

The Linear Circuit Builder

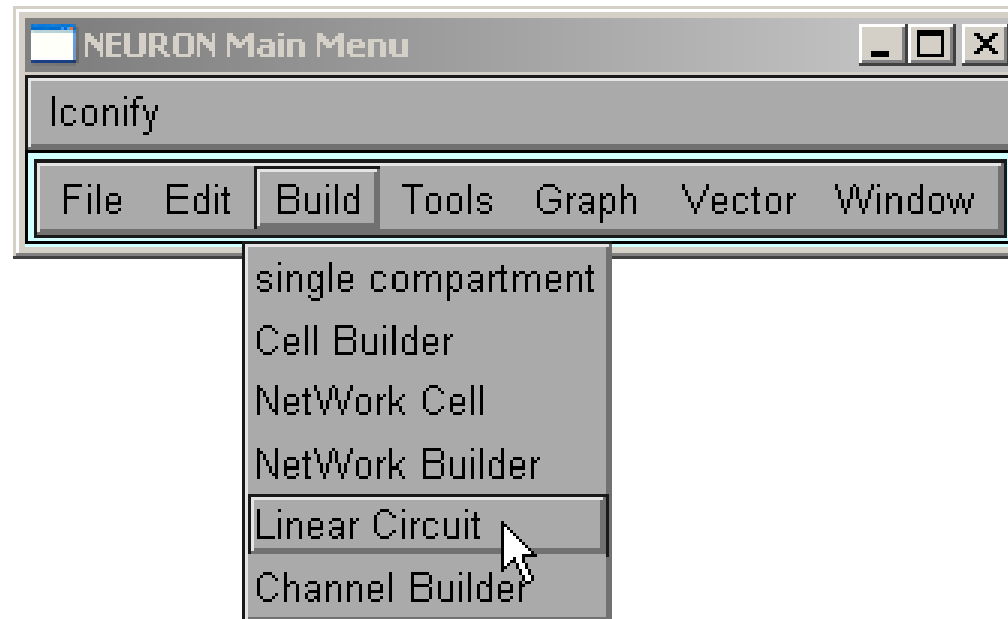
For building models that have linear circuit elements and may also involve neurons

Circuit elements include ground, current & voltage source, R, C, op amp

Potential applications include

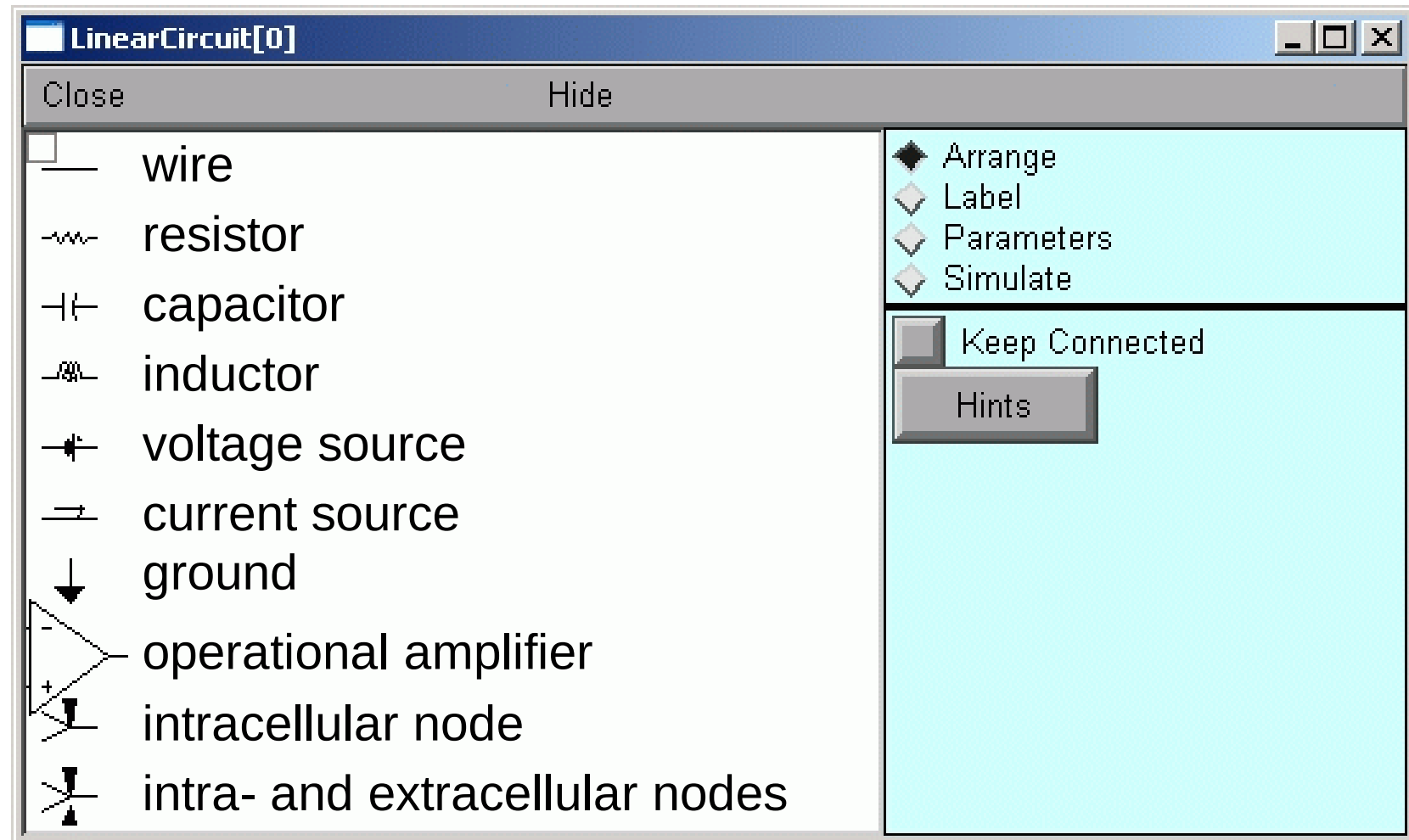
- effects and compensation of electrode R & C
- two-electrode voltage clamp
- ohmic and nonlinear gap junctions

