

## **[Interconnect Port Groups]**

Rules for Version 1.0 Files:

The [Interconnect Port Groups] keyword is not permitted in Version 1.0 files.

Rules for Version 2.0 Files:

Each Touchstone® Version 2.0 file may contain one and only one [Interconnect Port Groups] keyword.

The [Interconnect Port Groups] keyword and associated data define how passive interconnect ports are arranged.

The [Interconnect Port Groups] keyword is followed by a list of port groups, corresponding to the ports associated with passive interconnects represented by network data later in the file.

The groups are represented as integers, separated by the colon character `:`. The groups must be separated by the left and right parenthesis characters `(` and `)`. Whitespace is permitted between the parentheses separating the groups and, the integers within each group and the colon character. For example, a transmission line which connects ports 1 and 2, described by corresponding network data later in the file, would be represented using this keyword as

```
[Interconnect Port Groups] (1:2)
```

The list of groups may span multiple lines, but must terminate in a newline character. Any given group may only appear once under [Interconnect Port Groups]. Any given port number (integer) may only appear once within a listed group.

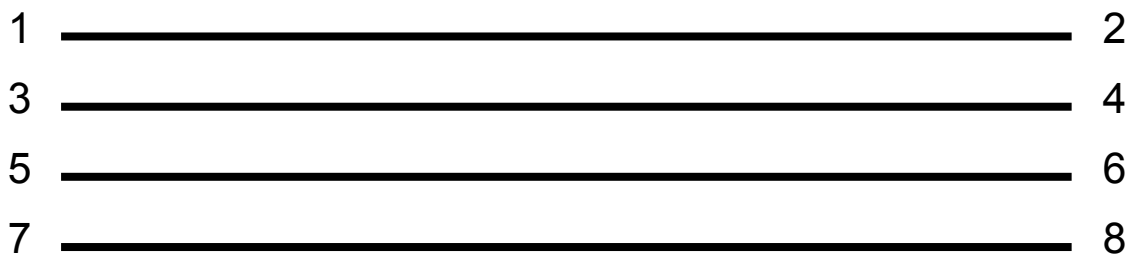
The groups are not required to be presented in numerically-ascending order, as the port assignment used for data collection may not have been so ordered. Model makers are strongly advised to list ports under this keyword consistent with the near-end and far-end arrangement, if any, used to collect or generate the data. For example, a two-line system where ports 1 and 3 are defined as the near-end ports and ports 2 and 4 are defined as the far-end ports would be consistently represented with port 1 and port 3 listed first in each group as shown below:

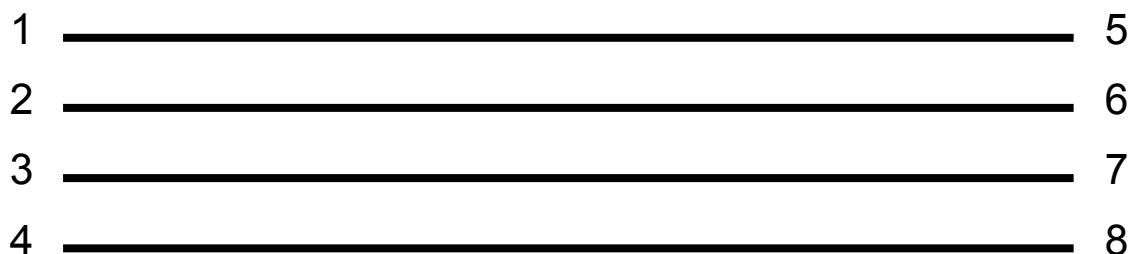
```
[Interconnect Port Groups] (1:2) (3:4)
```

The highest integer present in the group list must be less than or equal to the [Number of Ports] entry.

The [Interconnect Port Groups] keyword and subparameters are optional for Version 2.0 files. If used, these must only appear after the [Version] keyword and before any network data.

The [Interconnect Port Groups] keyword shows the relationship of a passive interconnect system to the port ordering (and therefore row and column ordering) of the network data later in the file. This permits unambiguous interpretation of the network data's transmission, reflection and coupling components. The figures below illustrate two possible port ordering schemes for simple interconnects where ambiguity could cause network data to be misinterpreted.





Note that [Interconnect Port Groups] does not define or imply any information about coupling within the network described by the file.

**Example xx (Version 2.0):**

```
! 4-port S-parameter data
! The data was taken from two coupled PCB traces
! Line 1 is defined by ports 1 and 2, with port 1 at the near end
! Line 2 is defined by ports 3 and 4, with port 3 at the near end
[Version] 2.0
# GHz S MA R 50
[Number of Ports] 4
[Interconnect Port Groups] (1:2) (3:4)
[Number of Frequencies] 1
5.00000 0.60 161.24 0.40 -42.20 0.42 -66.58 0.53 -79.34 !row 1
          0.40 -42.20 0.60 161.20 0.53 -79.34 0.42 -66.58 !row 2
          0.42 -66.58 0.53 -79.34 0.60 161.24 0.40 -42.20 !row 3
          0.53 -79.34 0.42 -66.58 0.40 -42.20 0.60 161.24 !row 4
```

**Comments – Not to be included in specification**

- We do not require that this keyword \*exhaustively\* list all the available ports, in case we have a system that doesn't conveniently split into near and far, e.g. a y-splitter network. Therefore, there is no enforcement that the [Number of Ports] entry and the highest listed integer are equal.
- The association of ports with lines of interconnect is direct; in other words, the syntax actually groups the ports into a conceptual structure. This may cause difficulty in supporting mixed-mode structures later. However, it does permit more exotic structures to be defined (e.g., (1:2:3))
- Thanks to Walter Katz of SiSoft for suggesting the original concept on which this was based.