PSCAD ESSENTIAL TUTORIALS

Tutorial

Getting Started and Basic Features

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Tutorial 1

Objective(s):

- Getting familiar with PSCAD.
- Getting familiar with different sections of the Master Library.
- Different ways to access the master library.
- Creating a simple case.
- Data entry.
- Plotting and control.
- Interactive controls.

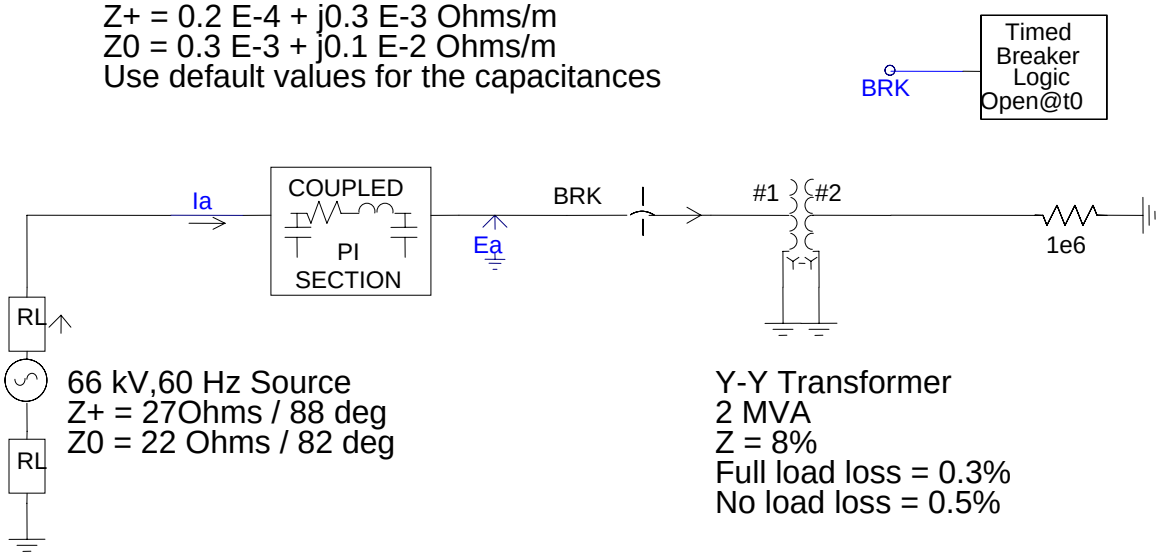
T1.1 Create a new case by using either the ***Menu*** or ***Toolbar***. A new case should appear in the ***Workspace settings*** entitled ***noname [psc]***. Right-click on this Workspace settings entry and select Save As… and give the case a name.

NOTE: ***Do not use any spaces in the name!***

Create a folder called **c:……/PscadTraining/Tutorial_01.** Save the case as ***case01.psc***

T1.2 Open the main page of your new case. Build a case to study the inrush phenomena when energizing a transformer. The component data is as shown. The transformer is rated 66/13.8 kV.

Short line of 15 km
Z+ = 0.2 E-4 + j0.3 E-3 Ohms/m
Z0 = 0.3 E-3 + j0.1 E-2 Ohms/m
Use default values for the capacitances



66 kV,60 Hz Source
Z+ = 27Ohms / 88 deg
Z0 = 22 Ohms / 82 deg

Y-Y Transformer
2 MVA
Z = 8%
Full load loss = 0.3%
No load loss = 0.5%

Fig.1 Transformer energizing circuit.

T1.3 Plot the currents (Ia) and voltages (Ea) on the LV side of the transformer. **Note:** Ia and Ea contains the three waveforms of the three phases.

