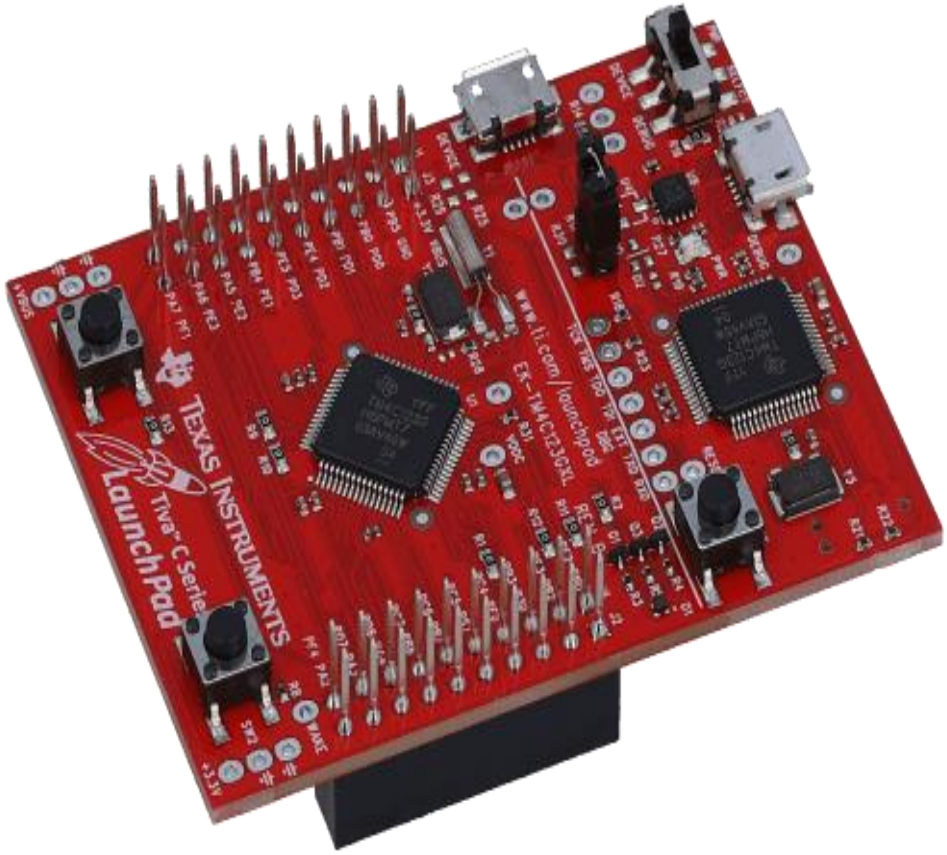
Embedded C
Unit 3 Lesson 4 (LAB 3)



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main.o

```
kf 7@DESKTOP-E11MB1Q MINGW32 /d/projects/lab 3
$ 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         0000008c  00000000  00000000  00000034  2**2
                  CONTENTS, ALLOC, LOAD, READONLY, CODE
  1 .data         00000000  00000000  00000000  000000c0  2**0
                  CONTENTS, ALLOC, LOAD, DATA
  2 .bss          00000000  00000000  00000000  000000c0  2**0
                  ALLOC
  3 .debug_info   00000098  00000000  00000000  000000c0  2**0
                  CONTENTS, RELOC, READONLY, DEBUGGING
  4 .debug_abbrev 0000005a  00000000  00000000  00000158  2**0
                  CONTENTS, READONLY, DEBUGGING
  5 .debug_loc    00000038  00000000  00000000  000001b2  2**0
                  CONTENTS, READONLY, DEBUGGING
  6 .debug_aranges 00000020  00000000  00000000  000001ea  2**0
                  CONTENTS, RELOC, READONLY, DEBUGGING
  7 .debug_line   00000061  00000000  00000000  0000020a  2**0
                  CONTENTS, RELOC, READONLY, DEBUGGING
  8 .debug_str    00000110  00000000  00000000  0000026b  2**0
                  CONTENTS, READONLY, DEBUGGING
  9 .comment      0000007c  00000000  00000000  0000037b  2**0
                  CONTENTS, READONLY
 10 .debug_frame  0000002c  00000000  00000000  000003f8  2**2
                  CONTENTS, RELOC, READONLY, DEBUGGING
 11 .ARM.attributes 00000033  00000000  00000000  00000424  2**0
                  CONTENTS, READONLY
```