1. Bring up a Linear Circuit Builder



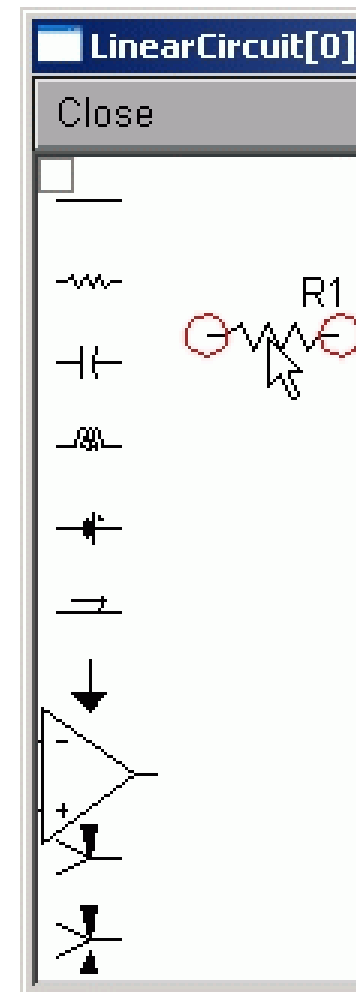
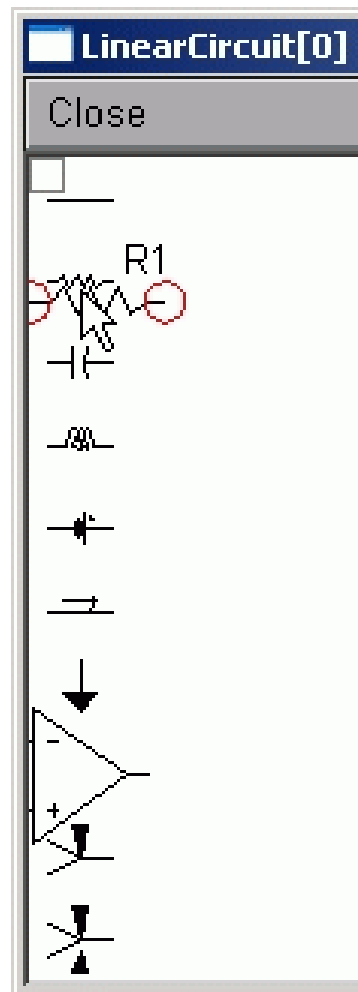
NEURON Main Menu / Build / Linear Circuit

