Deleted: 0

Formatted: Heading 1

BINARY FORMAT DESCRIPTION

Formatted: Font: Calibri, 13 pt, Font color: Auto

Formatted: Heading 5

Introduction

This section describes an optional binary format for the numerical portion under [Network Data]. A binary format is useful for large files since it can reduce memory storage requirements to about 20 to 33 percent of the original ASCII data file.

The binary format is designated by the [Binary] keyword and is supported in [Version] 2.1 and above Touchstone files. The rules and limitations are discussed under the keyword description.

Conversions to and from the binary format are expected to be supported by a a utility that preserves the ASCII portion of the file above the [Network Data] keyword. The conversion utility would not process comment characters and text to the end of the line and ignore blank lines. Such content would not be restored if converted back to ASCII format.

The conversion utility to a binary format is expected to use the same arguments (designated as T1, T2, and T3) associated with the [Binary] keyword to direct the conversion.

[Binary]

Rules for Version 1.0 Files:
The [Binary] keyword is not permitted in Version 1.0 files.

Rules for Version 2.0 and Greater Files:
The [Binary] keyword is not permitted in Version 2.0 files. The [Binary] keyword is optional for Version 2.1 and greater files. However, the [Noise Data] keyword and the [Binary] keyword shall not be used in the same file.

Each Touchstone Version 2.1 file may contain one and only one [Binary] keyword.

The [Binary] keyword indicates that network data is presented in binary format, for purposes of file size compression and faster file parsing.

The [Binary] keyword shall be the first keyword after the [Network Data] keyword and before any data (i.e., between the [Network Data] keyword and the network data itself, to inform parsers that the network data is in binary format).

[Binary] shall be followed by a single three-character argument. For explanatory purposes in this document only, the characters of the argument are designated T1, T2 and T3 below. The three

characters comprising the argument shall not be separated by whitespace or line-termination sequences.

The first character, T1, indicates the numerical precision of the frequency information.

The second character, T2, indicates numerical precision of the data.

Both T1 and T2 tokens shall use the same upper-case characters to designate precision:
F: single precision (floating point)
D: double precision

The third token, T3, indicates byte order using the following upper-case characters:
B: big-endian (most significant byte first)
L: little-endian (least significant byte first)

Example #:

```
[Binary] DFB
```

The example above indicates double-precision frequency and float data in big-endian order. The [Binary] keyword arguments shall be followed by a line-termination sequence. Immediately following the line-termination sequence shall be a single byte with value 0 (e.g., binary 00000000) to indicate that the information that follows will be in binary format.

No other keywords or comments are permitted after line-termination sequence following the [Binary] keyword's arguments.

The [Noise Data] keyword shall be prohibited in any file containing the [Binary] keyword.

The [End] keyword shall be prohibited in any file containing the [Binary] keyword. The use of [Binary] with network data implies that only binary data, and not ASCII information, shall be present between the line-termination sequence after the [Binary] arguments and the end of the file.

Example #:

```
[Version] 2.1
# MHZ S RI R 50
[Number of Ports] 4
[Number of Frequencies] 1
! FREQ S11 S12 S13 S14
! S21 S22 S23 S24
! S31 S32 S33 S34
! S41 S42 S43 S44
!
[Network Data]
[Binary] DFB
___HBž_Ð¼ÚŒ,½²÷_?_ƒO¿¢Õ·<
à <_rN¼ƒYŒ»¾÷_?_ƒO¿6öÏ¼FŠ,½KrN¼ž^Œ»x‰·<_Ç <²Õ·<ûß <öqN¼¿ZŒ»ý_Ð¼_ ,½Í÷_?î,O¿wr
N¼;[Œ»ƒ‰·<EÇ <Ò÷_?"ƒO¿PöÏ¼P‹,½À_‹B_'!½MíÈ¼;×/›š^¿×Ôç<%ˆ     <kÎ—
¼Êù§:M×/>°š^¿Ãv!½`ÖÈ¼_Ï—¼ôí§:NŠç<–  <âÔç<Ü‡      <…Î—¼Wö§:Ú !½ÇíÈ¼¾×/>¤š^¿ÏÎ—
```

Deleted: .00e+001

Deleted: ¶

Deleted: ! Binary Encoded data

```
¼å÷§:WŠç<Ë  <š×/>Âš^¿_w!½ ×È¼€_²B{üZ½™áß»Ï§<¾_ m¿æÕ
=<_&»;tÈ¼_
```

{insert binary frequency and data in hex format here, for example}

The hex data shown in the example above corresponds to the following ASCII network information:

```
[Version] 2.1
# MHZ S RI R 50
[Number of Ports] 4
[Number of Frequencies] 1
! FREQ S11 S12 S13 S14
! S21 S22 S23 S24
! S31 S32 S33 S34
! S41 S42 S43 S44
!
[Network Data]
1.000000e+001
2.063717e-002 -1.480975e-002 9.540607e-001 -1.925392e-001
-2.306818e-003 7.529011e-003 -5.623072e-003 -1.259668e-003
9.540620e-001 -1.925394e-001 2.063725e-002 -1.480983e-002
-5.622481e-003 -1.259875e-003 -2.307512e-003 7.529252e-003
-2.306700e-003 7.528990e-003 -5.622914e-003 -1.259719e-003
2.063738e-002 -1.480973e-002 9.540608e-001 -1.925388e-001
-5.622897e-003 -1.259744e-003 -2.307649e-003 7.529295e-003
9.540621e-001 -1.925393e-001 2.063837e-002 -1.481020e-002
[End]
```