startup.O

```
kf 7@DESKTOP-E11MB1Q MINGW32 /d/projects/lab 3
$ arm-none-eabi-objdump.exe -h startup.o

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          00000400  00000000  00000000  000000c4  2**2
                  ALLOC
  3 .vectors      0000001c  00000000  00000000  000000c4  2**2
                  CONTENTS, ALLOC, LOAD, RELOC, READONLY, DATA
  4 .debug_info   000001ca  00000000  00000000  000000e0  2**0
                  CONTENTS, RELOC, READONLY, DEBUGGING
  5 .debug_abbrev 000000eb  00000000  00000000  000002aa  2**0
                  CONTENTS, READONLY, DEBUGGING
  6 .debug_loc    0000007c  00000000  00000000  00000395  2**0
                  CONTENTS, READONLY, DEBUGGING
  7 .debug_aranges 00000020  00000000  00000000  00000411  2**0
                  CONTENTS, RELOC, READONLY, DEBUGGING
  8 .debug_line   000001f2  00000000  00000000  00000431  2**0
                  CONTENTS, RELOC, READONLY, DEBUGGING
  9 .debug_str    0000019d  00000000  00000000  00000623  2**0
                  CONTENTS, READONLY, DEBUGGING
 10 .comment      0000007c  00000000  00000000  000007c0  2**0
                  CONTENTS, READONLY
 11 .debug_frame  00000050  00000000  00000000  0000083c  2**2
                  CONTENTS, RELOC, READONLY, DEBUGGING
 12 .ARM.attributes 00000033  00000000  00000000  0000088c  2**0
                  CONTENTS, READONLY
```

