Writing embedded systems code in C using Metrowerks

- **Installation**
- **Projects**
- **Mixed C/assembly**
- **PLL**
- **Debugger**
- **Importing TExaS code from previous labs**
- **Exporting object code to simulate in TExaS**

Installation

- **9S12/Metrowerks link**
- **http://users.ece.utexas.edu/~valvano/S12C32.htm**
- **How to download Metrowerks**

StarterFiles

- **xxxx_DP512.zip is a DP512 Metrowerks project**
- **xxxx_DP512asm.zip is a DP512 TExaS example**
- **xxxx_DG128.zip is a DG128 Metrowerks project**
- **xxxx_DG128asm.zip is a DG128 TExaS example**

Projects, look at an example starter file, OC_DG128.zip

- **See Folders**
  - **Sources programs**
  - **bin object code, TExaS files**
  - **xxx.mcp project, can double click this**
- **Source code files (you create these) (text)**
  - **xxx.asm assembly source**
  - **xxx.c C source code file**
  - **xxx.h C header file**
- **Object code files (created when you compile) (text)**
  - **xxx.lst multiple assembly listing files**
  - **xxx.map symbol table**
  - **xxx.sx object code**

Create a new project

Add a new file called pll.asm

```
SYNR     equ $0034  ; CRG Synthesizer Register
REFDV    equ $0035  ; CRG Reference Divider Register
CRGFLG   equ $0037  ; CRG Flags Register
CLKSEL   equ $0039  ; CRG Clock Select Register
PLLCTL   equ $003A  ; CRG PLL Control Register
      absentry   PLL_Init
;********* PLL_Init ***************
; Active PLL so the 9S12 runs at 24 MHz
; Inputs: none
; Outputs: none
; Errors: will hang if PLL does not stabilize
PLL_Init
  movb #$02,SYNR       ; 9S12DP512 OSCCLK is 16 MHz
  movb #1,REFDV
  movb #0,CLKSEL       ; PLLCLK = 2 * OSCCLK * (SYNR + 1) / (REFDV + 1)
  movb #$D1,PLLCTL     ; Clock monitor, PLL On, high bandwidth filter
  brclr CRGFLG,#$08,*  ; wait for PLLCLK to stabilize.
  bset CLKSEL,#$80     ; Switch to PLL clock
  rts
```

Add this to main

```
void PLL_Init(void);
```

We are starting Metrowerks for Labs 7,8,9,10

Here is how to download the limited version (free)
http://users.ece.utexas.edu/~valvano/S12C32.htm#Metrowerks

Here is a start project for Lab 7
http://users.ece.utexas.edu/~valvano/EE319K/Lab7Starter.zip

This site has movies about the book and TExaS
http://users.ece.utexas.edu/~valvano/Lessons/
including 6 movies about how to use Metrowerks
http://users.ece.utexas.edu/~valvano/Lessons/#Metrowerks

This site covers C programming syntax
http://users.ece.utexas.edu/~ryerraballi/CPrimer/

This is an easy first program
http://users.ece.utexas.edu/~valvano/Starterfiles/LEDtoggle_DG128.zip
http://users.ece.utexas.edu/~valvano/Starterfiles/LEDtoggle_DP512.zip

This is also an easy program
http://users.ece.utexas.edu/~valvano/Starterfiles/Moore_DG128.zip
http://users.ece.utexas.edu/~valvano/Starterfiles/Moore_DP512.zip

This is an output compare interrupt (can not be used in EE319K lab, but useful for understanding interrupts)
http://users.ece.utexas.edu/~valvano/Starterfiles/OC_DG128.zip
http://users.ece.utexas.edu/~valvano/Starterfiles/OC_DP512.zip