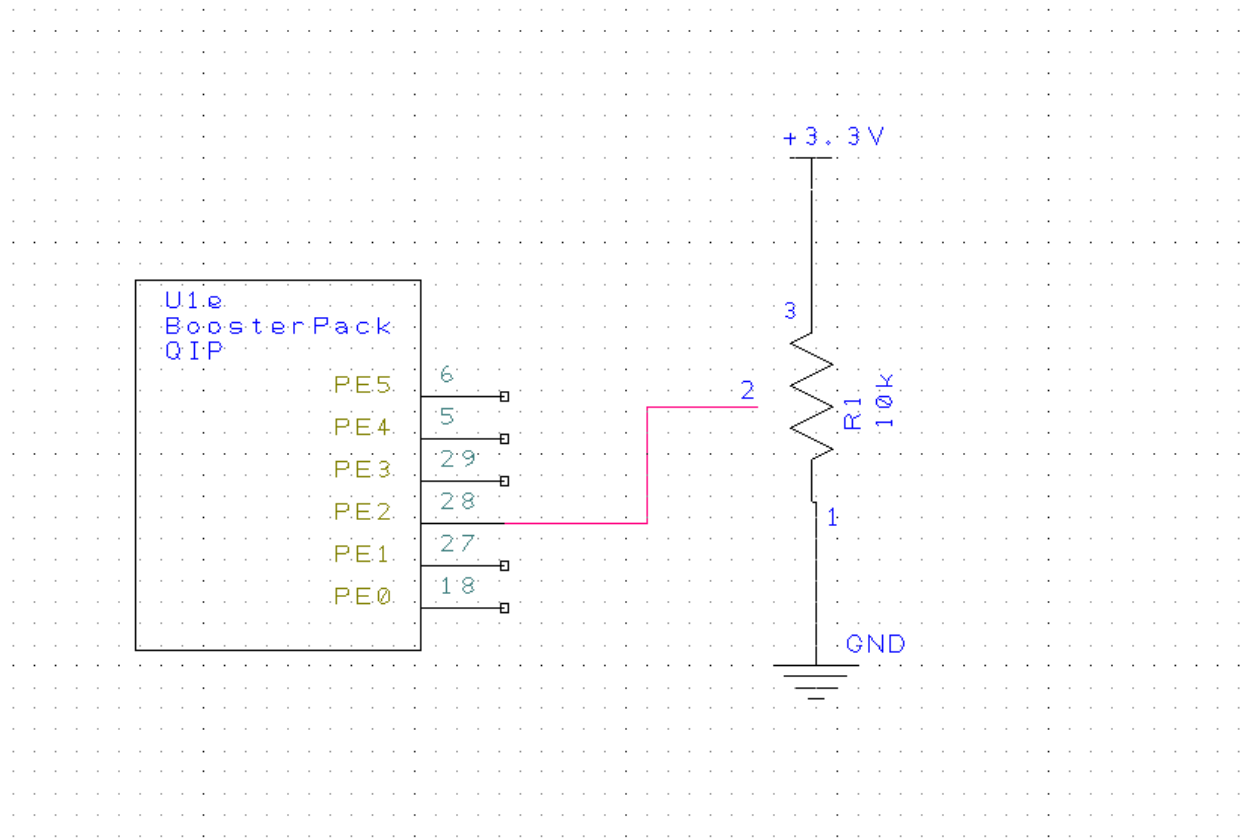


Elgin Allen

Zach Sisti

Lab 8 Deliverables

1. Circuit Diagram



2. Time Measurements

ADC 9 μsec

LCD Output 56 μsec

3. Calibration Data

Postion (cm)	Analog Input	ADC sample
0	0	0
0.5	0.85	780
0.7	1.21	1316
1	1.67	2036
1.3	2.18	2756
1.6	2.81	3545
2.1	3.25	4093

