Learn-in Depth

project 1

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Table of Contents

1

case study

1

case study

- 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.
- keeps track of the measured values(optional).

ASSUMPTIONS

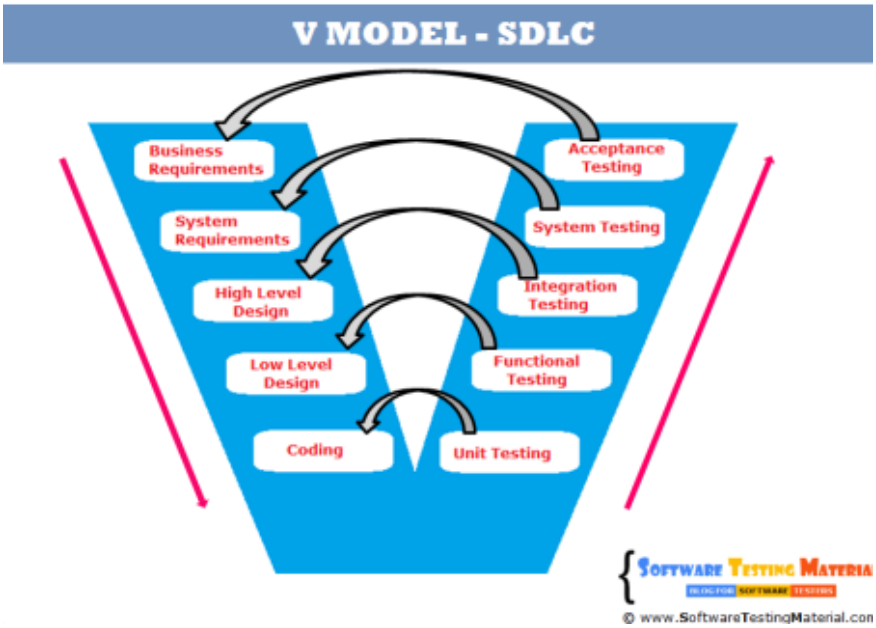
- The controller set up and shutdown procedures are not modeled.
- The controller maintenance is not modeled.
- The pressure sensor never fails.
- The alarm never fails.
- The controller never faces power cut.

