Accelerometer Calibration

How to conduct accelerometer validation/calibration
Matt Millard

V-Note # 0006

Abstract

The VR8500 and VR9500 Revolution vibration control systems can be used (with appropriate software options) to verify the calibration of an accelerometer (or other input). The software feature also provides the ability to write to TEDS (Transducer Electronic Data Sheet).

Objective

Easily check the input sensor sensitivity and verify/calibrate the sensor and update the TEDS info if applicable to the sensor.

Solution

VR9106 (for VR9500 systems) or VR-632 (for VR8500 systems) – requires SineVIEW.

Accelerometer Calibration

Use this option to verify calibration on all your accelerometers. It provides an easy interface to calculate accelerometer sensitivity. This will allow the user to perform a sine sweep, controlling on a reference accelerometer, and produce a calibration report suitable for calibration record keeping. Automatically calculates the accelerometer sensitivity at the chosen frequency. Requires at least 2 input channels (one for reference accelerometer, one for accelerometer undergoing calibration), (VR9100) SineVIEW, reference accelerometer, and a shaker system.

The Accelerometer Calibration Verification option measures the sensitivity level of an accelerometer connected to the Channel 2 input, using an accelerometer on the Channel 1 input as the calibrated reference accelerometer. After measuring the sensitivity level, a frequency sweep is run to measure the frequency response of the accelerometer. In the following we will use the following definitions:

· UUT: Unit Under Test is the accelerometer connected to the channel 2 input, which is the accelerometer to be calibrated (more than 1 channel can be verified at a time).

· REF: Reference Accelerometer is the accelerometer connected to the channel 1 input, which is your measurement standard.

The sample test profile "*Calibrate Channel 2.vsp*" demonstrates the use of this option. It is assumed that your shaker has both the REF and UUT accelerometers connected such that they both measure the same acceleration. This is typically done using a piggy-back mount at the center of the shaker. Load this test by selecting the 'Open Test' toolbar button, or select Test .. Open Test from the menu.
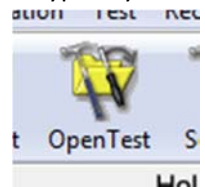

Select the "Calibrate Channel 2.vsp" test from the list of tests. Note that it may be necessary to change the "Files of type" setting to "VibrationVIEW Sine Profiles".

To view or change the test settings, click the 'Settings' icon, or select Test .. Edit Test Settings from the menu.
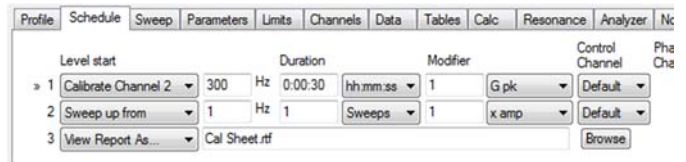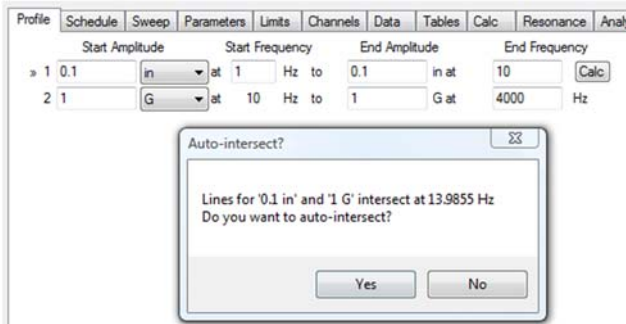

The frequency range and amplitude profile to be used for the frequency sweep are both defined on the 'Profile' tab of the test settings. This example file sweeps from 10Hz to 4000Hz at a constant amplitude of 1G peak.
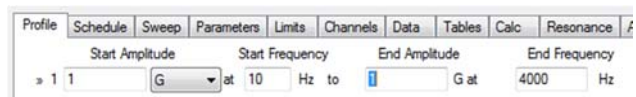
Set the frequency sweep values as appropriate for your accelerometer. Since the frequency response is reported as a ratio of UUT relative to REF, the amplitude does not need to be constant over the entire frequency range. For example, it may be necessary to transition to a constant displacement at low frequencies. To do this, click on the "Insert" button to add another level, set the 1st level to displacement values and set the 2nd level to acceleration values. Then click the "Calc" button to compute the cross-over frequency.

The next step is to define the sequence of events to run during the test. This is done using the "Schedule" tab. The typical accelerometer calibration test goes through 3 steps:

1. **Calibrate Ch2**: This step holds the REF accelerometer at a constant frequency and amplitude, and measures the sensitivity of the UUT accelerometer at this frequency and amplitude. Typically you will want to run a duration of 30 seconds to get an accurate measurement. The Modifier value selects the acceleration (or velocity or displacement) level used for the calibration measurements.

2. **Sweep up from**: This step runs a frequency sweep from 20 Hz, with a duration of 1 sweep. This means it will start at 20 Hz, and stop at the maximum frequency defined on the "Profile" tab. The Modifier level here defines the amplitude relative to the values defined on the "Profile" tab.

3. **Open Report As**: This step creates a report using the selected template file. When the test is run and it reaches this step, the

program will prompt the operator for a filename under which to save the report. After the operator enters a file name, the report will be generated and opened in your word processor.

The "Sweep" tab defines the tolerance and abort levels used during the test, and defines the sweep rate used for the frequency sweep. Change these values if you want a faster or slower frequency sweep.

To run the test, simply press the Run button.

Note: The report template (in this case "Cal Sheet.rtf") can be customized or modified to provide more automation or other specific information. Contact Vibration Research Tech Support for assistance or check out the "How To" section of the manual or help file for details on creating customized reports.