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1DT301 – Computer Technology 1
Laboratory 4

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Task 1 & 2

Due to the similarities of both task 1 and task 2 this problem has been merged into one program that fulfils the requirements for both tasks. The task was to create a frequency of 1Hz in duty cycle of 50%, in other words the LED's should have a 0.5 seconds OFF state and 0.5 seconds ON state. The solution was tested on oscilloscope that measured the duty cycle followed with voltage and frequency. Example of is shown below (figure 1). The following task (task 2) required to modify task 1 with additional functionality to increase or decrease the duty cycle by 5% on each interrupt by pressing the switch 1 and switch 2. Flow chart is shown below (figure 2).

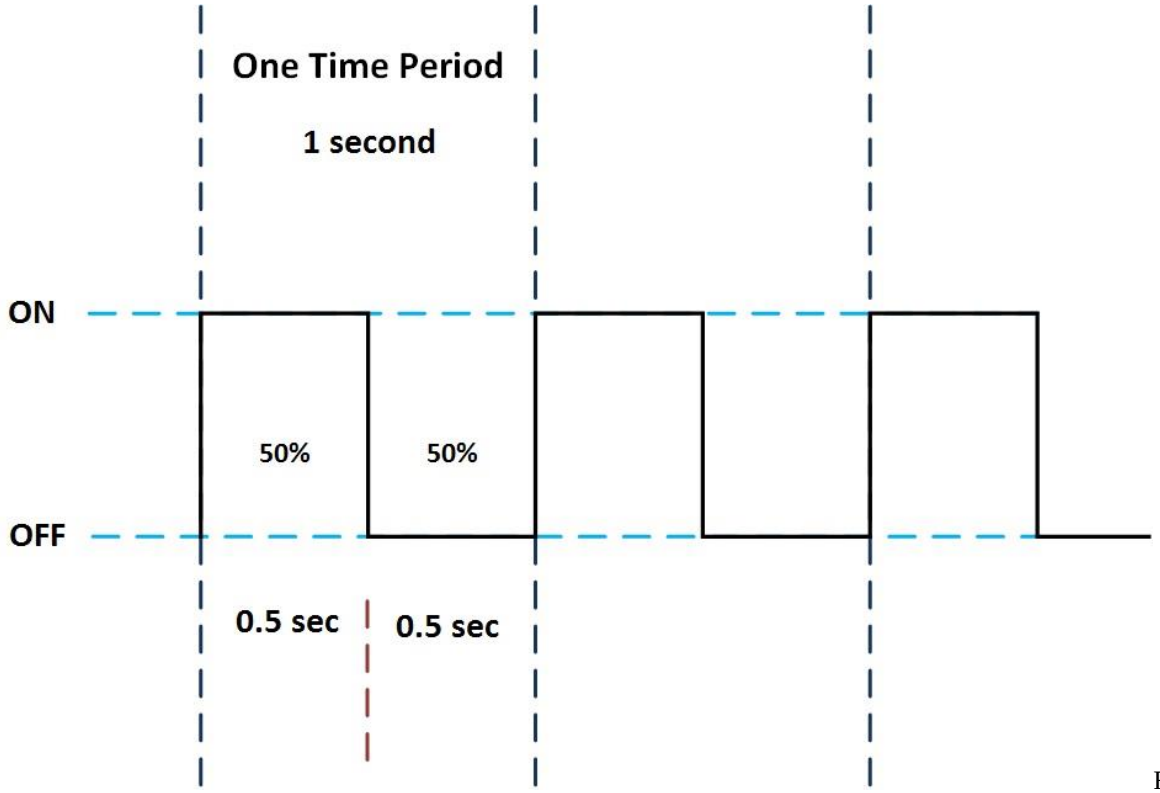
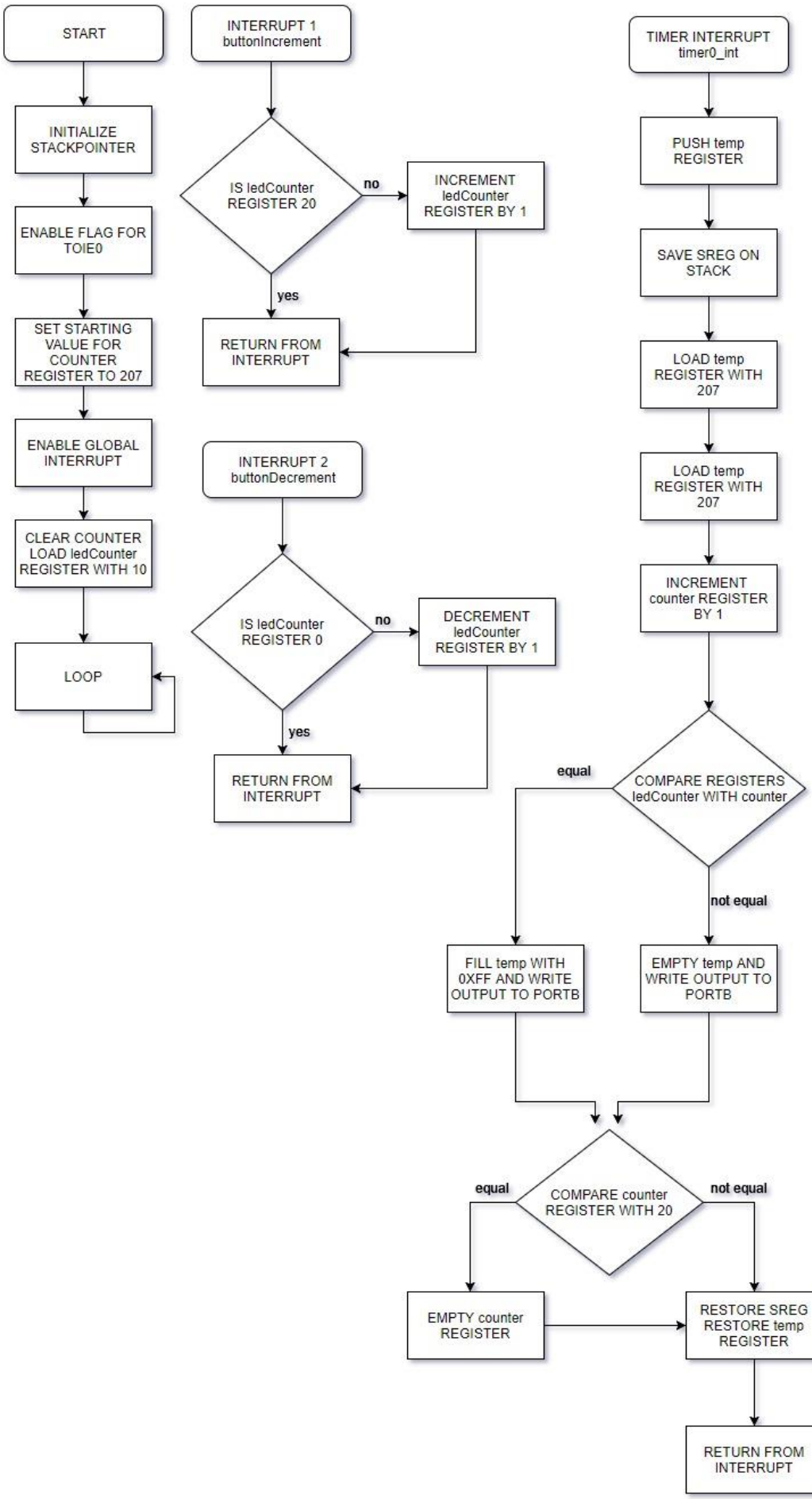


Figure 1

Code : please refer to the Lab4Task1_2.asm file that is included with this document.