2

method

2

method

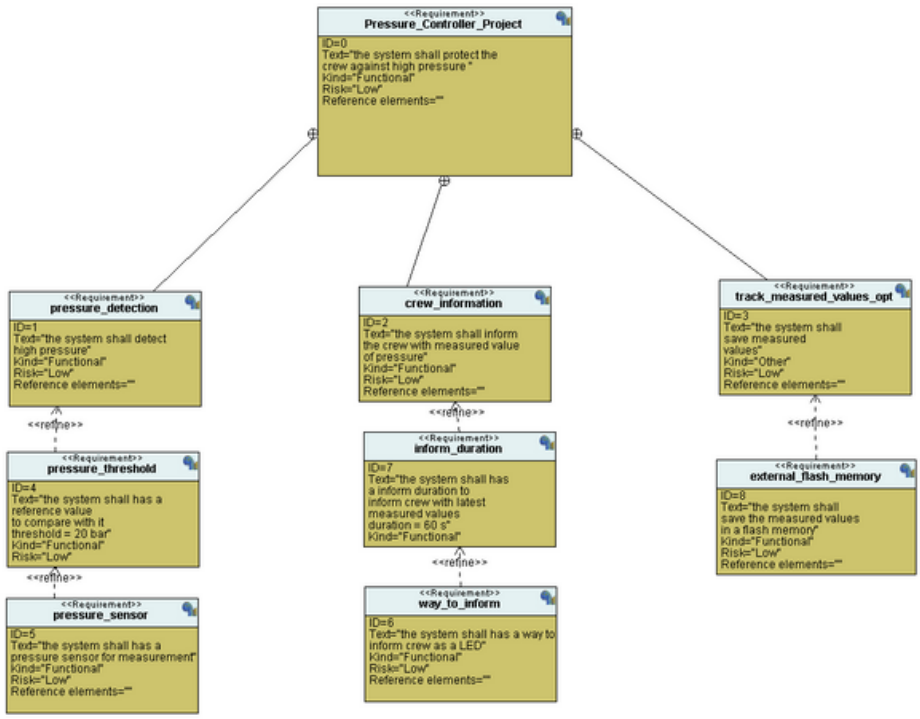


we used v model in this project
as a software development life cycle

3 requirements

3

system requirements

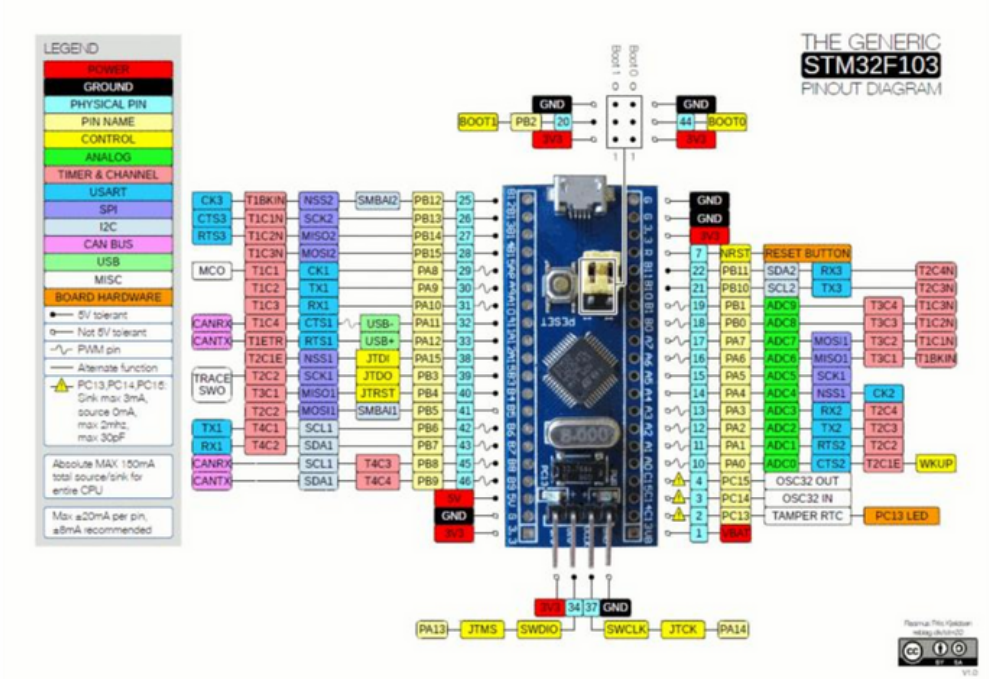


4

space exploration

4

