



Pressure Detection

First Term Project

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1 Problem Statement

The more we travel up in the air, pressure decreases. Airplane travels up and down causes the air pressure changing. This problem is dangerous for passengers.

2 Goal

Develop a device to control and manage the air pressure in the crew cabin.

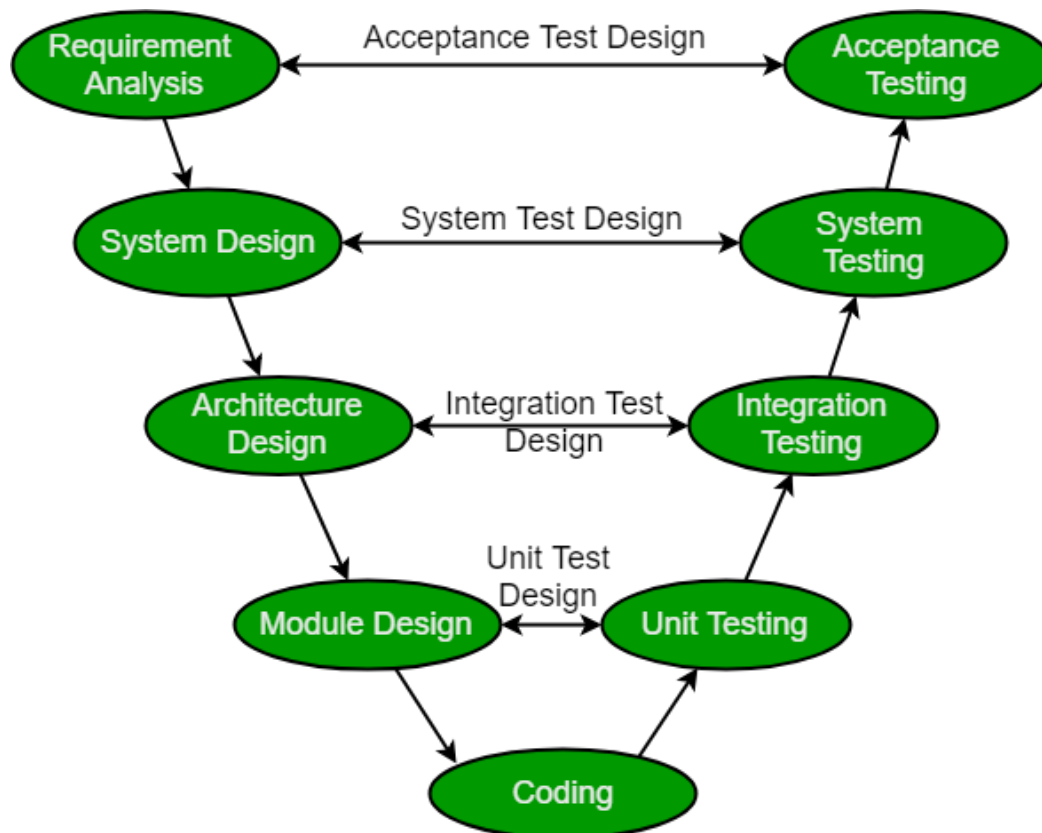
3 Specification

Pressure Detection informs the crew of a cabin with an alarm, when the pressure exceeds 20 bars in the cabin.

