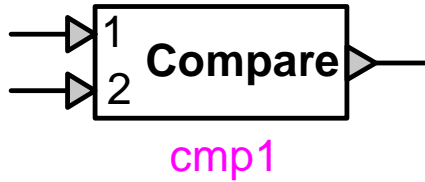


# Control device: comparator



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## 1 Description

This control device compares the input signal to a reference signal. The output is  $-1$ ,  $0$ , or  $1$  depending on whether the input is less than, equal to, or greater than the reference.

### 1.1 Pins



This device has three signal pins:

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

### 1.2 Parameters

No user-defined parameters are required.

### 1.3 History

Selection options for the history value of the output signal:

<i>option</i>	<i>value</i>	<i>rules</i>
zero	Inherit from input	any value, 0 means inherit, use 0.0 to get 0 constant or f(t)
constant value	history(t) = user-defined value	
function value	history(t) = user-defined function	

### 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  $\Delta t$ . 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 <math>t - \Delta t</math> and <math>t^-</math></i>	<i>value at <math>t^-</math></i>	<i>value at <math>t</math></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 follows:

$$\begin{aligned}
 &\text{when } in(t) < ref(t) \text{ then } out(t) = -1 \\
 &\text{when } in(t) = ref(t) \text{ then } out(t) = 0 \\
 &\text{when } in(t) > ref(t) \text{ then } out(t) = 1
 \end{aligned}
 \tag{1}$$

## 3 Steady-state representation

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

$$\begin{aligned}
 &\text{if history is defined then } out(0) = history(0) \\
 &\text{else if } in(0) < ref(0) \text{ then } out(0) = -1 \\
 &\text{else if } in(0) = ref(0) \text{ then } out(0) = 0 \\
 &\text{else } out(0) = 1
 \end{aligned}
 \tag{2}$$

## 4 Netlist

### 4.1 Format

Multi-line Netlist format:

```
_c_cmp;name;3;3;out,in,ref,  
history,step/ramp,scope,  
history function expression
```

<i>field</i>	<i>description</i>	<i>value</i>
c_cmp	part name	
name	instance name	
3	pin count	
3	pin count	
out	signal name of the output	
in	signal name of the input	
ref	signal name of the reference	
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"	

The comma separated data is saved into the ParamsA attribute of this device. The **history function expression** is saved into the ModelData attribute.