

Abstract: The goal of this experiment is to design an Astable multivibrator and implement the multivibrator using 555 timer which comes from the three 5 k Ω resistors embedded in it.

Introduction: 555 Timer is a digital monolithic integrated circuit (IC) which may be used as a clock generator. In other words, 555 Timer is a circuit which may be connected as a stable or monostable multivibrator. In more simple words, 555 Timer is a monolithic timing circuit, which can produce accurate timing pulses with 50% or 100% duty cycle. 555 Timer is a linear device and it can be directly connected to the CMOS or TTL (Transistor – Transistor Logic) digital circuits due to its compatibility but, interfacing is must to use 555 timer with other digital circuits. Being an integral part of electronics project, 555 Timer IC is very often used in simple to complex electronics projects. The standard 555 timer IC is made of 2 diodes, 25 transistors, 15 resistors installed in an 8-pin dual in-line package [1].

Theory and Methodology:

Astable Multivibrator: An astable multivibrator is also known as a free-running multivibrator. It is called free-running because it alternates between two different output voltage levels during the time it is on. The output remains at each voltage level for a definite period of time [2]. The Astable Multivibrator is another type of cross-coupled transistor switching circuit that has NO stable output states as it changes from one state to the other all the time. The astable circuit consists of two switching transistors, a cross-coupled feedback network, and two-time delay capacitors which allows oscillation between the two states with no external triggering to produce the change in state [3].

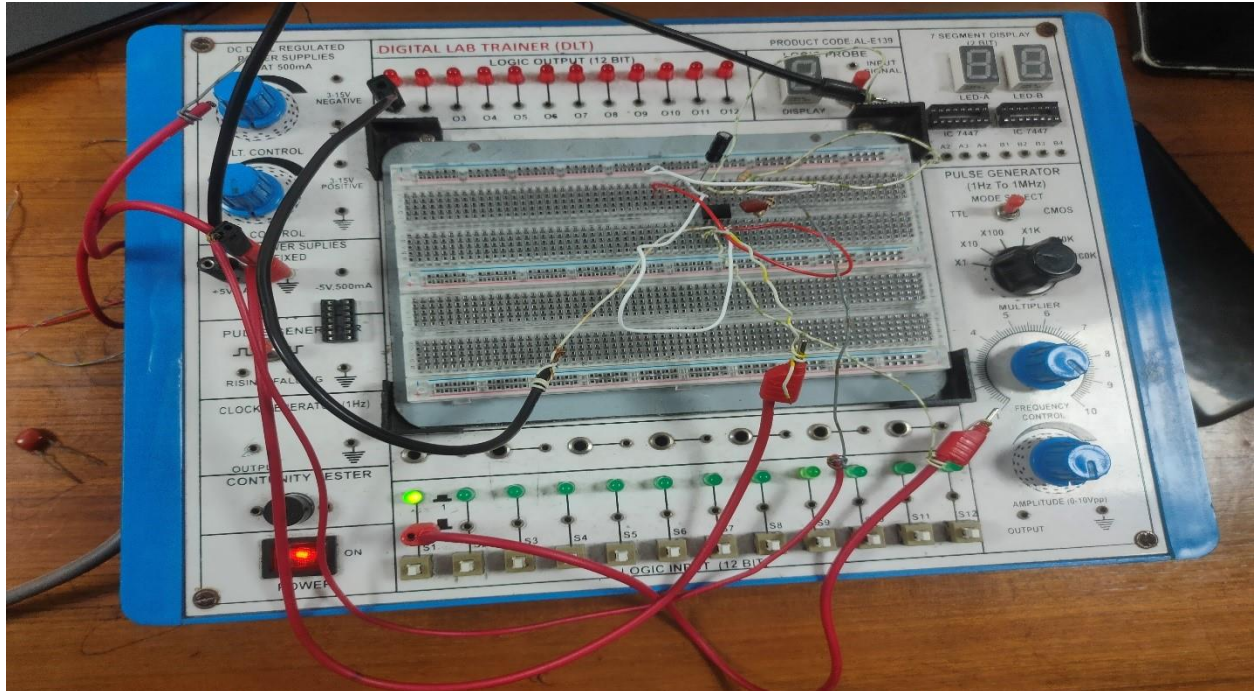
Unlike the Monostable Multivibrator or the Bistable multivibrator, we looked at in the previous tutorials that require an “external” trigger pulse for their operation, the Astable Multivibrator has automatic built in triggering which switches it continuously between its two unstable states both set and reset. In electronic circuits, astable multivibrators are also known as Free-running Multivibrator as they do not require any additional inputs or external assistance to oscillate. Astable oscillators produce a continuous square wave from its output or outputs, (two outputs no inputs) which can then be used to flash lights or produce a sound in a loudspeaker [3]. Astable mode works as an oscillator circuit, in which output oscillate at a particular frequency and generate pulses in rectangular wave form. Using 555 timer IC, we can generate precise time duration of HIGH and LOW output, from micro seconds to hours, that's why 555 is very popular and versatile IC [4].

