THE NATIONAL INSTITUTE OF ENGINEERING

MYSURU – 570008

DEPARTMENT OF ELECTRONICS AND COMMUNICATION ENGINEERING

Course Project [EC3C02] – III Semester

Synopsis on

TIMER CIRCUIT USING DECADE COUNTER

under the guidance of

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ABSTRACT

Timers were used in many applications in our day to day life.One can see the timers in washing machines, micro ovens *etc.* These devices uses timer to switch the loads for particular amount of time.Traditionally, various loads would have been manually controlled, *i.e.,* the operator would turn ON the loads and after desired conditions met, the loads again would have been turned off by the operator.

In this project we are making a timer circuit using decade counter and comparator. The output of the timer circuit will be a buzzer beep which will occur when inputs of the comparator become equal to the preset value. The decade counter counts from 0 to 9. The count is displayed using a 7-segment display.

CONTENTS

INTRODUCTION

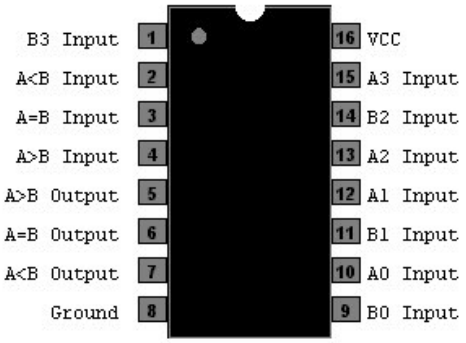
The timer circuit consists of a decade counter(IC-LS7490) a comparator(IC-LS7485), a display driver(IC-LS7447) and a 7-segment display. The clock pulse is given using microcontroller. The 74LS90 integrated circuit is basically a MOD-10 decade counter that produces a BCD output code. The 74LS90 consists of four master-slave JK flip-flops internally connected to provide a MOD-2(count-to-2) counter and a MOD-5 (count-to-5) counter. The 74LS90 has one independent toggle JK flip-flop driven by the CLK A input and three toggle JK flip-flops that form an asynchronous counter driven by the CLK B.

The 74LS90 counting sequence is triggered on the negative going edge of the clock signal, that is when the clock signal CLK goes from logic 1 (HIGH) to logic 0 (LOW). The four outputs of the counter is given to 4-bit comparator which compares the output to pre given input.The comparator IC has three outputs i.e A=B, A<B, A>B. In this case we are using A=B and A>B. The output A=B signal is fed into buzzer causing it to beep and the output A>B signal is given to master reset of the counter making it reset to its initial count *i.e.,* zero.The outputs of counter is displayed using a 7-segment display driven using IC74LS47.

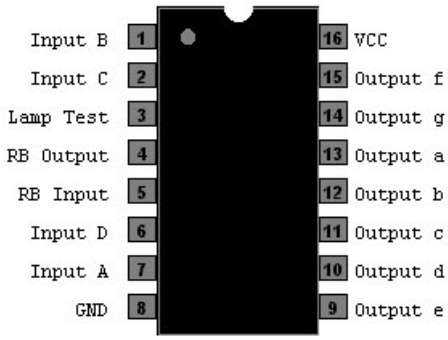
HARDWARE

1. IC 74LS90 (Decade Counter).
2. IC 74LS85 (4-bit Comparator).
3. IC 74LS47 (7-segment Display driver).
4. Common anode 7-segment display.
5. Buzzer.
6. Resistor (100 Ω).
7. Jumpers.

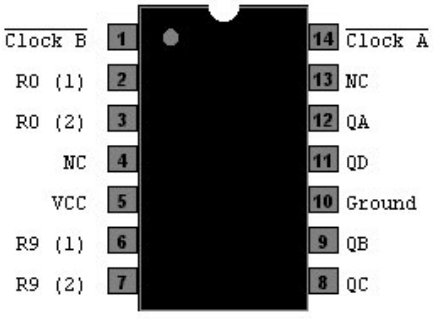
Pin Diagram:



74LS85



74LS47



74LS90

SOFTWARE

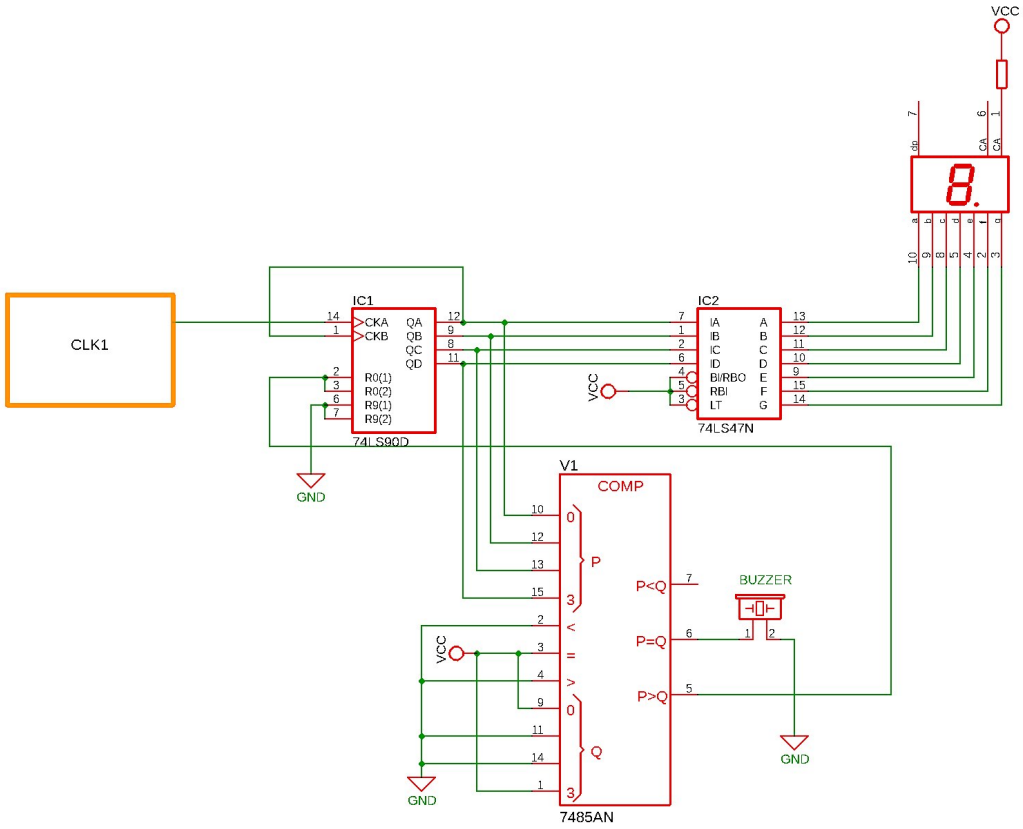
- The clock pulse is generated from micro-controller(Arduino Mega 2560). The code is written using embedded C-language.The following is the code used to produce clock of 10% duty cycle:


```
void setup() {
      // Initialise digital pin 13 as an output.
      pinMode(13, OUTPUT);
}

// the loop function runs over and over again forever
void loop() {
      digitalWrite(13, HIGH);
      delay(100);                    // wait for 0.9 second.
      digitalWrite(13, LOW);
      delay(900);                    // wait for 0.1 second.
}
```

- **TINA-TI** Simulation Software for simulation of system design.
- Circuit Schematic produced by **AUTODESK-EAGLE**.

WORKING



Timer Schematic

The clock pulse to the counter is given using a micro-controller.The decade counter is a negative edged triggered clock pulse. During each negative edge it counts one bit. The output of the decade counter represented by QA, QB, QC, QD is given to the comparator. The pin 3 is kept high while the pins 2 and 4 are kept low. The input which has to be compared is given to the comparator for *eg.* 6(0110). The counter counts from zero and when it reaches value 6 the pin 6 (A=B) becomes high and this high signal causes the buzzer to beep. Now when the count becomes 7, the pin number 5 (A>B) becomes high and this signal is given to the master reset of the decade counter making it reset to its initial stage *i.e.,* zero. The outputs of the counter QA, QB, QC, QD is also given to the display driver (IC-LS7447) which decodes BCD(Binary Coded Decimal) and it is displayed in a 7-segment display.

