

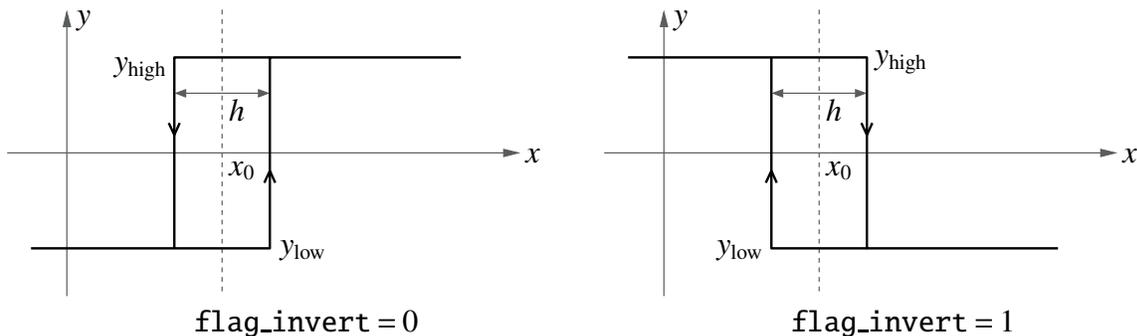
cmprh_1_1.xbe

Attributes

```
xbe name=cmprh_1_1 evaluate=yes limit_tstep=yes save_history=yes
# if  $x > x_0 \pm h/2$ ,  $y = \text{high}$ , else low
# (reverse if flag_inverting=1)
# h is the hysteresis band, centred around  $x_0$ 
Jacobian: variable
input_vars: x
output_vars: y
aux_vars:
iparms:
+ flag_invert=0
+ flag_quad=0
sparms:
rparms:
+  $x_0=0$ 
+  $y_{\text{low}}=0$ 
+  $y_{\text{high}}=1$ 
+  $h=0.1$ 
+  $x_1=0$ 
+  $x_2=0$ 
+  $t_1=0$ 
+  $t_2=0$ 
+  $\text{eps1}=1.0\text{e-}6$ 
+  $\text{delt\_min}=1.0\text{e-}6$ 
+  $\text{delt\_nrml}=0.001$ 
+  $\text{hby2}=0$ 
+  $y_{\text{old}}=0$ 
+  $y_{\text{half}}=0$ 
stparms:
igparms:
outparms: x y
```

Description

cmprh_1_1.xbe is a comparator with hysteresis. Its input-output relationship is shown below.



The parameters `delt_min`, `delt_nrml`, and `eps1` are used for controlling the simulator time steps. Additional time points are forced, depending on the values of `delt_min` and `delt_nrml`, when x is within ϵ of the threshold point ($x_0 + h/2$ or $x_0 - h/2$). This feature allows accurate simulation without having to make the average time step very small. Generally, `delt_nrml` should be made equal to the typical simulator time step while `delt_min` should be made much smaller (say, by a factor of 100).

`flag_quad` decides the type of interpolation used to estimate the cross-over time. If `flag_quad` is 0, linear interpolation is used; if it is 1, quadratic interpolation is used. For more details, see Ref. [1].

References

1. M.B. Patil, R.D. Korgaonkar, K. Appaiah, "GSEIM: A General-purpose Simulator with Explicit and Implicit Methods," submitted to *Sādhanā*, also available at <https://arxiv.org/abs/2104.06621>