Monostable Multivibrator: The monostable mode is also called “one-shot” pulse generator. The sequence of events starts when a negative going trigger pulse is applied to the trigger comparator. When this trigger comparator senses the short negative going trigger pulse to be just below the reference voltage ($1/3 V_{CC}$), the device triggers and the output goes HIGH. The discharge transistor is turned OFF and the capacitor C that is externally connected to its collector will start charging to the max value through the resistor R. The HIGH output pulse ends when the

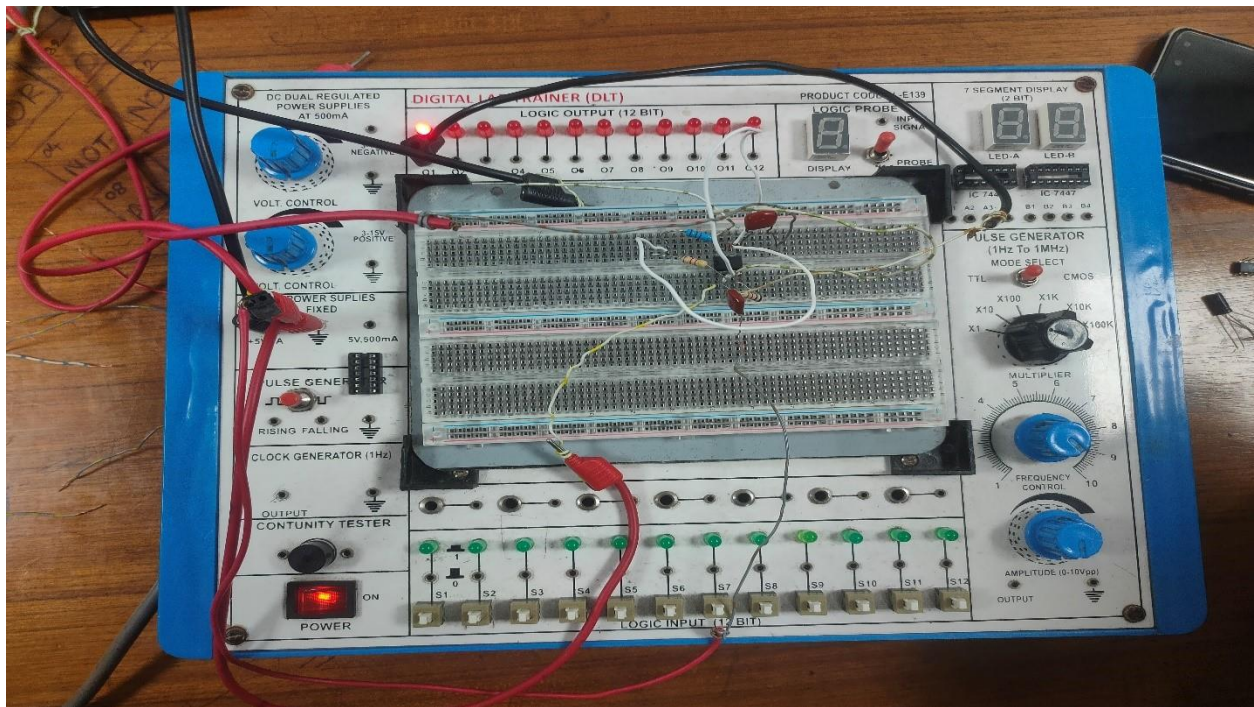
charge on the capacitor reaches $\frac{2}{3} V_{CC}$. The internal connection of the IC 555 in monostable mode along with the RC timing circuit [5].