APPLICATIONS

- Timer circuit can be used to generate clock to drive electronic storage elements like latches and flip-flops.
- It can be used as alarm systems.
- It can be used to drive servo motors.
- It can be used to create delay in digital circuits.

BIBLIOGRAPHY

[1] 74LS90 Datasheet
https://www.ti.com/lit/ds/symlink/sn54ls90.pdf

[2] 74LS85 Datasheet
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[3] 74LS47 Datasheet
http://www.ti.com/lit/ds/sdls111/sdls111.pdf

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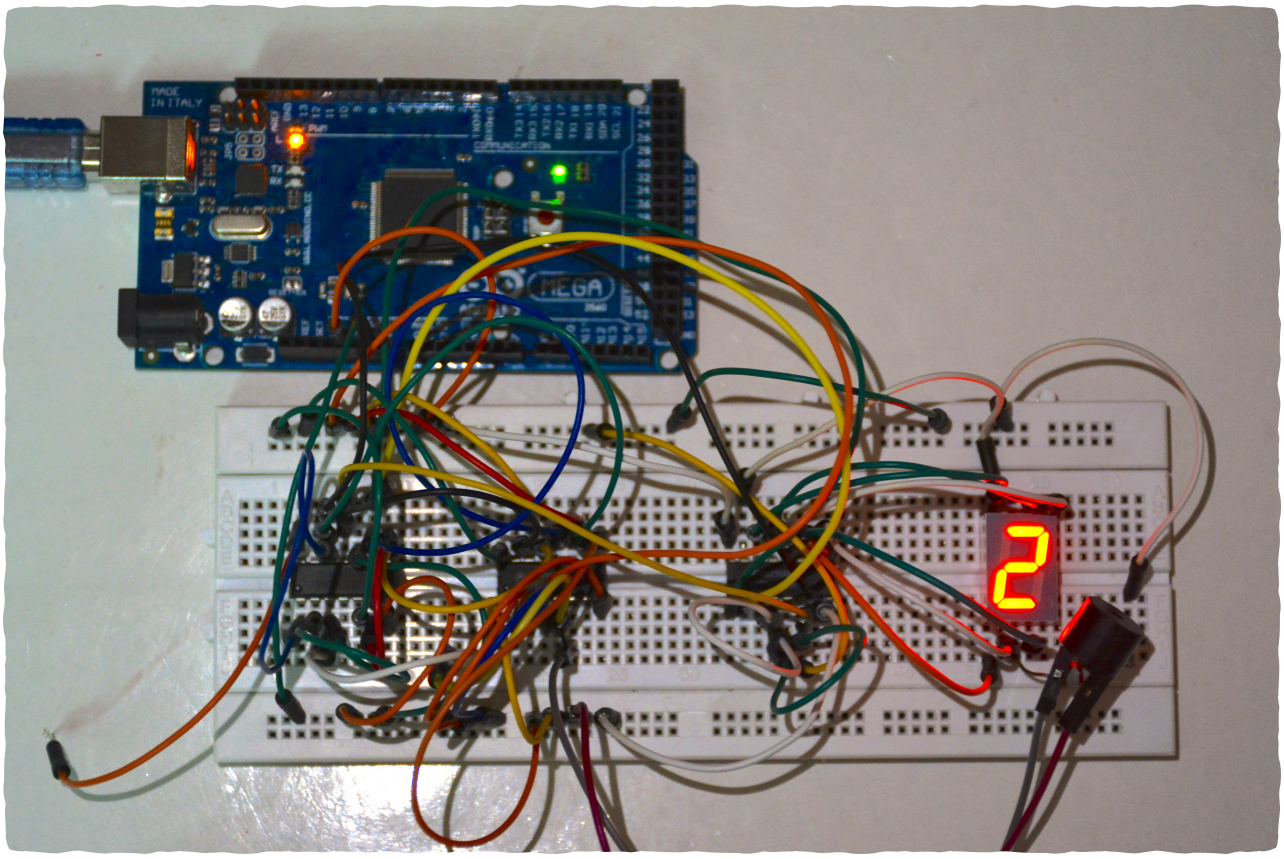

TIMER CIRCUIT