

EE112 Project- **STOPWATCH**

Group 2

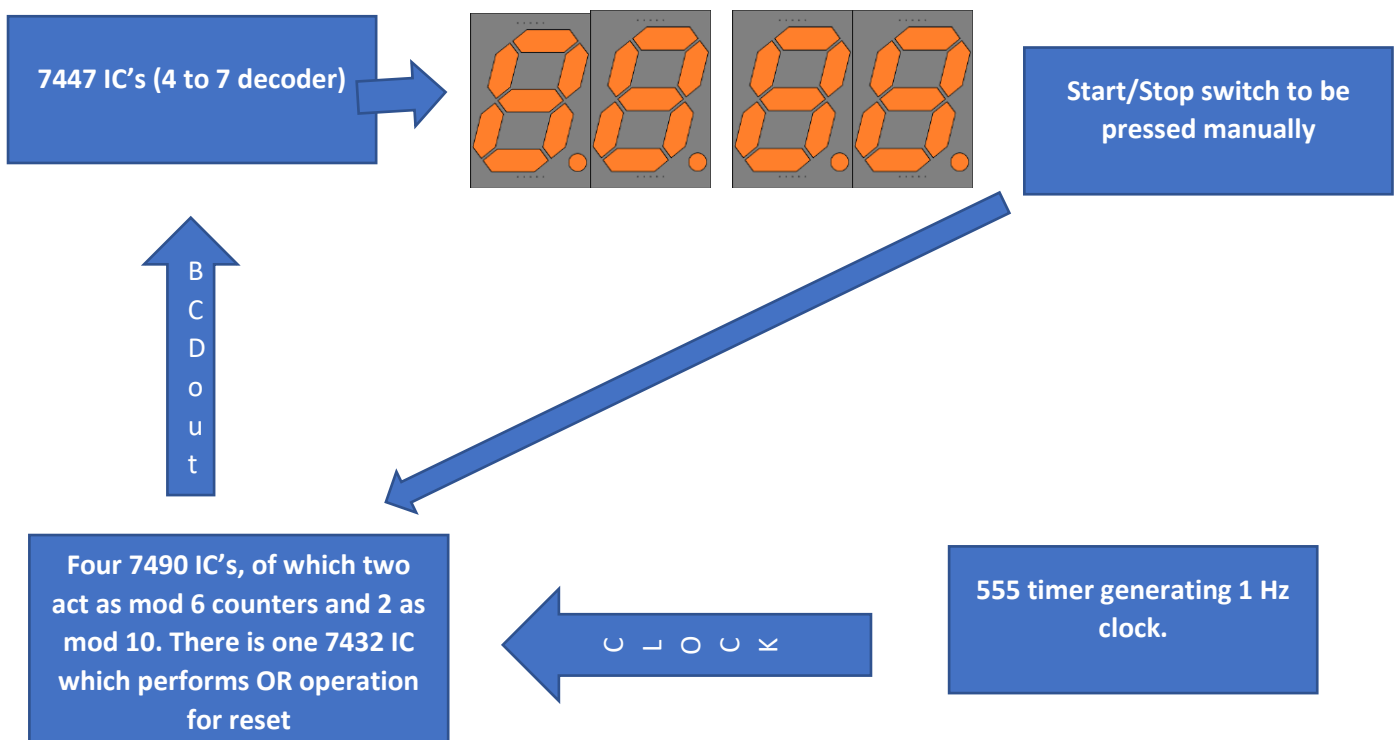
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Project Description

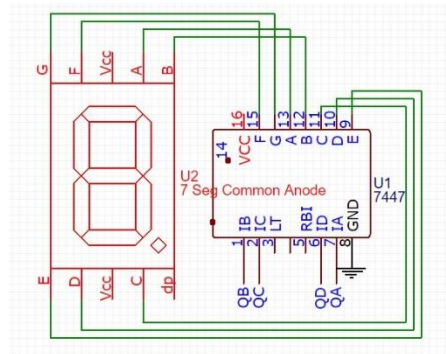
The digital stopwatch measures time elapsed between pressing the START/STOP button. It can measure and display upto 99 minutes and 59 seconds.

