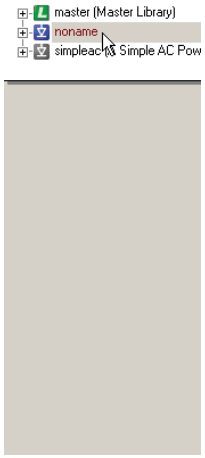
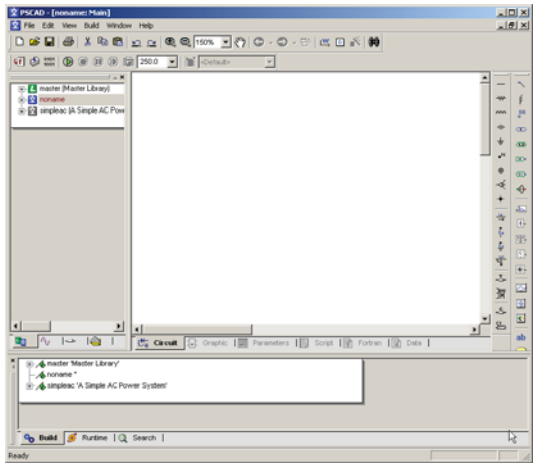
Creating a file in PSCAD/EMTDC vers 4.2

- Create new project
- Set project as active (blue icon)
- Double click on project to open schematic drawing pallet
  - » Can view an inactive project by not run it



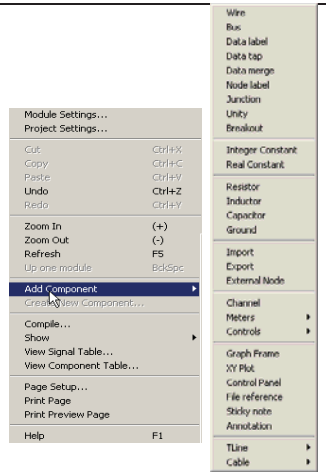
Adding components (1)

- A few basic components in bars on right of screen



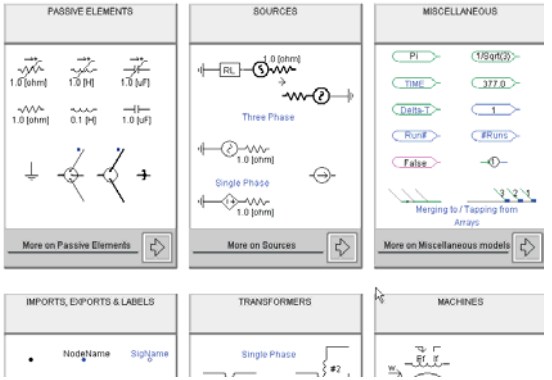
Adding components (2)

- Can also add components by right clicking mouse in drawing area
  - » Add Component



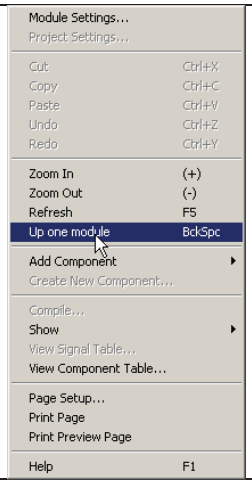
Adding Components (3) Master Library

- Libraries for different types of components
  - » Select one to expand it
  - » Copy the component you want to use
  - » Need to double click on your project
  - » Paste the component



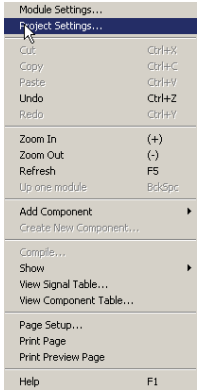
Moving Up Modules

- When you are in a submodule you can move up with:



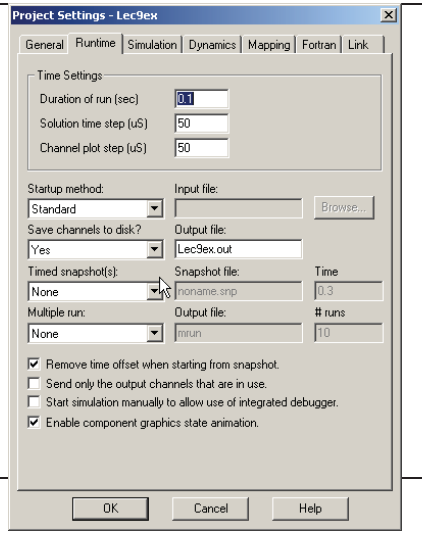
Setting up your simulation

- Right click in drawing area
  - » Select “Project Settings”



