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Hardware Platforms

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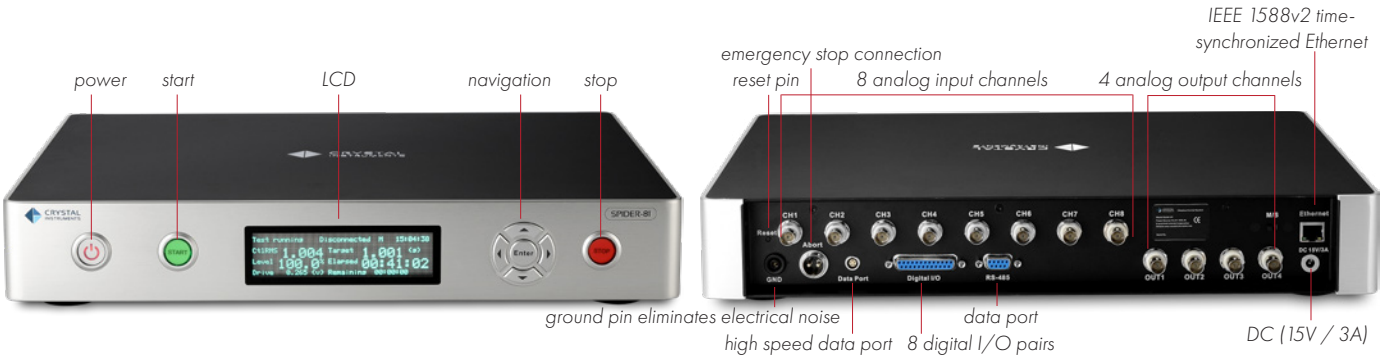


Spider-81 Premium Vibration Controller

The **Spider-81** is the flagship model of Crystal Instruments' vibration controllers. This 4th-generation hardware is highly modular, distributed, and scalable.

Features include:

- **8 analog input** and **2 analog output** channels.
- **8 digital I/O pairs** for custom applications.
- A bright **front panel LCD** displaying system status and real-time test information such as control RMS or sweeping frequency.

Expandability:

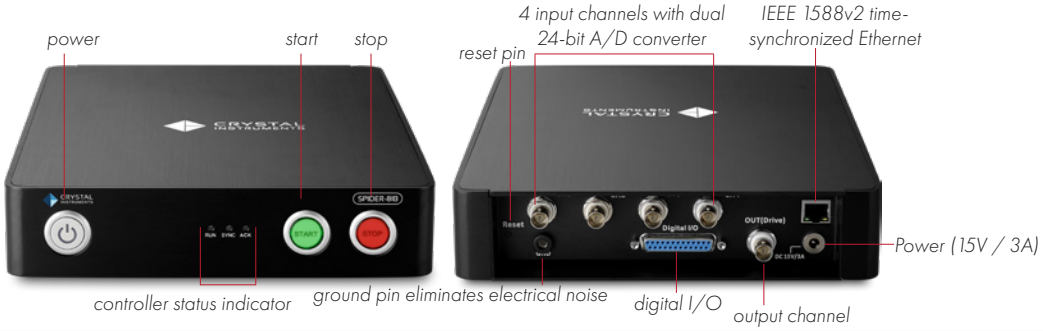
- The **Spider-HUB** industrial Ethernet switch scales the system up to **512 input channels.**
- All input channels maintain amplitude matching within **0.1 dB** and phase matching within **1°** over a **20 kHz bandwidth.**

Storage:

Built-in **4 GB flash memory** for data and test processing instructions.

Optional **Spider-NAS** for extended recording capabilities with **250 GB to 4 TB SSD storage** and optional RAID 1 configuration for data redundancy.

The Spider-81 leverages **IEEE 1588v2 time-synchronized Ethernet connectivity** for data communication. This enables remote input modules (up to 100 meters away) to connect via Ethernet without requiring dedicated sync cables, achieving sampling and triggering synchronization accuracy within **50 ns.**

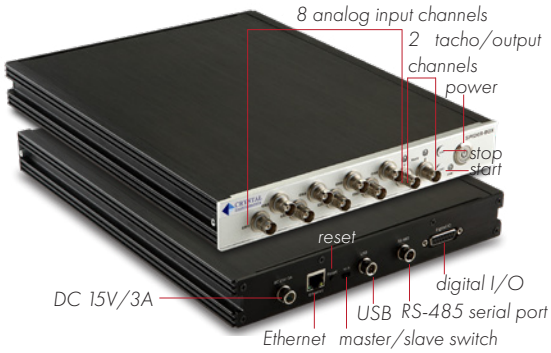


Spider-81B Economical Vibration Controller

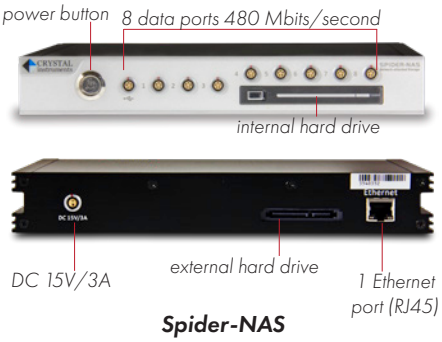
The **Spider-81B** is a smaller, cost-effective system designed for fundamental tests such as **Sine, Random, and Shock.** Despite its simplified design, it retains the exceptional control quality, safety, and measurement precision that define Crystal Instruments' controllers.

Features include:

- Supports control and up to **3 monitor signals.**
- Provides an affordable solution without compromising on quality or expandability.



Spider-80X (front & back views)



Spider-NAS (front & back views)

Spider-80X Vibration Control, Data Acquisition, & Machine Monitoring

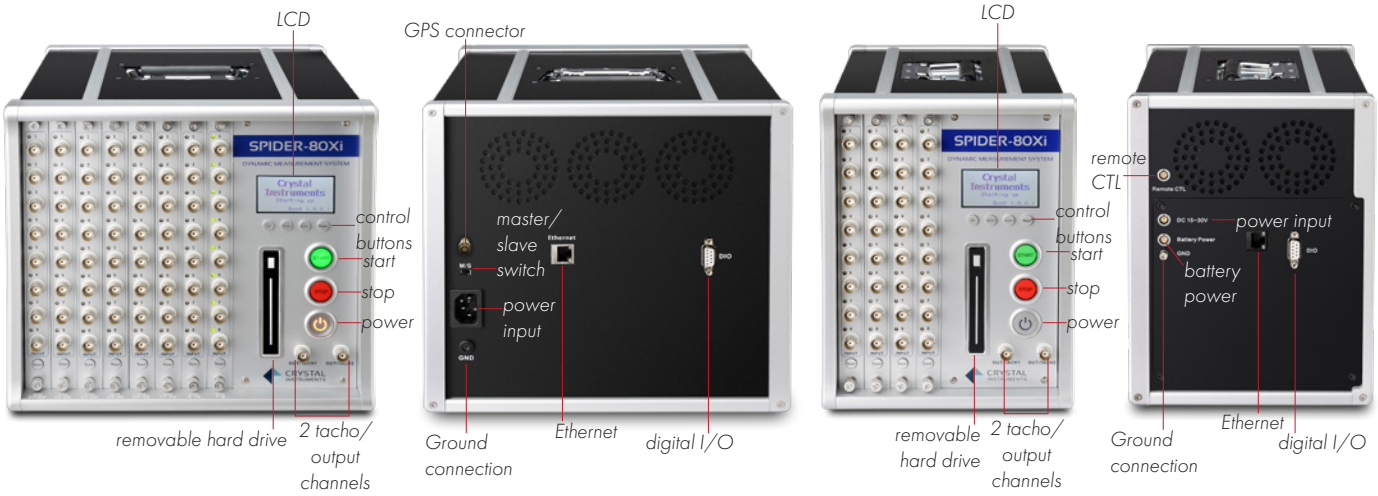
The Spider-80X combines dynamic data acquisition, vibration control, and machine monitoring in a compact form factor.