Block Diagram



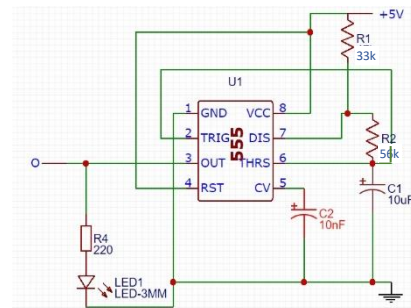
Display Block

The 7447 decoder receives its input as 4-bit BCD from the 7490 decade counter and has seven outputs for the 7-segment display. The 7-segment display is a common anode display LT542.



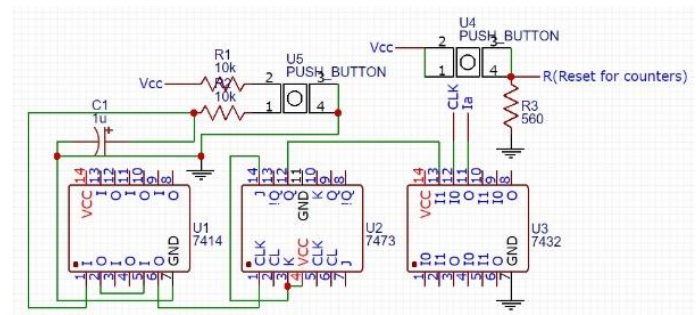
Timer block

The 555 timer works as an astable multivibrator. The values of the resistors and capacitors are so chosen such that the sum of the charging and discharging times is 1 s. $0.693 (R1+2R2)*C1=1$ s, $C1=10$ microF, $R1=33$ k and $R2=56$ k.



Reset Block

The reset is implemented by using a push button such that when it is depressed, $R=5$ V and otherwise $R=0$ V. This terminal R is connected directly to the R01 and R02(reset pins) of the 7490s corresponding to unit seconds and minutes. For tens seconds and minutes, it should reset when $QDQCQBQA=0110$ or when $R=1$, so $R+QC$ and $R+QD$ are connected(using the 7432 OR gate) to R01 and R02 of the 7490s corresponding to tens seconds and minutes.

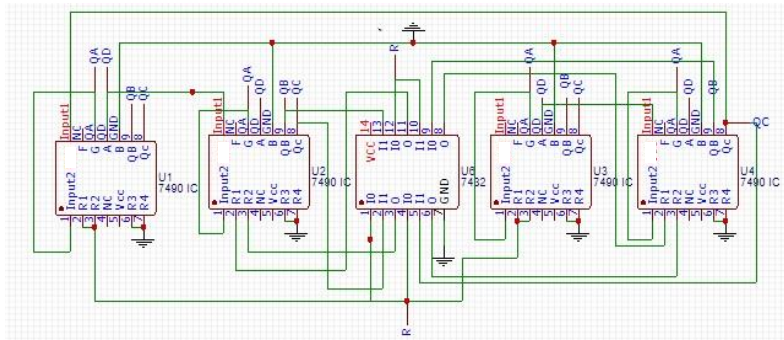


Start/Stop Block

The push button is first debounced using a 1 microF capacitor, 10k resistors and 2 Schmitt inverters. Then the output is connected as clock to a JK flipflop whose inputs J,K are high. Output of the flipflop toggles whenever the clock gets a positive edge

i.e. as soon as the push button is depressed. Q=0 is Start, Q=1 is Stop. Q+CLK(from 555) is given as clock to the 7490 decade counter.

Computation Block



The counter corresponding to the units seconds receive the clock from the Start/Stop Block. The outputs connect to the corresponding 7-seg disp. The QD (MSB) acts as a clock for the seconds tens which further signals the 7-seg disp. The Qc of seconds tens triggers the minutes units. The IC 7490 works as a decade counter when QA is connected to IB and R91, R92 are low.

Components Used

7490 (Decade Counter)

7432 (OR gate IC)

7447 (4-bit BCD to 7-bit decoder for common anode 7-seg display)

7473(JK flipflop IC)

7414(Schmitt inverter)

LT542(7-segment display)

555(Timer)

Push Button

Appropriate Resistors, Capacitors

LEDs for indication