CRYSTAL INSTRUMENTS

EDM 10.1

Engineering Data Management Software Release Notes

SPIDER VIBRATION CONTROL SYSTEMS (VCS)
MULTIPLE-INPUT MULTIPLE-OUTPUT VIBRATION CONTROL SYSTEMS (MIMO VCS)
TEMPERATURE, HUMIDITY, VIBRATION (THV)
FATIGUE DAMAGE SPECTRUM (FDS)

www.crystalinstruments.com | info@go-ci.com

TABLE OF CONTENTS

RELEASE HIGHLIGHTS 4

EDM Cloud and EDM Mobile App 4

- Demo from Web Browser 4
- Demo from EDM Mobile App 4
- Supported Modules 4

EDM Supports SQLite 4

VCS Enterprise 5

Force Limiting with Overturning Moment Limiting 5

Displacement Protection 6

Auto Create VCS Tests with Test Standards 6

Variance Reduction in VCS-Random 6

Create Mission Profile Analysis and Sine on Random (SOR) Profile in PA - Fatigue Damage Spectrum (FDS) 7

- Fatigue Damage Spectrum – Mission Profile Analysis 7
- FDS Sine-on-Random - Extracting Sine tones from Sine-dominated broadband signals 7

Monitor & Control EDM with MQTT IoT Messaging Protocol 8

CI Data File Reader 9

- Third-party Equipment Control Integrated for Battery Testing 9

NEW FEATURES 11

New Features in EDM-VCS Vibration Control Software 11

- Any Channel as Drive Channel in Single-Axis EDM-VCS 11
- Abort Status Window 11
- Incremental Ramp Levels in Run Schedule 11
- Create Drive Signal Profile on Sine Oscillator 11
- PC SRS Feature 11
- Configure Specific Digital Output for Limit 11
- Copy/Paste Test Profile and Limit Channels in Random and Sine Tests 12
- Normalized Error Signal for Random 12

New Features in MIMO Vibration Control Software 12

- COLA in MIMO Sine 12
- Push-Pull Diagram for MESA Configurations 12

New General Features 13

- Improved Time Format Display 13
- Digital Output Live View 13
- Data Download - Pause and Resume 13
- Display Signal Symbols 13
- Customize Symbols for Markers 14
- Vibration Calculator 14
- View Past Pop-up Notifications 14
- Add Test Progress to Report Filename 15
- Export data within specified frequency range 15
- Customize double-click on signals 15
- Add Additional Notes to Report Option 15

Major Improvements 15

EDM Vibration Control Software 15

- Constant A/V/D Amplitude is added as a segment type in the Sine Profile Editor. 15
- Start Recording & Stop Recording System Events in Run Schedule 15
- Configure and Control Run Log Event Types in Run Log 15
- Separate Abort and Alarm Lines for SoR Sine Sweeps 16
- SoR Low Abort & Low Alarm for Sine Tone 16

- Display Profile with Level in VCS-Random 16
- Append Shaker Information to each Run 16
- Freeze Control or Control Composite Display 17
- Display SOR or ROR Narrowband Profile with Broadband Profile 17
- Display Low Abort and Low Alarm Lines for Limit Channels 17
- Enable/Disable Auto Sine Ramp up 17
- Set APS Signals as Profile/Limit in VCS-Random 18
- Random Profile Support Linear-Log for Slope dB/Hz 18
- Random RMS Limits Support dB 18
- Improved SRS Synthesis Methods 18
- Vertical Cursor for SRS Synthesis 19
- Add Shaker Name into VCS Testing Reports 19

EDM Temperature, Humidity, Vibration Control Software 19

General Improvements 20

- Improved 3D Waterfall Display 20
- Clear in Test Sequence 20
- Improvements to Margins in Report 20
- Enhanced Import of Sensor Data from Excel 20
- Add Time Elapsed at Full Level & Start of Test Run to UFF, UNV files 21
- Numeric Display Improvements - Remaining Test Time 21
- Individual Tolerance Signals for Stack Plots 21
- Improved Run Folder Options Accessibility 21
- Selecting the Network Adapter on Front End IP Address Setup 21
- Front-End IP Address Tool Configuration Improvements 22
- Improvements to Save/Load from Library Feature 22
- Checklist Includes Shaker Information 23
- Test Locked Warning 23
- EDM Installation and Initial Setup Convenience 23

Software Release History 23

System Requirements 23

Minimum System Requirements: 23

Recommended System Requirements (Minimum for Spider Systems Higher than 16 Channels): 23

Version Compatibility 24

RELEASE HIGHLIGHTS

EDM Cloud and EDM Mobile App

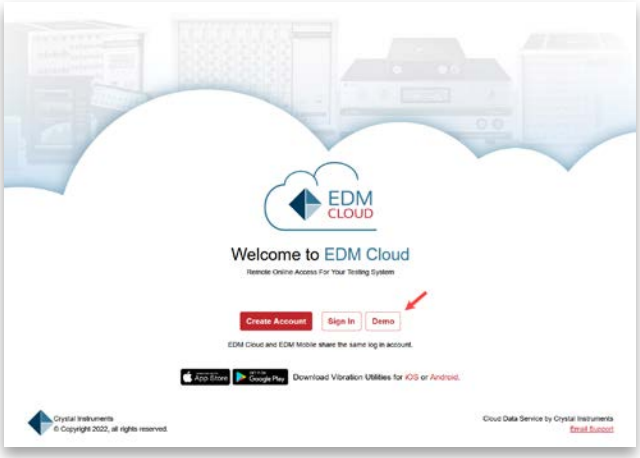
EDM Cloud service is introduced with the EDM 10.1 Release. EDM Cloud allows users to view a test status remotely through a web browser, mobile app, or a combination of both. Multiple devices and users are allowed to simultaneously login.

EDM Cloud and EDM Mobile will be provided free of charge for an introductory period ending on March 31, 2023, for all users.

Demo from Web Browser

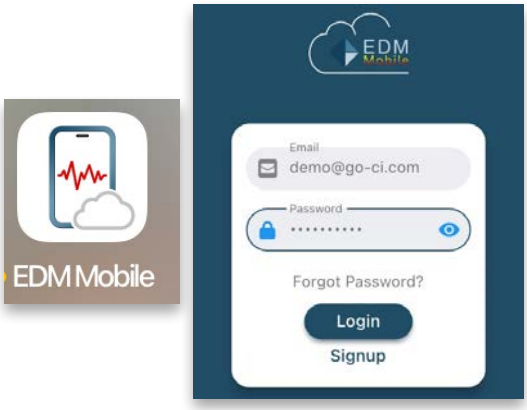
All users are invited to try out EDM Cloud service features from a web browser or mobile phone app.

Access EDM Cloud from a web browser: https://cloud.go-ci.com/. Click on “Demo” and enter demo@go-ci.com in the email field.



Demo from EDM Mobile App

Users can download the EDM Mobile app for iOS or Android. Enter demo@go-ci.com in the email field and “Spider-80X” in the password field to try out the EDM Mobile app.

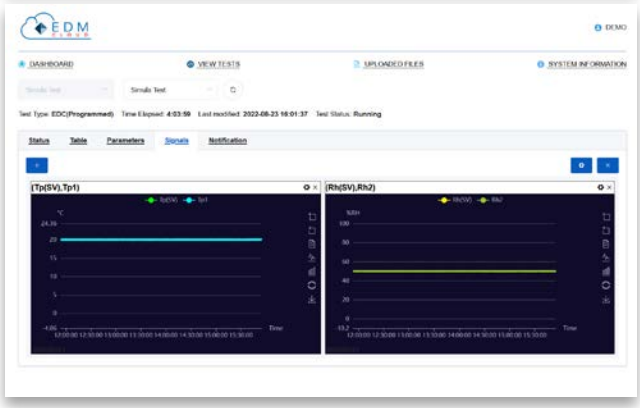


EDM Cloud allows users to upload the status of current tests or upload run logs of historic tests to the cloud.

Multiple user accounts can share access to uploaded data, including live or historic test statuses.

Supported Modules

EDM Cloud supports vibration testing and THV (temperature/ humidity/vibration) testing.



EDM Supports SQLite

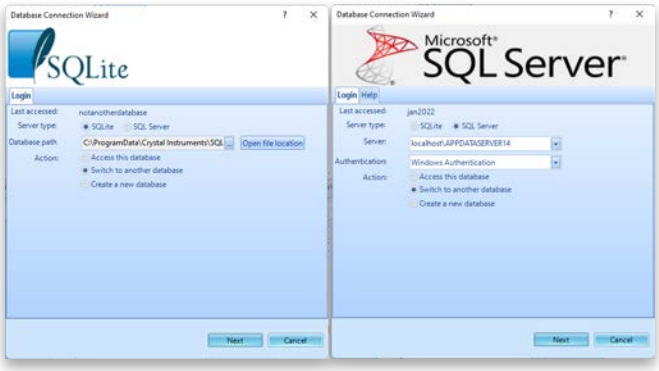
EDM 10.1 supports SQLite - a small, fast, self-contained, and reliable database engine. SQLite provides a seamless installation process and is a light-weight application. EDM reliability is further improved, and speed is increased even on computers with limited resources.

Combined with the support of SQL Server, EDM now supports the two most popular database engine forms. Users now have the choice to install and use SQLite and/or SQL Server according to their application needs.

SQLite comfortably fulfills all the capabilities required by EDM and provides a similarly fully featured experience as the existing SQL Server.

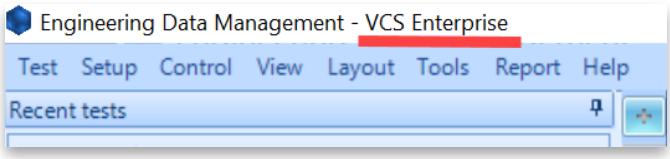
Crystal Instruments highly recommends the use of SQLite for a majority of users due to the easy installation, fast trouble-free performance, and lack of limitations.

Users can create databases in either SQLite or MSSQL and migrate existing databases from one database engine to another.



VCS Enterprise

VCS Enterprise features advanced testing, expanded test data management features, test data review, and integration with third party devices. This version is designed for the industrial enterprise environment, with multiple levels of users, multiple sets of test equipment, and multiple simultaneously running tests.

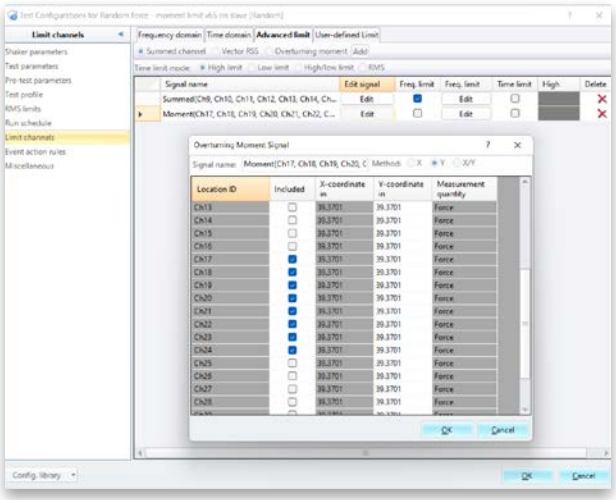


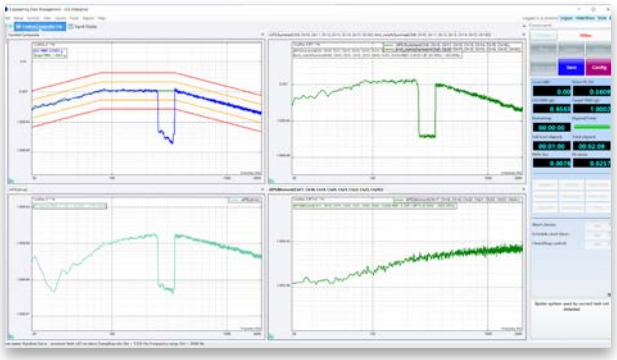
The following features are included in the Enterprise version and are not available in the Standard version:

General VCS Enterprise features
Expandable to MIMO/MESA/MDOF vibration testing
User management
Review/compare mode
Multiple instances
Run history
Configuration library
Data transfer tool
Search and export data files by given criteria
Strain measurement
Temperature measurement
EDM extension tools
Data recording
PC math signals
User-defined signals
VCS Enterprise for Random
Variable sample rate
Multi-channel drive/notch limiting
Force limiting and virtual channels
Frequency ranges from 3 kHz to 46 kHz
Spectrum resolution higher than 1600
Multi-resolution control (patented)
VCS Enterprise for Sine
Multi-channel drive/notch limiting
Force limiting and virtual channels
Frequency ranges from 3 kHz to 30 kHz
Customized ramp rate in frequency ranges
Customized measurement strategy for limit channels
THD measurement
PC coherence signals
VCS Enterprise for Shock
SRS predictive notching
Additional pre-test excitation type: Random
User-defined wavelet window type (SRS)
Auto-power spectrum for input signals
User-defined SRS signals

Force Limiting with Overturning Moment Limiting

Force limiting provides a notching function based on the total force and/or total overturning moment applied to the UUT. It provides the UUT protection from over-testing and also qualifies the UUT to a sufficient testing severity. This feature is available for Random and Sine vibration control.

