Pressure Control System Report

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System Architecture

CASE STUDY

Pressure Controller Assumptions:

1- The controller set up and shutdown procedures are not modeled

2- The controller maintenance is not modeled

3- The pressure sensor never fails ∪ The alarm never fails

4- The controller never faces power cut

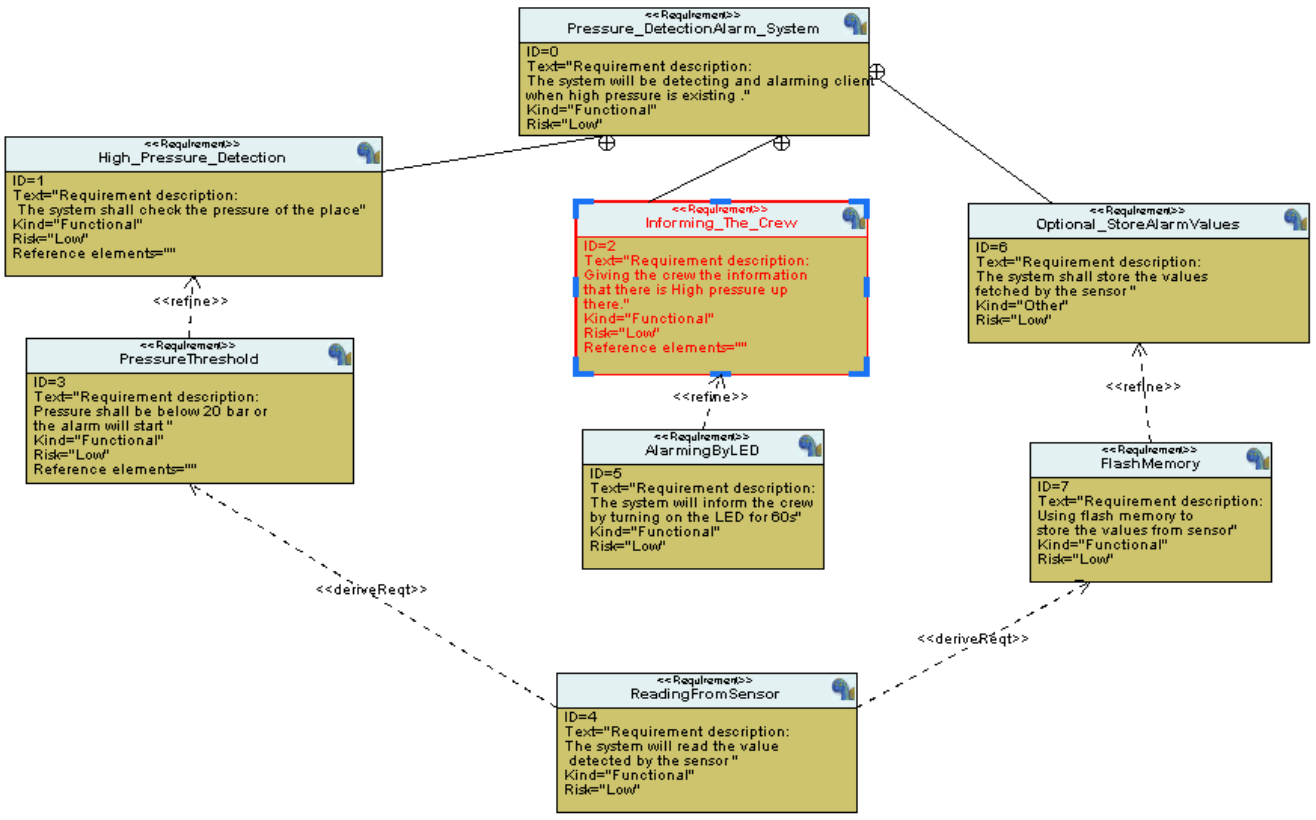
5- The" keep track of measured value" option is not modeled in this version of the design

METHOD

Waterfall Modelling.

