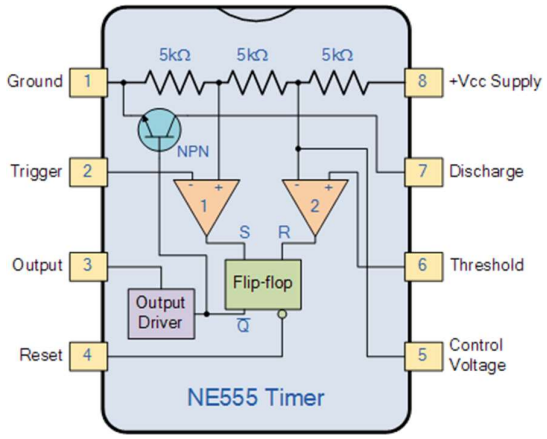
การทดลองที่ 8

555 timers



• Pin 1. – **Ground**, The ground pin connects the 555 timer to the negative (0v) supply rail.

• Pin 2. – **Trigger**, The negative input to comparator No 1. A negative pulse on this pin "sets" the internal Flip-flop when the voltage drops below 1/3Vcc causing the output to switch from a "LOW" to a "HIGH" state.

• Pin 3. – **Output**, The output pin can drive any TTL circuit and is capable of sourcing or sinking up to 200mA of current at an output voltage equal to approximately Vcc – 1.5V so small speakers, LEDs or motors can be connected directly to the output.

• Pin 4. – **Reset**, This pin is used to "reset" the internal Flip-flop controlling the state of the output, pin 3. This is an active-low input and is generally connected to a logic "1" level when not used to prevent any unwanted resetting of the output.

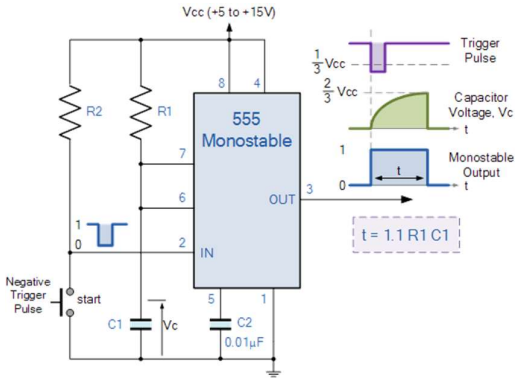
• Pin 5. – **Control Voltage**, This pin controls the timing of the 555 by overriding the 2/3Vcc level of the voltage divider network. By applying a voltage to this pin the width of the output signal can be varied independently of the RC timing network. When not used it is connected to ground via a 10nF capacitor to eliminate any noise.

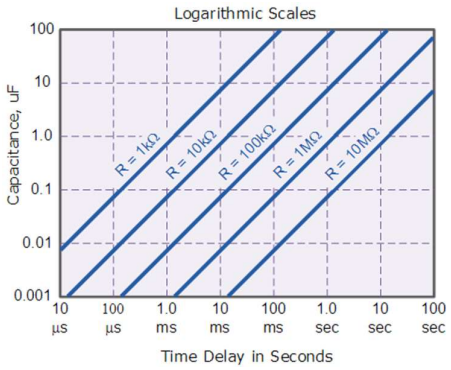
• Pin 6. – **Threshold**, The positive input to comparator No 2. This pin is used to reset the Flip-flop when the voltage applied to it exceeds 2/3Vcc causing the output to switch from "HIGH" to "LOW" state. This pin connects directly to the RC timing circuit.

• Pin 7. – **Discharge**, The discharge pin is connected directly to the Collector of an internal NPN transistor which is used to "discharge" the timing capacitor to ground when the output at pin 3 switches "LOW".

• Pin 8. – **Supply +Vcc**, This is the power supply pin and for general purpose TTL 555 timers is between 4.5V and 15V.

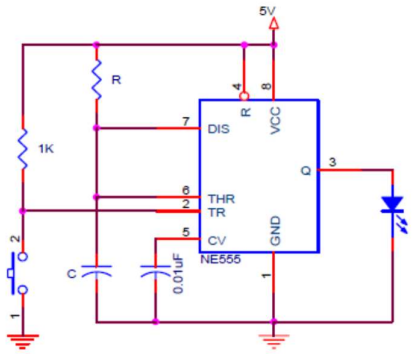
8.1 Monostable 555 Timer





8.1.1 Connect the signal from the circuit to the oscilloscope and determine the type of signal present, the period, amplitude, and the DC offset.