The Linear Circuit Builder



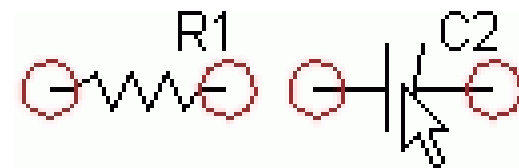
Arrange: spawn components

Click on palette and drag onto canvas

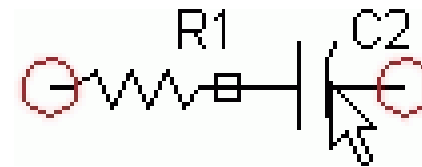


Arrange: connect components

Click and drag to
overlap red circles



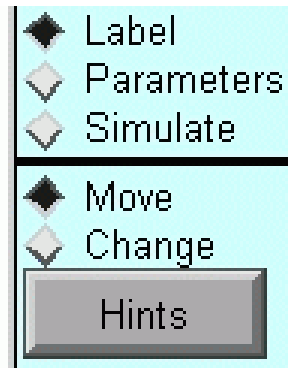
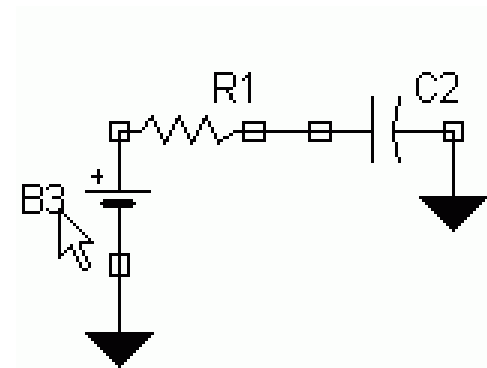
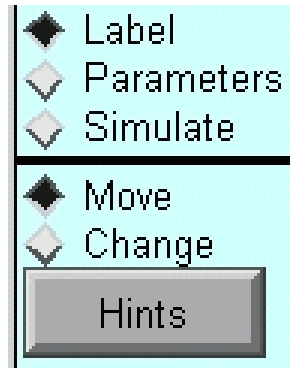
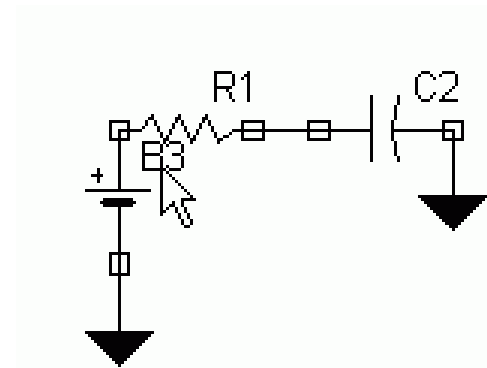
Black square is
"solder joint"



Pull apart to break
connection

Label: move labels

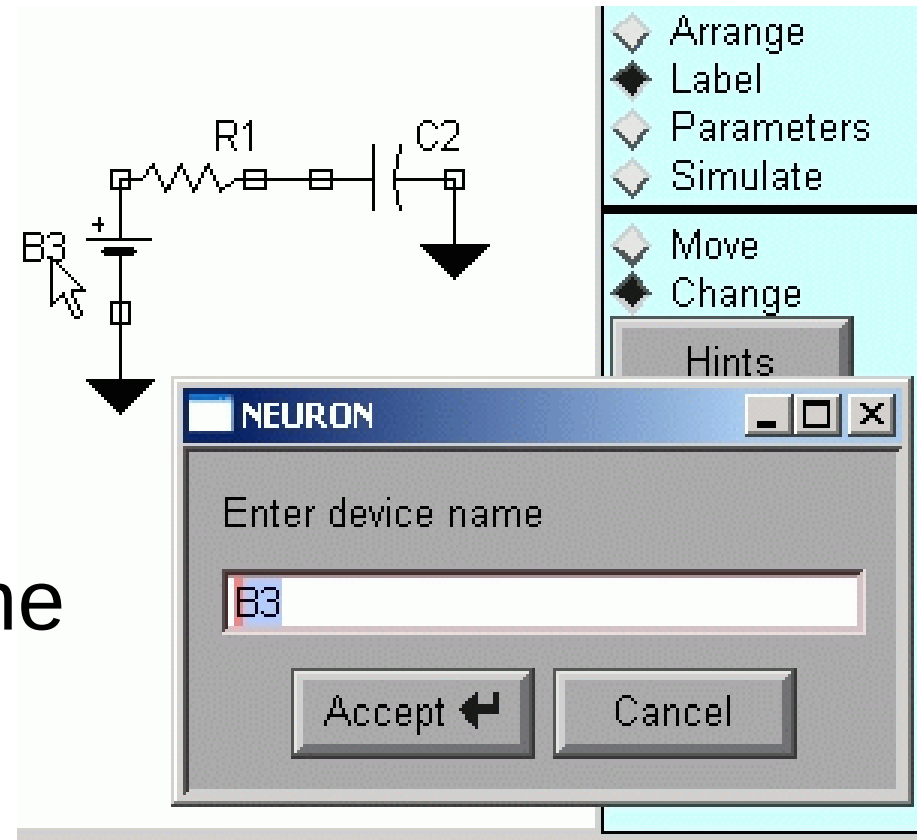
Click and drag
to new location



Label: change labels 1

Click on a label . . .

