

section *air_Controller* parents *stateflow_toolkit*

s_Off3, s_On4, s_FAN2, s_SpeedValue, s_Off7, s_On8, s_FAN1, s_PowerOn, s_PowerOff, c_Controller : SID

t_On8_Off7, t_Off7_On8, t_PowerOff_PowerOn, t_default_PowerOff, t_PowerOn_PowerOff, t_On4_Off3, t_Off3_On4, t_default_Off3, t_default_Off7 : TID

C_Controller : State

$$C_Controller = \left(\begin{array}{l} \langle identifier == c_Controller, \\ default == t_default_PowerOff, \\ inner == nulltransition.identifier, \\ outer == nulltransition.identifier, \\ parent == nullstate.identifier, \\ left == nullstate.identifier, \\ right == nullstate.identifier, \\ substates == \langle s_PowerOn, s_PowerOff \rangle, \\ decomposition == CLUSTER, \\ type == CHART, \\ history == \mathbf{False} \rangle \end{array} \right)$$

S_Off3 : State

$$S_Off3 = \left(\begin{array}{l} \langle identifier == s_Off3, \\ default == nulltransition.identifier, \\ inner == nulltransition.identifier, \\ outer == t_Off3_On4, \\ parent == s_FAN2, \\ left == nullstate.identifier, \\ right == nullstate.identifier, \\ substates == \langle \rangle, \\ decomposition == CLUSTER, \\ type == OR, \\ history == \mathbf{False} \rangle \end{array} \right)$$

S_On4 : State

$$S_On4 = \left(\begin{array}{l} \langle identifier == s_On4, \\ default == nulltransition.identifier, \\ inner == nulltransition.identifier, \\ outer == t_On4_Off3, \\ parent == s_FAN2, \\ left == nullstate.identifier, \\ right == nullstate.identifier, \\ substates == \langle \rangle, \\ decomposition == CLUSTER, \\ type == OR, \\ history == \mathbf{False} \rangle \end{array} \right)$$

S_FAN2 : State

$$S_FAN2 = \left(\begin{array}{l} \langle identifier == s_FAN2, \\ default == t_default_Off3, \\ inner == nulltransition.identifier, \\ outer == nulltransition.identifier, \\ parent == s_PowerOn, \\ left == s_FAN1, \\ right == s_SpeedValue, \\ substates == \langle s_Off3, s_On4 \rangle, \\ decomposition == CLUSTER, \\ type == AND, \\ history == \mathbf{False} \rangle \end{array} \right)$$

S_SpeedValue : State

$$S_SpeedValue = \left(\begin{array}{l} \langle identifier == s_SpeedValue, \\ default == nulltransition.identifier, \\ inner == nulltransition.identifier, \\ outer == nulltransition.identifier, \\ parent == s_PowerOn, \\ left == s_FAN2, \\ right == nullstate.identifier, \\ substates == \langle \rangle, \\ decomposition == CLUSTER, \\ type == AND, \\ history == \mathbf{False} \rangle \end{array} \right)$$

S_Off7 : State

$$S_Off7 = \left(\begin{array}{l} \langle identifier == s_Off7, \\ default == nulltransition.identifier, \\ inner == nulltransition.identifier, \\ outer == t_Off7_On8, \\ parent == s_FAN1, \\ left == nullstate.identifier, \\ right == nullstate.identifier, \\ substates == \langle \rangle, \\ decomposition == CLUSTER, \\ type == OR, \\ history == \mathbf{False} \rangle \end{array} \right)$$

S_On8 : State

$$S_On8 = \left(\begin{array}{l} \langle identifier == s_On8, \\ default == nulltransition.identifier, \\ inner == nulltransition.identifier, \\ outer == t_On8_Off7, \\ parent == s_FAN1, \\ left == nullstate.identifier, \\ right == nullstate.identifier, \\ substates == \langle \rangle, \\ decomposition == CLUSTER, \\ type == OR, \\ history == \mathbf{False} \rangle \end{array} \right)$$

