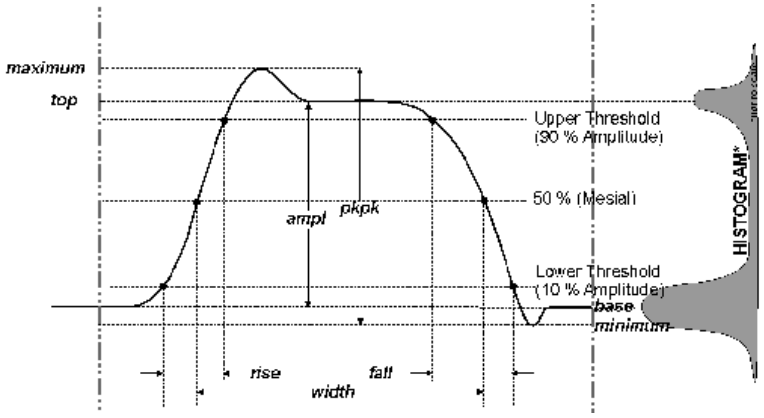
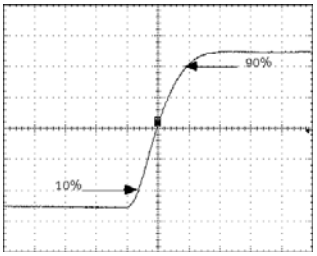
Oscilloscope Measurements –
Pulse Parameters

Determining Rise and Fall Times

The analysis begins by computing a *histogram* of the waveform (wfm) data; for example, the histogram of a wfm transitioning in two states will contain two peaks. The analysis will attampt to identify the two clusters that contain the largest data density. Then *the most probable* state (centroids) associated with these two clusters will be computed to determine the Top and Base *reference levels*.



Once Top and Base are estimated, *calculation* of the Rise and Fall times is easily done.



The 90% and 10% threshold levels are automatically determined by using the amplitude (ampl) parameter; the vertical interval spanned between the Base and Top line is subdivided into a percentile scale (Base = 0%, Top = 100%) to determine the vertical position of the *crossing points*. The time *interval* separating the points on the rising or falling edges is then estimated to yield the Rise or Fall time.

The right signal to test
Rise an Fall time measurement

Sine waves have a predictable shape and, theoretically, *known* timing parameters such as Rise times (and Fall times)

$$RiseTime = \frac{\arcsin(0.8)}{\pi \cdot Freq} = \frac{0.9273}{\pi \cdot Freq} = \frac{0.2952}{Freq} \approx 0.3 \cdot Period$$

Also, the frequency content of a pure sine wave is very simple, containing of a single component at the fundamental frequency. Using sine waves simplifies the task of looking for distortion components in the *frequency domain*.