Features include:

- **8 analog input** channels.
- **2 software-selectable channels** as analog outputs or **1** tachometer inputs for rotating machinery analysis.

Applications:

- Vibration control
- Data acquisition
- Machine monitoring



64 Channel System (front & back views)

32 Channel System (front & back views)

Spider-80Xi High Channel Count System

The **Spider-80Xi** supports large-scale, high-channel-count data acquisition systems for portable field testing. Weighing less than **10.5 kg**, a single chassis offers **64 input channels** and excels in field testing where portability is critical.

Key features:

- AC-powered (100-240V) for **64-channel chassis.**
- DC-powered (10-22V) for **32-channel chassis**, operable with **Spider-Battery** for up to **4 hours** of portable data acquisition.

Scalability:

- Up to **512 synchronized channels** across multiple chassis.
- Supports a wide range of front-ends, including **voltage, IEPE, strain gage, temperature, and charge mode sensors.**

Applications:

- Modal testing
- Vibration control
- Dynamic signal measurement
- Data acquisition

Spider-HUB (front & back views)

Spider-80M MIMO Control and Structural Testing

The **Spider-80M** platform, based on the Spider-80Xi architecture, is optimized for **MIMO Vibration Control Systems (VCS)** and **MIMO Structural Testing**.

Key features:

- Each chassis supports **16 analog outputs** for **6-DOF MIMO testing**.
- Expandable to **8 output and 504 input channels** or **16 output and 496 input channels** when combined with Spider-80Xi chassis.

Applications:

- Multi-input Multi-output Vibration Control.
- MIMO FRF testing for structural analysis.

Hardware Platform	Spider-81	Spider-81B	Spider-80X	Spider-80Xi	Spider-80M
Application	VCS, DSA*	VCS, DSA*	VCS, DSA, EMA, RCM*	VCS, DSA, EMA, RCM*	MIMO VCS, MIMO FRF*
Max sampling rate	512 kHz	512 kHz	512 kHz	512 kHz	512 kHz
Number of inputs per front-end	8	4	8	8	8
Number of front-end per chassis	1	1	1	8	7
Max number of inputs per chassis	8	4	8	64	56
Max number of inputs per system	512	4	512	512	504 (496)
Number of outputs per system	4	1	2	2	8 (16)
Input mode	Charge TEDS IEPE Voltage	Charge TEDS IEPE Voltage	Charge (optional) TEDS IEPE Voltage	Charge (optional) TEDS IEPE Voltage Strain gage MEMS RTD Thermocouple	Charge (optional) TEDS IEPE Voltage Strain gage MEMS RTD Thermocouple
Digital I/O	8 in/out, isolated	4 in/out, isolated	2 in/out, isolated	2 in/out, isolated	2 in/out, isolated
Front panel LCD	Yes	No	No	Yes	Yes
Record to Spider-NAS	Yes	No	Yes	Yes	Yes
Notes	Flagship product for VCS line. Input protection up to 250 V. Equipped with Stop/ Start button.	Economical solution	Modular at box level.	Modular at board level. Input Mode depends on front-end type. View following table.	Modular at board level. Input Mode depends on front-end type. View following table.

** VCS = Vibration Control System*
** DSA = Dynamic Signal Analyzer*
** EMA = Experimental Modal Analysis*
** RCM = Remote Condition Monitoring*
** MIMO VCS = Multi-input Multi-output Vibration Control System*
** MIMO FRF = Multi-input Multi-output FRF analysis in EMA*

The Front-ends of the Spider-80Xi and Spider-80M Platform					
Front-end types	**Spider-80Hi**	**Spider-80Ci**	**Spider-80Gi**	**Spider-80SGi**	**Spider-80Ti**
Max sampling rate	512 kHz	512 kHz	25.6 kHz	512 kHz	1 kHz
Number of inputs per front-end	8	8	16	8	16
Connector type	BNC	BNC	50 pin D-Sub	LEMO	6-pin pluggable terminal blocks
Input type	IEPE Voltage TEDS	IEPE Voltage TEDS Charge	Strain gage-based sensors	Voltage Strain gage Strain gage-based sensors MEMS DC-based sensors IEPE	3-wire RTD K type thermocouple
Input coupling	AC Differential DC Differential AC Single-ended DC Single-ended	AC Single-ended DC Single-ended	AC Differential DC Differential	AC Differential DC Differential Bridge-Based Sensor	PT 100 (RTD) K, S, T, J, R -Type thermoucouples (TC)
Sensor excitation	4.2 mA at 21 V for IEPE	4.2 mA at 21 V for IEPE	+/-2.5 V, +/-5 V	+/2.5 V, +/5 V, 10 V 22 V for IEPE	10 µA to 1.5 mA RTD
Strain gage type	-------	-------	Quarter Bridges (Type I,II, 3 – Wire Quarter Bridge) Half Bridge (Type I,II) Full Bridge (Type I,II) Excitation voltage: ±2.5, ±5	Quarter Bridge (Type I, II) Half Bridge (Type I, II) Full Bridge Type (I, II) Excitation voltage: ±2.5, ±5	
Max input range	±20 V_{pk}	±20 V_{pk}	±10 mV, ±100 mV, ±1 V, ±10 V	±10 mV, ±100 mV, ±1 V, ±10 V	400 Ohm (RTD) ±80 mV (TC)
Input protection voltage	±220 V	±220 V	±40 V	±40 V	-------
Analog to digital converter per channel	Dual 24-bit ADC	Dual 24-bit ADC	24-bit ADC	24-bit ADC	24-bit ADC
Cross talk rejection	Better than 120 dB	Better than 120 dB	Better than 120 dB	Better than 120 dB	-------
Amplitude accuracy	±0.1% at 1 kHz 1 V	±0.1% at 1 kHz 1 V	0.1% typical, Less than 1.5% (up to 10 KHz), cable length up to 1000 ft (18AWG)	±0.1%	-------
Phase match	< 1° up to 20 kHz	< 1° up to 20 kHz	< 1° up to 20 kHz	< 1° up to 20 kHz	-------

High Channel Count System Using Spider Front-ends

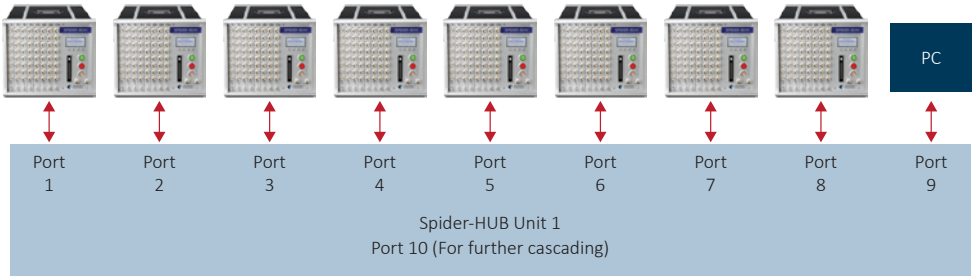
www.crystalinstruments.com/high-channel-vibration-controller-system

Spider-HUB Industrial Ethernet Switch

Spider-NAS Network Attached Storage

Spider-80X Front-end

Spider-80Xi System (512 Channel Count)



Modular, Scalable Spider Systems

Crystal Instruments' **Spider systems** utilize **Ethernet** and advanced **time synchronization** technology to support up to **512 input channels.** All data is:

- Simultaneously acquired.
- Phase matched to <1 ° across the testing frequency range.

This precision enables accurate **frequency response analysis** and **modal shape/damping ratio** characterization.

Versatile Test Performance

Spider systems excel across test modes:

- **Swept Sine:** Tracking filters and notching on any channel.
- **Random/Sine-on-Random:** Limiting functions applied simultaneously.
- **TTH and Shock:** Synchronized data capture across all channels.