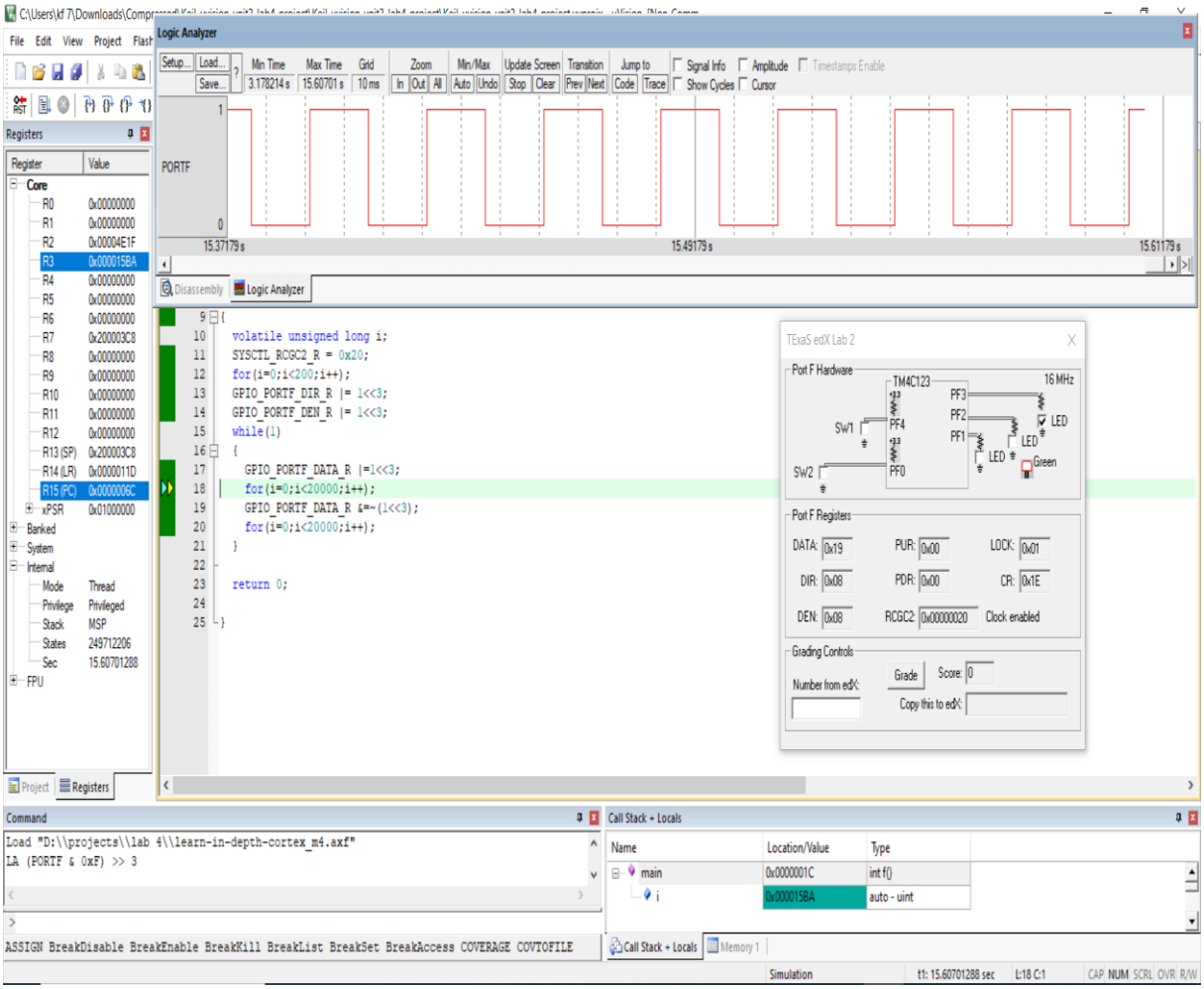
learn-in-depth-cortex_m4.axf

```
kf 7@DESKTOP-E11MB1Q MINGW32 /d/projects/lab 3
$ arm-none-eabi-objdump.exe -h learn-in-depth-cortex_m4.axf

learn-in-depth-cortex_m4.axf:     file format elf32-littlearm

Sections:
Idx Name          Size      VMA       LMA       File off  Algn
  0 .text         00000138  00000000  00000000  00010000  2**2
                  CONTENTS, ALLOC, LOAD, READONLY, CODE
  1 .data         00000000  20000000  00000138  00020000  2**0
                  CONTENTS, ALLOC, LOAD, DATA
  2 .bss          00000400  20000000  00000138  00020000  2**2
                  ALLOC
  3 .debug_info   00000262  00000000  00000000  00020000  2**0
                  CONTENTS, READONLY, DEBUGGING
  4 .debug_abbrev 00000145  00000000  00000000  00020262  2**0
                  CONTENTS, READONLY, DEBUGGING
  5 .debug_loc    000000b4  00000000  00000000  000203a7  2**0
                  CONTENTS, READONLY, DEBUGGING
  6 .debug_aranges 00000040  00000000  00000000  0002045b  2**0
                  CONTENTS, READONLY, DEBUGGING
  7 .debug_line   00000253  00000000  00000000  0002049b  2**0
                  CONTENTS, READONLY, DEBUGGING
  8 .debug_str    0000016c  00000000  00000000  000206ee  2**0
                  CONTENTS, READONLY, DEBUGGING
  9 .comment      0000007b  00000000  00000000  0002085a  2**0
                  CONTENTS, READONLY
 10 .ARM.attributes 00000033  00000000  00000000  000208d5  2**0
                  CONTENTS, READONLY
 11 .debug_frame  0000007c  00000000  00000000  00020908  2**2
                  CONTENTS, READONLY, DEBUGGING
```

Simulation


Logic Analyzer
PORTF
Registers
Core
R0
R1
R2
R3
R4
R5
R6
R7
R8
R9
R10
R11
R12
R13 (SP)
R14 (LR)
R15 (PC)
xPSR
Banked
System
Internal
FPU
volatile unsigned long i;
SYSCTL_RCGC2_R = 0x20;
for(i=0;i<200;i++);
GPIO_PORTF_DIR_R |= 1<<3;
GPIO_PORTF_DEN_R |= 1<<3;
while(1)
{
GPIO_PORTF_DATA_R |=1<<3;
for(i=0;i<20000;i++);
GPIO_PORTF_DATA_R &=~(1<<3);
for(i=0;i<20000;i++);
}
return 0;
}
TExaS edX Lab 2
Port F Hardware
TM4C123
16 MHz
SW1
SW2
PF4
PF0
PF3
PF2
PF1
LED
Green
Port F Registers
DATA: 0x19
PUR: 0x00
LOCK: 0x01
DIR: 0x08
PDR: 0x00
CR: 0x1E
DEN: 0x08
RCGC2: 0x00000020
Clock enabled
Grading Controls
Number from edX
Grade
Score: 0
Copy this to edX
Command
Load "D:\\projects\\lab 4\\learn-in-depth-cortex_m4.axf"
LA (PORTF & 0xF) >> 3
Call Stack + Locals
Name
Location/Value
Type
main
0x0000001C
int f()
i
0x000015BA
auto - uint
Memory 1
Simulation
t1: 15.60701288 sec
L:18 C:1