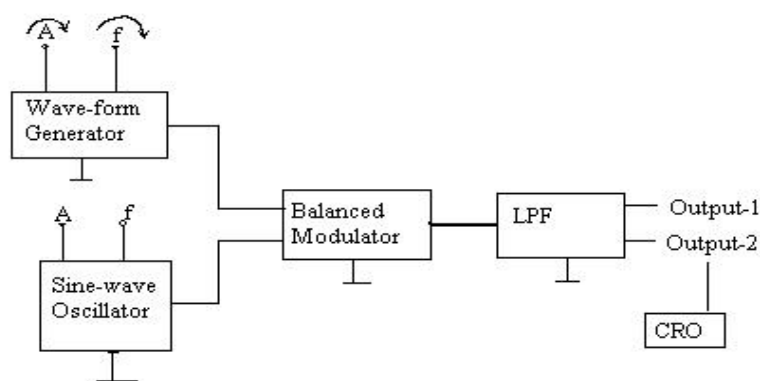


## Experiment # 01 (WF Analysis)

**Object:-** (a) Generate a symmetrical Square wave of lowest frequency using wave-form generator section of the kit supplied. Measure its Amplitude & Frequency.  
 (b) Determine the amplitudes & frequencies of the first eight harmonics of the wave-form generated in part (a) above, using the same kit.

**Apparatus / Kit used:-** 1. Sigma Harmonic Analyzer Trainer Kit Model COM-118.  
 2. 20 MHz Dual Trace CRO  
 3. An AF Sine-wave Signal Generator (optional)

**Experimental setup:-**



**Procedure :-**

Set: Power switch to "ON" position,  
 Mode select switch to "NORMAL" position,

### 1. Square-wave generation section:-

Set Sliders # 1 to 8 Upwards and Sliders # 9 to 16 Downwards  
 Measure the ranges available for the amplitude and frequency of the symmetrical square wave generated as above. Adjust its amplitude to  $4.0 V_{p-p}$  and frequency around 150 Hz.

### 2. Measurement of harmonics of the symmetrical square wave generated as above:-

1. Adjust the amplitude of Sine-wave generator to slightly more than that of sq-wave & its frequency to much lower than that of sq-wave.
2. Connect the above-adjusted sine-wave to one input of the Balanced modulator and the generated sq-wave to another input.
3. Connect the output of BM to the input of the LPF and observe its second output on the CRO.
4. Now increase the frequency of the sine-wave gradually until a vertical oscillation is observed on the CRO screen. Adjust this frequency very finely to get maximum vertical

shift of oscillation, and measure the magnitude of this maximum vertical shift of oscillation in mV which is nothing but the relative amplitude of the harmonic.

5. Now, measure the frequency of sine-wave at this setting which will give the order of that harmonic (n).  $n = \{\text{sine-wave frequency} / \text{square-wave frequency}\}$
6. Increase further the sine-wave frequency and check for vertical oscillation at frequencies equal to the twice, thrice, 4-times, of sq-wave frequency, and so on
7. Whenever vertical oscillation is observed, measure its amplitude, and the freq of sine-wave. Tabulate your observations as shown in the following observation-table:-

### Observations:-

Wave-form generated:- Symmetrical Square wave

Amplitude of the symmetrical Square wave = ----- Volts<sub>p-p</sub> (adjusted)

Frequency of the symmetrical Square wave = ----- Hz (adjusted)

S.No.	frequency of Sine-wave (Hz)	Relative Amplitude of the Harmonic (mV)	Remarks
1.			1 <sup>st</sup> harmonic present
2.			2 <sup>nd</sup> harmonic absent
3.			3 <sup>rd</sup> harmonic present
4.			4 <sup>th</sup> harmonic absent
5.			5 <sup>th</sup> harmonic present
6.			6 <sup>th</sup> harmonic absent
7.			7 <sup>th</sup> harmonic present
8.			8 <sup>th</sup> harmonic absent

Plot the Spectrum of the above signal.