This integration of **dynamic signal measurement, modal data acquisition,** and **vibration control** across up to **512 channels** sets the Spider system apart as the **only solution of its kind worldwide.**

Spider-HUB and Spider-NAS

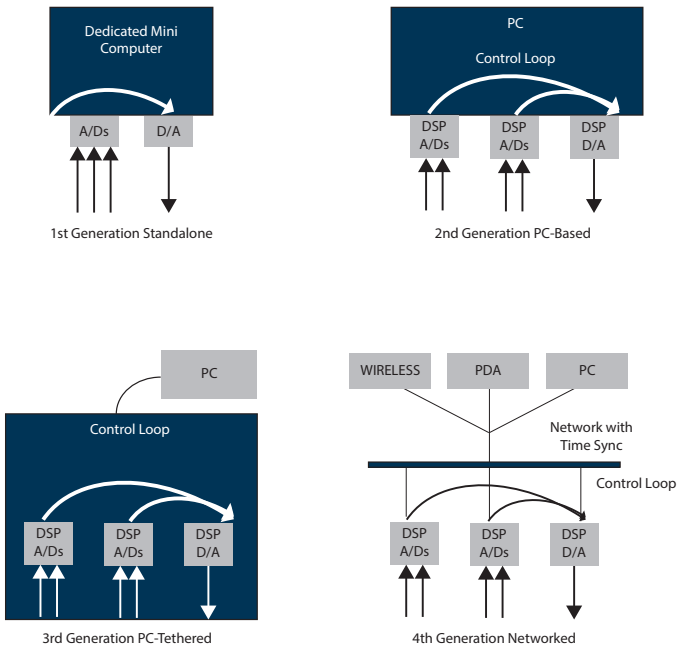
- **Spider-HUB:** Provides high-speed Ethernet connectivity for linking multiple Spider front-ends.
- **Spider-NAS:** High-capacity external storage ideal for large-scale, high-sample-rate applications.

Data Recording Capabilities

- **High Channel Count:** Record raw time data from up to **512 input channels** with sample rates up to **512 kHz**. (record 8 channels per front-end at up to 102.4 kHz or record 1 channel per front-end at up to 512 kHz)
- **Storage Options:**
  - **Internal Flash Memory:** Convenient on-board storage.
  - **Spider-NAS Devices:** Provide external storage of up to **250 GB per 64 channels**, expandable to **4 TB**. Each Spider-NAS can optionally be configured with **RAID 1** for enhanced data redundancy and safety.
  - **Local PC Storage:** Direct recording with built-in safety and redundancy.
  - **Parallel Recording:** Continuous data recording runs seamlessly alongside vibration control without impact.
- **High Accuracy:**
  - **IEEE 1588 Time Synchronization:** Ensures 50 ns accuracy across front-end modules.
  - **Dynamic Range:** Up to **175 dB.**
  - **Frequency Resolution:** As fine as **0.001 Hz.**
  - **Post-Processing:** Analyze data using **EDM Post Analysis Software** for detailed insights.

For systems over **64 channels,** multiple Spider-NAS units ensure seamless storage.

Unique Features



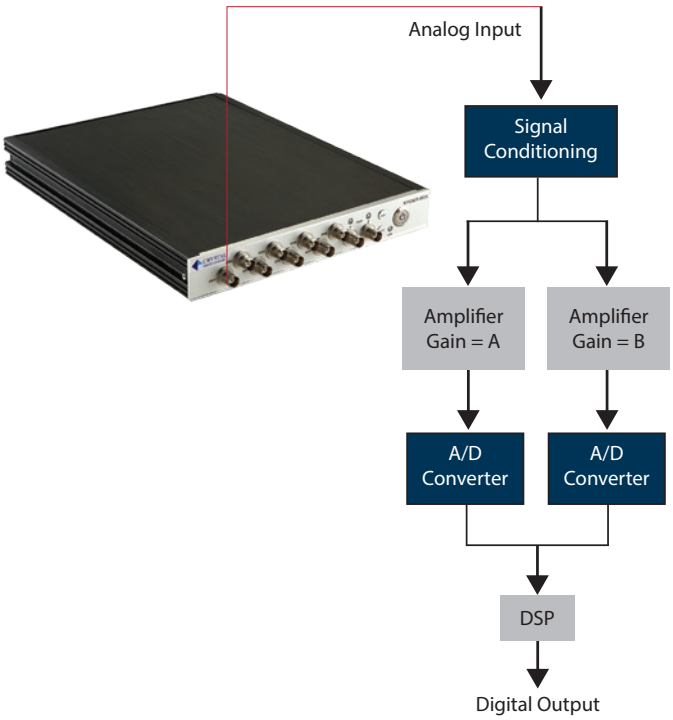
The Spider platform is based on a fourth generation DSP centralized architecture.

Latest Hardware Design

Crystal Instruments' Spider front-ends support various inputs, including **voltage, IEPE,** and **charge sensors,** ideal for shock, vibration, and acoustic measurements.

Key highlights:

- **Up to 512 input channels** for high spatial resolution.
- Sampling rates up to **512 kHz**.
- Internal **flash memory** for configuration and real-time analysis.
- **220 V transient protection** for input channels.
- Scalable architecture supporting NAS/PC data recording.



Hardware per US Patent 7,302,354 applies two ADCs to each input channel.

Wide Measurement Capabilities

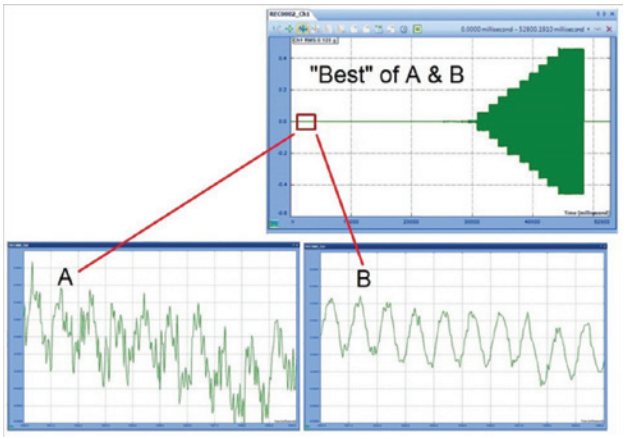
The Spider series supports diverse measurements, including **acceleration, displacement, strain, temperature, force, torque,** and more, with compatibility for a wide range of sensors.

Shaker Compatibility

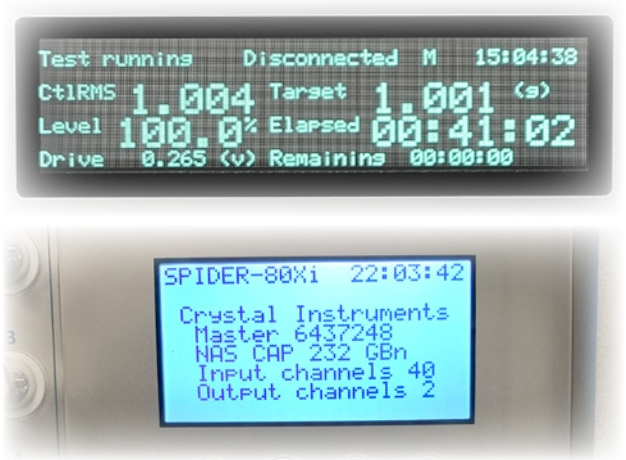
Spider controllers integrate with **electrodynamic, servo-hydraulic,** and **servo-electric shakers** across all force ranges, from desktop systems to large multi-ton systems. Frequency range extends from **sub-1 Hz to 40 kHz.**

Precision and Accuracy

- **Single-ended/differential AC/DC input coupling.**
- Built-in **charge amplifiers** for high-shock testing.
- **IEPE mode** with TEDS (IEEE 1451.4) transducer support for plug-and-play compatibility.
- Using our patented parallel dual analog-to-digital converter (ADC) design (U.S. Patent Number 7,302,354), each measurement channel provides an unprecedented **dynamic range of 175 dBFS** (v8.9 and later) and can detect signals as small as 600 nV and as large as 20 V. This design eliminates the need for the input range or gain settings found on traditional controllers.