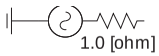
Project Settings

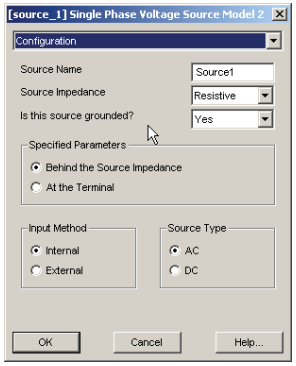
- Usually interested in “Runtime”
  - » Duration
  - » Solution time step
  - » Channel plot step
- May want to save channel to disk



Adding a Single Phase Source

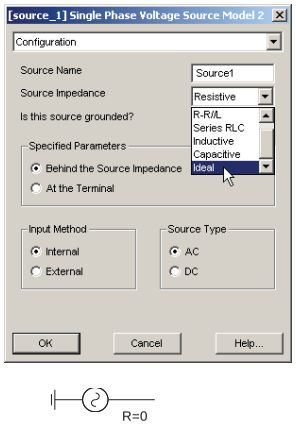
- Copy source from library
  - » Double-click for dialog box
- Several pulldown menus
  - » First configuration





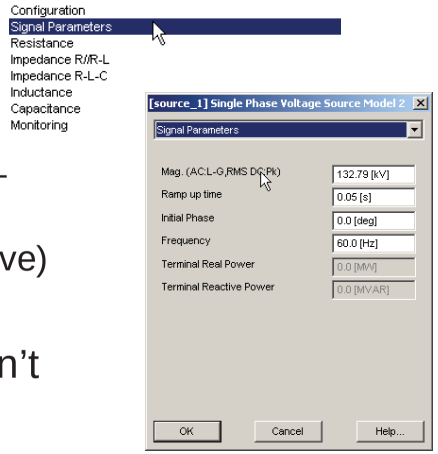
Source Configuration

- Enter source name
- Source impedance
  - » For example ideal
    - – Circuit symbol changes when done
- Can also specify
  - » Grounding
  - » AC/DC
  - » Input internal or external
    - – External allows user interactive or control loop



Other data entry points

- Signal parameters
  - » RMS magnitude
  - » Ramp-up time
    - – Remember no steady-state solution
  - » Initial phase (sine wave)
  - » Frequency
- Impedance fields won't allow entry for ideal

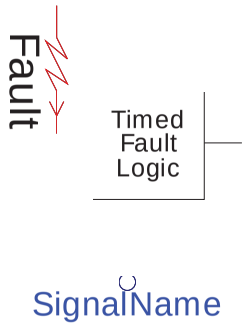


Resistors, Capacitors, Inductors

- For single phase branches can get from menus in window or master library
  - » Need to get from master library for polyphase
  - » Have option of 3 phase view of single line diagram view in later versions of program
- Enter R in ohms, L in H and C in μF

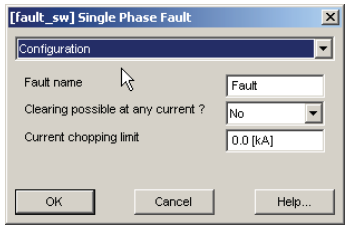
Switches and Faults

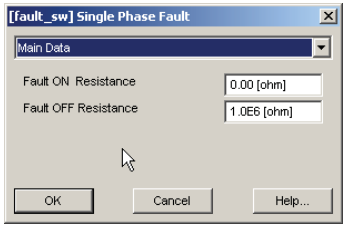
- Copy from Master Library
- For example, for a fault
  - » Need the fault "switch" itself
  - » And the fault timing control
  - » And need a signal node
  - » Signal name matches input name for fault (default is "Fault")
- Similar for a breaker
  - » Need three parts



Faults

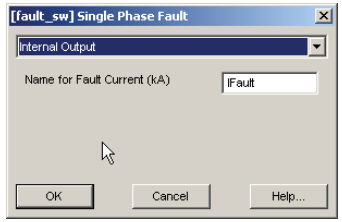
- Configuration:
  - » Fault name (control input)
    - – Must match signal_name
  - » Clearing and chopping are for switches
- Main data
  - » On and Off resistance (same for switches—open close)