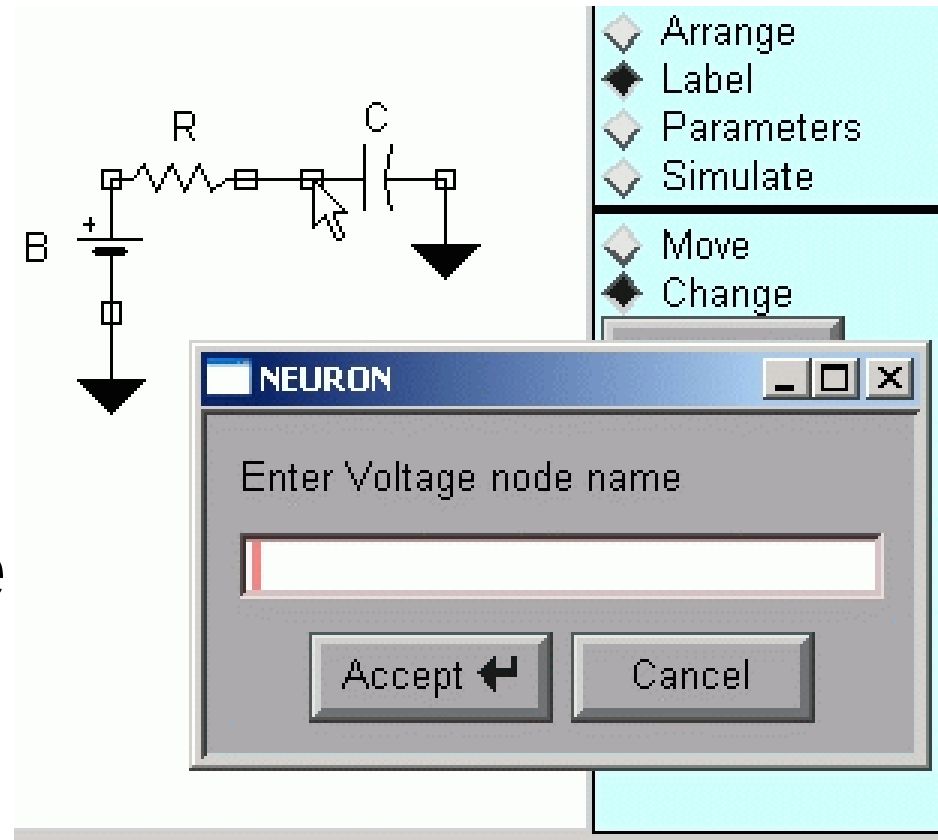
. . . to change its name



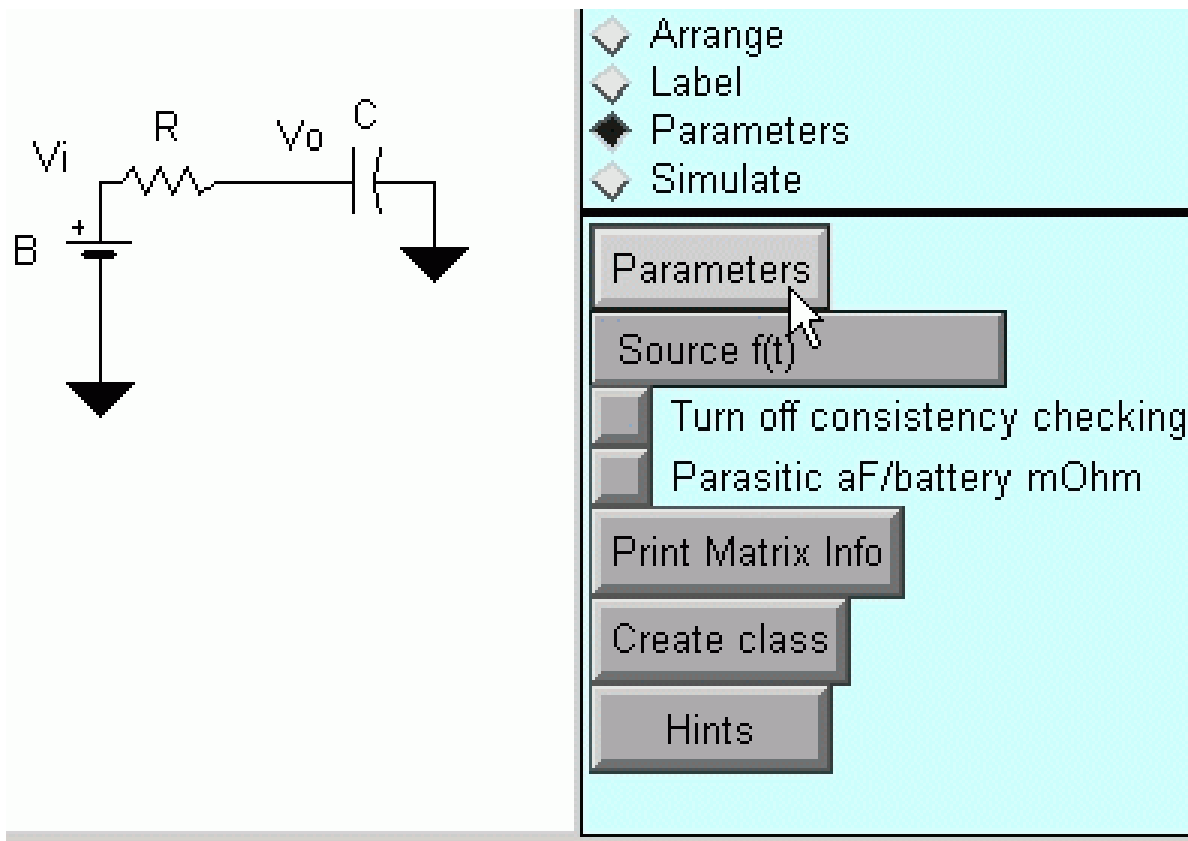
Label: change labels 2

Click on a node . . .

. . . to label a voltage



Parameters: non-source elements



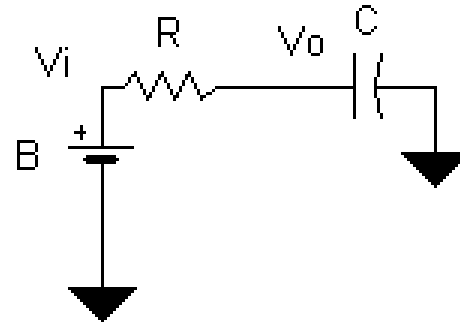
Click on
"Parameters"

A dialog box titled "Values for LinearCircuit[...]" with "Close" and "Hide" buttons. It contains two rows of controls:

Parameter	Value	Unit
R (Mohm)	1	Mohm
C (nF)	1	nF

Parameters: signal sources

Source $f(t)$ / B



◇ Arrange

◇ Label

◆ Parameters

◇ Simulate