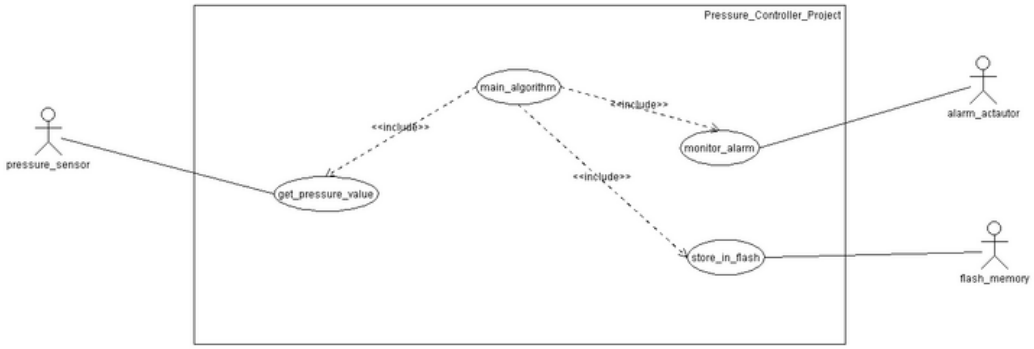
space exploration



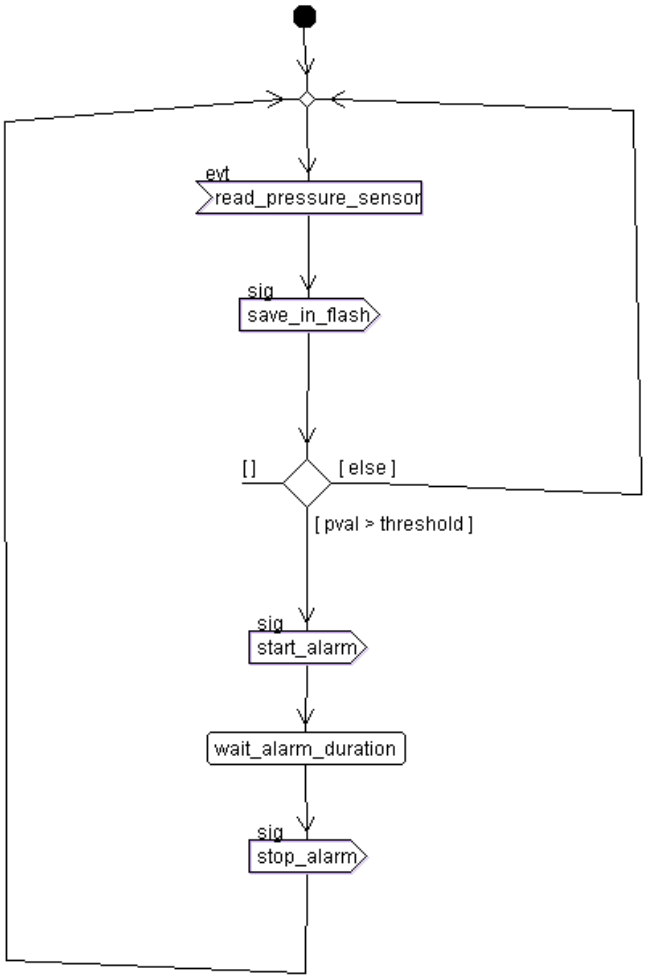
As it’s a small-scale project, we are going to use only one MCU (Stm32f103CX) with a cortex-m3 processor which is suitable for this project