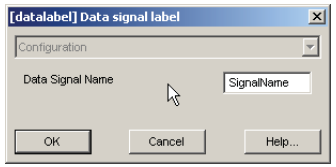


Faults

- Internal Output
  - » Can request current output (can reduce node count)

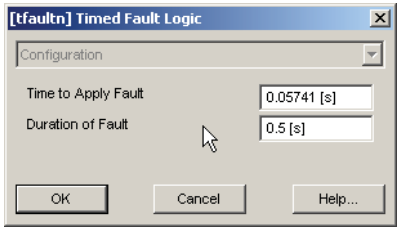


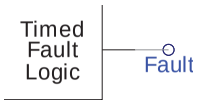
- Signal name:
  - » Set to match fault control input



Fault Timed Logic

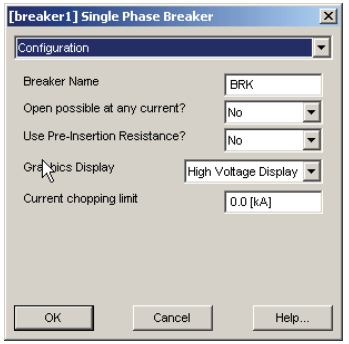
- Set start time and duration of fault
- Attach signal name to end of line on icon:
  - » Set to match fault control input





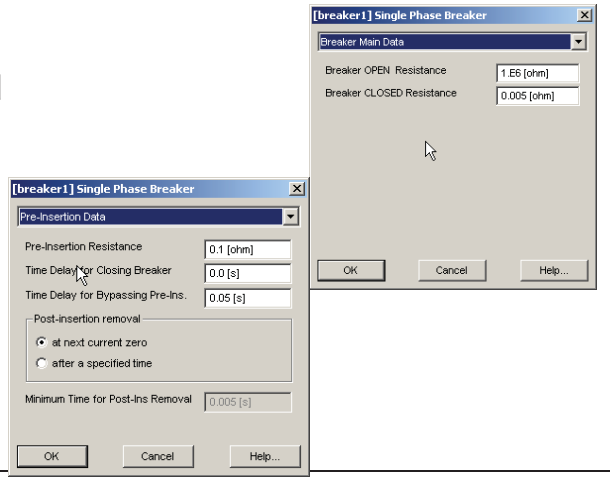
Breakers

- Configuration
  - » Breaker name is again control input
- Can specify interrupting current
  - » Current chopping limit
- Preinsertion resistance
  - » Current limiting R
- Symbol type



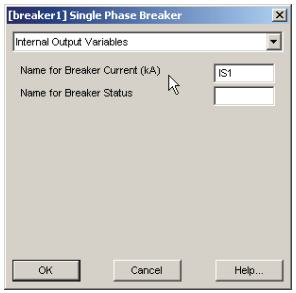
Breakers

- Main Data
  - » Open/Closed resistance
- Preinsertion



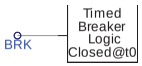
Breakers

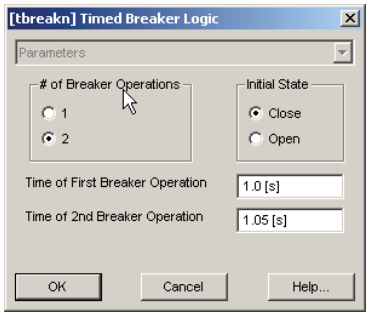
- Output data
  - » Current measure
    - – Name appears on circuit symbol



Breaker Timing Logic

- Controls timing of switching
  - » Again need signal input to match breaker control
- Timing control
  - » Number operations
  - » Initial state
  - » Timing of operations



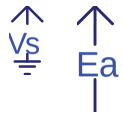


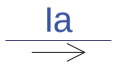
Connecting circuit together

- Wire icon on top toolbar
  - » Pencil symbol appears
  - » Trace with left mouse clicks
    - – Click each time change direction
  - » Right click or escape to complete
    - – Right click lets you select points to rescale
- "Junction" to connect wires as cross each other (otherwise disconnected
  - » Get from right click in drawing space

Voltage and Current measurements

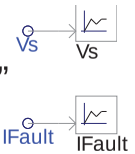
- Voltage measurements
  - » Can do line to ground and arbitrary
    - – Need to connect to circuit
    - – Name the measurement (default is Ea)
- Current measurement
  - » Need to connect to the line, don't copy on top of a wire.

