Pressure control

Case study:

The client wants to the software of the following system:

Specification (from the client)

A pressure controller informs the crew of a cabin with an alarm when the pressure exceeds 20 bars in the cabin, the alarm duration equals 60 seconds.

Assumptions:

1. The power is valid on time
2. The sensor is valid on time
3. The alarm is valid on time

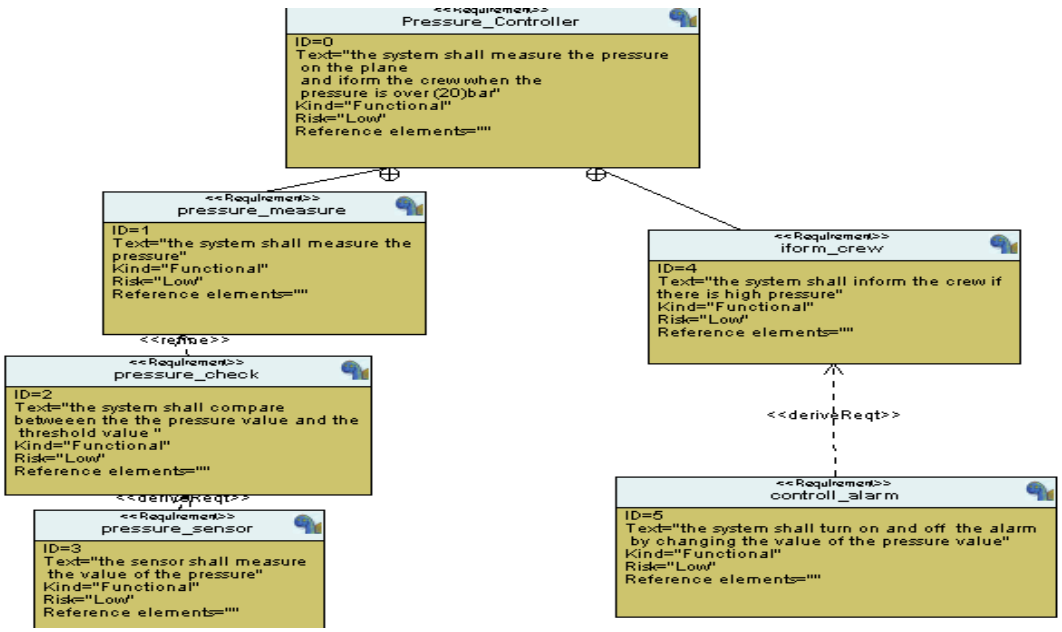
Method:

I will use the waterfall model to this project.

Requirements:

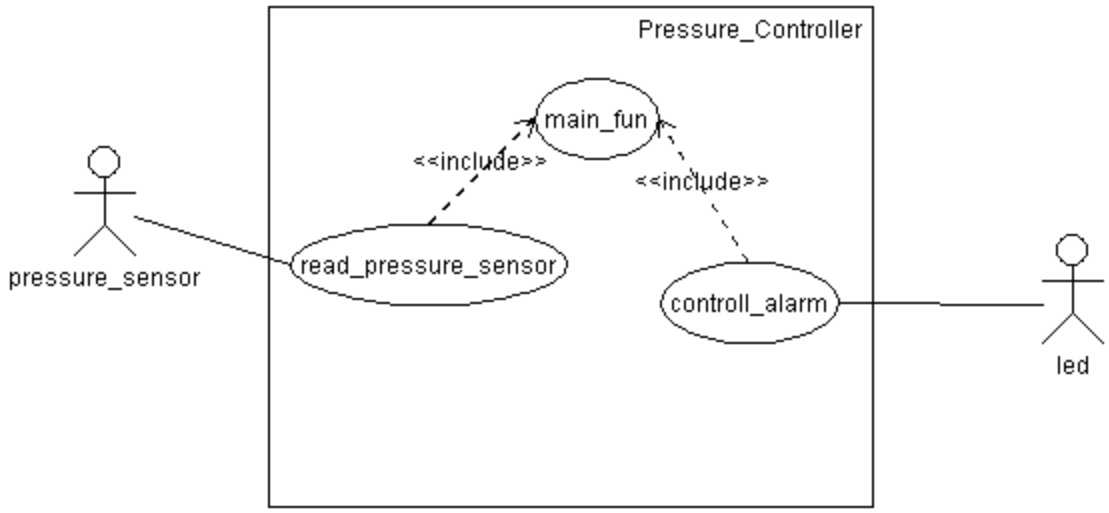
- ✓ Sensor to read the pressure value
- ✓ Alarm to inform the crew when high pressure
- ✓ Alarm time duration is 60 sec

Requirement diagram:

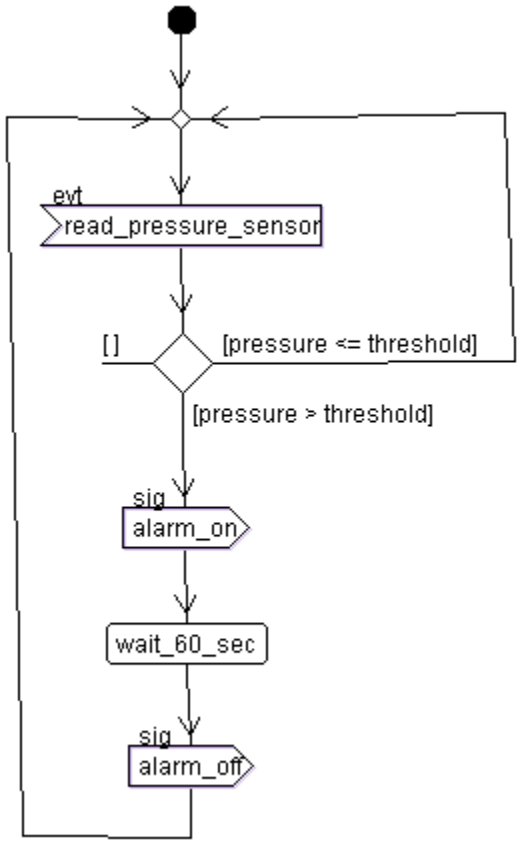


Analysis:

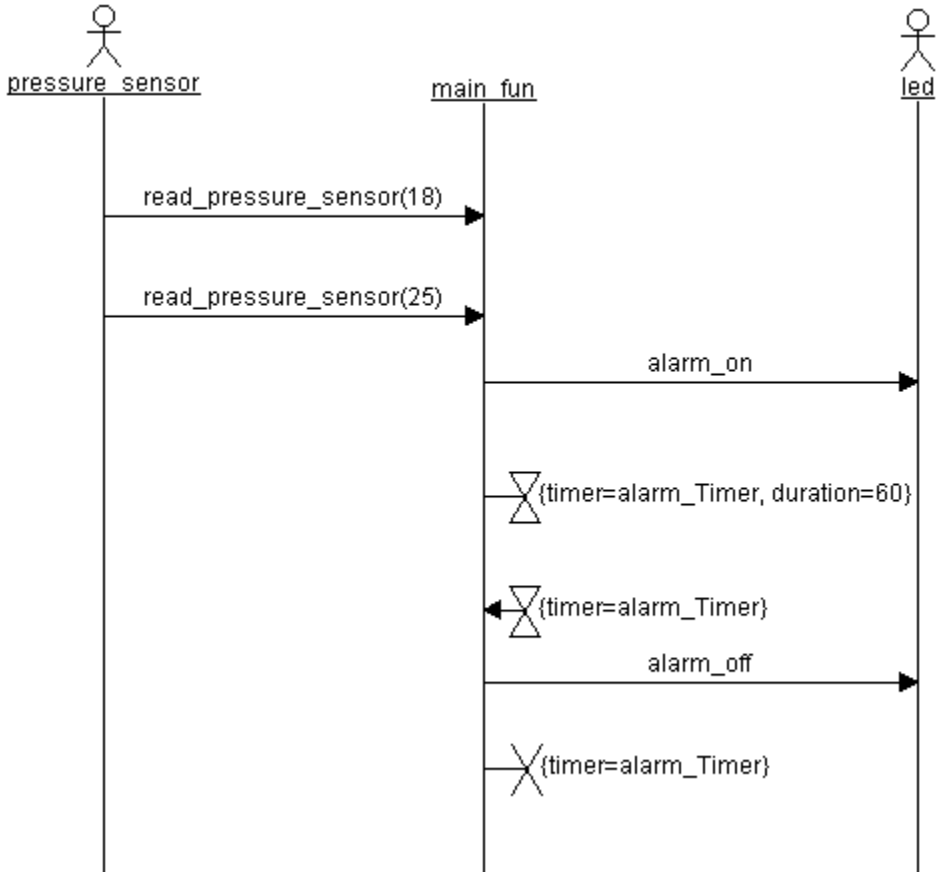
Use case Diagram:



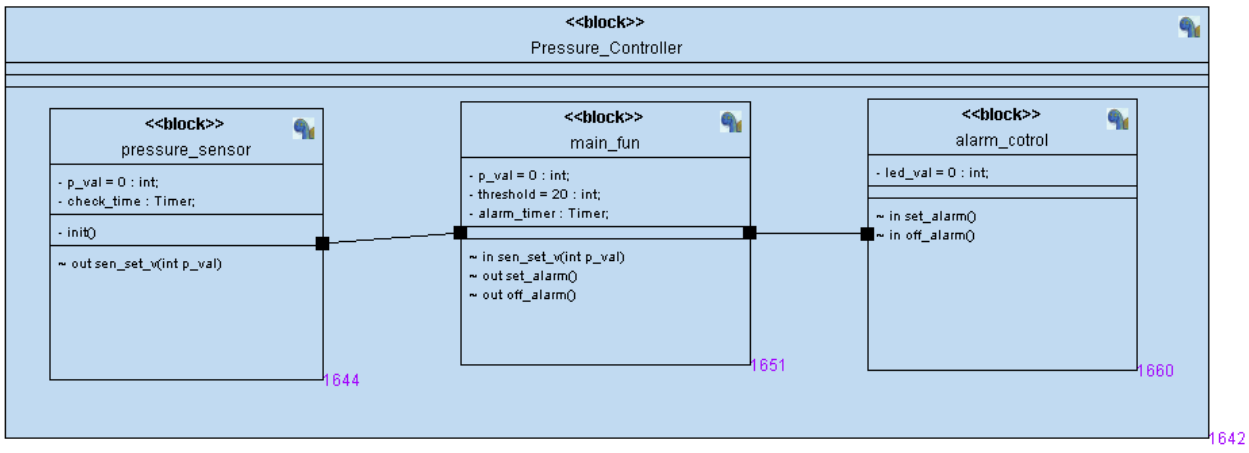
Activity Diagram:



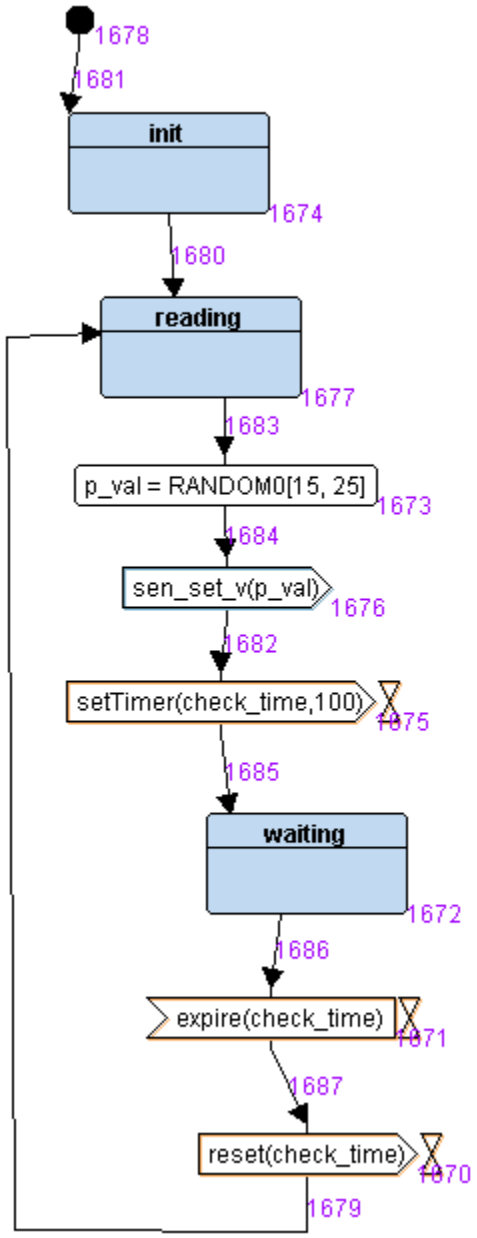
Sequence Diagram:



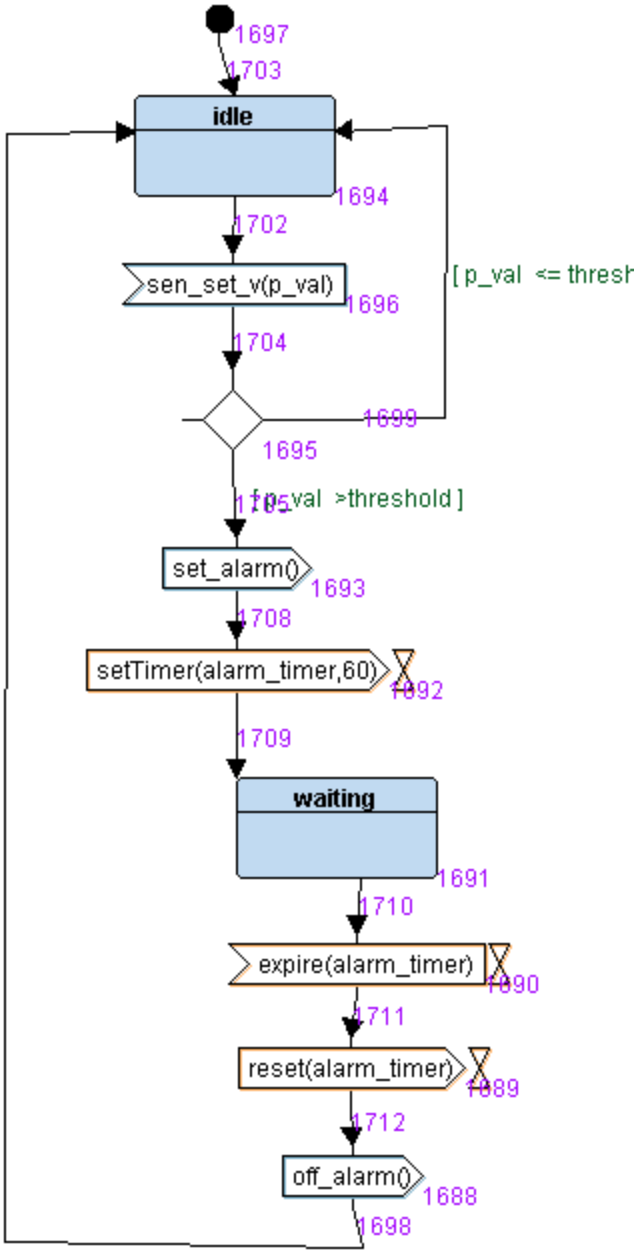
Block Diagram:



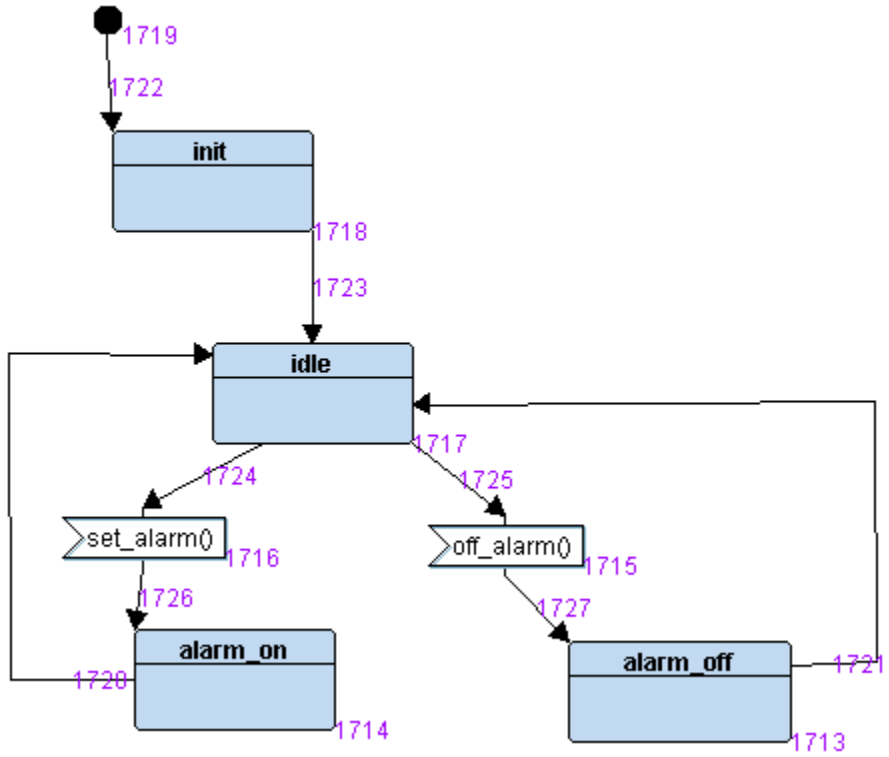
State Machine : pressure sensor



State Machine : main function

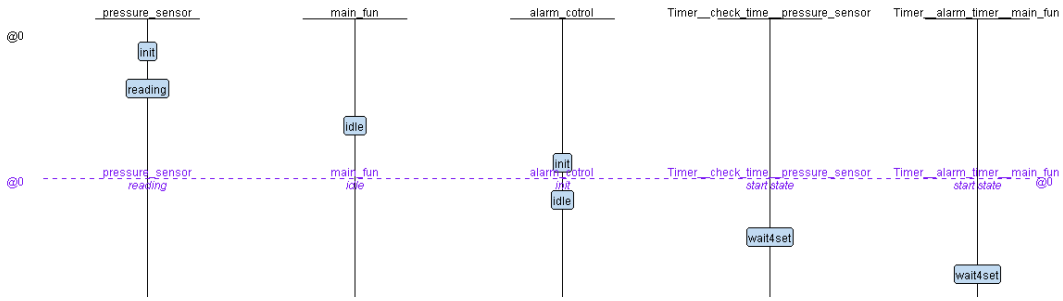

1697
1703
idle
1694
1702
sen_set_v(p_val)
1696
[p_val <= thresh
1704
1699
1695
[p_val >threshold]
1705
set_alarm()
1693
1708
setTimer(alarm_timer,60)
1692
1709
waiting
1691
1710
expire(alarm_timer)
1690
1711
reset(alarm_timer)
1689
1712
off_alarm()
1688
1698

