Mastering Embedded system online diploma

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First project: Pressure Controller

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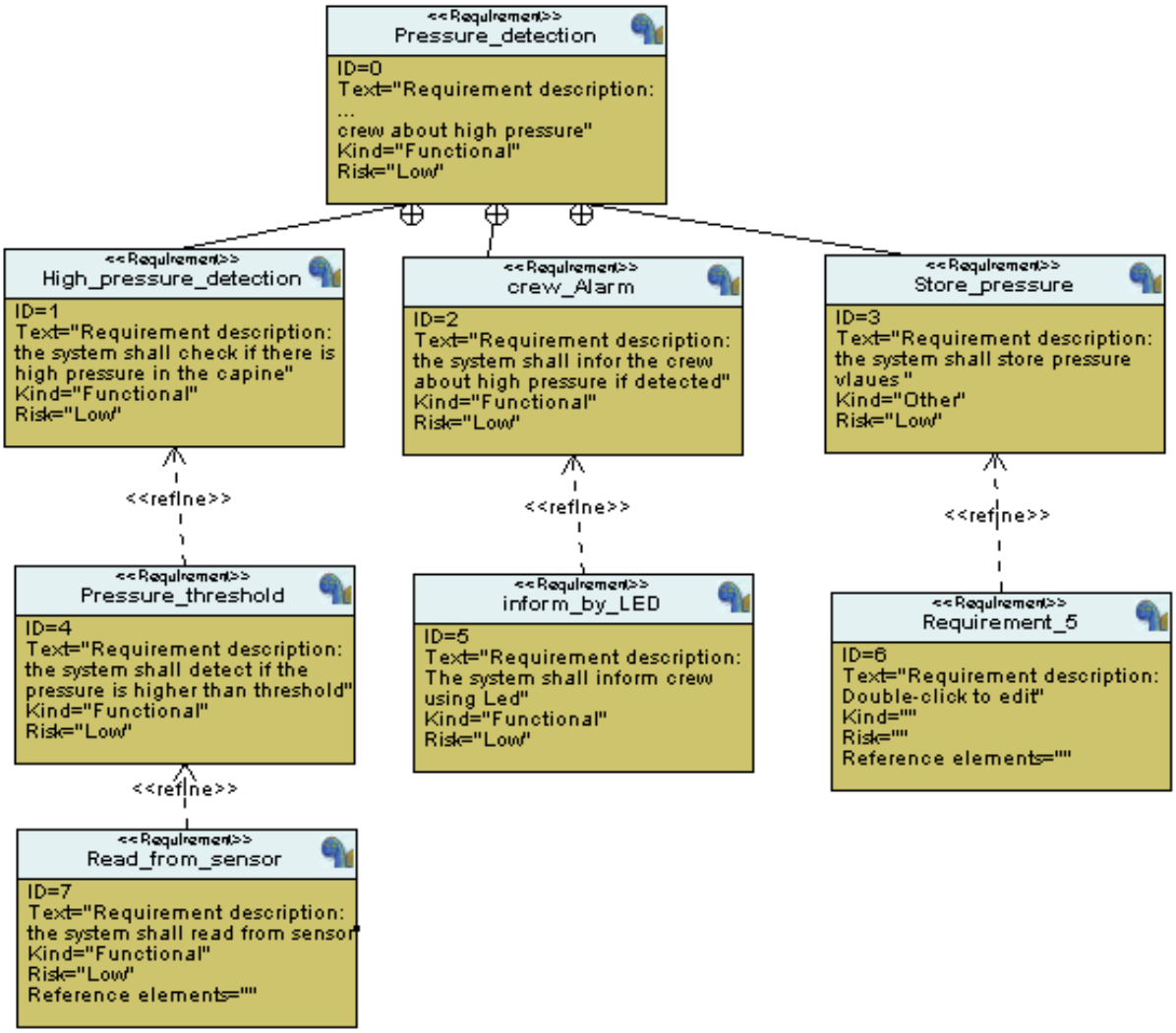
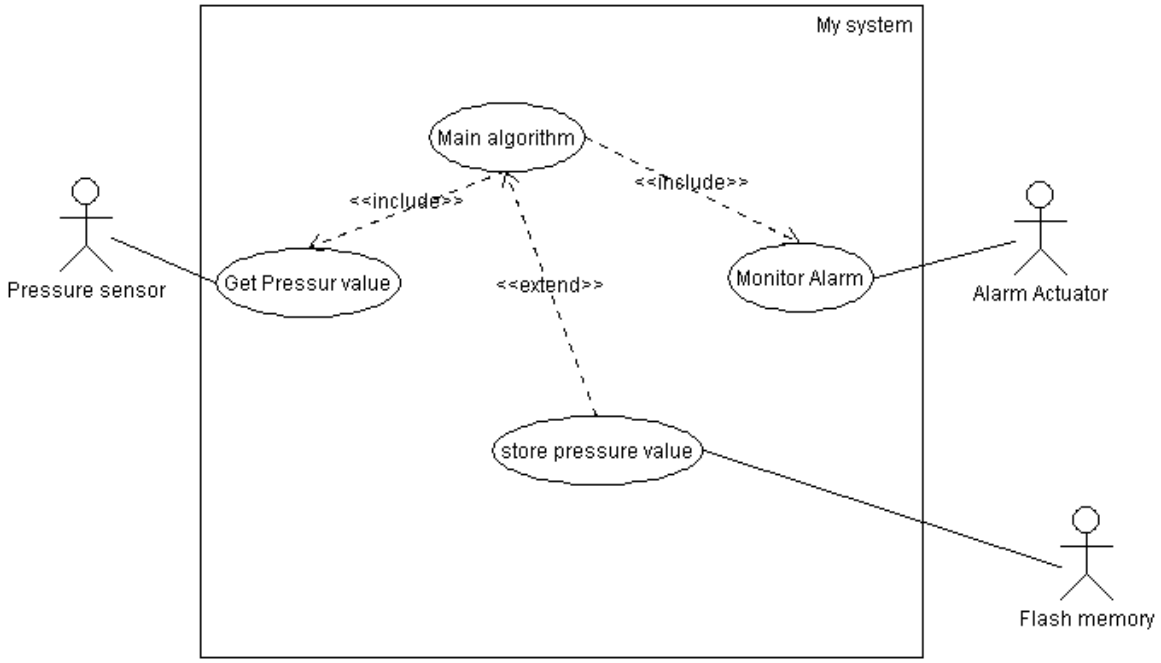
1.Requirment diagram