S_FAN1 : State

$$S_FAN1 = \left(\begin{array}{l} \langle identifier == s_FAN1, \\ default == t_default_Off7, \\ inner == nulltransition.identifier, \\ outer == nulltransition.identifier, \\ parent == s_PowerOn, \\ left == nullstate.identifier, \\ right == s_FAN2, \\ substates == \langle s_Off7, s_On8 \rangle, \\ decomposition == CLUSTER, \\ type == AND, \\ history == \mathbf{False} \rangle \end{array} \right)$$

S_PowerOn : State

$$S_PowerOn = \left(\begin{array}{l} \langle identifier == s_PowerOn, \\ default == nulltransition.identifier, \\ inner == nulltransition.identifier, \\ outer == t_PowerOn_PowerOff, \\ parent == c_Controller, \\ left == nullstate.identifier, \\ right == nullstate.identifier, \\ substates == \langle s_FAN1, s_FAN2, s_SpeedValue \rangle, \\ decomposition == SET, \\ type == OR, \\ history == \mathbf{False} \rangle \end{array} \right)$$

S_PowerOff : State

$$S_PowerOff = \left(\begin{array}{l} \langle identifier == s_PowerOff, \\ default == nulltransition.identifier, \\ inner == nulltransition.identifier, \\ outer == t_PowerOff_PowerOn, \\ parent == c_Controller, \\ left == nullstate.identifier, \\ right == nullstate.identifier, \\ substates == \langle \rangle, \\ decomposition == CLUSTER, \\ type == OR, \\ history == \mathbf{False} \rangle \end{array} \right)$$

T_On8_Off7 : Transition

$$T_On8_Off7 = \left(\begin{array}{l} \langle identifier == t_On8_Off7, \\ source == snode(s_On8), \\ destination == snode(s_Off7), \\ next == nulltransition.identifier, \\ parent == s_FAN1 \rangle \end{array} \right)$$

T_Off7-On8 : Transition

$$T_Off7_On8 = \left(\begin{array}{l} \langle identifier == t_Off7_On8, \\ source == snode(s_Off7), \\ destination == snode(s_On8), \\ next == nulltransition.identifier, \\ parent == s_FAN1 \rangle \end{array} \right)$$

T_PowerOff_PowerOn : Transition

$$T_PowerOff_PowerOn = \left(\begin{array}{l} \langle identifier == t_PowerOff_PowerOn, \\ source == snode(s_PowerOff), \\ destination == snode(s_PowerOn), \\ next == nulltransition.identifier, \\ parent == c_Controller \rangle \end{array} \right)$$

T_default_PowerOff : Transition

$$T_default_PowerOff = \left(\begin{array}{l} \langle identifier == t_default_PowerOff, \\ source == snode(nullstate.identifier), \\ destination == snode(s_PowerOff), \\ next == nulltransition.identifier, \\ parent == c_Controller \rangle \end{array} \right)$$

T_PowerOn_PowerOff : Transition

$$T_PowerOn_PowerOff = \left(\begin{array}{l} \langle identifier == t_PowerOn_PowerOff, \\ source == snode(s_PowerOn), \\ destination == snode(s_PowerOff), \\ next == nulltransition.identifier, \\ parent == c_Controller \rangle \end{array} \right)$$

T_On4_Off3 : Transition

$$T_On4_Off3 = \left(\begin{array}{l} \langle identifier == t_On4_Off3, \\ source == snode(s_On4), \\ destination == snode(s_Off3), \\ next == nulltransition.identifier, \\ parent == s_FAN2 \rangle \end{array} \right)$$

T_Off3_On4 : Transition

$$T_Off3_On4 = \left(\begin{array}{l} \langle identifier == t_Off3_On4, \\ source == snode(s_Off3), \\ destination == snode(s_On4), \\ next == nulltransition.identifier, \\ parent == s_FAN2 \rangle \end{array} \right)$$

T_default_Off3 : Transition

$$T_default_Off3 = \left(\begin{array}{l} \langle identifier == t_default_Off3, \\ source == snode(nullstate.identifier), \\ destination == snode(s_Off3), \\ next == nulltransition.identifier, \\ parent == s_FAN2 \rangle \end{array} \right)$$