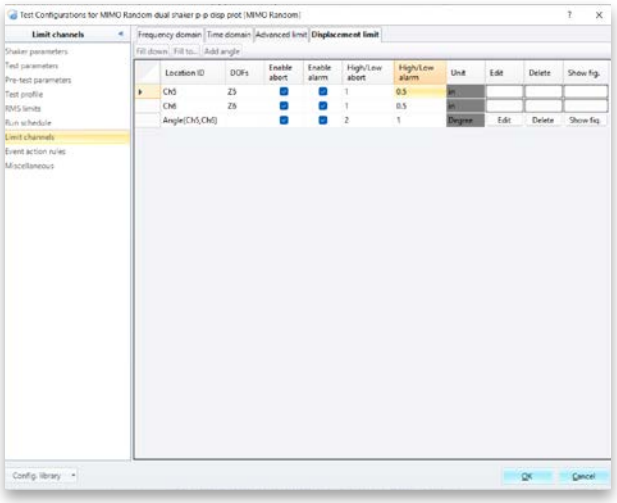


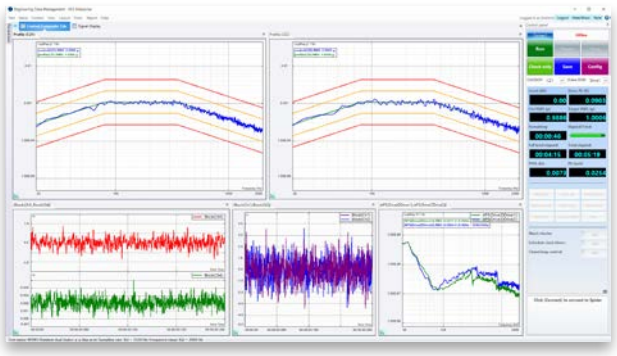


Displacement Protection

Many shaker safety features are available to ensure the shaker is protected while undergoing rigorous testing. Displacement Protection adds another layer of protection to the shaker system. The displacement of the shaker table is monitored and checked against preset alarm and abort limits. When the measured displacement exceeds the alarm or abort value, a warning is given, or the test is aborted.

Shaker tables involving two or more shakers can put the relative rotation angle under the angular displacement protection. Users can also set similar alarm and abort criteria to protect the shaker table from excessive rotation.



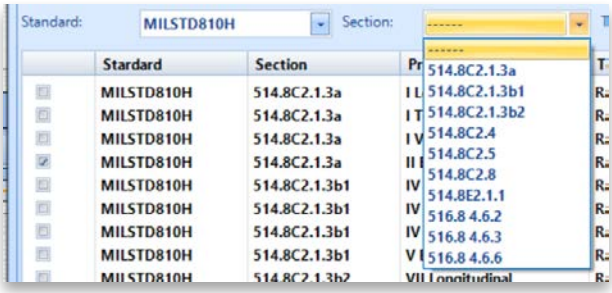


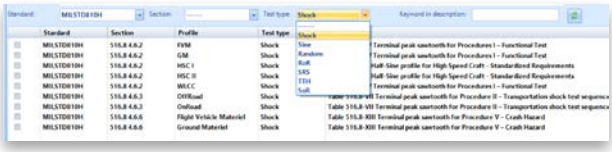
Auto Create VCS Tests with Test Standards

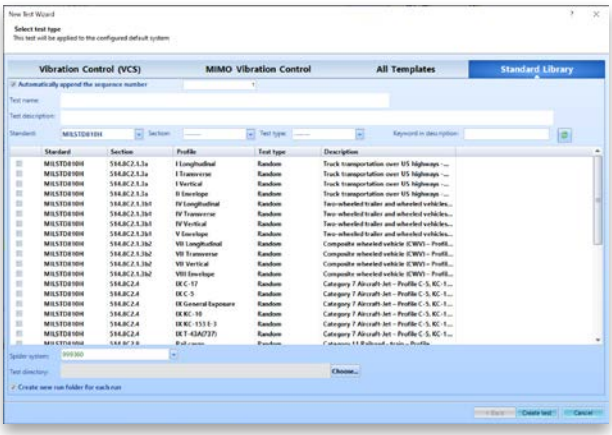
EDM VCS users can create tests from built-in libraries based on popular standards. Additional standards will be added in future releases as they become available.

Users can filter the entire list by standard, section, test type, and keyword.

The entire list can be sorted by standard, section, profile, test type, and description.







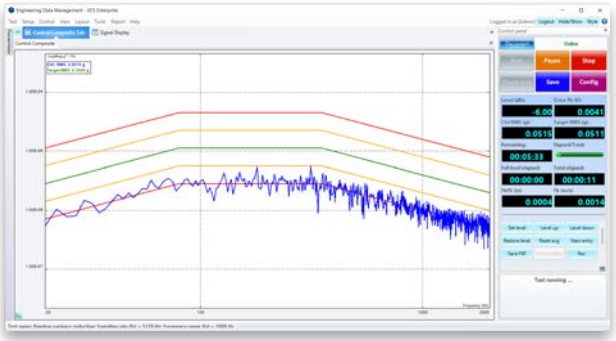
Variance Reduction in VCS-Random

As a convention of Random control, a high number DOF requirement will result in a waiting period before the control signal variance begins to settle. When the end-user runs a shorter test, the settling time of the control variance is short. The unique Variance Reduction feature is implemented in this new release to solve this issue. The control signal variance will settle much faster than regular spectrums with this option enabled.

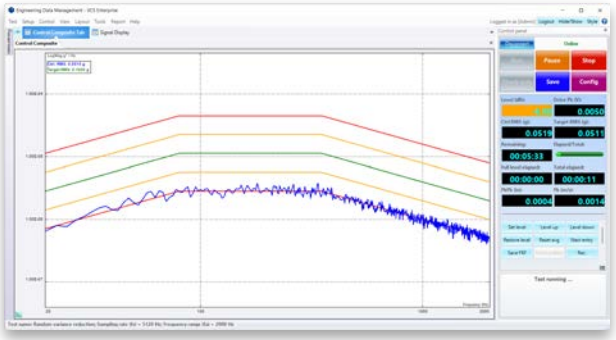
The variance of a random signal can be computed based on the statistics of a random signal. Once the variance is known, it can be reduced or even removed from the final spectrum in PSD format. The Variance Reduction option readily provides a smooth PSD without a long averaging process.

Variance Reduction does not affect the control loop itself. This process is applied to the computation of the control PSD by reducing its variance. The resulting control spectrum will be within the strict alarm limits much faster. This is especially beneficial when the test duration is very rapid.

The following screenshot shows the control spectrum at the start of a test without Variance Reduction enabled.



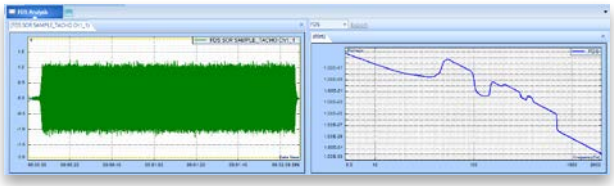
The following screenshot shows the control spectrum at the start of a test with Variance Reduction enabled.



The control PSD is significantly smoother with Variance Reduction enabled.

Create Mission Profile Analysis and Sine on Random (SOR) Profile in PA - Fatigue Damage Spectrum (FDS)

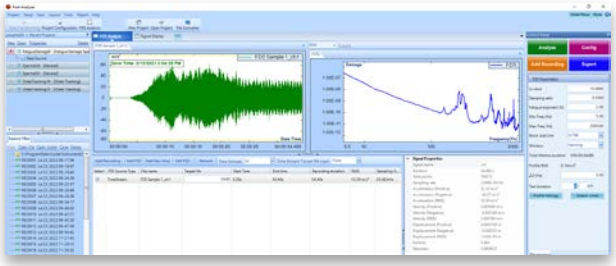
PA - FDS allows users to import raw time waveform data from field testing under multiple conditions and build a combined mission profile. Then based on the expected number of life hours (or cycles), the lifetime damage can be calculated. A new accelerated PSD can then be developed with an equivalent damage potential as the original life cycle but at a fraction of the necessary testing time.

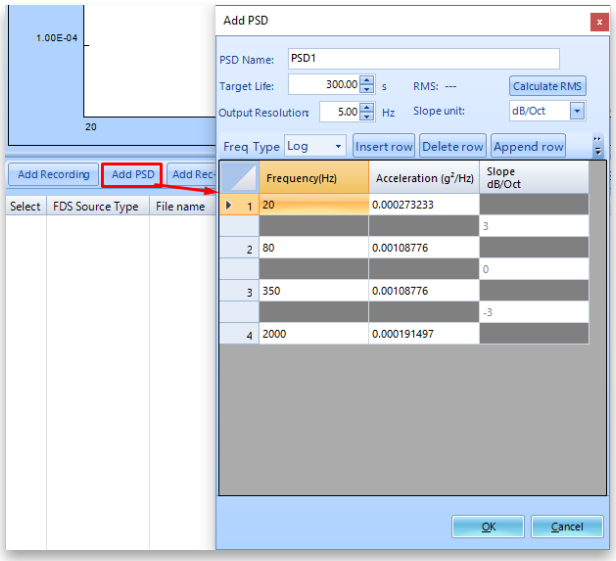


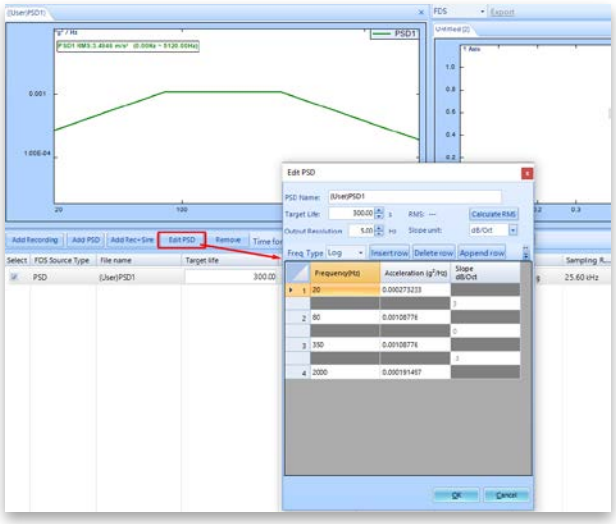
Fatigue Damage Spectrum – Mission Profile Analysis

PA 10.1 allows users to add multiple time recordings, PSDs, and sine tone profiles to generate custom Random or Sine-on-Random profiles based on recordings taken from the field.

Fatigue Damage Spectrum theory is applied to convert time domain recordings into frequency domain plots with the equivalent amount of damage. Mission parameters including different weights for different load cases can be added to provide a complete assessment of the total lifetime damage accumulated by a DUT, which can be time accelerated to provide an equivalent damage assessment in a shorter time frame using FDS.



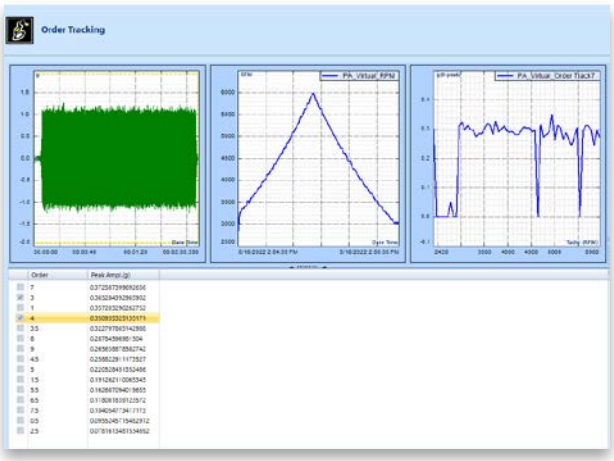


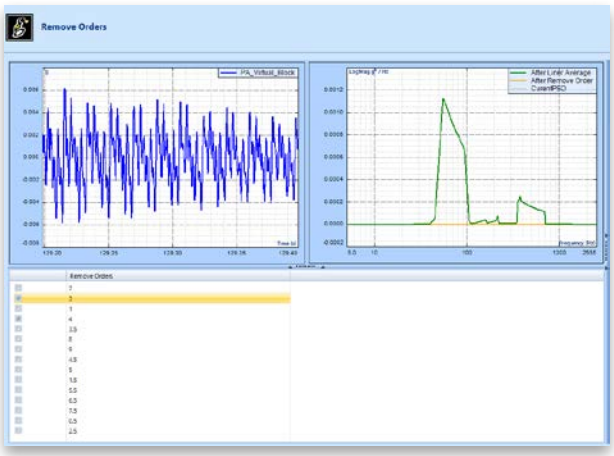


FDS Sine-on-Random - Extracting Sine tones from Sine-dominated broadband signals

PA now has the ability to extract Sine tones from a broadband signal with the help of a Tachometer. Most signals obtained from rotating machinery will have Sine tones and harmonics from periodic elements. FDS cannot be directly applied on these Sine dominated broadband tones as this would misrepresent the true damage imparted to the DUT.

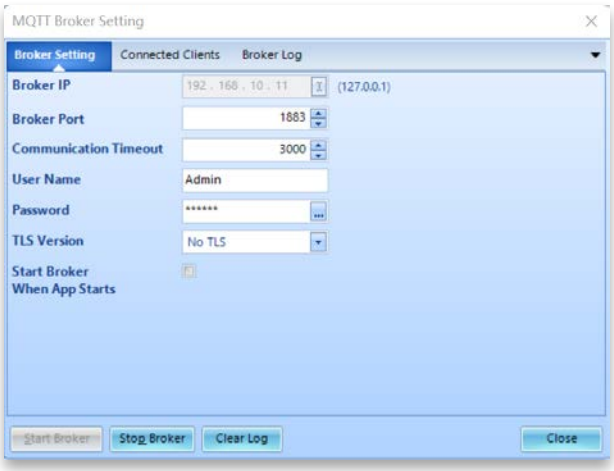
The PA 10.1 FDS feature allows users to filter out Sine tones using an advanced order tracking filter. This produces a signal with an independent sine tone and another with just the broadband. FDS algorithms are used to calculate damage from the two sources and is time accelerated to produce an equivalent lifetime damage. The resulting accelerated PSD is combined with Sine tones and results in an SOR profile to run on a shaker.