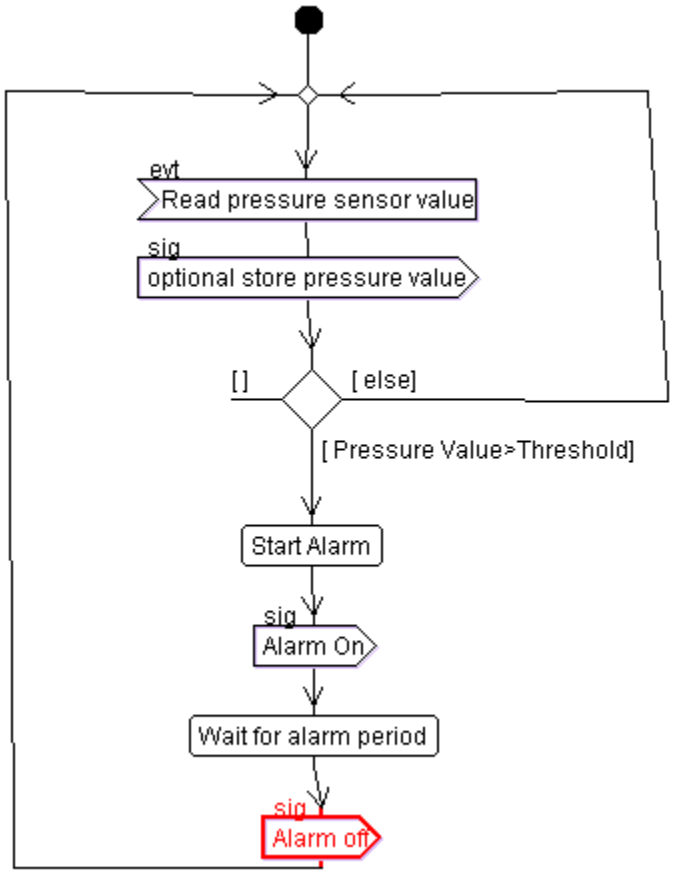


2. System analysis

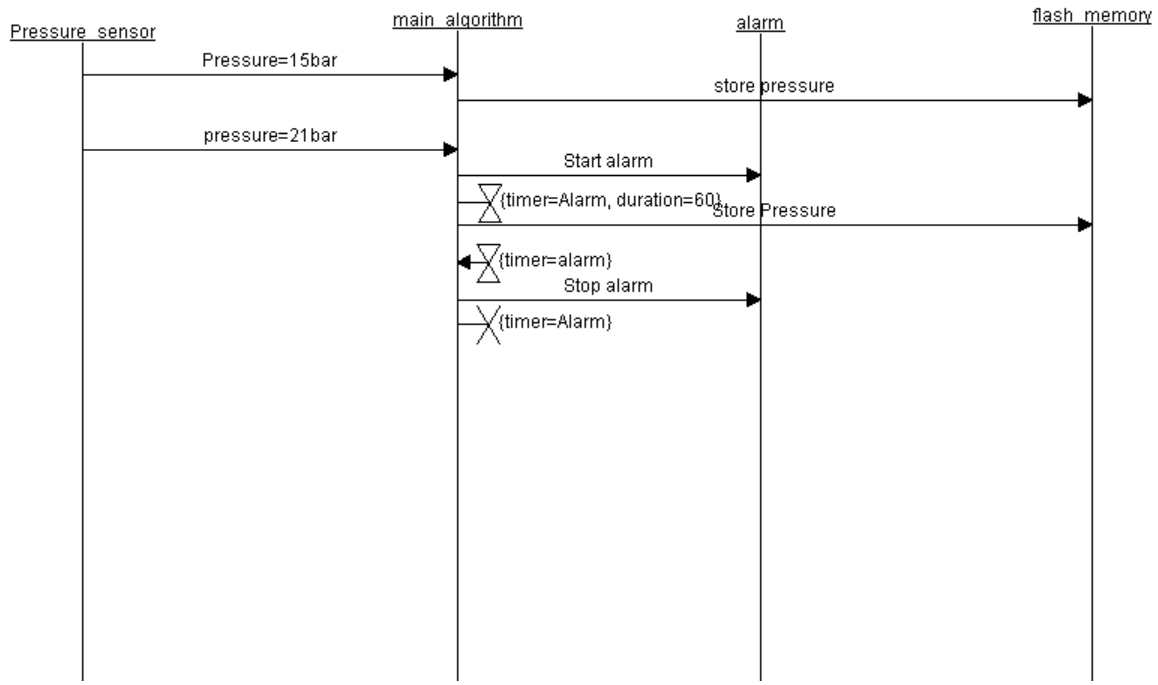
a. Use case diagram



b. Activity diagram

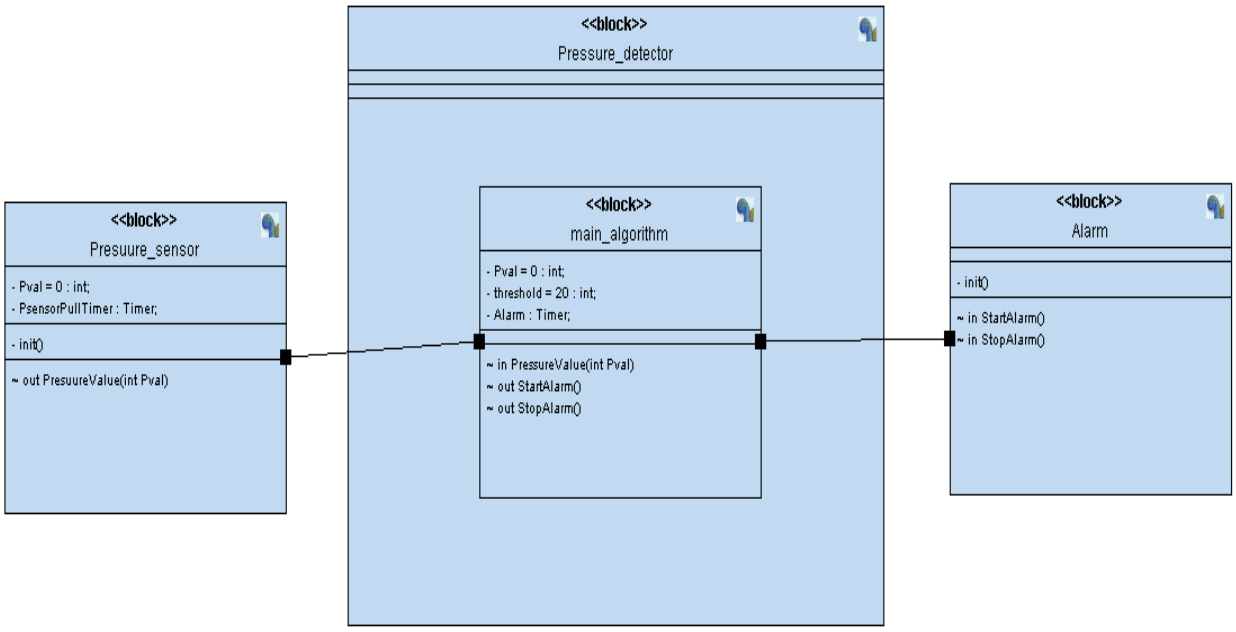


c. sequence diagram

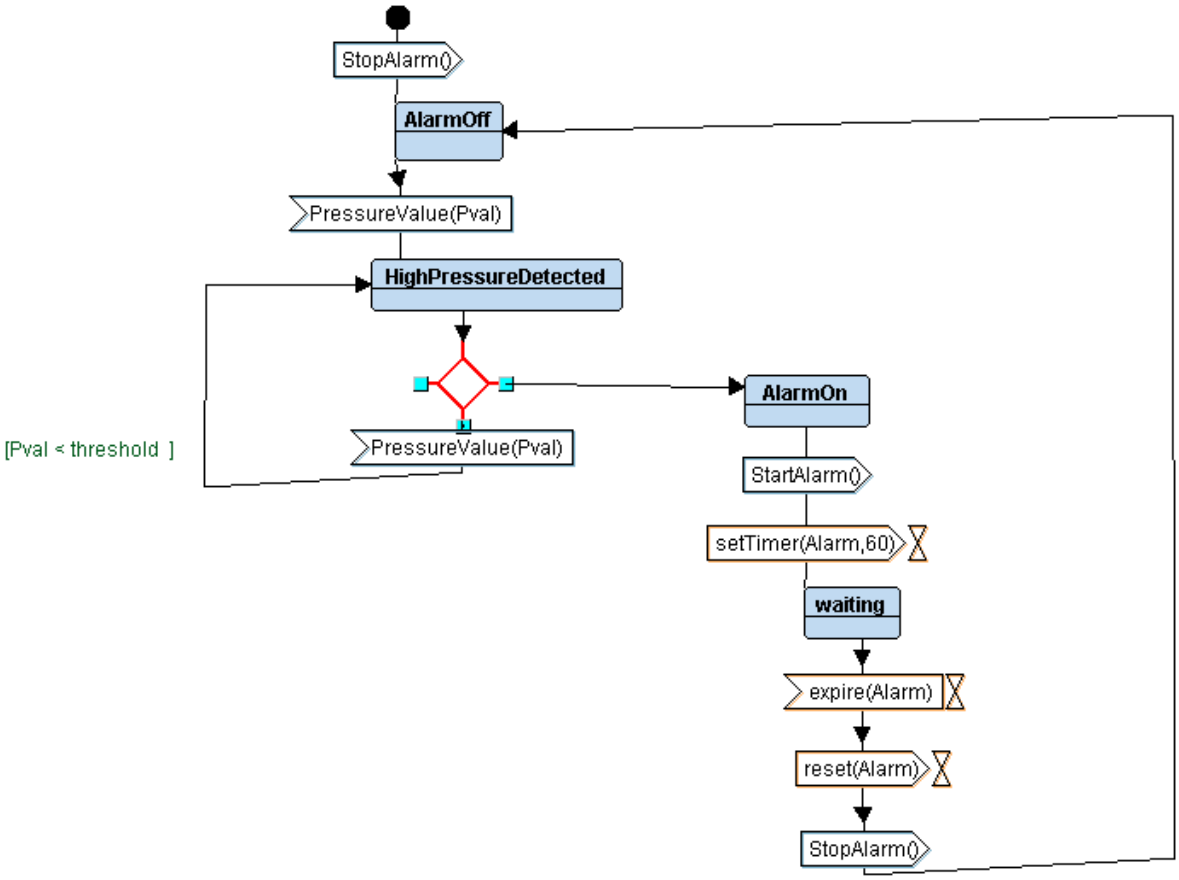


3. Design

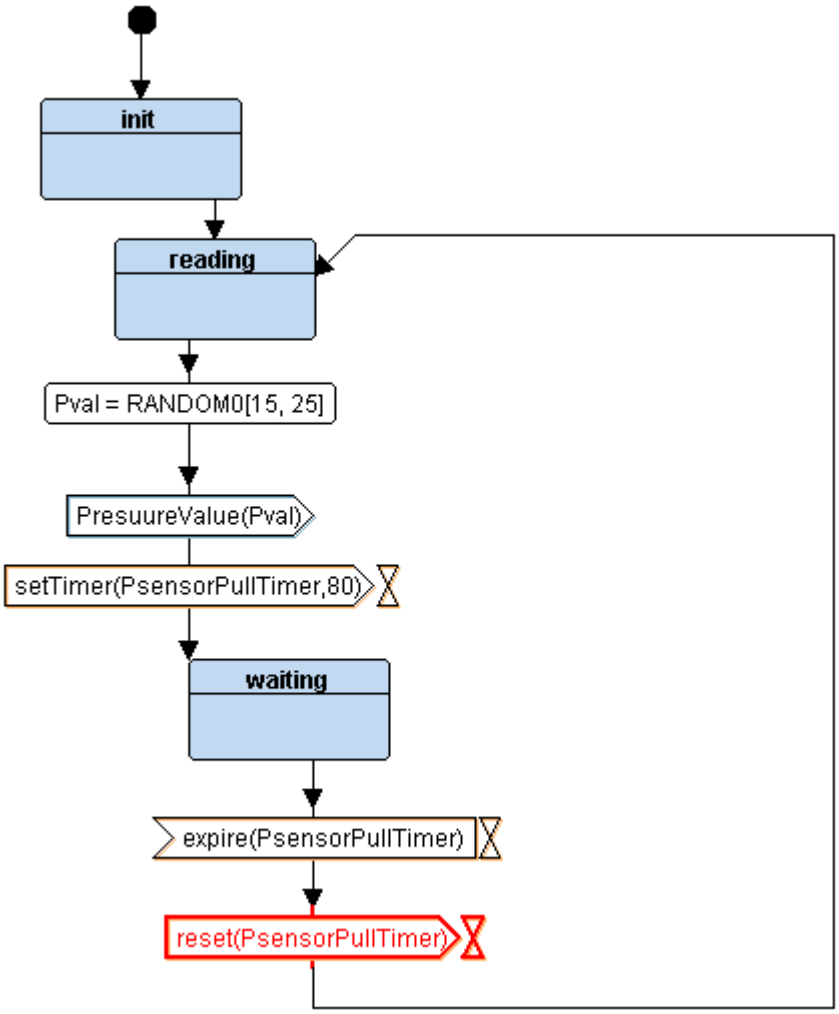
Blocks



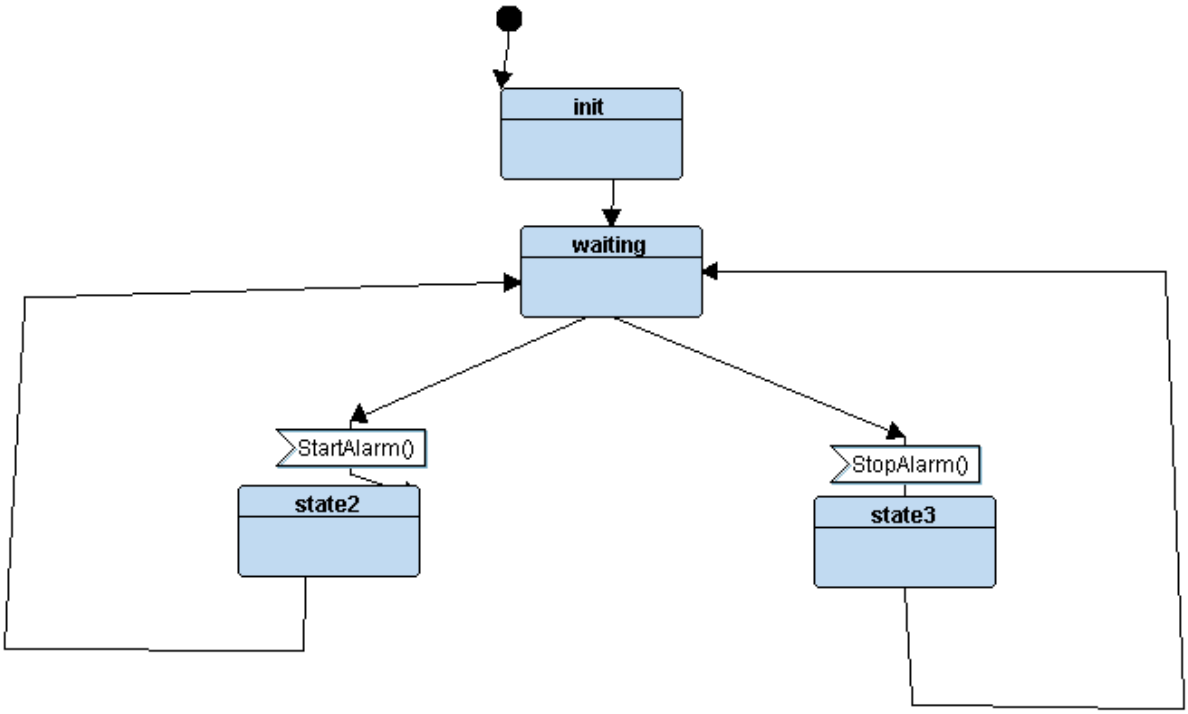
Main algorithm State Machine



Pressure Sensor State Machine



Alarm State Machine



4. Sections and symbols tables

a. main

Sections

```
main.o:     file format elf32-littlearm

Sections:
Idx Name          Size      VMA       LMA       File off  Algn
  0 .text         00000060  00000000  00000000  00000034  2**2
                  CONTENTS, ALLOC, LOAD, RELOC, READONLY, CODE
  1 .data         00000000  00000000  00000000  00000094  2**0
                  CONTENTS, ALLOC, LOAD, DATA
  2 .bss          00000000  00000000  00000000  00000094  2**0
                  ALLOC
