

PSCAD ADVANCE TRAINING

Tutorial on Creating Custom Components

Tutorial – 1

Adder

Purpose:

To get familiar with the Component Workshop (or the design editor).

Create input/output nodes.

Get familiar with the graphic, Parameters and the script sections of the editor.

Create a library file.

Use the component workshop to create a simple control block to do the following computation.

$$K1 \times A + K2 \times B = C$$

A and B - External inputs

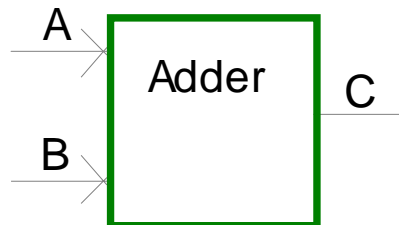
K1 and K2 – Internal parameters

C – Output

Include the component in a case and verify its accuracy

Modify the component so that K1 and K2 can be entered as variables.

Verify the modified component.



Tutorial – 2

Integrator

Purpose:

Calling external subroutines.

Storing data for computations in following (future) time steps.

The block should perform the following function

$$y = \int x dt$$

x – input

y – output

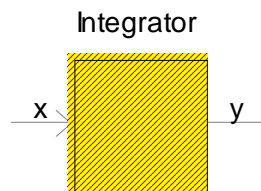
To keep things simple, use ‘rectangular integration’.

$$y(t) = y(t - \Delta t) + x(t) \times \Delta t$$

This will require the storage of ‘past’ value of y.

Allow for the input of initial value of y.

Use an external FORTRAN Subroutine to do the calculations.



Tutorial – 3

Electrical Component – Transformer (coupled wires)

Purpose:

Design an ‘electrical’ component.

Using ‘branch’ and ‘transformer’ sections of the ‘script’

Design a model of two magnetically coupled wires.

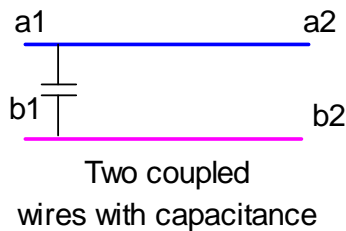
The model is to be interfaced with other electrical components in the master library.

The inductances and resistances are the inputs.

$$\begin{bmatrix} v_a \\ v_b \end{bmatrix} = \begin{bmatrix} L_a & M_{ab} \\ M_{ab} & L_b \end{bmatrix} \frac{d}{dt} \begin{bmatrix} i_a \\ i_b \end{bmatrix} + \begin{bmatrix} R_a & o \\ o & R_b \end{bmatrix} \begin{bmatrix} i_a \\ i_b \end{bmatrix}$$

Use the ‘transformers’ section to enter the L and R values.

Connect the model to a source and verify the model.



Use the ‘Branch’ section to add ‘stray capacitance’ between the wires on the input side.

Tutorial – 4

Electrical Component – A simple DC Machine

Purpose:

Interface an electric component as a voltage source. (Branch based interface)

Design a simple model of a DC machine.

Field circuit - Series L and R

Armature circuit – A series branch of L, R and a voltage source of magnitude E_b .

$$E_b = k_{\Phi} \times w$$

$$w = \text{speed}$$

$$k_{\Phi} = \frac{150}{188.5} \left(1 - e^{-i_f / k_f}\right)$$

i_f – Field current

k_f – Input parameter (constant)

The inductances and resistances are the other inputs.