REQUIREMENT

Requirement Diagram

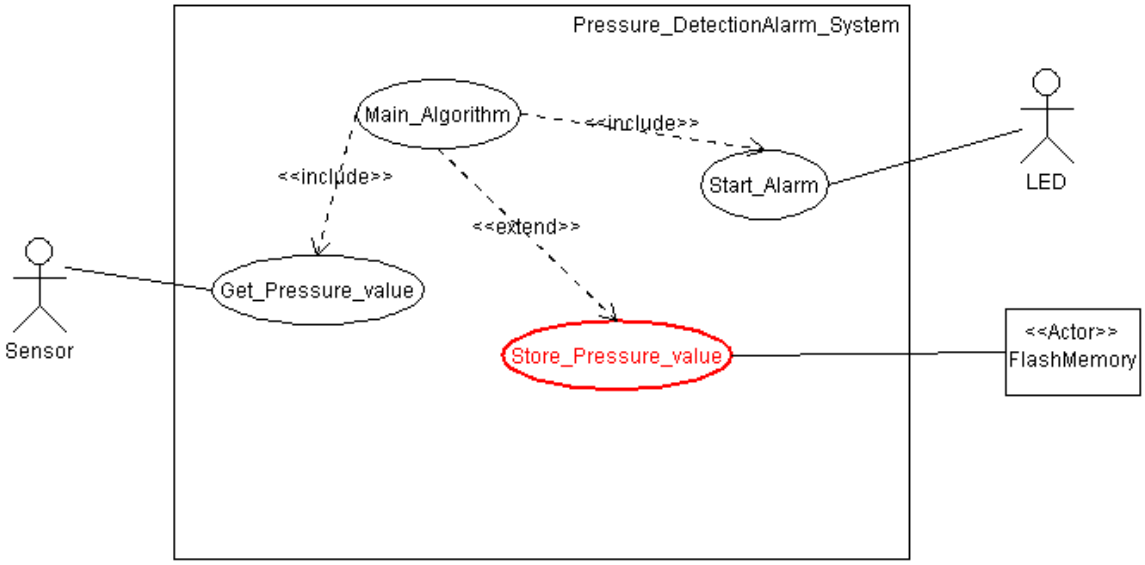


SPACE EXPLORATION

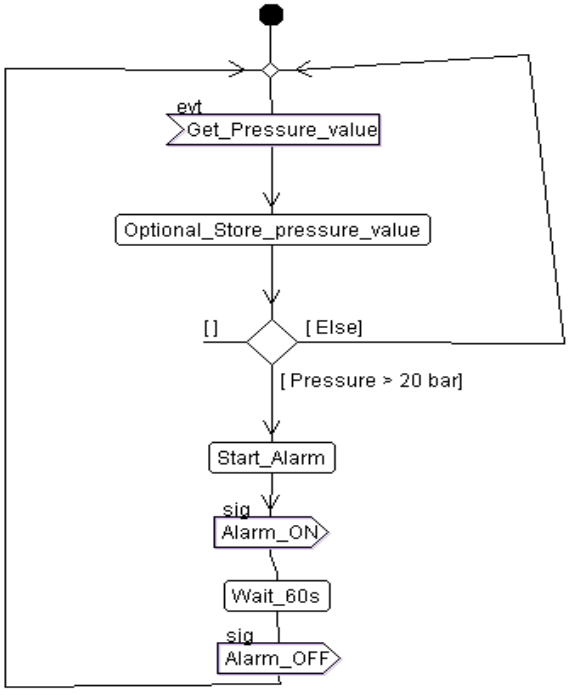
Working on STM32F103C6

SYSTEM ANALYSIS