  3 .debug_info   000000e1  00000000  00000000  00000094  2**0
                  CONTENTS, RELOC, READONLY, DEBUGGING, OCTETS
  4 .debug_abbrev 00000084  00000000  00000000  00000175  2**0
                  CONTENTS, READONLY, DEBUGGING, OCTETS
  5 .debug_loc    00000058  00000000  00000000  000001f9  2**0
                  CONTENTS, READONLY, DEBUGGING, OCTETS
  6 .debug_aranges 00000020  00000000  00000000  00000251  2**0
                  CONTENTS, RELOC, READONLY, DEBUGGING, OCTETS
  7 .debug_line   00000093  00000000  00000000  00000271  2**0
                  CONTENTS, RELOC, READONLY, DEBUGGING, OCTETS
  8 .debug_str    00000191  00000000  00000000  00000304  2**0
                  CONTENTS, READONLY, DEBUGGING, OCTETS
  9 .comment      0000004a  00000000  00000000  00000495  2**0
                  CONTENTS, READONLY
 10 .debug_frame  00000048  00000000  00000000  000004e0  2**2
                  CONTENTS, RELOC, READONLY, DEBUGGING, OCTETS
 11 .ARM.attributes 0000002d  00000000  00000000  00000528  2**0
                  CONTENTS, READONLY
```

Symbols

```
            U alarmState
            U GPIO_INITIALIZATION
            U GPpressureState
00000038 T main
            U mainAlgoState
00000000 T setup
            U ST_alarmOff
            U ST_pressureDetection
            U ST_PS_reading
```

b. main Algorithm

Sections

```
Sections:
Idx Name          Size      VMA       LMA       File off  Algn
  0 .text         0000004c  00000000  00000000  00000034  2**2
                  CONTENTS, ALLOC, LOAD, RELOC, READONLY, CODE
  1 .data         00000004  00000000  00000000  00000080  2**2
                  CONTENTS, ALLOC, LOAD, DATA
  2 .bss          00000004  00000000  00000000  00000084  2**2
                  ALLOC
  3 .debug_info   0000010f  00000000  00000000  00000084  2**0
                  CONTENTS, RELOC, READONLY, DEBUGGING, OCTETS
  4 .debug_abbrev 000000c2  00000000  00000000  00000193  2**0
                  CONTENTS, READONLY, DEBUGGING, OCTETS
  5 .debug_loc    00000070  00000000  00000000  00000255  2**0
                  CONTENTS, READONLY, DEBUGGING, OCTETS
  6 .debug_aranges 00000020  00000000  00000000  000002c5  2**0
                  CONTENTS, RELOC, READONLY, DEBUGGING, OCTETS
  7 .debug_line   0000006a  00000000  00000000  000002e5  2**0
                  CONTENTS, RELOC, READONLY, DEBUGGING, OCTETS
  8 .debug_str    000001b7  00000000  00000000  0000034f  2**0
                  CONTENTS, READONLY, DEBUGGING, OCTETS
  9 .comment      0000004a  00000000  00000000  00000506  2**0
                  CONTENTS, READONLY
 10 .debug_frame  0000004c  00000000  00000000  00000550  2**2
                  CONTENTS, RELOC, READONLY, DEBUGGING, OCTETS
 11 .ARM.attributes 0000002d  00000000  00000000  0000059c  2**0
                  CONTENTS, READONLY
```

