

XGOLDHEINEKENSOFT Company™

XCSim v 0.82

(β - version)

Symbolical and Numerical Circuit Simulator

Documentation and Examples

I - Introduction

Xcsim is a circuit simulator for TI-89 and TI-92. It is based on Csim for HP48 by Per Stenius. It is still the best numerical simulator on calculator (since 1991). His principal handicap is due to HP48 limitations : it wasn't able to do symbolical calculations. Xcsim can simulate easy electronic circuits (calculations become quickly too huge for the calculator).

One of his advantages is his graphical interface which, even if it's a bit slow (made in Basic...), allow to build easily a circuit.

II - Features

- Graphical interface
- Supported components :
 - R - Resistances
 - L - Inductances
 - C - Capacitors
 - E - Voltage generators
 - I - Current generators
 - O - Perfect A.O.P (Linear IC)
- In numerical mode :
 - Rectangular voltage generators
 - A.O.P in comparator mode (saturated)
- Calculation abilities :
 - Numerical :
 - Voltage between two nodes (oscilloscope)
 - Bode diagrams (filters)
 - Thevenin - Norton
 - Symbolical :
 - Voltage and current (in sinusoidal with L and C)
 - Transfer function (filters)
 - Thevenin - Norton (in sinusoidal with L and C)

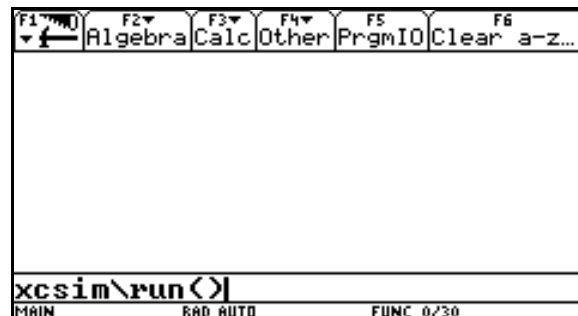
III - Installation

Send XCSIMxxx.89g or XCSIMxxx.92g to your calculator.

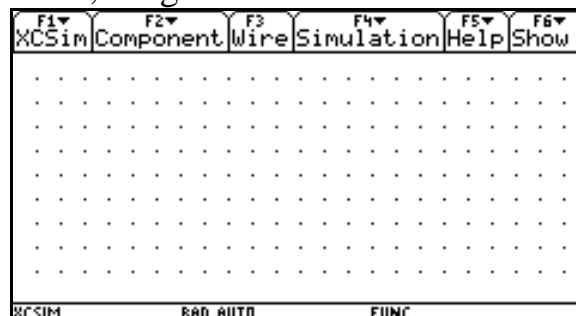
The program and his variables are in the 'XCSIM' folder. Circuits saved are located in 'XISAV' (if 'XISAV' doesn't exist, it will be created automatically).

IV - Tutorial (voltage divisor bridge)

Execute 'run' in the 'XCSIM' folder to launch XCSim :



After a few seconds, we get :



XCSim's interface is divided into a workspace to build a circuit and a toolbar to access to various features of the interface :



Main menu :

- New circuit
- Save the circuit
- Load a circuit
- Erase a saved circuit
- Useless command...



Component :

- Add a component
- Modify a component's value



Draw wire



Simulation :

- Voltage or current analysis
- Thevenin-Norton elements calculation
- Draw the Bode diagram (numerical)



Help :

- Keys summary
- Credits



Display components' values

How to build the circuit :

- F2

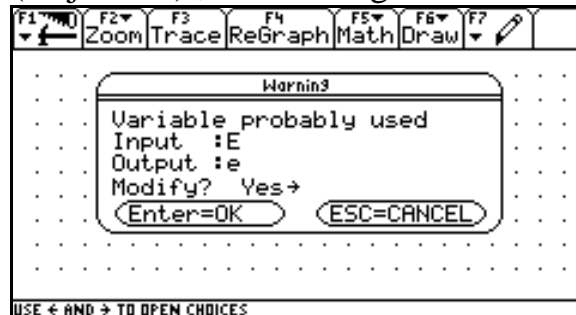
1:add

4:voltage generator

- Use arrows keys to move the component, 'HOME' (TI-89) or 'APPS' (TI-92) key to rotate it and 'ENTER' key to validate.