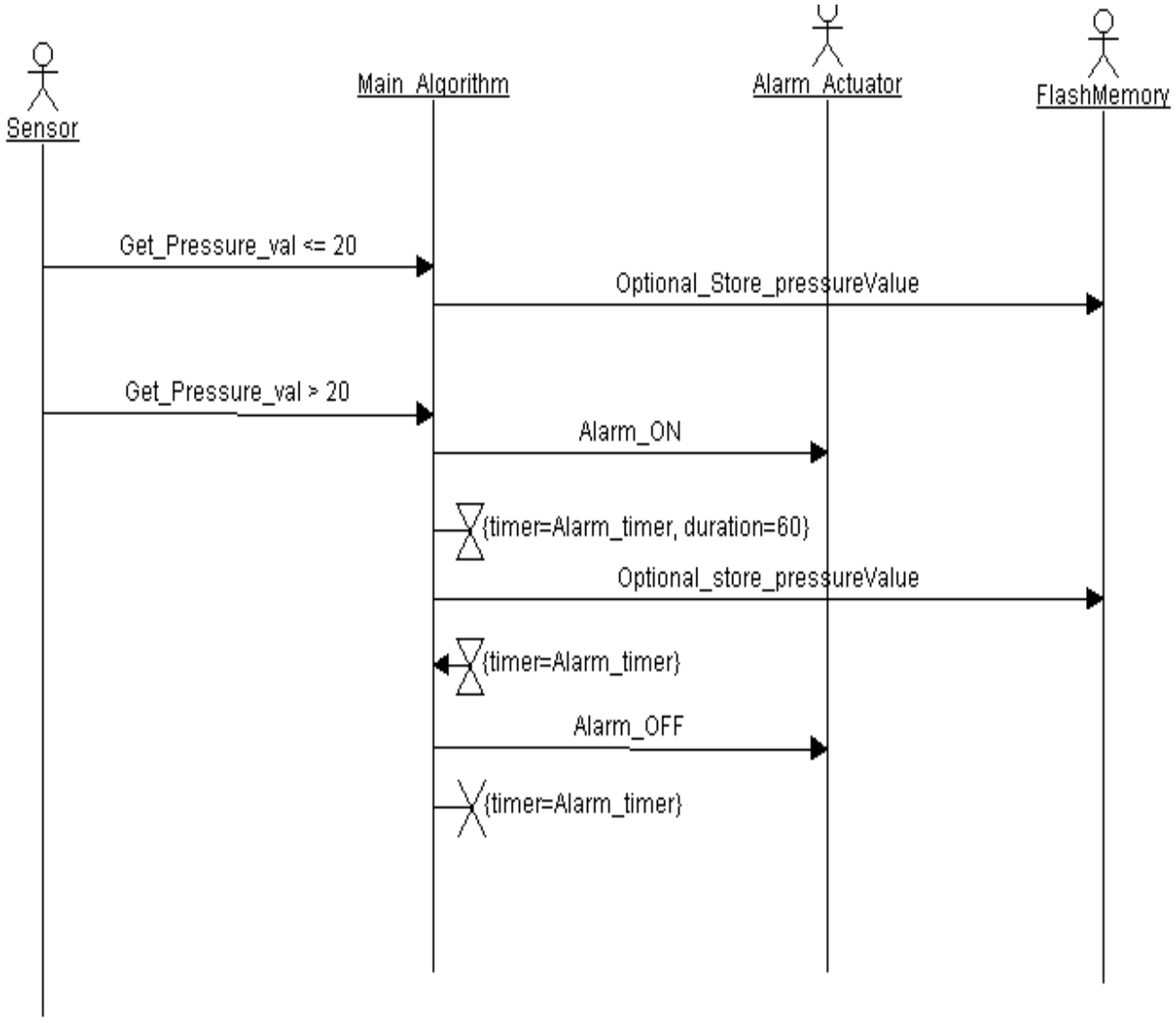
USE CASE DIAGRAM



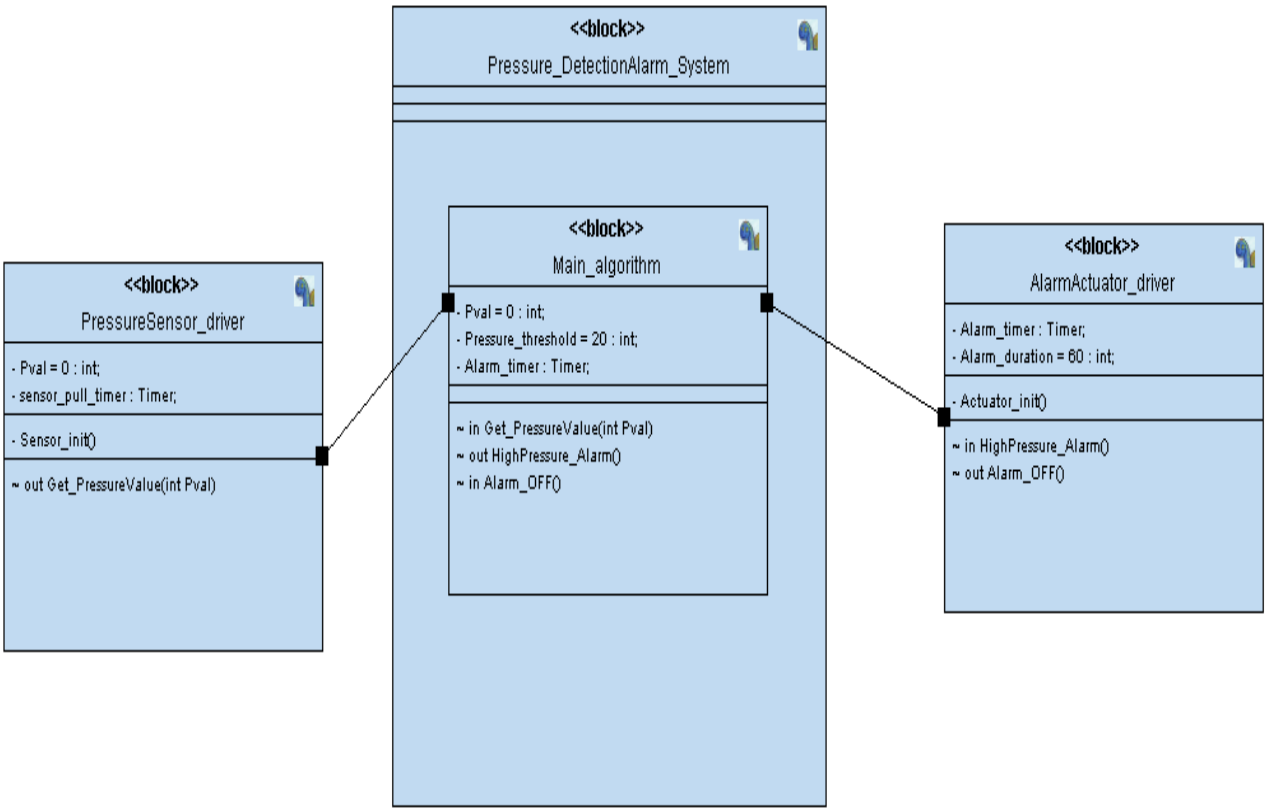
ACTIVITY DIAGRAM

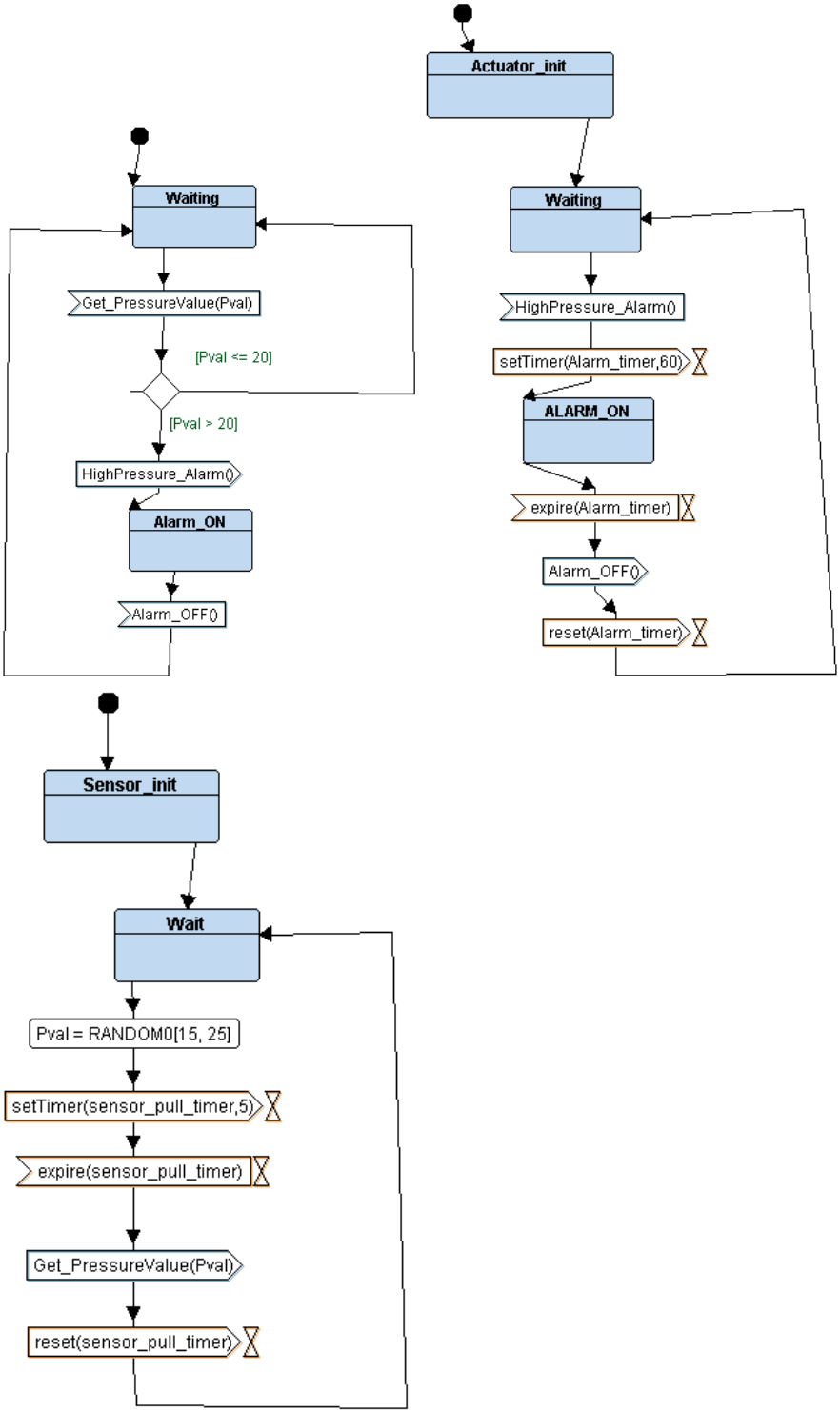


SEQUENCE DIAGRAM



SYSTEM DESIGN




Actuator_init
Waiting
HighPressure_Alarm()
setTimer(Alarm_timer,60)
ALARM_ON
expire(Alarm_timer)
Alarm_OFF()
reset(Alarm_timer)
Waiting
Get_PressureValue(Pval)
[Pval <= 20]
[Pval > 20]
HighPressure_Alarm()
Alarm_ON
Alarm_OFF()
Sensor_init
Wait
Pval = RANDOM0[15, 25]
setTimer(sensor_pull_timer,5)
expire(sensor_pull_timer)
Get_PressureValue(Pval)
reset(sensor_pull_timer)

