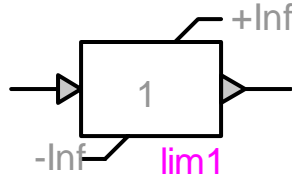


Control device : limiter

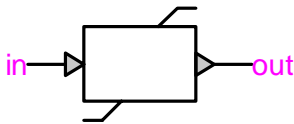


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1 Description

This device applies a gain C to the input signal, and applies low and high limits to the resulting output signal. The gain is a user-defined parameter of constant value. The limits are user-defined and can have constant or variable values. The limits are static.

1.1 Pins



This device has two signal pins:

<i>pin</i>	<i>description</i>	<i>value when unconnected</i>
in	input	0
out	output	as calculated

1.2 Gain

The gain is a user-defined constant value.

<i>parameters</i>	<i>rules</i>
gain	constant value

1.3 Limits

The low and high limits are user-defined constant or variable values.

The selection options for the low limit values are:

<i>option</i>	<i>value</i>
no limit	low limit = -infinity
constant value	low limit = user-defined value
function value	low limit = user-defined function

The selection options for the high limit values are:

<i>option</i>	<i>value</i>
no limit	low limit = +infinity
constant value	low limit = user-defined value
function value	low limit = user-defined function

1.4 History

No user-defined history is required.

1.5 Scopes

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

1.6 Output signal interpolation

During the simulation, the output value of this 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:

<i>mode</i>	<i>output value between $t - \Delta t$ and t^-</i>	<i>value at t^-</i>	<i>value at t</i>
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 a sequence of three operations:

- first, a constant gain is applied to the input value

$$\text{out1}(t) = \text{in}(t) \cdot \text{gain} \quad (1)$$
- then, the calculated value is checked against the value of the low limit

$$\text{out2}(t) = \max(\text{low}(t), \text{out1}(t)) \quad (2)$$
- then, the calculated value is checked against the value of the high limit

$$\text{out}(t) = \min(\text{high}(t), \text{out2}(t)) \quad (3)$$

The equivalent complete expression of the output value is:

$$\text{out}(t) = \min(\text{high}(t), \max(\text{low}(t), \text{in}(t) \cdot \text{gain})) \quad (4)$$

When the value of the low limit exceeds the value of the high limit, the output is given the value of the high limit without warning.

3 Steady-state representation

In the steady-state calculation at $t=0$, the output value is calculated using the same sequence of operations as above.

4 Netlist

4.1 Format

Netlist format:

```
_c_lim;name;2;2;out,in,
high,low,gain,step/ramp,scope,
high limit function expression
;
low limit function expression
```

<i>field</i>	<i>description</i>	<i>value</i>
c_lim name 2 2	part name instance name pin count pin count	
out in	signal name of the output signal name of the input	
high	high limit	constant value or "H" for function
low	low limit	constant value or "L" for function
gain	gain value	any value
step/ramp	output interpolation	"S1" for stepped "S0" for ramped
scope	Monitoring, optional	"?s" for enabled
high limit function expression	optional, required when high limit field is "H"	
;	optional, required when both the line above and the line below are present	
low limit function expression	optional, required when low limit field is "L"	