T_default_Off7 : Transition

$$T_default_Off7 = \left(\begin{array}{l} \langle identifier == t_default_Off7, \\ source == snode(nullstate.identifier), \\ destination == snode(s_Off7), \\ next == nulltransition.identifier, \\ parent == s_FAN1 \rangle \end{array} \right)$$

e_SWITCH, e_CLOCK : EVENT

channel $o_airflow : \mathbb{N}; i_temp : \mathbb{R}$

process $P_Controller \hat{=} \mathbf{begin}$

StateflowChart

$identifier = c_Controller$

$states = \{(c_Controller, C_Controller), (s_Off3, S_Off3), (s_On4, S_On4), (s_FAN2, S_FAN2),$
 $(s_SpeedValue, S_SpeedValue), (s_Off7, S_Off7), (s_On8, S_On8), (s_FAN1, S_FAN1),$
 $(s_PowerOn, S_PowerOn), (s_PowerOff, S_PowerOff)\}$

$transitions = \{(t_On8_Off7, T_On8_Off7), (t_Off7_On8, T_Off7_On8),$
 $(t_PowerOff_PowerOn, T_PowerOff_PowerOn), (t_default_PowerOff, T_default_PowerOff),$
 $(t_PowerOn_PowerOff, T_PowerOn_PowerOff), (t_On4_Off3, T_On4_Off3),$
 $(t_Off3_On4, T_Off3_On4), (t_default_Off3, T_default_Off3), (t_default_Off7, T_default_Off7)\}$

$junctions = \{\}$

SimulationInstance

$v_airflow : \mathbb{N}$

$v_temp : \mathbb{R}$

InitSimulationInstance

SimulationInstance'

$v_airflow' = 0$

$v_temp' = 0$

SimulationData

$state_status : SID \rightarrow \mathbb{B}$

$state_history : SID \rightarrow SID$

$\text{dom } state_status = \text{dom } states$

$\text{dom } state_history = \{j : \text{ran } junctions \mid j.history = \mathbf{True} \bullet j.parent\}$

$\forall s : \text{ran } states \mid s.decomposition = \mathbf{CLUSTER} \bullet \#\{ss : \text{ran } s.substates \mid state_status(ss) = \mathbf{True}\} \leq 1$

InitSimulationData

SimulationData'

$state_status' = \{n : \text{dom } states \bullet n \mapsto \mathbf{False}\}$

$state_history' = \{n : \text{dom } state_history' \bullet n \mapsto nullstate.identifier\}$

ActivateNoHistory

$\Delta SimulationData$

$x? : SID$

$x? \in \text{dom } state_status$

$(parent(state_status\ x?)).history = \mathbf{False}$

$state_history' = state_history$

$state_status' = state_status \oplus \{x? \mapsto \mathbf{True}\}$

ActivateWithHistory

$\Delta SimulationData$
 $x? : SID$

$x? \in \text{dom } state_status$
 $(parent (states x?)).history = \mathbf{True}$
 $state_history' = state_history \oplus \{((states x?).parent) \mapsto x?\}$
 $state_status' = state_status \oplus \{x? \mapsto \mathbf{True}\}$

$Activate == (ActivateWithHistory \vee ActivateNoHistory) \wedge \exists SimulationInstance$

Deactivate

$\Delta SimulationData$
 $\exists SimulationInstance$
 $x? : SID$

$x? \in \text{dom } state_status$
 $state_history' = state_history$
 $state_status' = state_status \oplus \{x? \mapsto \mathbf{False}\}$

