555 IC CIRCUIT REPORT

TEJ 3MI - 02 | TECHNICAL REPORT

SUBMITTED TO:

ADNAN SHEIKH

SUBMITTED BY:

ISHAN BIJUKUCHHAY

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Commented [1]: An excellent effort

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INTRODUCTION

Circuits are powered by electricity, which can be used to create different types of circuits. A circuit is an electric path where electricity flows through. With circuits, it is possible to make appliances function properly (power to a speaker, lights, etc) and can send electrical information to different components. The 555 IC Timer is a chip which is used to make circuits that would require a delay, oscillations, or a timer, among other things. It can also make warning flashes and sounds of varying frequencies. The chip has 8 pins, each with a specific function. In this experience, I was tasked into making circuits, given the schematic diagram (electronically, then in real life). The circuits that I made used the 555 IC Timer as their chip. By participating in this hands-on lab activity, I can hone in my knowledge of building circuits, the uses of the 555 IC Timer, and how each of the components works together

PROCEDURE:

I was tasked with designing two circuits with the software Tinkercad. Tinkercad is a free software used for creating 3D models and prototypes, such as shapes, code, and, in this assignment, circuits. It is used as a prototype to make sure that whatever works electronically, would be able to work in real life, and not cause a fuse to run short, damaging components in the process. Tinkercad provides all the components needed and has varieties of components used for building different types of circuits. First, I built a Blinking LED circuit using the 555 IC Timer chip, after being provided with a diagram. Then, I built the Screaming Siren Circuit (like the Blinking LED circuit, starting in Tinkercad). After that, I built them in real life with the real-life components. Below are

pictures and diagrams of the circuits, a components list, a datasheet of the 555 Timer chip, and a schematic diagram of the circuits.

DIAGRAMS, SCHEMATICS, DATASHEETS:

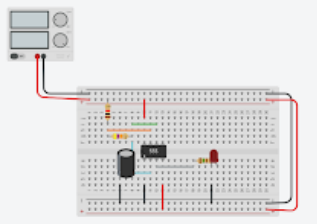


Figure 1

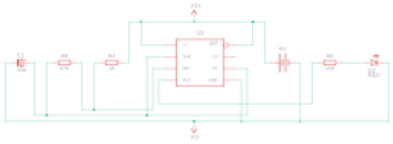
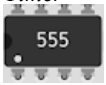
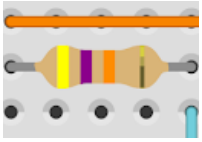


Figure 2

Name	*Quantity*	*Component Name*
U2	*1*	*Timer* 
R4	*1*	*1 kΩ Resistor* 
R5	*1*	*47 kΩ Resistor* 
C1	*1*	*10 uF, 9 V Polarized Capacitor* 
R6	*1*	*150 Ω Resistor*

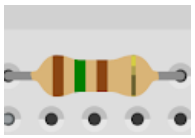
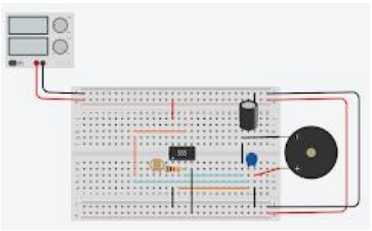
		
D2	*1*	*Red LED* 
P2	*1*	*5, 5 Power Supply* 

Figure 3

Figure 1 *- Blinking LED Circuit on Tinkercad,* ***Figure 2*** *- Schematic Diagram of Figure 1, Provided by Tinkercad.* ***Figure 3*** *- Components List, Provided by Tinkercad.*



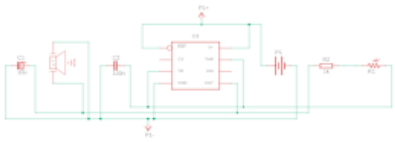


Figure 4 ***Figure 5***

Name	*Quantity*	*Component Name*
P1	*1*	*5, 5 Power Supply* 
PIEZO1	*1*	*Piezio*

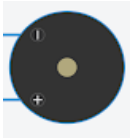
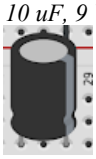
		
C1	*1*	*10 uF, 9 V Polarized Capacitor* 
C2	*1*	*100 nF Capacitor* 
R1	*1*	*Photoresistor* 
U1	*1*	*Timer* 
R2	*1*	*1 kΩ Resistor* 

Figure 6

Figure 4 *- Screaming Siren Circuit on Tinkercad,* ***Figure 5*** *- Schematic Diagram of Figure 3, Provided by Tinkercad,* ***Figure 6*** *- Components List, Provided by Tinkercad*

