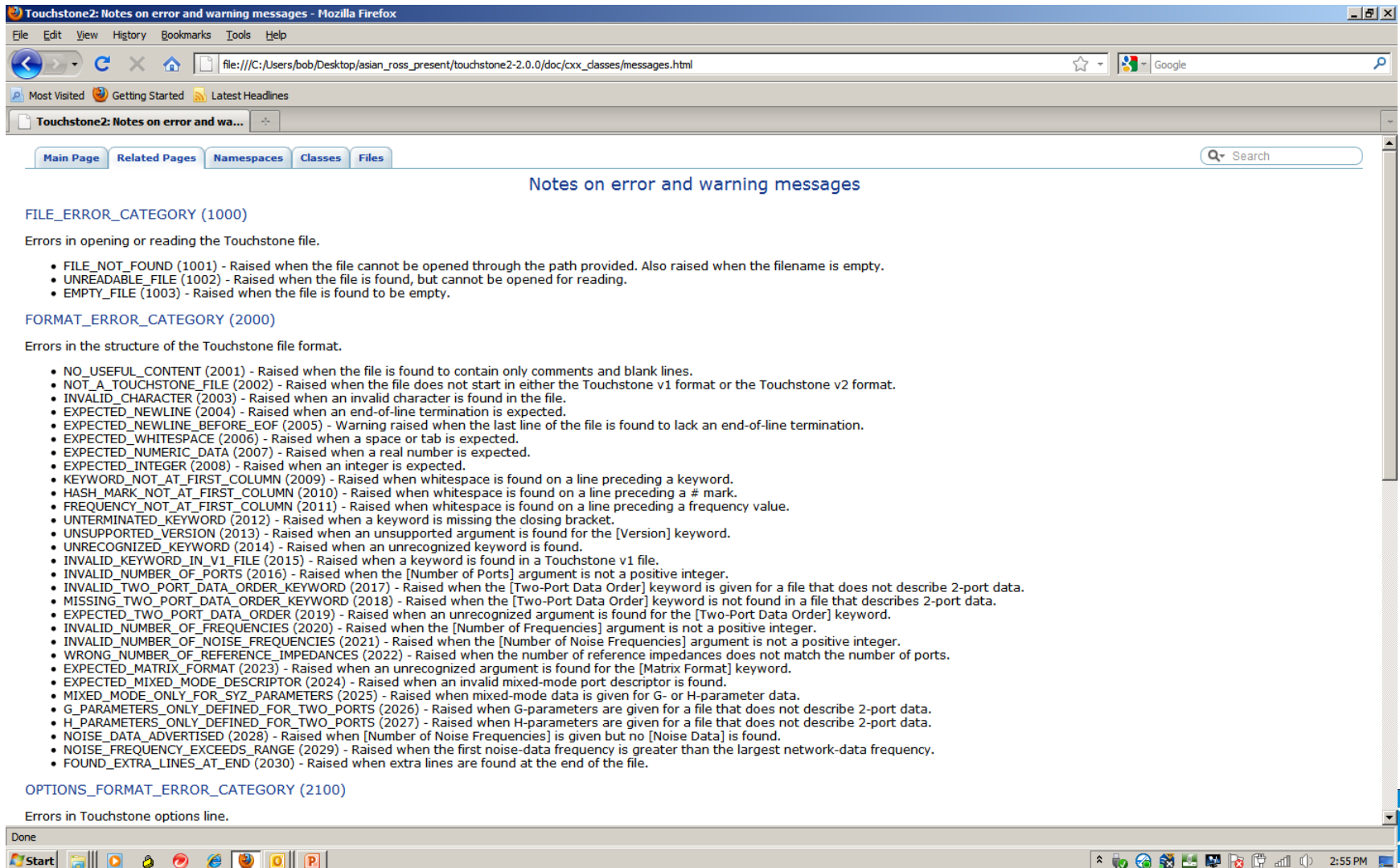
10000 -0.665574600466 -0.0006609751214130001 0.333068101839
0.000663504688568 0.333100908672 -0.0006633295929

Etc.



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7 | tschk2 Messages



Touchstone2: Notes on error and warning messages - Mozilla Firefox

file:///C:/Users/bob/Desktop/asian_ross_present/touchstone2-2.0.0/doc/cxx_classes/messages.html

Touchstone2: Notes on error and wa...

Main Page Related Pages Namespaces Classes Files

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.

Message Groupings

- Message chart in source code package
- Message categories (starting number)
 - **Full Error (1000)**
 - **Format Error (2000)**
 - **Options Error (2100)**
 - **Keyword Order (2200)**
 - **Data Format (2300)**



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Lessons

- Parsing rules based on specification
 - Complete rule descriptions
 - Simplicity
 - New features rather than overloading existing features
 - Consistent rules
 - Presentation: tables, format clarity, consistent terminology
- Both parsers excellent though detailed attention
 - ibischk5 evolved over 21+ years, but fragile
 - tschk2 based on good software engineering – with code, documentation, tests referencing a complete specification



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Conclusions

- ibischk5 and tschk2 parsers - free to **officially** check files for specification compliance
- Parser development also checks specification for accuracy and clarity
- BUG process helps maintain integrity of parsers with latest fixes
- **Parsers are critical to IBIS success**



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