Complex parallel branches or terminations

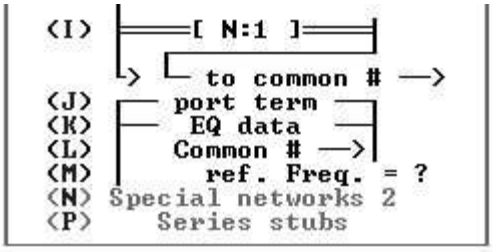
Networks are often terminated by loads having complex impedances that vary with frequency. Two methods are provided for this purpose or for insertion at any point within a network. One method features reading complex R +-jX data directly from a disk file. The other uses separate polynomial curve fit coefficients from the file to calculate R and +-jX impedance. These files need to be generated manually.

R +-jX data files:

Each file consists of frequency, R data and +-jX data separated by camas. There can be up to 900 frequency points. The example below is data taken from the impedance plot of a Dayton DC300-8 loudspeaker woofer driver. The frequency range is 100 to 5000 Hz. The frequency points must be given in the notation set by the main menu "Notation" option. In this case the frequency data is Hz. Data for frequencies between those provided in the file are calculated by linear interpolation. The R and +-jX data is in Ohms. There can be up to 10 different complex branch files in a network. The file name must have the extension ".frx" such as "DAYTONDC300.frx"

```
100, 7.8, -1.4
200, 7.5, 2.4
300, 8.7, 2.18
400, 8.1, 5.9
500, 8.8, 8.2
700, 9.5, 10.2
1000, 11.2, 13.4
2000, 16.2, 22.2
5000, 26.7, 41.1
```

The circuit editor is used to insert the data branches into the network. The same internal network connection code is used as for the transmission line reference frequency (code 22, see page 5-2). You will use the editor option MIS1: Insert, "> Par stubs and special <", option **"(M) | Ref. Freq. = ?**".



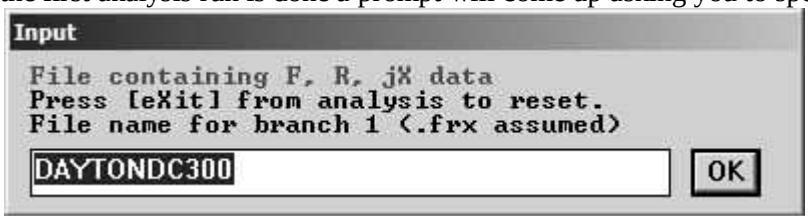
When selected, these options will appear:

Choose option [D] and exit from the insert menu.

When the new branch is first inserted it will appear on the schematic with the default file name found in the parameters file at position 15 from the top. In this case "K33".

```
0 ,- Termination -,          2000 Ohms
1 |-- R+jX data --|           (K33)
2 |------ C ------|            39 uFd
3 |------ C ------|            39 uFd
  |               |
4 |               L           3.3 mHy
  |               |
```

Note that the filter termination at branch 0 is 2000 Ohms. This impedance is many times higher than the impedance data in the file (about 8 Ohm). This allows the "K33" to be the filter termination. When the first analysis run is done a prompt will come up asking you to specify the actual file that is to be used:

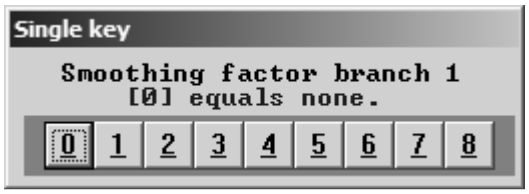


Simply key in the correct file name and press the [OK] button or the <Enter> key. The schematic will now show the correct file name:

```
0 ,- Termination -,          2000 Ohms
1 |-- R+jX data --|           (DAYTONDC300)
2 |------ C ------|            39 uFd
3 |------ C ------|            39 uFd
  |               |
4 |               L           3.3 mHy
  |               |
```

To reset the analysis so that all the file names may be specified again simply press the [eXit] button on the analysis dialog box. The next time you run analysis you will be asked the file name for each data branch again. Key in a new name or just press [OK] to keep the current name.

Smoothing



Data smoothing is offered for any data file having 30 or more frequency points. The DAYTONDC300 file used in the earlier example had only 9 points so the smoothing option dialog box did not appear. The smoothing factor can be selected from 0 to 8. This is simply an averaging scheme controlled by the number you select. Smoothing factor is the number of frequency points on either side of each point to include in the average. For example, a factor of 3 means 3 points on either side of each point is included in the average for an average of 2 X 3 + 1 or 7 points. These 3 points are also removed from the extreme ends of the data. Assuming 100 total points, 6 points are lost at the ends leaving 94 points. This is why 30 or more points are required. A smoothing factor of 8would waste 16 points! A smoothing factor of 0 is no smoothing at all.

Impedance fit data files:

This method works just like the direct data file method expect there can be only a single file in the network. It may be used in several places however. The file names use the extension ".fit", such as the sample file below. The file name is stored in the 15th position from the top in the ".spk" file.

```
7.45748936896E+0, 9.65745119608E-1
2.17187825429E-3, 4.74191622825E-3
-7.62569803330E-8, -2.54394620056E-7
1.57298481322E-12, 6.69236720593E-12
```

This represents the coefficients for two 4th order polynomials. Those for the R component of the complex impedance are in the left column and those for the +-jX component are in the right column. Comas are used to separate the R and jX columns. Up to 9th order polynomial coefficients may be used.

Use the circuit editor "Insert" option to insert a fit data branch in the same way as the Data branch.

Choose option [F] and exit from the insert menu.