State Machine : alarm

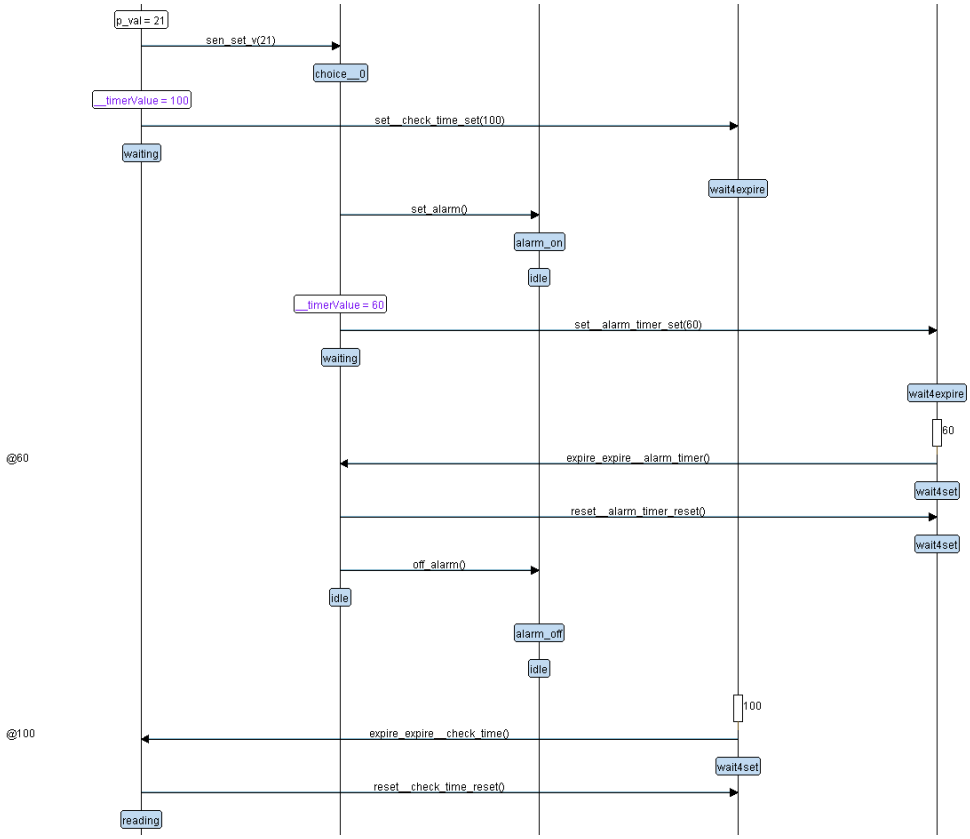


After simulate the project:

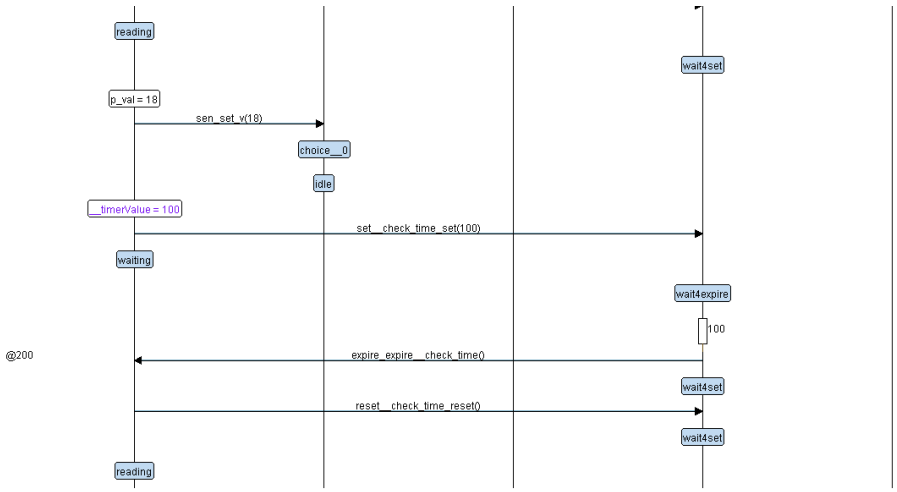
At program start



When pressure sensor read (21) bar



When pressure sensor read (18) bar



When we finished the implementation

1. Symbol of driver

```
Mohamed_ELkomy@DESKTOP-77DMLIJ MINGW32 /f/all/project_1/driver
$ arm-none-eabi-nm.exe driver.o
00000000 T Delay
00000020 T getPressureVal
00000074 T GPIO_INITIALIZATION
00000038 T Set_Alarm_actuator
```