Symbols table

```
20000024 B _E_bss
20000008 D _E_data
08000438 T _E_text
20001024 B _heap_End
20000008 B _S_bss
20000000 D _S_data
20002024 B _stack_top
2000000c B Alarm_Back_Signal
08000140 T Alarm_OFF
20000010 B ALARM_state
20000018 B ALARM_State_id
20000000 D alarmTimer
0800042c W Bus_Fault
0800042c T Default_Handler
08000198 T Delay
080001bc T getPressureVal
08000224 T GPIO_INITIALIZATION
0800042c W H_Fault_Handler
08000174 T HighPressure_Alarm
080002b8 T main
0800042c W MM_Fault_Handler
0800042c W NMI_Handler
20000014 B PS_Forward_Signal
2000001c B PS_state
20000020 B PS_State_id
20000004 D pull_time
20000008 B Pval
0800037c T Reset_Handler
080001d4 T Set_Alarm_actuator
080002a4 T setup
0800001c T ST_ALARM_init
08000110 T ST_ALARM_OFF
080000d8 T ST_ALARM_ON
0800004c T ST_ALARM_WAITING
08000360 T ST_PS_init
080002dc T ST_PS_WAITING
0800042c W Usage_Fault_Handler
08000000 T vectors
```

Executable file Details

```
ELF Header:
  Magic:   7f 45 4c 46 01 01 01 00 00 00 00 00 00 00 00 00
  Class:                             ELF32
  Data:                              2's complement, little endian
  Version:                           1 (current)
  OS/ABI:                            UNIX - System V
  ABI Version:                       0
  Type:                              EXEC (Executable file)
  Machine:                           ARM
  Version:                           0x1
  Entry point address:               0x8000000
  Start of program headers:          52 (bytes into file)
  Start of section headers:          70924 (bytes into file)
  Flags:                             0x5000002, has entry point,
Version5 EABI
  Size of this header:               52 (bytes)
  Size of program headers:           32 (bytes)
  Number of program headers:         2
  Size of section headers:           40 (bytes)
  Number of section headers:         16
  Section header string table index: 13

Section Headers:
  [Nr] Name              Type            Addr     Off    Size   ES Flg
Lk Inf Al
  [ 0]                   NULL            00000000 000000 000000 00
0   0  0
  [ 1] .text             PROGBITS        08000000 008000 000438 00  AX
0   0  4
  [ 2] .data             PROGBITS        20000000 010000 000008 00  WA
0   0  4
  [ 3] .bss              NOBITS          20000008 010008 00201c 00  WA
0   0  4
  [ 4] .debug_info       PROGBITS        00000000 010008 000677 00
0   0  1
  [ 5] .debug_abbrev     PROGBITS        00000000 01067f 00031b 00
0   0  1
  [ 6] .debug_loc        PROGBITS        00000000 01099a 0002e4 00
0   0  1
  [ 7] .debug_aranges    PROGBITS        00000000 010c7e 0000a0 00
0   0  1
  [ 8] .debug_line       PROGBITS        00000000 010d1e 00028d 00
0   0  1
  [ 9] .debug_str        PROGBITS        00000000 010fab 00027d 01  MS
0   0  1
  [10] .comment          PROGBITS        00000000 011228 000011 01  MS
0   0  1
  [11] .ARM.attributes   ARM_ATTRIBUTES  00000000 011239 000033 00
