PART 7

Wave generation with 555 / 2206

1. Analyzing Symmetric Square Wave Generator Constructed by 555 IC (4.5)
2. Analyzing Pulse Width Modulation Mode (Asymmetric) Square Wave Generator Constructed by Op-Amp (4.6)
3. Analyzing Asymmetric Square Wave Generator Constructed by 555 IC (4.7)
4. Analyzing Triangular, Sinusoidal And Square Wave Generator Constructed by Xr 2206 IC (4.8)

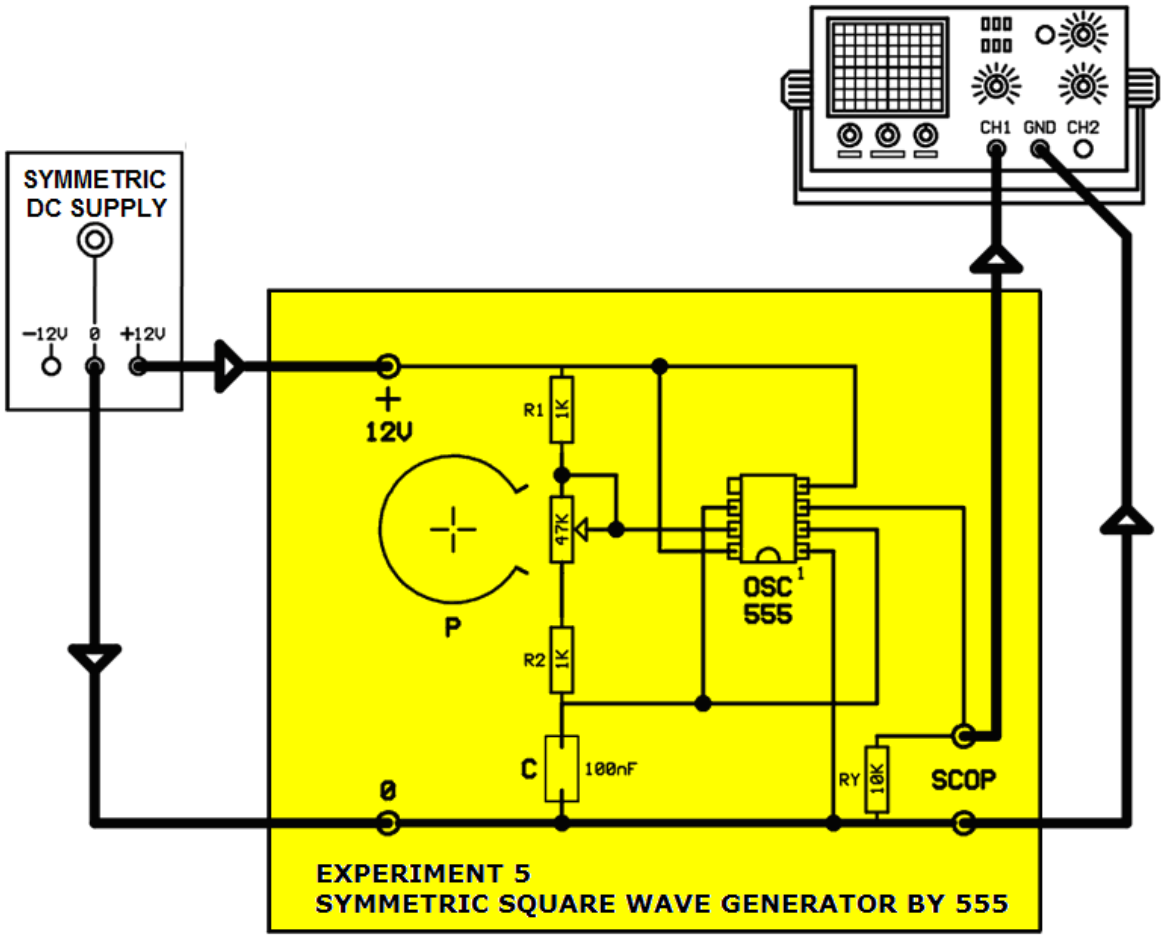
MODULE Y-0014/04

EXPERIMENT: 4.5

ANALYZING SYMMETRIC SQUARE WAVE GENERATOR CONSTRUCTED BY 555 IC

EXPERIMENTAL PROCEDURE:

Connect the circuit as shown in the figure.