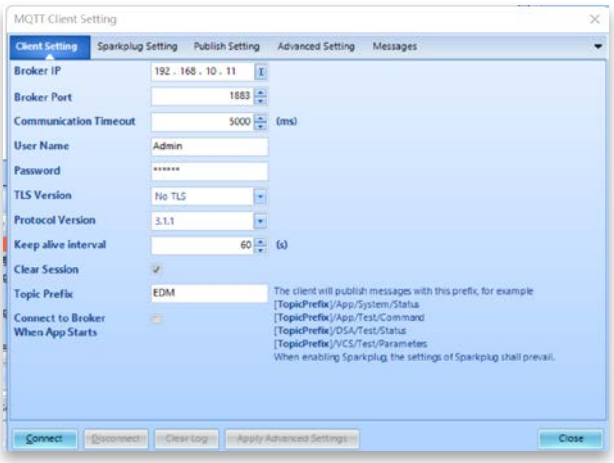




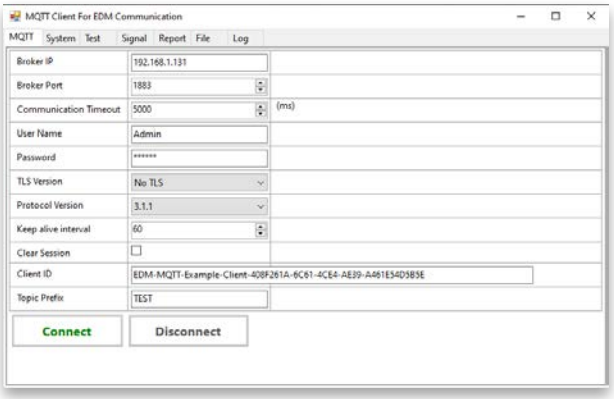
Monitor & Control EDM with MQTT IoT Messaging Protocol

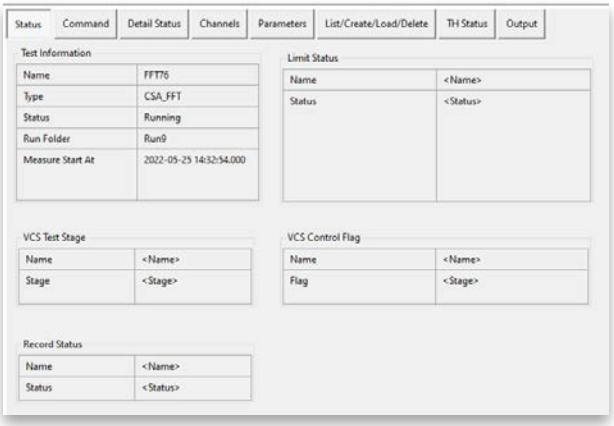
MQTT IoT is an OASIS standard messaging protocol designed for a lightweight publish & subscribe messaging network that connects to remote devices for data viewing and control. The implementation of MQTT in EDM allows users to monitor the status of environmental tests (vibration, temperature, humidity) running in EDM VCS, monitor measurements taken in EDM DSA, and even remotely run a test. This new messaging protocol will replace Socket Messages in EDM.

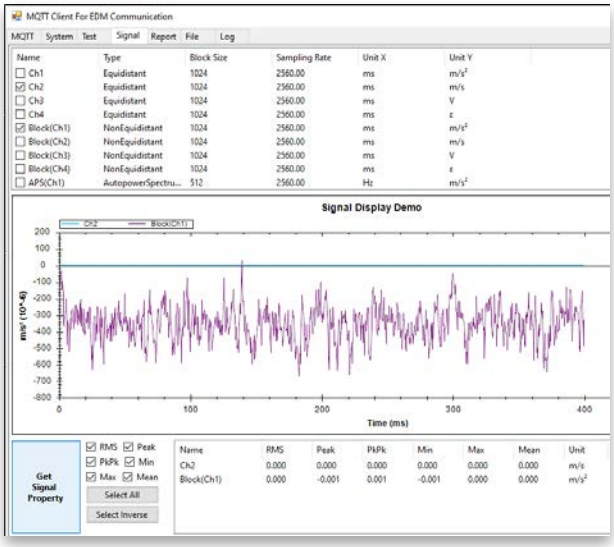




The screenshots below are from an MQTT example program that can connect to an EDM MQTT network to remotely run tests and view data.



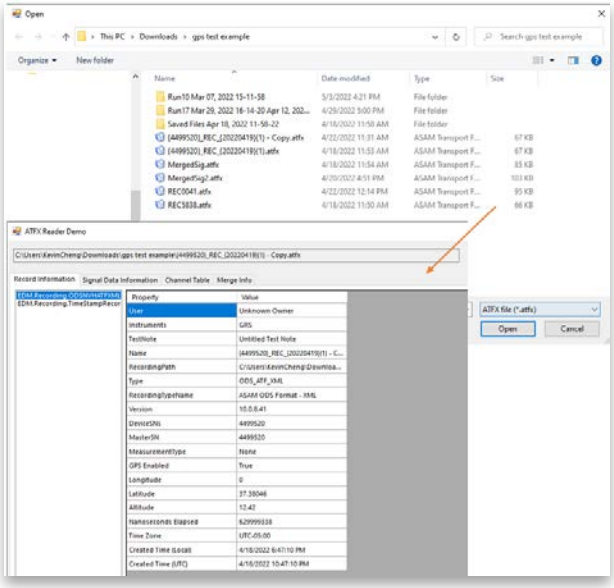


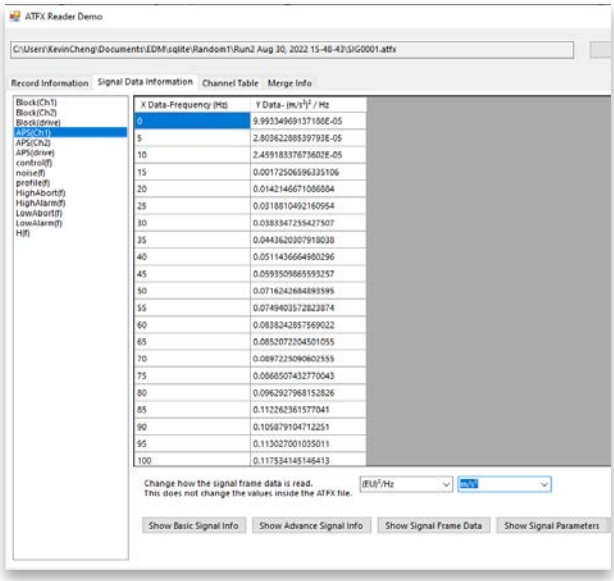


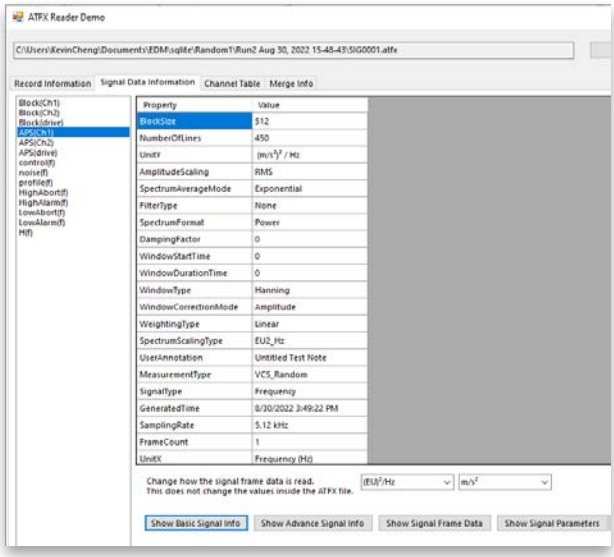
CI Data File Reader

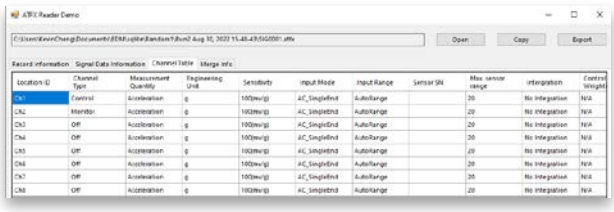
The CI Data File Reader API provides end-users with a streamlined file reading and browsing library to decode ATFX, TS and GPS files. Users can integrate the API with their own custom developed application. Crystal Instruments currently supports Windows-based programs, ideally written in C#. The same API also supports Python, MatLab and LabView.

The API offer methods and object calls to obtain data from an ATFX file, such as obtaining the DateTime with nano seconds elapsed or obtaining the saved frame data of a signal. This application also allows users to read any of the signals, time, or frequency in other engineering units (EU). Users can also read frequency domain signals in other spectrum types.





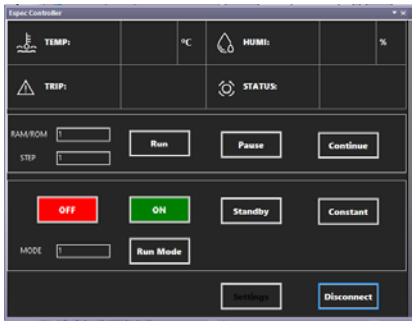




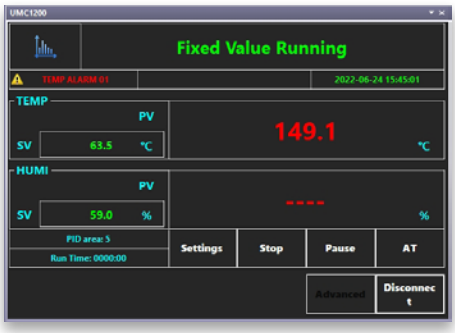
Third-party Equipment Control Integrated for Battery Testing

The control of the following equipment is integrated into EDM extensions. All of the following equipment is compatible with the CAN bus interface.

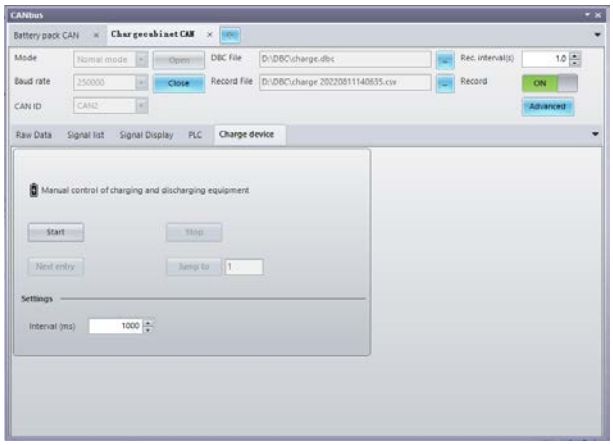
Espec chamber control

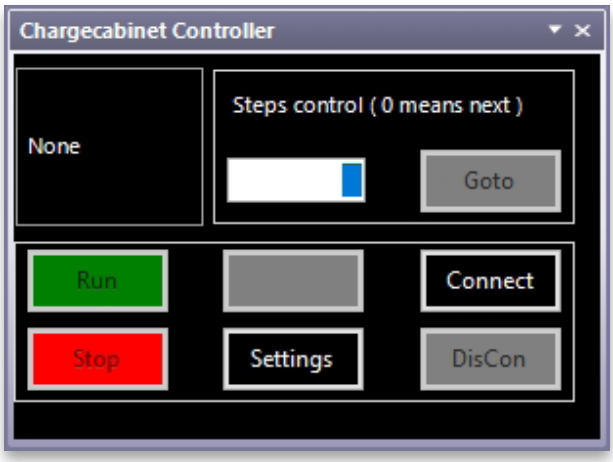


UMC1200 chamber controller control

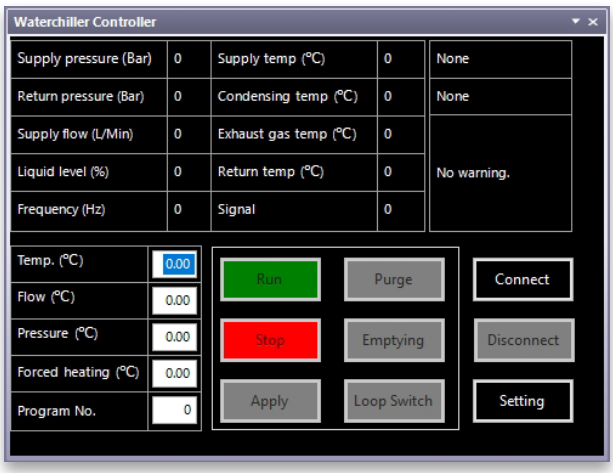


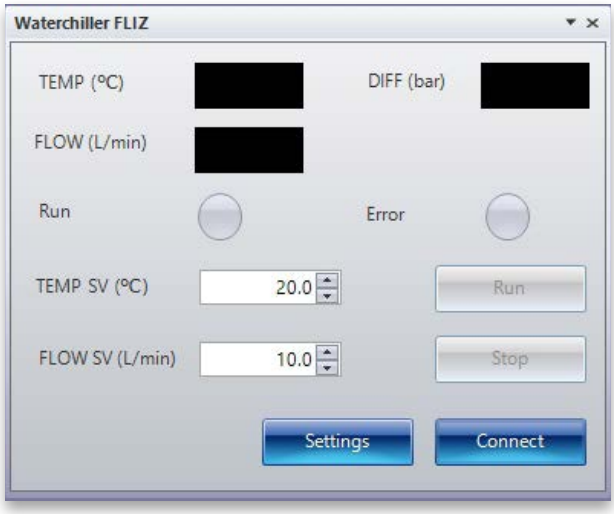
Charge cabinet control



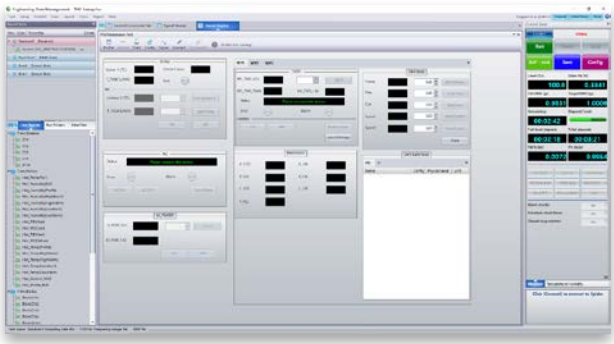


Water chiller control

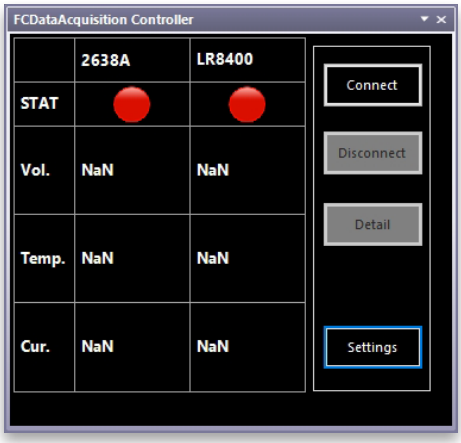




Low voltage source, high voltage source control, water chiller, and CAN bus interface



Data acquisition control (2638A, LR8400)

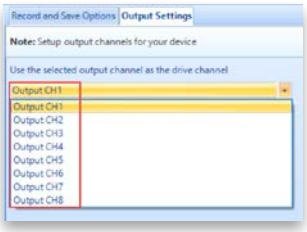


NEW FEATURES

New Features in EDM-VCS Vibration Control Software

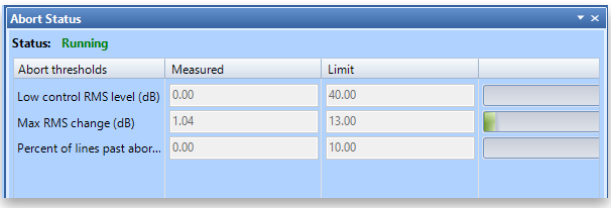
Any Channel as Drive Channel in Single-Axis EDM-VCS

When more than one output channel is enabled, any channel can be assigned as the drive channel.



