
EXPERIMENT 7: Implementation of Astable Multivibrator in 555 Timer IC and Other Applications

Objectives: *To Implement Astable Multivibrator in 555 Timer IC.
Modify the Circuit for Less than 50% Duty Cycle.
To use 555 Timer IC in the Application like Voltage Controlled Oscillator (VCO)*

Materials and Equipment:

Resistors: 2.2K Ω [1], 10K Ω [Pot] [1]
Capacitors: 0.01 μ F [1], 0.1 μ F [1]
Diode: 1
IC 555: [1]
Oscilloscope Probes: 2
Breadboard and Dual Power Supply

Theory:

A high quality Multivibrators can be generated using 555 timer IC adding external resistors and capacitors. In this lab we will see the astable operation of 555 timer IC for both greater than 50% and less than 50% duty cycle.

In this lab we will use control pin (Pin 5) of 555 timer IC for V/F conversion application.

Less than 50% duty cycle is not possible in normal astable operation because capacitor charges through the combination of R_A and R_B and discharges through R_B . So, charging time constant is always more than discharging time constant.

To achieve less than 50% duty cycle a diode can be kept across discharging resistor.

The control pin (Pin 5) can be used for VCO application.

Always note that the voltage across the capacitor will be from ($V_{cc}/3$) to ($2V_{cc}/3$).

ON time is given by $0.693(R_A + R_B)C$ and OFF time is given by $0.693R_B C$. Frequency of oscillation is determined by R_A , R_B and C . Duty cycle from (50% to 100%) can be varied by changing R_A or R_B .

Free Running Multivibrator (>50% duty cycle)

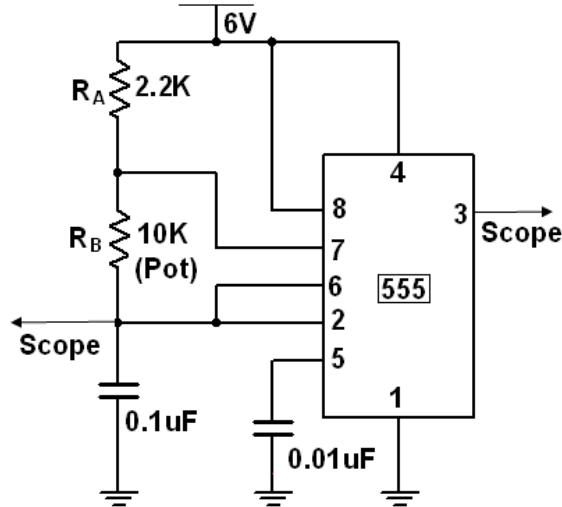


Fig 1

Procedure

1. Set the supply voltage at 6V.
2. See the voltage across the capacitor. Don't worry; capacitor voltage will fluctuate around $V_{cc}/3$ and $2V_{cc}/3$.
3. See the waveform across Pin 3.
4. Repeat procedure 2 and 3 in dual mode.
5. Vary the Pot so that duty cycle and frequency of oscillation will vary.
6. Note that the charging time is always more than the discharging time.
7. $V_{cc}/3$ and $2V_{cc}/3$ points will not vary with the setting of pot. [☺ Why?]

Free Running Multivibrator (<50% duty cycle)

Procedure

1. Use a diode across R_B . P at pin 7 and N at pin 6.
2. Vary the pot and see the change in voltage across capacitor as well as voltage across Pin 3.
3. You can achieve duty cycle of less than 50%. That means ON time will be less than OFF time. For that R_A must be less than R_B .

Voltage Control Oscillator Using 555 Timer IC (V/F Converter)

Procedure

1. Remove the diode.
2. Remove 0.01uF capacitor from Pin 5.
3. Apply control voltage at Pin 5. (0-5V DC voltage from power supply)
4. Change the voltage at Pin 5 and your frequency of oscillation will change.
5. See the voltage across the capacitor. Note that $V_{cc}/3$ and $2V_{cc}/3$ points will also change.