

DEPARTMENT OF COMPUTER SCIENCE AND ENGINEERING

ANNA UNIVERSITY, Chennai

CS6105: Digital Fundamentals and Computer
Organization

24-HOUR DIGITAL CLOCK

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Abstract:

This Project Digital clock displays the time using a seven-segment display. This device displays time in hours, minutes and seconds. It is a 24-hour digital clock. We create this digital clock using counters and decoders. A 1Hz Clock Signal is used to produce a pulse every second which when used along with a counter can be used to track the seconds. 2 Counters are used for each of the two digits in Hours, Minutes and Seconds. The output of these counters is connected to a seven-segment decoder, which in turn is connected to a seven-segment display that is used to display the time to the user. We can use push to on switch to set the correct time.

Introduction:

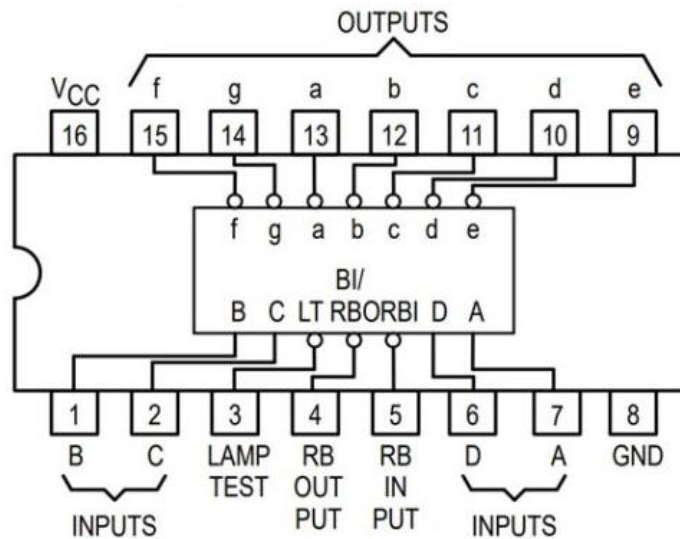
This project is designed to display the time in hours, minutes and seconds format and is wired such that it functions in 24-hour mode. For this purpose, this circuit makes use of six 74LS90 decade counters, six 74LS247 BCD to 7-segment decoders/drivers, and six LTS542 common anode displays. In addition, passive components like few resistors, capacitors, and push-to-on switches are employed. A 1Hz clock is used to supply the input to the IC1 through pin 14. 1 Hz clock generator circuit is shown in the button of the article. The output obtained from both of the above-mentioned circuits become more accurate with the fact that both circuits take advantage of 32.768kHz quartz crystal.

Apparatus Required:

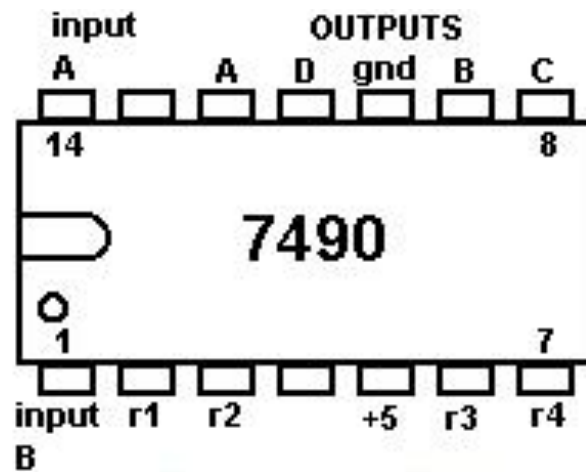
❖ IC 555	Timer
❖ IC 74LS247	BCD to seven segment Decoder
❖ IC74LS90	Decade Counter
❖ FNDLTS542	Common Anode Display
❖ Resistors	560 Ω , 10 k Ω , 220 Ω
❖ Variable resistor	100 k Ω
❖ Capacitors	0.1 μ F, 10 μ F, 10 nF
❖ Push to on switch	
❖ Bread board	
❖ LED	
❖ Connecting wires	
❖ 9V battery	

