

## 1 Variables

### 2 root

	var	symbol	documentation	type	units	tokens	eqs
13	$F_{N,A}$	<b>F</b>	directed graph incidence matrix	network		[]	
1	$t_N$	<b>t</b>	time	frame	$s$	[]	
3	$t_N^o$	<b>to</b>	starting time	frame	$s$	[]	1
4	$t_N^e$	<b>te</b>	end time	frame	$s$	[]	2
2	$\#$	<b>value</b>	numerical value	constant		[]	
18	0	<b>null</b>	numerical value 0	constant		[]	16
19	1	<b>one</b>	numerical value 1	constant		[]	17

## 3 System

	var	symbol	documentation	type	units	tokens	eqs
5	$x_N$	<b>x</b>	state - length	state	$m$	[]	13
11	$\pi_N^a$	<b>pi_a</b>	effort a	state	$m$	[]	7 14
12	$\pi_N^b$	<b>pi_b</b>	effort b	state	$m$	[]	8 15
14	$\hat{x}_N^a$	<b>fx_a</b>	flow of x mechanism a	state	$ms^{-1}$	[]	9
15	$\hat{x}_N^b$	<b>fx_b</b>	flow of x mechanism b	state	$ms^{-1}$	[]	10
16	$\dot{x}_N$	<b>dx</b>	differential state	state	$ms^{-1}$	[]	11 18
17	$x_N^o$	<b>xo</b>	initial condition	state	$m$	[]	12
20	$\pi_N$	<b>pi_stack</b>	the stack of intensive variables	state	$m$	[]	19
7	$K_N$	<b>K</b>	frequency a	constant	$s^{-1}$	[]	3
8	$L_N$	<b>L</b>	frequency b	constant	$s^{-1}$	[]	4

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	var	symbol	documentation	type	units	tokens	eqs
9	$M$	M	gain a	constant		[]	5
10	$N$	N	gain b	constant		[]	6

## 4 Properties

	var	symbol	documentation	type	units	tokens	eqs
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## 5 Control

	var	symbol	documentation	type	units	tokens	eqs
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## 6 System-Properties

	var	symbol	documentation	type	units	tokens	eqs
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## 7 Properties-System

	var	symbol	documentation	type	units	tokens	eqs
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## 8 System-Control

	var	symbol	documentation	type	units	tokens	eqs
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## 9 Control-System

	var	symbol	documentation	type	units	tokens	eqs
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## 10 Properties–Control

	var	symbol	documentation	type	units	tokens	eqs
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## 11 Control–Properties

	var	symbol	documentation	type	units	tokens	eqs
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## 12 Equations

### 12.1 Model equations

no	equation	documentation	layer
1	$t_N^o := Set(t_N, \#)$	starting time	root
2	$t_N^e := Set(t_N, \#)$	end time	root
3	$K_N := Set((t_N)^{-1}, \#)$	frequency a	System
4	$L_N := Set((t_N)^{-1}, \#)$	frequency b	System
5	$M := Set(\#, \#)$	gain a	System
6	$N := Set(\#, \#)$	gain b	System
7	$\pi_N^a := M \cdot x_N$	effort a	System
8	$\pi_N^b := N \cdot x_N$	effort b	System
9	$\hat{x}_N^a := F_{N,A} \overset{A}{\star} \left( K_N \cdot F_{N,A} \overset{N}{\star} \pi_N^a \right)$	flow of x mechanism a	System
10	$\hat{x}_N^b := F_{N,A} \overset{A}{\star} \left( L_N \cdot F_{N,A} \overset{N}{\star} \pi_N^b \right)$	flow of x mechanism b	System
11	$\dot{x}_N := \hat{x}_N^a + \hat{x}_N^b$	differential state	System
12	$x_N^o := Set(x_N, \#)$	initial condition	System
13	$x_N := \int_{t_N^o}^{t_N^e} \dot{x}_N \, dt + x_N^o$	state - length	System
14	$\pi_N^a := Set(\pi_N^a, \#)$	effort a	System
15	$\pi_N^b := Set(\pi_N^b, \#)$	effort b	System
16	$0 := Set(\#, \#)$	numerical value 0	root

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no	equation	documentation	layer
17	$1 := Set(\#, \#)$	numerical value 1	root
18	$\dot{x}_N := Set(\dot{x}_N, 0)$	differential state	System
19	$\underline{\pi}_N := Stack(\pi^a_N, \pi^b_N)$	the stack of intensive variables	System