1 Variables

2 root

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

3 System

	var	symbol	documentation	type	units	tokens	eqs
28	${\hat{x}^{A,\alpha}}_A$	`fx_A_alpha`	flow of A mechanism alpha	transport	ms^{-1}	[]	28
29	${\hat{x}^{A,\beta}}_A$	`fx_A_beta`	flow of A mechanism beta	transport	ms^{-1}	[]	29
32	${\hat{y}^{B,\gamma}}_A$	`fy_B_gamma`	flow of B mechanism gamma	transport	s^{-1}	[]	31
35	${\hat{y}^{B,\delta}}_A$	`fy_B_delta`	flow of B mechanism delta	transport	s^{-1}	[]	34
5	x_N	`x`	state token A	state	m	[]	38
11	${\pi^{A,\alpha}}_N$	`pi_A_alpha`	effort A mechanism alpha	state	m	[]	7 14
12	${\pi^{A,\beta}}_N$	`pi_A_beta`	effort A mechanism beta	state	m	[]	8 15
16	$\dot{x}_N$	`dx`	differential state	state	ms^{-1}	[]	18 37
17	${x^o}_N$	`xo`	initial condition for token A	state	m	[]	12
20	${\underline{\pi}^A}_N$	`pi_A_stack`	the stack of intensive variables token A	state	m	[]	19

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	var	symbol	documentation	type	units	tokens	eqs
21	y_N	`y`	state token B	state		[]	39
24	${\pi^{B,\gamma}}_N$	`pi_B_gamma`	effort B mechanism gamma	state		[]	23
26	$\dot{y}_N$	`dy`	differential state for token B	state	s^{-1}	[]	35 36
27	${y^o}_N$	`yo`	initial condition for token B	state		[]	26
33	${\pi^{B,\delta}}_N$	`pi_B_delta`	effort B mechansim delta	state		[]	32
7	${K^{A,\alpha}}_N$	`K_A_alpha`	frequency A alpha	constant	s^{-1}	[]	3
8	${K^{A,\beta}}_N$	`K_A_beta`	frequency A beta	constant	s^{-1}	[]	4
9	$M^{A,\alpha}$	`M_A_alpha`	gain a	constant		[]	5
10	$M^{A,\beta}$	`M_A_beta`	gain b	constant		[]	6
22	$M^{B,\gamma}$	`M_B_gamma`	gain B gamma	constant		[]	
23	${K^{B,\gamma}}_N$	`K_B_gamma`	frequency B gamma	constant	s^{-1}	[]	22
30	${K^{B,\delta}}_N$	`K_B_delta`	frequency B delta	constant	s^{-1}	[]	30
31	$M^{B,\delta}$	`M_B_delta`	gain B delta	constant		[]	

4 Properties

	var	symbol	documentation	type	units	tokens	eqs

5 Control

	var	symbol	documentation	type	units	tokens	eqs

6 System–Properties

	var	symbol	documentation	type	units	tokens	eqs

7 Properties–System

	var	symbol	documentation	type	units	tokens	eqs

8 System–Control

	var	symbol	documentation	type	units	tokens	eqs

9 Control–System

	var	symbol	documentation	type	units	tokens	eqs

10 Properties–Control

	var	symbol	documentation	type	units	tokens	eqs

11 Control–Properties

	var	symbol	documentation	type	units	tokens	eqs

12 Equations

12.1 Model equations

no	equation	documentation	layer
1	${t^o}_N := Set(t_N, \#)$	starting time	root
2	${t^e}_N := Set(t_N, \#)$	end time	root
3	${K^{A,\alpha}}_N := Set((t_N)^{-1}, \#)$	frequency a	System
4	${K^{A,\beta}}_N := Set((t_N)^{-1}, \#)$	frequency b	System
5	$M^{A,\alpha} := Set(\#, \#)$	gain a	System
6	$M^{A,\beta} := Set(\#, \#)$	gain b	System
7	${\pi^{A,\alpha}}_N := M^{A,\alpha} . x_N$	effort a	System
8	${\pi^{A,\beta}}_N := M^{A,\beta} . x_N$	effort b	System
12	${x^o}_N := Set(x_N, \#)$	initial condition	System
14	${\pi^{A,\alpha}}_N := Set({\pi^{A,\alpha}}_N, \#)$	effort a	System
15	${\pi^{A,\beta}}_N := Set({\pi^{A,\beta}}_N, \#)$	effort b	System
16	$0 := Set(\#, \#)$	numerical value 0	root
17	$1 := Set(\#, \#)$	numerical value 1	root
18	$\dot{x}_N := Set(\dot{x}_N, 0)$	differential state	System
19	${\underline{\pi}^A}_N := Stack\left({\pi^{A,\alpha}}_N, {\pi^{A,\beta}}_N\right)$	the stack of intensive variables	System
22	${K^{B,\gamma}}_N := Set((t_N)^{-1}, \#)$	frequency B alpha	System

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no	equation	documentation	layer
23	$\pi^{B,\gamma}{}_N := M^{B,\gamma} \,.\, y_N$	transport of B mechanism gamma	System
26	$y^o{}_N := Set(y_N, \#)$	initial condition for token B	System
28	$\hat{x}^{A,\alpha}{}_A := K^{A,\alpha}{}_N \,.\, F_{N,A} \overset{N}{\star} \pi^{A,\alpha}{}_N$	flow of A mechanism alpha	System
29	$\hat{x}^{A,\beta}{}_A := K^{A,\beta}{}_N \,.\, F_{N,A} \overset{N}{\star} \pi^{A,\beta}{}_N$	flow of A mechanism beta	System
30	$K^{B,\delta}{}_N := Set((t_N)^{-1}, \#)$	var doc : frequency B delta	System
31	$\hat{y}^{B,\gamma}{}_A := K^{B,\gamma}{}_N \,.\, F_{N,A} \overset{N}{\star} \pi^{B,\gamma}{}_N$	flow of B mechanism gamma	System
32	$\pi^{B,\delta}{}_N := M^{B,\delta} \,.\, y_N$	effort B mechansim delta	System
34	$\hat{y}^{B,\delta}{}_A := K^{B,\delta}{}_N \,.\, F_{N,A} \overset{N}{\star} \pi^{B,\delta}{}_N$	flow of B mechanism delta	System
35	$\dot{y}_N := F_{N,A} \overset{A}{\star} \hat{y}^{B,\gamma}{}_A + F_{N,A} \overset{A}{\star} \hat{y}^{B,\delta}{}_A$	differential state for token B	System
36	$\dot{y}_N := Set(\dot{y}_N, \#)$	differential state for token B	System
37	$\dot{x}_N := F_{N,A} \overset{A}{\star} \hat{x}^{A,\alpha}{}_A + F_{N,A} \overset{A}{\star} \hat{x}^{A,\beta}{}_A$	differential state	System
38	$x_N := \int_{t^o{}_N}^{t^e{}_N} \dot{x}_N \;\; d\,t_N$	state token A	System
39	$y_N := \int_{t^o{}_N}^{t^e{}_N} \dot{y}_N \;\; d\,t_N$	state token B	System