START
INITIALIZE STACKPOINTER
ENABLE FLAG FOR TOIE0
SET STARTING VALUE FOR COUNTER REGISTER TO 207
ENABLE GLOBAL INTERRUPT
CLEAR COUNTER LOAD ledCounter REGISTER WITH 10
LOOP
INTERRUPT 1 buttonIncrement
IS ledCounter REGISTER 20
no
INCREMENT ledCounter REGISTER BY 1
yes
RETURN FROM INTERRUPT
INTERRUPT 2 buttonDecrement
IS ledCounter REGISTER 0
no
DECREMENT ledCounter REGISTER BY 1
yes
RETURN FROM INTERRUPT
TIMER INTERRUPT timer0_int
PUSH temp REGISTER
SAVE SREG ON STACK
LOAD temp REGISTER WITH 207
LOAD temp REGISTER WITH 207
INCREMENT counter REGISTER BY 1
COMPARE REGISTERS ledCounter WITH counter
equal
not equal
FILL temp WITH 0XFF AND WRITE OUTPUT TO PORTB
EMPTY temp AND WRITE OUTPUT TO PORTB
COMPARE counter REGISTER WITH 20
equal
not equal
EMPTY counter REGISTER
RESTORE SREG RESTORE temp REGISTER
RETURN FROM INTERRUPT

Task 3 & 4

The following tasks have similar requirements that we decided to merge them into one program as we did in the previous tasks (1&2). The problem on task 3 required to use serial communication on port 0 (RS232) using a serial port COM1 to establish communication with the computer using a terminal emulation program called PUTTY. The quest was to get input from the keyboard and transfer that information through the emulation program into the STK 600 board and display the information (e.g a letter) on the LCD screen (JHD202) connected to the board. Task 3 only required the input to be displayed on the LCD and task 4 requirement was the echo back the information (retrieve the information) displayed on the LCD to the emulation program to confirm that the information (correct character) has been transferred correctly. The flow chart is presented below (figure 3).

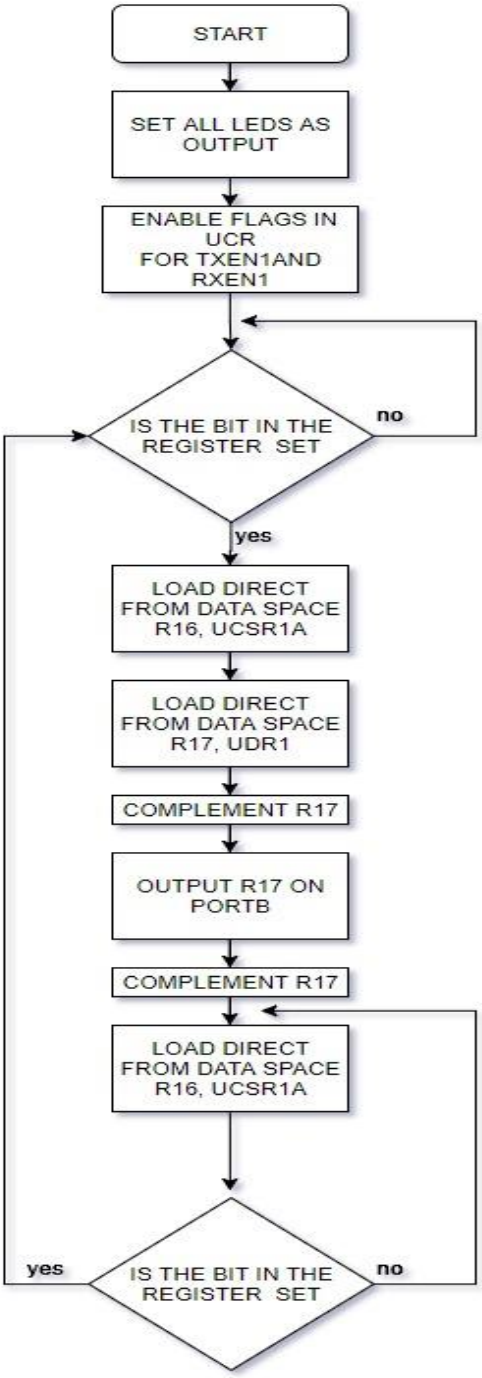


figure 3

Task 5

Final task on laboratory 4 with requirement to modify task 4 (modified task3) to use interrupt instead of polled UART. Flow chart is presented below (figure 4).

