Name: Mohamed Mohsen

Unit: 5 – Project 1

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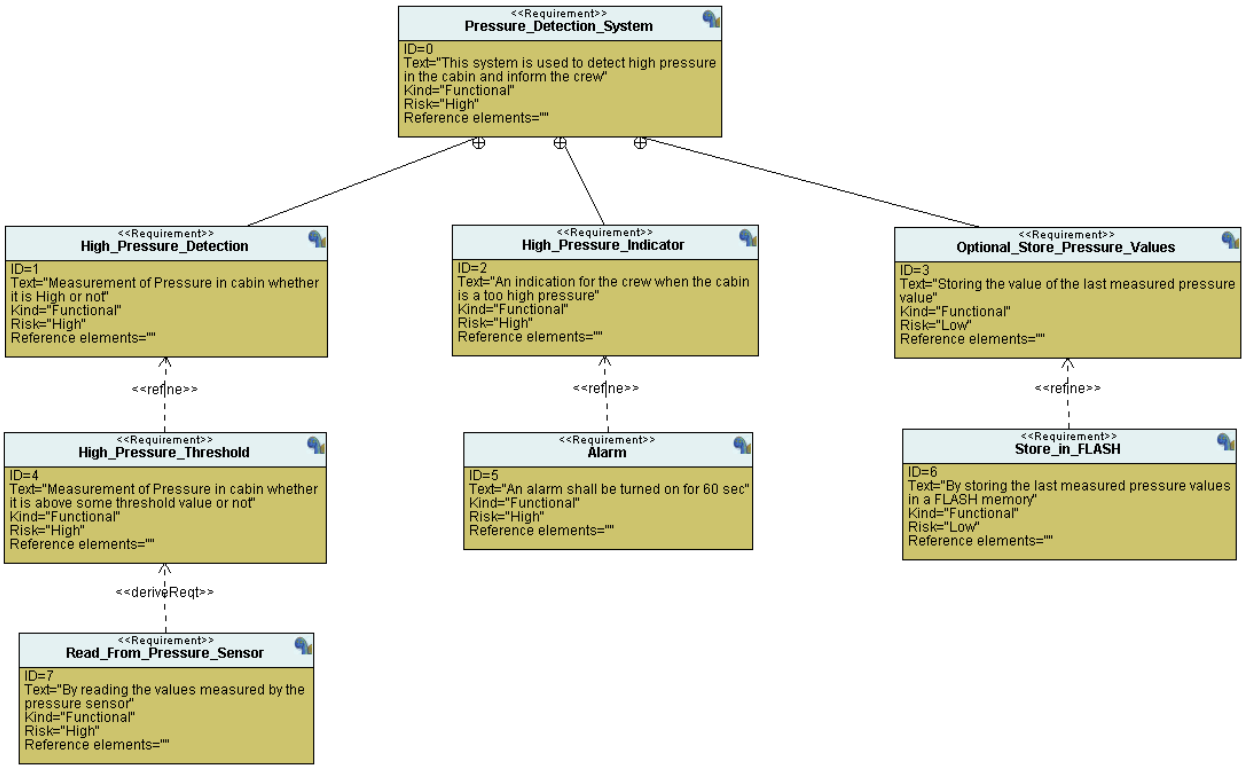
1- Case Study:

A pressure detection system that monitors the value of the pressure in the cabin and sets an alarm on for 60 seconds if the pressure value is greater than or equal to 20 bars.

Assumptions:

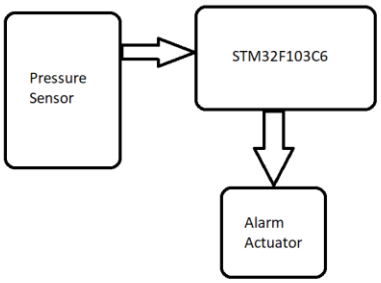
- The pressure sensor never fails
- The alarm actuator never fails
- The system never faces power cuts
- The system maintenance is not modeled