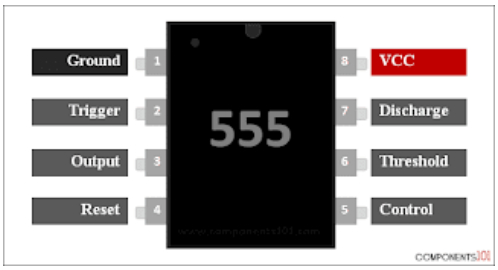


***Figure 7** - A layout of the 555 IC Timer Chip and the roles of each of the 8 pins of the chip. Provided by Components101*

Pin #	Pin Name	Description of Pin[1]
1	Ground	Ground Reference Voltage 0V
2	Trigger	Responsible for the transition of the flip-flop from set to reset. The output of the timer depends on the amplitude of the external trigger pulse applied to this pin
3	Output	This pin is normally connected to load as it is the only pin with output-driven waveform
4	Reset	Negative pulse applied to this pin to disable or reset the timer. When not used for reset 4 purposes, it should be connected to VCC to avoid false triggering
5	Control	Controls the threshold and trigger levels. It determines the pulse width of the output (5) Voltage waveform. An external voltage applied to this pin can also be used to modulate the output waveform
6	Threshold	Compares the voltage applied to the terminal with a reference voltage of 2/3 VCC. The 6 amplitude of the voltage applied to this terminal is responsible for the set state of the flip-flop
7	Discharge	Open collector output, which discharges a capacitor between intervals (in phase with output). 7 toggles the output from high to low when the voltage reaches 2/3 of the supply voltage
8	Vcc	Supply Voltage (Typical = 5V, Maximum = 18V)

[1] From *555 Timer IC Pinout, Diagrams, Features, Operating Modes, Description & Datasheet*, Components 101, 2017, Components101 (https://components101.com/ics/555-timer-ic-pinout-datasheet)

Figure 8 *- 555 Timer Pinout Configuration*

555 TIMER, BLINKING LED, SCREAMING SIREN:

The 555 Timer is an 8-pin chip used for circuits that require a time delay or oscillations. Some of its features are the range of voltage (+5V to +18V), and its pin layout. In each of those 8 pins, they correspond to a specific function. Below is the diagram of it.

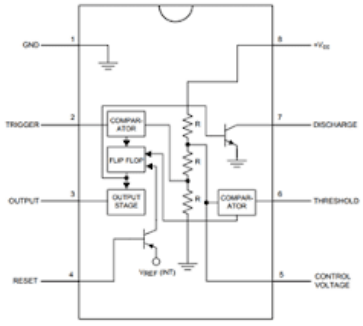


Figure 9 *- 555 Timer Diagram*

From Pins 1 through 8, they are: Ground, Trigger, Output, Reset, Control Voltage, Threshold, Discharge, and VCC (See **Figure 7** for reference). The ground pin connects the circuit to the "ground", a negative terminal path for electricity to flow through. Should a fault occur in the device, electricity will flow through the ground pin, preventing the effects of electrical shock from occurring. The trigger pin detects pulses and is able to detect the change in voltage. In the 555 IC Timer chip, it is used to activate the timer for usage. The output pin outputs the voltage to the component(s) that need power. In my project, it would have included the LED. The reset pin resets the timer of the chip, allowing for an LED to flash indefinitely. In my circuits, they are connected to the positive terminal path of the power supply. The control voltage pin is used to clear out any imperfections in the voltage of the power supply by being connected to ground

via a capacitor. The threshold pin is used to check the voltage from Pin 7. Once it reaches a certain point, it will activate Pin 3, setting it on low. The discharge pin is used to discharge a capacitor that is connected to a resistor. It is connected to ground via a capacitor, and to the voltage via a resistor. The VCC pin is connected to the power supply to give the circuit voltage. Below is how the chip is integrated into the circuits I made.