1- Apply power to the circuit. Set the potentiometer to its maximum resistance position (middle pin is up). Measure the amplitude, the frequency and duty cycle of the signal on the oscilloscope screen.

V=	f=	Duty Cycle:

2- Vary the position of the potentiometer slowly. At which frequency the output waveform is deformed. Measure the duty cycle of the signal on the oscilloscope screen.

f =	Duty Cycle:

3- Set the potentiometer to its minimum resistance position (middle pin is down). Measure the frequency for that case. Draw the shape of the wave and Measure the duty cycle of the signal on the oscilloscope screen.

f =

4- Calculate the minimum and maximum frequencies mathematically. Compare with the experimental results.

The minimum frequency is obtained for the maximum values of the resistances since the resistance values are at the denominator. In that case;

R1= 1K

RT= 47K+1K= 48K

C= 100nF

Fmin= $\frac{1{,}44}{(R1+2RT).C}$

Fmin=

The maximum frequency is obtained for the minimum values of the resistances.

R1= 1K

RT= 1K

C= 100nF

Fmax= $\frac{1{,}44}{(R1+2RT).C}$

Fmax=

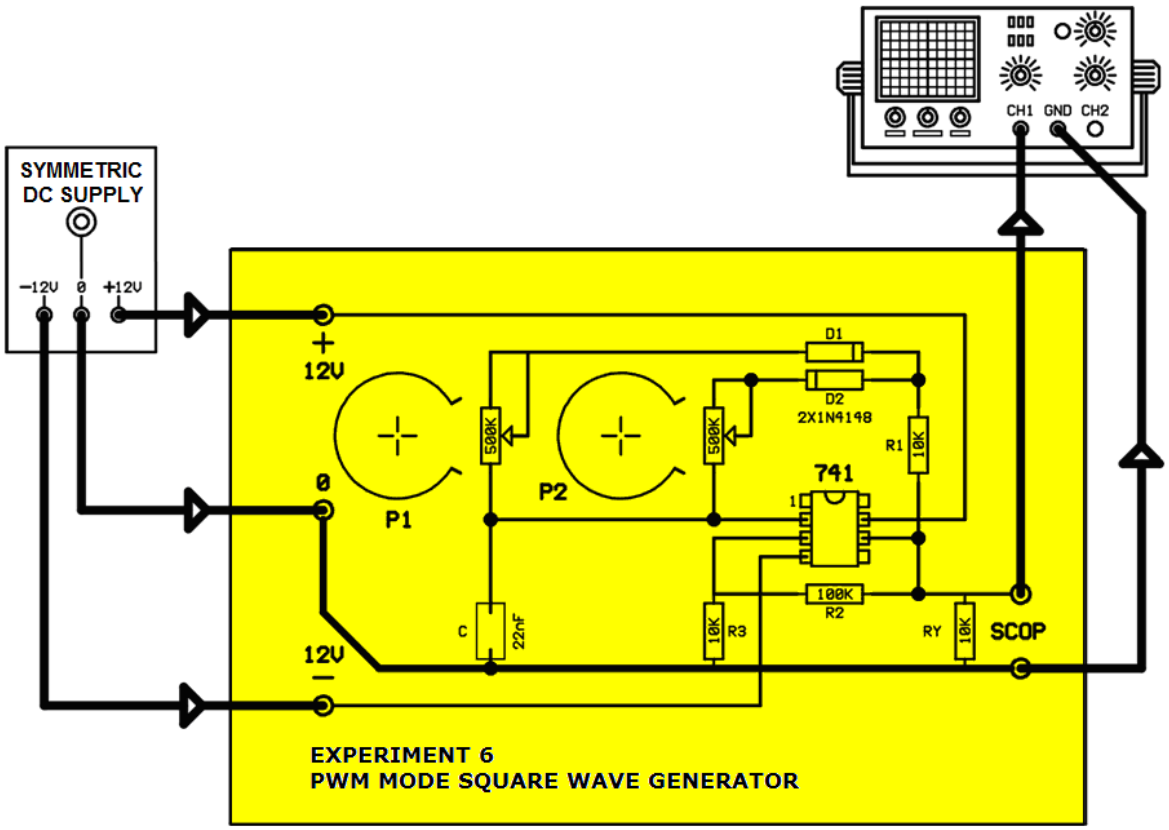
Comment:

EXPERIMENT: 4.6

ANALYZING PULSE WIDTH MODULATION MODE (ASYMMETRIC) SQUARE WAVE GENERATOR CONSTRUCTED BY OPERATIONAL AMPLIFIER

EXPERIMENTAL PROCEDURE:

Connect the circuit as shown in the figure.