5 system analysis

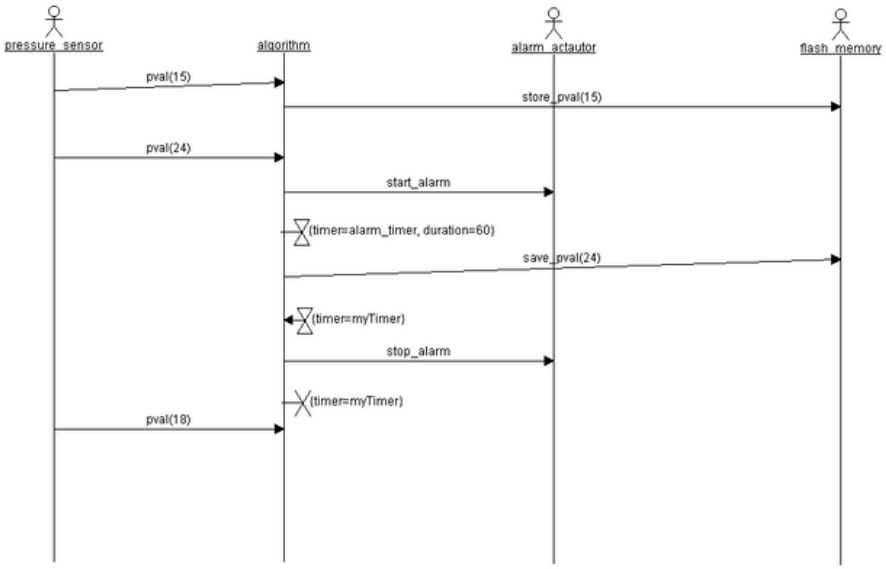
use case diagram



Activity diagram



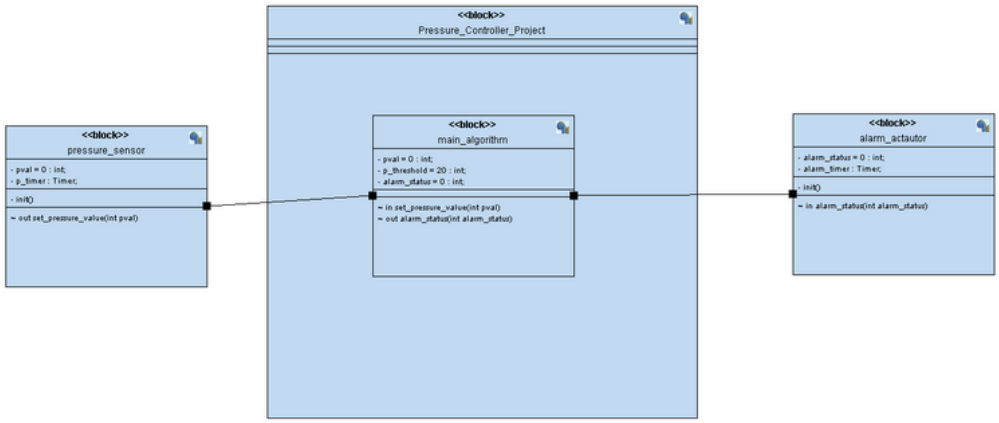
sequance diagram



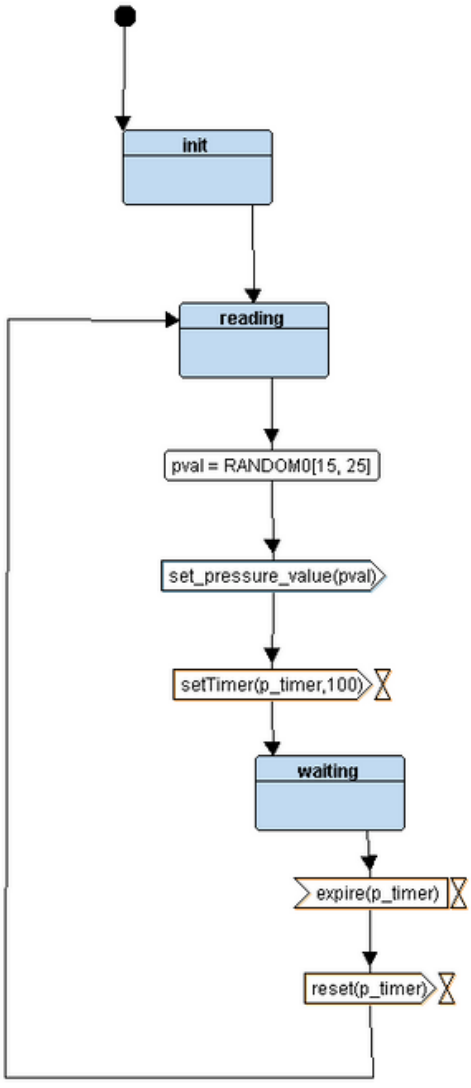
6

system design

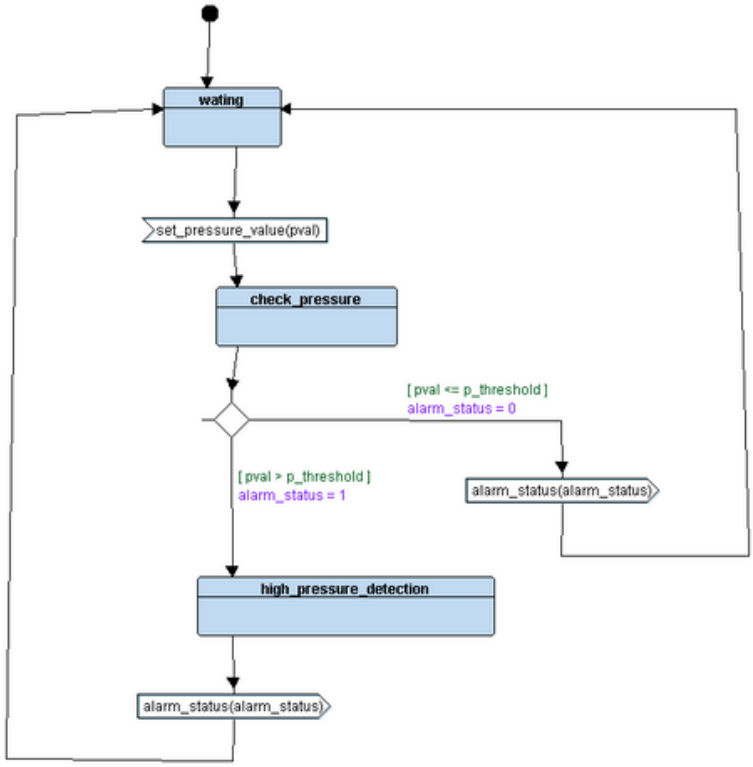
pressure controller system design



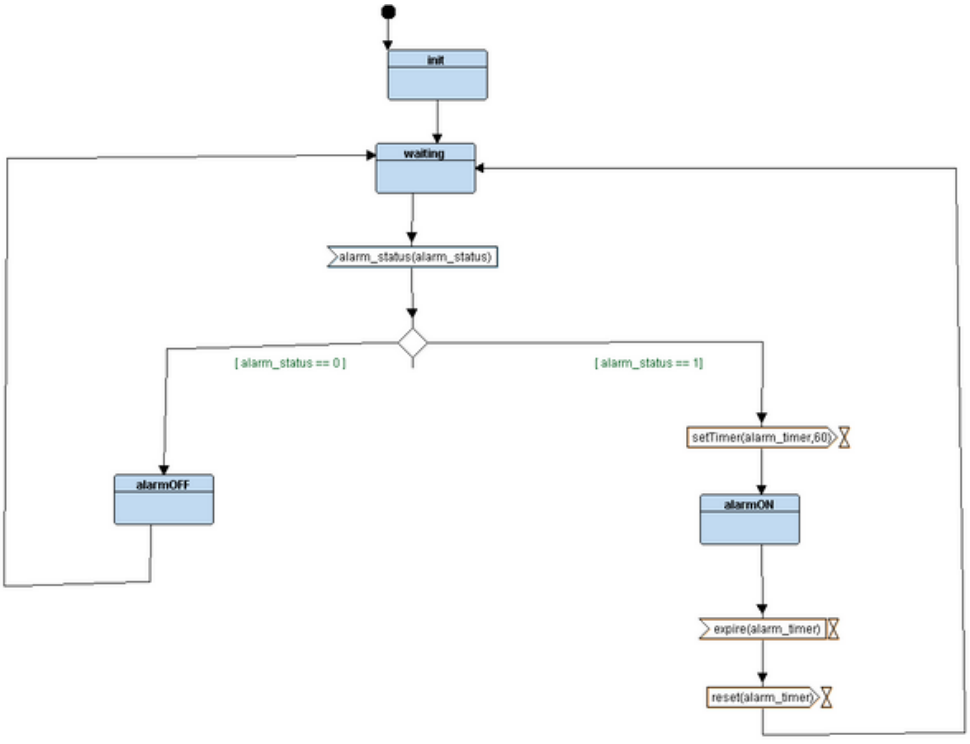
pressure sensor state machine diagram

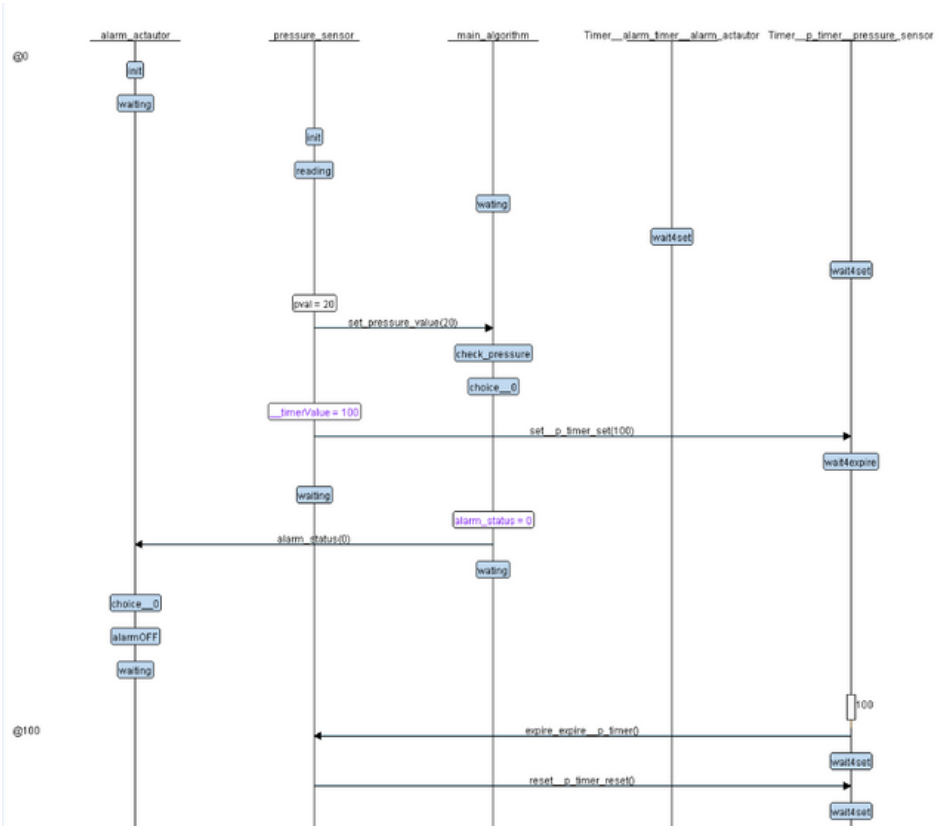


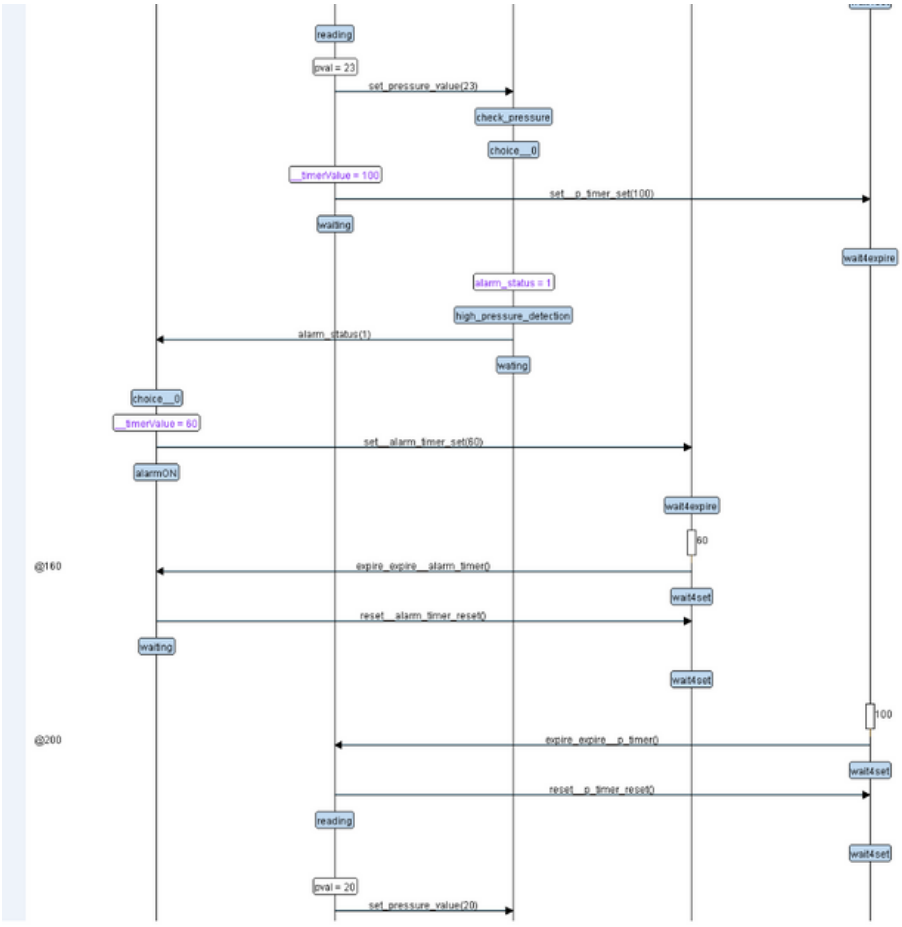
main algorithm state machine diagram



alarm actautor state machine diagram




alarm_actautor
pressure_sensor
main_algorithm
Timer__alarm_timer__alarm_actautor
Timer__p_timer__pressure_sensor
@0
init
waiting
init
reading
wating
wait4set
wait4set
pval = 20
set_pressure_value(20)
check_pressure
choice__0
__timerValue = 100
set__p_timer_set(100)
wait4expire
waiting
alarm_status = 0