$InitState == (InitSimulationInstance) \wedge (InitSimulationData)$

state $Controller_state == (SimulationInstance) \wedge (SimulationData)$

$entryaction_Off3 \hat{=} (executeentryaction.(s_Off3) \rightarrow \mathbf{Skip})$
 $entryaction_On4 \hat{=} (executeentryaction.(s_On4) \rightarrow \mathbf{Skip})$
 $entryaction_FAN2 \hat{=} (executeentryaction.(s_FAN2) \rightarrow \mathbf{Skip})$
 $entryaction_SpeedValue \hat{=} (executeentryaction.(s_SpeedValue) \rightarrow \mathbf{Skip})$
 $entryaction_Off7 \hat{=} (executeentryaction.(s_Off7) \rightarrow \mathbf{Skip})$
 $entryaction_On8 \hat{=} (executeentryaction.(s_On8) \rightarrow \mathbf{Skip})$
 $entryaction_FAN1 \hat{=} (executeentryaction.(s_FAN1) \rightarrow \mathbf{Skip})$
 $entryaction_PowerOn \hat{=} (executeentryaction.(s_PowerOn) \rightarrow \mathbf{Skip})$
 $entryaction_PowerOff \hat{=} (executeentryaction.(s_PowerOff) \rightarrow v_airflow := 0)$
 $entryactions \hat{=} \left(\begin{array}{l} entryaction_Off3 \square entryaction_On4 \square entryaction_FAN2 \square entryaction_SpeedValue \square \\ entryaction_Off7 \square entryaction_On8 \square entryaction_FAN1 \square entryaction_PowerOn \square \\ entryaction_PowerOff \end{array} \right)$

$duringaction_Off3 \hat{=} (executeduringaction.(s_Off3)?ce \rightarrow \mathbf{Skip})$
 $duringaction_On4 \hat{=} (executeduringaction.(s_On4)?ce \rightarrow \mathbf{Skip})$
 $duringaction_FAN2 \hat{=} (executeduringaction.(s_FAN2)?ce \rightarrow \mathbf{Skip})$
 $duringaction_SpeedValue \hat{=} (executeduringaction.(s_SpeedValue)?ce \rightarrow$
 $v_airflow := (b2r(state_status(s_On8)) + b2r(state_status(s_On4))))$
 $duringaction_Off7 \hat{=} (executeduringaction.(s_Off7)?ce \rightarrow \mathbf{Skip})$
 $duringaction_On8 \hat{=} (executeduringaction.(s_On8)?ce \rightarrow \mathbf{Skip})$
 $duringaction_FAN1 \hat{=} (executeduringaction.(s_FAN1)?ce \rightarrow \mathbf{Skip})$
 $duringaction_PowerOn \hat{=} (executeduringaction.(s_PowerOn)?ce \rightarrow \mathbf{Skip})$
 $duringaction_PowerOff \hat{=} (executeduringaction.(s_PowerOff)?ce \rightarrow \mathbf{Skip})$
 $duringactions \hat{=} \left(\begin{array}{l} duringaction_Off3 \square duringaction_On4 \square duringaction_FAN2 \square duringaction_SpeedValue \square \\ duringaction_Off7 \square duringaction_On8 \square duringaction_FAN1 \square duringaction_PowerOn \square \\ duringaction_PowerOff \end{array} \right)$

$$\begin{aligned}
\textit{exitaction_Off3} &\hat{=} (\textit{executeexitaction}.(s_Off3) \longrightarrow \mathbf{Skip}) \\
\textit{exitaction_On4} &\hat{=} (\textit{executeexitaction}.(s_On4) \longrightarrow \mathbf{Skip}) \\
\textit{exitaction_FAN2} &\hat{=} (\textit{executeexitaction}.(s_FAN2) \longrightarrow \mathbf{Skip}) \\
\textit{exitaction_SpeedValue} &\hat{=} (\textit{executeexitaction}.(s_SpeedValue) \longrightarrow \mathbf{Skip}) \\
\textit{exitaction_Off7} &\hat{=} (\textit{executeexitaction}.(s_Off7) \longrightarrow \mathbf{Skip}) \\
\textit{exitaction_On8} &\hat{=} (\textit{executeexitaction}.(s_On8) \longrightarrow \mathbf{Skip}) \\
\textit{exitaction_FAN1} &\hat{=} (\textit{executeexitaction}.(s_FAN1) \longrightarrow \mathbf{Skip}) \\
\textit{exitaction_PowerOn} &\hat{=} (\textit{executeexitaction}.(s_PowerOn) \longrightarrow \mathbf{Skip}) \\
\textit{exitaction_PowerOff} &\hat{=} (\textit{executeexitaction}.(s_PowerOff) \longrightarrow \mathbf{Skip}) \\
\textit{exitactions} &\hat{=} \left(\begin{array}{l} \textit{exitaction_Off3} \square \textit{exitaction_On4} \square \textit{exitaction_FAN2} \square \textit{exitaction_SpeedValue} \square \\ \textit{exitaction_Off7} \square \textit{exitaction_On8} \square \textit{exitaction_FAN1} \square \textit{exitaction_PowerOn} \square \\ \textit{exitaction_PowerOff} \end{array} \right)
\end{aligned}$$