DSP knows how to pick the data from either A or B path, and "stitch" them together.



Simple Network Connectivity

Ethernet connectivity allows Spiders to be located far from the host PC, reducing electrical interference. Multiple controllers can be monitored and controlled over a single network, ensuring reliable performance.

Advanced Time Synchronization

Using **IEEE 1588 PTP** technology, Spider front-end modules achieve synchronization accuracy within **50 ns**, ensuring **±1° phase match** up to **20 kHz** across the entire system.

Black Box Mode

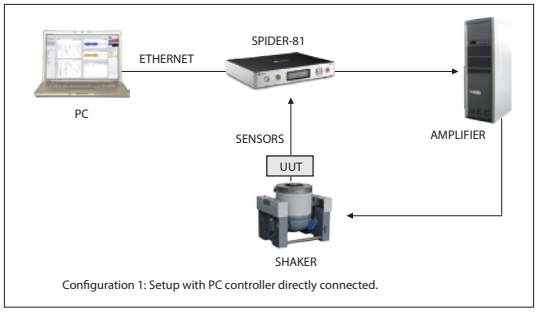
Operate Spider autonomously without a PC. Use a PC for configuration and data retrieval only.

LCD Display

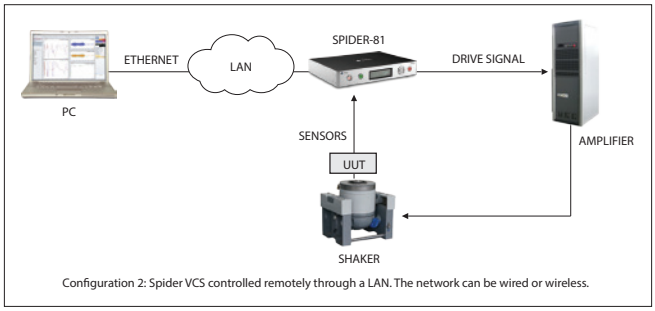
The **Spider-81, Spider-80Xi**, and **Spider-80M** models feature a bright LCD display to show real-time test status, IP settings, and navigation information.

High Reliability and Safety

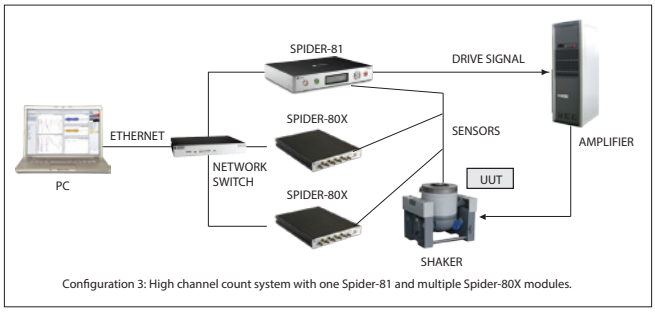
- **Fail-safe operation** during network or power loss.
- Sensor failure detection within milliseconds.
- Early detection mechanisms ensure power loss protection
- Rigorously tested for **EMI, vibration, drop shock,** and environmental durability.



Configuration 1: Setup with PC controller directly connected.



Configuration 2: Spider VCS controlled remotely through a LAN. The network can be wired or wireless.



Configuration 3: High channel count system with one Spider-81 and multiple Spider-80X modules.

High Performance Control

- Feedback loop time of Sine and Random control reach 10 ms latency
- Improve control performance for resonance search and at high-Q resonances.
- Shorter response time for safety measures

Ease of Use

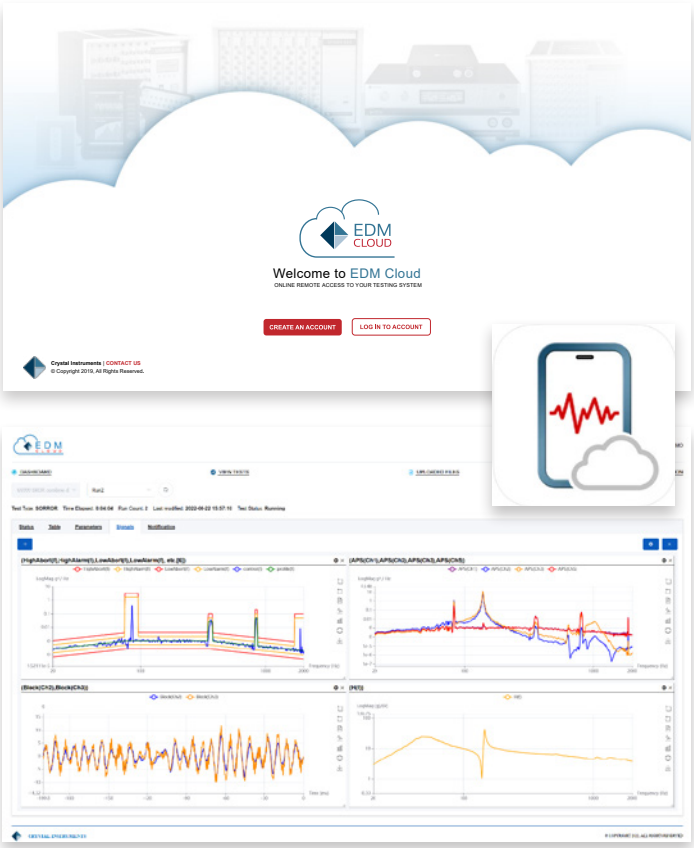
- **Graphical interface** with intuitive tools and setup wizards.
- Features like **Event-Action Rules** and **Abort-Sensitivity** simplify operation.
- Smart **network detection tools** for hassle-free installation.

Admin and User Account Permissions

The controller software provides different account profiles with permissions that can be enabled or disabled (e.g., editing profiles, manually control of run level) to meet the user's role in the organization. An account with disabled features uses a cleaner interface that minimizes confusion.

Variable Sampling Rate

Applications that require measuring several quantities (e.g., acceleration, strain, temperature) may have different requirements for the sampling rate. The Spider product line provides a variety of front-ends that support mixed sampling rates for different quantity measurements.



Cloud and Mobile Access

- Access real-time test status via **EDM Cloud** (https://cloud.go-ci.com/) on web browsers or the **EDM Mobile app** (on both iOS and Android).
- Fully encrypted data transmission with secure login credentials.
- Test data sharing among team members
- Trial account: demo@go-ci.com, password: Spider-80X

Vibration Visualization

This feature animates the DUT's deformation during a vibration test from real-time measurements. The animation is based on the 3D model (geometry) of the DUT, which can be imported from a FEA/CAD model or be constructed from a sequence of evenly spaced photos taken around the object with a tool included in the EDM software.

Scalability and Flexibility

Spider hardware allows users to scale systems as needed. For example, **8 Spider-80X front-ends** can function as a **64-channel system**, two **32-channel systems**, or eight **8-channel systems**.

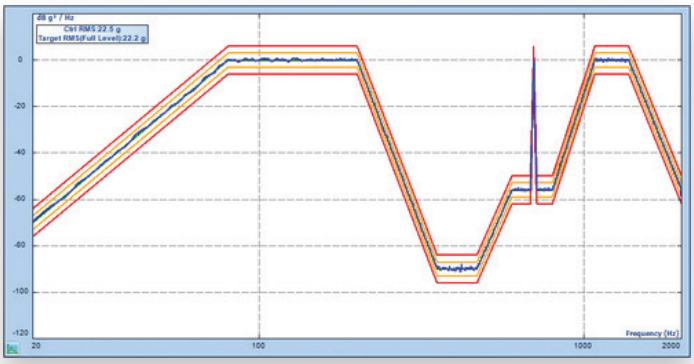
Flexible Storage and Data Security

Choose the best storage solution for your application:

- **Front-End Storage:** 4 GB internal storage.
- **Spider-NAS:** Up to **4 TB SSD** with RAID 1 for redundancy.
- **PC Storage:** Configurable RAID 1 or other types for enhanced data security.

