MODULE 3

SIGNAL GENERATORS

INTRODUCTION

- A Signal generator is a vital component in a test setup & in electronic troubleshooting

- It has a variety of applications
  - Checking the state gain
  - Frequency response
  - Alignment in the receiver

- It provides a variety of waveforms for testing the electronic circuits➔ at low powers

INTRODUCTION

- In a signal generator
  - The oscillator➔ provides an sinusoidal output signal.
  - The generator➔ provides sine wave, square wave, triangular wave, amplitude modulated waveform

- Requirements
  - The frequency of the signal should be known
  - The amplitude should be controllable➔ small values to relatively large values
  - The signal should be distortion free

Signals in different frequency bands

Band	Approximate range
AF	20 HZ – 20KHZ
RF	> 30KHZ
VLF	15 ---------- 100KHZ
LF	100 ---------- 500KHZ
BROADCAST	0.5 ---------- 1.5MHZ
HF	1.5 ----------30MHZ
VHF	30 ---------- 300MHZ
UHF	300 ---------- 3000MHZ
MICROWAVE	> 3000 MHZ (3GHZ)

Fixed & variable frequency AF OSCILLATOR

Fixed frequency AF oscillator

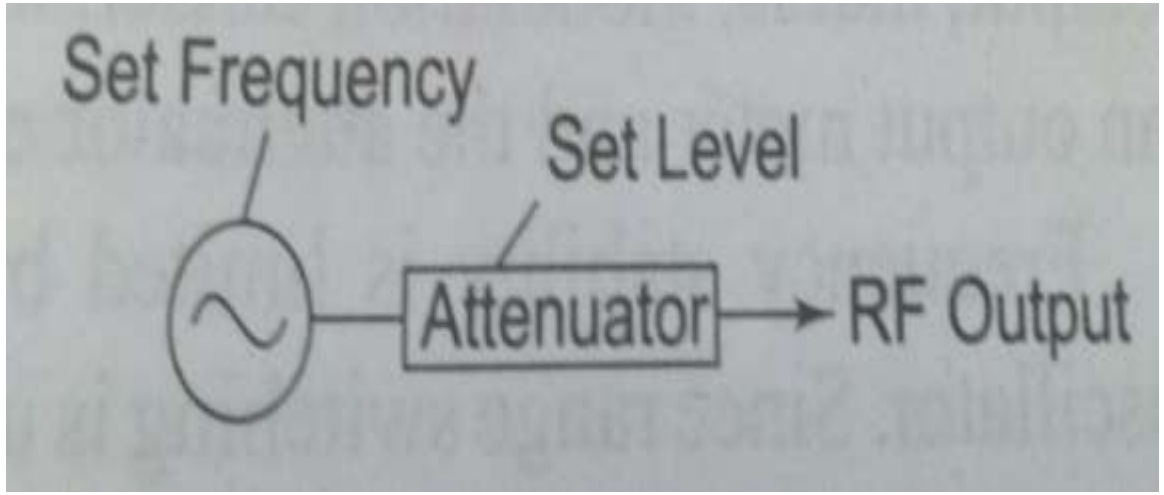
- A self contained oscillator circuit is an integral part➔ generate a signal at specified audio frequency range (20 HZ - 20KHZ)
- The fixed frequency might be
  - 400 HZ signal ➔ audio testing
  - 1000 HZ signal ➔ exciting a bridge circuit
- Oscillations can be easily generated by the use of
  - Iron core transformer➔ inductive coupling b/w the primary & secondary windings➔ to obtain positive feedback.