$$\begin{aligned}
\textit{conditionaction_On8_Off7} &\hat{=} (\textit{executeconditionaction}.(t_On8_Off7) \longrightarrow \mathbf{Skip}) \\
\textit{conditionaction_Off7_On8} &\hat{=} (\textit{executeconditionaction}.(t_Off7_On8) \longrightarrow \mathbf{Skip}) \\
\textit{conditionaction_PowerOff_PowerOn} &\hat{=} (\textit{executeconditionaction}.(t_PowerOff_PowerOn) \longrightarrow \mathbf{Skip}) \\
\textit{conditionaction_default_PowerOff} &\hat{=} (\textit{executeconditionaction}.(t_default_PowerOff) \longrightarrow \mathbf{Skip}) \\
\textit{conditionaction_PowerOn_PowerOff} &\hat{=} (\textit{executeconditionaction}.(t_PowerOn_PowerOff) \longrightarrow \mathbf{Skip}) \\
\textit{conditionaction_On4_Off3} &\hat{=} (\textit{executeconditionaction}.(t_On4_Off3) \longrightarrow \mathbf{Skip}) \\
\textit{conditionaction_Off3_On4} &\hat{=} (\textit{executeconditionaction}.(t_Off3_On4) \longrightarrow \mathbf{Skip}) \\
\textit{conditionaction_default_Off3} &\hat{=} (\textit{executeconditionaction}.(t_default_Off3) \longrightarrow \mathbf{Skip}) \\
\textit{conditionaction_default_Off7} &\hat{=} (\textit{executeconditionaction}.(t_default_Off7) \longrightarrow \mathbf{Skip}) \\
\textit{conditionactions} &\hat{=} \left(\begin{array}{l} \textit{conditionaction_On8_Off7} \square \textit{conditionaction_Off7_On8} \square \\ \textit{conditionaction_PowerOff_PowerOn} \square \textit{conditionaction_default_PowerOff} \square \\ \textit{conditionaction_PowerOn_PowerOff} \square \textit{conditionaction_On4_Off3} \square \\ \textit{conditionaction_Off3_On4} \square \textit{conditionaction_default_Off3} \square \\ \textit{conditionaction_default_Off7} \end{array} \right)
\end{aligned}$$

$$\begin{aligned}
\textit{transitionaction_On8_Off7} &\hat{=} (\textit{executetransitionaction}.(t_On8_Off7) \longrightarrow \mathbf{Skip}) \\
\textit{transitionaction_Off7_On8} &\hat{=} (\textit{executetransitionaction}.(t_Off7_On8) \longrightarrow \mathbf{Skip}) \\
\textit{transitionaction_PowerOff_PowerOn} &\hat{=} (\textit{executetransitionaction}.(t_PowerOff_PowerOn) \longrightarrow \mathbf{Skip}) \\
\textit{transitionaction_default_PowerOff} &\hat{=} (\textit{executetransitionaction}.(t_default_PowerOff) \longrightarrow \mathbf{Skip}) \\
\textit{transitionaction_PowerOn_PowerOff} &\hat{=} (\textit{executetransitionaction}.(t_PowerOn_PowerOff) \longrightarrow \mathbf{Skip}) \\
\textit{transitionaction_On4_Off3} &\hat{=} (\textit{executetransitionaction}.(t_On4_Off3) \longrightarrow \mathbf{Skip}) \\
\textit{transitionaction_Off3_On4} &\hat{=} (\textit{executetransitionaction}.(t_Off3_On4) \longrightarrow \mathbf{Skip}) \\
\textit{transitionaction_default_Off3} &\hat{=} (\textit{executetransitionaction}.(t_default_Off3) \longrightarrow \mathbf{Skip}) \\
\textit{transitionaction_default_Off7} &\hat{=} (\textit{executetransitionaction}.(t_default_Off7) \longrightarrow \mathbf{Skip}) \\
\textit{transitionactions} &\hat{=} \left(\begin{array}{l} \textit{transitionaction_On8_Off7} \square \textit{transitionaction_Off7_On8} \square \\ \textit{transitionaction_PowerOff_PowerOn} \square \textit{transitionaction_default_PowerOff} \square \\ \textit{transitionaction_PowerOn_PowerOff} \square \textit{transitionaction_On4_Off3} \square \\ \textit{transitionaction_Off3_On4} \square \textit{transitionaction_default_Off3} \square \\ \textit{transitionaction_default_Off7} \end{array} \right)
\end{aligned}$$