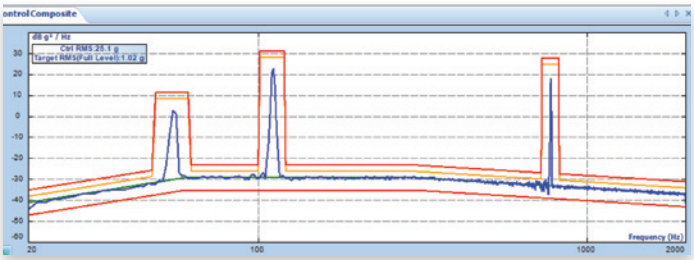
Vibration Control Software

Crystal Instruments' Vibration Control Software (EDM VCS) offers industry-leading solutions for precise, real-time vibration testing across multiple applications. Designed to meet stringent testing standards, EDM VCS combines powerful control algorithms with a user-friendly interface to ensure accurate, repeatable results



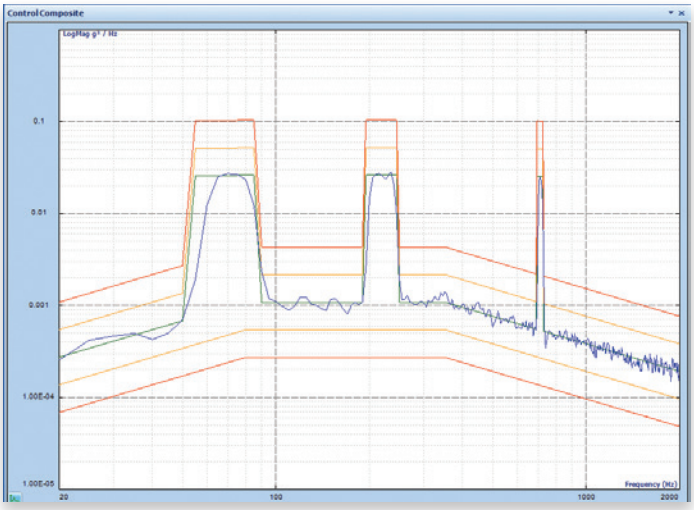
Random Vibration Control

- Generate **Gaussian** or **non-Gaussian** random signals for broadband excitation.
- Meets **aerospace** and **military testing standards.**
- Assign input channels for **control, monitoring,** or **limiting.**



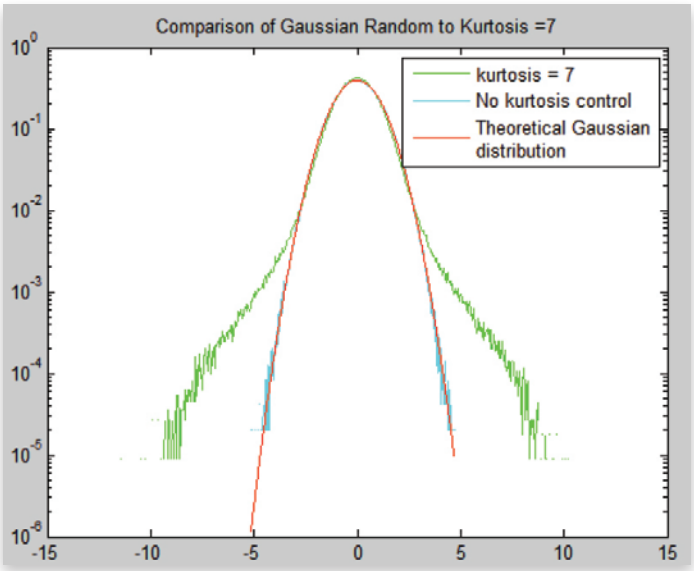
Sine on Random Control

- Add up to **12 sweeping sine tones** and **32 harmonic tones** to random signals.
- Customizable **sweep rates** and schedules for real-world simulation.
- **Multi-resolution technology** improves low-frequency accuracy without affecting response time.



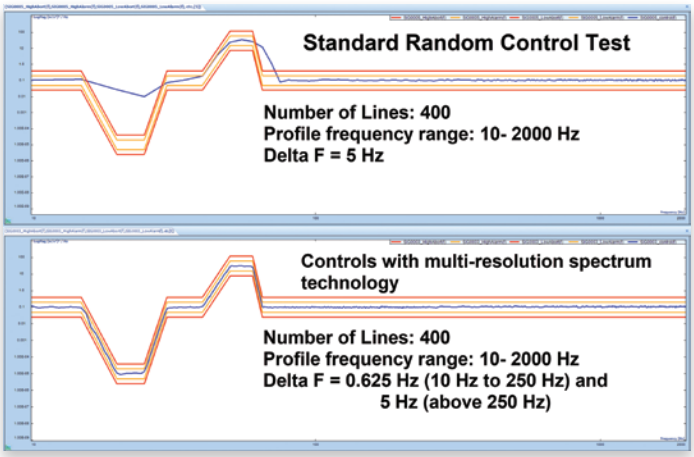
Random on Random Control

- Superimpose up to **32 random narrowband signals** on a broadband random signal.
- Independent schedules for sweeping, activation, and deactivation.



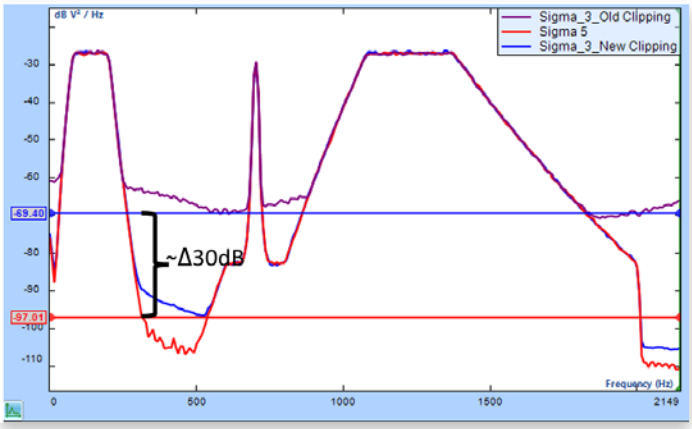
Kurtosis Control

- Generate more damaging **non-Gaussian control signals** while maintaining the spectrum shape.



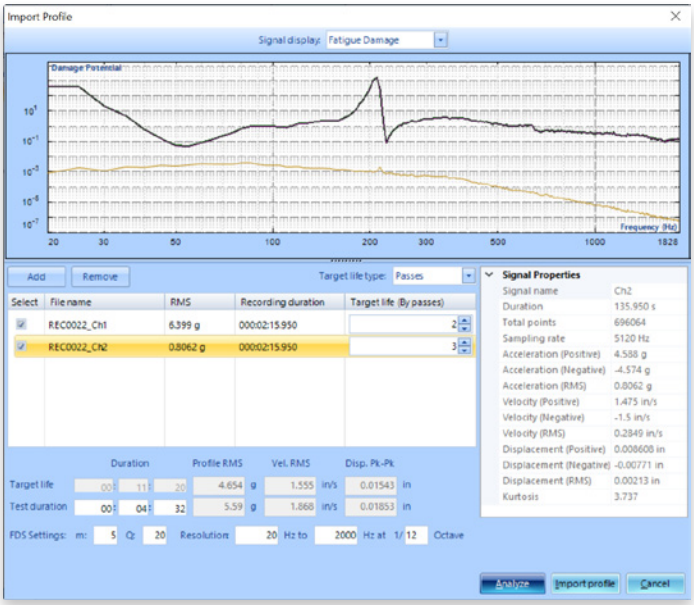
Multi-Resolution Control

- Provides **8x finer frequency resolution** in lower frequencies.
- Enhances control accuracy and dynamic range without sacrificing response time for detecting alarms and aborts.
- Supports **Random, Sine-on-Random,** and **Random-on-Random** tests.