2- Requirements Diagram



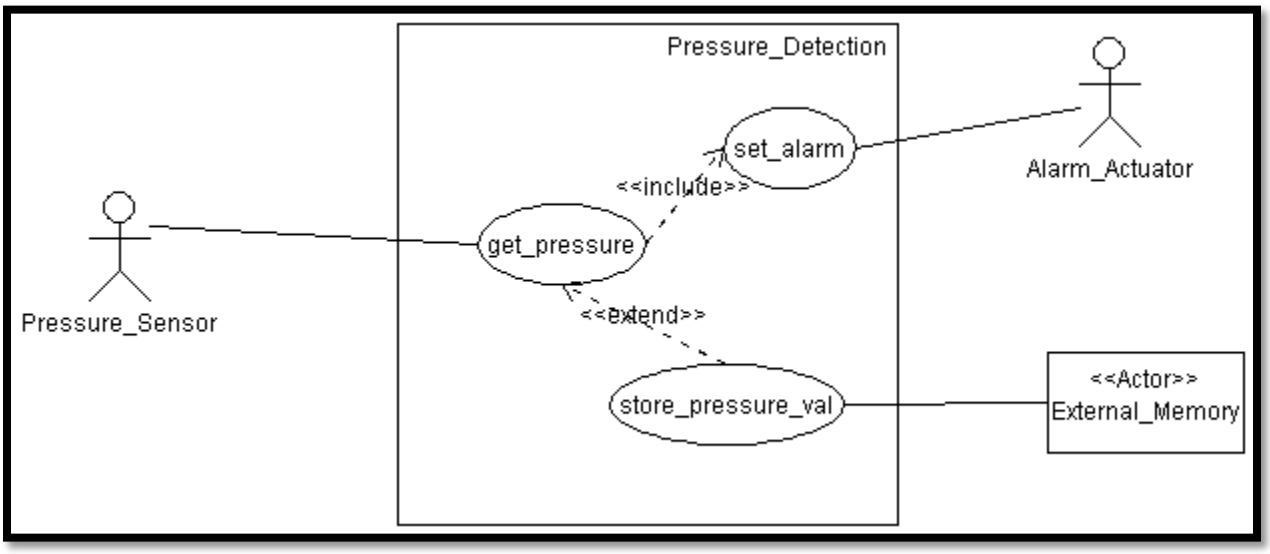
3- Space Exploration

- STM32F103C6 board
- Pressure sensor
- Alarm actuator

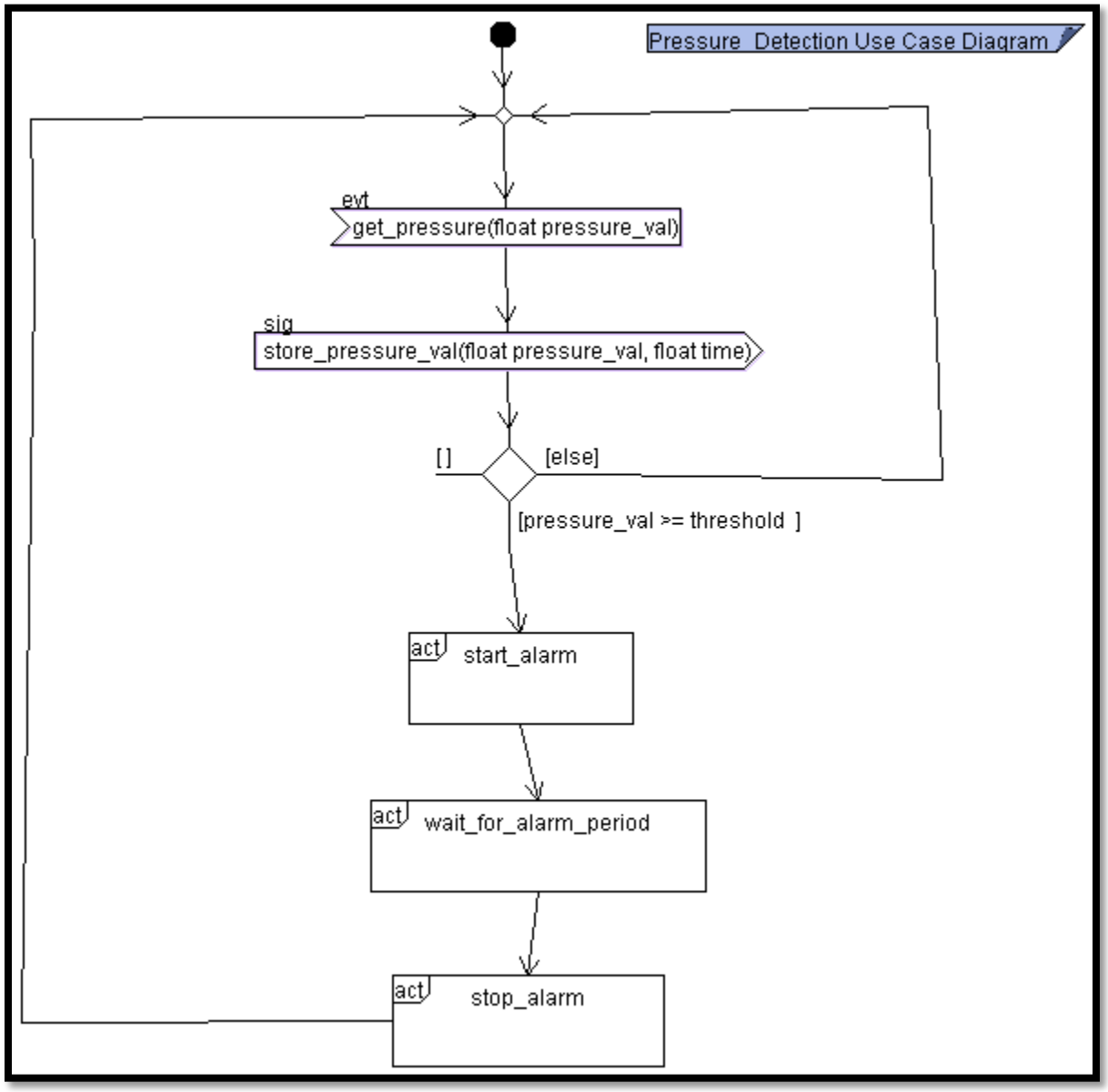


4-System Analysis

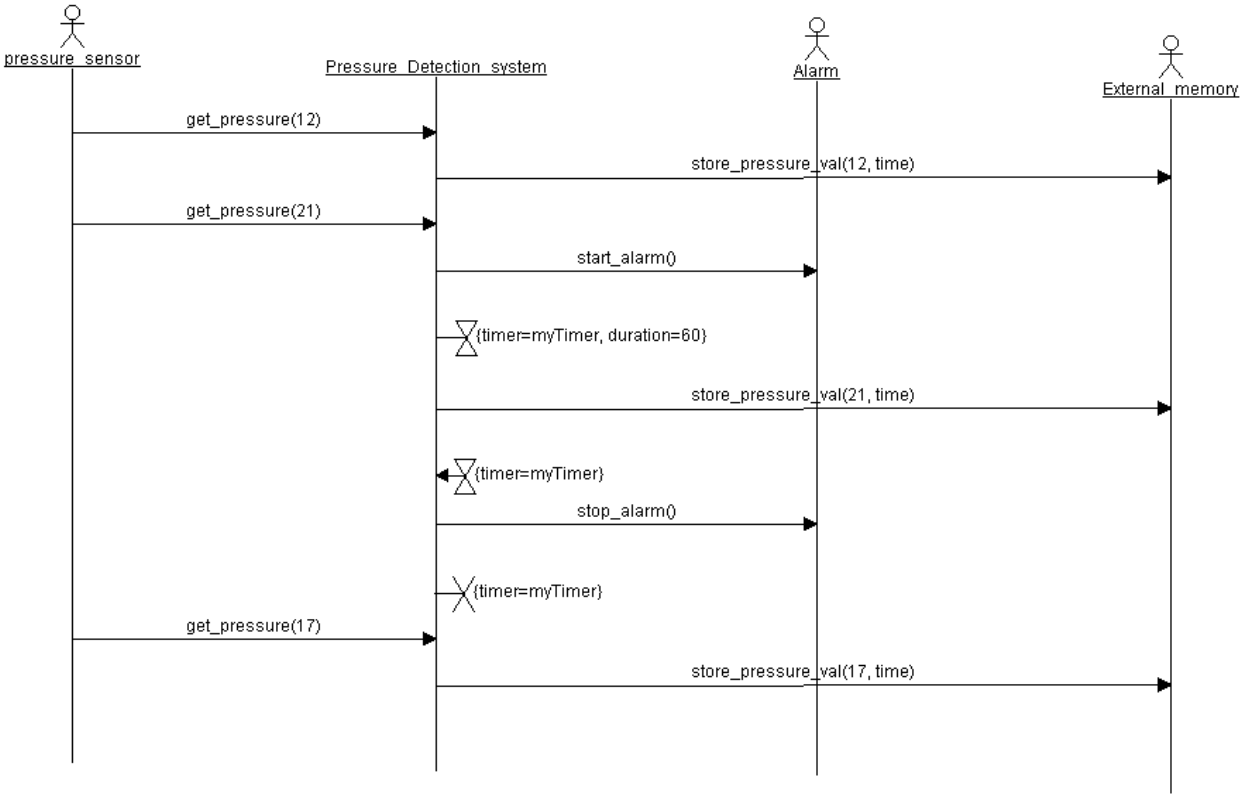
1.Use Case Diagram