1- Apply power to the circuit. Measure the amplitude of the output signal. Why is that value obtained? Draw the shape and measure the duty cycle of the signal.

2- Set the potentiometers P1 and P2 to their middle positions. Define the output waveform. Draw the shape and measure the duty cycle of the signal.

3- Set the potentiometer P1 to zero **(middle pin is down)**. What happened to the output signal? Why? Draw the shape and measure the duty cycle of the signal

4- Set the potentiometer P1 to middle position. At that time set the potentiometer P2 to zero (middle pin is down). What happened to the output signal? Why? Draw the shape and measure the duty cycle of the signal.

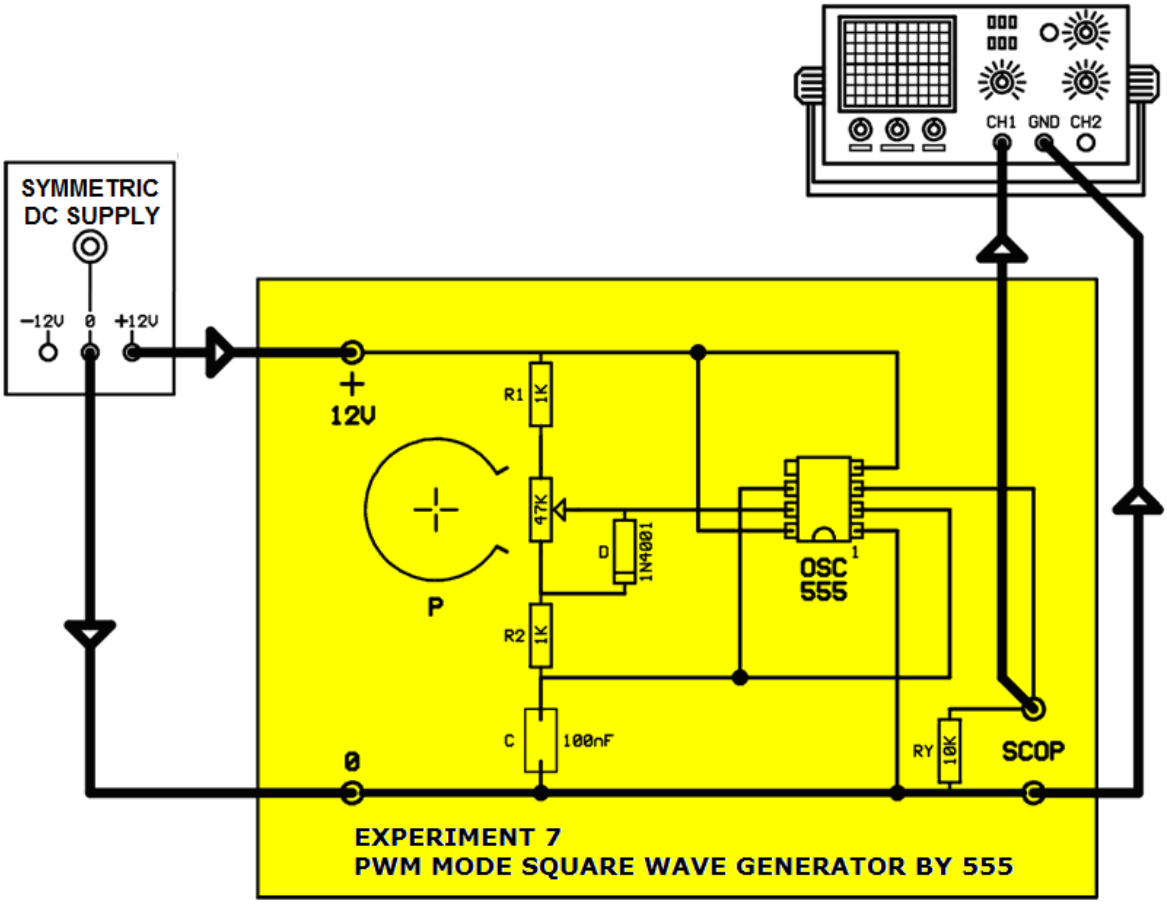
5- Set the potentiometers to maximum (middle pin is up) position one by one. Define the output waveform. Draw the shape and measure the duty cycle of the signal