Intelligent Clipping on Drive Signal

- Minimizes control dynamic range loss while reducing high-frequency amplitudes by **-30 dB**.
- Ensures optimal control signal performance.

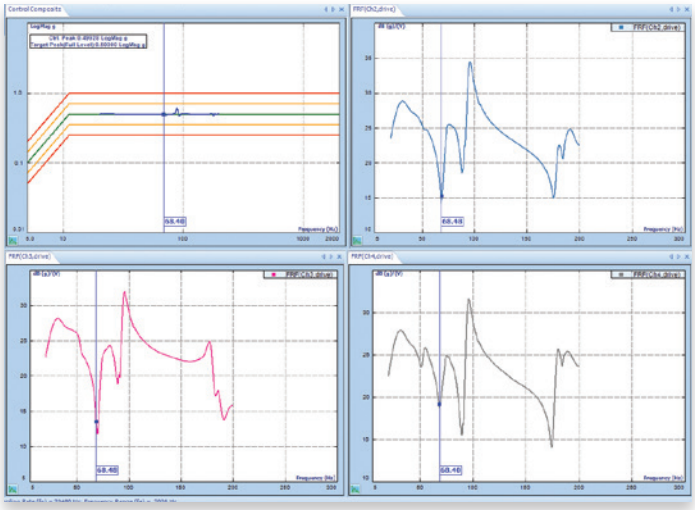


Fatigue Damage Spectrum

- Generate a Random PSD profile containing the same fatigue damage levels as the imported time stream using the Fatigue Damage theory
- Reduce test durations by generating a spectrum that matches real-world fatigue damage.
- Combines multiple time waveforms and scales the spectrum to simulate lifetime damage in a shorter testing time.

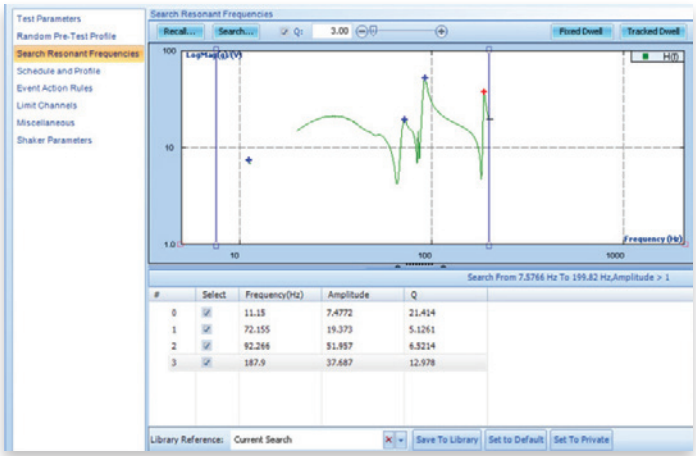
Force Limited Vibration Test

- Compliant to NASA handbook 7004C.
- Summed force, Overturning moment, and Vector RSS can be limited
- Available for both Random and Sine vibration control.



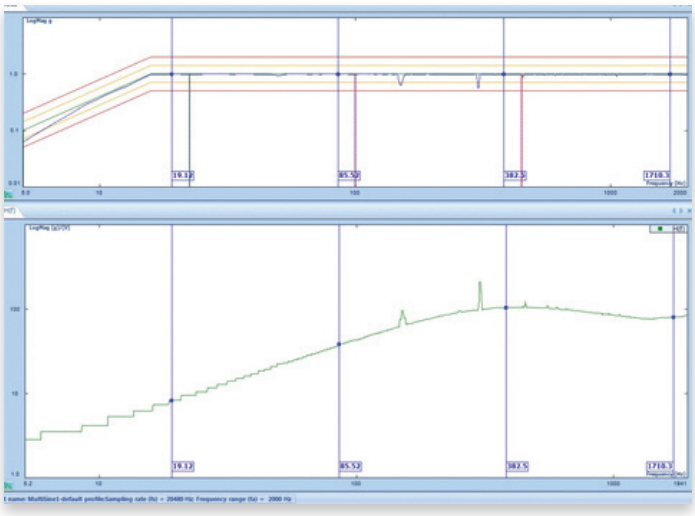
Swept Sine Control

- Real-time control with up to **100 dB dynamic range.**
- Supports up to **512 channels** for control, notching, or monitoring.



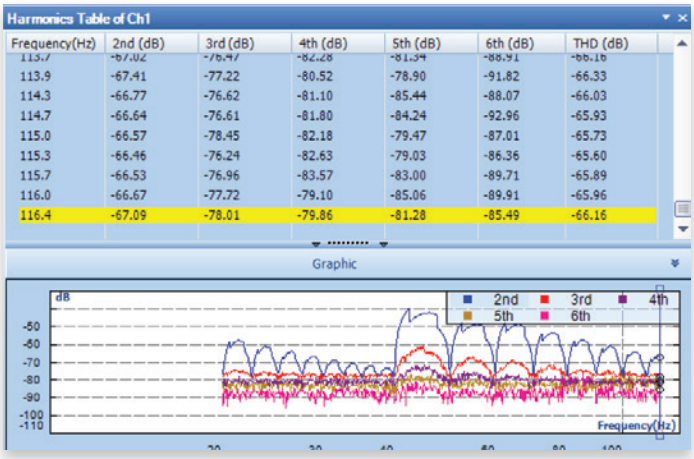
Resonance Search and Tracked Dwell (RSTD) Control

- Automatically detect resonant frequencies and dwell on them.
- Support for **fixed dwell, tracked dwell,** and **phase dwell** modes.



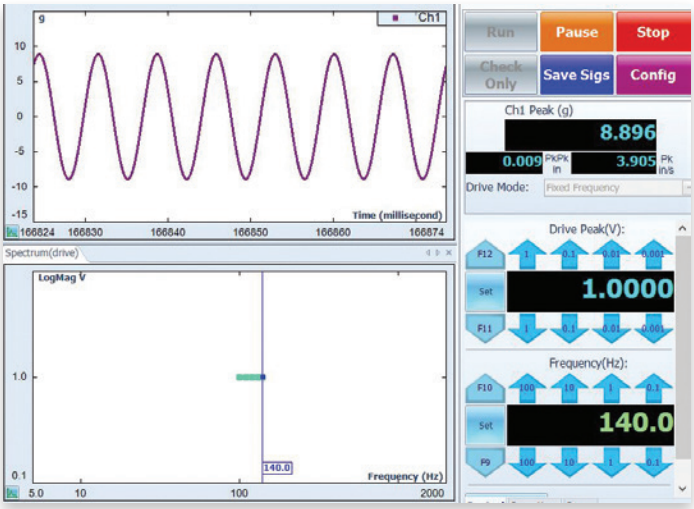
Multi-Sine Control

- Enables multiple sine tones to sweep simultaneously.
- Excites multiple resonant frequencies, significantly reducing sine testing duration.



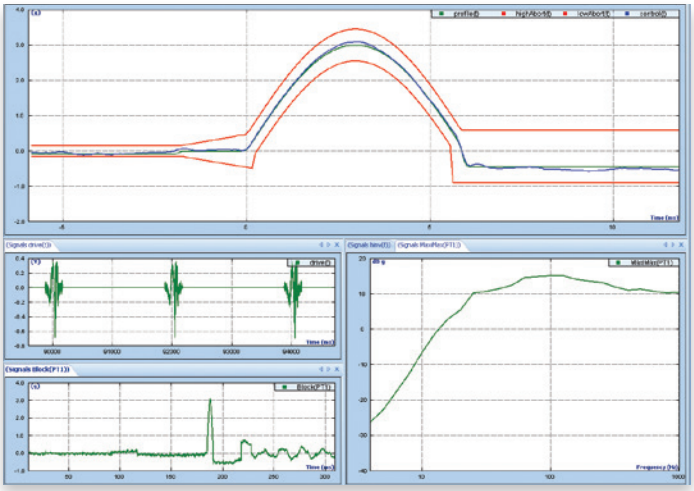
Total Harmonic Distortion (THD) Measurement for Sine

- Calculates and displays THD for control and input signals.
- Generates THD plots during stepped frequency or swept sine tests.



