

DIGITAL ELECTRONICS

DIGITAL STOPWATCH

SUBMITTED BY -

AYUSHI TANDON (BT18ECE036)

PARIJA MALGAONKAR(BT18ECE040)

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Introduction

Digital electronics has a wide array of applications in all kinds of different fields . Ranging from something simple as sensors checking for temperature or simple counters to quantum computing and the science and technology that goes behind building and launching rockets and space probes, digital electronics has its own importance.

So we come up with a DIGITAL STOPWATCH having two seven segment displays with a time delay of 1 second. The main focus of the project is to measure the amount of time elapsed from a particular time when activated and when the piece is deactivated.

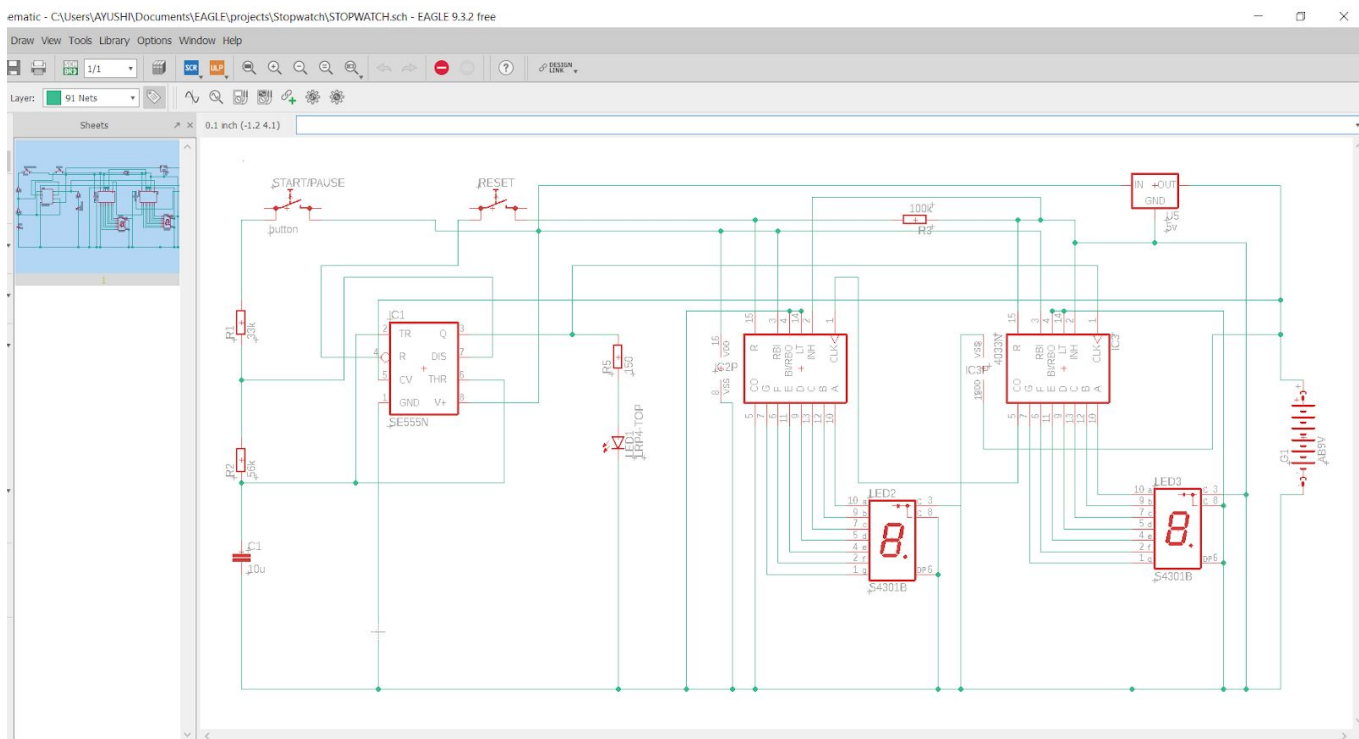
Project Requirements

Hardware

1. IC 4033 - 2
2. 555 timer IC -1
3. Common Cathode 7 Segment Display -2
4. 150 Ohm -1
5. 100K resistor -1
6. 33K resistor -1
7. 56K resistor -1
8. 10uF capacitor -1
9. On/off switch -1
10. Push button -1
11. Bread board -1
12. 9 Volt Battery -1
13. Battery Connector -1
14. LED -1
15. Voltage Regulator 7805 -1

Software

The implementation was done firstly on the **EAGLE software** for knowing the accuracy of the connections that we had built. This is the most important step in order to practically implement the whole circuit on the breadboard.