Parameters

Source $f(t)$

B

Turn off consistency checking

Parasitic aF/battery mOhm

Print Matrix Info

Create class

Hints

Parameters: signal sources *continued*

f(t) for B of LinearCircuit... [Close] [Hide]

External Stim Pattern

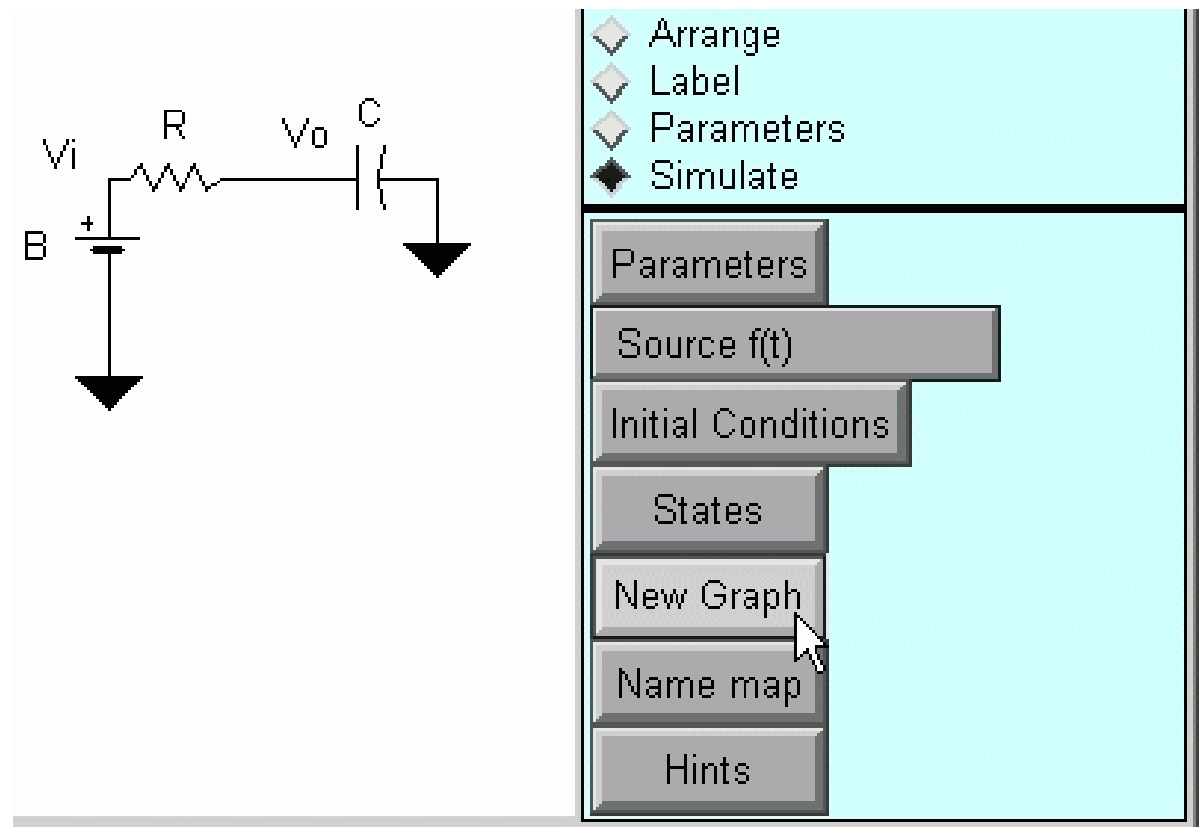
dur0 (ms)	<input checked="" type="checkbox"/>	1	▲▼
amp0 (mV)	<input type="checkbox"/>	0	▲▼
dur1 (ms)	<input checked="" type="checkbox"/>	1	▲▼
amp1 (mV)	<input checked="" type="checkbox"/>	1	▲▼
dur2 (ms)	<input type="checkbox"/>	1e+09	▲▼
amp2 (mV)	<input type="checkbox"/>	0	▲▼