4. Final version of distance meter with SysTick, ADC, convert, and main (your code for parts c, e, f, g and h)

```
// ADC initialization function
// Input: none
// Output: none
void ADC_Init(void){
    unsigned long delay;
    SYSCTL_RCGCGPIO_R |= 0x00000010; // 1) activate clock for Port E
    delay = SYSCTL_RCGC2_R; // allow time for clock to stabilize
    GPIO_PORTE_DIR_R &= ~0x04; // 2) make PE2 input
    GPIO_PORTE_AFSEL_R |= 0x04; // 3) enable alternate function on PE2
    GPIO_PORTE_DEN_R &= ~0x04; // 4) disable digital I/O on PE2
    GPIO_PORTE_AMSEL_R |= 0x04; // 5) enable analog function on PE2
    SYSCTL_RCGC0_R |= 0x00010000; // 6) activate ADC0
    delay = SYSCTL_RCGC2_R;
    SYSCTL_RCGC0_R &= ~0x00000300; // 7) configure for 125K DO THIS LATER
    ADC0_SSPR1_R = 0x0123; // 8) Sequencer 3 is highest priority
    ADC0_ACTSS_R &= ~0x0008; // 9) disable sample sequencer 3
    ADC0_EMUX_R &= ~0xF000; // 10) seq3 is software trigger
    ADC0_SSMUX3_R &= ~0x000F; // 11) clear SS3 field
    ADC0_SSMUX3_R += 1; // set channel Ain9 (PE4)
    ADC0_SSCTL3_R = 0x0006; // 12) no TS0 D0, yes IE0 END0
    ADC0_ACTSS_R |= 0x0008; // 13) enable sample sequencer 3
}

//-----ADC_In-----
// Busy-wait Analog to digital conversion
// Input: none
// Output: 12-bit result of ADC conversion
uint32_t ADC_In(void){
    unsigned long result;
    ADC0_PSSI_R = 0x0008; // 1) initiate SS3
    while((ADC0_RIS_R&0x08)==0){}; // 2) wait for conversion done
    result = ADC0_SSIF03_R&0xFFF; // 3) read result
    ADC0_ISC_R = 0x0008; // 4) acknowledge completion
    return result;
}

uint32_t Convert(uint32_t input){//(1097x+115582)/2325714
    uint32_t result = input;
    result*=1097;
    result/=2326;
    return result;
}

void SysTick_Init(void){
    NVIC_ST_CTRL_R = 0; // disable SysTick during setup
    NVIC_ST_RELOAD_R = 0x007FFFFFFF; // reload value
    NVIC_ST_CURRENT_R = 0; // any write to current clears it
    NVIC_SYS_PRI3_R = (NVIC_SYS_PRI3_R&0x00FFFFFF)|0x20000000; // priority 1
    NVIC_ST_CTRL_R = 0x0007; // enable SysTick with core clock and interrupts
}

void SysTick_Handler(void){
    PF2 ^= 0x04;
    PF2 ^= 0x04;
    ADCMailbox=ADC_In();
    ADCStatus = 1;
    PF2 ^= 0x04;
}

int main(void){
    PLL_Init();
    PortF_Init();
    DisableInterrupts();
    SysTick_Init();
}
```

```
ST7735_InitR(INITR_REDTAB);
ADC_Init();
EnableInterrupts();
while(1){

    int32_t ADCHolder;
    while(ADCStatus==0){
        ADCHolder=1;
    }
    ADCHolder = ADCMailbox;
    ADCStatus = 0;
    ST7735_SetCursor(0,0);
    LCD_OutFix(Convert(ADCHolder));
    ST7735_OutString("cm");
}
}
```

4. Photo of Sample Rate



5. Accuracy Data and Accuracy Calculation

True Positi	Measured	Error	average
0.5	0.46	0.04	-0.0796
0.8	0.848	-0.048	
1	1.11	-0.11	
1.3	1.44	-0.14	
1.5	1.64	-0.14	