Symbols

```
00000000 B mainAlgoState
         U Pval
         U ST_highPressure
0000001c T ST_pressureDetection
00000000 T ST_setPressure
00000000 D threshold
```

c. Pressure sensor

Sections

```
PressureSensor.o:     file format elf32-littlearm

Sections:
Idx Name          Size      VMA       LMA       File off  Algn
  0 .text         0000004c  00000000  00000000  00000034  2**2
                  CONTENTS, ALLOC, LOAD, RELOC, READONLY, CODE
  1 .data         00000000  00000000  00000000  00000080  2**0
                  CONTENTS, ALLOC, LOAD, DATA
  2 .bss          00000008  00000000  00000000  00000080  2**2
                  ALLOC
  3 .debug_info   000000f3  00000000  00000000  00000080  2**0
                  CONTENTS, RELOC, READONLY, DEBUGGING, OCTETS
  4 .debug_abbrev 000000b7  00000000  00000000  00000173  2**0
                  CONTENTS, READONLY, DEBUGGING, OCTETS
  5 .debug_loc    00000058  00000000  00000000  0000022a  2**0
                  CONTENTS, READONLY, DEBUGGING, OCTETS
  6 .debug_aranges 00000020  00000000  00000000  00000282  2**0
                  CONTENTS, RELOC, READONLY, DEBUGGING, OCTETS
  7 .debug_line   00000072  00000000  00000000  000002a2  2**0
                  CONTENTS, RELOC, READONLY, DEBUGGING, OCTETS
  8 .debug_str    000001a7  00000000  00000000  00000314  2**0
                  CONTENTS, READONLY, DEBUGGING, OCTETS
  9 .comment      0000004a  00000000  00000000  000004bb  2**0
                  CONTENTS, READONLY
 10 .debug_frame  00000048  00000000  00000000  00000508  2**2
                  CONTENTS, RELOC, READONLY, DEBUGGING, OCTETS
 11 .ARM.attributes 0000002d  00000000  00000000  00000550  2**0
                  CONTENTS, READONLY
```

Symbols

```
                 U Delay
                 U getPressureVal
00000004 B GPpressureState
00000000 B Pval
00000000 T ST_PS_reading
00000028 T ST_PS_waiting
                 U ST_setPressure
```

d. Alarm

Sections

```
Alarm.o:     file format elf32-littlearm

Sections:
Idx Name          Size      VMA       LMA       File off  Algn
  0 .text         00000068  00000000  00000000  00000034  2**2
                  CONTENTS, ALLOC, LOAD, RELOC, READONLY, CODE
  1 .data         00000000  00000000  00000000  0000009c  2**0
                  CONTENTS, ALLOC, LOAD, DATA
  2 .bss          00000004  00000000  00000000  0000009c  2**2
                  ALLOC
  3 .debug_info   000000fb  00000000  00000000  0000009c  2**0
                  CONTENTS, RELOC, READONLY, DEBUGGING, OCTETS
  4 .debug_abbrev 00000091  00000000  00000000  00000197  2**0
                  CONTENTS, READONLY, DEBUGGING, OCTETS
  5 .debug_loc    000000c8  00000000  00000000  00000228  2**0
                  CONTENTS, READONLY, DEBUGGING, OCTETS
  6 .debug_aranges 00000020  00000000  00000000  000002f0  2**0
                  CONTENTS, RELOC, READONLY, DEBUGGING, OCTETS
  7 .debug_line   00000069  00000000  00000000  00000310  2**0
                  CONTENTS, RELOC, READONLY, DEBUGGING, OCTETS
  8 .debug_str    000001a0  00000000  00000000  00000379  2**0
                  CONTENTS, READONLY, DEBUGGING, OCTETS
  9 .comment      0000004a  00000000  00000000  00000519  2**0
                  CONTENTS, READONLY
 10 .debug_frame  00000084  00000000  00000000  00000564  2**2
                  CONTENTS, RELOC, READONLY, DEBUGGING, OCTETS
 11 .ARM.attributes 0000002d  00000000  00000000  000005e8  2**0
                  CONTENTS, READONLY
```

Symbols

```
00000000 B  alarmState
         U  Delay
         U  Set_Alarm_actuator
00000038 T  ST_alarmOff
0000001c T  ST_alarmON
00000046 T  ST_alarmWaiting
00000000 T  ST_highPressure
```

e. driver

Sections

```
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   00000112  00000000  00000000  000000f8  2**0
                  CONTENTS, RELOC, READONLY, DEBUGGING, OCTETS
  4 .debug_abbrev 000000c3  00000000  00000000  0000020a  2**0
                  CONTENTS, READONLY, DEBUGGING, OCTETS
  5 .debug_loc    00000140  00000000  00000000  000002cd  2**0
                  CONTENTS, READONLY, DEBUGGING, OCTETS
  6 .debug_aranges 00000020  00000000  00000000  0000040d  2**0
                  CONTENTS, RELOC, READONLY, DEBUGGING, OCTETS
  7 .debug_line   000000eb  00000000  00000000  0000042d  2**0
                  CONTENTS, RELOC, READONLY, DEBUGGING, OCTETS
  8 .debug_str    000001b6  00000000  00000000  00000518  2**0
                  CONTENTS, READONLY, DEBUGGING, OCTETS
  9 .comment      0000004a  00000000  00000000  000006ce  2**0
                  CONTENTS, READONLY
 10 .debug_frame  000000a0  00000000  00000000  00000718  2**2
                  CONTENTS, RELOC, READONLY, DEBUGGING, OCTETS
 11 .ARM.attributes 0000002d  00000000  00000000  000007b8  2**0
                  CONTENTS, READONLY
```