$$\begin{aligned}
\text{condition_On8_Off7} &\hat{=} \left(\begin{array}{l} \text{if}((v_temp <_{\mathcal{A}} 120) \neq 0) \longrightarrow (\text{evaluatecondition}.(t_On8_Off7)!(\mathbf{True}) \longrightarrow \mathbf{Skip}) \\ \llbracket \neg((v_temp <_{\mathcal{A}} 120) \neq 0) \rrbracket \longrightarrow ((\text{evaluatecondition}.(t_On8_Off7)!(\mathbf{False}) \longrightarrow \mathbf{Skip})) \\ \mathbf{fi} \end{array} \right) \\
\text{condition_Off7_On8} &\hat{=} \left(\begin{array}{l} \text{if}((v_temp \geq_{\mathcal{A}} 120) \neq 0) \longrightarrow (\text{evaluatecondition}.(t_Off7_On8)!(\mathbf{True}) \longrightarrow \mathbf{Skip}) \\ \llbracket \neg((v_temp \geq_{\mathcal{A}} 120) \neq 0) \rrbracket \longrightarrow ((\text{evaluatecondition}.(t_Off7_On8)!(\mathbf{False}) \longrightarrow \mathbf{Skip})) \\ \mathbf{fi} \end{array} \right) \\
\text{condition_PowerOff_PowerOn} &\hat{=} (\text{evaluatecondition}.(t_PowerOff_PowerOn)!(\mathbf{True}) \longrightarrow \mathbf{Skip}) \\
\text{condition_default_PowerOff} &\hat{=} (\text{evaluatecondition}.(t_default_PowerOff)!(\mathbf{True}) \longrightarrow \mathbf{Skip}) \\
\text{condition_PowerOn_PowerOff} &\hat{=} (\text{evaluatecondition}.(t_PowerOn_PowerOff)!(\mathbf{True}) \longrightarrow \mathbf{Skip}) \\
\text{condition_On4_Off3} &\hat{=} \left(\begin{array}{l} \text{if}((v_temp <_{\mathcal{A}} 150) \neq 0) \longrightarrow (\text{evaluatecondition}.(t_On4_Off3)!(\mathbf{True}) \longrightarrow \mathbf{Skip}) \\ \llbracket \neg((v_temp <_{\mathcal{A}} 150) \neq 0) \rrbracket \longrightarrow ((\text{evaluatecondition}.(t_On4_Off3)!(\mathbf{False}) \longrightarrow \mathbf{Skip})) \\ \mathbf{fi} \end{array} \right) \\
\text{condition_Off3_On4} &\hat{=} \left(\begin{array}{l} \text{if}((v_temp \geq_{\mathcal{A}} 150) \neq 0) \longrightarrow (\text{evaluatecondition}.(t_Off3_On4)!(\mathbf{True}) \longrightarrow \mathbf{Skip}) \\ \llbracket \neg((v_temp \geq_{\mathcal{A}} 150) \neq 0) \rrbracket \longrightarrow ((\text{evaluatecondition}.(t_Off3_On4)!(\mathbf{False}) \longrightarrow \mathbf{Skip})) \\ \mathbf{fi} \end{array} \right) \\
\text{condition_default_Off3} &\hat{=} (\text{evaluatecondition}.(t_default_Off3)!(\mathbf{True}) \longrightarrow \mathbf{Skip}) \\
\text{condition_default_Off7} &\hat{=} (\text{evaluatecondition}.(t_default_Off7)!(\mathbf{True}) \longrightarrow \mathbf{Skip}) \\
\text{conditions} &\hat{=} \left(\begin{array}{l} \text{condition_On8_Off7} \square \text{condition_Off7_On8} \square \\ \text{condition_PowerOff_PowerOn} \square \text{condition_default_PowerOff} \square \\ \text{condition_PowerOn_PowerOff} \square \text{condition_On4_Off3} \square \\ \text{condition_Off3_On4} \square \text{condition_default_Off3} \square \\ \text{condition_default_Off7} \end{array} \right)
\end{aligned}$$

