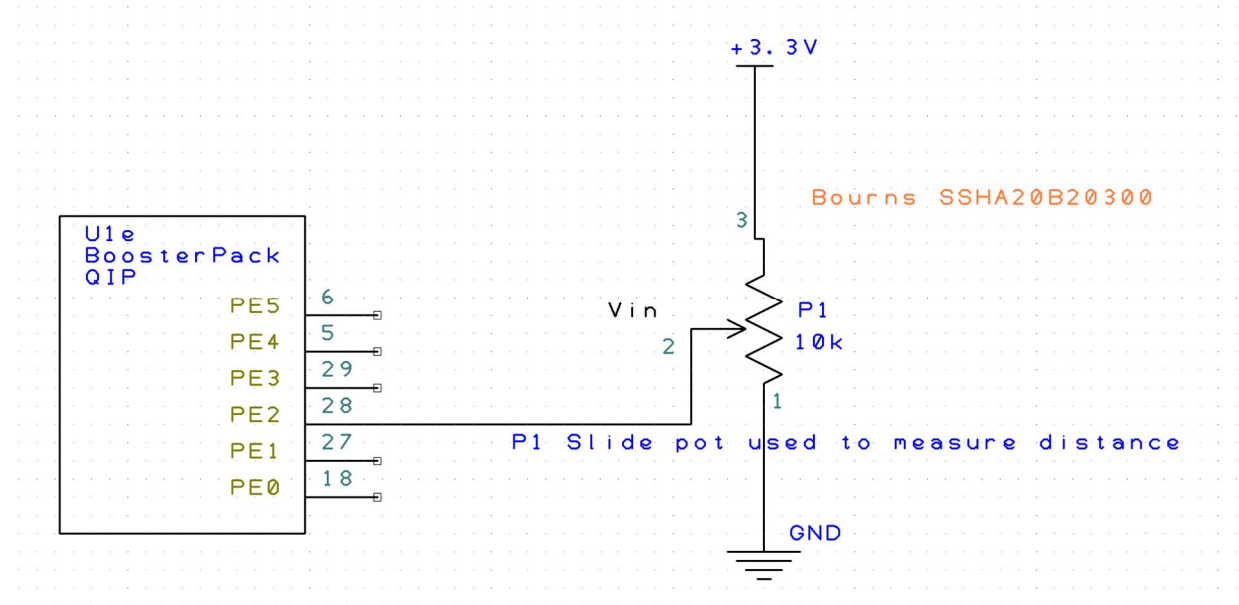# Lab 8 Deliverables

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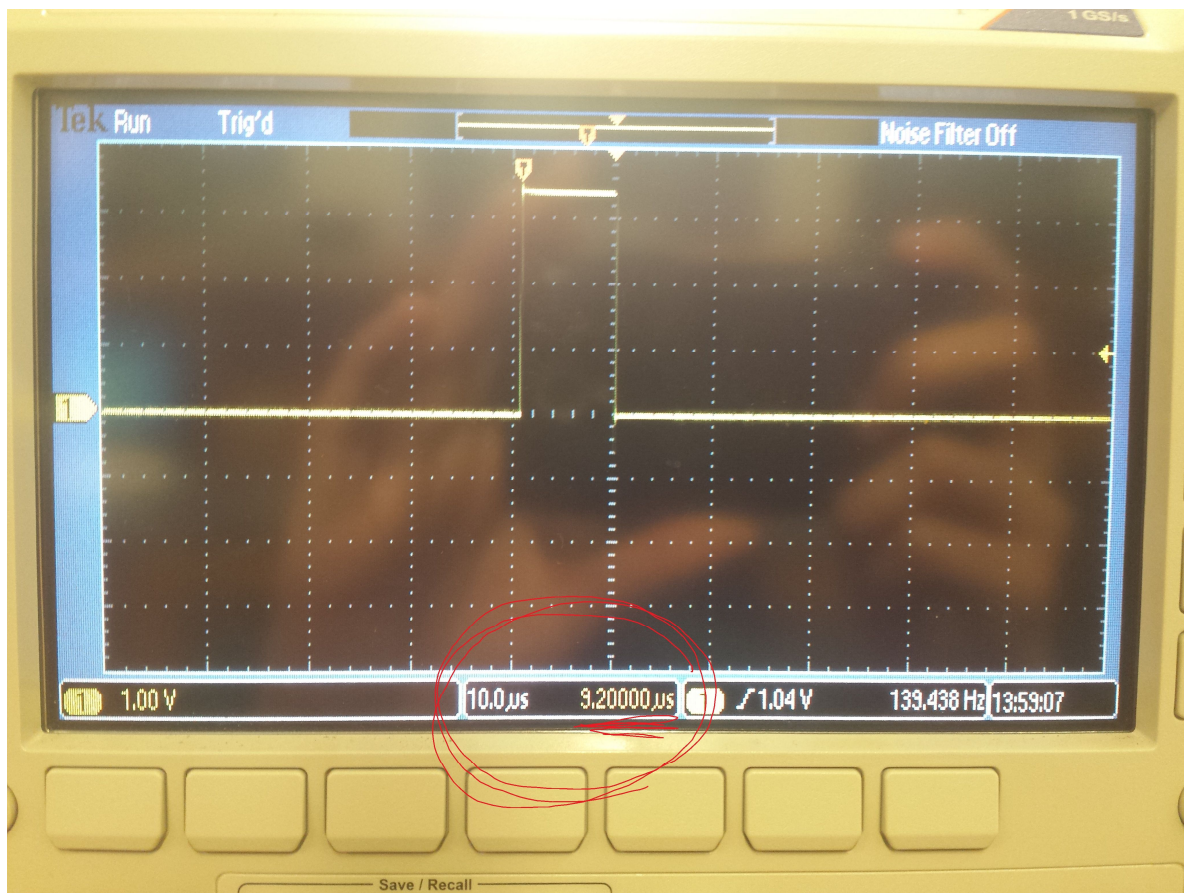
Section: 16085