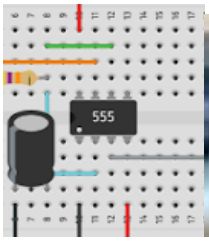


Figure 10 *- 555 Timer Connections for the Blinking LED circuit.* ***Figure 11*** *- Blinking LED circuit in real life.*

Blinking LED: This circuit involves an LED which turns on and off at equal times, giving the appearance of a flashing LED, hence the name, “Blinking LED”. Each of the connections of the chip does a different function. Pin 1 (Marked with a white dot in the electronic version) connects the circuit to “ground”, a 0 voltage area. Pin 2 connects to the positive leg of the capacitor, which is then connected to the terminal via the capacitor (see Figure 1). Pin 3 connects to a resistor, which is connected to the anode of the LED, the cathode (negative) is connected to ground. Pin 4 connects to the positive power supply. While pin 5 does not have a specified connection, pin 6 is connected to pin 2 and the capacitor via wires (they have a connected path, see the schematic diagram in Figure 2). Pin 7 connects to the terminal of a resistor that is also connected by pin 2, which is then connected to the positive power supply. Finally, pin 8 also connects to the positive power supply with a direct connection to it. By putting them all together, the LED turns on and off at a rapid rate, giving a flashing impression.

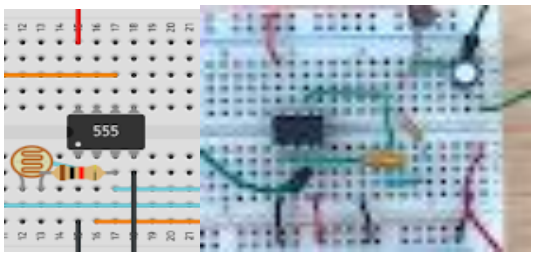


Figure 12 *- 555 Timer Connections for the Screaming Siren circuit.* ***Figure 13*** *- Screaming Siren circuit in real life.*

Screaming Siren: This circuit involves a speaker which produces varying types of sound, depending on the amount of light that the photoresistor is exposed to. The brighter the light that the photoresistor is exposed to, the louder the sound that will be produced by the speaker, hence the name, “Screaming Siren”. Each pin of the chip has a different function. Pin 1 (Marked with a white dot in the electronic version) connects the circuit to “ground”, a 0 voltage area. Pin 2 is connected to the terminal of the photoresistor, as well capacitor (regular capacitor) with a wire. Its other terminal is used by the positive speaker wire for the capacitor and by a resistor by a photoresistor. Pin 3 is connected to a resistor, which is then connected to the photoresistor that was also connected by pin 2. It is also connected to the negative speaker wire, as well as the positive leg of the polarized capacitor, with its negative leg being connected to ground. Pin 4 is connected to the positive power supply. While pin 5 does not have a defined connection in this circuit, pin 6 is connected to the same destination as pin 2; the capacitor. Although pin 7 does not have a specified connection, pin 8 is connected to the positive power supply. By doing this, the photoresistor will activate, and the speaker will also be activated, allowing the photoresistor to respond to light, with its signals being outputted in the form of sound by the speaker, giving the various types of sounds it can produce.

PICTURES AND VIDEOS:

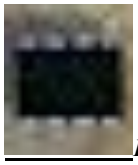


Figure 14 *- 555 IC Timer chip in real life.*

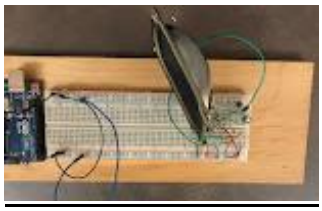


Figure 15 *- A Bird's-Eye-View of the Screaming Siren Circuit.* This picture represents the final result of the Screaming Siren Circuit

Figure 16 *- Blinking LED from a different angle.* This picture represents the final result of the Blinking LED Circuit

Screaming Siren - https://youtu.be/BN8TTKlZRMk

Tinkercad Circuit - https://www.tinkercad.com/things/eWRhg1k1Jmk-fantastic-hillar-curcan/editel?tenant=circuits

Blinking LED - https://youtube.com/shorts/61e0ZH50hLk?feature=share

Tinkercad Circuit - https://www.tinkercad.com/things/aq560pSoP7o-neat-albar-elzing/editel?tenant=circuits

Conclusion:

This experiment was a chance for me to expand my knowledge of breadboarding and circuit making in different forms. It also taught me the usage of one type of chip used in circuits, as well as the components required for the circuit to function properly. Within this experience, I gained knowledge of components, schematic symbols and drawings, and the 555 IC Timer chip. By doing this, I was able to make circuits with the 555 IC Timer chip after being given the schematic diagram. After doing this experience, I am more knowledgeable in the field of breadboarding than before this experience. Circuits, obvious or not, are part of life now; an interaction with a circuit is inevitable.

Works Cited

Components 101. (2017, August 30). *555 Timer IC Pinout, Diagrams, Features, Operating Modes, Description & Datasheet*. Components101. Retrieved November 23, 2023, from https://components101.com/ics/555-timer-ic-pinout-datasheet

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