Lab Setup:

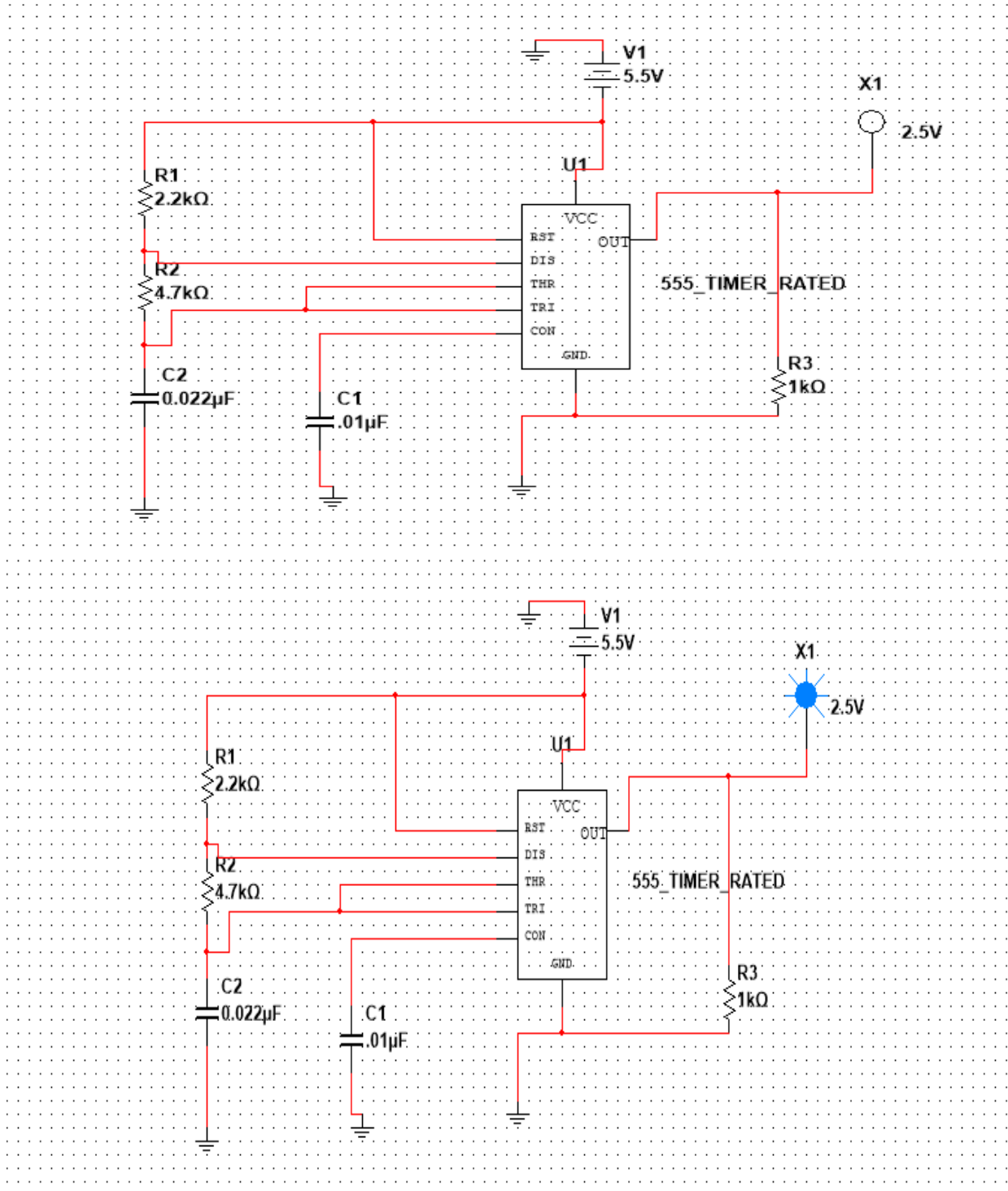
Monostable



Astable



Simulation:



Discussion & Conclusion: Astable multivibrator using 555 timers were designed and implemented. Multisim results were obtained through the designed system. Astable multivibrator and Monostable multivibrator circuit is very simple and easy to design requiring

few components. As the 555 timer is used the system has low power consumption. Furthermore, with the use of 555 timer, the system is very stable, easy to use and requires low cost. In addition, another important boon is that, the system can be used for timing from microseconds to hours. Generating time delays from microseconds to ours is useful in many applications.

References:

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