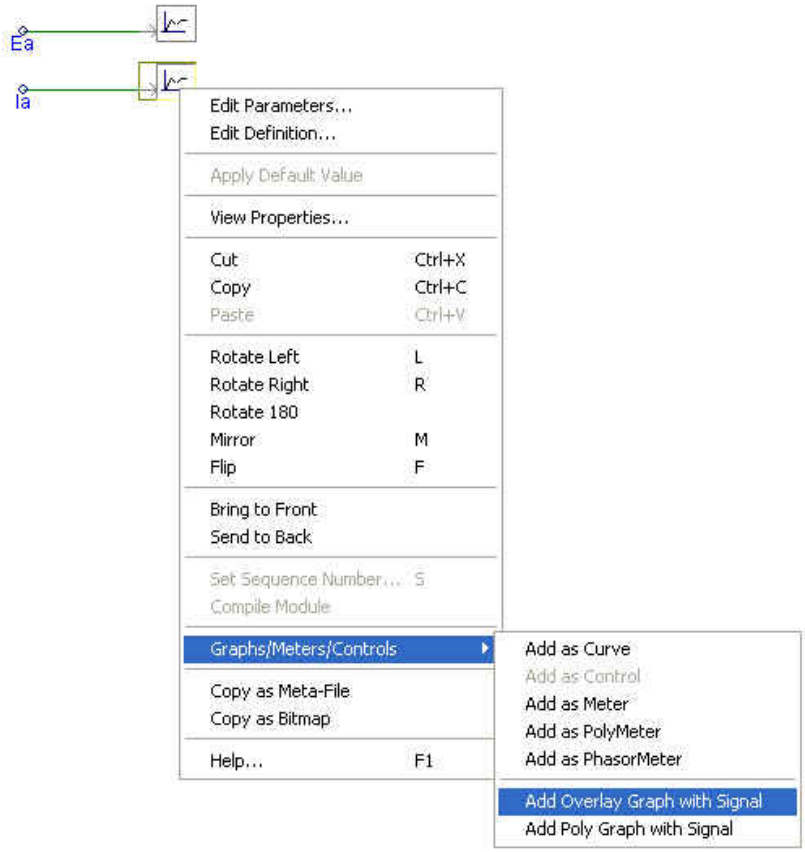


Fig.2 Basic steps to create a graph with a selected signal.

T1.4 The LV side of the transformer is not connected to a load or any other system equipment. The breaker is closed at 0.5 s to energize the transformer 66 kV side.

Inrush is related to core saturation. Verify that saturation is included in the model used for this simulation.

Ask your instructor to explain the large resistance connected to the HV side.

Inrush current magnitude depends on the 'point on wave' switching conditions. Use a manual switch to operate the breaker. Note the point on wave dependency of the inrush peak.

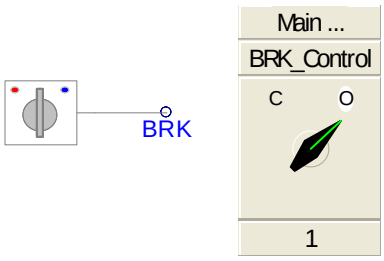
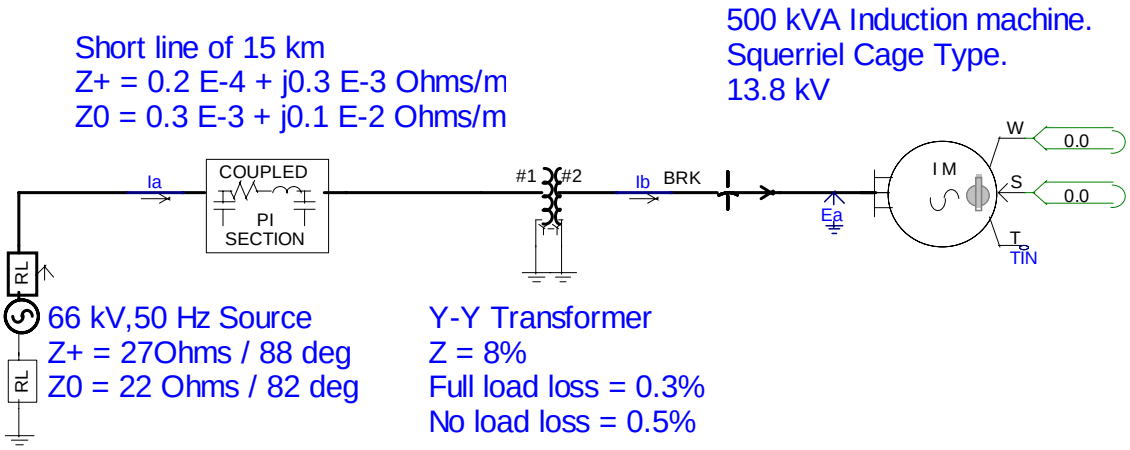


Fig.3 Two state switch attached to a control panel.

T1.5 Modify the case to include a 13.8 kV/0.5 MVA (Squirrel cage type) induction machine. The case will be used to study the process of starting an Induction motor. The component data is as shown.



You may use the wire mode to connect different components.

T1.6 Enter the component data.

Note: Calculate the rated phase voltage and current to be entered in the model.

Note: Use 'typical' data for the machine.

T1.7 Plot the currents on either side of the transformer (ia and ib).

T1.8 The input torque to the machine is equal to 80% of the square of the speed. Derive this signal using control blocks. i.e

$$T_m = 0.8 \cdot w^2$$

Use control blocks to implement the above equation.

Your instructor will explain the calculation program structure of EMTDC and the definition of ‘electric’ and ‘control’ type models.

T1.9 The breaker (initially open) should be closed at 0.2s to start the motor.

T1.10 Plot the machine speed, the mechanical torque and the developed electric torque.

Note: Some variables can be measured from within the component. These are normally listed under the parameter section ***‘Internal output variables’***

If time permits…

T1.11 Add a load of 1 MVA at 0.8-power factor at 13.8 kV. The same transformer supplies this load. Does the load see an unacceptable voltage sag during motor start?