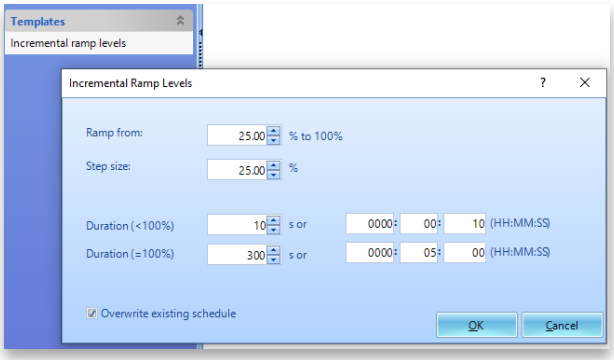
Abort Status Window

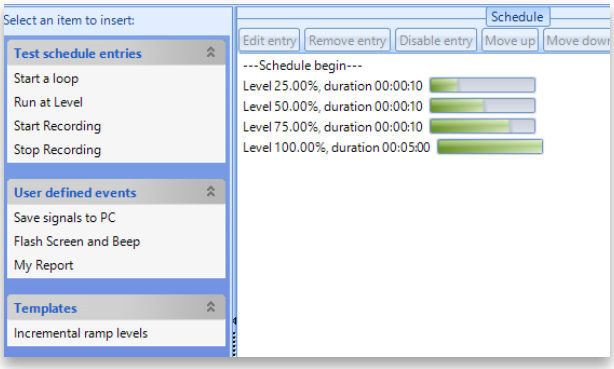
The new Abort Status window on the View toolbar provides users with an abort status during a test run and reasons why a test was aborted. The values in the window are found in Test Parameters -> Abort Sensitivity.



Incremental Ramp Levels in Run Schedule

Incremental Ramp Levels is a new template option provided in the Run Schedule. This template can generate events to overwrite or add to the Run Schedule.



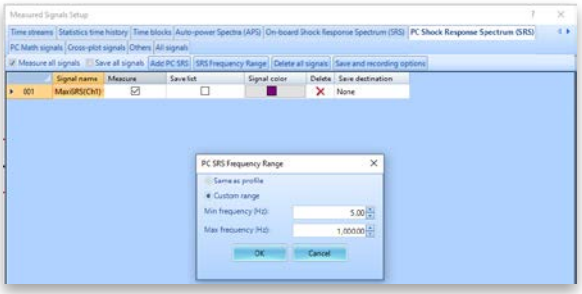


Create Drive Signal Profile on Sine Oscillator

- Users can define the Drive Signal Profile (in voltage) using a breakpoint table of frequencies and drive peak.
- Users can set the “Drive Peak” and “Frequency” to follow the profile in the Control Panel or enter the values manually.

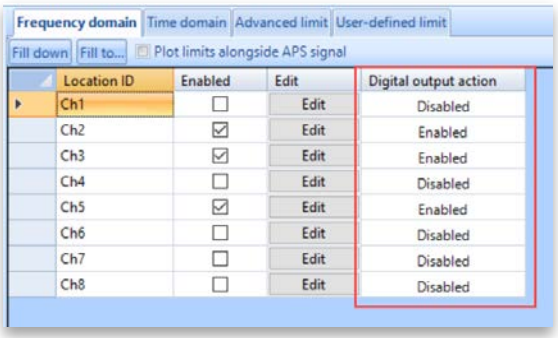
PC SRS Feature

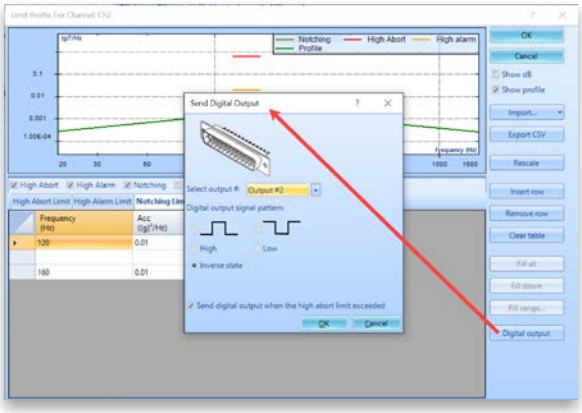
PC SRS signals can be calculated from any given channel. These signals can have a custom frequency range that is different from the RRS profile frequency range and does not interfere with the performance of SRS test control.



Configure Specific Digital Output for Limit

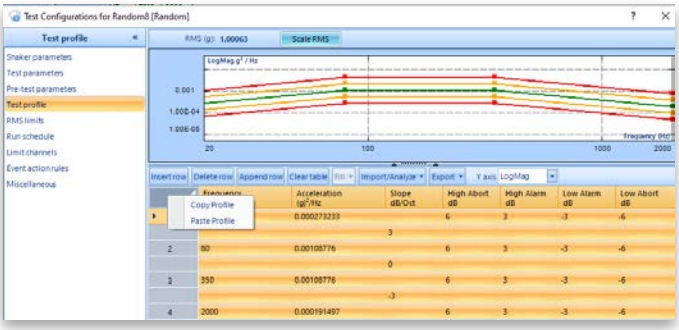
Users can configure each limit to trigger a separate Digital Output along with a separate signal pattern.





Copy/Paste Test Profile and Limit Channels in Random and Sine Tests

Users can now copy/paste columns and profiles into Profile Editor from a CSV or similarly formatted files.

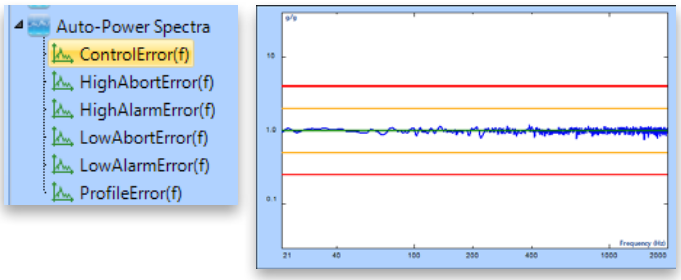


Frequency	Accelerati	Slope	HiAbort	HiAlarm	LowAlarm	LowAbort
20	0.000273		6	3	-3	-6
80	0.001088		6	3	-3	-6
350	0.001088		6	3	-3	-6
2000	0.000191		6	3	-3	-6

HiAbort	HiAlarm	LowAlarm
6	3	-3
6	3	-3
6	3	-3

Normalized Error Signal for Random

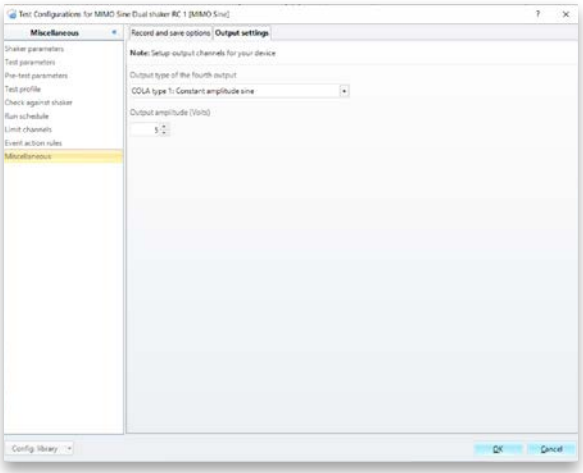
The Normalized Error Signal between a Control and Profile helps users determine the magnitude of error at different levels. EDM 10.1 introduces the Normalized Error Signal features which displays the ratio of error with respect to the profile at any level during a test.



New Features in MIMO Vibration Control Software

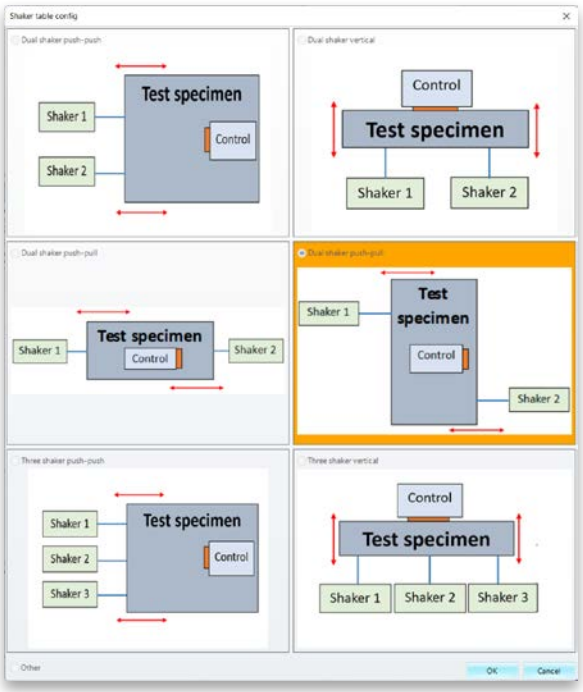
COLA in MIMO Sine

COLA is added to MIMO Sine. The Output Channel besides the Drive Channel can be specified as a COLA Output when utilizing an adequate number of output channels from the Spider hardware platform.



Push-Pull Diagram for MESA Configurations

The Push-Pull MESA shaker configuration is added as an option during test creation.



New General Features

Improved Time Format Display

All EDM modules support four precision levels on the time axes: Seconds, Milliseconds, Microseconds, and Nanoseconds.

The precision options are available for both relative and absolute time displays.

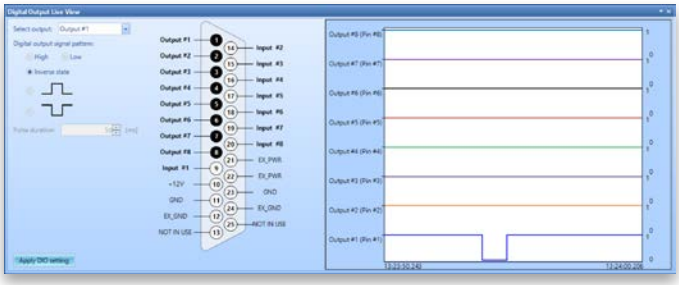
This improves the time display down to nanoseconds on displayed signals.

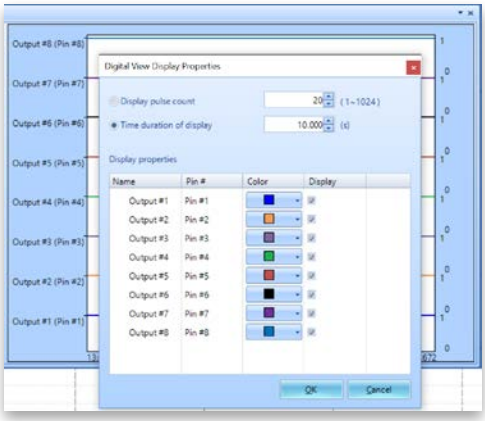
The improved Time Display allows users to display time streams in Absolute or Relative Time. Absolute Time allows users to display time streams in PC Local or UTC format.

Digital Output Live View

Digital Outputs now offers a live view in the EDM signal display. This feature allows users to:

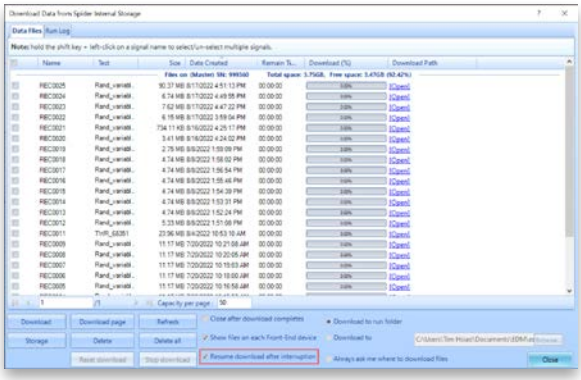
- Display all pin numbers of the DB connector
- Display the current state of each digital output pin
- Display the state of each digital output pin over a given duration
- Manually set the output pulse or state of a digital output pin
- Set the display duration and color of each digital output signal





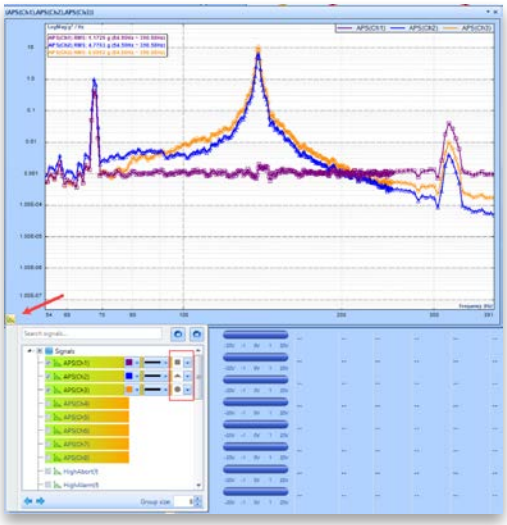
Data Download - Pause and Resume

Users can now pause and resume during data download to easily download large data files in multiple sessions.