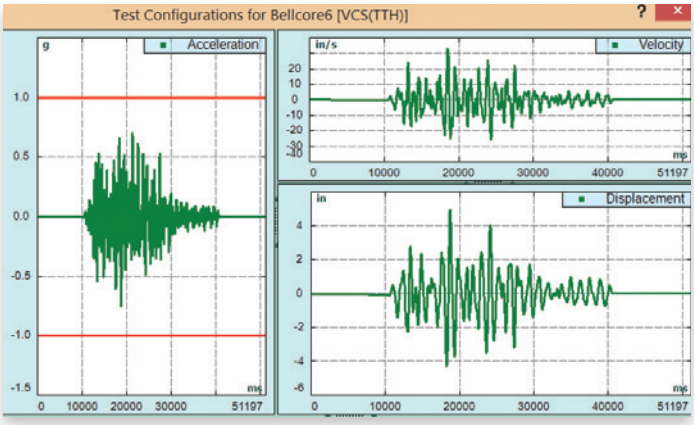
Sine Oscillator

- Diagnostic tool providing **manual** or **automated** sine output control (including dwell sine, step sine, swept sine).
- Displays real-time time signals and frequency spectra.
- Offers close-loop sine control with added manual functions.



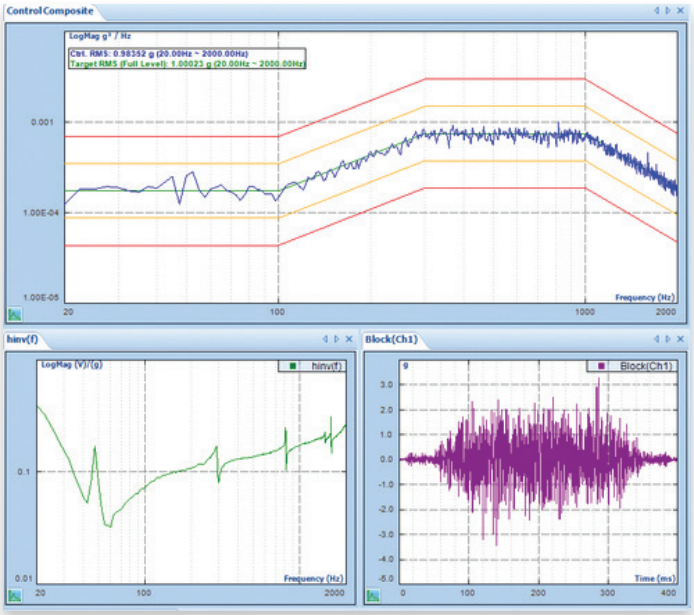
Classical Shock Control

- Real-time control for standard pulse shapes (e.g., half-sine, haversine, terminal- peak sawtooth, initial-peak saw tooth, triangle, rectangle, and trapezoid).
- Meets MIL-STD-810F/G/H, MIL-STD-202F, ISO 9568 and IEC 60068 (plus user-defined specifications) standards.



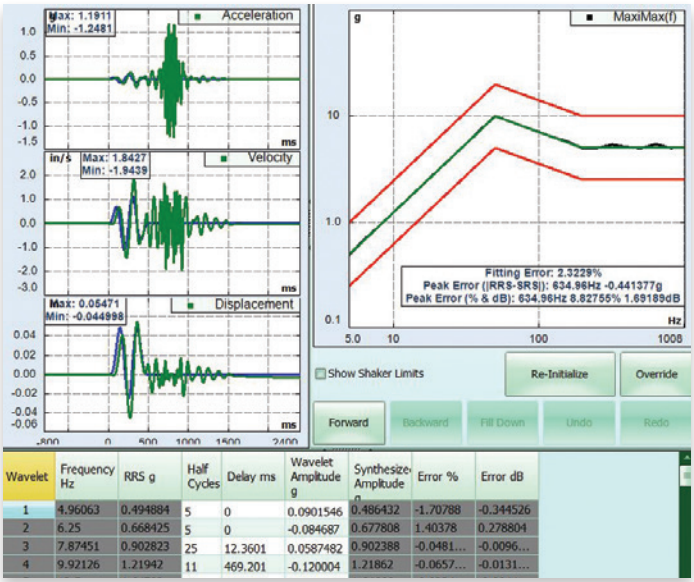
Transient Time History Control (TTH)

- Duplicate **seismic** or **built-in** or **user-defined** transient waveforms on a shaker.
- Tools for scaling, filtering, digital re-sampling, compensation and waveform tailoring.



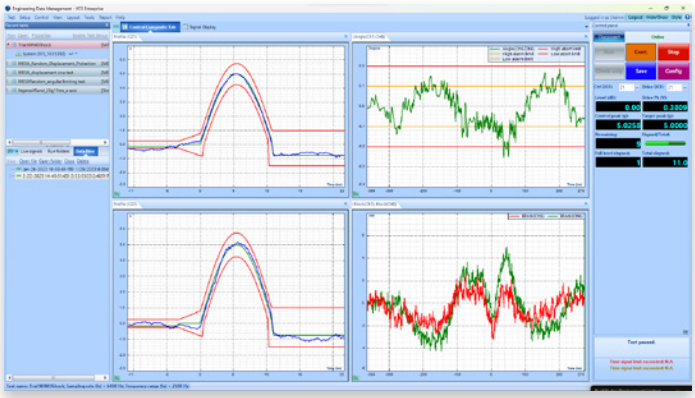
Transient Random Control

- Applies random pulse sequences to match power spectrum targets.
- Ideal for **gunfire** and **road simulation** applications.



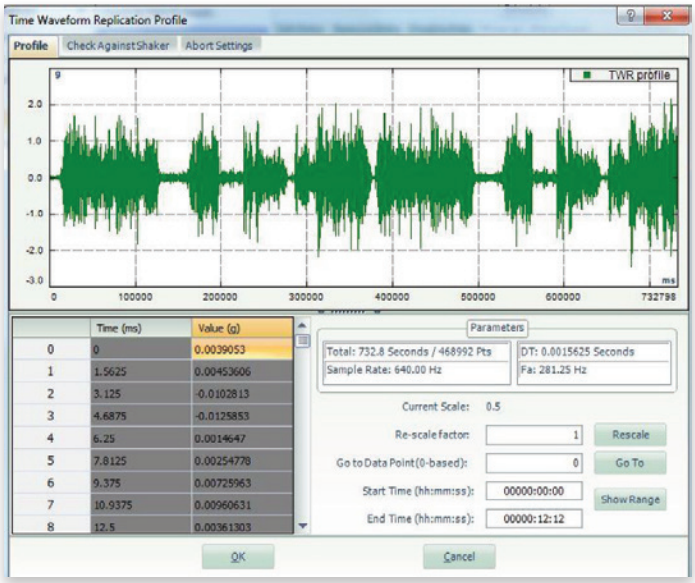
Shock Response Spectrum (SRS) Synthesis & Control

- Control DUT response to match a target SRS (RRS).
- Drive signals synthesized from **damped-sine** or **sine-beat wavelets.**
- Synthesis methods include Pyroshock, Minimum acceleration, MIL-810 Te, MIL-810 TE



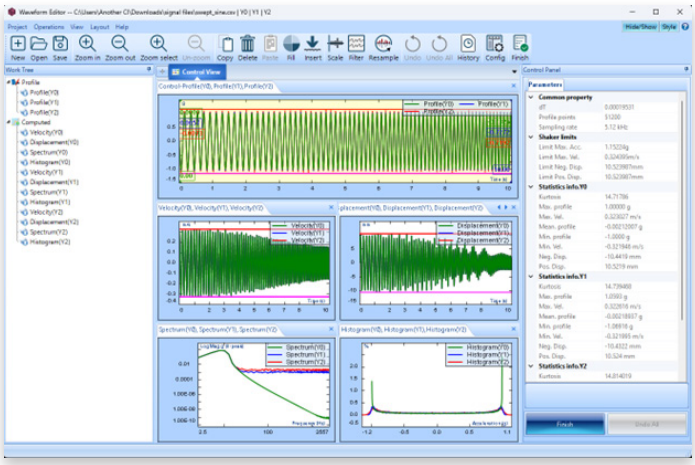
Linear and Angular Displacement Protection

- Based on high accuracy laser displacement.
- Linear displacement and Angular displacement can be limited.
- Provides extra safety to the shaker system and UUT.