Short Description of the software :

1.EAGLE SOFTWARE

EAGLE, an acronym for Easily Applicable Graphical Layout Editor, is a design software by Cadsoft Computers. EAGLE contains a schematic editor, for designing circuit diagrams. Schematics are stored in files.SCH extension. The PCB layout editor stores board files with the extension. EAGLE provides a multi-window graphical user interface and menu system for editing, project management and customizing the interface and design parameters.

2.MULTI SIM

Multisim integrates industry-standard SPICE simulation with an interactive schematic environment to instantly visualize and analyze electronic circuit behavior. Researchers and designers use Multisim to reduce PCB prototype iterations and save development costs by adding powerful circuit simulation and analyses to the design flow.

Hardware

(Using a breadboard)

IMPORTANT COMPONENTS :

1.IC 555

The 555 timer IC is an integrated circuit (chip) used in a variety of timer, pulse generation, and oscillator applications. The 555 can be used to provide time delays and as a Flip flop element .It is used in its astable mode.It operates from a wide range of power ranging from +5 Volts to +18 Volts supply voltage. Also, the maximum power dissipation per package is 600 mW and its trigger and reset inputs has logic compatibility.

2.IC 4033

CD4033 is a Johnson counter IC commonly used in digital display. It has a 5 stage Johnson

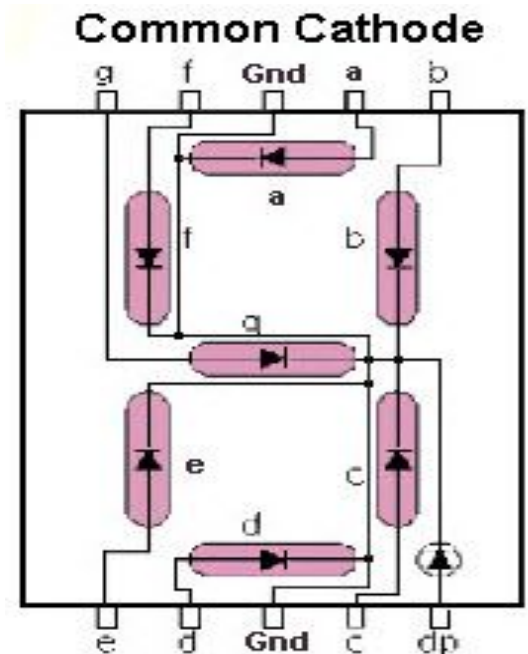
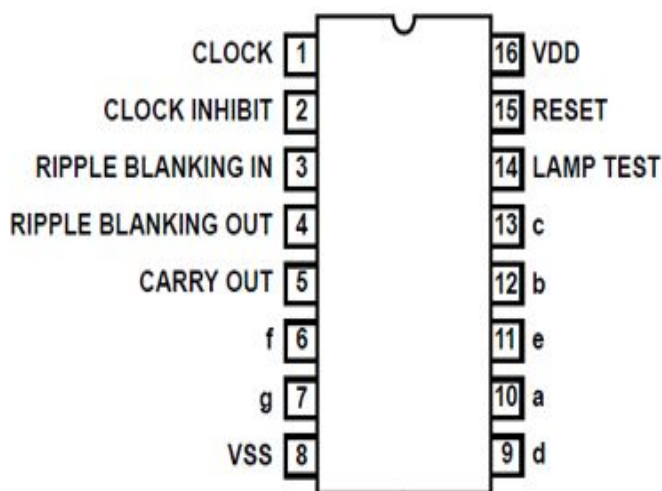
decade counter with decoder which convert the Johnson code to a 7 segment decoder

output. Means it will convert the input into numeric display which can be seen on seven

segment display or with the help of LEDs.

3. SEVEN SEGMENT DISPLAY

Seven segment displays are the output display devices that provide a way to display information in the form of image or text. In this type of display, all the cathode connections of the LED segments are connected together to logic 0 or ground. The separate segments are lightened by applying the logic 1 or HIGH signal through a current limiting resistor to forward bias the individual anode terminals a to g.



Working :