2. Symbol of pressure sensor

```
Mohamed_ELkomy@DESKTOP-77DMLIJ MINGW32 /f/all/project_1/driver
$ arm-none-eabi-nm.exe p_sensor.o
         U getPressureVal
00000000 T read_sensor
```

3. Symbol of alarm

```
Mohamed_ELkomy@DESKTOP-77DMLIJ MINGW32 /f/all/project_1/driver
$ arm-none-eabi-nm.exe p_alarm.o
0000000e T alarm_tern_off
00000000 T alarm_tern_on
         U Set_Alarm_actuator
```

4. Symbol of main function

```
Mohamed_ELkomy@DESKTOP-77DMLIJ MINGW32 /f/all/project_1/driver
$ arm-none-eabi-nm.exe main.o
         U alarm_tern_off
         U alarm_tern_on
         U Delay
         U GPIO_INITIALIZATION
00000000 T main
         U read_sensor
```

5. Symbol of pressure control

```
Mohamed_ELkomy@DESKTOP-77DMLIJ MINGW32 /f/all/project_1/driver
$ make symbol
arm-none-eabi-nm.exe projec_1.elf
20000400 B _E_bss
20000000 T _E_data
000001dc T _E_text
20000000 B _S_bss
20000000 T _S_data
20001400 B _stack_top
00000126 T alarm_tern_off
00000118 T alarm_tern_on
000001d0 W bus_fault
000001d0 T default_handler
00000014 T Delay
00000000 T g_vector
00000034 T getPressureVal
00000088 T GPIO_INITIALIZATION
000001d0 W h_fault_handler
000000d8 T main
000001d0 W nmi_handler
00000134 T read_sensor
0000014c T reset_handler
0000004c T Set_Alarm_actuator
20000000 b stack_top
```

6. Header of driver

```
Mohamed_ELkomy@DESKTOP-77DMLIJ MINGW32 /f/all/project_1/driver
$ arm-none-eabi-objdump.exe -h driver.o

driver.o:     file format elf32-littlearm

Sections:
Idx Name          Size      VMA       LMA       File off  Algn
  0 .text         000000c4  00000000  00000000  00000034  2**2
                  CONTENTS, ALLOC, LOAD, READONLY, CODE
  1 .data         00000000  00000000  00000000  000000f8  2**0
                  CONTENTS, ALLOC, LOAD, DATA
  2 .bss          00000000  00000000  00000000  000000f8  2**0
                  ALLOC
  3 .debug_info   00000a05  00000000  00000000  000000f8  2**0
                  CONTENTS, RELOC, READONLY, DEBUGGING
  4 .debug_abbrev 000001de  00000000  00000000  00000afd  2**0
                  CONTENTS, READONLY, DEBUGGING
  5 .debug_loc    00000140  00000000  00000000  00000cdb  2**0
                  CONTENTS, READONLY, DEBUGGING
  6 .debug_aranges 00000020  00000000  00000000  00000e1b  2**0
                  CONTENTS, RELOC, READONLY, DEBUGGING
  7 .debug_line   000002ca  00000000  00000000  00000e3b  2**0
                  CONTENTS, RELOC, READONLY, DEBUGGING
  8 .debug_str    00000557  00000000  00000000  00001105  2**0
                  CONTENTS, READONLY, DEBUGGING
  9 .comment      0000007c  00000000  00000000  0000165c  2**0
                  CONTENTS, READONLY
 10 .debug_frame  000000a0  00000000  00000000  000016d8  2**2
                  CONTENTS, RELOC, READONLY, DEBUGGING
 11 .ARM.attributes 00000033  00000000  00000000  00001778  2**0
                  CONTENTS, READONLY
```

