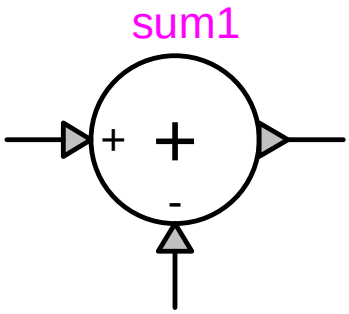
Control device : sum

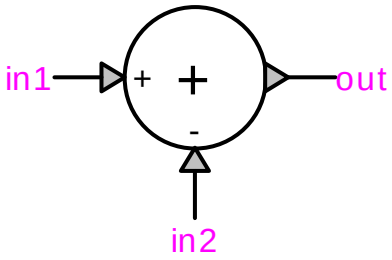


Control device : sum 1
1 Description 1
1.1 Pins 1
1.2 Signs 2
1.3 History 2
1.4 Scopes 2
1.5 Output signal interpolation 2
2 Time-domain representation 3
3 Steady-state representation 3
4 Netlist 3
4.1 Format 3

1 Description

The output of this control device is the signed sum of its inputs. The input signs are user-defined parameters.

1.1 Pins



This device has two or more signal pins:

pin	*description*	*value when unconnected*
in1	input 1	0
...	more inputs	0
out	output	as calculated

1.2 Signs

The sign of each input is user-defined as + or -. The sign indicates whether the input value is added to or subtracted from the total (equivalent to a coefficient of value +1 or –1). The number of inputs is derived from the number of specified signs.

parameters	*rules*
signs	space-separated list of "+" and "-"
count of signs	$1 \le n \le 32$

1.3 History

Selection options for the history value of the output signal:

option	*value*	*rules*
zero	Inherit from inputs	
constant value	history(t) = user-defined value	any value, 0 means inherit, 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 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:

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:

$$out(t) = \sum_{k=1}^{n} (coef_k \cdot in_k(t)) \qquad (1)$$

where

n	count of inputs
coef	+1 for + sign
	-1 for - sign

3 Steady-state representation

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

if history is defined, $out(0) = history(0)$

else $out(0) = \sum_{k=1}^{n} (coef_k \cdot in_k(0))$ (2)

where

n	count of inputs
coef	+1 for + sign
	-1 for - sign

4 Netlist

4.1 Format

Netlist format:

```
_c_sum;name;npins;npins;out,list(inputs),
history,1,step/ramp,scope,
history function expression
;
list of input coefficients
```

field	*description*	*value*
c_sum	part name	
name	instance name	
npins	pin count	1+count(inputs)
npins	pin count	1+count(inputs)
out	signal name of the output	
list(inputs)	signal names of the inputs	
history	history	constant value or "H" for function
1	fixed gain	1
step/ramp	calculation mode	"S1" for stepped "S0" for ramped
scope	monitoring, optional	"?s" for enabled
history function expression	optional, required when history field is "H"	
;	required separator when history function expression is present	
list of input coefficients	space-separated list of input coefficients	