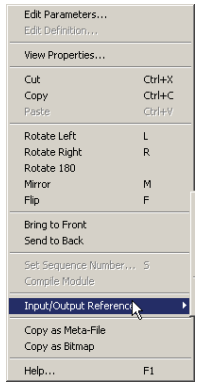




Output Channels

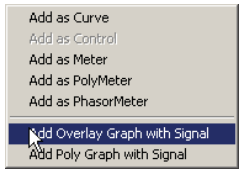
- Create output channel next
  - » Again need signal
  - » Connect to "Output channel"
- Choose Input/Output Reference

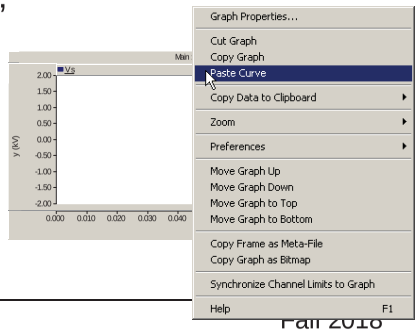




Input/Output Reference Graphs

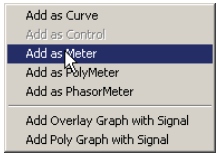
- Several Options
  - » Add Overlay Graph Most Common
  - » If choose "Add as Curve"
  - » Paste to existing graph
    - – Right click in white part

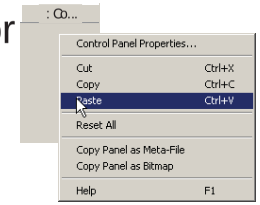




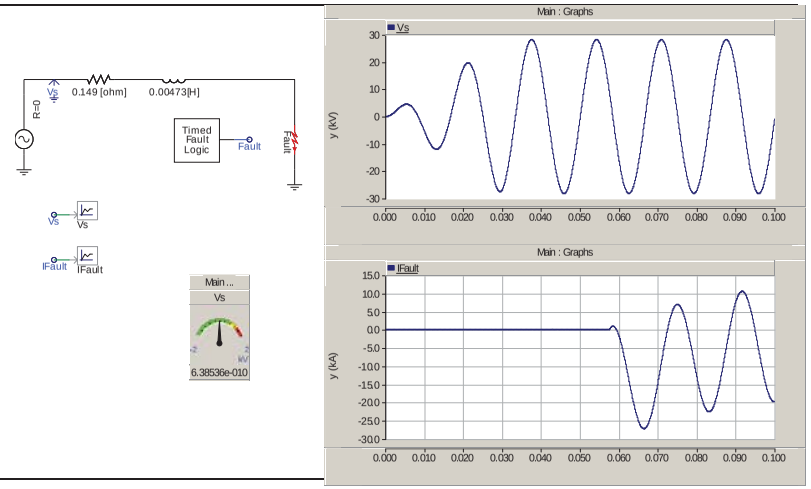
Input/Output Reference: Meters

- Add as Meter
- Then select put a control panel in your drawing (from right side tool bars or right click of mouse)
  - » Right click - Paste