Display Signal Symbols

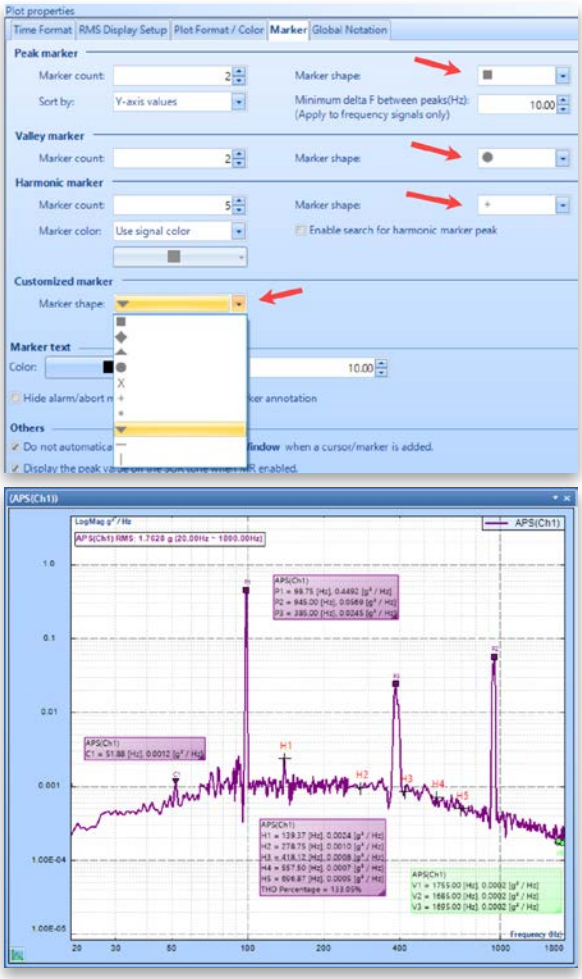
Users can select an available symbol to label a displayed signal.



Customize Symbols for Markers

Users can select the shape of various markers including customized, peak, or harmonic markers.

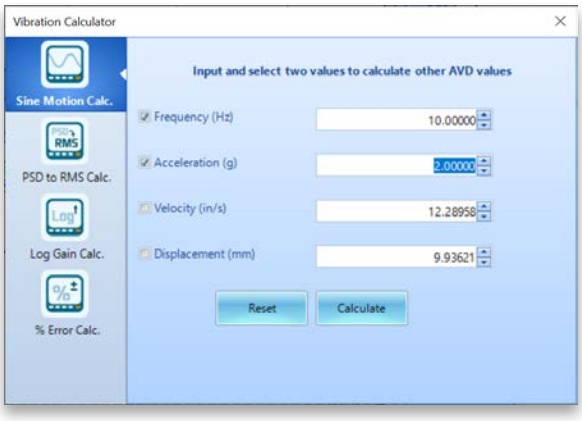
This feature provides an easy visual differentiation of markers.



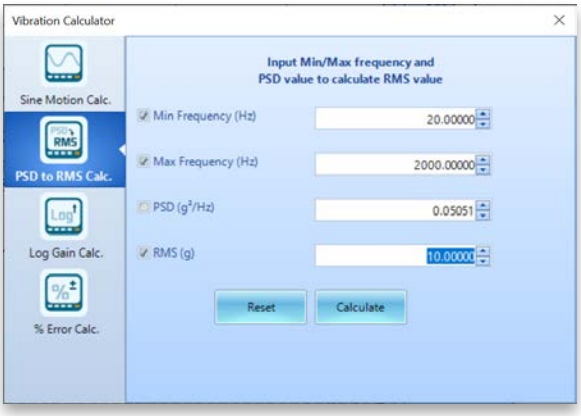
Vibration Calculator

The Vibration Calculator tool is available in EDM 10.1 as an EDM extension. This tool is accessible from the “Setup” menu and can perform various calculations as listed below:

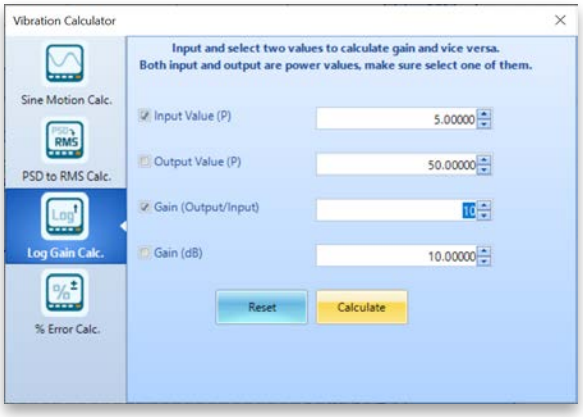
Sine Frequency/A/V/D Calculator



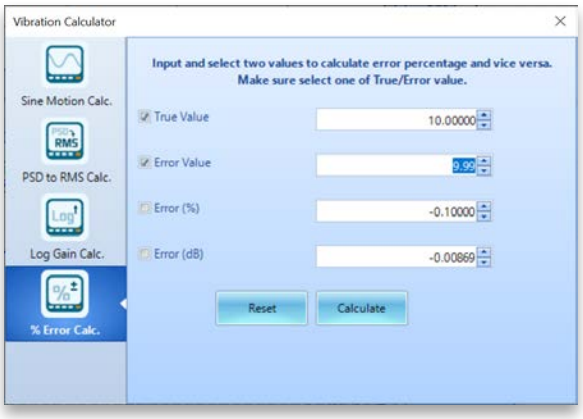
Random PSD/RMS Calculator



Gain Calculator

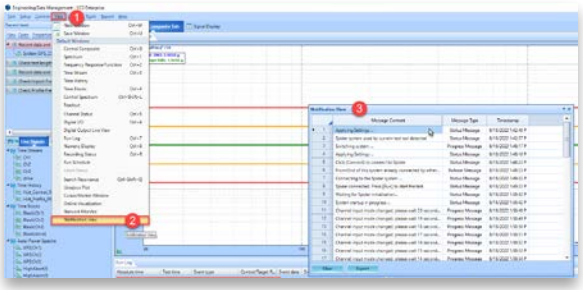


Error Calculator



View Past Pop-up Notifications

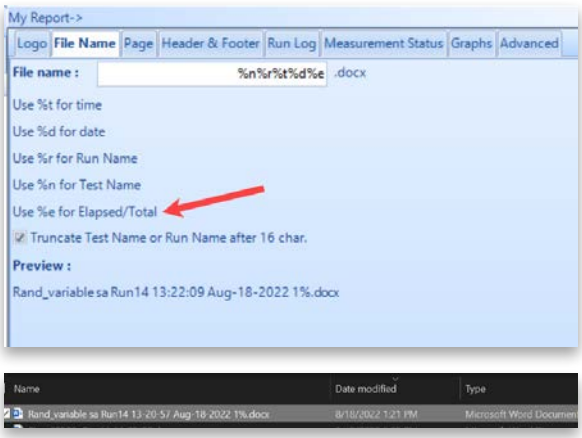
Users can now view all past pop-up notifications for a current DSA, VCS, or TDA test in the new Notification View window. This list of messages can be exported as an Excel worksheet.



Add Test Progress to Report Filename

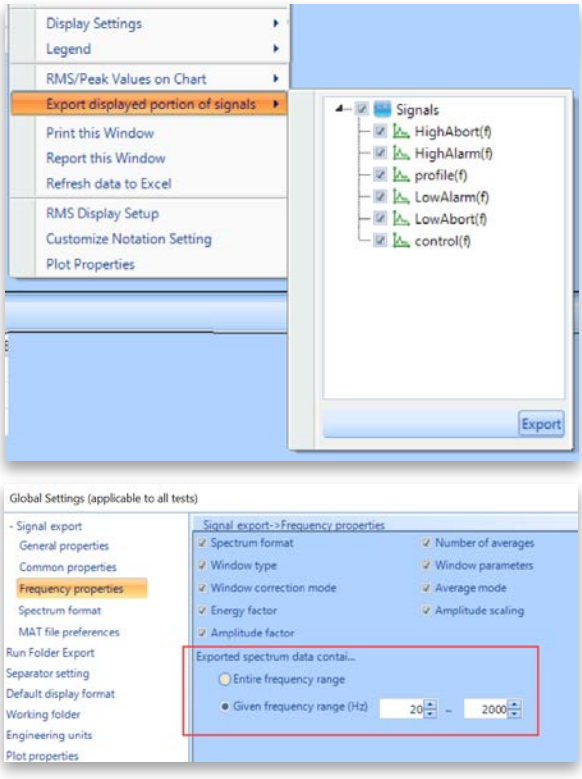
When generating multiple reports during a test, users will find it helpful to insert the test progress into the filename.

This new feature allows users to select and insert the elapsed time into the report filename.



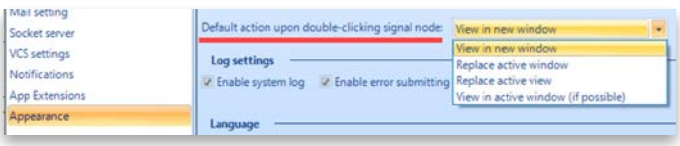
Export data within specified frequency range

Export signal data only within a specified frequency range or only within the display range.



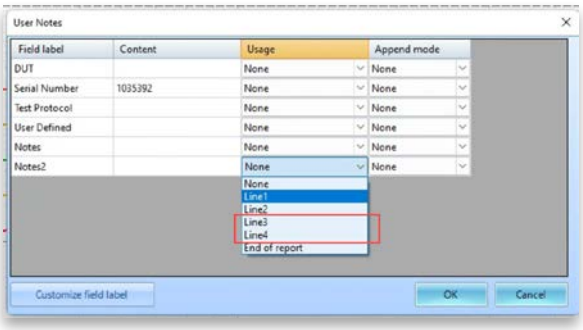
Customize double-click on signals

Users can designate the double click on a signal to perform a selectable function as shown in the following screenshot.



Add Additional Notes to Report Option

Users can now add and define several lines of text to the test report.



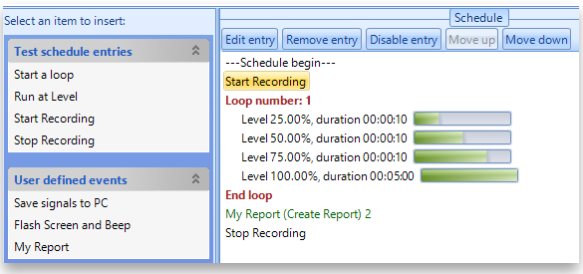
MAJOR IMPROVEMENTS

EDM Vibration Control Software

Constant A/V/D Amplitude is added as a segment type in the Sine Profile Editor.

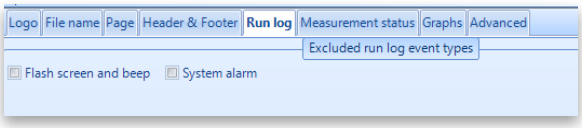
Start Recording & Stop Recording System Events in Run Schedule

The new Start Recording & Stop Recording functions allow users to easily add events in the Run Schedule without creating event rules.



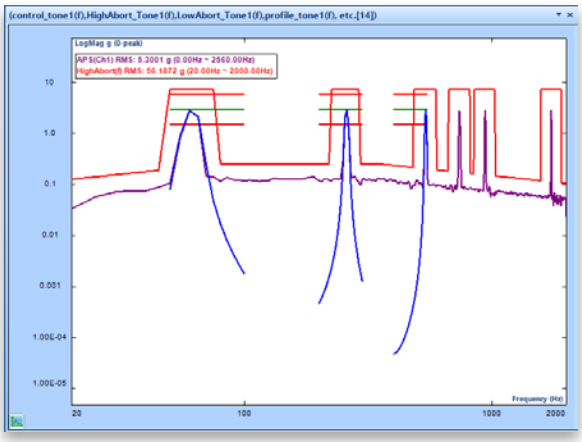
Configure and Control Run Log Event Types in Run Log

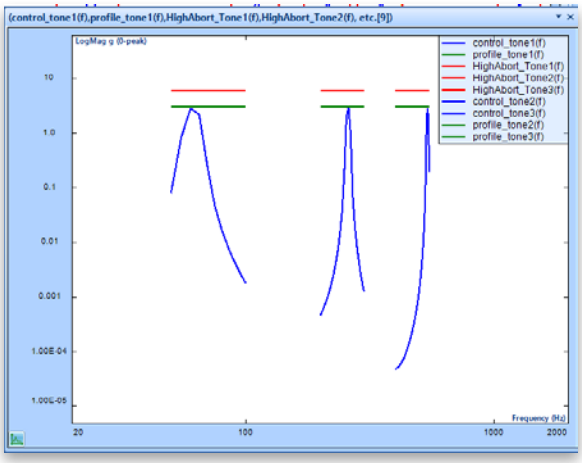
Users can access the Report Settings to exclude certain events such as “Flash screen and beep” or “System alarm” from appearing in the Run Log section of the report.

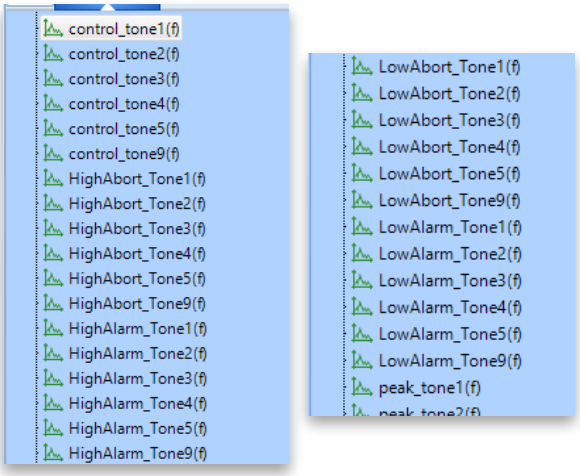


Separate Abort and Alarm Lines for SoR Sine Sweeps

Users can enable abort and alarm lines for each Sine Sweep tone from a Sine on Random test.





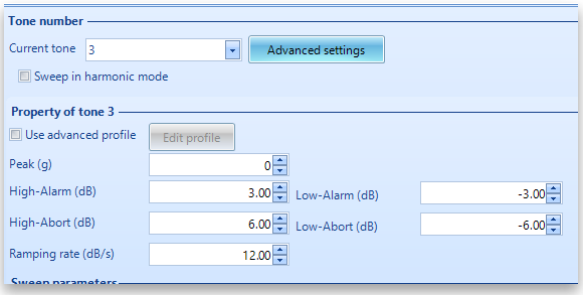


SoR Low Abort & Low Alarm for Sine Tone

Sine tones for Sine on Random tests work with high alarms and high aborts to ensure that any Sine tones beyond the user defined limits are captured.

