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Experiment No.9:RC Phase Shift Oscillator

Electronic Devices & Applications Lab EE324

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Grade:_____

Experiment No.9: RC Phase Shift Oscillator

Objective:

To produce frequency without using input voltage and to Study the Oscillator.

Components:

1- OPAMP μA741
2- Bread Board.
3- DC Dual power supply.
4- Oscilloscope.
5- Capacitors & Resistors.

Theory:

The basic RC Oscillator which is also known as a Phase-shift Oscillator, produces a sine wave output signal using regenerative feedback obtained from the resistor-capacitor combination. This regenerative feedback from the RC network is due to the ability of the capacitor to store an electric charge.

This resistor-capacitor feedback network can be connected to produce a leading phase shift (phase advance network) or interchanged to produce a lagging phase shift (phase retard network) the outcome is still the same as the sine wave oscillations only occur at the frequency at which the overall phase-shift is 360^o.

By varying one or more of the resistors or capacitors in the phase-shift network, the frequency can be varied and generally this is done by keeping the resistors the same and using a 3-ganged variable capacitor.

In a Resistance-Capacitance Oscillator or simply an RC Oscillator, we make use of the fact that a phase shift occurs between the input to a RC network and the output from the same network by using RC elements in the feedback branch, for example.

RC Phase-Shift Network: The circuit on the left shows a single resistor-capacitor network whose output voltage "leads" the input voltage by some angle less than 90^o. An ideal single-pole RC circuit would produce a phase shift of exactly 90^o, and because 180^o of phase shift is required for oscillation, at least two

single-poles must be used in an *RC oscillator* design.

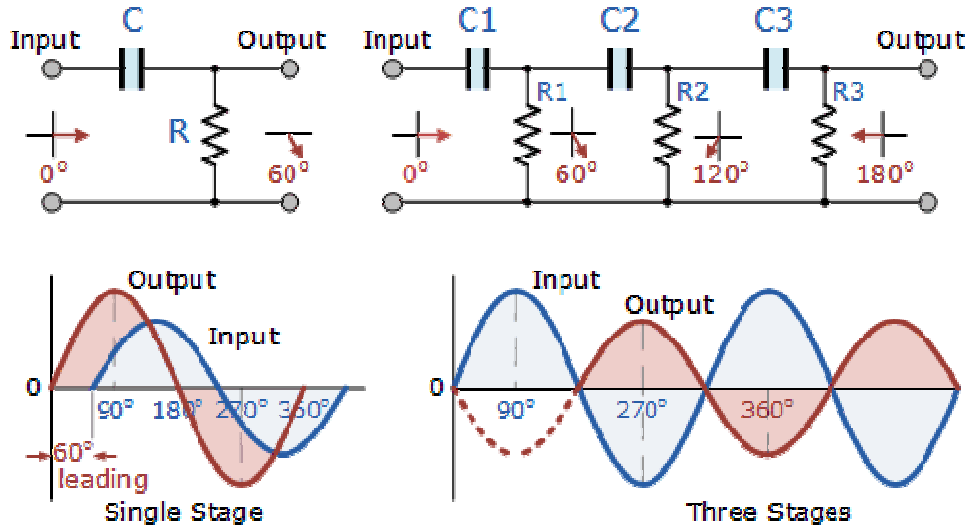

Fig.1: Phase Shift Network

Circuit Diagram:

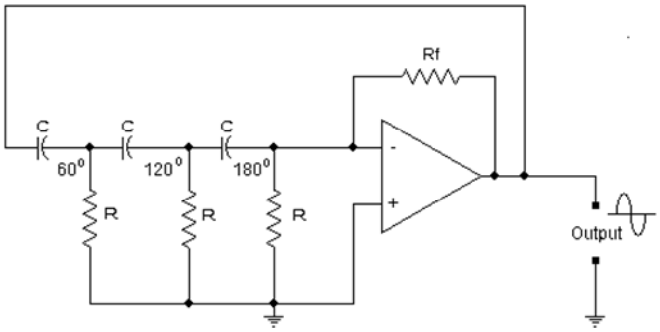

Figure 2: RC phase shift Oscillator using Op-amp

Procedure:

1. Construct the RC phase circuit on the breadboard as shown in the circuit diagram.
2. Use: V_{++} = 14 V, V_{--} = -14 V, R_i = 10kΩ, and R_f = 470kΩ.
3. Capacitor value is 0.0022 uF.
4. Find f_c practically and theoretically.

Theoretical Frequency Calculation:

$$f_c = \frac{1}{2\pi RC\sqrt{6}} = \frac{1}{2\pi\,(10\,K)(0.0022\,uF)\sqrt{6}} = 2.95\,kHz$$

Observations:

Graph:

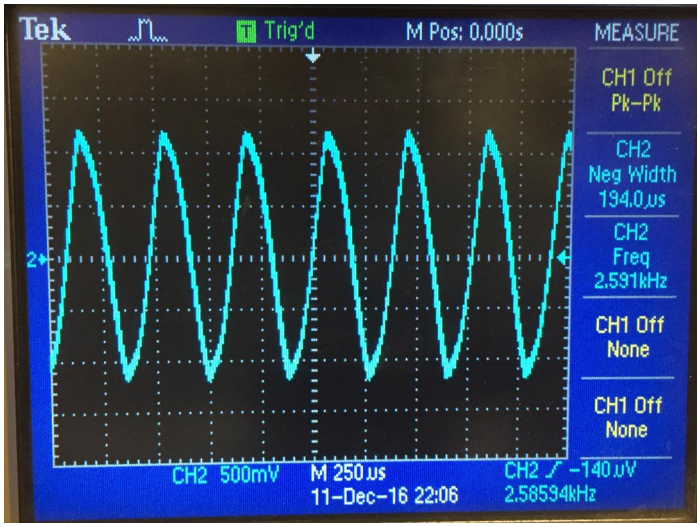

Fig.3: Output Wave with a Frequency =2.589KHz

Table1.1: Theoretical and Practical Frequencies of RCphase shift Oscillator

Observations	
Theoretical Frequency of the Oscillator	**=2.95KHz**
Practical Frequency of the Oscillator	**=2.589KHz**

Practical Frequency generated by RC Phase Shift Oscillator is f_c=2.589KHz

Conclusion:

The practical circuit of RC phase shift oscillator is successfully conducted, it has generated a sine wave of frequency f_c=2.589KHz, with an amplitude of 500mVX4.75=2.375 Volts

The error percentage is 11 %.