2. Activity Diagram

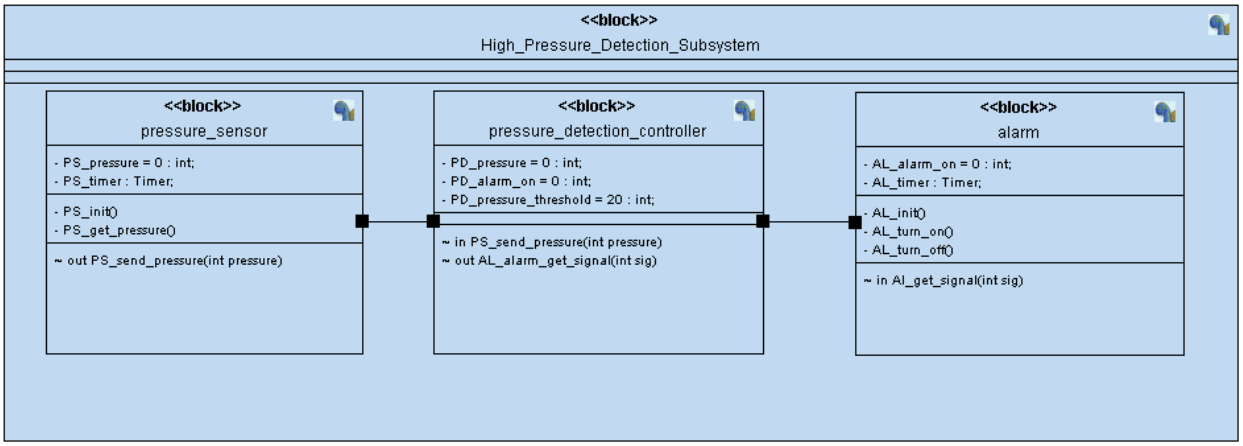


3. Sequence Diagram

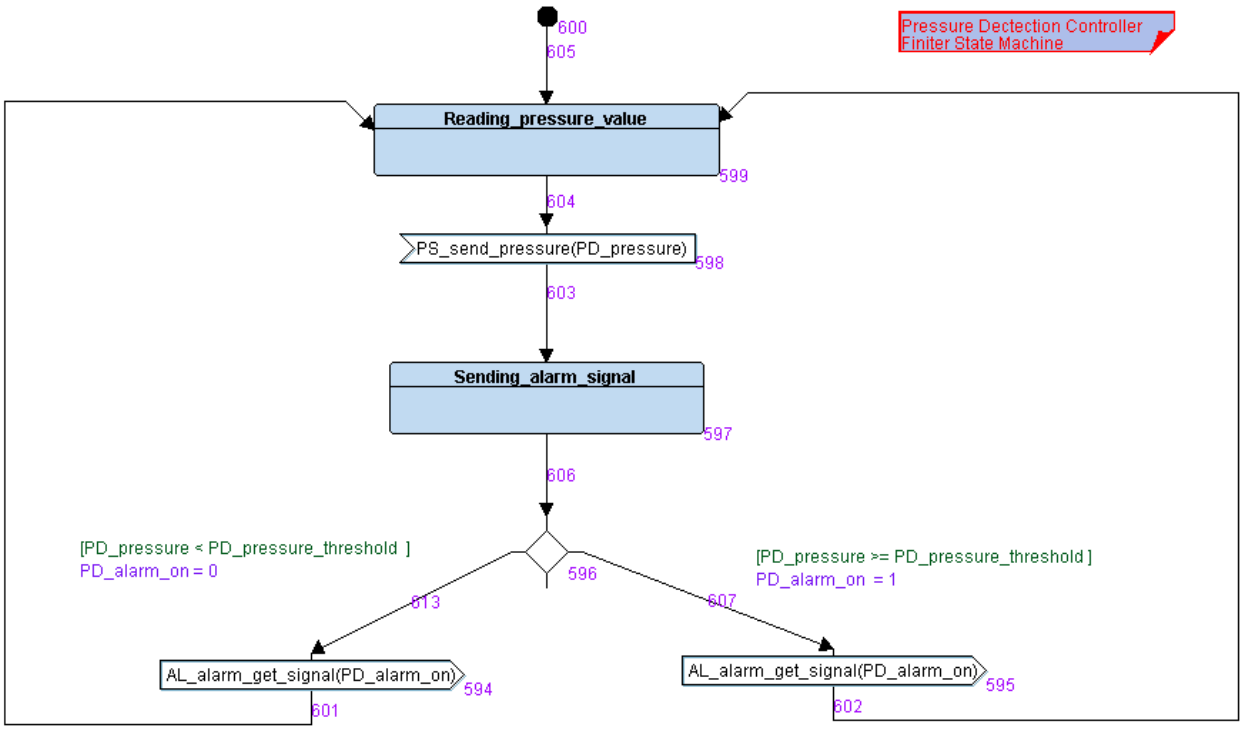


5-System Design

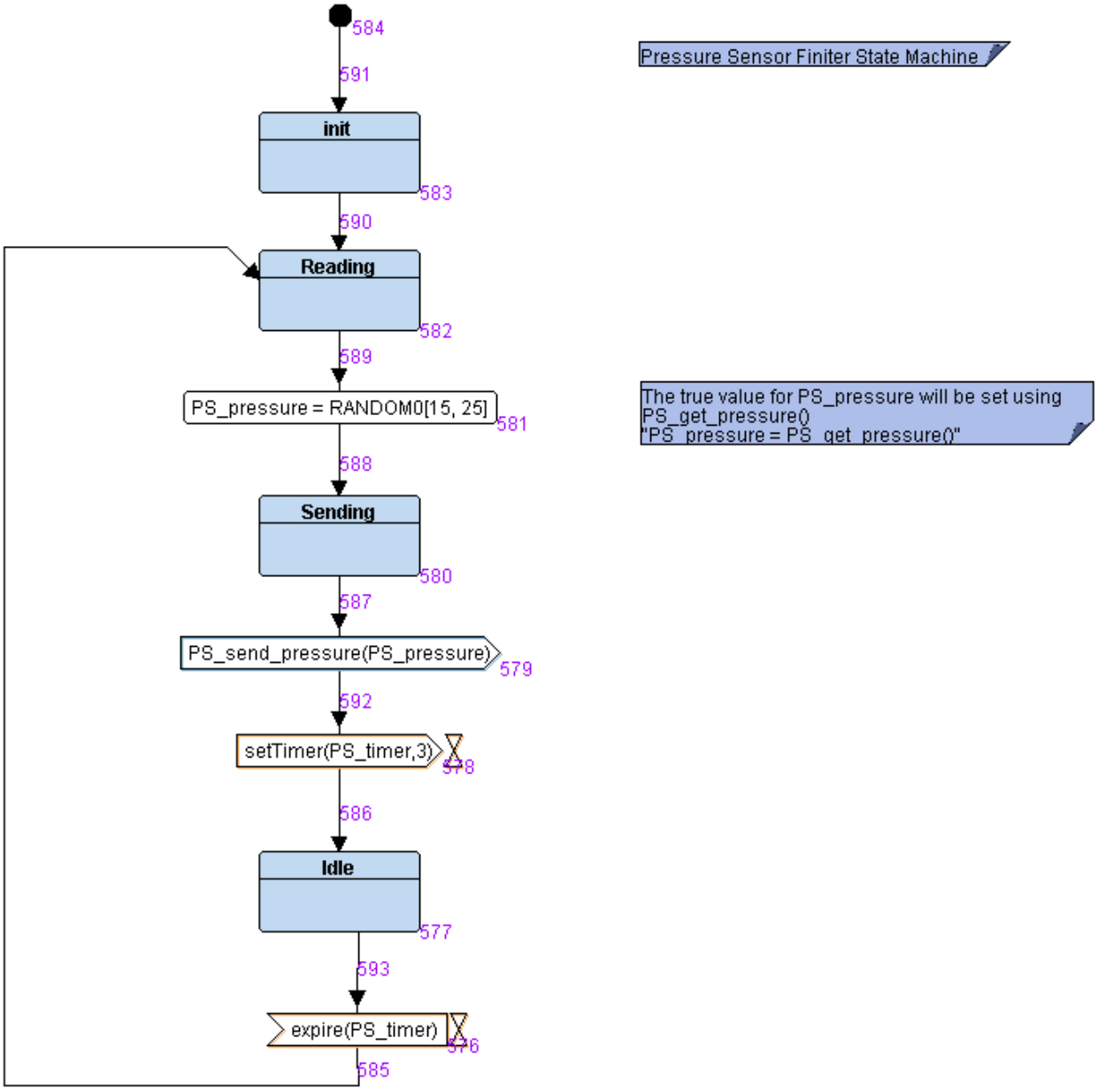
1.Block Diagram



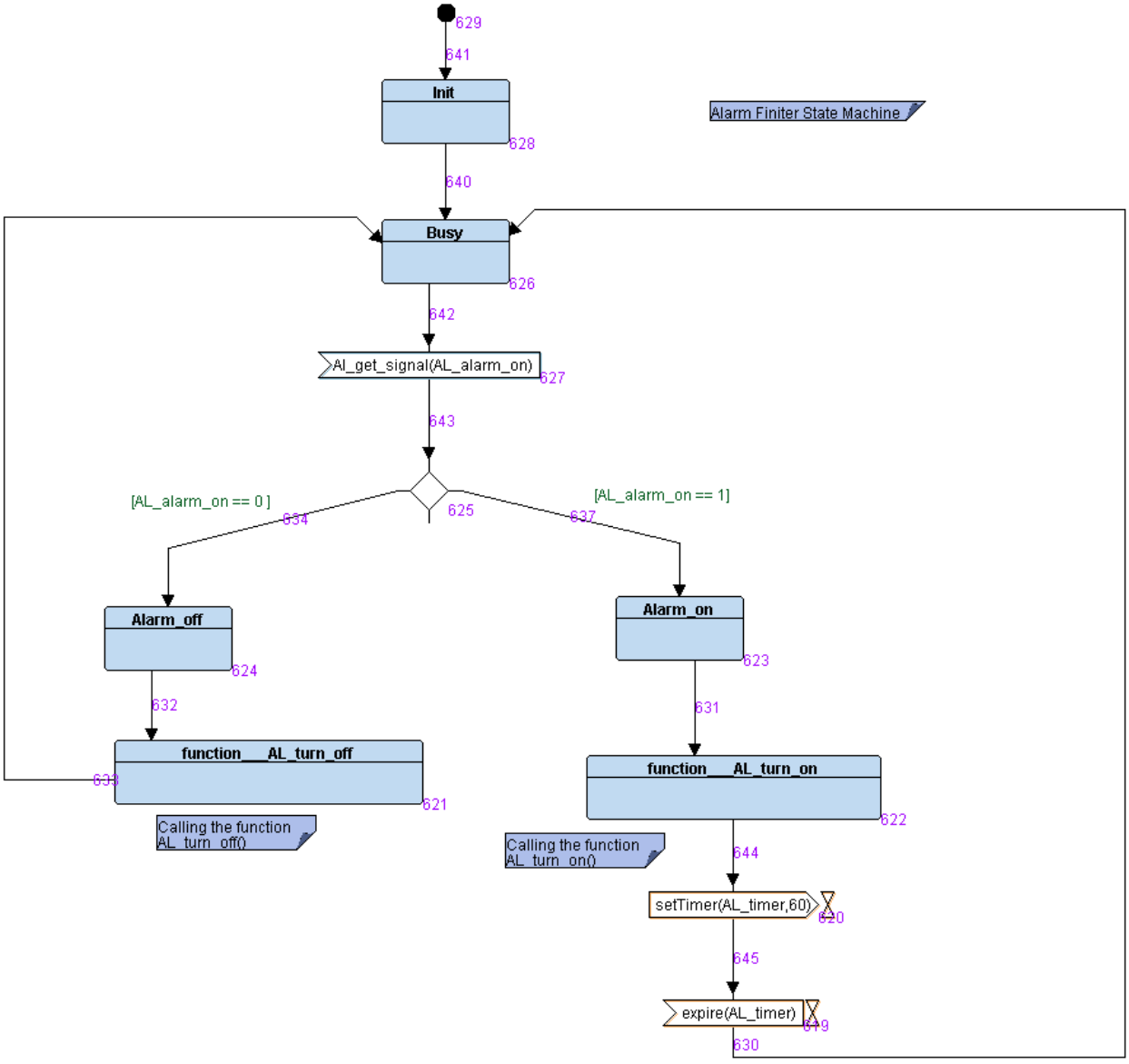
2.Main System FSM