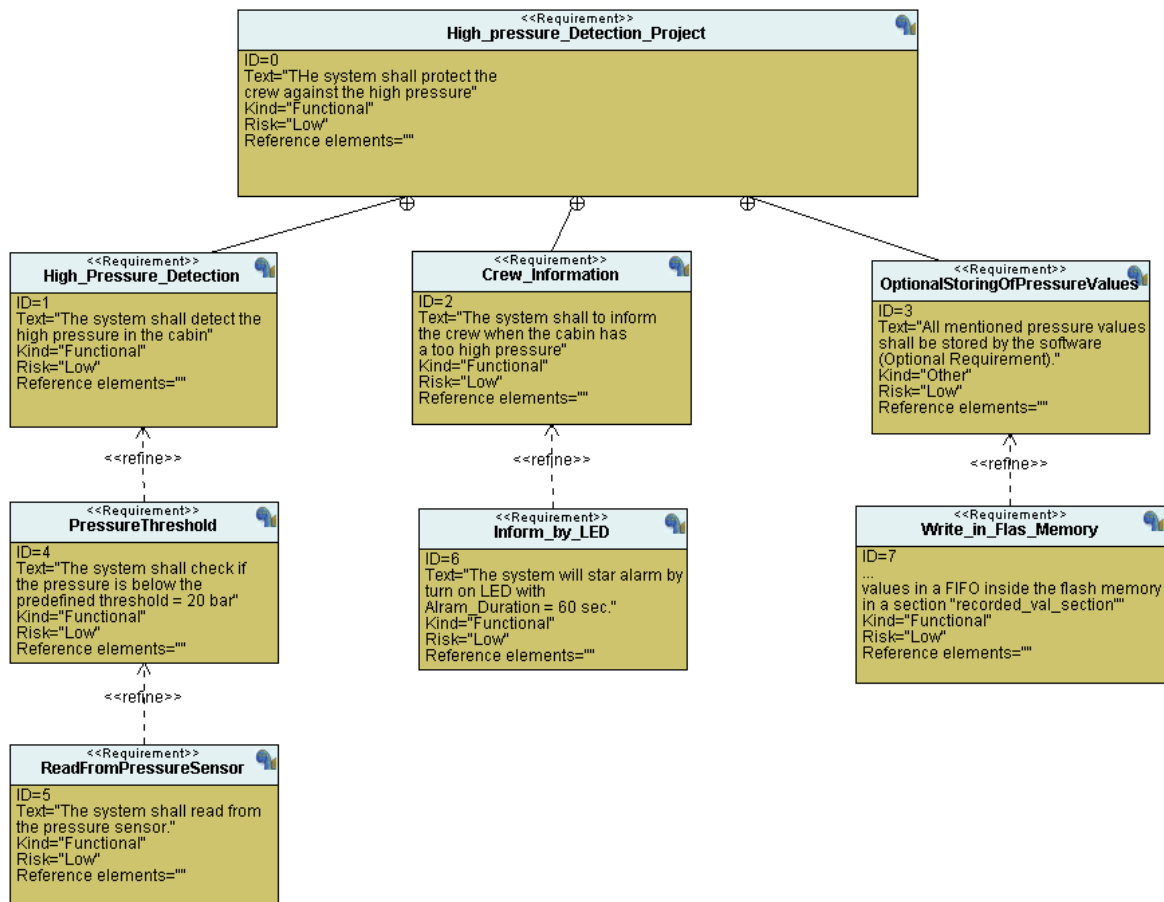
- The alarm duration equal 60 seconds.
- Optional: Keep track of the measured value.

4 Method

The V-model is the used method for developing and testing.



5 Requirement Diagram



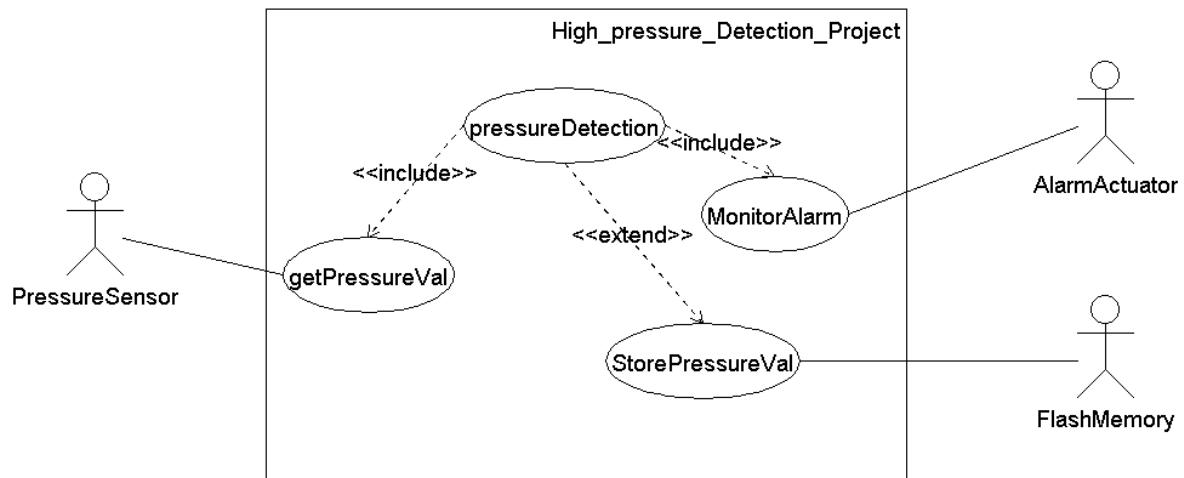
6 Space Exploration

STM32 Microcontroller will be used.