PIN DIAGRAMS

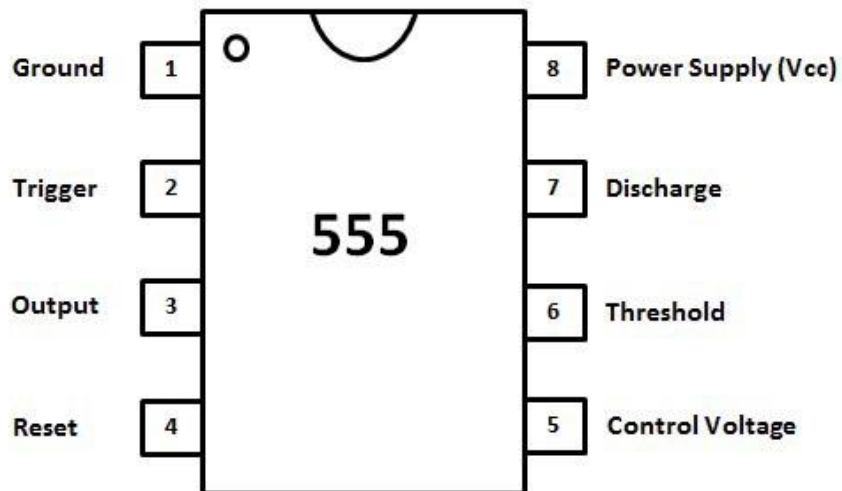
IC 74LS247 (BCD to 7-Segment Decoder):



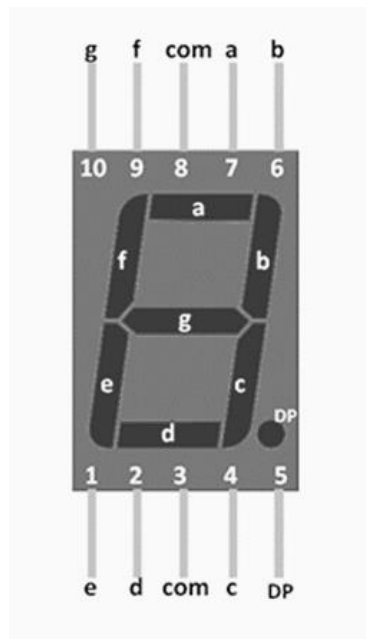
IC 74LS90 (Decade Counter):

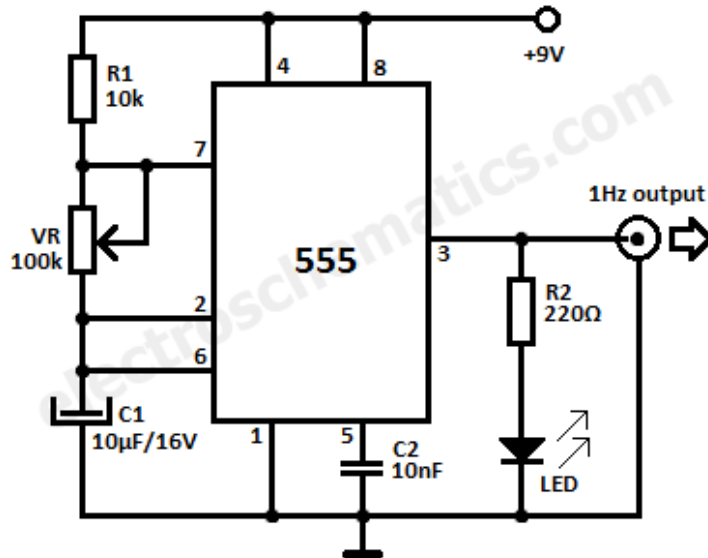


IC 555 (Timer):



Common Anode Display:



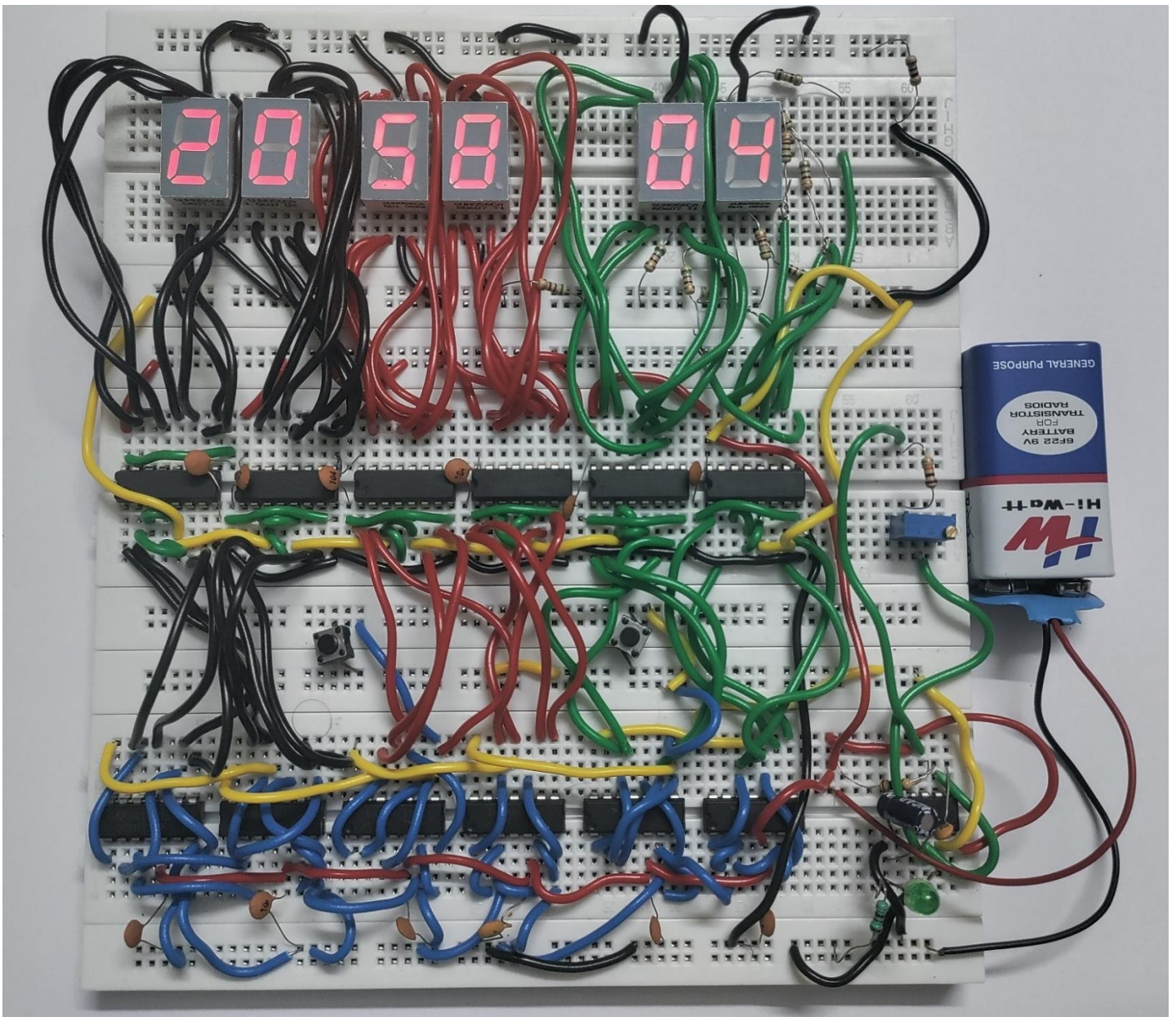


Working:

Each ICs are designed/wired with a particular task to perform. In this circuit, IC1 serves as a divide-by-10 counter and IC2 as a divide-by-6 counter. Thus, the output of IC2 connected to clock pin 14 of IC3 has a pulse recurrence period of one minute. Similarly, following the connection pattern of IC1-IC2, the IC3-IC4 pair is wired likewise. And, so the output of IC4 connected to clock pin 14 of IC5 has a pulse recurrence frequency of one hour. IC pair 5 and 6(IC5-IC6) is set such that it resets themselves on reaching a count of 24. The BCD to 7-segment decoders IC7 through IC10 is used to decode the BCD outputs of IC3 through IC6. In response to this, the 7-segment common-anode displays DIS1 is driven through DIS4 respectively.

The clock gets reset at 24 hours count and for this reason, the maximum time that would be displayed by the clock is 23 hours and 59 minutes. Circuit noise can rise as a major problem in the operation. To solve this, Decoupling capacitors of 0.1μF each have been used between Vcc and ground of all ICs.

We can see in the figure, that the 1Hz clock is also connected to one of the poles of push-to-on switches S1 and S2. These switches are used for quick adjustment of minutes and hours count respectively. With this arrangement of switches, the clock can be set to display any desired time between zero hours and zero minutes to 23 hours and 59 minutes.



Result:

Hence a Digital Clock which displays time in HH: MM: SS has been designed and implemented.