

ACTUATOR ::= Enabled | Disabled
LEVEL_SENSOR ::= Empty | Low | High | Full
ULTRASONIC_SENSOR == \mathbb{N}
STATUS ::= Updated | Outdated
MODE ::= Refill | TimeSlots
HH_MM == $\mathbb{N} \times \mathbb{N}$
FLOW_SENSOR == \mathbb{N}
ON_OFF ::= On | Off

<i>threshold: \mathbb{N}</i>
<i>threshold = 25</i>

<i>STATE</i>
<i>automatic_activation: ON_OFF</i> <i>activation_time: seq HH_MM</i> <i>sensor_state: STATUS</i> <i>ground_pump: ACTUATOR</i> <i>underground_pump: ACTUATOR</i> <i>top_tank: LEVEL_SENSOR</i> <i>ground_tank: LEVEL_SENSOR</i> <i>underground_flow: FLOW_SENSOR</i>
<i>ground_pump = Enabled \Rightarrow top_tank \neq Full \wedge ground_tank \neq Empty</i> <i>underground_pump = Enabled \Rightarrow ground_tank \neq Full</i>

<i>POWER_ON_GROUND</i>
<i>ΔSTATE</i>
<i>sensor_state = Updated</i> <i>ground_tank \neq Low</i> <i>ground_pump' = Enabled</i> <i>sensor_state' = Outdated</i>

<i>POWER_ON_GROUND_Pre</i>
<i>STATE</i>
<i>sensor_state = Updated</i> <i>ground_tank \neq Empty</i> <i>ground_tank \neq Low</i> <i>top_tank \neq Full</i>

theorem *Pre_POWER_ON_GROUND*

$\forall STATE \mid POWER_ON_GROUND_Pre \bullet \text{pre } POWER_ON_GROUND$

POWER_ON_UNDERGROUND

$\Delta STATE$

sensor_state = Updated

ground_tank \neq Full

underground_pump' = Enabled

sensor_state' = Outdated

POWER_ON_UNDERGROUND_Pre

STATE

sensor_state = Updated

ground_tank \neq Full

theorem *Pre_POWER_ON_UNDERGROUND*

$\forall STATE \mid POWER_ON_UNDERGROUND_Pre \bullet \text{pre } POWER_ON_UNDERGROUND$

POWER_OFF_GROUND

$\Delta STATE$

ground_pump' = Disabled

sensor_state' = Outdated

theorem *Pre_POWER_OFF_GROUND*

$\forall STATE \mid true \bullet \text{pre } POWER_OFF_GROUND$

POWER_OFF_UNDERGROUND

$\Delta STATE$

underground_pump' = Disabled

sensor_state' = Outdated

theorem *Pre_POWER_OFF_UNDERGROUND*

$\forall STATE \mid true \bullet \text{pre } POWER_OFF_UNDERGROUND$

UPDATE_SENSORS

$\Delta STATE$

top_tank?: LEVEL_SENSOR

ground_tank?: LEVEL_SENSOR

underground_flow?: FLOW_SENSOR

sensor_state = Updated

top_tank' = top_tank?

ground_tank' = ground_tank?

underground_flow' = underground_flow?

theorem *Pre_UPDATE_SENSORS*
 $\forall STATE \mid true \bullet \text{pre } UPDATE_SENSORS$

<i>UPDATE_CURRENT_FLOW</i>
$\Delta STATE$ <i>sensorReading!</i> : \mathbb{N}
$underground_flow' = sensorReading!$

$UPDATE_SENSORS \cong UPDATE_CURRENT_FLOW \S UPDATE_SENSOR_STATE$

<i>MAINTENANCE</i>
$\Delta STATE$ <i>flow_sensor?</i> : \mathbb{N} <i>aad?</i> : <i>ON_OFF</i>
$automatic_activation' = aad?$ $underground_flow' = flow_sensor?$