$$\begin{aligned}
\text{trigger_On8_Off7} &\hat{=} (\text{checktrigger}.(t_On8_Off7)?e \longrightarrow (\text{result}.(t_On8_Off7).(e)!(\mathbf{True}) \longrightarrow \mathbf{Skip})) \\
\text{trigger_Off7_On8} &\hat{=} (\text{checktrigger}.(t_Off7_On8)?e \longrightarrow (\text{result}.(t_Off7_On8).(e)!(\mathbf{True}) \longrightarrow \mathbf{Skip})) \\
\text{trigger_PowerOff_PowerOn} &\hat{=} \text{checktrigger}.(t_PowerOff_PowerOn)?e \longrightarrow \\
&\left(\begin{array}{l} \text{if } e = e_SWITCH \longrightarrow (\text{result}.(t_PowerOff_PowerOn).(e)!(\mathbf{True}) \longrightarrow \mathbf{Skip}) \\ \llbracket \neg(e = e_SWITCH) \rrbracket \longrightarrow ((\text{result}.(t_PowerOff_PowerOn).(e)!(\mathbf{False}) \longrightarrow \mathbf{Skip})) \\ \mathbf{fi} \end{array} \right) \\
\text{trigger_default_PowerOff} &\hat{=} \text{checktrigger}.(t_default_PowerOff)?e \longrightarrow \\
&(\text{result}.(t_default_PowerOff).(e)!(\mathbf{True}) \longrightarrow \mathbf{Skip}) \\
\text{trigger_PowerOn_PowerOff} &\hat{=} \text{checktrigger}.(t_PowerOn_PowerOff)?e \longrightarrow \\
&\left(\begin{array}{l} \text{if } e = e_SWITCH \longrightarrow (\text{result}.(t_PowerOn_PowerOff).(e)!(\mathbf{True}) \longrightarrow \mathbf{Skip}) \\ \llbracket \neg(e = e_SWITCH) \rrbracket \longrightarrow ((\text{result}.(t_PowerOn_PowerOff).(e)!(\mathbf{False}) \longrightarrow \mathbf{Skip})) \\ \mathbf{fi} \end{array} \right) \\
\text{trigger_On4_Off3} &\hat{=} \text{checktrigger}.(t_On4_Off3)?e \longrightarrow (\text{result}.(t_On4_Off3).(e)!(\mathbf{True}) \longrightarrow \mathbf{Skip}) \\
\text{trigger_Off3_On4} &\hat{=} \text{checktrigger}.(t_Off3_On4)?e \longrightarrow (\text{result}.(t_Off3_On4).(e)!(\mathbf{True}) \longrightarrow \mathbf{Skip}) \\
\text{trigger_default_Off3} &\hat{=} \text{checktrigger}.(t_default_Off3)?e \longrightarrow (\text{result}.(t_default_Off3).(e)!(\mathbf{True}) \longrightarrow \mathbf{Skip}) \\
\text{trigger_default_Off7} &\hat{=} \text{checktrigger}.(t_default_Off7)?e \longrightarrow (\text{result}.(t_default_Off7).(e)!(\mathbf{True}) \longrightarrow \mathbf{Skip}) \\
\text{triggers} &\hat{=} \left(\begin{array}{l} \text{trigger_On8_Off7} \square \text{trigger_Off7_On8} \square \\ \text{trigger_PowerOff_PowerOn} \square \text{trigger_default_PowerOff} \square \\ \text{trigger_PowerOn_PowerOff} \square \text{trigger_On4_Off3} \square \\ \text{trigger_Off3_On4} \square \text{trigger_default_Off3} \square \\ \text{trigger_default_Off7} \end{array} \right)
\end{aligned}$$