The button is used to create a negative pulse to trigger the circuit. Once this button is pressed the 555 will start to charge the capacitor and the light should turn on. Once the capacitor reaches a threshold level (2/3 of Vcc), the 555 discharges the capacitor (through is discharge pin) and the light turns off. Use the chart at the right to determine values for R and C to get a pulse that is 0.5 seconds in length



Draw the waveform shown on the oscilloscope. What is the name of this waveform? What is the amplitude, frequency, and DC offset? Show all your calculations.

8.1.2 What values of R and C did you use?

R=…… C=…….

8.1.3 Use the scope to measure to voltage on capacitor (Vc). What voltage does the capacitor get to when the light turns off? Increase the Vcc voltage to 9 volts.

Voltage on Cap when light turns off=…….

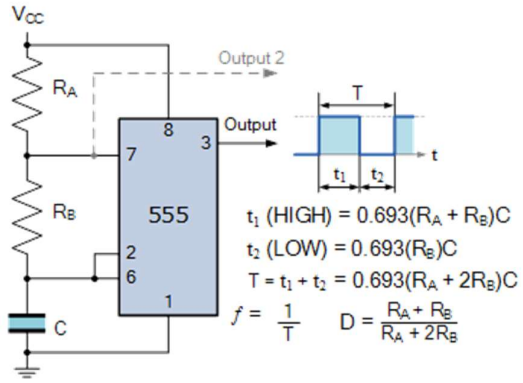
8.1.4 What happens to the length of the output pulse? Why?

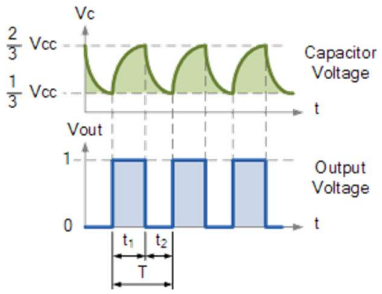
……
……
……
……

Vc

Output

8.2 Astable 555 Oscillator Circuit





8.2.1 Use these formulas and chart to design a circuit that will provide a waveform with a frequency of 1KHz with a duty cycle of 25%. You may have to arbitrarily choose some of the values based on availability.

R_A= …… R_B=…… C=……..

8.2.2 Is it possible to create a symmetric square wave with this circuit (50% duty cycle)?

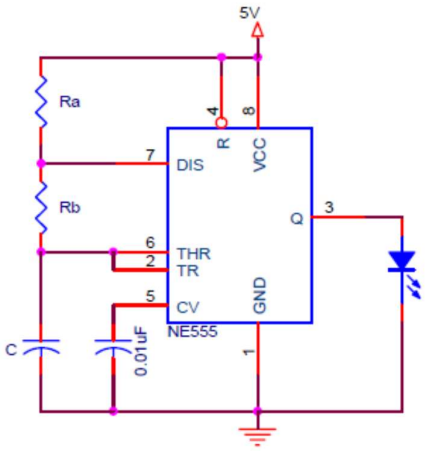
How can you make a symmetric (50%) duty cycle?

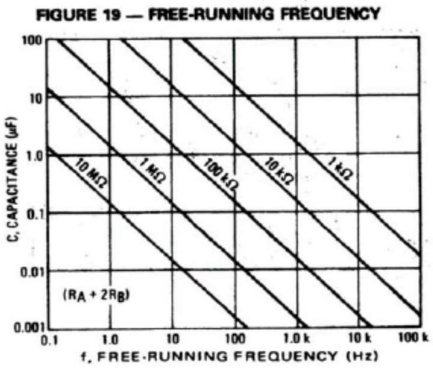
8.2.3 What happens to the frequency of the waveform if Vcc is increased?

If Vcc affect frequency? If so, how? If not, why not?

8.2.4 Find values for R_A, R_B, and C to create a waveform with a period of 1 second.

R_A= …… R_B=…… C=……..





Vc

Output

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