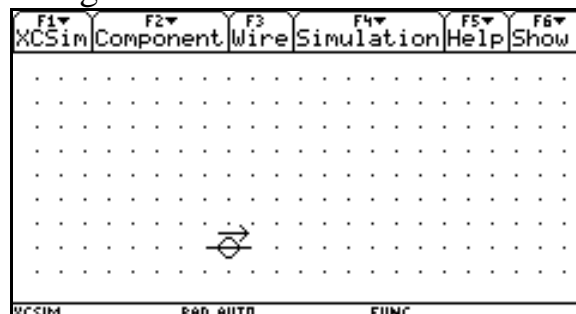
- Enter 'e' (minuscule) in the value box.

In case of 'E' (majuscule) , we would get :

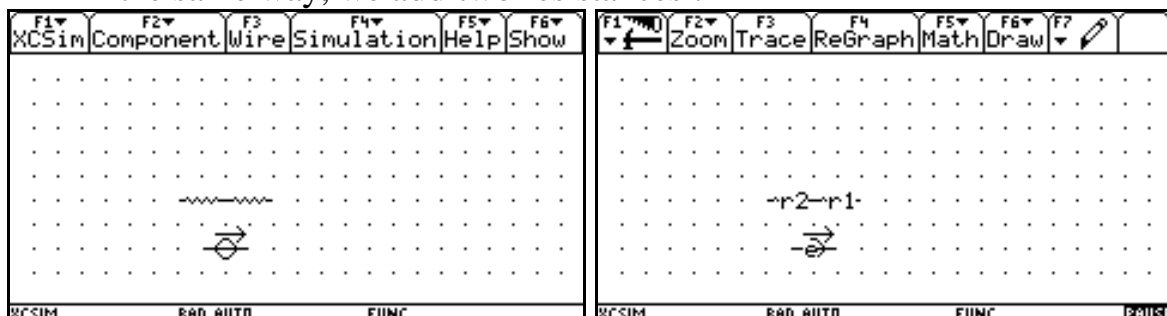


In fact, the program checks if the calculator modifies the value just entered. For example, 'E' becomes 'e', '0.1' becomes '.1'. This test prevents from using an existing or reserved variable in the 'XCSIM' folder.

So we get something like this :



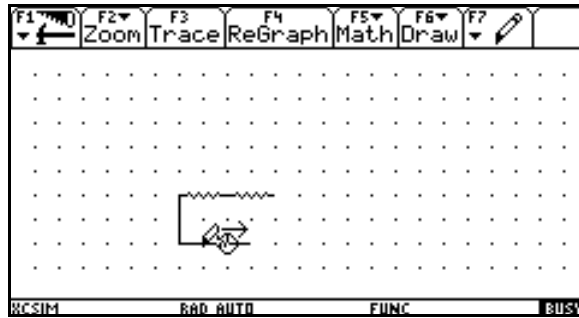
In the same way, we add two resistances :



(We get the second screen by using 'F6 : values')

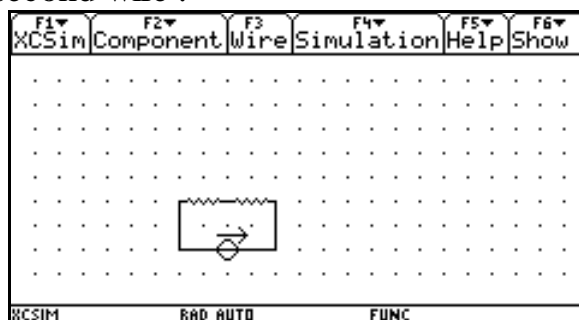
The we add wires (F3) :

- select the first point then validate
- select the second and validate



There is some limitations : the wire is first drawn vertically then horizontally (β-version !!!). But we can always draw a wire in separate pieces. Moreover, one end of the wire must be linked to another wire or a component.