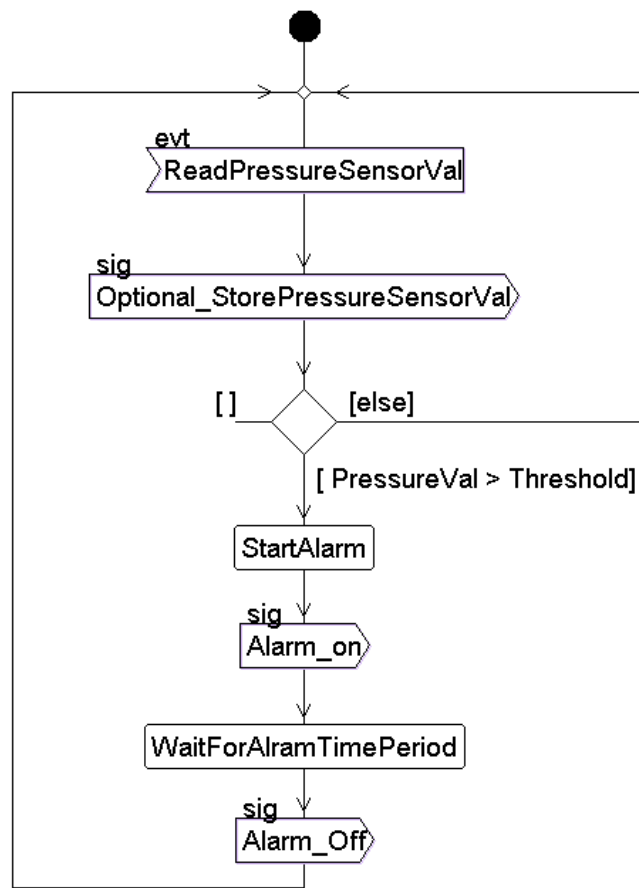


7 System Analysis

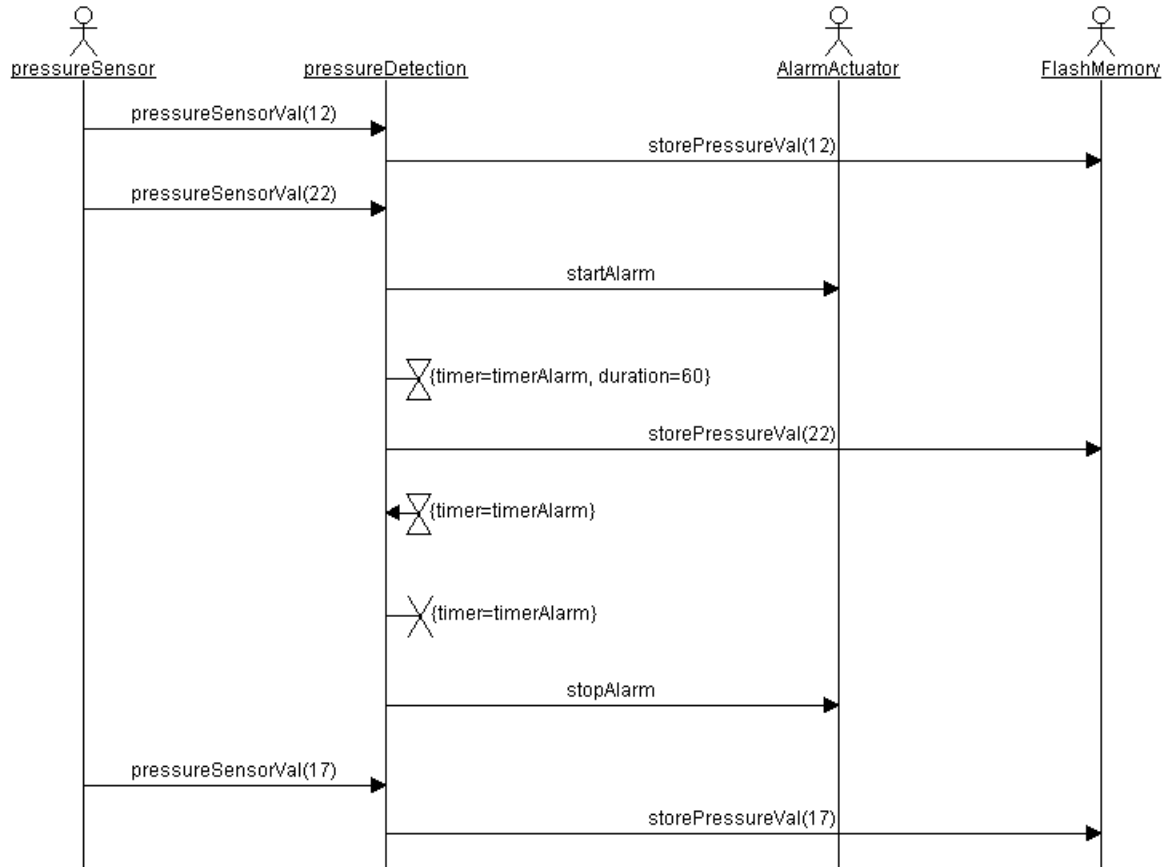
7.1 Use Case Diagram



7.2 Activity Diagram

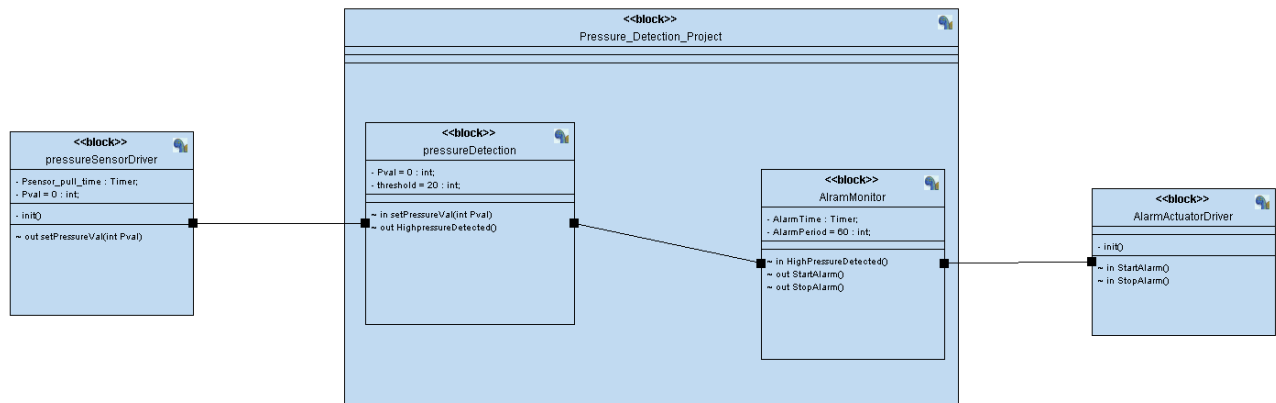


7.3 Sequence Diagram

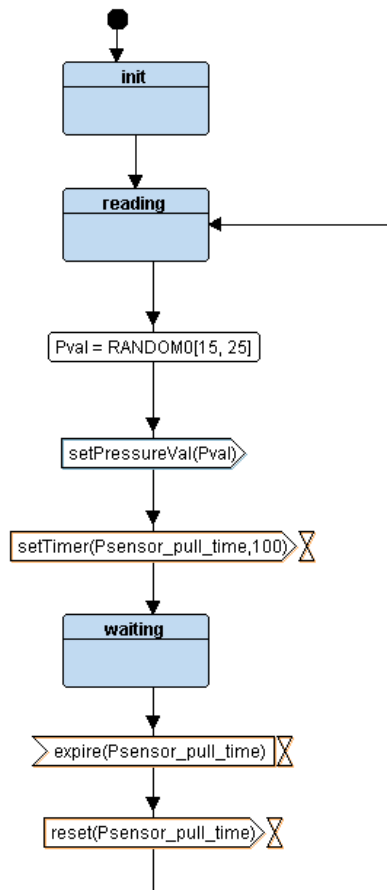


8 System Design

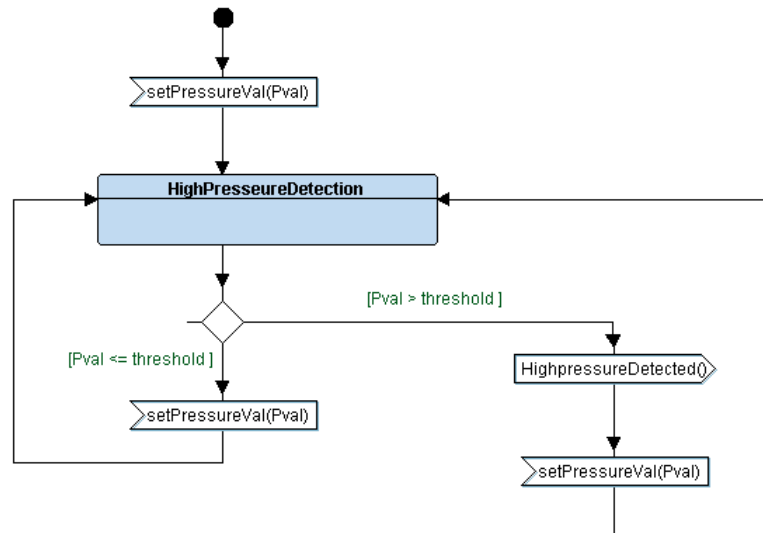
8.1 Block (Instance) Diagram



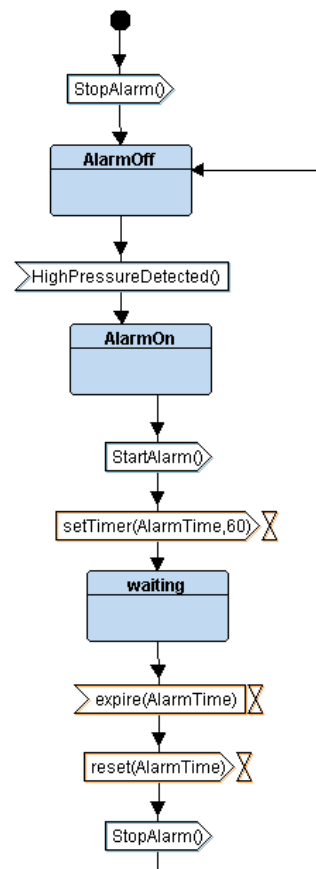
8.2 Pressure Sensor Driver



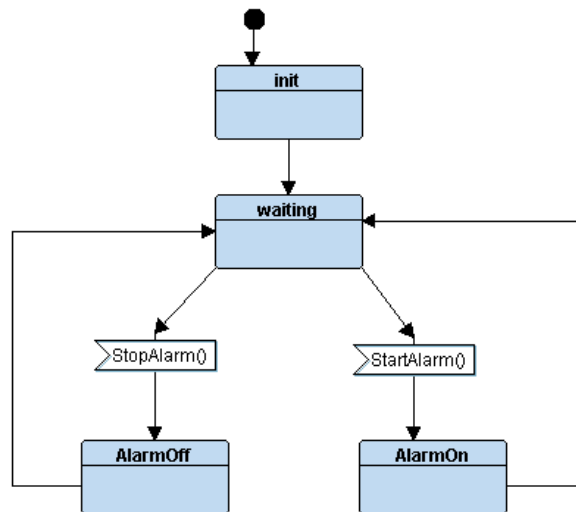
8.3 Pressure Detection



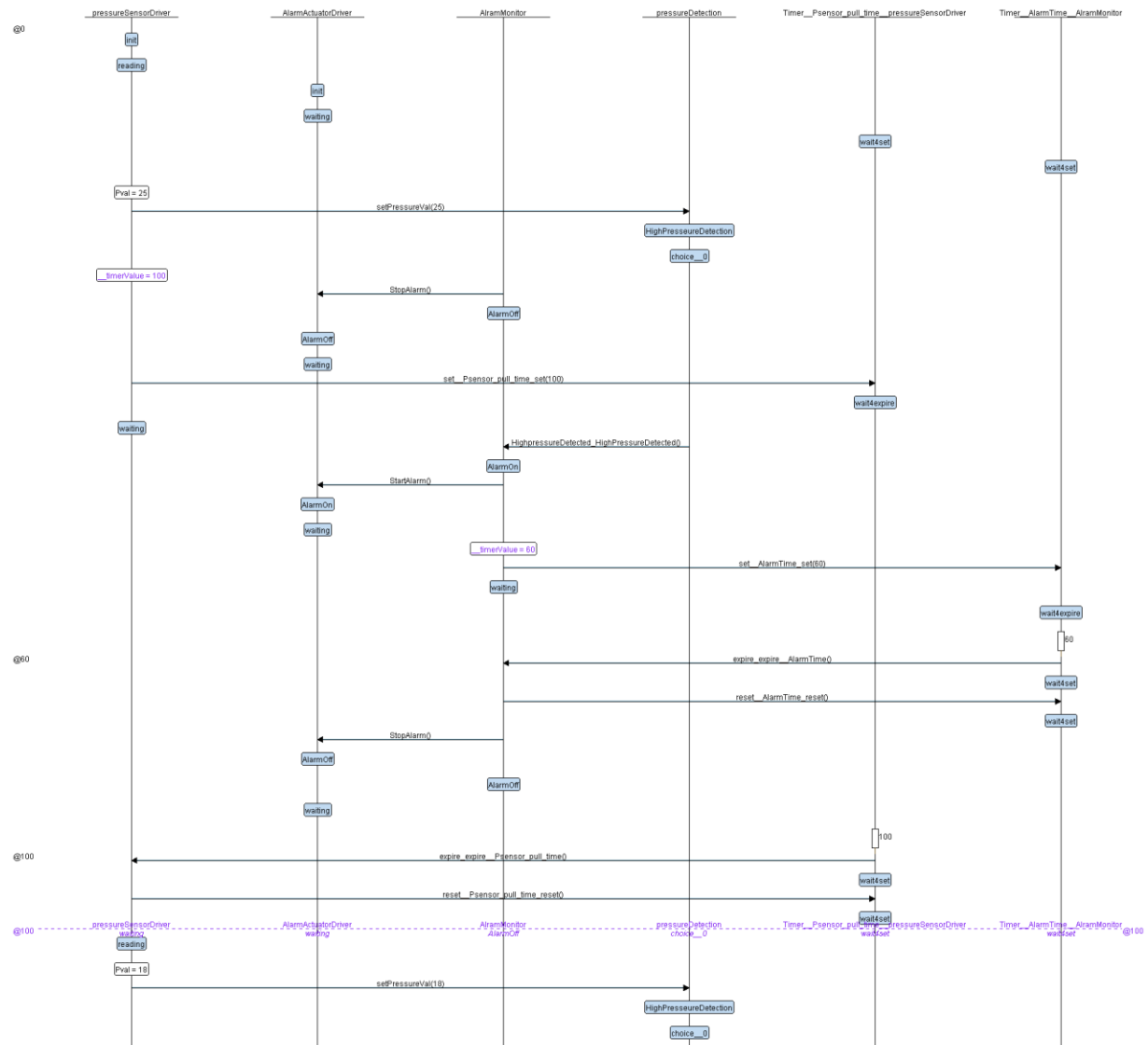
8.4 Alarm Monitor



8.5 Alarm Actuator Driver



8.6 System Design Simulation



10 Software Analysis

10.1 Object files section

```
$ 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          0000005c  00000000  00000000  00000034  2**2
                CONTENTS, ALLOC, LOAD, RELOC, READONLY, CODE
 1 .data          00000000  00000000  00000000  00000090  2**0
                CONTENTS, ALLOC, LOAD, DATA
 2 .bss           00000000  00000000  00000000  00000090  2**0
                ALLOC
 3 .debug_info    000009e1  00000000  00000000  00000090  2**0
                CONTENTS, RELOC, READONLY, DEBUGGING
 4 .debug_abbrev  000001bc  00000000  00000000  00000a71  2**0
                CONTENTS, READONLY, DEBUGGING
 5 .debug_loc     00000070  00000000  00000000  00000c2d  2**0
                CONTENTS, READONLY, DEBUGGING
 6 .debug_aranges 00000020  00000000  00000000  00000c9d  2**0