Symbols

```
00000000 T Delay
00000022 T getPressureVal
00000074 T GPIO_INITIALIZATION
00000038 T Set_Alarm_actuator
```

f. Start Up

Sections

```
startup.o:     file format elf32-littlearm

Sections:
Idx Name          Size      VMA       LMA       File off  Algn
  0 .text         00000090  00000000  00000000  00000034  2**2
                  CONTENTS, ALLOC, LOAD, RELOC, READONLY, CODE
  1 .data         00000000  00000000  00000000  000000c4  2**0
                  CONTENTS, ALLOC, LOAD, DATA
  2 .bss          00000000  00000000  00000000  000000c4  2**0
                  ALLOC
  3 .vectors      0000001c  00000000  00000000  000000c4  2**2
                  CONTENTS, ALLOC, LOAD, RELOC, DATA
  4 .debug_info   000001af  00000000  00000000  000000e0  2**0
                  CONTENTS, RELOC, READONLY, DEBUGGING, OCTETS
  5 .debug_abbrev 000000e4  00000000  00000000  0000028f  2**0
                  CONTENTS, READONLY, DEBUGGING, OCTETS
  6 .debug_loc    0000007c  00000000  00000000  00000373  2**0
                  CONTENTS, READONLY, DEBUGGING, OCTETS
  7 .debug_aranges 00000020  00000000  00000000  000003ef  2**0
                  CONTENTS, RELOC, READONLY, DEBUGGING, OCTETS
  8 .debug_line   000000cf  00000000  00000000  0000040f  2**0
                  CONTENTS, RELOC, READONLY, DEBUGGING, OCTETS
  9 .debug_str    000001e5  00000000  00000000  000004de  2**0
                  CONTENTS, READONLY, DEBUGGING, OCTETS
 10 .comment      0000004a  00000000  00000000  000006c3  2**0
                  CONTENTS, READONLY
 11 .debug_frame  00000050  00000000  00000000  00000710  2**2
                  CONTENTS, RELOC, READONLY, DEBUGGING, OCTETS
 12 .ARM.attributes 0000002d  00000000  00000000  00000760  2**0
                  CONTENTS, READONLY
```

Symbols

```
                 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 NM_fault_Handler
00000000 W NMI_Handler
0000000c T reset_Handler
00000000 W Usage_fault_Handler
00000000 D vectors
```

g. Symbol table

```
20000014 B _E_bss
20000004 D _E_data
080002d0 T _E_text
20000004 B _S_bss
20000000 D _S_data
20001014 B _stack_top
20000004 B alarmState
0800001c W Bus_fault
0800001c T Default_Handler
0800020c T Delay
0800022e T getPressureVal
08000280 T GPIO_INITIALIZATION
2000000c B GPpressureState
0800001c W H_fault_Handler
080000e4 T main
20000010 B mainAlgoState
0800001c W NM_fault_Handler
0800001c W NMI_Handler
20000008 B Pval
08000028 T reset_Handler
08000244 T Set_Alarm_actuator
080000ac T setup
08000144 T ST_alarmOff
08000128 T ST_alarmON
08000152 T ST_alarmWaiting
0800010c T ST_highPressure
080001dc T ST_pressureDetection
08000174 T ST_PS_reading
0800019c T ST_PS_waiting
080001c0 T ST_setPressure
20000000 D threshold
0800001c W Usage_fault_Handler
08000000 T vectors
```