We draw the second wire :



Press 'ESC' to quit the 'wire' mode, we can now save this circuit ('F1', file name limited to 7 characters).

Press 'F4' then '1' to launch the simulation.

The program does some calculations then asks if the result may be displayed in symbolical (Needed in this case, the numerical mode is a function of time, so numerical values are required...).

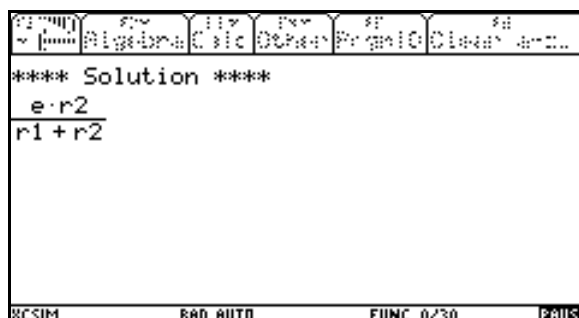
Then the program asks if it must find all solutions : in fact, the calculation becomes very slow with a large circuit.

We select 'yes' in this case (the circuit is very small and we need several measures).

The first measure is the voltage in the resistance 'R2'.

Select 'Voltage' then the positive and the negative pins of the measures.

We get :



Then we measure the current supplied by the generator :

F2

1:new

2:current

select the generator

select current's direction

Here it is :

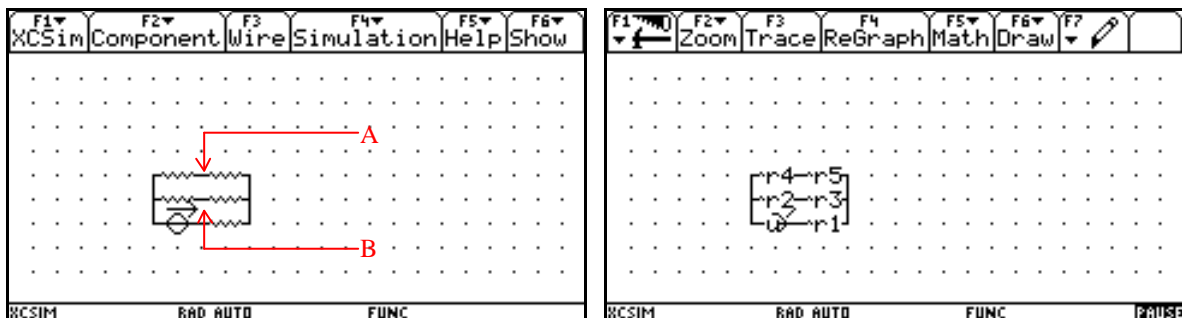
The screenshot shows the XCSIM interface with a menu bar (F1-F6) and a status bar (XCSIM, RAD AUTO, FUNC 0/20, PAUSE). The main display area shows the following text:

```
**** Solution ****  
e·r2  
r1+r2  
e  
r1+r2
```

You can try all the features of this small editor which allows to save, factor, develop the result...

V - Examples

A – Weasthone's bridge



In this example, we want to know the voltage between pins **A** and **B**. We launch CSIM in symbolical, and we get easily :

The screenshot shows the XCSIM interface with a menu bar (F1-F6) and a status bar (XCSIM, RAD AUTO, FUNC 0/20, PAUSE). The main display area shows the following text:

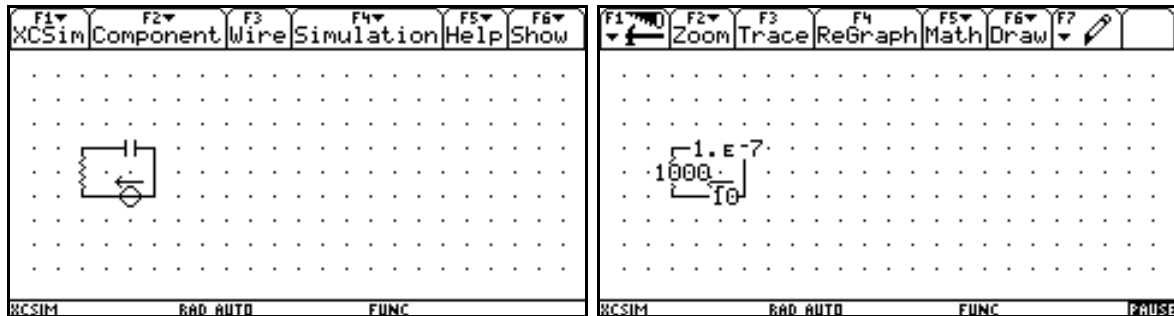
```
**** Solution ****  
-(r2·r5 - r3·r4)·u  
r1·(r2 + r3 + r4 + r5) + (r2 + r3)·(r4 + r5)
```

N.B:

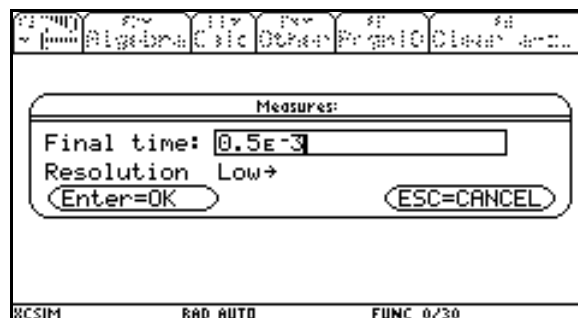
- on a TI-89 and a TI-92+, we can scroll the result with the arrows.
- obviously we can get a numerical value if we replace symbolical values by numerical ones, and we do the same manipulation (CSIM/symbolical...).

B – First example in transitional

We want to study the charge of a capacitor. So we build this circuit :

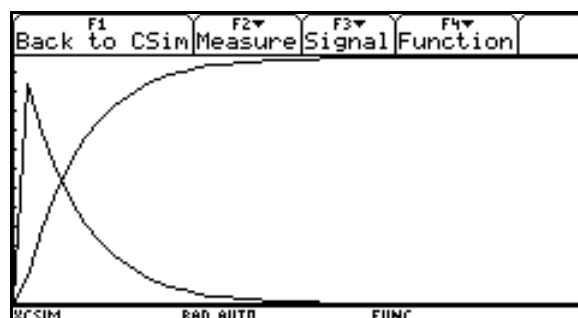


Here we launch CSim in numerical. Then the screen displays :



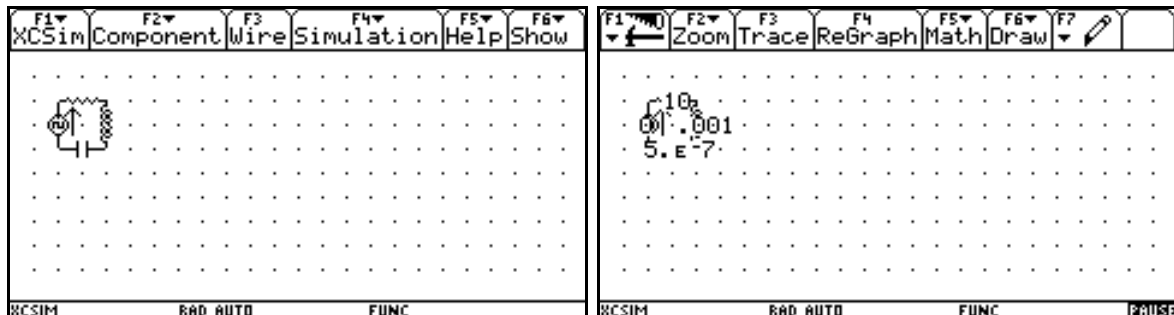
It allows to choose the final time and the display resolution. More this resolution is high more the calculator will be slow to draw the graph. Moreover, you should use '0' as initial time. Here we use 0.5ms as final time...