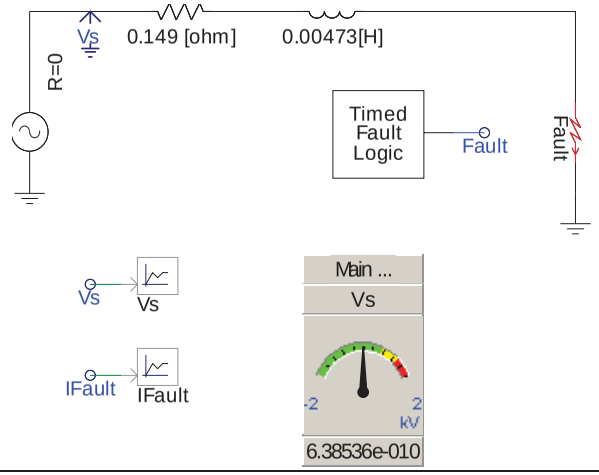




Complete Circuit

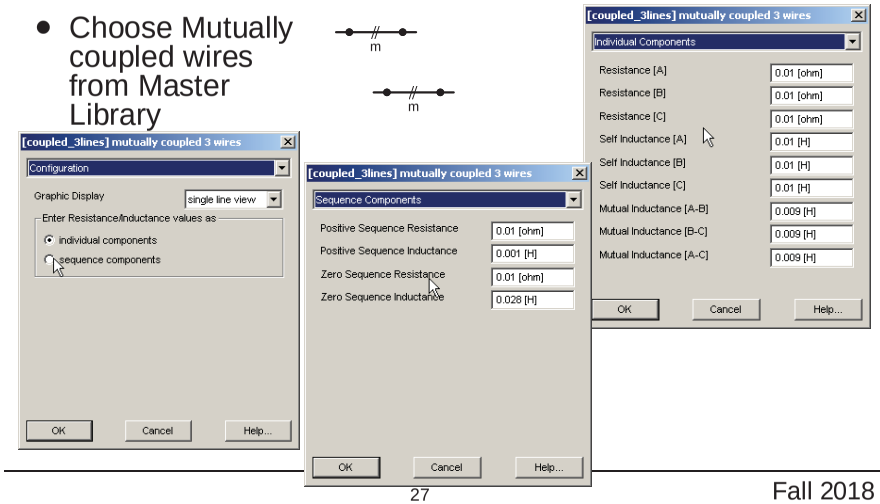


Complete Circuit: without graphs shown



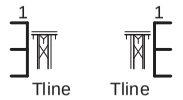
Coupled RL: EMTDC

- Choose Mutually coupled wires from Master Library

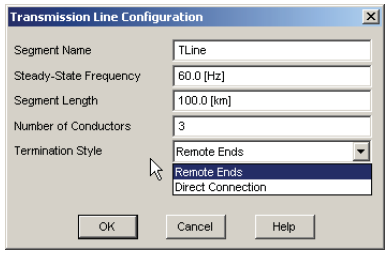


Distributed Parameter Line: EMTDC: Steps 1 and 2

- Two interface options:
  - » Step 1: Connect Interface Component into Circuit:

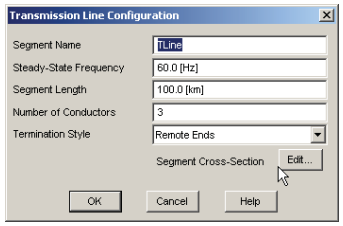


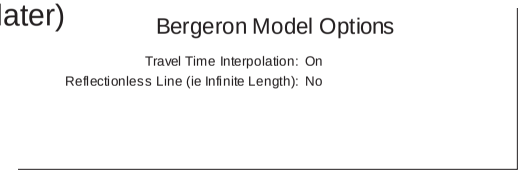
  - » Step 2: Then copy in TLINE configuration component
    - – Can be connect to interface components or
    - – Directly connected



Distributed Parameter Line: EMTDC: Steps 3 and 4

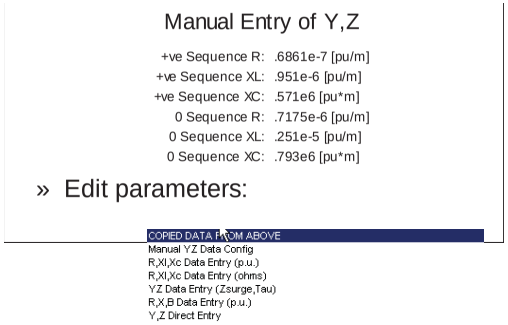
- Step 3: Next choose Edit:
- Step 4: Copy Line Model and Options Box from Master Library:
  - » In this case choose Bergeron (others later)





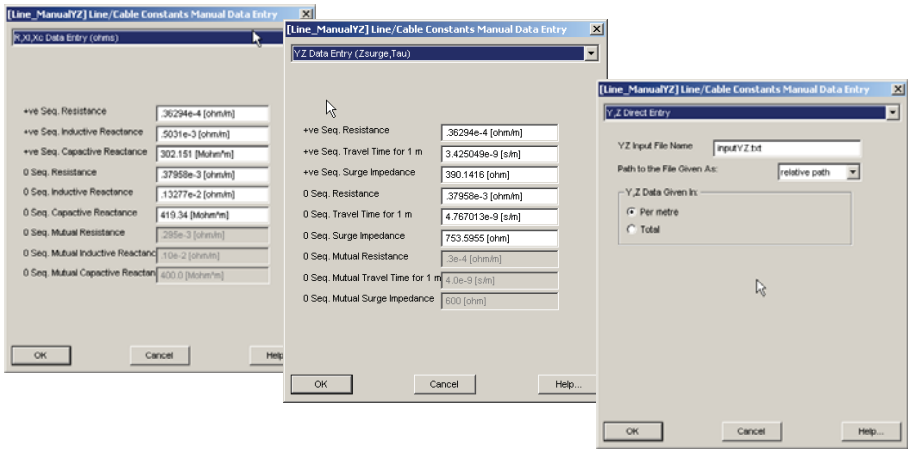
Distributed Parameter Line: EMTDC: Steps 5