Variable frequency AF oscillator:

- Generates a audio frequency signal in the range of 20 HZ TO 20 KHZ➔ fairly constant pure sinusoidal wave output

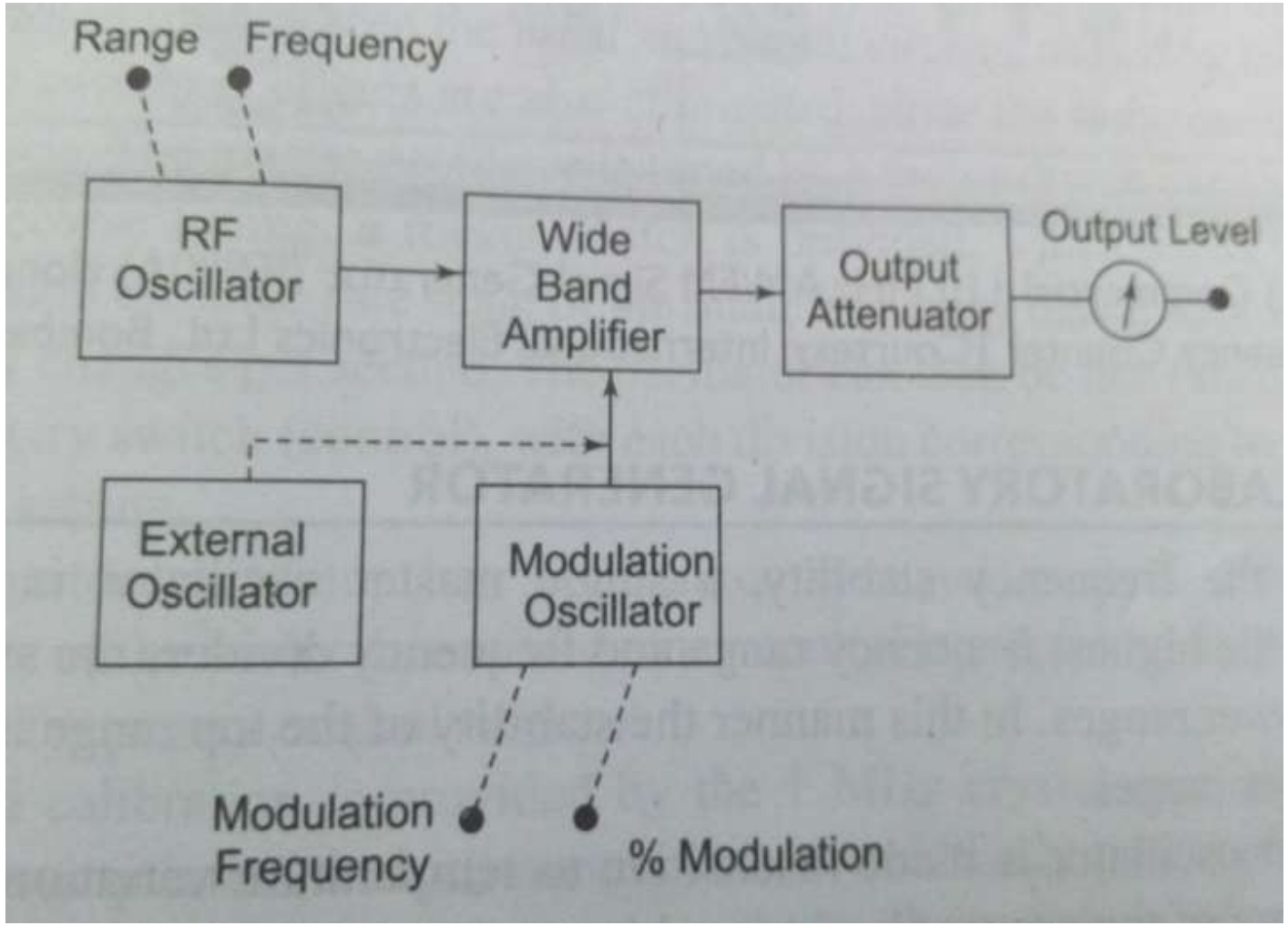
BASIC STANDARD SIGNAL GENERATOR (sine wave)

- The sine wave generator consists of 2 blocks
  - Oscillator
  - Attenuator
- Accuracy, stability, freedom from distortion➔ design of the oscillator
- Amplitude➔ depends on the design of the attenuator