                CONTENTS, RELOC, READONLY, DEBUGGING
 7 .debug_line    00000227  00000000  00000000  00000cbd  2**0
                CONTENTS, RELOC, READONLY, DEBUGGING
 8 .debug_str     000005ab  00000000  00000000  00000ee4  2**0
                CONTENTS, READONLY, DEBUGGING
 9 .comment       0000007c  00000000  00000000  0000148f  2**0
                CONTENTS, READONLY
10 .debug_frame   0000004c  00000000  00000000  0000150c  2**2
                CONTENTS, RELOC, READONLY, DEBUGGING
11 .ARM.attributes 00000033  00000000  00000000  00001558  2**0
                CONTENTS, READONLY

$ arm-none-eabi-objdump.exe -h pressure-detection.elf
pressure-detection.elf:  file format elf32-littlearm

Sections:
Idx Name          Size      VMA           LMA           File off  Algn
 0 .text          00000360  08000000  08000000  00010000  2**2
                CONTENTS, ALLOC, LOAD, READONLY, CODE
 1 .data          00000008  20000000  08000360  00020000  2**2
                CONTENTS, ALLOC, LOAD, DATA
 2 .bss           00001021  20000008  08000368  00020008  2**2
                ALLOC
 3 .debug_info    00003451  00000000  00000000  00020008  2**0
                CONTENTS, READONLY, DEBUGGING
 4 .debug_abbrev  00000a0e  00000000  00000000  00023459  2**0
                CONTENTS, READONLY, DEBUGGING
 5 .debug_loc     00000458  00000000  00000000  00023e67  2**0