- Step 5: Choose manual entry of X,Z



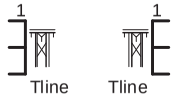
  - » Edit parameters:

Distributed Parameter Line: EMTDC: Steps 5-cont.

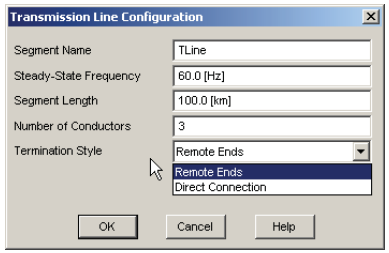


Distributed Parameter Line: EMTDC: Steps 1, 2 stay same

- Two interface options:
  - » Step 1: Connect Interface Component into Circuit:

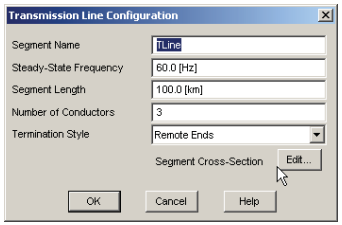


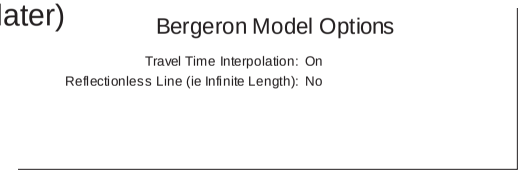
  - » Step 2: Then copy in TLINE configuration component
    - – Can be connect to interface components or
    - – Directly connected



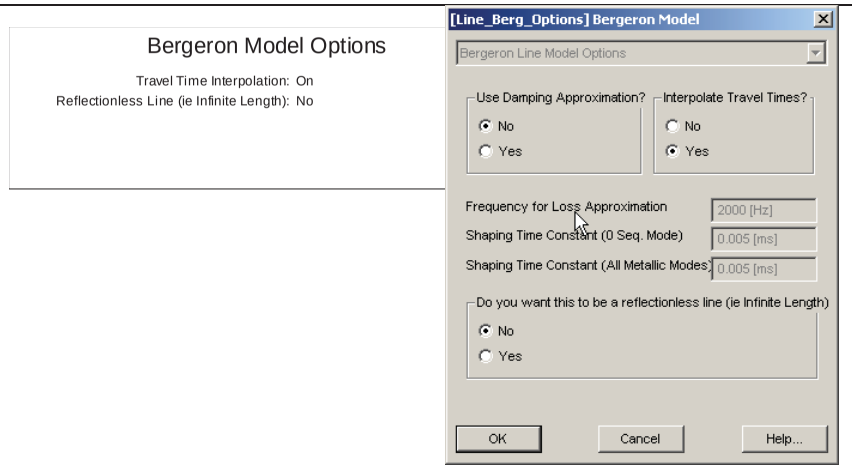
Distributed Parameter Line: EMTDC: Steps 3,4—stay same

- Step 3: Next choose Edit:
- Step 4: Copy Line Model and Options Box from Master Library:
  - » In this case choose Bergeron (others later)