After a few calculations, XCSim ask the channel A and B of this virtual oscilloscope. The channel A is between the both pins of the capacitor, and the channel B, between the both pins of the resistance. So we get :



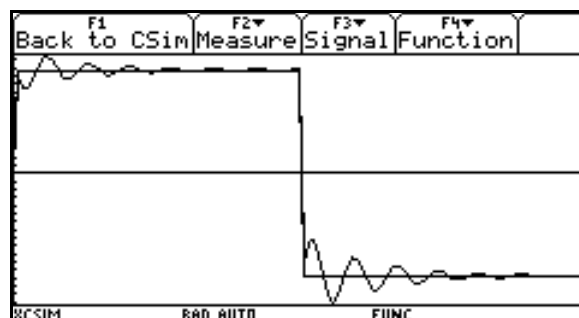
B – Second example in transitionnal

In this example we will study a R-L-C circuit with a voltage step. So we use a rectangular voltage generator. The period is 1ms, the cyclic ratio is 0.5 (square signal) and the maximum values are +10 and -10.



N.B. : It is normal that the generator's value is 0, because this is not a DC generator.

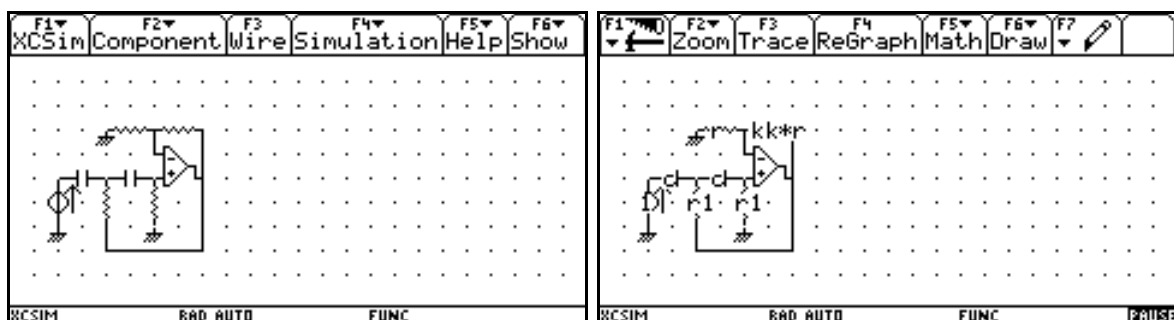
After a simulation (CSIM/numerical/final time = 1ms) we get :



N.B. : in case of rectangular voltage generator and saturated A.O.P in the circuit, the values measured in this mode are false (time and voltage) because of offsets, but it draws the true signal graph.

C – Studying a filter in symbolical

This filter was given in one of our exams. It makes us introduce a perfect A.O.P. Furthermore with an A.O.P, **you must add at least one ground**. Now the circuit :



(at the bottom, the resistances' values are r1, the first at the top is r, the second is kk*r1 and the capacitors' are C).

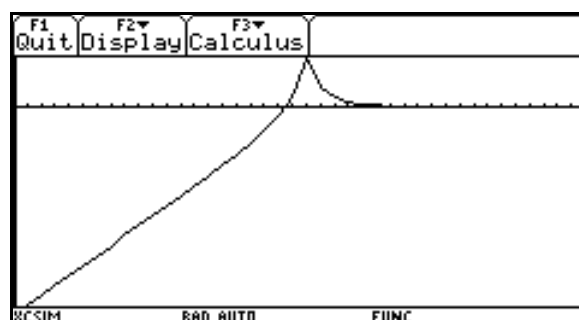
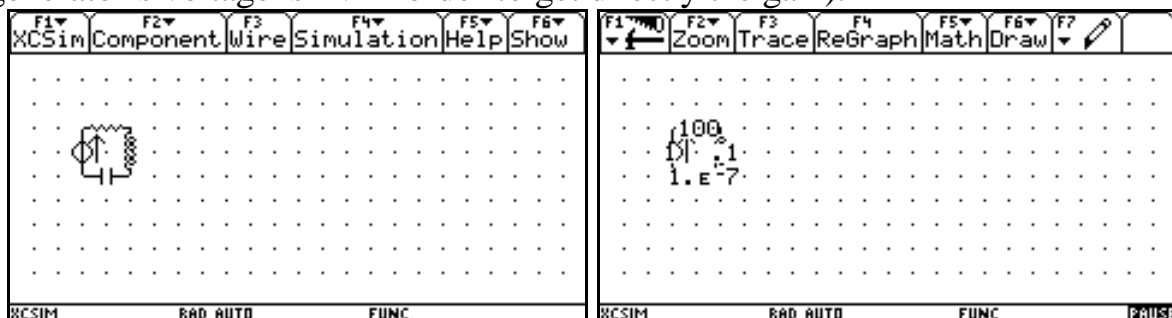
The generator's value is 1V in order to not appear in the result.