EXPERIMENT: 4.7

ANALYZING ASYMMETRIC SQUARE WAVE GENERATOR CONSTRUCTED BY 555 IC

EXPERIMENTAL PROCEDURE:

Make the circuit connections as in the figure.



1- Set the potentiometer to the mid-value. Apply power to the circuit. Define the output signal. Measure the amplitude of the output signal? Draw the shape and measure the duty cycle of the signal

2- If we connect a lamp to the output pins and set the mid-point of the potentiometer to above point, how does the lamp emit light?

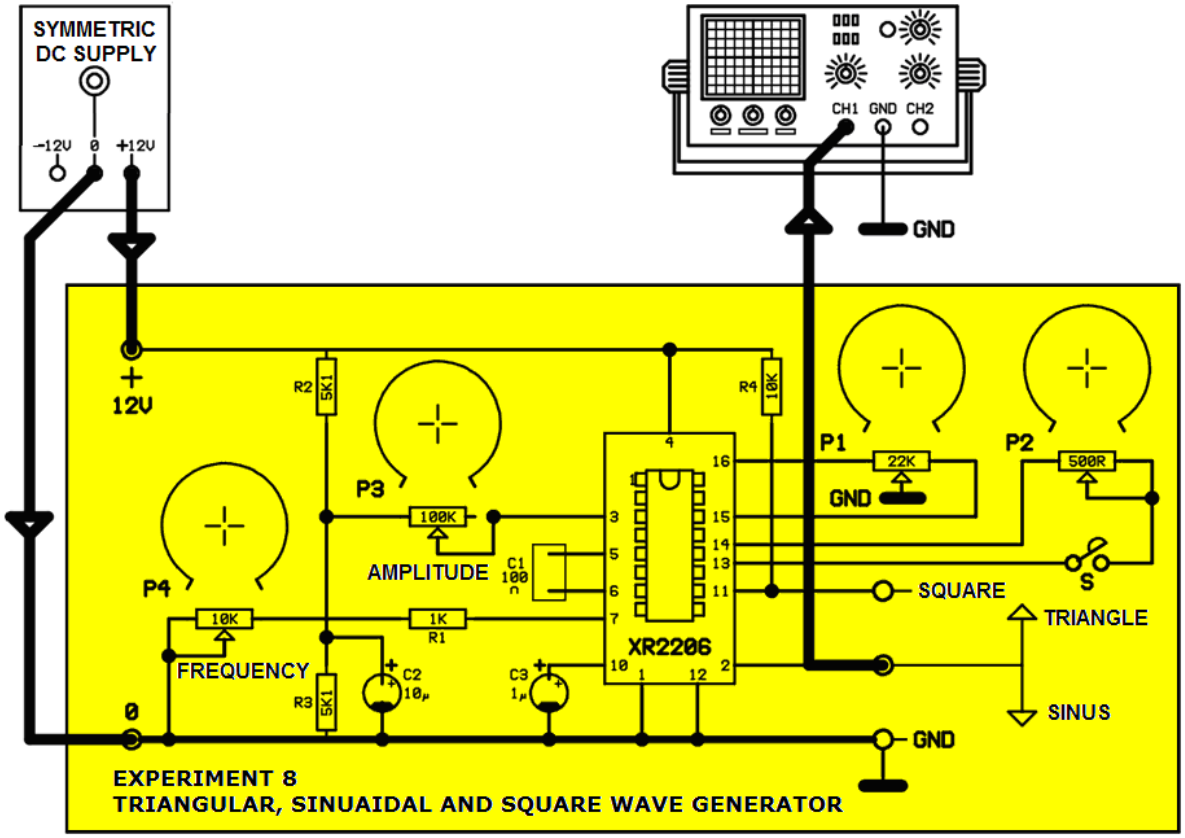
3- If we connect a lamp to the output pins and set the mid-point of the potentiometer to below point, how does the lamp emit light?