                CONTENTS, READONLY, DEBUGGING
 6 .debug_aranges 000000c0  00000000  00000000  000242bf  2**0
                CONTENTS, READONLY, DEBUGGING
 7 .debug_line    00000d13  00000000  00000000  0002437f  2**0
                CONTENTS, READONLY, DEBUGGING
 8 .debug_str     0000074c  00000000  00000000  00025092  2**0
                CONTENTS, READONLY, DEBUGGING
 9 .comment       0000007b  00000000  00000000  000257de  2**0
                CONTENTS, READONLY
10 .ARM.attributes 00000033  00000000  00000000  00025859  2**0
                CONTENTS, READONLY
11 .debug_frame   000002b0  00000000  00000000  0002588c  2**2
                CONTENTS, READONLY, DEBUGGING
```

```
$ arm-none-eabi-objdump.exe -h alarmMonitor.o

alarmMonitor.o:      file format elf32-littlearm

Sections:
Idx Name              Size      VMA       LMA       File off  Algn
  0 .text              000000b0 00000000 00000000 00000034 2**2
                     CONTENTS, ALLOC, LOAD, RELOC, READONLY, CODE
  1 .data              00000004 00000000 00000000 000000e4 2**2
                     CONTENTS, ALLOC, LOAD, DATA
  2 .bss               00000000 00000000 00000000 000000e8 2**0
                     ALLOC
  3 .debug_info        00000a56 00000000 00000000 000000e8 2**0
                     CONTENTS, RELOC, READONLY, DEBUGGING
  4 .debug_abbrev      000001c3 00000000 00000000 00000b3e 2**0