0   0  1
  [12] .debug_frame      PROGBITS        00000000 01126c 000200 00
0   0  4
  [13] .shstrtab         STRTAB          00000000 01146c 00009d 00
0   0  1
  [14] .symtab           SYMTAB          00000000 01178c 000470 10
15  33  4
  [15] .strtab           STRTAB          00000000 011bfc 000201 00
0   0  1
Key to Flags:
  W (write), A (alloc), X (execute), M (merge), S (strings)
```

```
  I (info), L (link order), G (group), T (TLS), E (exclude), x
(unknown)
  O (extra OS processing required) o (OS specific), p (processor
specific)

There are no section groups in this file.

Program Headers:
  Type           Offset   VirtAddr   PhysAddr   FileSiz MemSiz  Flg
Align
  LOAD           0x008000 0x08000000 0x08000000 0x00438 0x00438 R E
0x8000
  LOAD           0x010000 0x20000000 0x08000438 0x00008 0x02024 RW
0x8000

 Section to Segment mapping:
  Segment Sections...
   00     .text
   01     .data .bss

There is no dynamic section in this file.

There are no relocations in this file.

There are no unwind sections in this file.

Symbol table '.symtab' contains 71 entries:
   Num:    Value  Size Type    Bind   Vis      Ndx Name
     0: 00000000     0 NOTYPE  LOCAL  DEFAULT  UND
     1: 08000000     0 SECTION LOCAL  DEFAULT    1
     2: 20000000     0 SECTION LOCAL  DEFAULT    2
     3: 20000008     0 SECTION LOCAL  DEFAULT    3
     4: 00000000     0 SECTION LOCAL  DEFAULT    4
     5: 00000000     0 SECTION LOCAL  DEFAULT    5
     6: 00000000     0 SECTION LOCAL  DEFAULT    6
     7: 00000000     0 SECTION LOCAL  DEFAULT    7
     8: 00000000     0 SECTION LOCAL  DEFAULT    8
     9: 00000000     0 SECTION LOCAL  DEFAULT    9
    10: 00000000     0 SECTION LOCAL  DEFAULT   10
    11: 00000000     0 SECTION LOCAL  DEFAULT   11
    12: 00000000     0 SECTION LOCAL  DEFAULT   12
    13: 00000000     0 FILE    LOCAL  DEFAULT  ABS startup.c
    14: 0800037c     0 NOTYPE  LOCAL  DEFAULT    1 $t
    15: 08000000     0 NOTYPE  LOCAL  DEFAULT    1 $d
    16: 000001c4     0 NOTYPE  LOCAL  DEFAULT   12 $d
    17: 00000000     0 FILE    LOCAL  DEFAULT  ABS alarm.c
    18: 20000000     0 NOTYPE  LOCAL  DEFAULT    2 $d
    19: 0800001c     0 NOTYPE  LOCAL  DEFAULT    1 $t
    20: 00000010     0 NOTYPE  LOCAL  DEFAULT   12 $d
    21: 00000000     0 FILE    LOCAL  DEFAULT  ABS driver.c
    22: 08000198     0 NOTYPE  LOCAL  DEFAULT    1 $t
    23: 000000c0     0 NOTYPE  LOCAL  DEFAULT   12 $d
    24: 00000000     0 FILE    LOCAL  DEFAULT  ABS main.c
    25: 080002a4     0 NOTYPE  LOCAL  DEFAULT    1 $t
    26: 00000138     0 NOTYPE  LOCAL  DEFAULT   12 $d
    27: 00000000     0 FILE    LOCAL  DEFAULT  ABS sensor.c
    28: 20000008     0 NOTYPE  LOCAL  DEFAULT    3 $d
    29: 20000004     0 NOTYPE  LOCAL  DEFAULT    2 $d
    30: 080002dc     0 NOTYPE  LOCAL  DEFAULT    1 $t
    31: 00000180     0 NOTYPE  LOCAL  DEFAULT   12 $d
    32: 00000000     0 FILE    LOCAL  DEFAULT  ABS