tvec is Vector[1335]
amp is Vector[1334]
amp is Vector[1334]

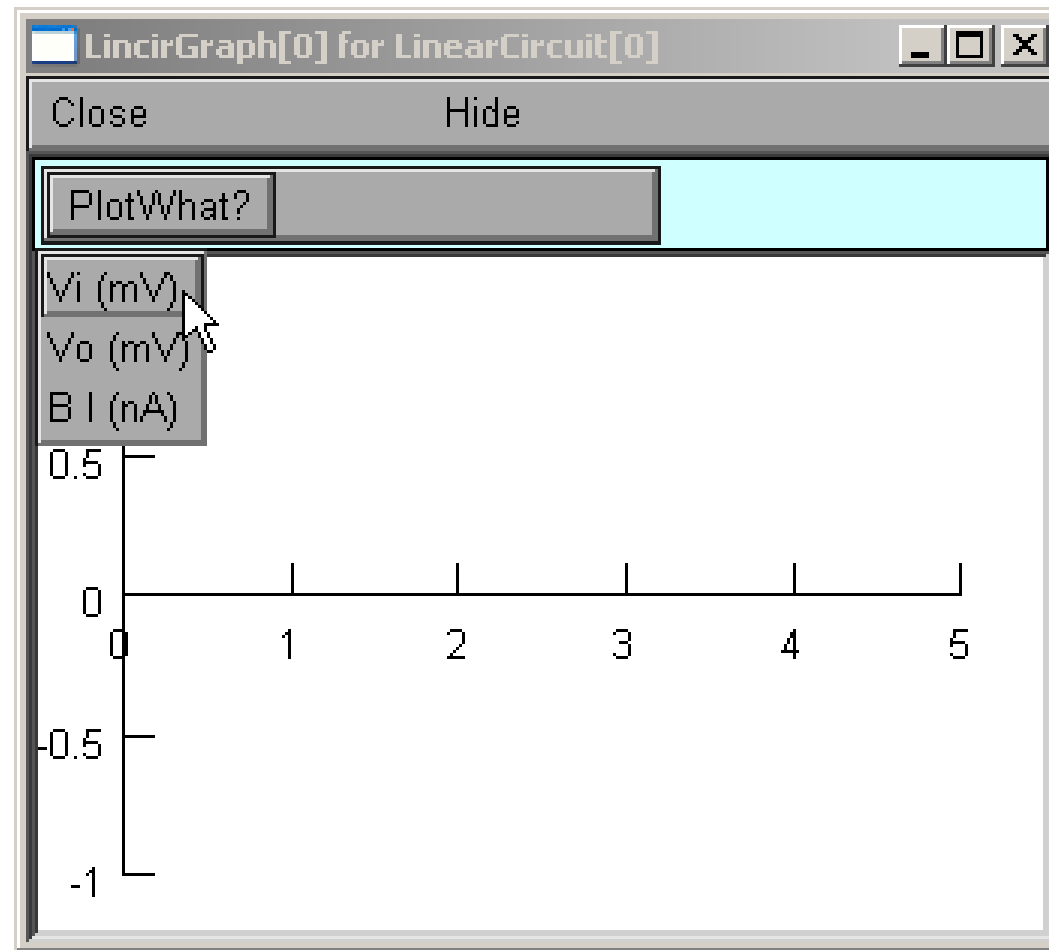
Configured

Simulate: creating a graph

New Graph