$$\begin{aligned}
\text{getevents} &\hat{=} (\text{events}!(\langle e_SWITCH, e_CLOCK \rangle) \longrightarrow \mathbf{Skip}) \\
\text{getstate} &\hat{=} (\text{state}?x : (x \in \text{dom}(\text{states}))!(\text{states}(x)) \longrightarrow \mathbf{Skip}) \\
\text{getjunction} &\hat{=} (\text{junction}?x : (x \in \text{dom}(\text{junctions}))!(\text{junctions}(x)) \longrightarrow \mathbf{Skip}) \\
\text{gettransition} &\hat{=} (\text{transition}?x : (x \in \text{dom}(\text{transitions}))!(\text{transitions}(x)) \longrightarrow \mathbf{Skip}) \\
\text{getchart} &\hat{=} (\text{chart}!(\text{states}(\text{identifier})) \longrightarrow \mathbf{Skip})
\end{aligned}$$

$$\begin{aligned}
\text{broadcast} &\hat{=} e : \text{EVENT}; \text{dest} : \text{SID} \bullet \text{local_event}!(e, \text{states}(\text{dest})) \longrightarrow \mu X \bullet \left(\begin{array}{l} (\text{AllActions}; X) \\ \square \\ (\text{end_local_execution} \longrightarrow \mathbf{Skip}) \end{array} \right) \\
\text{check} &\hat{=} \text{res } \text{erl} : \mathbb{B} \bullet \mu X \bullet (\text{InterfaceActions}; X \square \text{interrupt}?x \longrightarrow \text{erl} := x)
\end{aligned}$$

$status \hat{=} (status?x : (x \in \text{dom}(state_status))!(state_status(x)) \rightarrow \mathbf{Skip})$
 $history \hat{=} (history?x : (x \in \text{dom}(state_history))!(state_history(x)) \rightarrow \mathbf{Skip})$
 $activation \hat{=} (activate?x \rightarrow (Activate))$
 $deactivation \hat{=} (deactivate?x \rightarrow (Deactivate))$
 $ChartActions \hat{=} \left(\begin{array}{l} \text{entryactions} \square \text{duringactions} \square \\ \text{exitactions} \square \text{conditionactions} \square \\ \text{transitionactions} \end{array} \right); (\text{end_action} \rightarrow \mathbf{Skip})$

$InterfaceActions \hat{=} \left(\begin{array}{l} \text{getevents} \square \text{getchart} \square \text{getstate} \square \\ \text{getjunction} \square \text{gettransition} \square \text{status} \square \\ \text{history} \square \text{activation} \square \text{deactivation} \end{array} \right)$

$Inputs \hat{=} (\text{read_inputs} \rightarrow (i_temp?x \rightarrow v_temp := x))$
 $Outputs \hat{=} (\text{write_outputs} \rightarrow (o_airflow!(v_airflow) \rightarrow \mathbf{Skip}))$

$AllActions \hat{=} \left(\begin{array}{l} \text{conditionactions} \square \text{triggers} \square \text{Inputs} \square \\ \text{Outputs} \square \text{ChartActions} \square \text{InterfaceActions} \end{array} \right)$

$\bullet (InitState); \mu X \bullet \left(\left(\mu Y \bullet \left(\begin{array}{l} (AllActions; Y) \\ \square \\ \text{end_cycle} \rightarrow \mathbf{Skip} \end{array} \right) \right); X \right)$

end

process *Controller* $\hat{=} (P_Controller \llbracket \text{interface} \cup \{ \text{end_cycle} \} \rrbracket Simulator) \setminus \text{interface}$