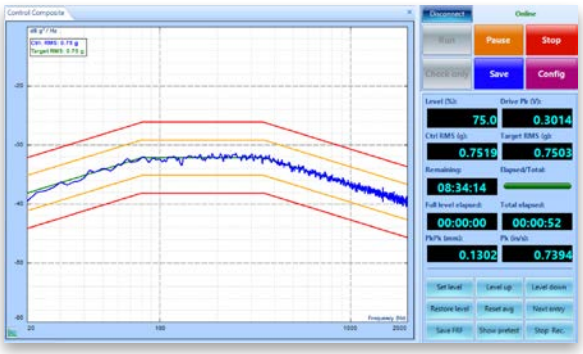
The EDM 10.1 release adds low abort and alarms specific to the Sine tones on the SOR profile.

This enables detection if any Sine tones have amplitudes that are less than the desired values.

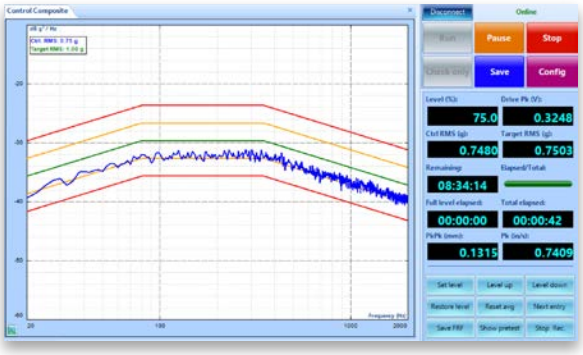


Display Profile with Level in VCS-Random

Users can display a Profile with alarm and abort lines with respect to the current level or at a user defined 100% level.

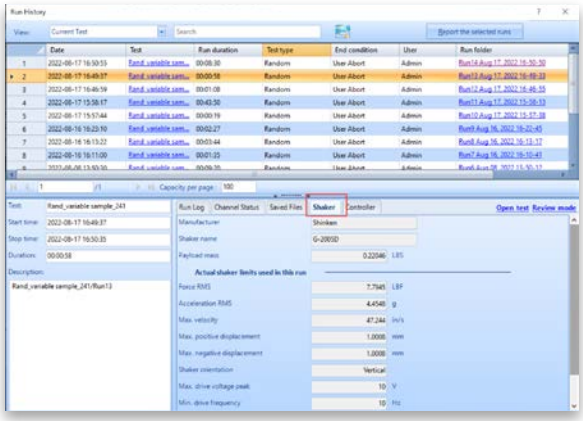


Displaying it at the current level provides an easier view of the control signal with respect to the profile and alarm/abort lines.



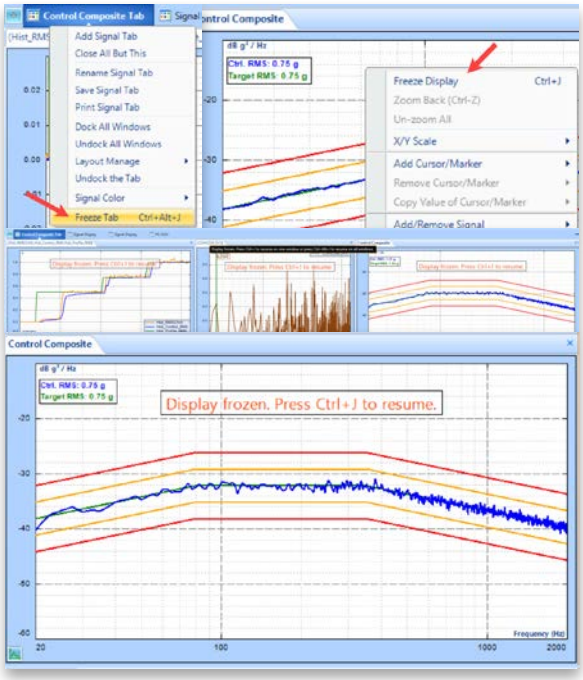
Append Shaker Information to each Run

The shaker information for each test run is saved. Users can view the type of shaker used along with the shaker limits for a test run in the Run History.



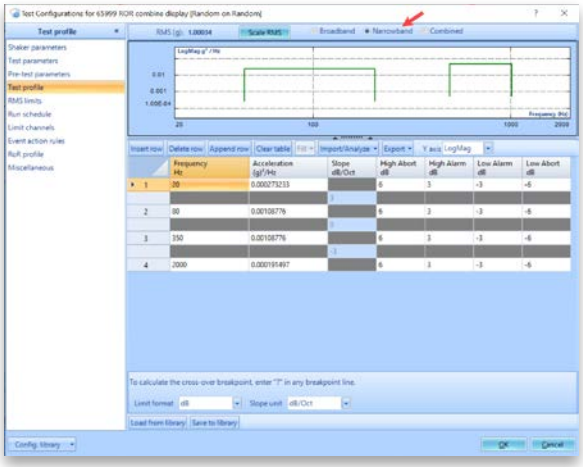
Freeze Control or Control Composite Display

Users can freeze the display to collect a report or to analyze signals. The Spider processor continuously manages the control, limiting, and alarm features even when the display is frozen.

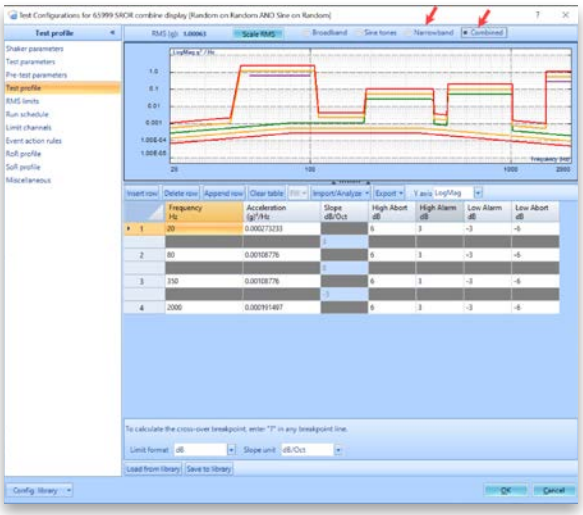


Display SOR or ROR Narrowband Profile with Broadband Profile

Random Narrowband Profile display:



Random Narrowband, Sine tone, and Broadband combined profile display:

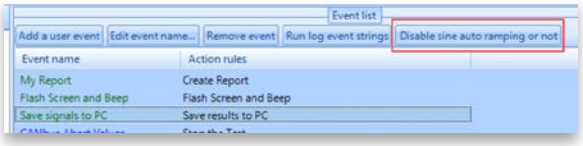


Display Low Abort and Low Alarm Lines for Limit Channels

Limit channels now support low alarm and low abort lines.

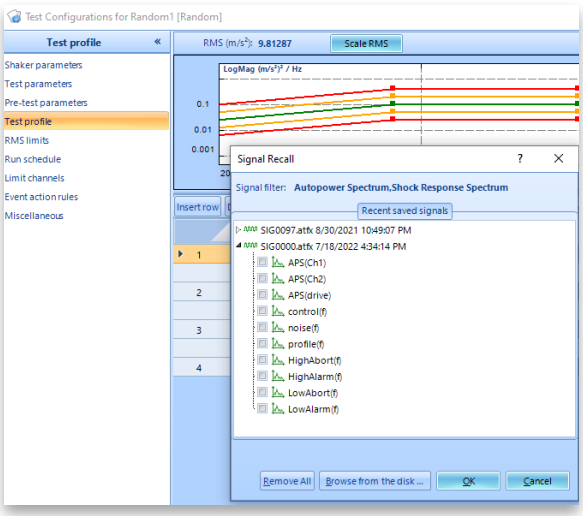
Enable/Disable Auto Sine Ramp up

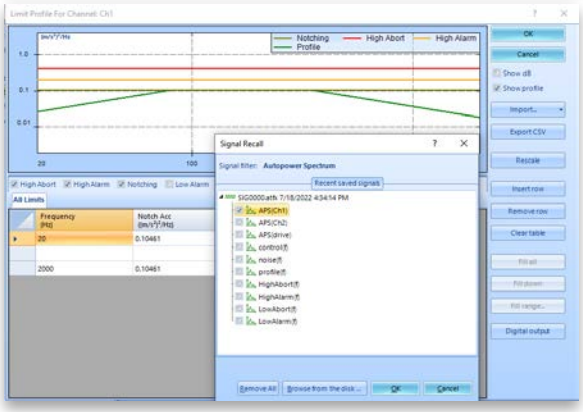
Users are provided an option to not ramp down and ramp up when a user event is between the end of an entry and where another entry begins.

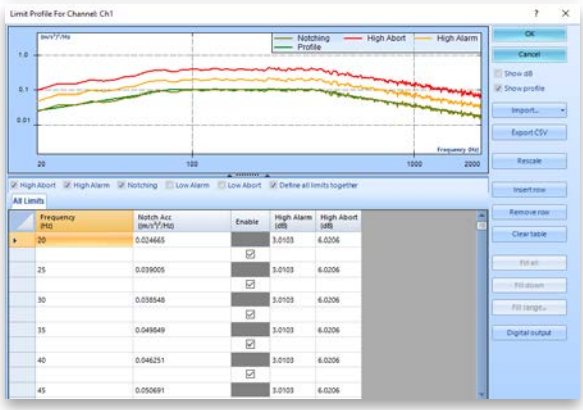


Set APS Signals as Profile/Limit in VCS-Random

The Random Test Profile and Limit Channels can now import previously ran APS signals.

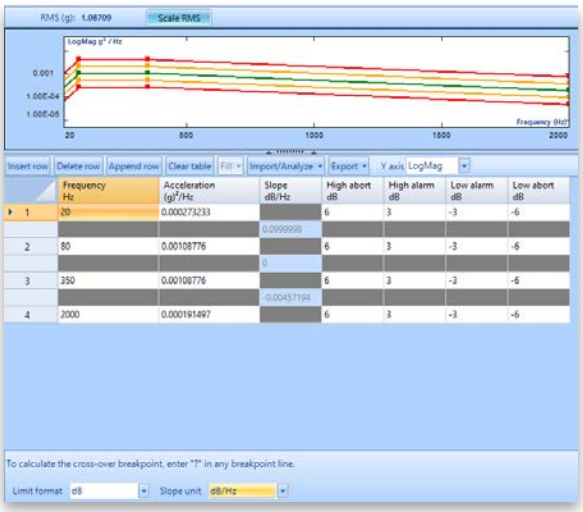






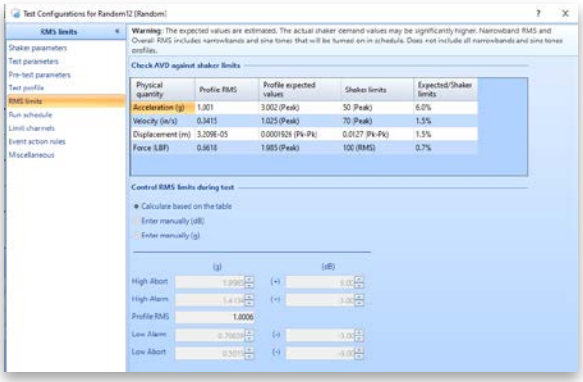
Random Profile Support Linear-Log for Slope dB/Hz

The Random test profile now shows the Frequency (Hz) in linear and Amplitude (m/s^2) in log when the slope format is selected as dB/Hz.



Random RMS Limits Support dB

The RMS limits in Random now allows users to manual enter the limit values as dB.



Improved SRS Synthesis Methods

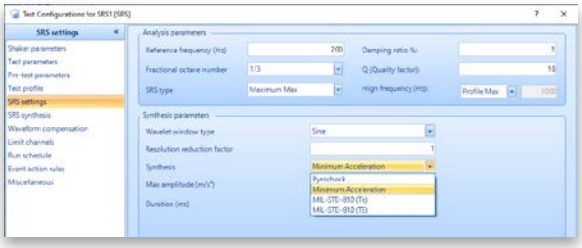
SRS Synthesis methods have been refactored into the following improved methods: Pyroshock, Minimum Acceleration, MIL-STD-810 (Te), and MIL-STD-810 (TE).

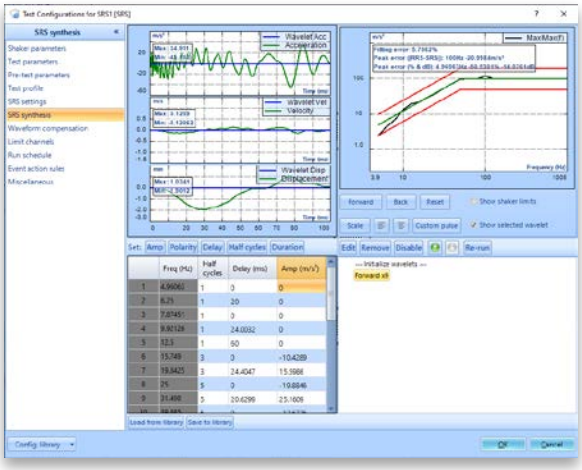
The Minimum Acceleration method takes in a suggested Max Amplitude and Duration, and attempts to spread the wavelets evenly throughout the provided duration. Half-cycles are varied amongst wavelets to fit the Max Amplitude requirement.

The Te and TE algorithms are similar to the Minimum Acceleration, except the MIL-STD-810 specific definitions of Te and TE are used to guide the synthesis. The user should iterate between different values of Te/TE and compare that to the realized Te/TE values. The input Te/TE value can be adjusted until a satisfactory Te/TE is realized.

These methods are used in conjunction with an improved “Run Schedule” list of operations for SRS synthesis, that are repeatable to save time if an upstream parameter is changed.

