

PULSE DEFINITIONS

The step function is the basic waveform in pulse work. The unit step function has the value zero for all times up to $t=0$ and the unit value thereafter. Theory shows that any waveform can be synthesized by adding step functions of suitable amplitude and polarity. A perfect rectangular pulse can be formed by two unit step functions; one at a time t_0 and another of opposite polarity at a later time t_1 . The perfect pulse would be generated, of course, by the ideal pulse generator, having controls to vary the pulse width, amplitude, and repetition frequency from zero to infinity. The maximum duty factor would be 100%. Most of the terms used in pulse work are a measure of how close the pulser comes to being ideal.

RISE TIME: The time that it takes the pulse to rise from 10 to 90% of its final amplitude. Rise time is measured in nanoseconds (or microseconds). It is usually specified as a fixed amount of time, e.g., 10 nanoseconds. There are other definitions of rise time and, occasionally, it will be found specified as a rate of rise (e.g. 5ns/volt).

FALL TIME: The time that it takes the pulse to fall from 90% of its full amplitude to 10%. It is occasionally called decay time, and is measured and specified the same as rise time.

AMPLITUDE: Usually specified in volts into a specified terminating impedance. However, it is often referred to in amps or milliamps.

REPETITION FREQUENCY: This is also commonly referred to as pulse recurrence frequency (prf), pulse repetition rate (pr), and pulse per second (pps). It is simply the number of pulses generated per second.

PULSE PERIOD: This is the reciprocal of the repetition frequency.

WIDTH: The duration of the pulse, measured between the half-amplitude points of the leading and trailing edges.

DELAY TIME: The time between the trigger output and pulse output.

OVERSHOOT: The amount by which the leading edge "overshoots" or exceeds its final amplitude. It is characteristically measured as a percentage of the final pulse amplitude.

UNDERSHOOT: Also referred to as roll-off. It is just the opposite of overshoot. The leading edge climbs quickly most of the way, but the final few percent of amplitude have a much slower rate of rise. Two features of undershoot are measured - first, when the undershoot sets in (e.g. the 90% point); second, the time it takes the pulse to reach full amplitude after it starts to roll off.

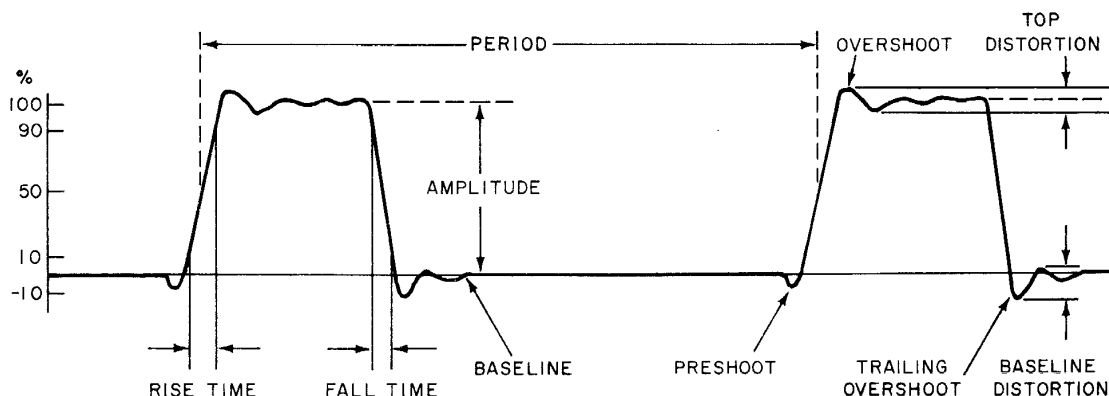
PRESHOOT: This is a small negative excursion which precedes a positive pulse. It is present only in some pulse generators and is measured in volts or as a percentage of the pulse amplitude, whichever is more appropriate for the particular case. It is sometimes called pre-emphasis.

TRAILING EDGE OVERSHOOT: This is often mistakenly called undershoot as it has the same characteristics. It is measured the same as overshoot on the leading edge of the pulse.

PULSE TOP DISTORTION: On most pulsers the distortion occurs immediately after the leading edge of the pulse and is often a ringing at one or more frequencies. The amplitude of the distortion is measured in volts and is often spoken of as a percentage of the pulse amplitude. This is peak-to-peak volts (if specified in peak volts, this is exactly one-half the correct definition).

BASELINE DISTORTION: This occurs after the trailing edge of the pulse just as pulse top distortion, also, is measured peak-to-peak.

DROOP: Also commonly known as sag, this is the amount the pulse top falls during the duration of the pulse. It is typically expressed as a percentage of the maximum pulse amplitude (excluding overshoot and ringing).



(E-H Research, Catalog, 1972)