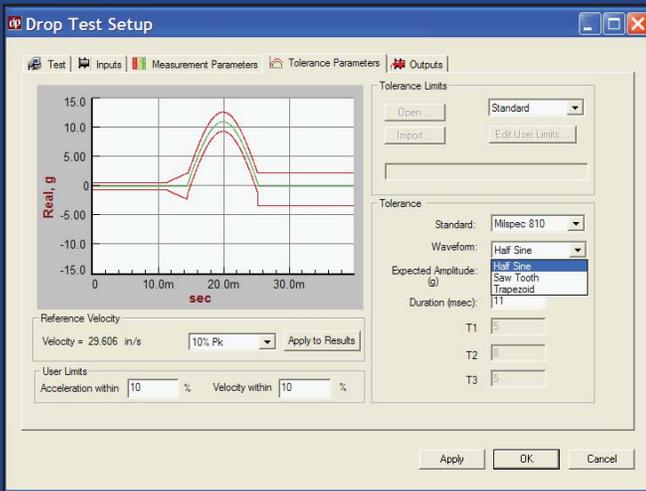# Drop Test

Engineered for SignalCalc Dynamic Analyzers

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Drop Test

Drop tests have been commonly used for product fragility assessment, prototype testing, package and cushion evaluation, and compliance with military standards. Working with drop and/or shock test machines, the Drop Test application software provides the user with the ability to capture and display the drop waveforms and perform "Fairing" (or filtering) on the waveforms to better understand and meet the drop test requirements.

Data Physics' Drop Test application software is built on a standalone platform using SignalCalc API. It offers a totally redesigned graphical user interface and combines many features that have become extremely popular with users of both the SignalCalc line of dynamic signal analyzers and SignalStar line of vibration controllers. From rapid measurement setup, to an easy to use and powerful runtime environment to automated reporting of measurement results and test set up, the Drop Test package from Data Physics delivers superior results in any shock or drop test application. The software runs on either the ultra portable Quattro hardware module offering up to 4 inputs or the powerful DSPCentric Abacus platform that can measure up to 32 inputs simultaneously.

Easy Setup, Accurate Measurements

The Drop Test software provides users with an intuitive and efficient dialog for set up of a new test; convenient features such as default engineering units, run notes and user comments, test names and descriptions and test incrementing protocols are all accessed via the Test page of the Setup menu. The input channel table including front end coupling, engineering units, scaling, channel names and point ID/direction and input trigger parameters are accessed via the Inputs page of the Setup menu.

The setup of measurement parameters including the frequency span and data blocksize for a test, signal fairing options, SRS parameters and trigger type are made through the *Measurement Parameters* page of the Setup menu. A single trigger per run, as is typically done with Drop Test machines or multiple triggers per run that are commonly used with shock test machines may be set up.

Users can use internal signal generators to output classical shock waveforms to the input channels for setup and verification purposes. This includes the ability to add noise to the output waveforms to aid in the setup of fairing parameters and tolerance limits.

Finally, the *Tolerance Parameters* page of the Setup menu offers users the ability to specify the expected shock waveform type (available waveforms include Half Sine, Saw Tooth and Trapezoid), amplitude and duration, tolerance standards and tolerance limits. The user also has the ability to define, save and recall User defined limits and has up to seven breakpoints for set up of the tolerance limits.

Based on the expected drop or shock test acceleration amplitude and duration, an expected or *Reference Velocity* change is calculated and displayed. The user can also set up tolerance limits on the faired peak acceleration and velocity change values. During run time, the measured acceleration velocity change levels are compared against the tolerance and the user can then see *Pass/Fail* indications for each channel in the runtime *Results* table.

Fairing

Fairing is done to reduce the high frequency content of transients captured during a shock or drop test. You can experiment with different Fairing types or parameter values to find the optimum settings. The Fairing parameter can be set as follows:

Smoothing: Applies an equal-weight moving average filter to the captured transient. The moving average window width is set by the *Smoothing Width* parameter. Width specifies a moving average window width in terms of number of samples.

Low Pass Filter: Applies a user specified low pass filter to the captured transient. The filter cutoff frequency is specified in the *CutOff* Freq field. The low pass filter has a 40 dB/decade rolloff.

Auto Filter: Applies an automatically designed low pass filter, which is based on pulse duration of the primary shock waveform.

Compliance with Standards

Users have a choice of tolerance defined by both Mil STD 810 and DEF_STAN_00_35 standards. Both standards have tolerance profiles for the three classical shock waveform; Half Sine, Sawtooth and Trapezoid. Users wishing to use custom tolerances based on internal standards can import previously saved tolerance profiles or define them online prior to starting any test.

Export of Signals to other Formats

Measured and calculated signals may be automatically exported to external signal formats such as Ascii, Matlab, MeScope and UFF. Exporting to MeScope, for example, allows users to visualize the time domain operationing deflection shape of a test item using the acceleration waveforms from multiple sensors placed around its geometry. Point numbers and associated X, Y or Z axis directions (either positive or negative) for each sensor are exported with the data.

Advanced Drop Test Options

Optional SRS (shock response spectrum) Analysis provides a special type of proportional-bandwidth spectral measurement for transient signals. Each frequency point of a Shock Response Spectrum is the peak response of a second-order filter excited by the input. Each of these filters simulates a base-excited single degree-of-freedom (SDOF) mechanical system. The natural frequencies of these systems are distributed in an 1/Nth Octave manner (with resolution choice of full Octave to 1/24th Octave) and their equivalent viscous damping factor may be selected to be anywhere between 0.01 and 100 percent of critical damping. A single signal, captured online, may be analyzed multiple times using different damping factors, spectral resolution and filter placement, as desired.

In many situations, users will perform Fairing calculations in conjunction with Shock Response Spectrum calculations on the captured waveform. This combination, elegantly offered in simple runtime dialogs, allows the user to properly evaluate the damage potential associated with the captured drop waveform in both the time and frequency domains. The user can also choose to *Recalculate* the measurement results based on a captured waveform using different Fairing parameters and/or different SRS parameters. This feature allows the user to capture a waveform and then try different Fairing and/or SRS parameter values without having to recapture another waveform.

Powerful Runtime Features

Users can invert (flip) captured waveforms to compensate for transducer mounting direction and can move tolerance limits around a captured waveform to enable its passing relative to the tolerance limits. A *Results* table provides a convenient display of all channels with color coded Pass/Fail indicators relative to the tolerance limits and the target acceleration and velocity change levels.

Ch #	Acc Tol Pass/Fail	Vel Mode	Vel Amp (in/s)	Vel Width (ms)	Faired Acc (g)	Tgt Vel Chg (in/s)	Tgt Vel Chg Pass/Fail	Tgt Peak Acc (g)	Tgt Peak Acc Pass/Fail
1	Pass	10% Pk	29.31123	10.15625	10.40105	29.60591	Pass	10	Pass

For drop test applications where multiple sensors are placed in orthogonal directions on a test item, Resultant magnitude calculations for triaxial or biaxial measurements are available. Users simply need to indicate groups of channels to be used for each resultant vector magnitude. Channels may be used in multiple resultant groups if necessary

If fractional octave analysis across narrower frequency bands than 1/3 octave is required, the data can be streamed to disk using the Throughput-to-Disk option, and then be played back for reanalysis. Without the requirement to keep up with a realtime signal, accurate fractional octave analysis becomes possible.

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