Working With Smith Charts

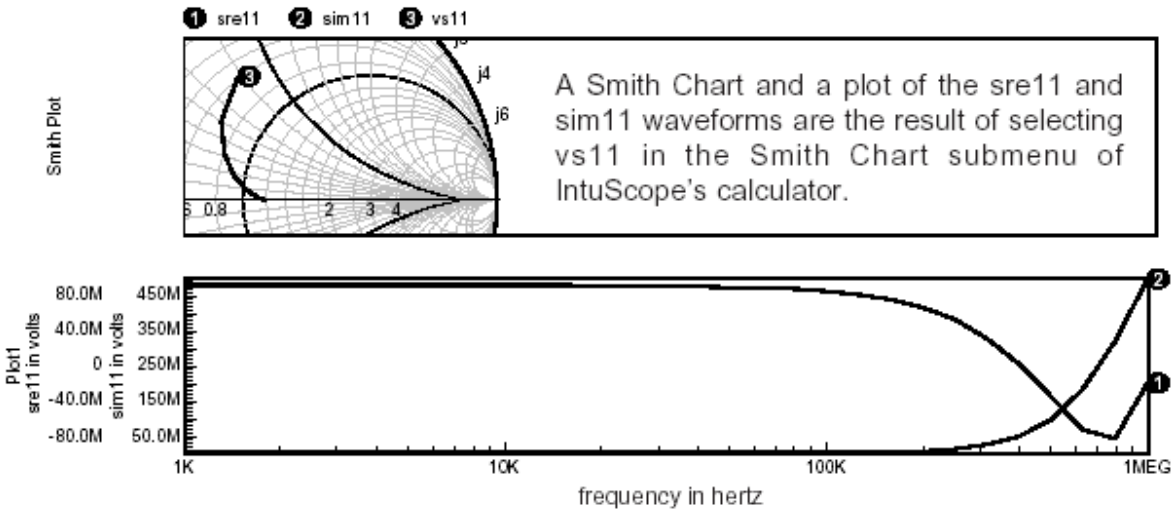
The Smith Chart function built into IntuScope enables you to determine the effects of altering network geometry during a Two-port network analysis.

Let's get familiar with Smith Charts by doing an exercise.

- **Open the TwoPort.DWG circuit with the following path :spice8\Circuits\Networks\TwoPort.DWG**
- **Set the Configuration and Simulation setups to be Sparams and 1k-1meg respectively.**
- **Click the Simulation icon.**
- **From the IsSpice4 Actions menu, select Scope.**
- **From Scope, select Calculator, Smith Chart, vs11**

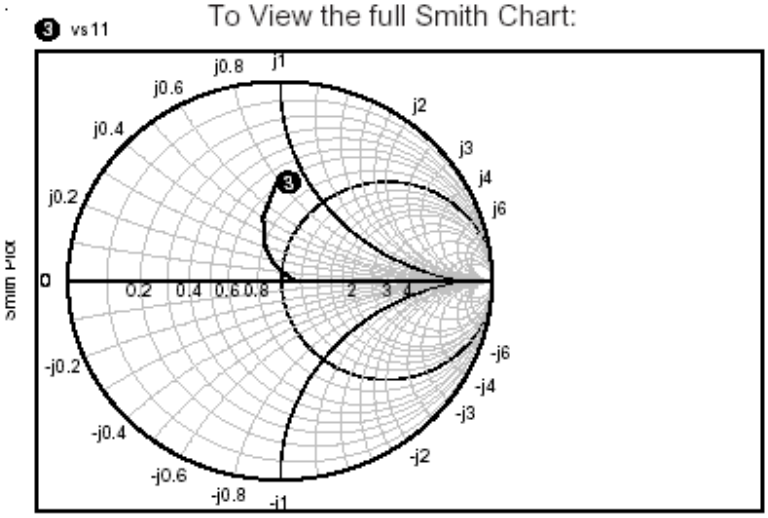
You will see a graph plotted similar to the one on the following page.

From the plots you can see how the real part (waveform1) and an imaginary part (waveform2) of S11 behave in a defined frequency range, from 1kHz to 1MegHz. You may also be able to see how vs11 moves in a Smith Chart at this frequency range.

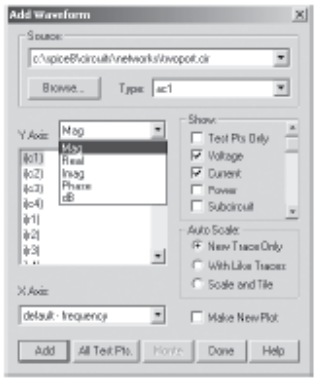


A Smith Chart and a plot of the sre11 and sim11 waveforms are the result of selecting vs11 in the Smith Chart submenu of IntuScope's calculator.

To View the full Smith Chart:



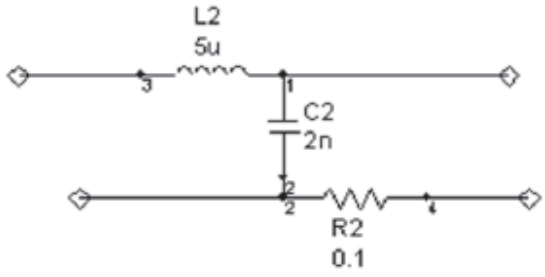
- **Click the Semi-Smith Chart.**
- **Hold Down the Shift key while clicking on the Auto Scale button in the Scaling dialog to display a full Smith Chart.**



IntuScope enables you to choose the type of waveforms displayed in the pull-down menu under the Y Axis section.