                     CONTENTS, READONLY, DEBUGGING
  5 .debug_loc         00000120 00000000 00000000 00000d01 2**0
                     CONTENTS, READONLY, DEBUGGING
  6 .debug_aranges     00000020 00000000 00000000 00000e21 2**0
                     CONTENTS, RELOC, READONLY, DEBUGGING
  7 .debug_line        00000205 00000000 00000000 00000e41 2**0
                     CONTENTS, RELOC, READONLY, DEBUGGING
  8 .debug_str         00000602 00000000 00000000 00001046 2**0
                     CONTENTS, READONLY, DEBUGGING
  9 .comment           0000007c 00000000 00000000 00001648 2**0
                     CONTENTS, READONLY
10 .debug_frame       000000bc 00000000 00000000 000016c4 2**2
                     CONTENTS, RELOC, READONLY, DEBUGGING
11 .ARM.attributes    00000033 00000000 00000000 00001780 2**0
                     CONTENTS, READONLY
```

```
$ arm-none-eabi-objdump.exe -h pressureSensor.o

pressureSensor.o:    file format elf32-littlearm

Sections:
Idx Name              Size      VMA       LMA       File off  Algn
  0 .text              0000009c 00000000 00000000 00000034 2**2
                     CONTENTS, ALLOC, LOAD, RELOC, READONLY, CODE
  1 .data              00000000 00000000 00000000 000000d0 2**0
                     CONTENTS, ALLOC, LOAD, DATA
  2 .bss               00000000 00000000 00000000 000000d0 2**0
                     ALLOC
  3 .debug_info        00000a57 00000000 00000000 000000d0 2**0