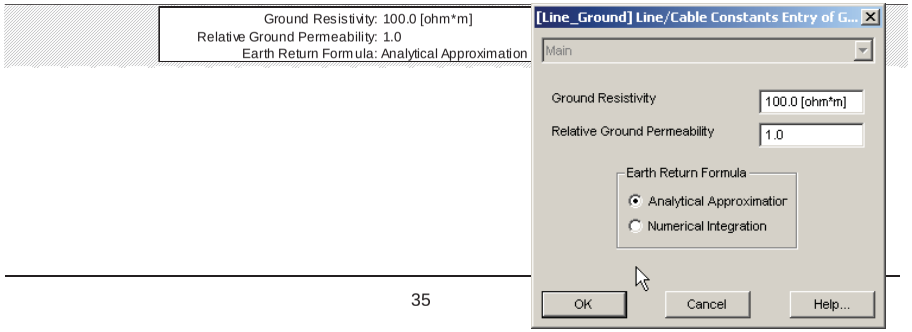


Bergeron Options



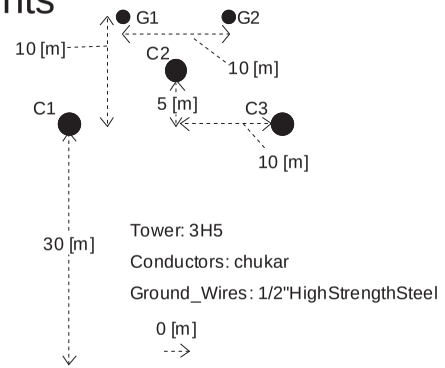
Step 5 changes:

- Now select Ground Component and Required Tower Components
  - » Ground component:

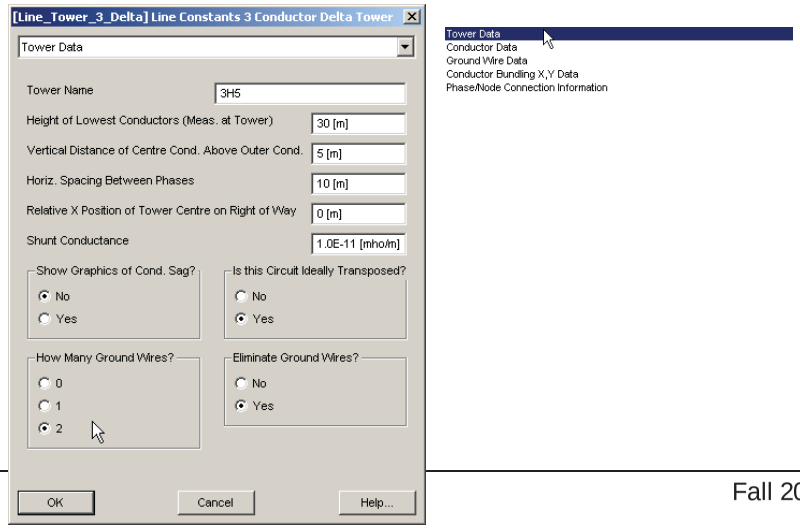


Step 5 changes:

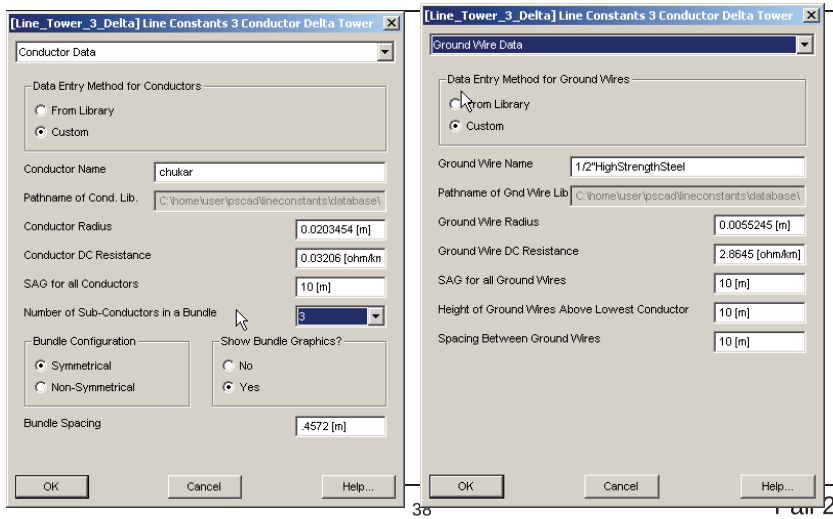
- Copy tower components from master library.