7. Header of pressure sensor

```
Mohamed_ELkomy@DESKTOP-77DMLIJ MINGW32 /f/all/project_1/driver
$ arm-none-eabi-objdump.exe -h p_sensor.o

p_sensor.o:     file format elf32-littlearm

Sections:
Idx Name          Size      VMA       LMA       File off  Algn
  0 .text         00000016  00000000  00000000  00000034  2**1
                  CONTENTS, ALLOC, LOAD, RELOC, READONLY, CODE
  1 .data         00000000  00000000  00000000  0000004a  2**0
                  CONTENTS, ALLOC, LOAD, DATA
  2 .bss          00000000  00000000  00000000  0000004a  2**0
                  ALLOC
  3 .debug_info   0000099d  00000000  00000000  0000004a  2**0
                  CONTENTS, RELOC, READONLY, DEBUGGING
  4 .debug_abbrev 00000187  00000000  00000000  000009e7  2**0
                  CONTENTS, READONLY, DEBUGGING
  5 .debug_loc    00000050  00000000  00000000  00000b6e  2**0
                  CONTENTS, READONLY, DEBUGGING
  6 .debug_aranges 00000020  00000000  00000000  00000bbe  2**0
                  CONTENTS, RELOC, READONLY, DEBUGGING
  7 .debug_line   000001d8  00000000  00000000  00000bde  2**0
                  CONTENTS, RELOC, READONLY, DEBUGGING
  8 .debug_str    00000514  00000000  00000000  00000db6  2**0
                  CONTENTS, READONLY, DEBUGGING
  9 .comment      0000007c  00000000  00000000  000012ca  2**0
                  CONTENTS, READONLY
 10 .debug_frame  00000034  00000000  00000000  00001348  2**2
                  CONTENTS, RELOC, READONLY, DEBUGGING
 11 .ARM.attributes 00000033  00000000  00000000  0000137c  2**0
                  CONTENTS, READONLY
```

8. Header of alarm

```
Mohamed_ELkomy@DESKTOP-77DMLIJ MINGW32 /f/all/project_1/driver
$ arm-none-eabi-objdump.exe -h p_alarm.o

p_alarm.o:     file format elf32-littlearm

Sections:
Idx Name          Size      VMA       LMA       File off  Algn
  0 .text         0000001c  00000000  00000000  00000034  2**1
                  CONTENTS, ALLOC, LOAD, RELOC, READONLY, CODE
  1 .data         00000000  00000000  00000000  00000050  2**0
                  CONTENTS, ALLOC, LOAD, DATA
  2 .bss          00000000  00000000  00000000  00000050  2**0
                  ALLOC
  3 .debug_info   0000099f  00000000  00000000  00000050  2**0
                  CONTENTS, RELOC, READONLY, DEBUGGING
  4 .debug_abbrev 00000176  00000000  00000000  000009ef  2**0
                  CONTENTS, READONLY, DEBUGGING
  5 .debug_loc    00000058  00000000  00000000  00000b65  2**0
                  CONTENTS, READONLY, DEBUGGING
  6 .debug_aranges 00000020  00000000  00000000  00000bbd  2**0
                  CONTENTS, RELOC, READONLY, DEBUGGING
  7 .debug_line   000001d9  00000000  00000000  00000bdd  2**0
                  CONTENTS, RELOC, READONLY, DEBUGGING
  8 .debug_str    0000051e  00000000  00000000  00000db6  2**0
                  CONTENTS, READONLY, DEBUGGING
  9 .comment      0000007c  00000000  00000000  000012d4  2**0
                  CONTENTS, READONLY
 10 .debug_frame  00000048  00000000  00000000  00001350  2**2
                  CONTENTS, RELOC, READONLY, DEBUGGING
 11 .ARM.attributes 00000033  00000000  00000000  00001398  2**0
                  CONTENTS, READONLY
```

9. Header of main function

```
Mohamed_ELkomy@DESKTOP-77DMLIJ MINGW32 /f/all/project_1/driver
$ arm-none-eabi-objdump.exe -h main.o

main.o:     file format elf32-littlearm

Sections:
Idx Name          Size      VMA       LMA       File off  Algn
  0 .text         00000040  00000000  00000000  00000034  2**1
                  CONTENTS, ALLOC, LOAD, RELOC, READONLY, CODE
  1 .data         00000000  00000000  00000000  00000074  2**0
                  CONTENTS, ALLOC, LOAD, DATA
  2 .bss          00000000  00000000  00000000  00000074  2**0
                  ALLOC
  3 .debug_info   000009ab  00000000  00000000  00000074  2**0
                  CONTENTS, RELOC, READONLY, DEBUGGING
  4 .debug_abbrev 00000187  00000000  00000000  00000a1f  2**0
                  CONTENTS, READONLY, DEBUGGING
  5 .debug_loc    00000038  00000000  00000000  00000ba6  2**0
                  CONTENTS, READONLY, DEBUGGING
  6 .debug_aranges 00000020  00000000  00000000  00000bde  2**0
                  CONTENTS, RELOC, READONLY, DEBUGGING
  7 .debug_line   000001e0  00000000  00000000  00000bfe  2**0
                  CONTENTS, RELOC, READONLY, DEBUGGING
  8 .debug_str    00000513  00000000  00000000  00000dde  2**0
                  CONTENTS, READONLY, DEBUGGING
  9 .comment      0000007c  00000000  00000000  000012f1  2**0
                  CONTENTS, READONLY
 10 .debug_frame  00000030  00000000  00000000  00001370  2**2
                  CONTENTS, RELOC, READONLY, DEBUGGING
 11 .ARM.attributes 00000033  00000000  00000000  000013a0  2**0
                  CONTENTS, READONLY
```

