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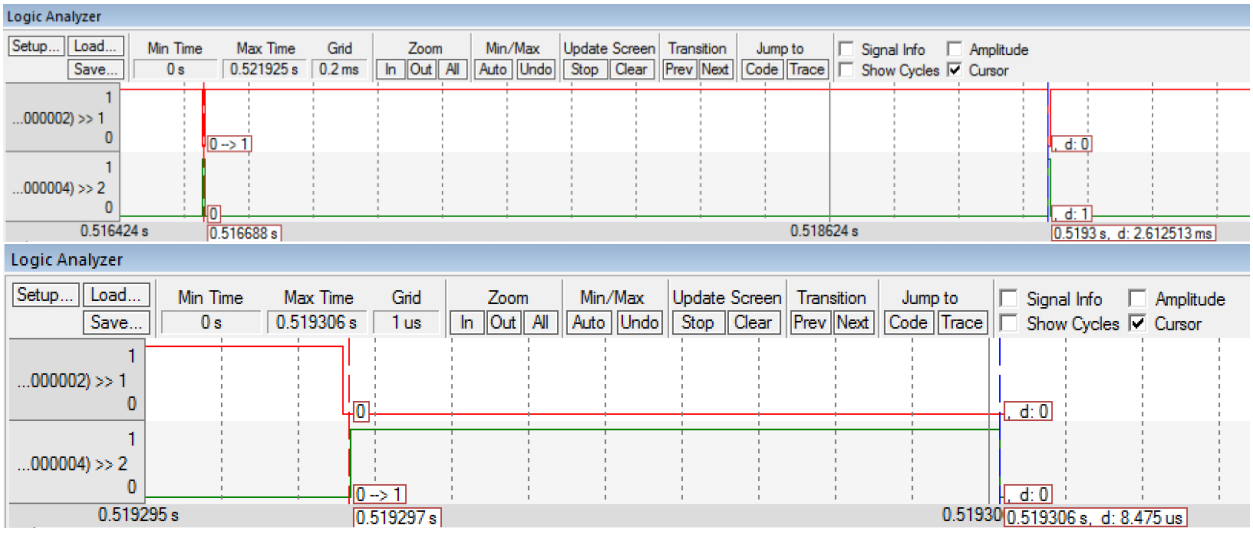
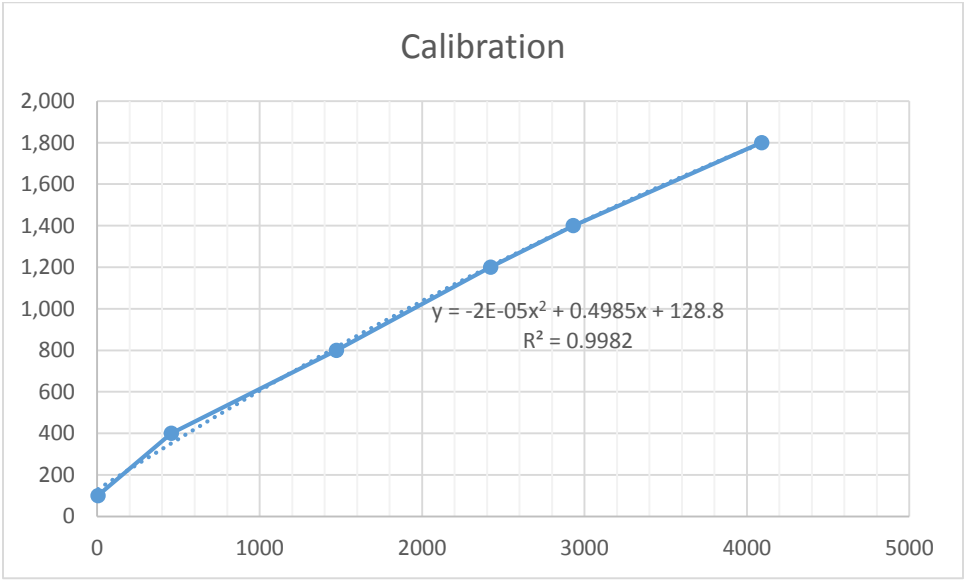
Lab 8
4/16/2015
EE319K - Tiwari

