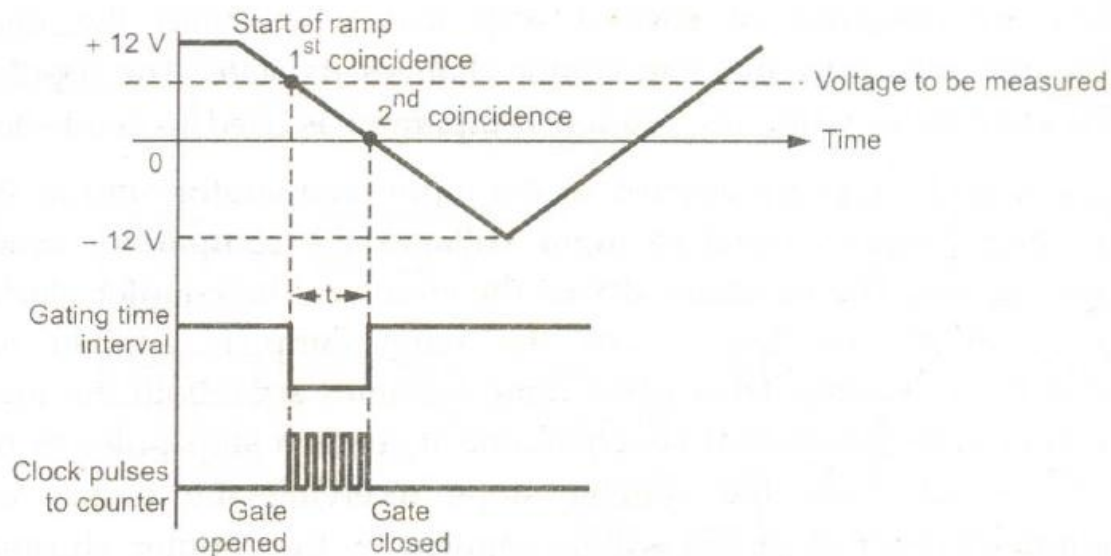


## RAMP TYPE DVM

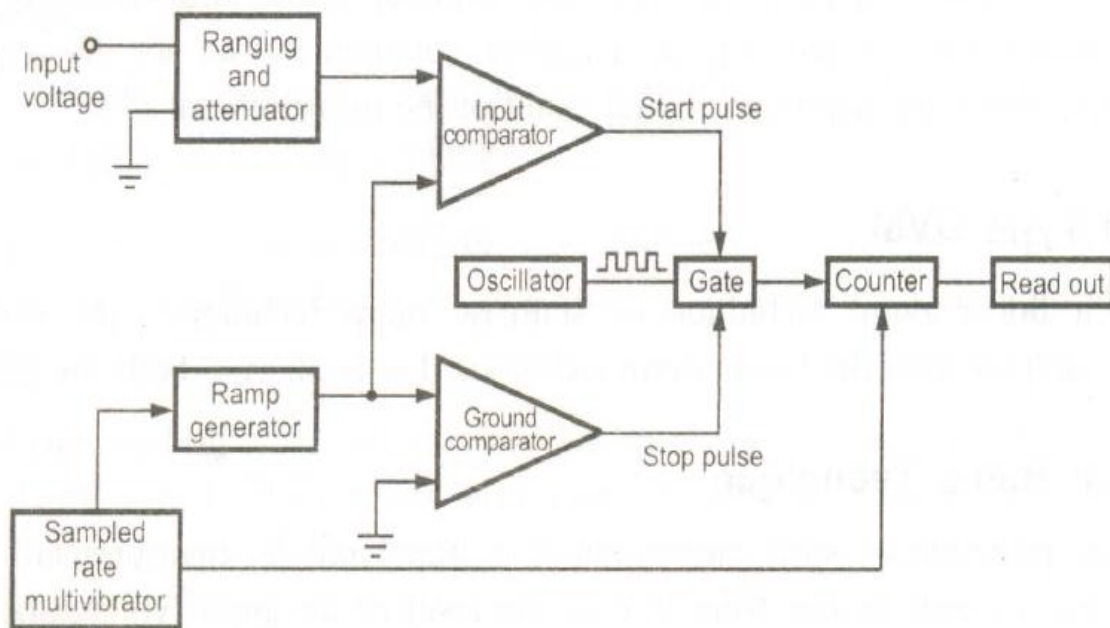
### Linear ramp technique:

The basic principle of such measurement is based on the measurement of the time taken by a linear ramp to rise from a  $V$  to the level of the input voltage or to decrease from the level of the input voltage to zero. This time is measured with the help of an electronic time interval counter and the count is displayed in the numeric form with the help of a digital display.



Basically it consists of a linear ramp which is positive going or negative going. The range of the ramp is  $\pm 12$  V while the base range is  $\pm 10$  V. The conversion from a *voltage* to a time interval is shown in the fig

At the start of measurement, a ramp *voltage* is initiated which is continuously compared with the input voltage. When these two voltages are same, the comparator generates a pulse which opens a gate i.e. the input comparator generates a start pulse. The ramp continues to decrease and finally reaches to 0 V or ground potential. This is sensed by the second comparator or ground comparator. At exactly 0 V, this comparator produces a stop pulse which closes the gate. The number of clock pulses are measured by the counter. Thus the time duration for which the gate is opened, is proportional to the input voltage. In the time interval between start and stop pulses, the gate remains open and the oscillator circuit drives the counter. The magnitude of the count indicates the magnitude of the input voltage, which is displayed by the display. The block diagram of linear ramp DVM is shown in the Fig



Properly attenuated input signal is applied as one input to the input comparator. The ramp generator generates the proper linear ramp signal which is applied to both the comparators. Initially the logic circuit sends a reset signal to the counter and the readout. The comparators are designed in such a way that when both the input signals of comparator are equal then only the comparator changes its state. The input comparator is used to send the start pulse while the ground comparator is used to send the stop pulse.

When the input and ramp are applied to the input comparator, and at the point when negative going ramp becomes equal to input voltages the comparator sends start pulse, due to which gate opens. The oscillator drives the counter. The counter starts counting the pulses *received* from the oscillator. Now the same ramp is applied to the ground comparator and it is decreasing. Thus when ramp becomes zero, both the inputs of ground comparator becomes zero (grounded) i.e. equal and it sends a stop pulse to the gate due to which gate gets closed. Thus the counter stops receiving the pulses from the local oscillator. A definite number of pulses will be counted by the counter, during the start and stop pulses which is measure of the input voltage. This is displayed by the digital readout.'

The sample rate multivibrator determines the rate at which the measurement cycles are initiated. The oscillation of this multivibrator is usually adjusted by a front panel control named rate, from few cycles per second to as high as 1000 or more cycles per second. The typical value is 5

measuring cycles/second with an accuracy of  $\pm 0.005\%$  of the reading. The sample rate provides an initiating pulse to the ramp generator to start its next ramp voltage. At the same time, a reset pulse is also generated which resets the counter to the zero state.

Source : <http://elearningatria.files.wordpress.com/2013/10/ece-iii-electronic-instrumentation-10it35-notes.pdf>