                     CONTENTS, RELOC, READONLY, DEBUGGING
  4 .debug_abbrev      00000205 00000000 00000000 00000b27 2**0
                     CONTENTS, READONLY, DEBUGGING
  5 .debug_loc         00000084 00000000 00000000 00000d2c 2**0
                     CONTENTS, READONLY, DEBUGGING
  6 .debug_aranges     00000020 00000000 00000000 00000db0 2**0
                     CONTENTS, RELOC, READONLY, DEBUGGING
  7 .debug_line        0000022b 00000000 00000000 00000dd0 2**0
                     CONTENTS, RELOC, READONLY, DEBUGGING
  8 .debug_str         000005ff 00000000 00000000 00000ffb 2**0
                     CONTENTS, READONLY, DEBUGGING
  9 .comment           0000007c 00000000 00000000 000015fa 2**0
                     CONTENTS, READONLY
10 .debug_frame       00000064 00000000 00000000 00001678 2**2
                     CONTENTS, RELOC, READONLY, DEBUGGING
11 .ARM.attributes    00000033 00000000 00000000 000016dc 2**0
                     CONTENTS, READONLY
```

```
$ 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      000005c7  00000000  00000000  00001105  2**0
    CONTENTS, READONLY, DEBUGGING
  9 .comment        0000007c  00000000  00000000  000016cc  2**0
    CONTENTS, READONLY
10 .debug_frame    000000a0  00000000  00000000  00001748  2**2
    CONTENTS, RELOC, READONLY, DEBUGGING
11 .ARM.attributes 00000033  00000000  00000000  000017e8  2**0