10.Header of pressure control

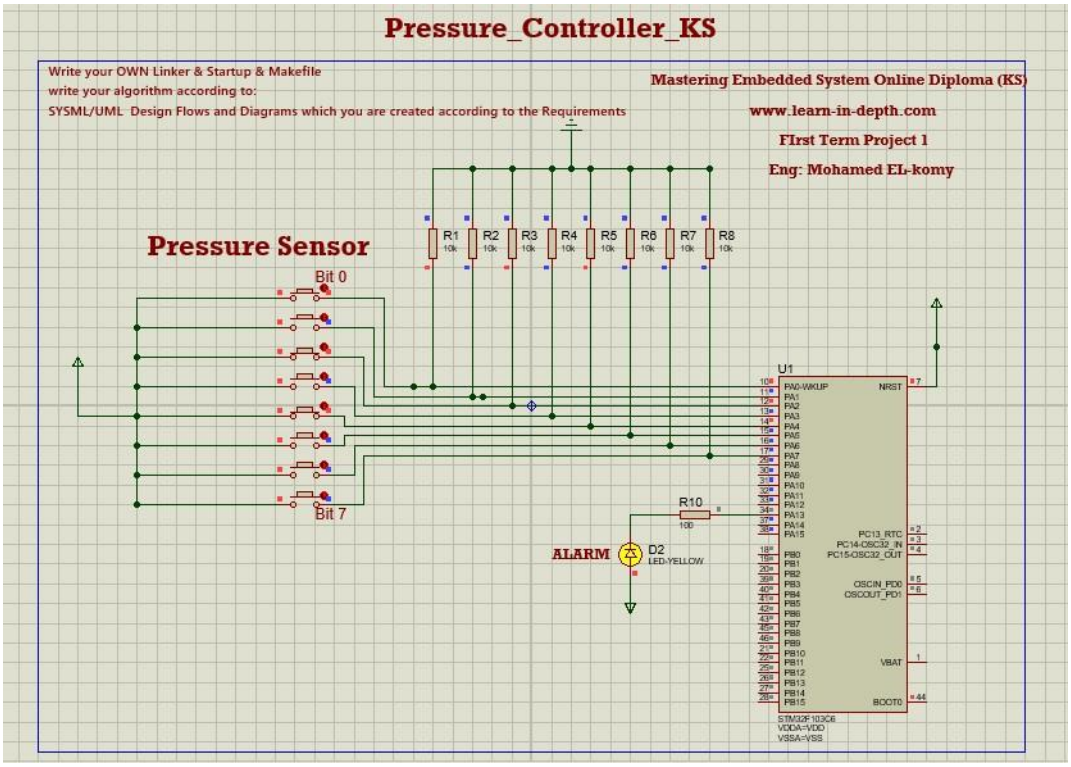
```
Mohamed_ELkomy@DESKTOP-77DMLIJ MINGW32 /f/all/project_1/driver
$ make header
arm-none-eabi-objdump.exe -h projec_1.elf

projec_1.elf:     file format elf32-littlearm

Sections:
Idx Name          Size      VMA       LMA       File off  Algn
  0 .text         000001dc  00000000  00000000  00010000  2**2
                  CONTENTS, ALLOC, LOAD, READONLY, CODE
  1 .bss          00000400  20000000  000001dc  00020000  2**2
                  ALLOC
  2 .debug_info   00002882  00000000  00000000  000101dc  2**0
                  CONTENTS, READONLY, DEBUGGING
  3 .debug_abbrev 00000735  00000000  00000000  00012a5e  2**0
                  CONTENTS, READONLY, DEBUGGING
  4 .debug_loc    0000029c  00000000  00000000  00013193  2**0
                  CONTENTS, READONLY, DEBUGGING
  5 .debug_aranges 000000a0  00000000  00000000  0001342f  2**0
                  CONTENTS, READONLY, DEBUGGING
  6 .debug_line   00000a4d  00000000  00000000  000134cf  2**0
                  CONTENTS, READONLY, DEBUGGING
  7 .debug_str    000005c4  00000000  00000000  00013f1c  2**0
                  CONTENTS, READONLY, DEBUGGING
  8 .comment      0000007b  00000000  00000000  000144e0  2**0
                  CONTENTS, READONLY
  9 .ARM.attributes 00000033  00000000  00000000  0001455b  2**0
                  CONTENTS, READONLY
 10 .debug_frame  0000019c  00000000  00000000  00014590  2**2
                  CONTENTS, READONLY, DEBUGGING
```

Simulation

1. When the pressure value is (21) bar



2. When the pressure value is (20) bar