

# Switch circuit simulation using IRSIM

## Starting IRSIM

Starting IRSIM from c-shell: `irsim [-s] scmos2um.prm file.sim`

Starting IRSIM from Magic: `:rsim scmos2um.prm file.sim`

## Important Commands

The following is a list of the most frequently used commands in `irsim`:

`@ filename` — sources commands from file “filename”.

`ana wnode ...` — display nodes in analyzer window. Same as `analyzer`.

`vector label node1 node2 ...` — group signals in a bit vector;

– easy to set using `set` command:

```
irsim> vector C c7 c6 c5 c4 c3 c2 c1 c0
```

```
irsim> set C 10110110
```

– vectors are displayed in the analyzer as a unit.

`h wnode1 wnode2 ...` — sets nodes to logic level high (1).

`l wnode1 wnode2 ...` — sets nodes to logic level high (0).

`u wnode1 wnode2 ...` — sets nodes to logic level undefined (x).

`x wnode1 wnode2 ...` — remove nodes from being inputs (externally driven).

`inputs` — display list of nodes which are inputs (externally driven).

`d [wnode] ...` — print display list or specified node(s).

`? wnode` — prints the value of node `wnode` along with a list of the transistors that pull the node up and down.

`! wnode` — list the transistors controller by this node.

`clock [node [value]]` — define value sequence for clock node.

`s [n]` — simulate for n ns. Default is stepsize.

`c [n]` — simulate for n clock cycles (default:1).

`p` — step clock cycle one simulation step.

`stepsize [n]` — set simulation step size to ns.

`clear` — clear analyzer display. Note that signal history is not lost; a new `ana` command will display the wanted signals.

`|` — indicates that the rest of the line is a comment. Useful to temporarily deactivate a command in a source file or to add comments.

`exit` — exit the `irsim` simulation.

The arguments in square brackets are optional. The wildcard “\*” can be used to match any string of characters:

```
irsim> d c* — display all nodes that start with c
```

```
irsim> h dfnf311_*/Q_b — set all the nodes with name that start with “dfnf311_” and end in “/Q_b” to 1.
```

## Hints

- Any node (including an output) can be set using the **h,l,u** or the **set** commands. Use the command **x** to unset an output node.
- Group signals that are related (e.g., 16 bits of a register) in a vector and display it using the analyzer as a vector. Note that the same signal may be used as part of more than one vector, i.g., you may have

```
irsim> vector Mode m3 m2 m1 m0
irsim> vector Mode1 m3 m2
irsim> set Mode1 10
irsim> h m1 m0
```

- Make sure that stepsize is long enough so that there are no outstanding events to process after a **c** command.
- Reset latches (if resettable) or set (drive) all latches outputs (or inputs) to initial state as if they were inputs, (otherwise some latches may remain in an undefined state (x)) and cycle the clock (the **c** command):

```
irsim> l dfnf311_*/Q — set Q outputs of all latches of type dfnf311 to 0
irsim> h dfnf311_*/Q_b — set Q bar output of all latches of type dfnf311 to 1
irsim> c
```

where we have assumed a naming convention as given by magic and using the latch `dfnf311` from the library of standard cells. You may also try to set the latches' inputs instead. Note that some of the internal nodes of the circuit are aliased in the sim file. In order to get all the nodes that exist in the circuit invoke `irsim` with `file.al` in addition to `file.sim` (`irsim -s scos2um.prm <rootname>.sim <rootname>.al`). Once all undefined states are taken care of, remember to unset (**x** command) all the internal nodes that you set.