Basic sine wave generator

Standard signal generator



MODERN LABORATORY TYPE SIGNAL GENERATORS

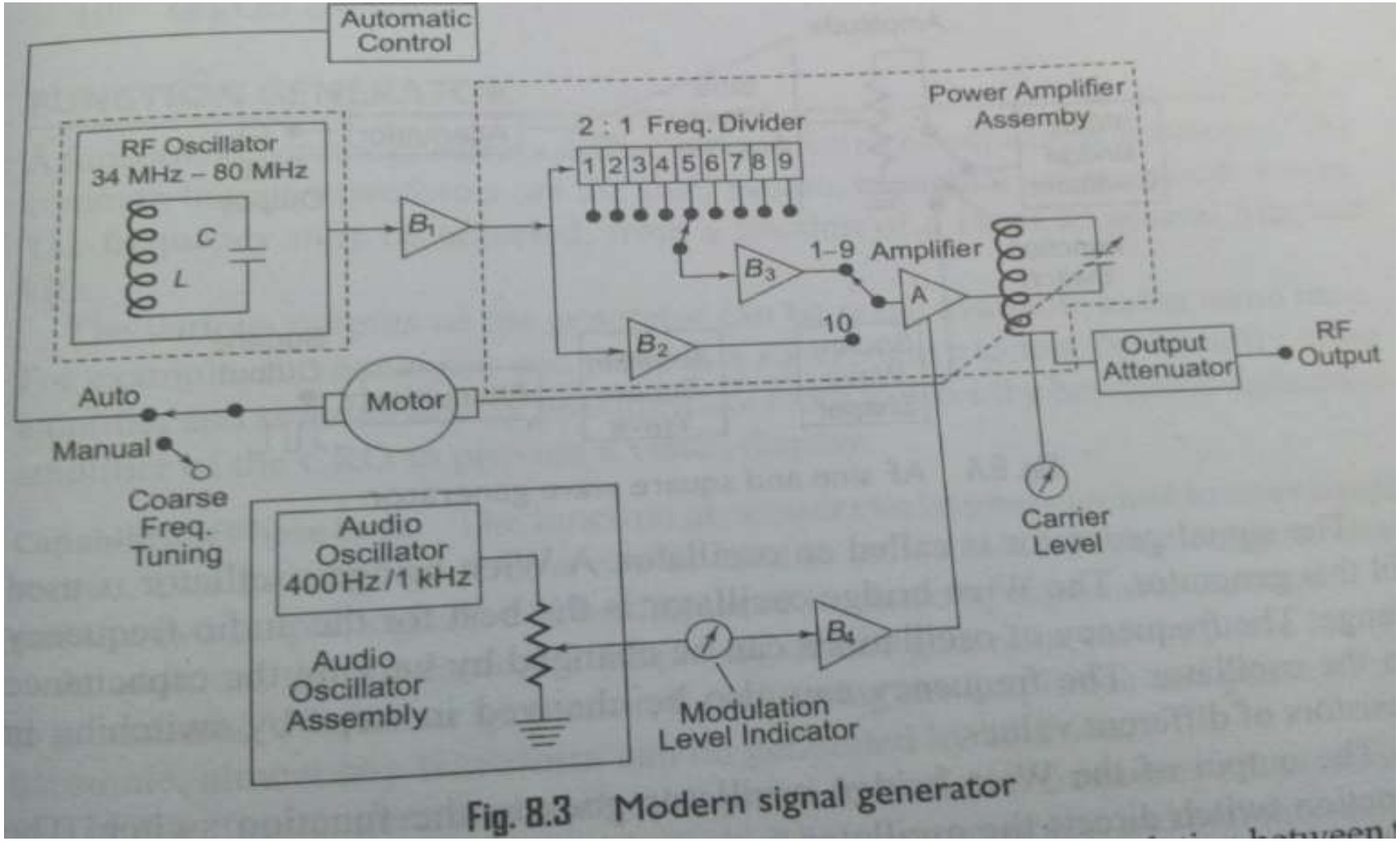
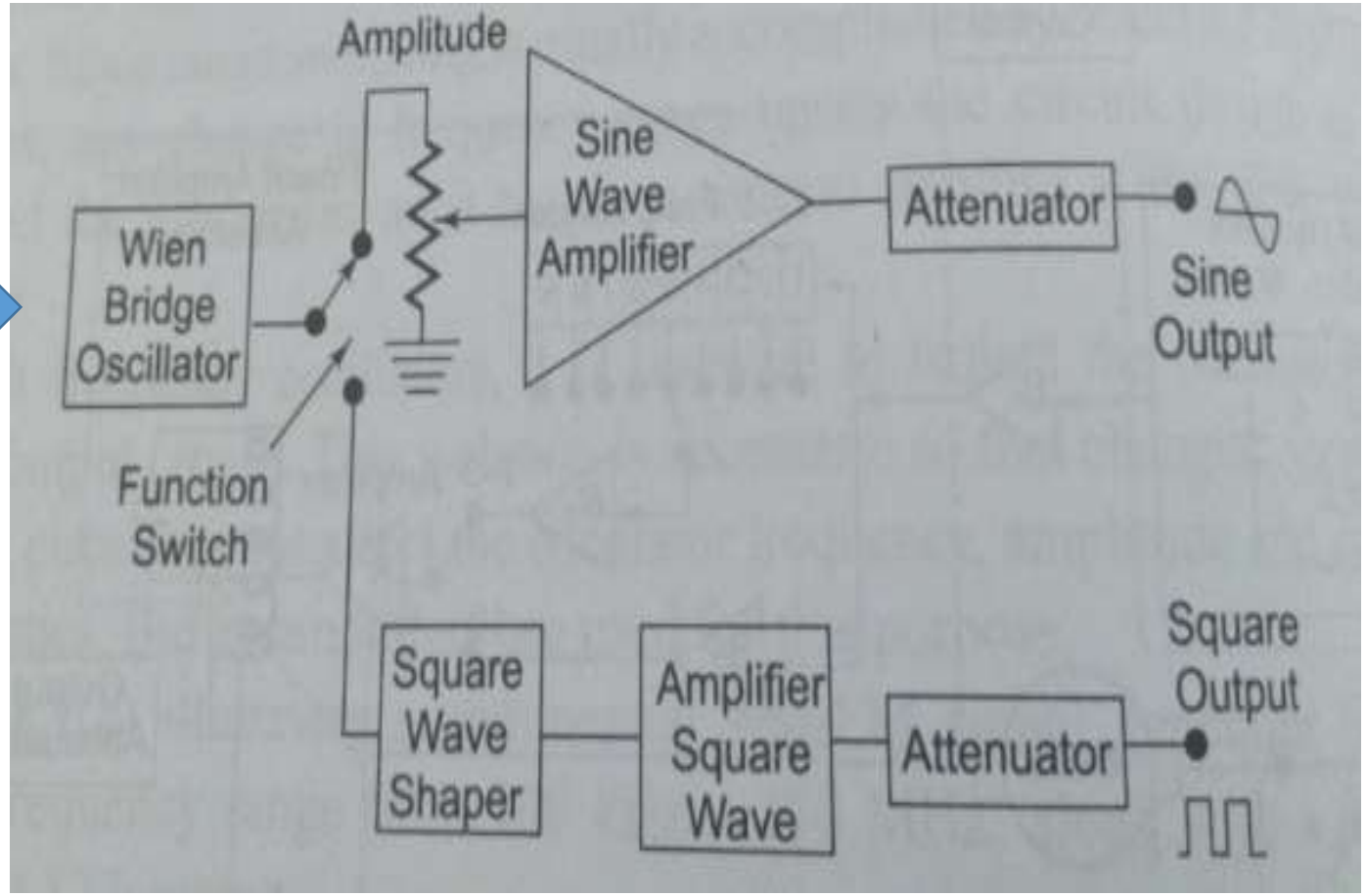