EXPERIMENT: 4.8

ANALYZING TRIANGULAR, SINE AND SQUARE WAVE GENERATOR CONSTRUCTED BY XR2206 IC

EXPERIMENTAL PROCEDURE:

Make the circuit connections as in the figure.

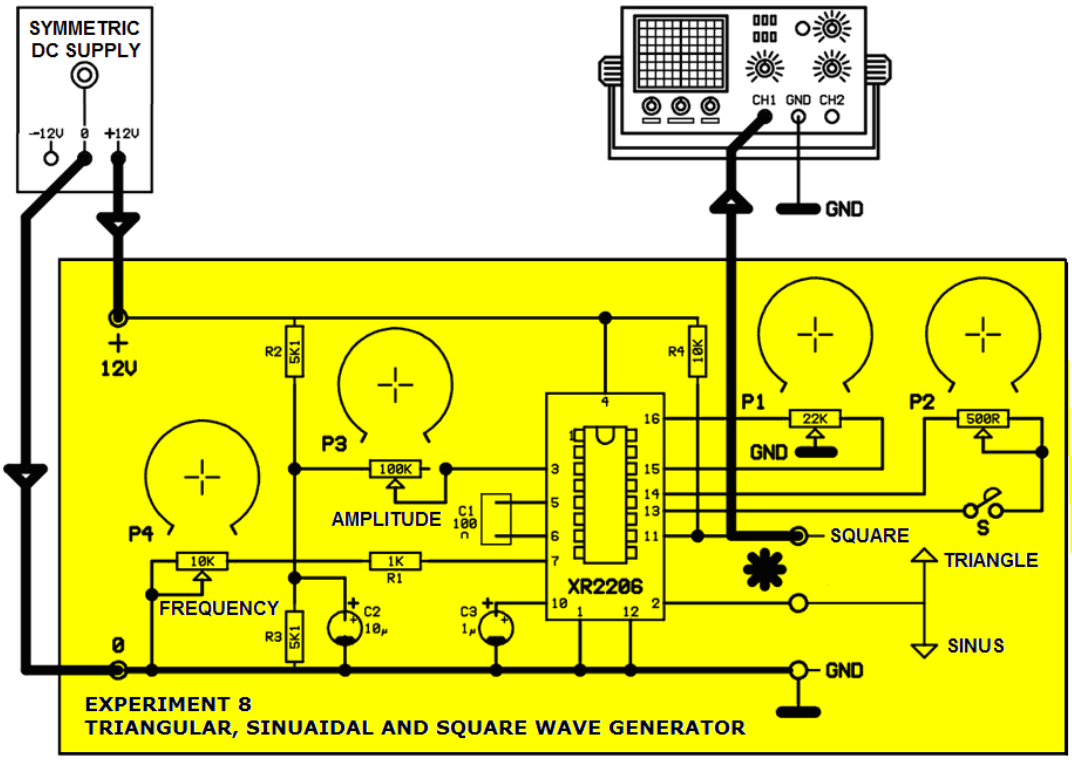


1- Set the oscilloscope to AC. Set the sine/triangular select pin to sine state (**switch pin is down**). At this moment, the switch is closed. Apply the power to the circuit. Define the waveform in the oscilloscope? Draw the signal.

2- Adjust the P1, P2 and P3 potentiometers at any frequency value. Obtain a distortion free sine wave in the oscilloscope. Measure the peak to peak voltage value (**Vpp**) of the sine wave? Draw the signal.

3- This time, set the sine/triangular select pin to triangular state (**switch pin is up**). This time the switch becomes open. Adjust the P1 and P3 potentiometer. Obtain a distortion free triangular wave in the oscilloscope. Determine the peak to peak voltage value (**Vpp**) of the triangular wave? Draw the signal.

4- Set the oscilloscope to DC. Connect the positive terminal of the oscilloscope to the square wave output socket as seen in the figure below. Define the shape in the figure. Determine the amplitude, frequency of the square wave?



5- Set the P4 potentiometer to minimum and maximum. Measure the frequency band of the circuit?

NOTICE: Trimpots are used in the symmetry and sine amplitude potentiometer application. These trimpots are adjusted once and left. There will be no access to the trimpots from the out of the device.