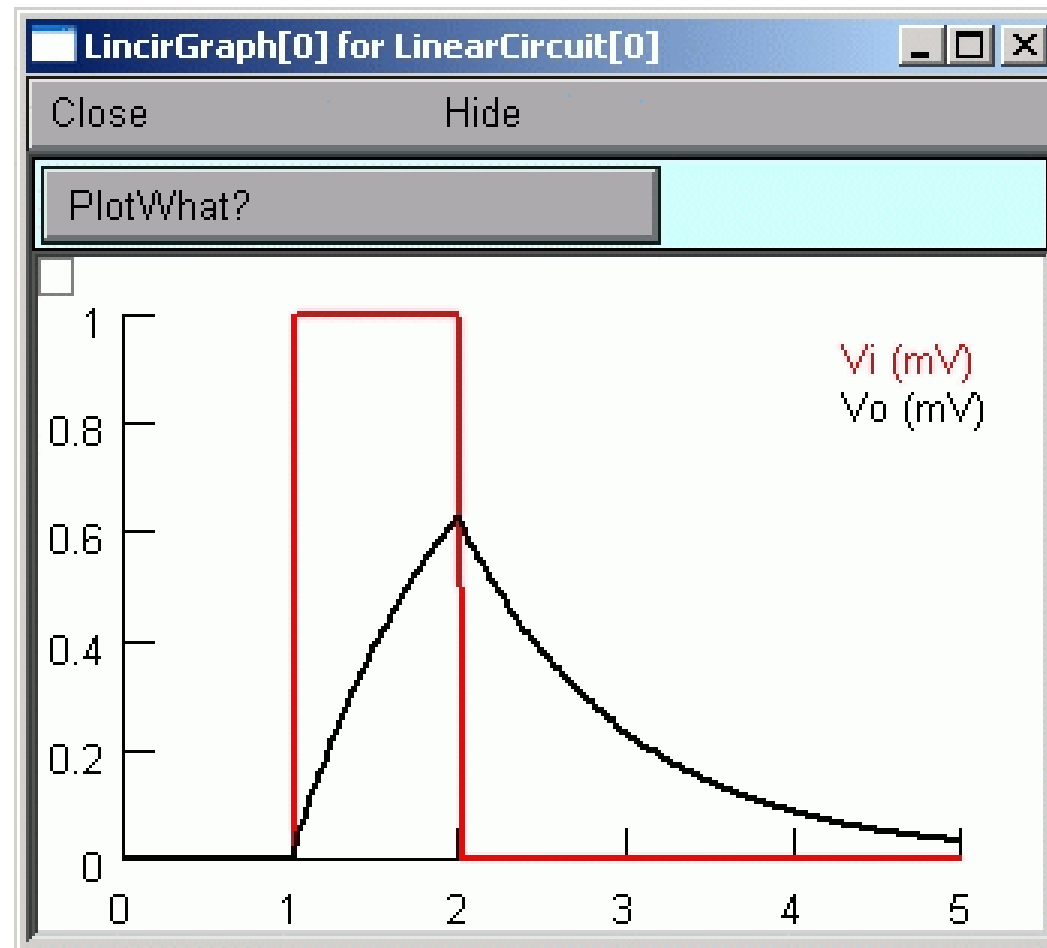


Simulate: specifying what to plot



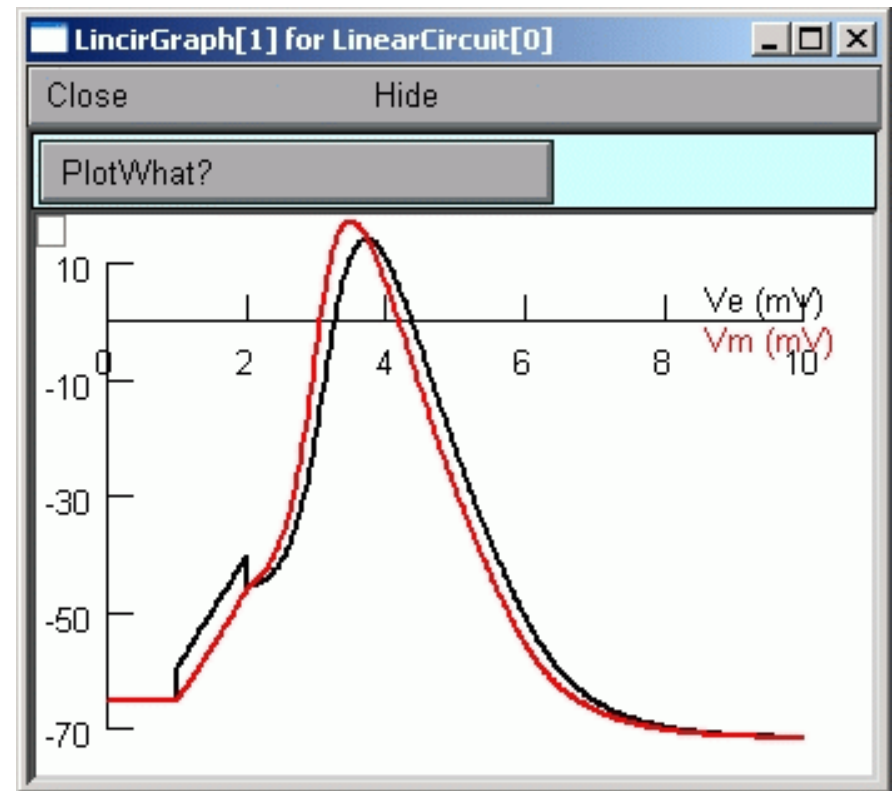
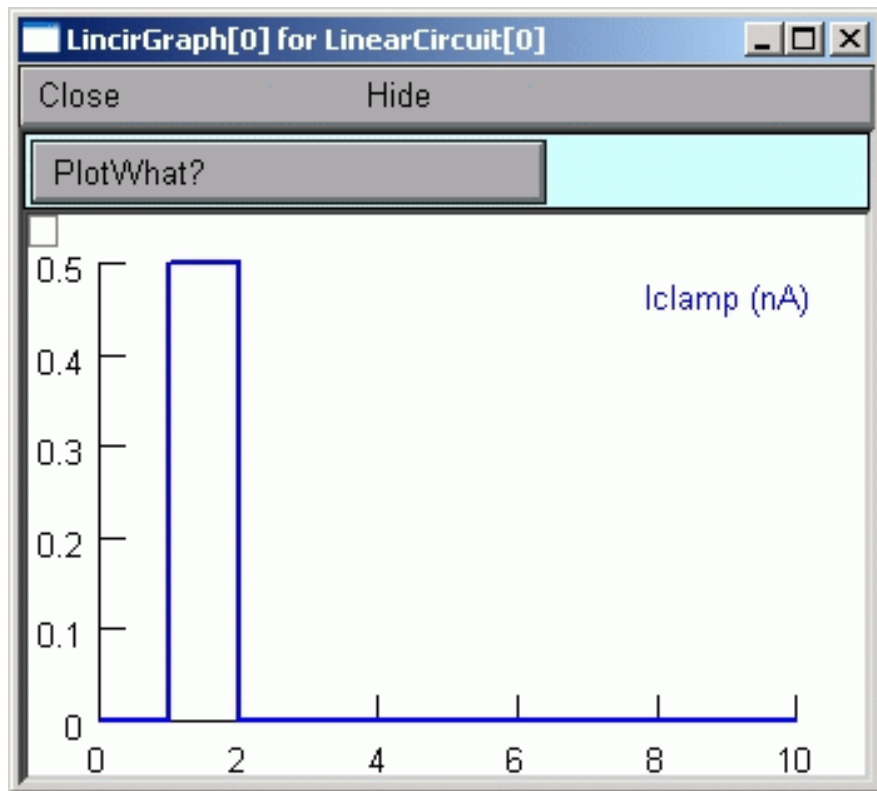
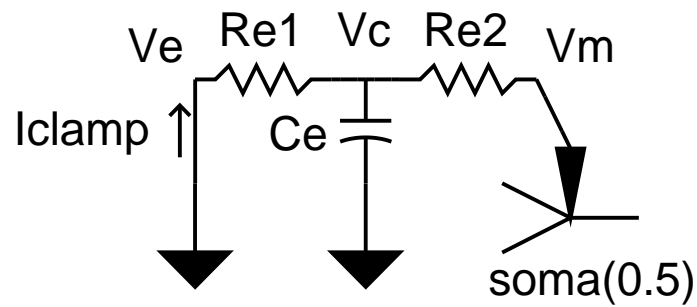
PlotWhat? / *variable_label*

Simulate: simulation results



After minor cosmetic changes

Patch clamp with electrode R and C



NEURON demo: dynamic clamp