Tower Data



Conductor Data



Universal Tower Geometry

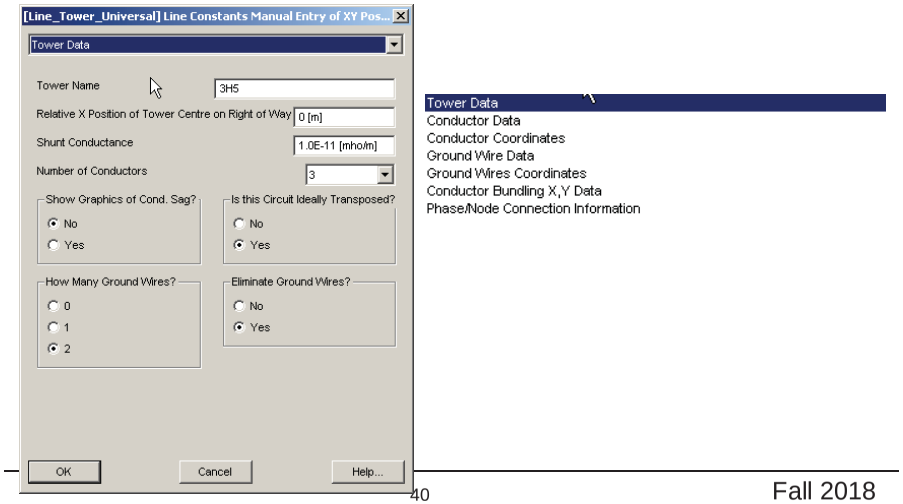
- Alternate option:

Tower: 3H5 Tower Centre 0 [m] --> Ground_Wires: 1/2"HighStrengthSteel
Conductors: chukar

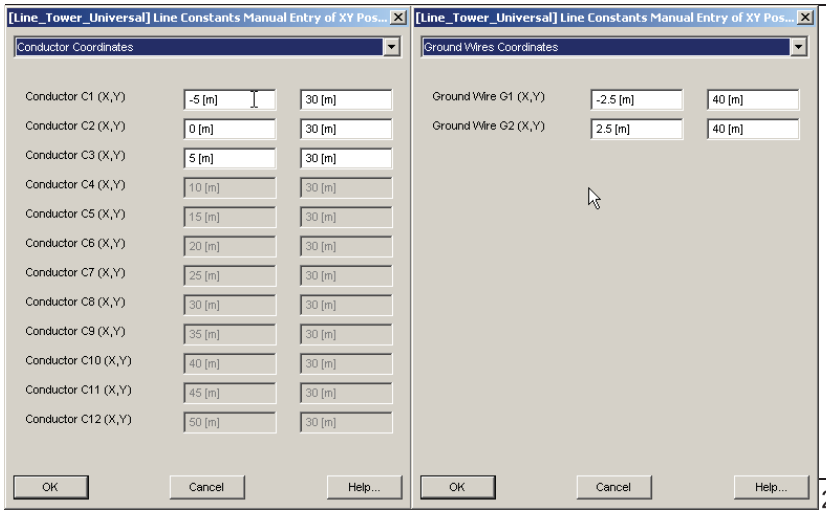
Cond. #	Connection Phasing #	X (from tower centre)	Y (at tower)
1	1	-5 [m]	30 [m]
2	2	0 [m]	30 [m]
3	3	5 [m]	30 [m]

GW. #	Connection Phasing #	X (from tower centre)	Y (at tower)
1	Eliminated	-2.5 [m]	40 [m]
2	Eliminated	2.5 [m]	40 [m]

Universal Tower Geometry



Conductor Coordinates

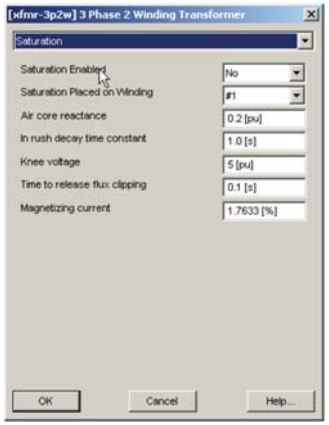


Transformer Models

Main dialog box

- Note per unit leakage reactance
- No load losses are from open circuit test
- Copper losses are from rated current through the winding resistances as above
- Note that ideal transformer not selected.

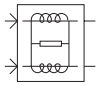
Transformer Models



- Saturation was not enabled. So the only line that means anything here is the magnetizing current.
- Note that unless the transformer is specified as ideal the magnetizing current cannot be set to zero.

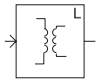
CT and VT

Current Transformer Models



2 Current Transformers in Differential Configuration

Capacitive Voltage Transformer



Potential Transformer

Autotransformer