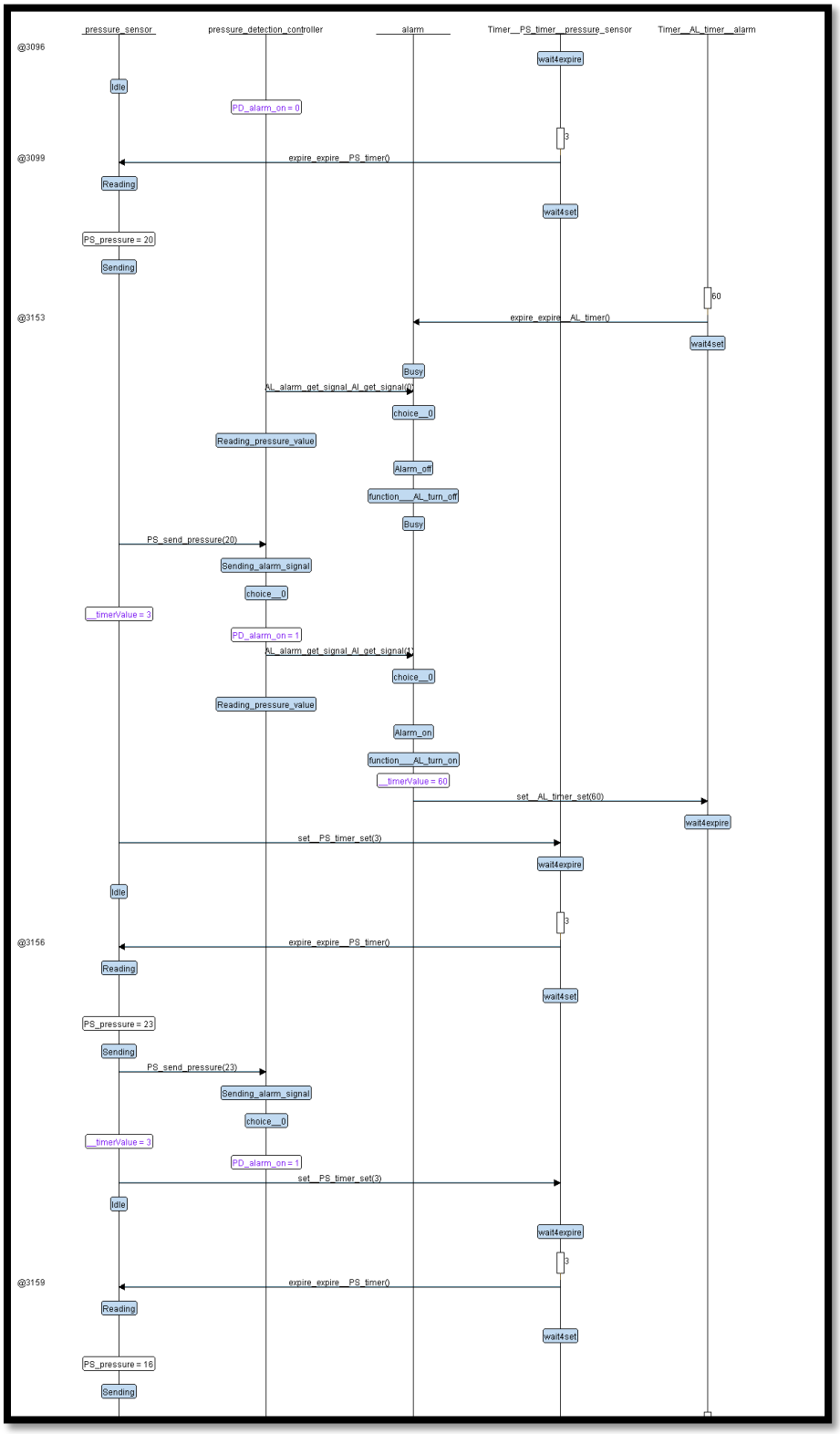
3. Pressure Sensor FSM

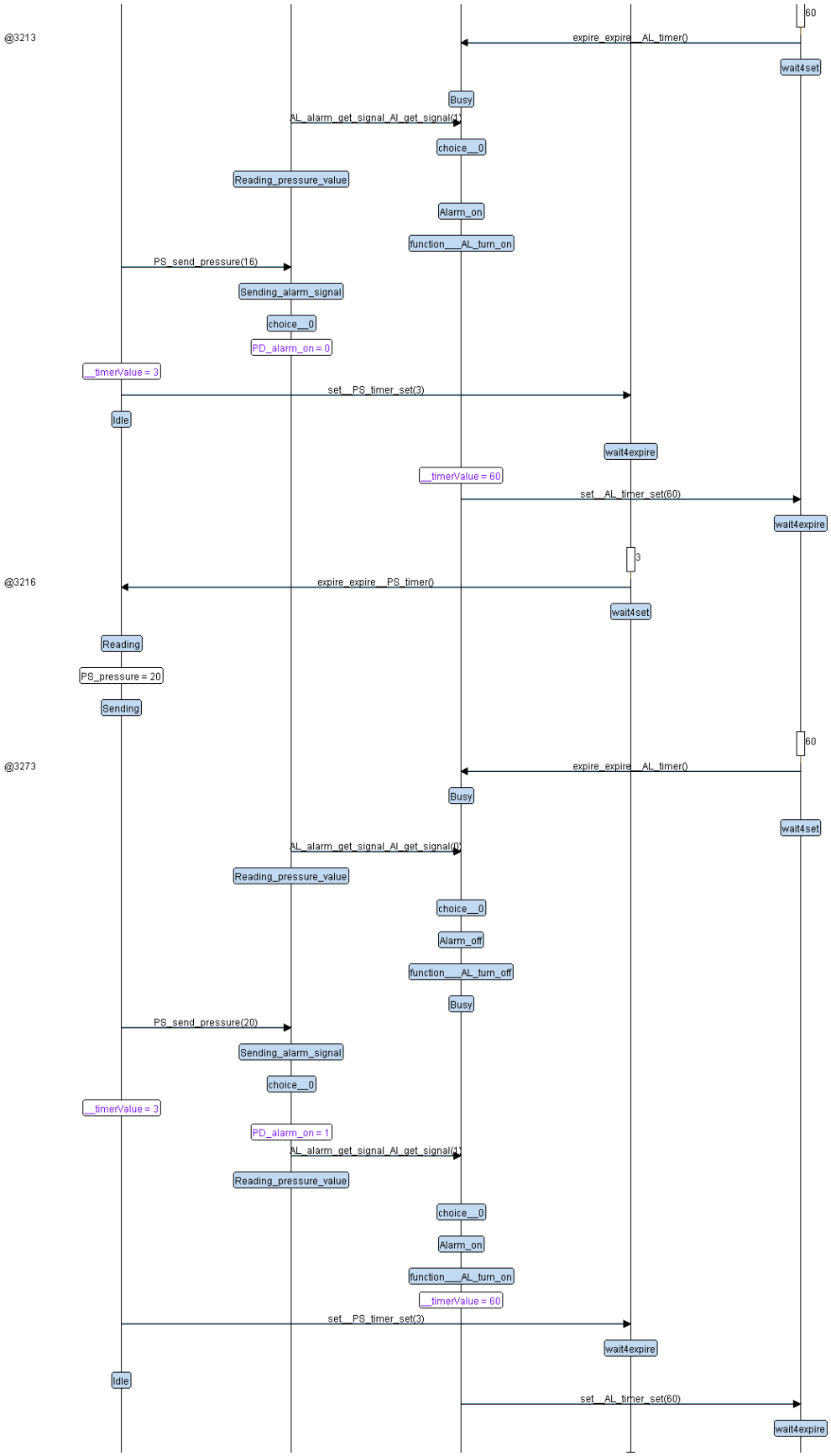


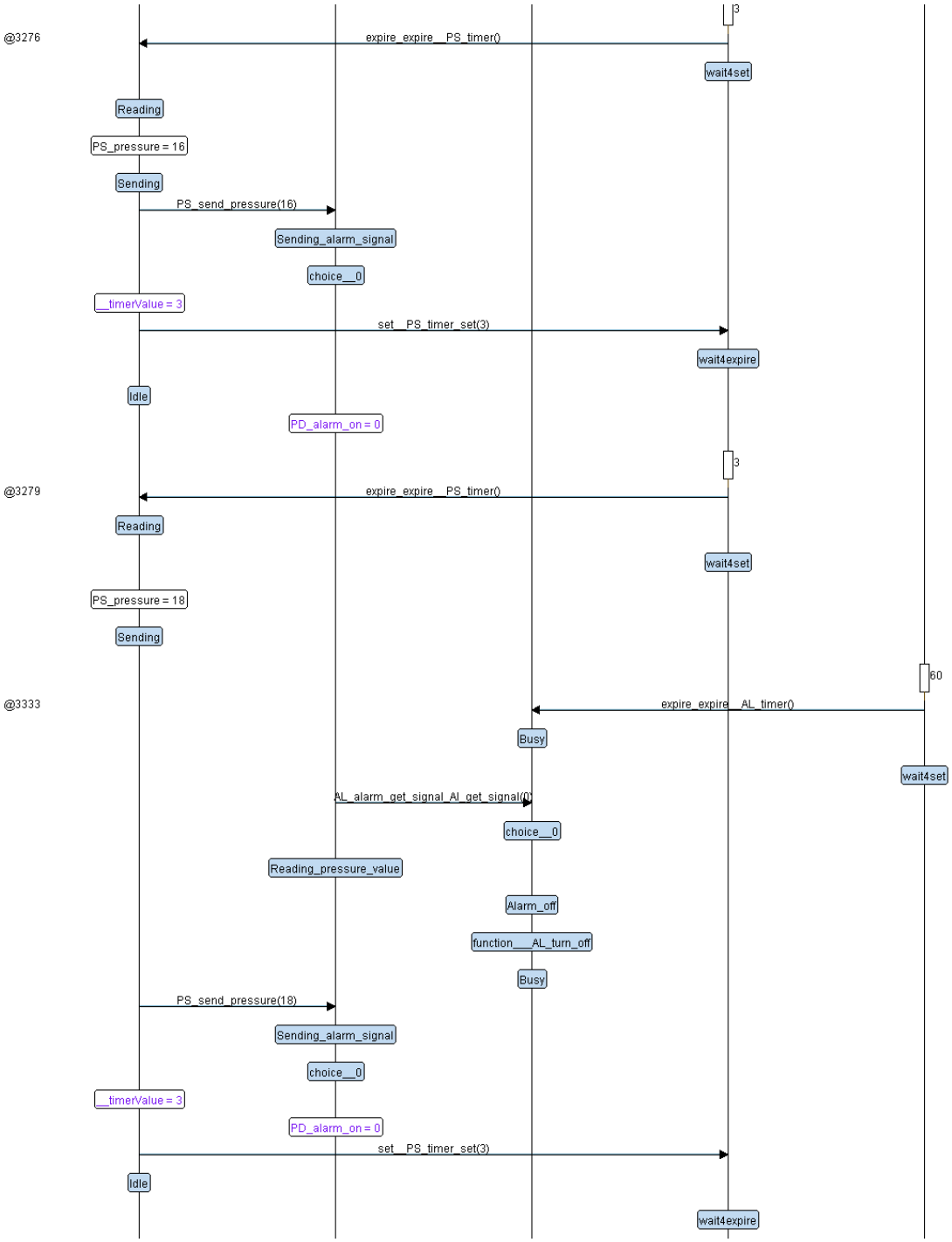
4. Alarm Actuator FSM



6-Verification and Logic

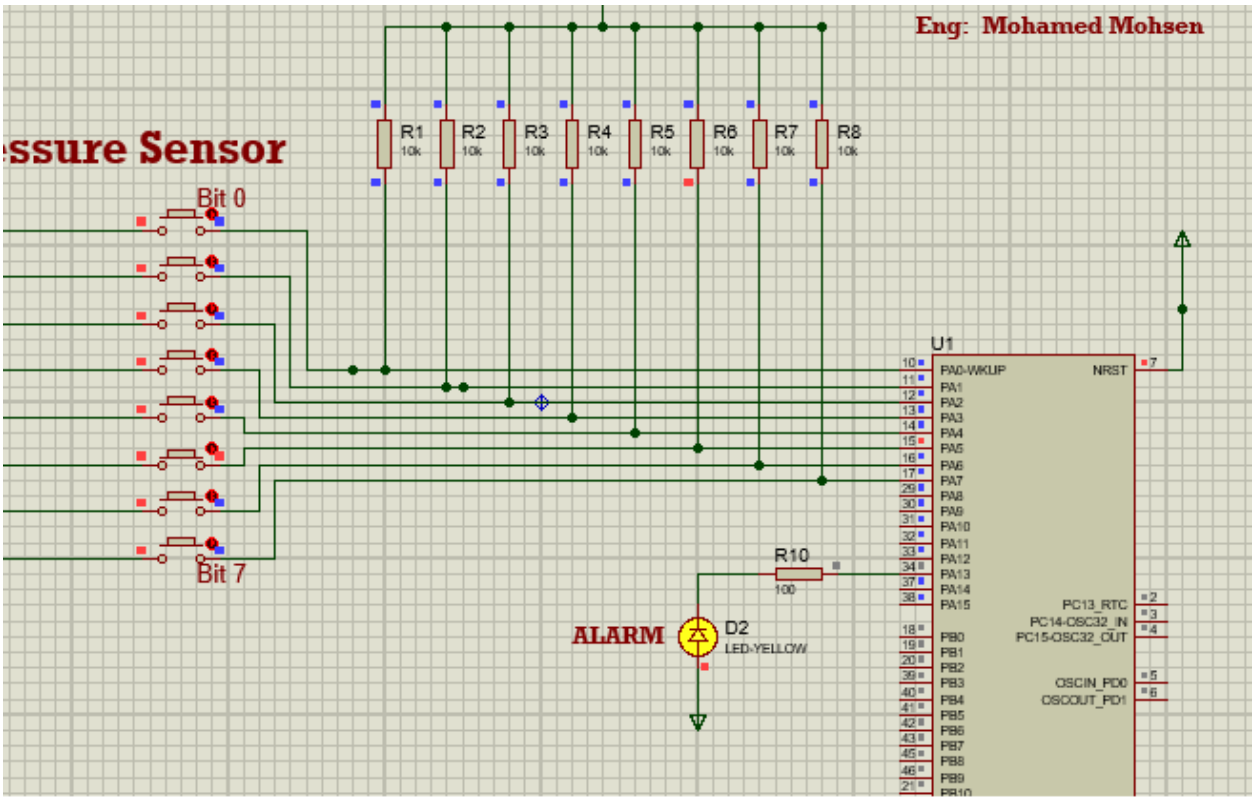



60
@3213
expire_expire__AL_timer()
wait4set
Busy
AL_alarm_get_signal_AI_get_signal(1)
choice__0
Reading_pressure_value
Alarm_on
function___AL_turn_on
PS_send_pressure(16)
Sending_alarm_signal
choice__0
PD_alarm_on = 0
__timerValue = 3
set__PS_timer_set(3)
Idle
wait4expire
__timerValue = 60
set__AL_timer_set(60)
wait4expire
3
@3216
expire_expire__PS_timer()
wait4set
Reading
PS_pressure = 20
Sending
60
@3273
expire_expire__AL_timer()
Busy
wait4set
AL_alarm_get_signal_AI_get_signal(0)
Reading_pressure_value
choice__0
Alarm_off
function___AL_turn_off
Busy
PS_send_pressure(20)
Sending_alarm_signal
choice__0
__timerValue = 3
PD_alarm_on = 1
AL_alarm_get_signal_AI_get_signal(1)
Reading_pressure_value
choice__0
Alarm_on
function___AL_turn_on
__timerValue = 60
set__PS_timer_set(3)
wait4expire
Idle
set__AL_timer_set(60)
wait4expire