Spring 2016

Schematic

Time Measurements (like Figure 8.6)

ADC execution time

LCD execution time

Calibration Data

Position (cm)	Analog Input (V)	ADC Sample
0	0.01	13
0.25	0.12	150
0.5	0.62	700
0.75	1.07	1250
1	1.6	1900
1.25	2.08	2500
1.5	2.53	3100
1.75	3.03	3750
2	3.28	4095

Final Distance Meter

void SysTick_Handler(void){

       GPIO_PORTF_DATA_R ^= 0x0C;

```c
        ADCMail = ADC_In();
        ADCStatus = 0x00000001;
        GPIO_PORTF_DATA_R ^= 0x0C;
        return;
}
uint32_t delay;
// ADC initialization function
// Input: none
// Output: none
void ADC_Init(void){
        SYSCTL_RCGC2_R |= 0x10;                          //1) activate PORTE clock
        while(SYSCTL_RCGC2_R == 0){        //null
        }
        GPIO_PORTE_DIR_R &= ~0x04;        //2) make PE2 input
        GPIO_PORTE_AFSEL_R |= 0x04;        //3) enable alternate function for PE2
        GPIO_PORTE_DEN_R &= ~0x04;        //4) disable digital I/O for PE2
        GPIO_PORTE_AMSEL_R |= 0x04;             //5) enable analong function on PE2
        SYSCTL_RCGCADC_R |= 0x01;             //6) activate ADC0
        delay = SYSCTL_RCGCADC_R;             //null
        delay = SYSCTL_RCGCADC_R;             //null
        delay = SYSCTL_RCGCADC_R;             //null
        delay = SYSCTL_RCGCADC_R;             //null
        ADC0_PC_R = 0x01;                                         //7) configure for 125k
        ADC0_SSPRI_R &= ~0x0123;             //8) Seq3 is highest priority
        ADC0_ACTSS_R &= ~0x0008;             //9) disable sample sequencer 3
        ADC0_EMUX_R &= ~0xF000;             //10) seq3 is software trigger
        ADC0_SSMUX3_R = (ADC0_SSMUX3_R & 0xFFFFFFF0) + 1;             //11) Ain1 (PE2)
        ADC0_SSCTL3_R = 0x0006;             //12) no TS0D0, yes IE0 END0
        ADC0_IM_R &= ~0x0008;                     //13) disable SS3 interrupts
        ADC0_ACTSS_R |= 0x0008;             //14) enable sample sequencer 3
}


//------------ADC_In------------
```

```c
// Busy-wait Analog to digital conversion
// Input: none
// Output: 12-bit result of ADC conversion
uint32_t ADC_In(void){
        uint32_t result;
        ADC0_PSSI_R = 0x0008;                       //1) initiate SS3
        while((ADC0_RIS_R & 0x08) == 0){            //2) wait for conversion to finish
        }
        result = ADC0_SSFIFO3_R & 0xFFF;      //3) read 12-bit result
        ADC0_ISC_R = 0x0008;                        //4) acknowledge completion
        return(result);
}


uint32_t Convert(uint32_t input){
  uint32_t converted;
        converted = input*100;
        converted = (converted + 29203);
        converted = (converted/223);


        return(converted);
}

int main(void){
  TExaS_Init();        // Bus clock is 80 MHz
  ST7735_InitR(INITR_REDTAB);
  PortF_Init();
  ADC_Init();        // turn on ADC, set channel to 1
        SysTick_Init();
  while(1){
                if(ADCStatus == 1){
                        ADCStatus = 0;
                        measurement = Convert(ADCMail);
                        ST7735_SetCursor(0,0);
```

```
                    LCD_OutFix(measurement);

                    ST7735_OutChar(0x20);

                    ST7735_OutChar(0x63);

                    ST7735_OutChar(0x6D);

            }

    }

}
```

Sampling Rate of 40 Hz (Figure 8.8)

Accuracy Data and Accuracy Calculation

True Values	Measured values	Errors
0	0.136	-0.136
0.5	0.444	0.056
1	0.982	0.018
1.5	1.521	-0.021

2	1.967	0.033

Average error	
0.053	