5. Simulation

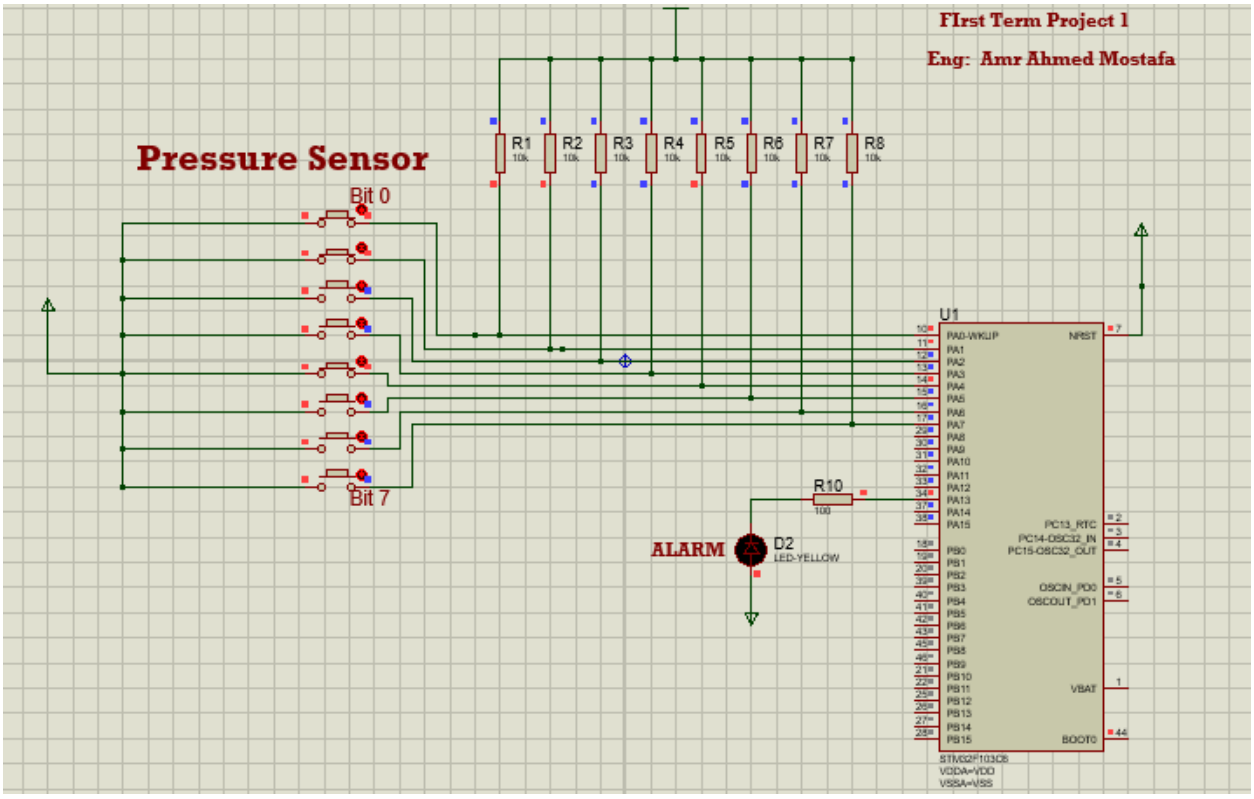


Figure 1Pressure =19 bar

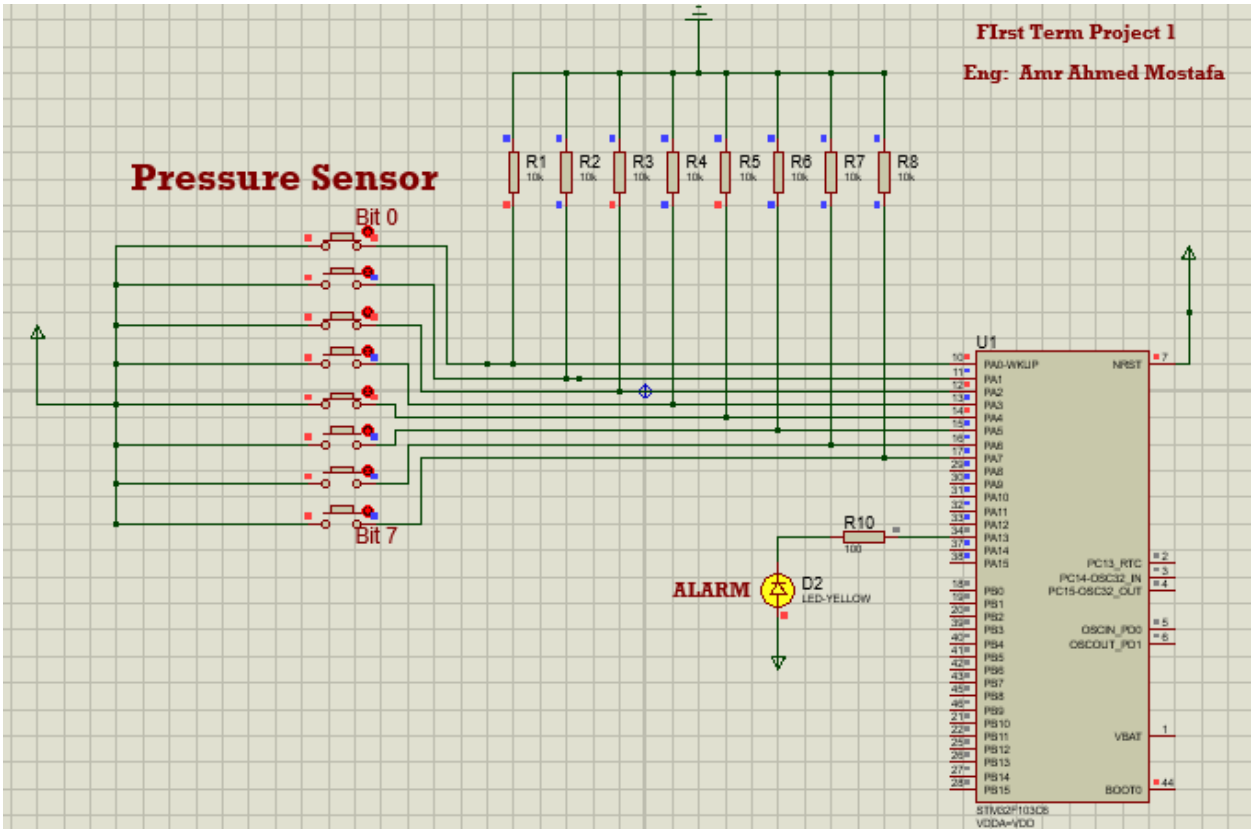


Figure 1pressure = 21bar