After the simulation (CSIM/Symbolical), we get at the A.O.P's output :

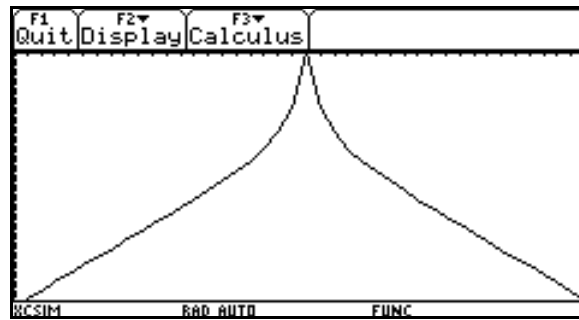
N.B.: One measure is required (the A.O.P's output is the only interesting pin).

D – Filter in numerical

We want to display a Bode diagram of a R-L-C filter (the generator's voltage is 1V in order to get directly the gain).



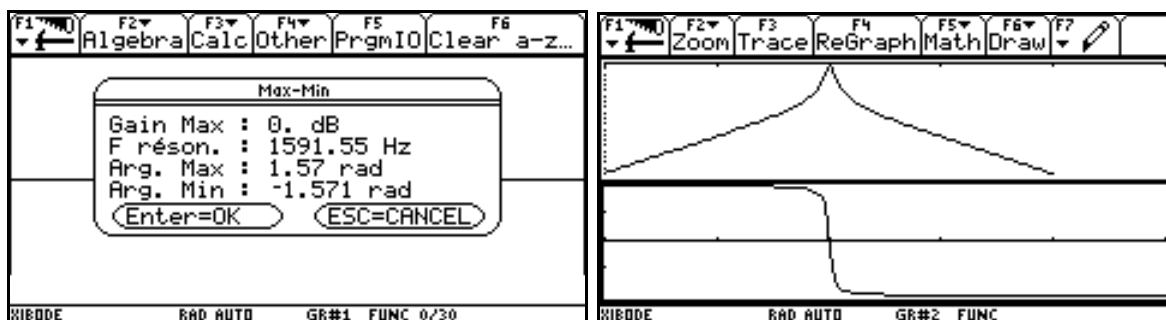
output on L



output on R

N.B. : once the simulation ended, we can use the program called 'BODE' in the 'XIBODE' folder. It can draw the gain and the argument on the same screen, measure values (use 'F3 - Trace' and select the graph by up and down arrows : the value in y is the gain (graph 'y98'), the argument (graph 'y97') and the frequency (graph 'y99')). In addition you can use all the integrated functions of the calculator (tangent, derivatives, zeros, intersection...)

Here is an example :



To shut down the splitted screen mode you can use `uninst()`...

This version is only a β of XCSim (and the documentation too !), so please be patient !

You can report us any bugs you will find...

TI-89 version and documentation :

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First official β -tester, TI-92 conversion, XBODE programmer (please be cool, it is a quickly-done first version !) and documentation translator (please excuse this poor english, I really expect comments and reports about the translation !) :

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