

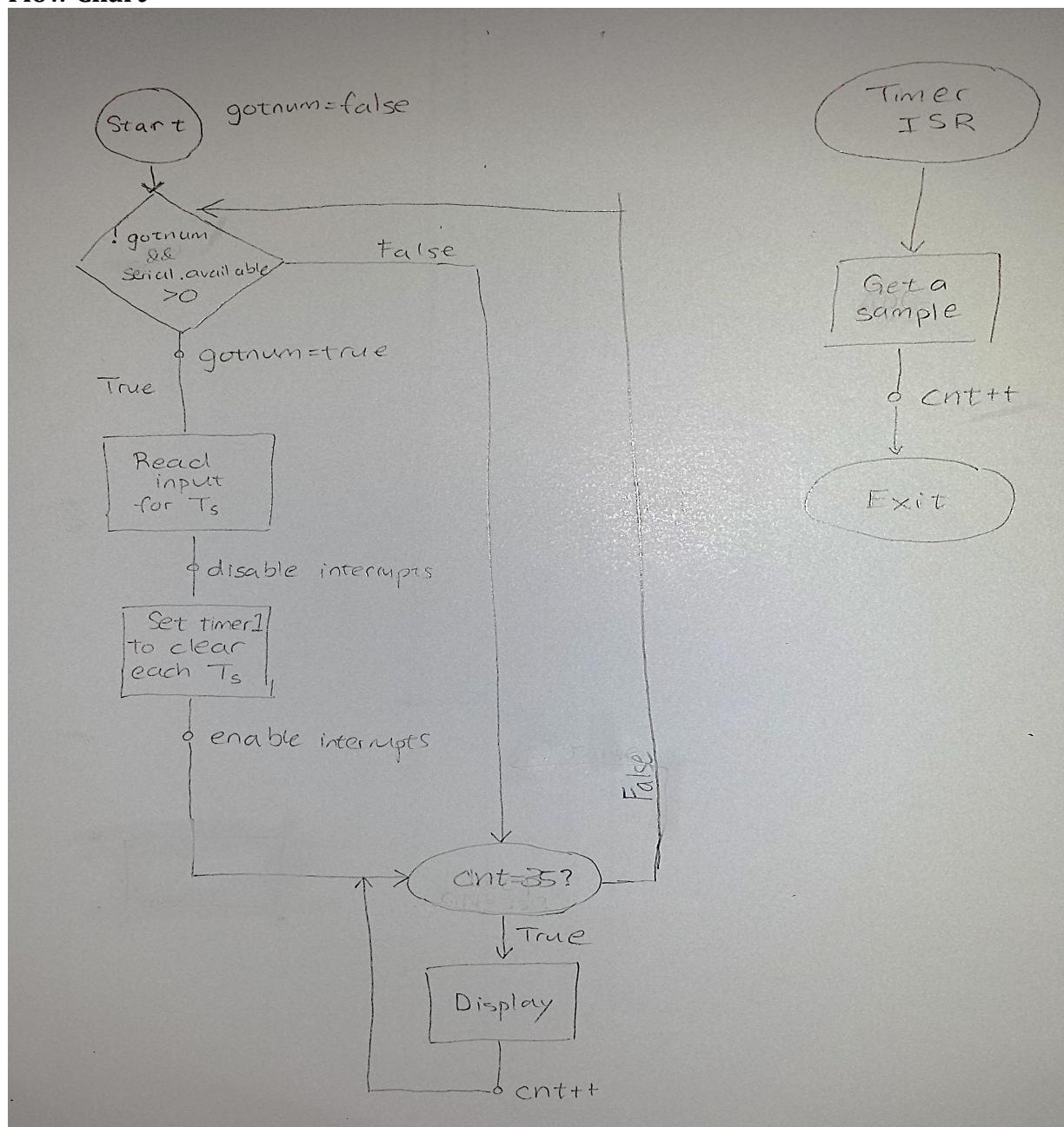
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October 2, 2013

Project 5

Project Description

In this project, we will implement a transient recorder that acquires 35 samples of waveform using a sampling period specified on the serial monitor. The recorder will then display the acquired waveform samples on the serial monitor with 6-bit resolution.

Flow Chart



Programs

Please refer to code in current directory.

Description of operation

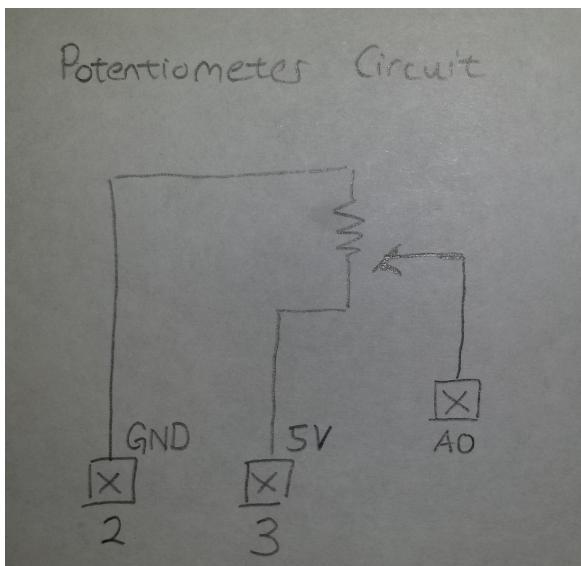
We acquire the sample period value T_s from the user by setting a one-time boolean variable called `gotnum`, which signifies whether or not we have received T_s yet. In this conditional, we read each byte into a char array and then convert it into an integer. In this section, we also set the timer to clear timer on compare and the compare value to the period $* 16 * 1000$ in order to get the value on which the counter clears. The recorder operates at an minimum achievable ADC conversion time by setting the timer prescaler to off, and setting the ADC prescaler to its smallest value, 2. This allows the ISR and the ACD processes to complete at the minimum time because both clock speeds are at their highest. The recorder triggers data acquisition when ADC signal exceeds threshold, and we use a counter to keep track of how many interrupts have been called, and when the counter reaches 35, interrupts are turned off. To print out the results, the program keeps track of the maximum as we print samples, and then prints out the max at the end of the diagram. After printing the results, we increment `cnt` by 1 to ensure that the program goes into an infinite loop.

Monitor Display with $T_s = 50$

```
T_s (ms)= 50
0 *
1 |   *
2 |       *
3 |           *
4 |               *
5 |                   *
6 |                       *
7 |                           *
8 |                               *
9 |                                     *
10 |                                         *
11 | *
12 *
13 *
14 *
15 *
16 *
17 |   *
18 |   *
19 |       *
20 |           *
21 |               *
22 |                   *
23 |                       *
24 |                           *
25 | *
26 | *
27 *
28 *
29 *
30 *
31 *
32 *
33 *
34 *
```

Max val= 63

Circuit Diagram



Notes

To better understand how the ADC prescaler would affect sampling speed, we created the following table which shows that decreasing the ADC prescaler value increases the cycles per sample:

ADC Prescaler Value	Time (ns)	Cycles per sample (T_s = 1ms)
2	125	8000
4	250	4000
8	500	2000
16	1000	1000
32	2000	500
64	4000	250
128	8000	125