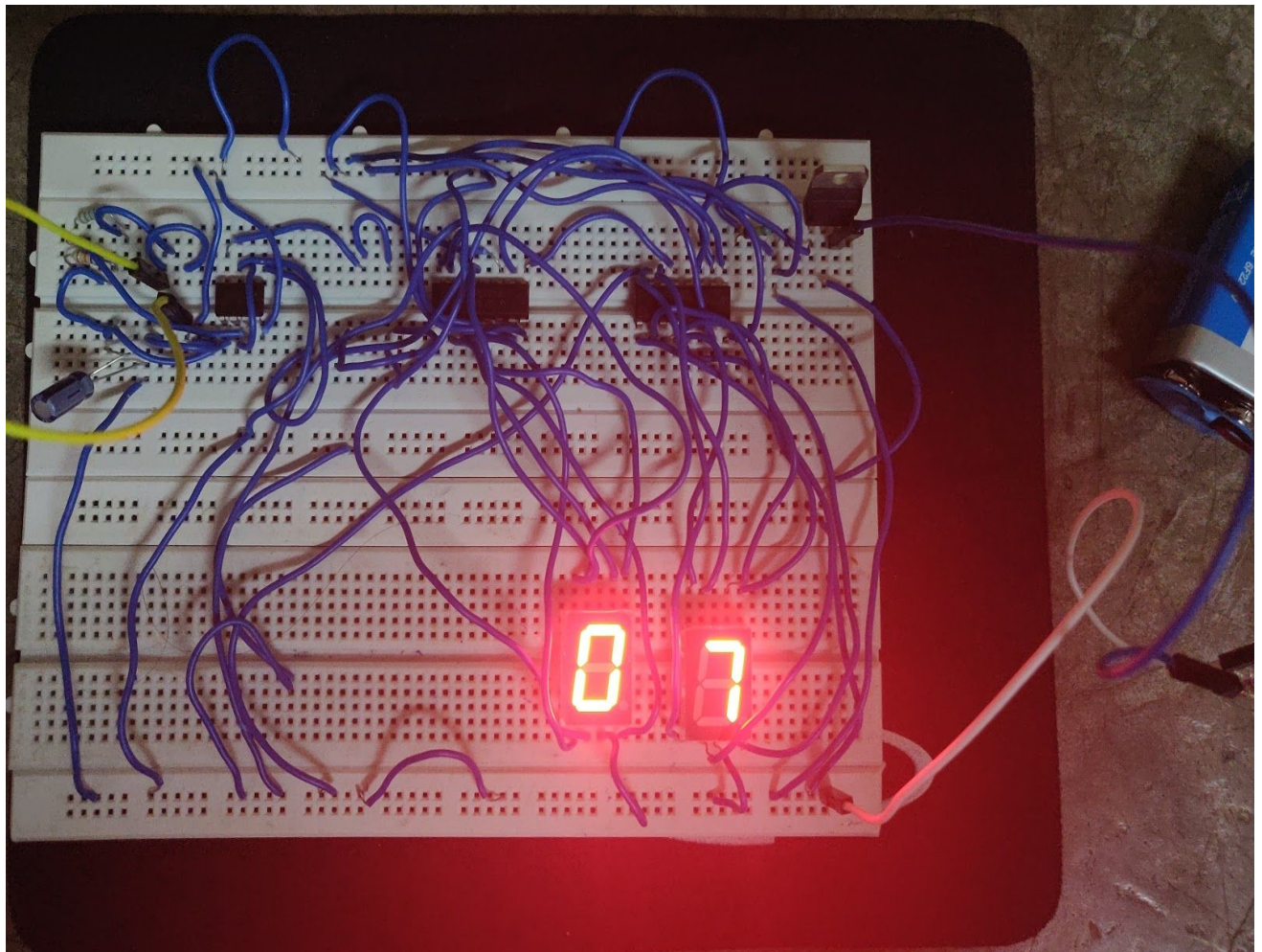
In this stopwatch circuit we have generated one second delay by using 555 timer based astable multivibrator. By using some calculation we can easily generate one second delay. In an astable multivibrator there are two resistors and one capacitor is responsible for delay by charging or discharging the capacitor through resistors.

Calculation formula for generating delay for an astable multivibrator is given below.

$$F=1/T=1.44/(R1 + 2R2) C1$$

When we turn ON the stopwatch (by start/stop button) it starts counting from zero and if we turn OFF the same button then counting stops or pauses until again turned ON the same button or press reset button.

There are two seven segment displays, so this stopwatch circuit can count 00-99 seconds time.



**(An image of the completed project in the middle of its
working process)**

Project Planning

The main goal of the project was to achieve several objectives. The main objective is to measure the time lapse between the initial and the final time i.e between the activation and deactivation.

This has been implemented using the timer ic 555 and ic 4033. Throughout this project, there have been a few considerable challenges faced throughout the development of **Digital stopwatch**. Amongst them, the most time consuming was its simulation. Firstly we had simulated our project using ICs unlike the present one on **Multisim**. There were several errors in simulation settings due to which we switched to **Eagle** software.

Thus we finally ended up with the simulation part and moved to its hardware implementation

Conclusion and Future Scope:

The ultimate goal of the project was the functioning of the digital stopwatch. After completion of this digital stopwatch project I have learnt some knowledge in designing the circuit and understood the implementation using 555 timer and Johnson counter.

The circuit has been implemented on breadboard .This circuit can operate in two modes with play and pause switches.

We do not want to stop here but want to jump ahead. All the implementations we saw are possible only if we upgrade it use it in applications like counting Heartbeats per minute . We can jump on next level by doing so.

References:

1. DIGITAL STOPWATCH

<https://circuitdigest.com/electronic-circuits/digital-stopwatch-circuit-diagram>

2. STOPWATCH

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