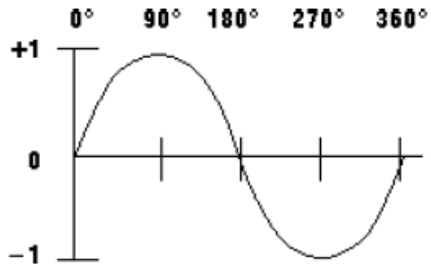
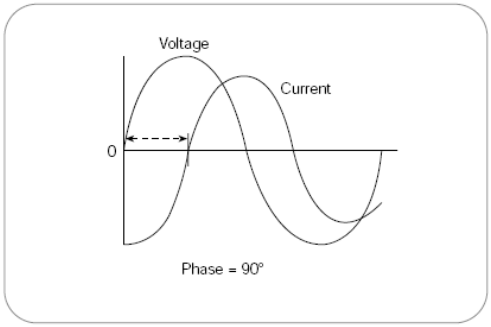


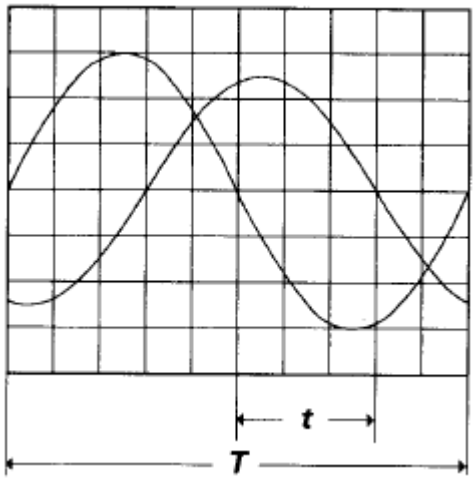


Phase

Phase is best explained by looking at a sine wave. The voltage level of sine waves is based on circular motion. Given that a circle has 360°, one cycle of a sine wave has 360°, Using degrees, you can refer to the phase angle of a sine wave when you want to describe how much of the period has elapsed.

Phase shift describes the difference in timing between two otherwise similar signals. The waveform labeled “current” is said to be 90° out of phase with the waveform labeled “voltage,” since the waves reach similar points in their cycles exactly 1/4 of a cycle apart (360°/4 = 90°). Phase shifts are common in electronics.

Phase shift describes the timing difference between two otherwise similar signals. The example shows two similar sine waves of the same frequency. ‘T’ denotes the period of one complete cycle (10 cm on screen), and ‘t’ signifies the time between the zero transition point of both signals (3 cm on screen).



The phase difference in degrees is calculated from

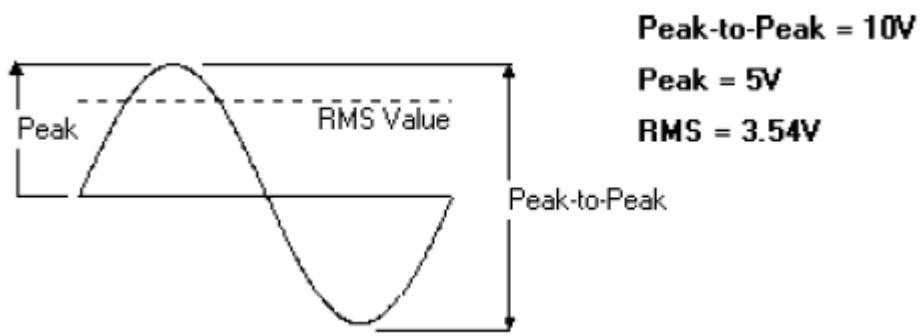
$$\varphi^\circ = \frac{t}{T} \cdot 360^\circ = \frac{3}{10} \cdot 360^\circ = 108^\circ$$

The Time Base
The TIME/DIV control determines the horizontal scale (the time scale) of the graph which appears on the oscilloscope screen. This is achieved by a ‘sweep voltage’ that is applied to the X plates of the oscilloscope. It is so called because it is used to sweep the electron beam horizontally across the screen.

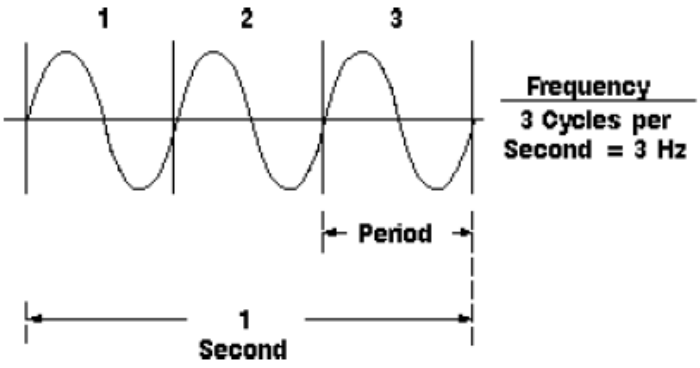
Rise Time
When dealing with square or pulse waveforms, the critical feature is the rise time of the voltage. The rise time of a signal is defined as the time required for it’s leading edge to rise from 10 percent of it’s final amplitude to 90 percent of it’s final amplitude.

6. Amplitude and Frequency Measurement
Generally, amplitudes of alternating voltages are quoted as RMS (root-mean-squared) values. However, when measuring the magnitude of such a signal using an oscilloscope, the peak to peak voltage (Vpp) value is used. It is also important to note that the amplitude of one half of the cycle is known as the peak voltage (Vp).
The relationship of all three voltage levels can be seen in Fig. 3.
The peak to peak voltage and the peak voltage can be converted to RMS as follows:

$$V_{RMS} = \frac{V_{PP}}{2 \cdot \sqrt{2}} = \frac{V_P}{\sqrt{2}} = V_{PP} \times 0.3535 = V_P \times 0.707$$



If a signal repeats, it has a frequency. This frequency is measured in Hertz (Hz) and equals the number of times the signal is repeated in one second (cycles per second). The signal also has a period, which is the time taken for one complete cycle to occur before it starts to repeat itself.
The oscilloscope can be used to measure the frequency of a repetitive signal. This is achieved by measuring the period of one complete cycle on the screen of the oscilloscope. Since period and frequency are reciprocals of each other (i.e. 1/period equals the frequency, and 1/frequency equals the period), the time taken for one cycle (the period) can be used to calculate the frequency.


1
2
3
Frequency
3 Cycles per
Second = 3 Hz
Period
1
Second