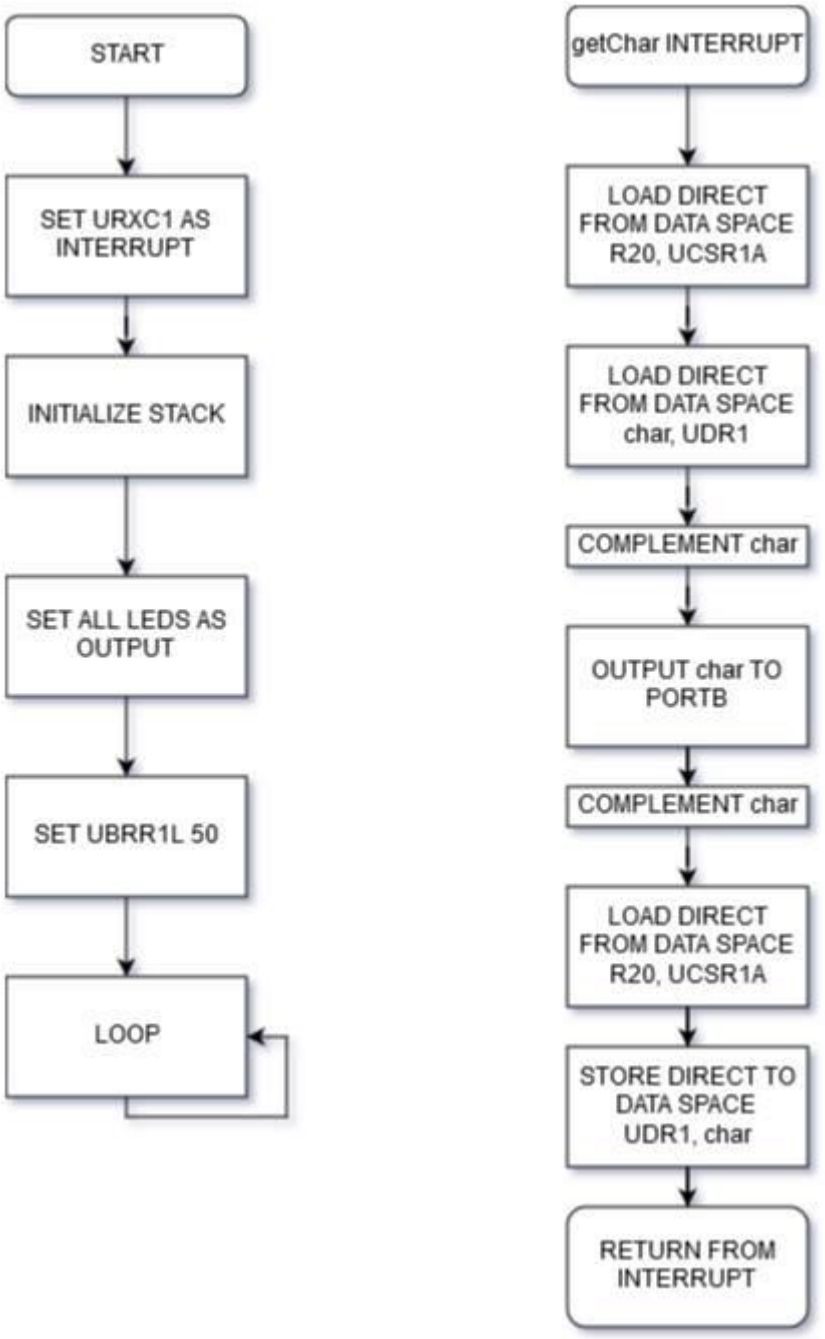


figure 4