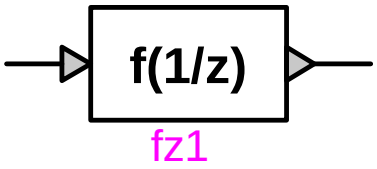
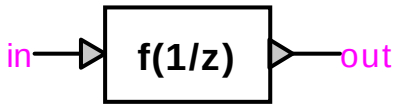
Control device : f(1/z)



1 Description

This device applies a 1/z transfer function to the input signal.

1.1 Pins



This device has two signal pins:

pin	*description*	*value when unconnected*
in	input	0
out	output	as calculated

1.2 Gain

The function gain is a user-defined constant value.

1.3 Function parameters

The parameters of the function can be specified in three ways:

coefficients of the numerator and denominator polynomials in increasing order of 1/z
coefficients of the numerator and denominator polynomials in decreasing order of 1/z
zeros and poles of the 1/z function

In either case, the parameters are provided as a space-separated list of values for each the numerator and the denominator.

1.4 History

Selection options for the history value of the output signal:

option	*value*	*rules*
zero	history(t) = zero	
constant value	history(t) = user-defined value	any value
function value	history(t) = user-defined function	constant or f(t)

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:

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, this device calculates the incremental value of the filtered input over the interval Δt by applying the specified function to the present and past values of the input and output signals.

This device responds correctly to discontinuities encountered in the value of the input between t^- and t.

$$out(t) = f(z^{-1}) \cdot in(t) \qquad (1)$$

3 Steady-state representation

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

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

4 Netlist

4.1 Format

Netlist format:

```
_c_fs;name;2;2;out,in,
history,kind,numcount,dencount,gain,step/ramp,scope,
history function expression
;
numerator parameters
;
denominator parameters
```

field	*description*	*value*
c_fz name 2 2	part name instance name pin count pin count	
out in	signal name of the output signal name of the input	
history	history	constant value or "H" for function
kind	kind of parameters	"1" for increasing order of 1/z "2" for decreasing order of 1/z "3" for polynomial roots
numcount	count of numerator coefficients	>0
dencount	count of denominator coefficients	>0
gain	function gain	
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", followed by “;” when present	
numerator parameters	numerator parameters, followed by “;”	
denominator parameters	denominator parameters	

The comma separated data is saved into the ParamsA attribute of this device. The remaining data is saved into the ModelData attribute.