Fig. 8.3 Modern signal generator

AF SINE AND SQUARE WAVE GENERATOR

Best for audio frequency range

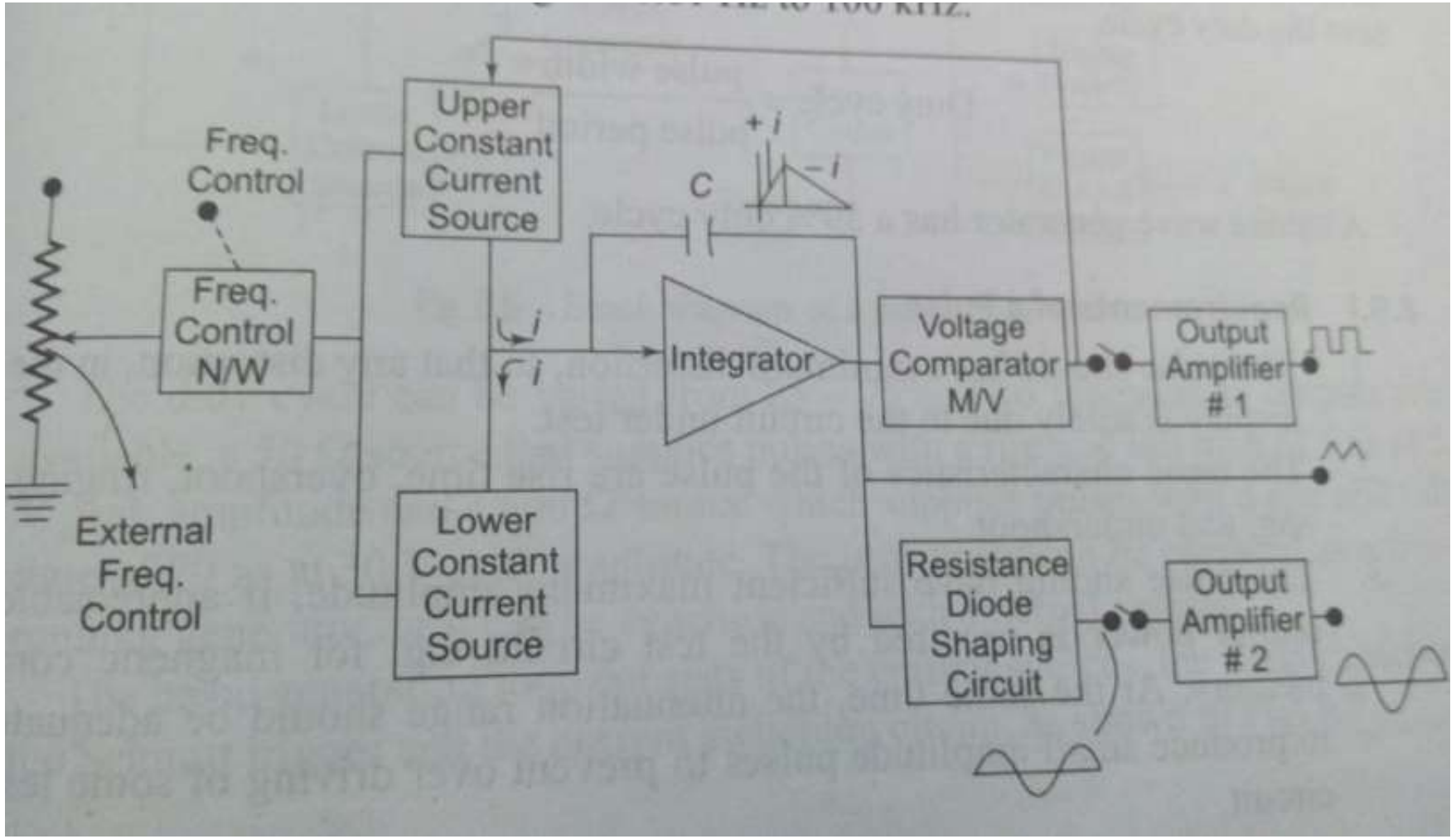


FRONT PANEL CONTROLS

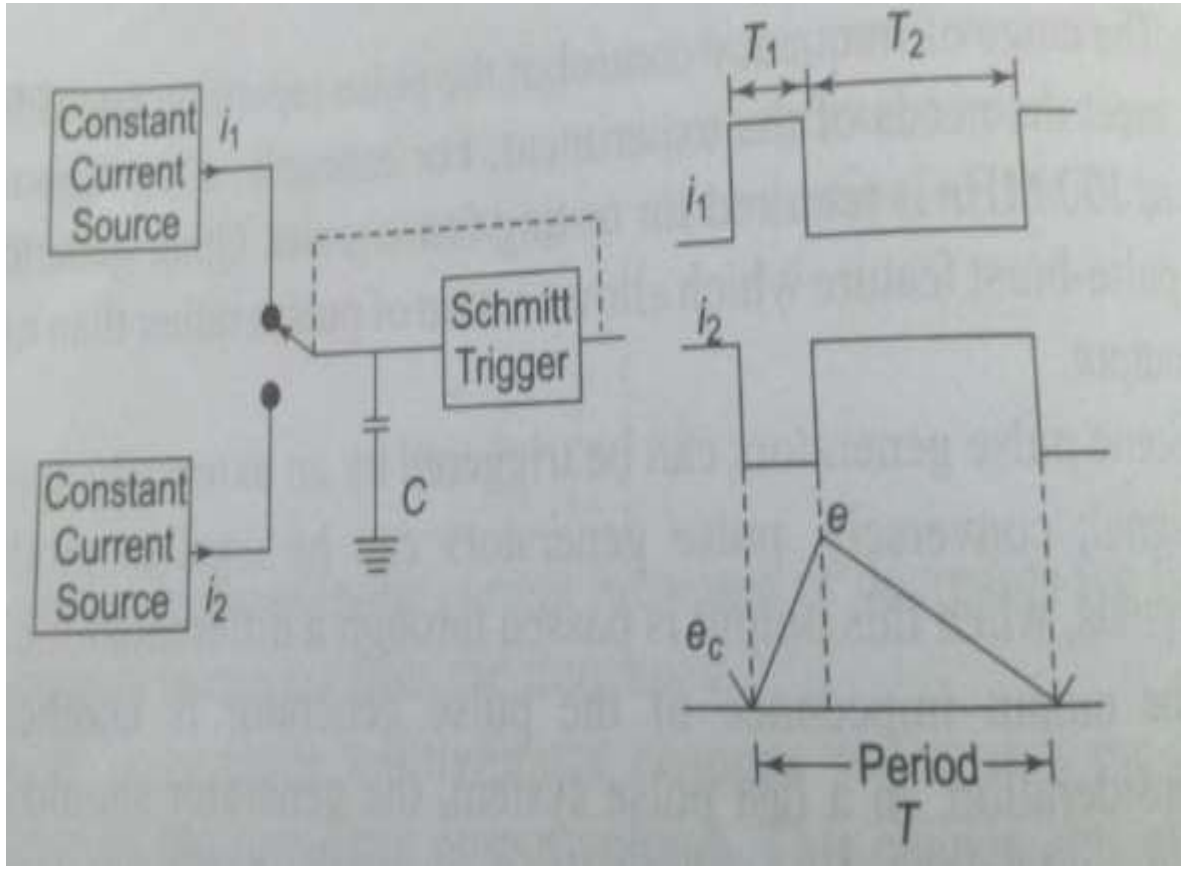
- **Frequency selector**
  - It selects the frequency in different ranges.
  - Varies the frequency in the range of 1:11.
  - Scale is nonlinear
- **Frequency multiplier**
  - Selects the frequency range over 5 decades from 10 HZ to 1 MHz
- **Amplitude multiplier**
  - Attenuates the sine wave in 3 decades by x1, x0.1, x0.01
- **Variable amplitude**
  - Attenuates the sine wave amplitude continuously
- **Symmetry control**
  - Varies the symmetry of the square wave from 30% to 70%
- **Amplitude**
  - Attenuates the amplitude output continuously

- **Function switch**
  - Selects either sine wave or square wave
- **Output available**
  - Provides sine wave or square wave
- **Sync**
  - It is used to provide synchronization of the internal signal with an external signal
- **On-off switch**