    33: 2000000c     4 OBJECT  GLOBAL DEFAULT    3 Alarm_Back_Signal
    34: 08000225   126 FUNC    GLOBAL DEFAULT    1 GPIO_INITIALIZATION
```

```
    35: 0800042d    10 FUNC    WEAK   DEFAULT    1 NMI_Handler
    36: 20000008     0 NOTYPE  GLOBAL DEFAULT    2 _E_data
    37: 20000008     4 OBJECT  GLOBAL DEFAULT    3 Pval
    38: 0800042d    10 FUNC    WEAK   DEFAULT    1 H_Fault_Handler
    39: 20000000     0 NOTYPE  GLOBAL DEFAULT    2 _S_data
    40: 20000024     0 NOTYPE  GLOBAL DEFAULT    3 _E_bss
    41: 20000000     4 OBJECT  GLOBAL DEFAULT    2 alarmTimer
    42: 20000010     4 OBJECT  GLOBAL DEFAULT    3 ALARM_state
    43: 0800042d    10 FUNC    WEAK   DEFAULT    1 MM_Fault_Handler
    44: 0800037d   176 FUNC    GLOBAL DEFAULT    1 Reset_Handler
    45: 20002024     0 NOTYPE  GLOBAL DEFAULT    3 _stack_top
    46: 20000014     4 OBJECT  GLOBAL DEFAULT    3 PS_Forward_Signal
    47: 0800001d    46 FUNC    GLOBAL DEFAULT    1 ST_ALARM_init
    48: 0800042d    10 FUNC    WEAK   DEFAULT    1 Bus_Fault
    49: 080001bd    24 FUNC    GLOBAL DEFAULT    1 getPressureVal
    50: 2000001c     4 OBJECT  GLOBAL DEFAULT    3 PS_state
    51: 0800042d    10 FUNC    GLOBAL DEFAULT    1 Default_Handler
    52: 20000008     0 NOTYPE  GLOBAL DEFAULT    3 _S_bss
    53: 20000020     1 OBJECT  GLOBAL DEFAULT    3 PS_State_id
    54: 0800004d   138 FUNC    GLOBAL DEFAULT    1 ST_ALARM_WAITING
    55: 080001d5    80 FUNC    GLOBAL DEFAULT    1 Set_Alarm_actuator
    56: 08000175    36 FUNC    GLOBAL DEFAULT    1 HighPressure_Alarm
    57: 080002b9    34 FUNC    GLOBAL DEFAULT    1 main
    58: 080002dd   132 FUNC    GLOBAL DEFAULT    1 ST_PS_WAITING
    59: 080000d9    56 FUNC    GLOBAL DEFAULT    1 ST_ALARM_ON
    60: 0800042d    10 FUNC    WEAK   DEFAULT    1 Usage_Fault_Handler
    61: 20000018     1 OBJECT  GLOBAL DEFAULT    3 ALARM_State_id
    62: 20001024     0 NOTYPE  GLOBAL DEFAULT    3 _heap_End
    63: 08000111    46 FUNC    GLOBAL DEFAULT    1 ST_ALARM_OFF
    64: 080002a5    18 FUNC    GLOBAL DEFAULT    1 setup
    65: 08000199    34 FUNC    GLOBAL DEFAULT    1 Delay
    66: 20000004     4 OBJECT  GLOBAL DEFAULT    2 pull_time
    67: 08000361    28 FUNC    GLOBAL DEFAULT    1 ST_PS_init
    68: 08000438     0 NOTYPE  GLOBAL DEFAULT    1 _E_text
    69: 08000000    28 OBJECT  GLOBAL DEFAULT    1 vectors
    70: 08000141    50 FUNC    GLOBAL DEFAULT    1 Alarm_OFF

No version information found in this file.
Attribute Section: aeabi
File Attributes
  Tag_CPU_name: "Cortex-M4"
  Tag_CPU_arch: v7E-M
  Tag_CPU_arch_profile: Microcontroller
  Tag_THUMB_ISA_use: Thumb-2
  Tag_ABI_PCS_wchar_t: 4
  Tag_ABI_FP_denormal: Needed
  Tag_ABI_FP_exceptions: Needed
  Tag_ABI_FP_number_model: IEEE 754
  Tag_ABI_align_needed: 8-byte
  Tag_ABI_align_preserved: 8-byte, except leaf SP
  Tag_ABI_enum_size: small
  Tag_ABI_optimization_goals: Aggressive Debug
  Tag_CPU_unaligned_access: v6
```