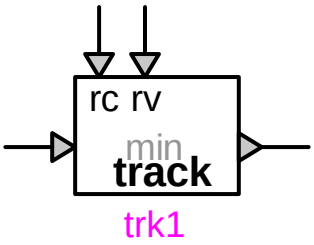
Control device: tracker

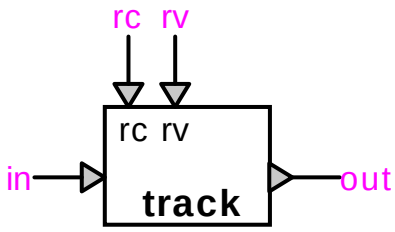


Jean Mahseredjian, 2023-05-12 04:56:00

1 Description

This device tracks the minimum or maximum value of the input signal.
When the reset control rc is >0, the output takes the reset value rv.
If the reset value signal rv is unconnected, the reset value is zero.

1.1 Pins



This device has four signal pins:

pin	*description*	*value when unconnected*
in	input	0
rc	reset control	0
rv	reset value	0
out	output	as calculated

1.2 Tracking type

Selection options for the type of tracking:

option	*value*
minimum tracking	output = tracked minimum value of input signal
maximum tracking	output = tracked maximum value of input signal

1.3 History

Selection options for the history value of the output signal:

option	*value*	*rules*
zero	Inherit from input when rc is not active, rv value otherwise	
constant value	history(t) = user-defined value	any value, 0 acts as zero, use 0.0 to get 0.
function value	history(t) = user-defined function	constant or f(t)

1.4 Scopes

Setting the scope flag enables monitoring of the output signal during the simulation.

1.5 Output signal interpolation

During the simulation, the output value of the device is calculated at successive instants t at intervals Δt. Between these simulation instants, the output value can be set to vary in one of two modes, ramped or stepped:

mode	*output value between* $t - \Delta t$ *and* t^-	*value at* t^-	*value at* t
ramped	interpolated linearly between values out($t - \Delta t$) and out(t^-)	calculated at t^-	calculated at t
stepped	remains at out($t - \Delta t$)	remains at out($t - \Delta t$)	calculated at t

2 Time-domain representation

In the time-domain calculation at t>0, the output value is calculated as follows:

$$\begin{aligned} &\text{when } rc(t) > 0, && out(t) = rv(t) \\ &\text{else} && out(t) = tracking(t) \end{aligned} \qquad (1)$$

where tracking(t) is one of the following:

option	*tracking(t)*
minimum tracking	$tracking(t) = \min(out(t - \Delta t), in(t))$
maximum tracking	$tracking(t) = \max(out(t - \Delta t), in(t))$

3 Steady-state representation

In the steady-state calculation at t=0, the output value is calculated as follows:

$$\begin{aligned} &\text{if history is defined,} && out(0) = history(0) \\ \text{else}\ &\text{if } rc(0) > 0, && out(0) = rv(0) \\ \text{else}\ & && out(0) = in(0) \end{aligned} \qquad (2)$$

4 Netlist

4.1 Netlist format for minimum tracking

Netlist format:

```
_c_smpn;name;4;4;out,in,rc,rv,
history,step/ramp,scope,
history function expression
```

field	*description*	*value*
c_smpn Name 4 4	part name instance name pin count pin count	
Out In Rc Rv	signal name of the output signal name of the input signal name of the reset control signal name of the reset value	
History	history	constant value or "H" for function
step/ramp	output interpolation	"S1" for stepped "S0" for ramped
Scope	monitoring, optional	"?s" for enabled
history function expression	optional, required when history field is “H”	

4.2 Netlist format for maximum tracking

Netlist format:

```
_c_smpx;name;4;4;out,in,rc,rv,
history,step/ramp,scope,
history function expression
```

field	*description*	*value*
c_smpx name 4 4	part name instance name pin count pin count	
out in rc rv	signal name of the output signal name of the input signal name of the reset control signal name of the reset value	
history	history	constant value or "H" for function
step/ramp	output interpolation	"S1" for stepped "S0" for ramped
scope	monitoring, optional	"?s" for enabled
history function expression	optional, required when history field is "H"	