Function generator

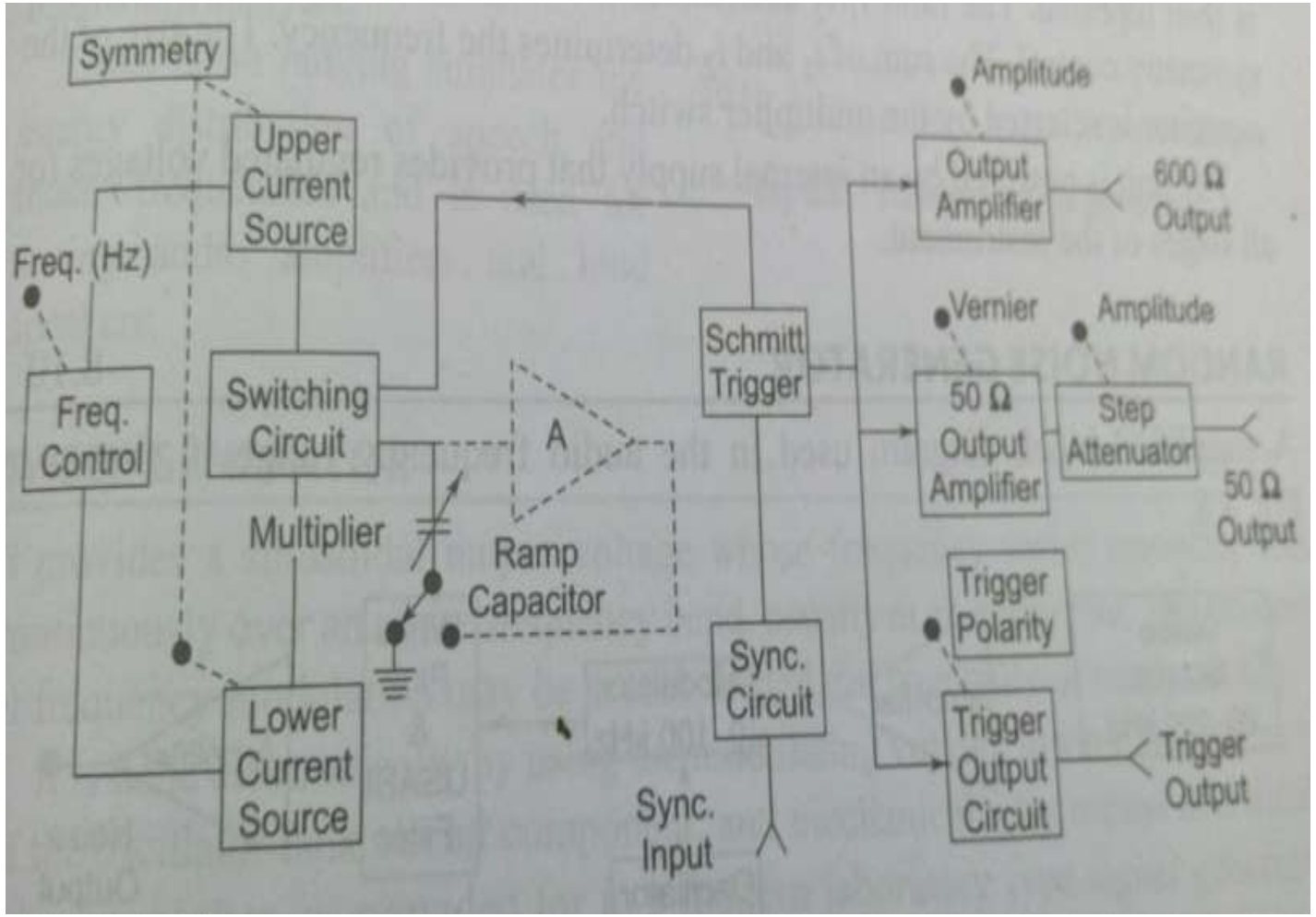


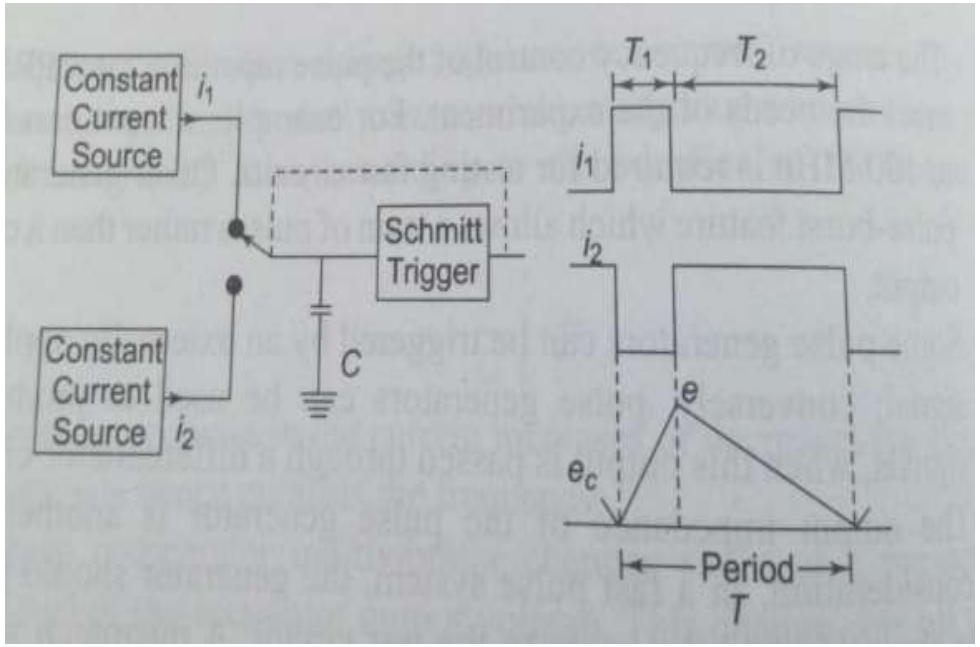
Square and pulse generator



Basic pulse generating loop

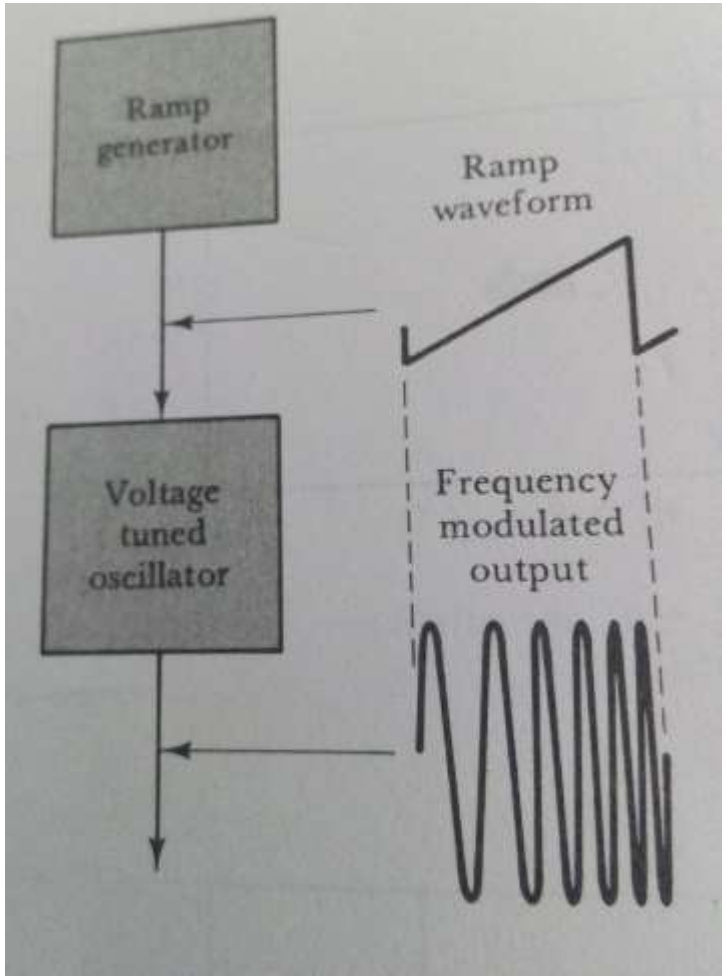
Square and pulse generator





Sweep frequency generator

- Process of testing the frequency response of the amplifier and filter can be done by a signal generator that automatically varies its frequency over a predetermined range.
- This instrument is called as " **sweep frequency generator**



Basic circuit of sweep frequency generator

Block diagram of a sweep frequency generator