NAME

circuit ... admittance - determine the 2-port admittance matrix for 2 nodes of a circuit

SYNOPSIS

circuit *cell* **admittance** [options] [--] *script*

OPTIONS

-h, --help

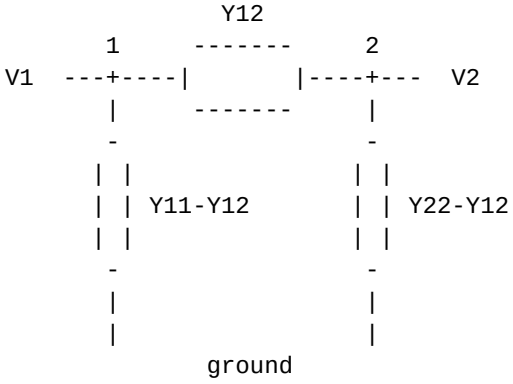
Display a help message.

DESCRIPTION

The *admittance* sub-command of the *circuit* tool allows the user to determine the two-port admittance matrix for two given nodes of a network. This matrix, traditionally called Y, gives the currents into each node, given the voltages at each node:

$$I = Y * V$$

The matrix elements of Y correspond to admittances in an equivalent pi-network, as shown below:



Note that the matrix element Y12 equals the element Y21, i.e., the matrix Y is symmetrical.

STEP 1

Before invoking the tool, a script file needs to be prepared with the following format:

grounded: *node1 ... nodeN*
grounded: *node1 ... nodeN*
...
twoport: *node1 node2*
twoport: *node1 node2*
...

Each line starts with a keyword, followed by a colon, followed by one or more parameters. A comment line should start with a hash mark (#). We will now describe the keywords; an example script is given at the end of this manual page.

grounded: *node1 ... nodeN*

This line is used to specify which nodes should be regarded as "ground" during the measurement of the admittances. In any case, nodes named **0**, **GND**, or **gnd** are taken to be grounded, and therefore it might not be necessary to specify this parameter. Multiple lines starting with **grounded** may be specified.

twoport: *node1 node2*
This line is used to indicate that the measurement should be conducted between nodes *node1* and *node2*. Multiple lines starting with **twoport** may be specified to perform multiple measurements.

frequencies: *freq1 ... freqN*
f: *freq1 ... freqN*
In case there are capacitive (or inductive) elements present in the network, the admittances become frequency-dependent. This line allows you to specify the frequencies at which measurement takes place. By default, measurement is done at zero frequency, meaning that capacitors are ignored, and inductors are short-circuited.

sweep: *begin-freq end-freq num-steps*
This line allows you to specify frequencies in an alternative manner. The parameter *begin-freq* specifies the begin frequency, *end-freq* specifies the end frequency, and *num-steps* specifies the number of steps. The steps are performed exponentially, which implies that both given frequencies should not be zero.

show: *directive1 ... directiveN*
This line specifies what output is to be generated. Possible directives are: **y11**, **y12**, **y21**, **y22** (to show the corresponding Y matrix elements); **r11**, **r12**, **r21**, **r22** (to show resistances instead of admittances). Furthermore, the directive **spice** can be used to also generate a SPICE network suitable for simulation. The directive **y10** may be used as a shortcut for the value of Y11-Y12 (the admittance to ground from *node1*). Similarly, **r10** may be used to generate the corresponding resistance. Also, **y20** and **r20** may be specified for the admittance and resistance to ground at *node2*.

STEP 2
Before running the script, make sure that the current directory is a project directory. Also make sure that the nodes mentioned in the script are present in the circuit. This can be checked by typing **xsls** *cell*.

The script can be run by typing the following command at the Unix prompt:

% circuit *cell* admittance *script*

CAVEATS

The tool can be used for small circuits only. If you need to determine the admittances of larger networks, you may want to use the **spice** parameter to the **show** command (as explained above) to generate SPICE input files. The input and output currents **i(vin)** and **i(vout)** mentioned in the SPICE files are numerically equivalent to the matrix elements Y11 and Y12, respectively.

Note that non-linear elements such as transistors are implicitly removed from the circuit before determining the admittances.

EXAMPLE SCRIPT

```
grounded: vss 0
twoport: 5 6
twoport: 1 5
sweep: 1 1e10 10
show: r12 spice
```

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SEE ALSO

circuit(1ICD).