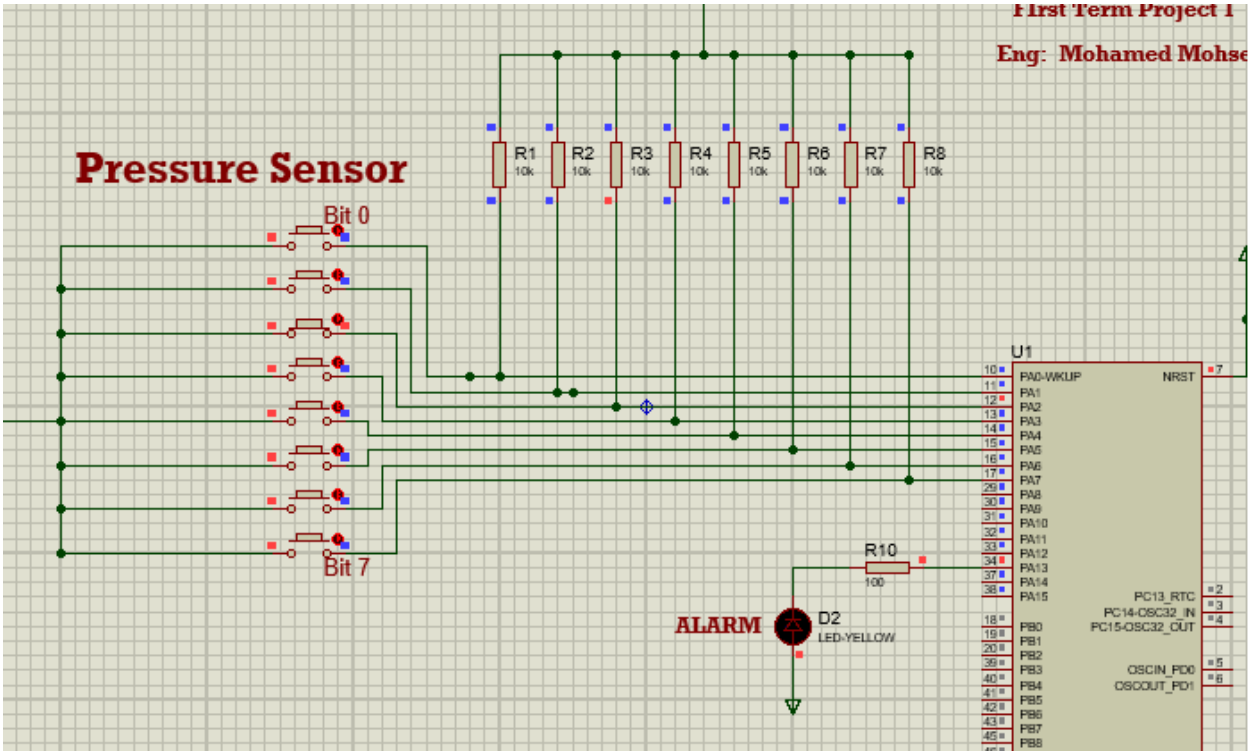

3
@3276
expire_expire__PS_timer()
wait4set
Reading
PS_pressure = 16
Sending
PS_send_pressure(16)
Sending_alarm_signal
choice__0
__timerValue = 3
set__PS_timer_set(3)
wait4expire
Idle
PD_alarm_on = 0
3
@3279
expire_expire__PS_timer()
Reading
wait4set
PS_pressure = 18
Sending
60
@3333
expire_expire__AL_timer()
Busy
wait4set
AL_alarm_get_signal_AI_get_signal()
choice__0
Reading_pressure_value
Alarm_off
function___AL_turn_off
Busy
PS_send_pressure(18)
Sending_alarm_signal
choice__0
__timerValue = 3
PD_alarm_on = 0
set__PS_timer_set(3)
Idle
wait4expire

7-Simulation Results

1. Alarm on State



2. Alarm off State



8-Symbols

```
Mohamed@DESKTOP-QJR98KP MINGW64 /g/Git_Repositories/Embedded_Diploma/05_First_Term_Projects/01_Project_1/Code (master)
$ arm-none-eabi-nm alarm.o
00000004 C AL_alarm_sig
00000000 T AL_init
00000004 C AL_state
00000001 C AL_state_id
0000001a T AL_turn_off
0000000c T AL_turn_on
         U Delay
         U Set_Alarm_actuator
0000006c T ST_AL_alarm_off
00000040 T ST_AL_alarm_on
00000028 T ST_AL_busy

Mohamed@DESKTOP-QJR98KP MINGW64 /g/Git_Repositories/Embedded_Diploma/05_First_Te
rm_Projects/01_Project_1/Code (master)
$ arm-none-eabi-nm driver.o
00000000 T Delay
00000020 T getPressureVal
00000074 T GPIO_INITIALIZATION
00000038 T Set_Alarm_actuator

Mohamed@DESKTOP-QJR98KP MINGW64 /g/Git_Repositories/Embedded_Diploma/05_First_Te
rm_Projects/01_Project_1/Code (master)
$ arm-none-eabi-nm pressure_detection_controller.o
00000038 T AL_alarm_get_signal
00000004 C AL_alarm_sig
00000004 C AL_state
00000001 C AL_state_id
00000004 C PD_alarm_sig
00000000 T PD_init
00000004 C PD_pressure
00000004 C PD_pressure_threshold
00000004 C PD_state
00000001 C PD_state_id
0000000c T PS_send_pressure
         U ST_AL_alarm_off
         U ST_AL_alarm_on
00000078 T ST_PD_reading_pressure_value
00000090 T ST_PD_sending_alarm_signal
```

```
Mohamed@DESKTOP-QJR98KP MINGW64 /g/Git_Repositories/Embedded_Diploma/05_First_Te
rm_Projects/01_Project_1/Code (master)
$ arm-none-eabi-nm pressure_sensor.o
         U Delay
         U getPressureVal
00000000 T PS_init
00000004 C PS_pressure
         U PS_send_pressure
00000004 C PS_state
00000001 C PS_state_id
00000070 T ST_PS_idle
0000000c T ST_PS_reading
0000003c T ST_PS_sending

Mohamed@DESKTOP-QJR98KP MINGW64 /g/Git_Repositories/Embedded_Diploma/05_First_Te
rm_Projects/01_Project_1/Code (master)
$ arm-none-eabi-nm startup.o
         U _E_bss
         U _E_data
         U _E_text
         U _S_bss
         U _S_data
         U _STACK_TOP
00000000 W Bus_Fault
00000000 T Default_Handler
00000000 W H_fault_Handler
         U main
00000000 W MM_Fault_Handler
0000000c T Reset_Handler
00000000 W Usage_Fault_Handler
00000000 D vectors
```