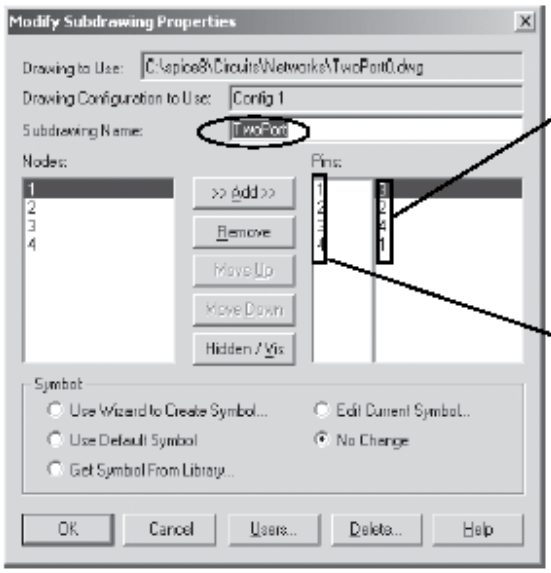
You are also able to create or modify the circuit inside of a TwoPort network box.

- **In SpiceNet, select File menu, Open.**



- **Open :\spice8\Circuits\Networks\TwoPort0.DWG**
- **Change C2 2n value to 5n.**
- **Select File menu, Subdrawings, Modify Subdrawing.**

- Subdrawing Name must be TwoPort to replace the TwoPort part in TwoPort.DWG.
- Nodes 3, 2, 4 and 1 on the schematic above are nodes 1, 2, 3, and 4 on the created box symbol. How this works is that we select the schematic nodes on the left and add it to the pin list on the right going in a counterclockwise direction, starting from the top left corner of the box symbol.

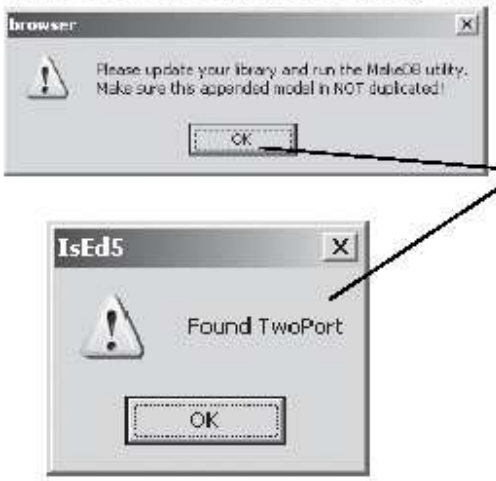


Schematic Nodes of the modified drawing

Nodes named for the TwoPort network box symbol.

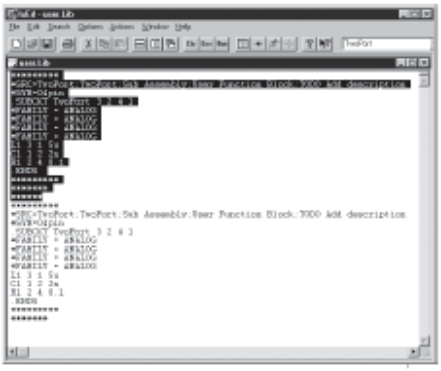
- For Symbol, select No Change, then OK.
- Select File menu, Export.
- Choose SubCkt from the pull-down menu and clickOK.

For users who don't have Library Manager:



- Click OK for both message dialogs.

Now you will see a pop-up IsEd-user.Lib dialog with duplicated TwoPort netlists listed.



- **Highlight the top TwoPort netlist and delete it.**
- **Save the changes**
- **DO NOT close the window.**

For users who have Library Manager:

- **Library Manager will be automatically activated once you click OK in the SubCkt dialog.**
- **If the library listing does not exist, give it a name: TwoPort.lib**
- **Click Yes to rebuild the database.**
- **Click Save to save the new netlist displayed in the Library Manager window.**

For both types of users:

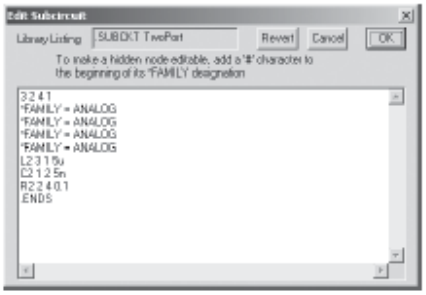
- **Close TwoPort0.dwg**
- **Open :\spice8\circuits\networks\TwoPort.dwg**
- **Select Update Cache under the Parts menu.**
- **Click Apply button to update the netlist infomation**

The old netlist inside of TwoPort network box has been replaced by the newly created one.

The changes made can be verified as follows:

- **In SpiceNet, double click on one of the TwoPort symbols in the schematic to bring up its Properties dialog.**
- **Select the Value field of .SUBCKT and click the Enter button.**

You will see the netlist of TwoPort network box shown in the Edit Subcircuit dialog.



- **Run a simulation with the same settings as the old one.**
- **Change to the IntuScope window.**
- **In IntuScope, select Calculator, Smith Chart and VS11.**
- **Select Smith Chart\VS21 under the Calculation menu.**

You will see a plot similar to the one shown.