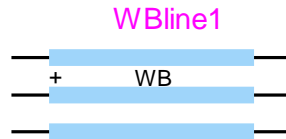


# Wideband line/cable



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## 1 Introduction

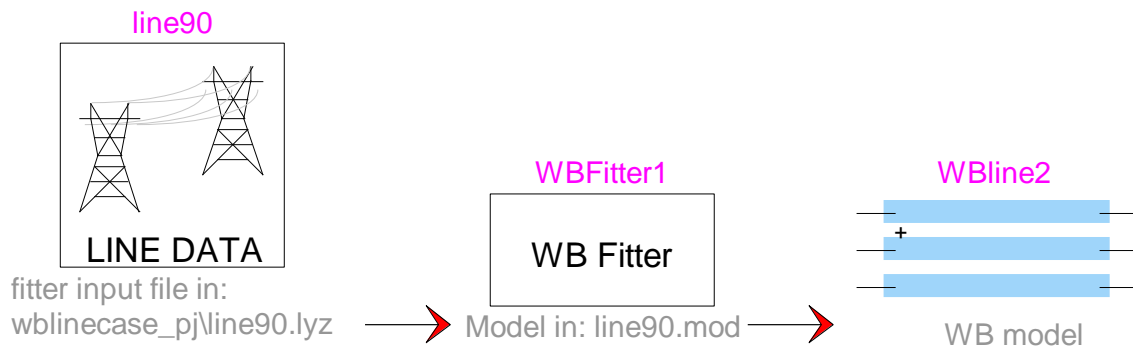
This device is used for modeling transmission lines or cables. It is the most sophisticated line and cable modeling technique available in this version of EMTP. It represents the complete frequency dependence of parameters and constitutes a wideband model. More theoretical details and qualifications can be found in [1]-[6].

## 2 Available versions

There is only a multiphase version of this device. The Drawing tab allows using 3-phase pins when the device has 3 phases.

## 3 Parameters

The user must select the model data file. The model data file is obtained from the “WB fitter” device. The steps are shown in the following figure. The first step is for generating the fitter input file. It is done using the Line Data or Cable Data devices (see Lines library). In this case the generated file “line90.lyz” is used by the fitter device “Wideband line/cable fitter” (WB Fitter) to generate the model file “line90.mod”. The user can then select the “line90.mod” model file for the “Wideband line/cable” model.



**Figure 1 Steps for generating model data for wideband line/cable model**

### 3.1 Generic rules

The model data file format must be the one given in the “WB fitter” device. There is no extra testing for wrong data.

It is not allowed to delete any pins or change pin attributes. The drawing of this device is continuously updated according to the selected number of wires and selected options in the Drawing tab.

## 4 Netlist format

The Netlist example for the 3-phase version is given by:

```

_WB;WBline1;6;6;BUS1a,BUS1b,BUS1c,s4,s5,s47,
3,1,1kV,
wbfit_line90_rv.dat,
0
0
0

```

Field	Description
<b>_WB</b>	Part name
<b>WBline1</b>	Instance name, any name.
<b>6</b>	Total number of pins
<b>6</b>	Number of pins given in this data section
<b>BUS1a,BUS1b,BUS1c</b>	Signal names connected to k-pins, any names, as many as wires
<b>s4,s5,s47</b>	Signal names connected to m-pins, any names, as many as wires
<b>3</b>	Number of phases
<b>1</b>	Use relative path when 1
<b>1kV</b>	Voltage units for trapped charge
<b>wbfit_line90_rv.dat</b>	Name for the model data file
<b>Trapped charge</b>	Trapped charge as many lines as wires

Comma separated data is saved into the ParamsA attributes. The rest of the data is saved into the ModelData attribute.

## 5 Steady-state model

The steady-state solution can be calculated using the same model data file.

## 6 Initial conditions

Automatic initial conditions are found from the harmonic steady-state solution. The line is initialized for achieving steady-state conditions in time-domain at simulation startup.

The user can also enter manual initial conditions for each wire. This represents trapped charge on the line. If the line or cable is energized in steady-state then the user should not also provide trapped charge data, since that will create inconsistent conditions.

## 7 Frequency Scan model

Same as in steady-state. The model provides its admittance matrix for each frequency requested in the frequency scan simulation.

## 8 Time-domain model

The time-domain representation is explained in [1]. Rules similar to the CP-line model are enforced.

## 9 References

- [1] Morched A., Gustavsen B. and Tartibi M.: "A universal model for accurate calculation of electromagnetic transients on overhead lines and underground cables". Power Delivery, IEEE Transactions, Volume: 14, Issue: 3, July 1999, pp. 1032 -1038.
- [2] I. Kocar, J. Mahseredjian, and G. Olivier, "Weighting Method for Transient Analysis of Underground Cables," IEEE Transactions on Power Delivery, Volume: 23, Issue: 3, pp. 1629-1635, July 2008.
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- [6] I. Kocar and J. Mahseredjian, "New procedure for computation of time delays in propagation function fitting for transient modeling of cables," IEEE Transactions on Power Delivery, Volume: 31, Issue: 2, pp. 613-621, June 2016.