2) ADC Conversion Time = 8.475us LCD Number Output Time = 2.613ms



3) Calibration Data

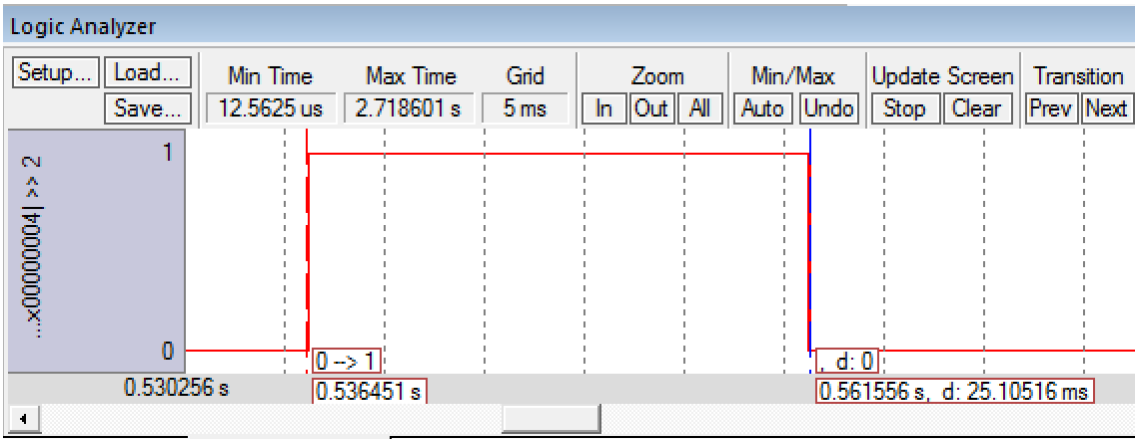
Position	Analog Input	ADC Sample
0.10	0.000	5
0.40	0.386	456
0.80	1.185	1473
1.20	2.050	2422
1.40	2.410	2931
1.80	3.260	4095



4) Code

```
void ADC_Init(void){
// Setup PE2 as analog input
SYSCTL_RCGCGPIO_R |= 0x10;                // 1) activate clock for
Port E
while ((SYSCTL_PRGPIO_R&0x10) == 0){};
GPIO_PORTE_DIR_R &= ~0x04;                // 2) make PE2 input
GPIO_PORTE_AFSEL_R |= 0x04;               // 3) enable alternate
fun on PE2
GPIO_PORTE_DEN_R &= ~0x04;                // 4) disable digital
I/O on PE2
GPIO_PORTE_AMSEL_R |= 0x04;               // 5) enable analog
fun on PE2
SYSCTL_RCGCADC_R |= 0x01;                           // 6)
activate ADC0
delay = SYSCTL_RCGCADC_R;    // extra time to stabilize
delay = SYSCTL_RCGCADC_R;    // extra time to stabilize
delay = SYSCTL_RCGCADC_R;    // extra time to stabilize
delay = SYSCTL_RCGCADC_R;
ADC0_PC_R = 0x01;          // 7) configure for 125K
ADC0_SSPRI_R = 0x0123;      // 8) Seq 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 = (ADC0_SSMUX3_R&0xFFFFFFF0)+1;  // 11)
Ain1 (PE2)
ADC0_SSCTL3_R = 0x0006;      // 12) no TS0 D0, yes IE0 END0
ADC0_IM_R &= ~0x0008;       // 13) disable SS3 interrupts
ADC0_ACTSS_R |= 0x0008;      // 14) enable sample sequencer 3
}

uint32_t ADC_In(void){
uint32_t data;
ADC0_PSSI_R = 0x08;
while((ADC0_RIS_R&0x08)==0){};
data = ADC0_SSFIFO3_R&0xFFFF;
ADC0_ISC_R = 0x08;
return data;
}

uint32_t Convert(uint32_t input){
// Linear fit, nubby
// return (100*input+60157)/256;
// Quadratic fit, more accurate
return (51046*input+13189120-2*input*input)/102400;
}

void SysTick_Init(void){
NVIC_ST_CTRL_R = 0;                   // disable SysTick during setup
NVIC_ST_CTRL_R = 0x00000007;    // enable SysTick with core
clock
NVIC_ST_RELOAD_R = 2000000-1;  // number of counts to wait
(40hz)
NVIC_ST_CURRENT_R = 0;              // any value written to
CURRENT clears
}

uint32_t ADCMail;       // 12-bit ADC
uint32_t ADCStatus;      // 12-bit ADC
void SysTick_Handler(){
PF2 ^= 0x04;                          // Heartbeat
PF2 ^= 0x04;                          // Heartbeat
ADCMail = ADC_In();  // sample 12-bit channel 1
ADCStatus = 1;
PF2 ^= 0x04;                          // Heartbeat
NVIC_ST_RELOAD_R = 2000000-1;  // number of counts to wait
NVIC_ST_CURRENT_R = 0;      // any value written to CURRENT
clears
}

int main(void){
TExaS_Init();
ST7735_InitR(INITR_REDTAB);
PortF_Init();
ADC_Init();       // turn on ADC, set channel to 1
SysTick_Init();                                  // This makes things
work
// your Lab 8
while(1){
while(ADCStatus == 0){}
Data = ADCMail;
Position = Convert(Data);
ST7735_SetCursor(0,0);
LCD_OutFix(Data); ST7735_OutString("    ");
ST7735_SetCursor(6,0);
LCD_OutFix(Position);
ADCStatus = 0;
}
}
```

5) 40hz Sampling Rate (25ms)



6) Accuracy Data

True Position x_{ti}	Measured Position x_{mi}	Error $x_{ti} - x_{mi}$
0.100	0.132	0.032
0.400	0.360	0.040
0.800	0.850	0.050
1.200	1.265	0.065
1.400	1.451	0.051
1.800	1.841	0.041
Average Accuracy:		0.047

1) Circuit Diagram