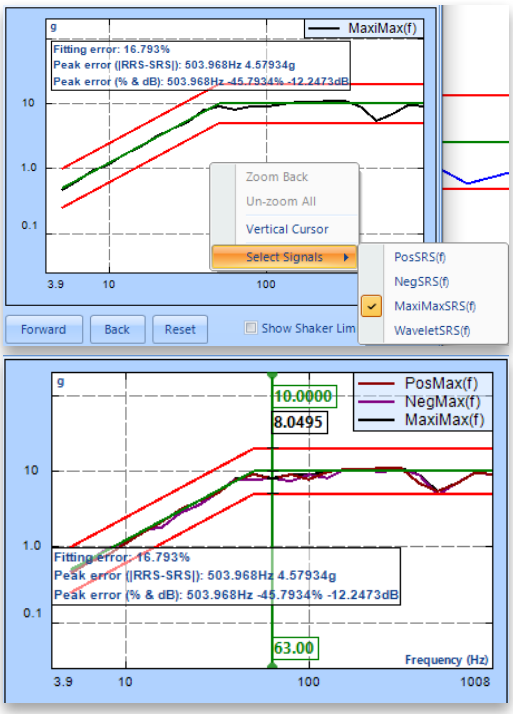
Additionally, the following wavelet types are now used: Sine, Damped Sine, and Custom User-Defined waveform.





Vertical Cursor for SRS Synthesis

SRS Synthesis graphs now provide a vertical cursor to display each data and profile point value.

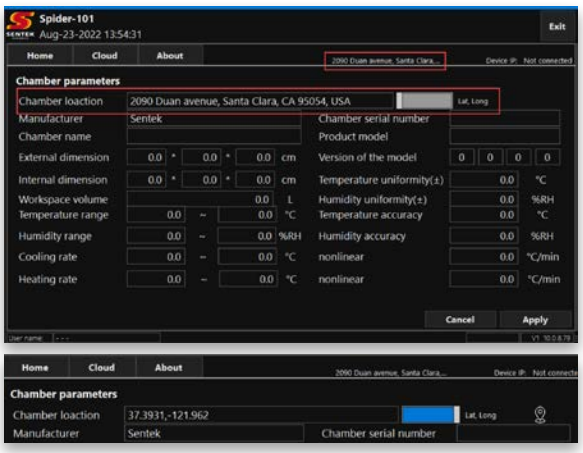


Add Shaker Name into VCS Testing Reports

The shaker name is integrated into the report when a Shaker Library is selected under Report Settings.

EDM Temperature, Humidity, Vibration Control Software

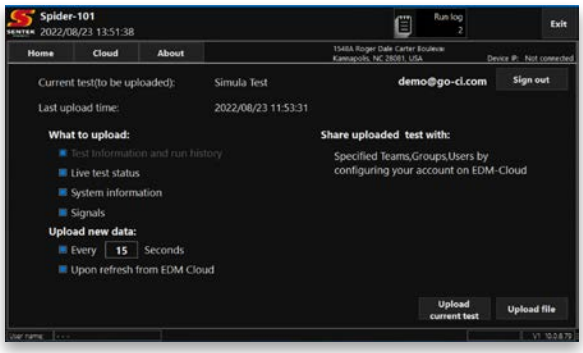
Specify Chamber Location in the chamber parameters. The location can be uploaded to EDM Cloud.



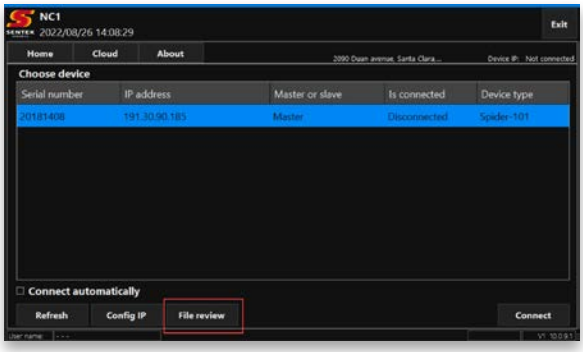
Enter address of an EDM Cloud server (CI or self-hosted servers):

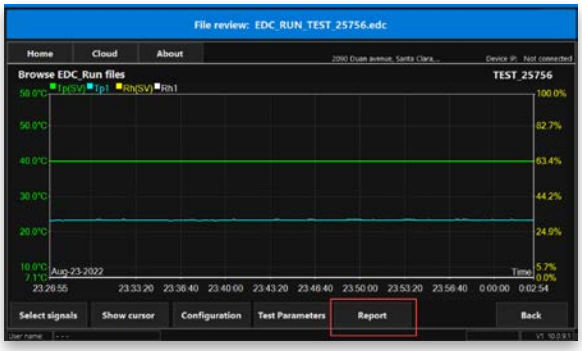
Enter login information

Upload settings for the currently running test:



Create a report from an EDC_run file



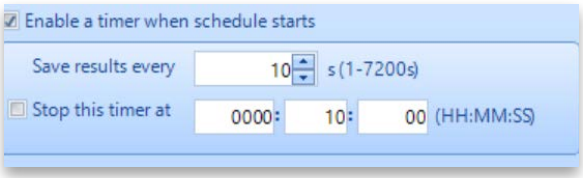


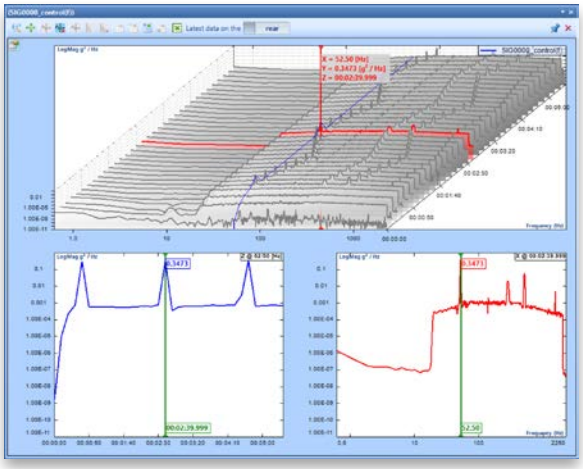
General Improvements

Improved 3D Waterfall Display

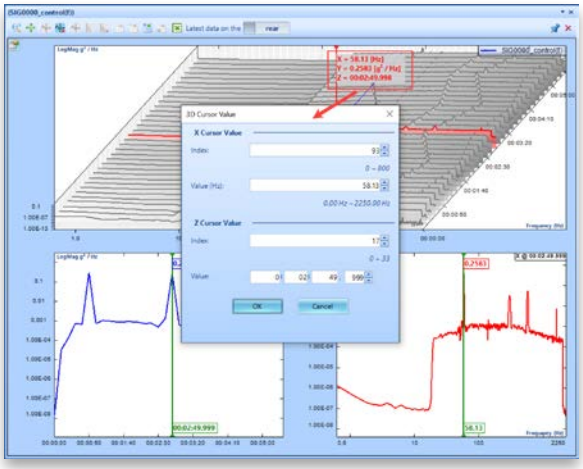
3D Waterfall Display is improved in the EDM 10.1 release.

- Synchronized display updates in 3D Plot and Slice Plots.
- Synchronized Zoom feature is introduced in 3D Plot and Slice Plots.
- Users can manually set the Z-axis range.



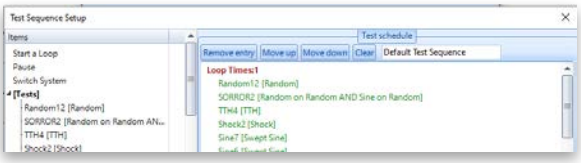


- Users can manually specify the cursor value for any axes.



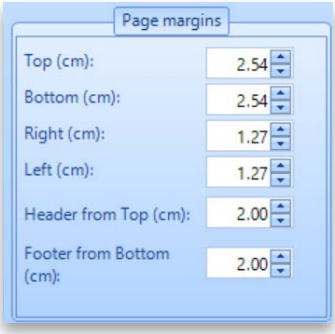
Clear in Test Sequence

The Test Sequence provides a Clear function to clear out all tests that populated the schedule by default.



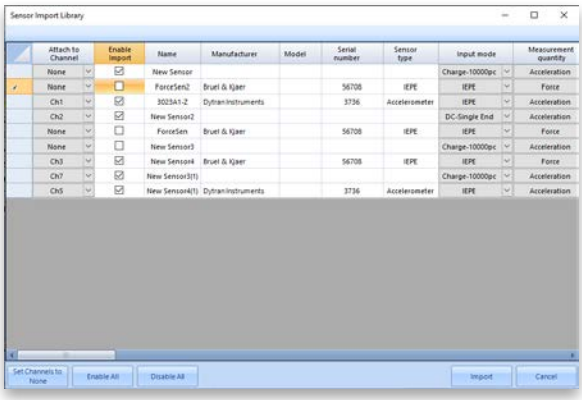
Improvements to Margins in Report

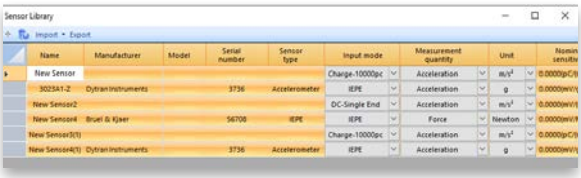
Users can set up page margins for content, header, and footer of a report template.



Enhanced Import of Sensor Data from Excel

An improved process for importing sensors to an Input Channel is introduced.

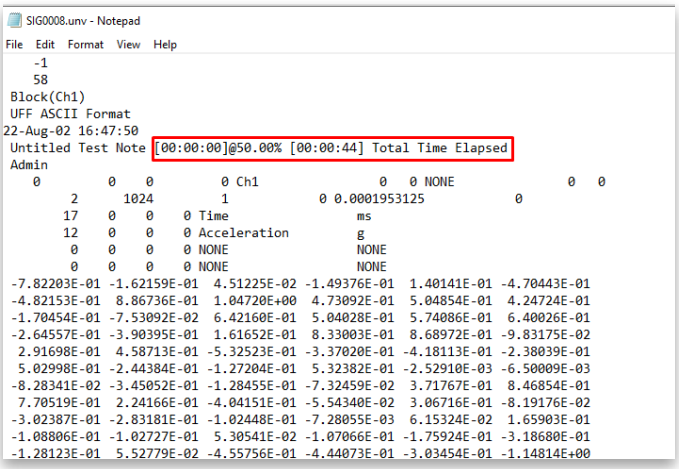


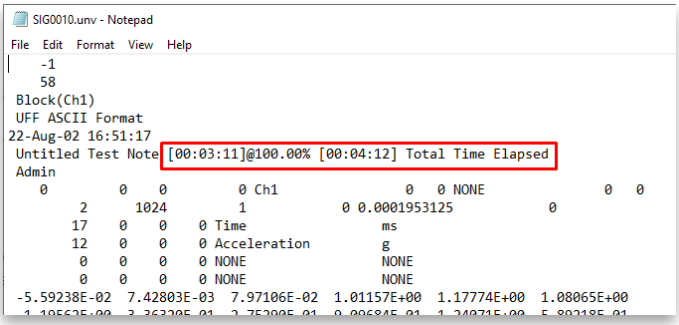


	On/Off	Measurement quantity	Engineering unit	Sensor
1	On	Acceleration	g	3023A1-Z
2	On	Acceleration	g	New Sensor2
3	Off	Force	LBF	New Sensor4
4	Off	Acceleration	g	User Defined
5	Off	Acceleration	g	New Sensor4(1)
6	Off	Acceleration	g	User Defined
7	Off	Acceleration	g	New Sensor3(1)
8	Off	Acceleration	g	User Defined

Add Time Elapsed at Full Level & Start of Test Run to UFF, UNV files

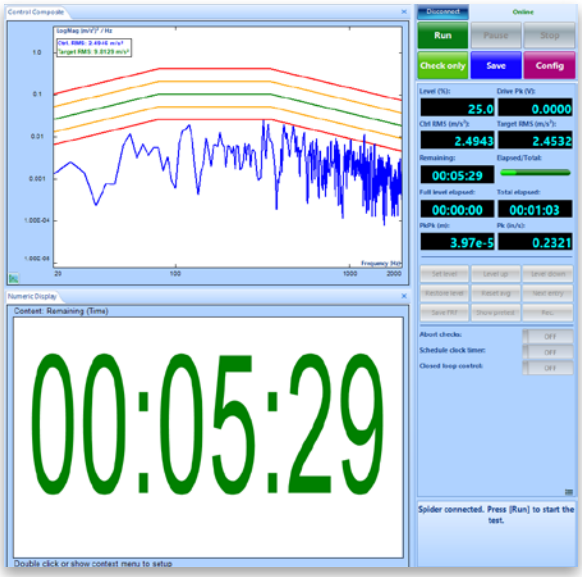
UFF and UNV files now appends the time elapsed at full level and total run time when exporting a signal.





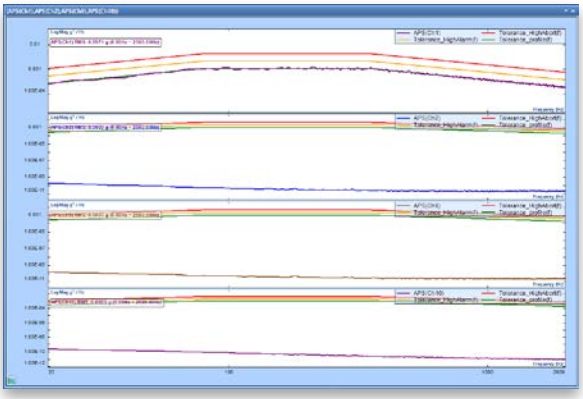
Numeric Display Improvements - Remaining Test Time

Numeric Display now displays the remaining test time.



