

Lab #5 - Stopwatch

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Exercise 1: Print Time!

```
pi@raspberrypi:~/group_01/ECEN3213Lab5 $ g++ -std=c++14 Lab5EX1.cpp -o Lab5EX1
pi@raspberrypi:~/group_01/ECEN3213Lab5 $ ./Lab5EX1
1 : 1st place: 00:01:000
2 : 2nd place: 00:02:000
3 : 3rd place: 00:03:000
4 : 4th place: 00:04:000
5 : 5th place: 00:05:001
6 : 6th place: 00:06:001
7 : 7th place: 00:07:001
8 : 8th place: 00:08:001
9 : 9th place: 00:09:001
10 : 10th place: 00:10:001
11 : 11th place: 00:11:002
12 : 12th place: 00:12:002
13 : 13th place: 00:13:002
14 : 14th place: 00:14:002
15 : 15th place: 00:15:002
16 : 16th place: 00:16:002
17 : 17th place: 00:17:003
18 : 18th place: 00:18:003
19 : 19th place: 00:19:003
20 : 20th place: 00:20:003
21 : 21st place: 00:21:003
22 : 22nd place: 00:22:003
23 : 23rd place: 00:23:004
24 : 24th place: 00:24:004
25 : 25th place: 00:25:004
26 : 26th place: 00:26:004
27 : 27th place: 00:27:004
28 : 28th place: 00:28:005
29 : 29th place: 00:29:005
30 : 30th place: 00:30:005
pi@raspberrypi:~/group_01/ECEN3213Lab5 $
```

Exercise 2: Timer with a Button!

Before reset:



After reset:



Exercise 3: Stopwatch

(not pictured)

Supplemental Questions:

1. Briefly summarize what you learned from this lab.

In this lab we got to learn more about the clock and timer function with our circuits. We designed some code that, every second, would display the current time from a timer function. Then we got to integrate that on to an LCD screen that also had a button reset, meaning we got some more experience implementing interrupts. Then we got to make a real life stop watch using circuits and code, through the LCD screen.

2. In Exercise 1, when you check the time recorded after each one-second delay, is the time increments exactly one second. If not, please explain the reason.

As seen on the picture for exercise 1, every 3 to 6 “seconds” a millisecond is added onto the timer. This is most likely due to over all computer lag and the time it takes to call the command to display the time.

3. Explain how you use an external function defined outside of the file of the main() function.

In the top of the code, you are able to add lines that say `#include <somelibrary>` that then gives you access to all of the commands in that library. Using this feature we added “lab_util.h” which held the function `formatTime()`, allowing us to use this in our exercises.