alarm_status(0)
wating
choice__0
alarmOFF
waiting
100
@100
expire_expire__p_timer()
wait4set
reset__p_timer_reset()
wait4set


reading
pval = 23
set_pressure_value(23)
check_pressure
choice__0
__timerValue = 100
set__p_timer_set(100)
waiting
wait4expire
alarm_status = 1
high_pressure_detection
alarm_status(1)
waiting
choice__0
__timerValue = 60
set__alarm_timer_set(60)
alarmON
wait4expire
60
@160
expire_expire__alarm_timer()
wait4set
reset__alarm_timer_reset()
waiting
wait4set
100
@200
expire_expire__p_timer()
wait4set
reset__p_timer_reset()
reading
wait4set
pval = 20
set_pressure_value(20)

Symbols

```
$ arm-none-eabi-nm Learn_In_Depth_CORTEX_M3.e
20000018 B _E_bss
20000004 D _E_data
08000548 T _E_text
20001018 B _heap_top
20000004 B _S_bss
20000000 D _S_data
20002018 B _stack_top
20002025 B AC_State_Status
2000000c b alarm_status
20000004 b alarm_status
08000048 T Alarm_Status
20002024 B ALG_State_Status
0800044c W BusFault_Handler
20002018 B current_state
0800044c T Default_Handler
0800021c T Delay
08000240 T getPressureVal
080002a8 T GPIO_INITIALIZATION
0800044c W HardFault_Handler
20000014 B i
08000368 T main
0800044c W MemMange_Handler
0800044c W NMI_Handler
20000000 d p_threshold
2000201c B PS_State_Status
20002020 B ptr_AC_ST
20002028 B ptr_ALG_ST
2000202c B ptr_PS_ST
20000008 b pval
20000010 b pval
08000458 T Reset_Handler
08000258 T Set_Alarm_actuator
08000134 T Set_Pressure_Value
08000328 T Set_UP
080000ec T State_AC_ALARM_OFF
080000b4 T State_AC_ALARM_ON
0800001c T State_AC_INIT
08000068 T State_AC_WAITING
08000164 T State_ALG_CHECK_PRESSURE
080001e4 T State_ALG_HIGH_PRESSURE_DETECTION
0800011c T State_ALG_WAITING
080003a0 T State_PS_INIT
080003d8 T State_PS_READING
08000420 T State_PS_WAITING
0800044c W UsageFault_Handler
08000000 T vectors
```

sections

```
Sections:
Idx Name          Size      VMA       LMA       File off  Algn
  0 .text         00000548  08000000  08000000  00008000  2**2
                  CONTENTS, ALLOC, LOAD, READONLY, CODE
  1 .data         00000004  20000000  08000548  00010000  2**2
                  CONTENTS, ALLOC, LOAD, DATA
  2 .bss          00002030  20000004  0800054c  00010004  2**2
                  ALLOC
  3 .debug        00001d18  00000000  00000000  00010004  2**2
                  CONTENTS, READONLY, DEBUGGING
  4 .comment      00000011  00000000  00000000  00011d1c  2**0
                  CONTENTS, READONLY
  5 .ARM.attributes 00000033  00000000  00000000  00011d2d  2**0
                  CONTENTS, READONLY
```

Simulation