    CONTENTS, READONLY
```

```
$ arm-none-eabi-objdump.exe -h pressureDetection.o

pressureDetection.o:      file format elf32-littlearm

Sections:
Idx Name          Size      VMA       LMA       File off  Algn
  0 .text          00000048  00000000  00000000  00000034  2**2
    CONTENTS, ALLOC, LOAD, RELOC, READONLY, CODE
  1 .data          00000004  00000000  00000000  0000007c  2**2
    CONTENTS, ALLOC, LOAD, DATA
  2 .bss           00000000  00000000  00000000  00000080  2**0
    ALLOC
  3 .debug_info     00000a2e  00000000  00000000  00000080  2**0
    CONTENTS, RELOC, READONLY, DEBUGGING
  4 .debug_abbrev   000001d6  00000000  00000000  00000aae  2**0
    CONTENTS, READONLY, DEBUGGING
  5 .debug_loc      00000088  00000000  00000000  00000c84  2**0
    CONTENTS, READONLY, DEBUGGING
  6 .debug_aranges  00000020  00000000  00000000  00000d0c  2**0
    CONTENTS, RELOC, READONLY, DEBUGGING
  7 .debug_line     000001fe  00000000  00000000  00000d2c  2**0
    CONTENTS, RELOC, READONLY, DEBUGGING
  8 .debug_str      00000606  00000000  00000000  00000f2a  2**0
    CONTENTS, READONLY, DEBUGGING
  9 .comment        0000007c  00000000  00000000  00001530  2**0
    CONTENTS, READONLY
10 .debug_frame    00000054  00000000  00000000  000015ac  2**2
    CONTENTS, RELOC, READONLY, DEBUGGING
11 .ARM.attributes 00000033  00000000  00000000  00001600  2**0
    CONTENTS, READONLY
```