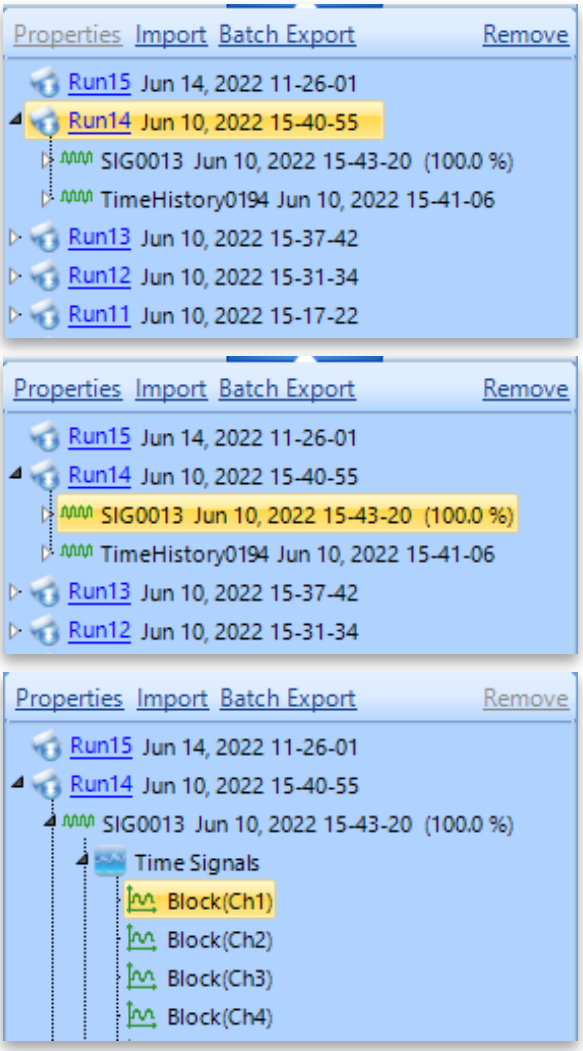
Individual Tolerance Signals for Stack Plots

Stack plot graphs can display their own tolerance signals.



Improved Run Folder Options Accessibility

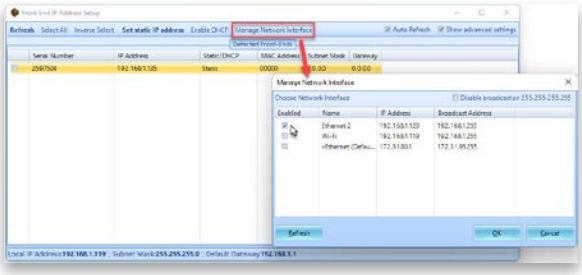
The Run Folder below Recent Tests displays commonly used options to view a Run Folder or Signal Properties, and further options to import, export and remove from view.



Selecting the Network Adapter on Front End IP Address Setup

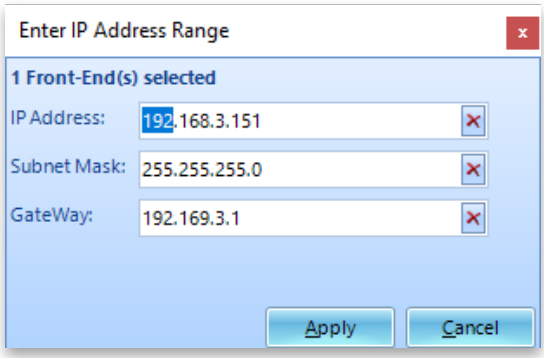
The Spider Configuration's Manage Network Interface feature to improve EDM-Spider connectivity is added to the Front-End IP Address Setup program. This streamlines the first-install Spider

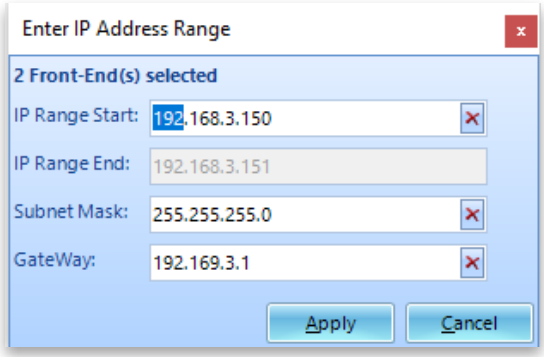
configuration by allowing users to select the network adapter on which the Spiders are available before EDM is even opened.

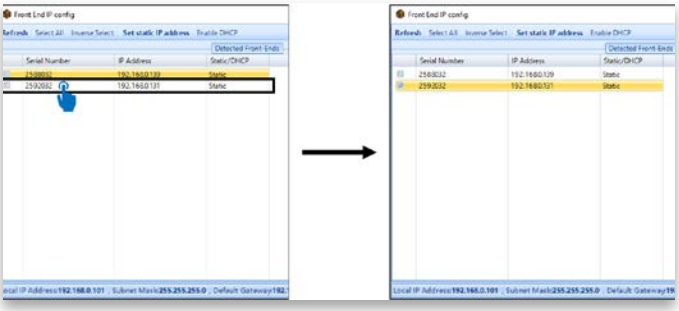


Front-End IP Address Tool Configuration Improvements

Front-End IP Configuration Tool provides an improved user interface to set up Spider device IP addresses and to select Spider devices.

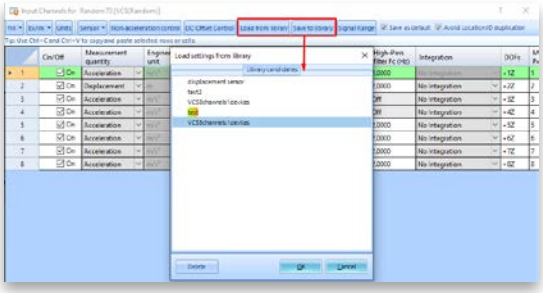


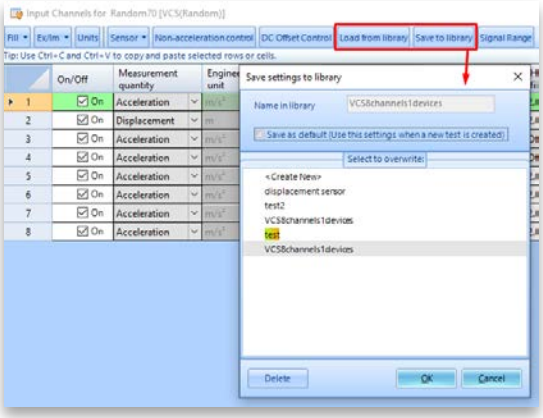


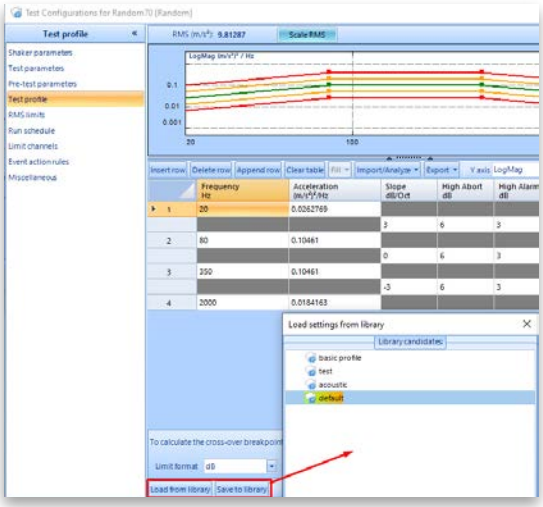


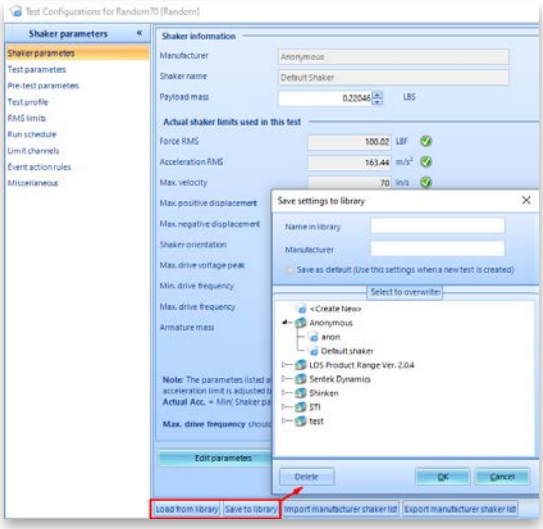
Improvements to Save/Load from Library Feature

Improved user interface to save or load from the library in EDM VCS.



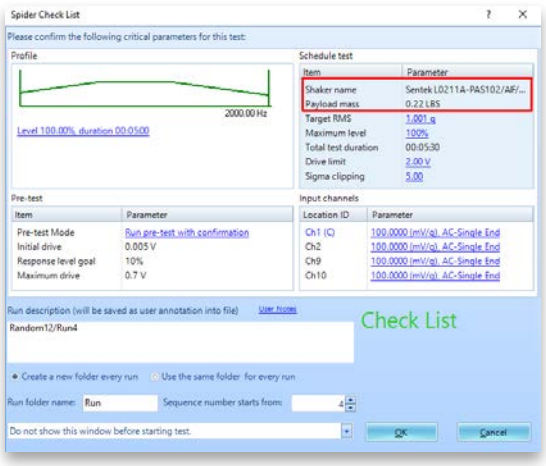






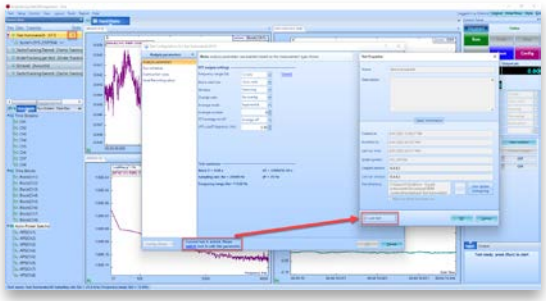
Checklist Includes Shaker Information

The test checklist displayed before a run now includes the Shaker Manufacturer, Shaker Name and Payload Mass information.



Test Locked Warning

A warning is generated if there is an attempt to change a locked test. To unlock and edit a test, select the hyperlink in the warning and unlock the test.



EDM Installation and Initial Setup Convenience

EDM 10.1 makes the user installation process as easy as possible and includes general updates and stronger default passwords to comply with newer trends in IT policy. These general improvements reduce the total number of steps required by new users to start testing with Crystal Instruments products.

SOFTWARE RELEASE HISTORY

Dates of software releases

Type	Release	Exact Version	Release Date
Release	EDM 4.2	CI 4.2.0.3	02/28/2014
Patch	EDM 4.2.0	CI 4.2.0.14	07/02/2014
Release	EDM 5.0	CI 5.0.0.2	11/27/2014
Patch	EDM 5.0.1	CI 5.0.1.3	02/27/2015
Release	EDM 5.1	CI 5.1.0.6	08/12/2015
Release	EDM 6.0	CI 6.0.0.1	05/19/2016
Patch	EDM 6.0.2	CI 6.0.2.9	08/09/2016
Release	EDM 6.1	CI 6.1.0.4	02/07/2017
Patch	EDM 6.1	CI 6.1.0.27	08/22/2017
Release	EDM 7.0	CI 7.0.0.6	02/01/2018
Patch	EDM 7.1	CI 7.1.0.7	07/19/2018
Release	EDM 8.0	CI 8.0.0.1	02/02/2019
Release	EDM 8.1	CI 8.1.0.1	11/13/2019
Release	EDM 9.0	CI 9.0.0.4	06/05/2020
Release	EDM 9.1	CI 9.1.0.0	02/03/2021
Release	EDM 10.0	CI 10.0.0.2	10/26/2021
Release	EDM 10.1	CI 10.1.0.1	09/09/2022

Type	Release	Exact Version	Release Date
Release	VDS 1.2	VDS 1.2.0.6	02/08/2019
Release	VDS 1.3	VDS 1.3.0.6	10/10/2019
Release	VDS 1.4	VDS 1.4.2.16	07/06/2020
Release	VDS 1.5	VDS 1.5.0.4	10/16/2020
Release	VDS 1.6	VDS 1.6.0.1	04/09/2021
Release	VDS 1.7	VDS 1.7.0.6	10/27/2021

SYSTEM REQUIREMENTS

Minimum System Requirements:

- **Operating System Support:** Windows 7 SP1 or higher
- **Operating System Type:** 32-bit or 64-bit
- **Processor Speed:** 1.5 GHz Dual-Core x86
- **RAM:** 4 GB
- **Available Storage Space:** 10 GB

Recommended System Requirements (Minimum for Spider Systems Higher than 16 Channels):

- **Ethernet Speed:** at least 1 Gbps Ethernet port on the computer
- **Network Cables:** provided by Crystal Instruments
- **Operating System:** Windows 10, 64-bit
- **Processor:** Intel Core i7, 2.0 GHz or Higher
- **RAM:** 8 GB DDR3 1600 or higher
- **Available Storage Space:** 10 GB or higher
- **Spider-HUB Firmware Version:** 2.0.5.17 or higher

VERSION COMPATIBILITY

Product and Software Version	Firmware Versions
Spider-80X/80Xi/80Hi/80Ci	
EDM Testing 10.0.0.x	10.0.0.x
Spider-81 (v7.x)	
EDM Testing 10.0.0.x	10.0.0.x
Spider-81B (v7.x)	
EDM Testing 10.0.0.x	10.0.0.x
Spider-80SG/SGi	
EDM Testing 10.0.0.x	10.0.0.x
Spider-20HE/20i	
EDM Testing 10.0.0.x	10.0.0.x

Product and Software Version	Firmware Versions
CoCo-80	
EDM 6.0.2.x	4.0.x
CoCo-70X	
EDM Testing 10.1.0.x (EDM CoCo for DSA)	2.0.x or above
CoCo-80X/90X	
EDM Testing 10.1.0.x (EDM CoCo for DSA)	2.0.x or above

Crystal Instruments Corporation
2090 Duane Avenue
Santa Clara, CA 95054 (USA)

Phone: +1 (408) 986-8880
Fax: +1 (408) 834-7818

Crystal Instruments Lab
1548A Roger Dale Carter Drive
Kannapolis, NC 28081 (USA)

www.crystalinstruments.com
info@go-ci.com

© 2022 Crystal Instruments Corporation. All Rights Reserved. 09/2022
Notice: This document is for informational purposes only and does not set forth any warranty, expressed or implied, concerning any equipment, equipment feature, or service offered or to be offered by Crystal Instruments. Crystal Instruments reserves the right to make changes to this document at any time, without notice, and assumes no responsibility for its use. This informational document describes features that may not be currently available. Contact a Crystal Instruments sales representative for information on features and product availability.