Deliverables

```c
// Lab8.c

// Runs on LM4F120 or TM4C123

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// Last Modified: 4/5/2016


// Analog Input connected to PE2=ADC1

// displays on Sitronox ST7735

// PF3, PF2, PF1 are heartbeats


#include <stdint.h>


#include "ST7735.h"

#include "TExaS.h"

#include "ADC.h"

#include "print.h"

#include "tm4c123gh6pm.h"


int ADCMail;

int ADCStatus;

void SysTick_Init(void);

void SysTick_Handler(void);


//*****the first three main programs are for debugging *****

// main1 tests just the ADC and slide pot, use debugger to see data
```

// main2 adds the LCD to the ADC and slide pot, ADC data is on Nokia

// main3 adds your convert function, position data is no Nokia

void DisableInterrupts(void); // Disable interrupts

void EnableInterrupts(void); // Enable interrupts


```c
#define PF1      (*((volatile uint32_t *)0x40025008))

#define PF2      (*((volatile uint32_t *)0x40025010))

#define PF3      (*((volatile uint32_t *)0x40025020))
// Initialize Port F so PF1, PF2 and PF3 are heartbeats
void PortF_Init(void){

        SYSCTL_RCGCGPIO_R |= 0x20;

        while( (SYSCTL_PRGPIO_R&0x20)==0){};

        GPIO_PORTF_DIR_R |= 0x0E;

        GPIO_PORTF_AFSEL_R &= 0x00;

        GPIO_PORTF_AMSEL_R &= 0x00;

        GPIO_PORTF_DEN_R |= 0x0E;

}
uint32_t Data;      // 12-bit ADC

uint32_t Position;   // 32-bit fixed-point 0.001 cm

int main1(void){     // single step this program and look at Data

 ADC_Init();       // turn on ADC, set channel to 1

 while(1){

  Data = ADC_In();  // sample 12-bit channel 1

               LCD_OutDec(Data);
```

```c
                    for(int i=0;i<40000;i++){}
  }
}


int main2(void){
  TExaS_Init();      // Bus clock is 80 MHz
  ADC_Init();        // turn on ADC, set channel to 1
  ST7735_InitR(INITR_REDTAB);
  PortF_Init();
  while(1){          // use scope to measure execution time for ADC_In and LCD_OutDec
    PF2 = 0x04;      // Profile ADC
    Data = ADC_In();  // sample 12-bit channel 1
    PF2 = 0x00;      // end of ADC Profile
    ST7735_SetCursor(0,0);
    PF1 = 0x02;      // Profile LCD
    LCD_OutDec(Data);
    ST7735_OutString("   ");  // these spaces are used to coverup characters from last output
    PF1 = 0;         // end of LCD Profile
  }
}


uint32_t Convert(uint32_t input){ //Convert reading from ADC_In to distance along slide pot
  double slope = 0.47806;                    //y = 0.0046806x+0.093609
        double intercept = 93.509;            //r = 0.992
        int result = (int) (slope*input + intercept);
```
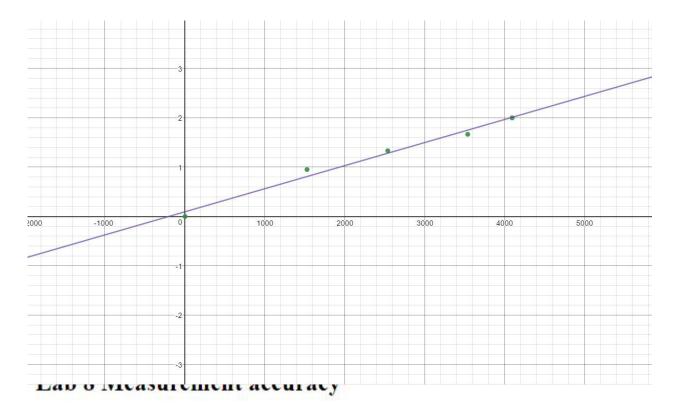
```c
        return result;


}
int main3(void){
 TExaS_Init();       // Bus clock is 80 MHz
 ST7735_InitR(INITR_REDTAB);
 PortF_Init();
 ADC_Init();        // turn on ADC, set channel to 1
 while(1){
  PF2 ^= 0x04;     // Heartbeat
  Data = ADC_In();  // sample 12-bit channel 1
  PF3 = 0x08;      // Profile Convert
  Position = Convert(Data);
  PF3 = 0;         // end of Convert Profile
  PF1 = 0x02;      // Profile LCD
  ST7735_SetCursor(0,0);
  LCD_OutDec(Data); ST7735_OutString("    ");
  ST7735_SetCursor(6,0);
  LCD_OutFix(Position);
  PF1 = 0;         // end of LCD Profile
 }
}
int main(void){
 TExaS_Init();//80MHz clk
```

```c
// your Lab 8

        DisableInterrupts();

        ST7735_InitR(INITR_REDTAB);

        PortF_Init();

        ADC_Init();

        SysTick_Init();

        EnableInterrupts();

        while( (SYSCTL_PRGPIO_R&0x20)==0){};//delay
   while(1){

                   while(ADCStatus == 0){}

                   Data = ADCMail;

                   ADCStatus = 0;

     ST7735_SetCursor(0,0);

     LCD_OutDec(Data); ST7735_OutString("   ");

     ST7735_SetCursor(6,0);

     LCD_OutFix(Convert(Data)); ST7735_OutString(" cm");

    }

}


void SysTick_Init(void){

 NVIC_ST_CTRL_R &=0x0;

        NVIC_ST_RELOAD_R = 10000000; //10 ms = 400,000

        NVIC_ST_CURRENT_R = 0;

        NVIC_SYS_PRI3_R = (NVIC_SYS_PRI3_R&0x00FFFFFF)|0x40000000; //Set priority 2

        NVIC_ST_CTRL_R |= 0x7;//Start and arm
```

```
}


void SysTick_Handler(void){

        PF2 ^= 0x04;

        PF2 ^= 0x04;

        ADCMail = ADC_In();

        ADCStatus = 1;

        PF2 ^= 0x04;

}



/////////////////////////////////
```

Lab 8 Measurement accuracy

This is Table 8.2. Collect two to five measurements with you~
distances as determined by your system. When you have ente~

True values	Measured values	Errors
0	0.095	-0.095
1.346	1.393	-0.047
2	2.095	-0.095
0.672	0.607	0.065
1.286	1.270	0.016

[Calculate]

The number of data sets is 5
The maximum error is 0.095
The average error is 0.064

[Reset]

U2g
BoosterPack
QIP

5V	21	
3.3V	1	
Gnd	20	
Gnd	22	
Reset	16	

Bourns SSHA20B20300

U1e
BoosterPack
QIP

PE5	6	
PE4	5	
PE3	29	
PE2	28	
PE1	27	
PE0	18	

Vin

P1
10k

P1: Slide pot used to measure distance

+3.3V
+3V3

U1a
BoosterPack
QIP

PA7	10	
PA6	9	
PA5	8	
PA4	13	
PA3	12	
PA2	11	

J3
ST7735
LCD

GND	1	Gnd	
+3V3	2	Vcc	
PA7	3	Reset	
PA6	4	Data/Command	
PD7	5	CARD_CS	
PA3	6	TFT_CS	
PA5	7	MOSI	
PA2	8	SCLK	
PA4	9	MISO	
+3V3	10	Light	

160x128 pixels
16-bit color

GND

Connect PD7 to use SD card