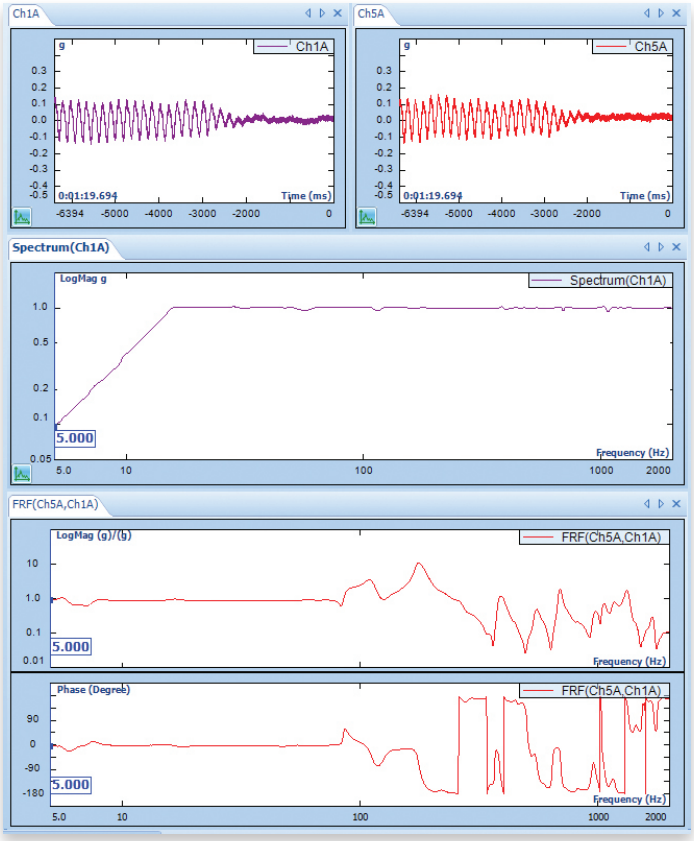
Time Waveform Replication

- Real-time, multi-channel control for precise long waveform duplication.
- Includes tools for waveform importing, editing, and customization.
- Record control and response signals while testing



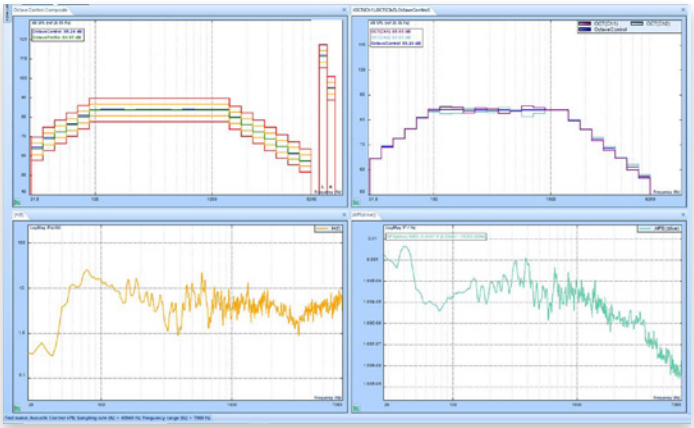
Waveform Editor

- Import, resample, scale, and filter waveforms.
- Easily crop, append, or insert waveform components.



Real-time Sine Reduction

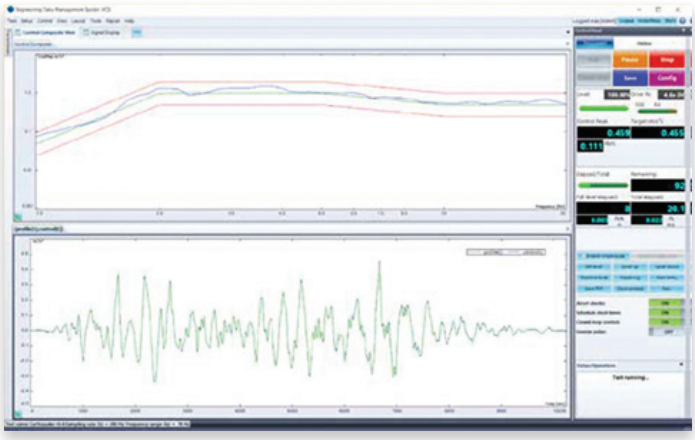
- Extend measurement channel capacity during sine tests.
- Instantaneous frequency, phase detection and spectrum analysis with tracking filter applied.
- Digital tracking filter has shorter response time than analog tracking filters.



Acoustic Control

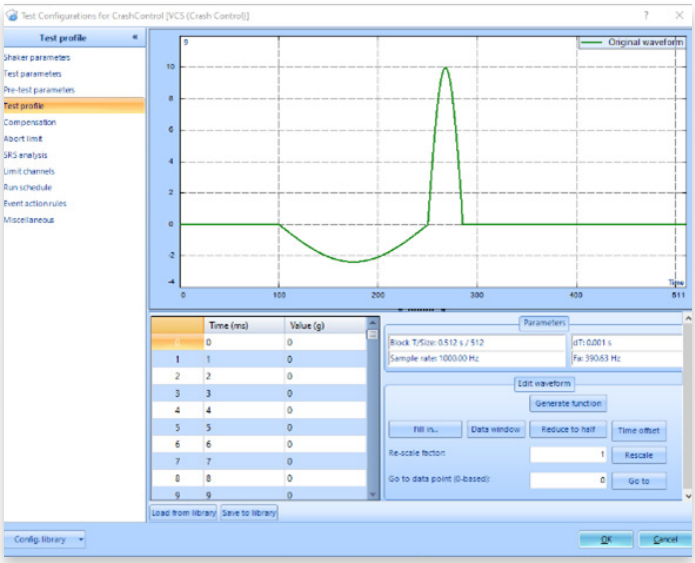
- Precise Control: Accurate noise level adjustment to match reference octave spectra and OASPL.
- Versatile Applications: Supports Reverberant Acoustic Test Facilities (RATF) and Progressive Wave Tubes (PWT).

Specialized Testing Applications



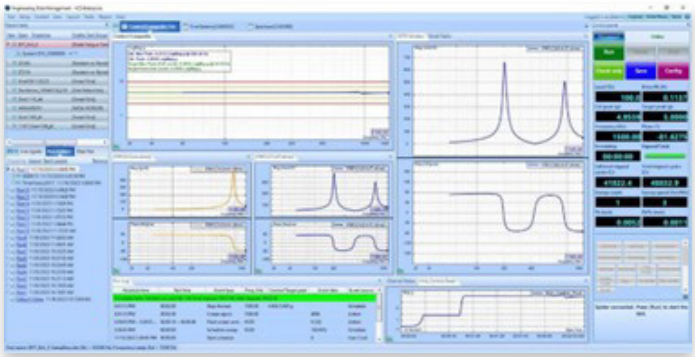
Earthquake Testing

- A specialized version of SRS control.
- **IEEE 344-2013** compliant.
- Synthesizes waveforms to meet Required Response Spectrums (RRS) using random, uniform, or shaped wavelets.
- Apply alarm and abort tolerances for test safety.



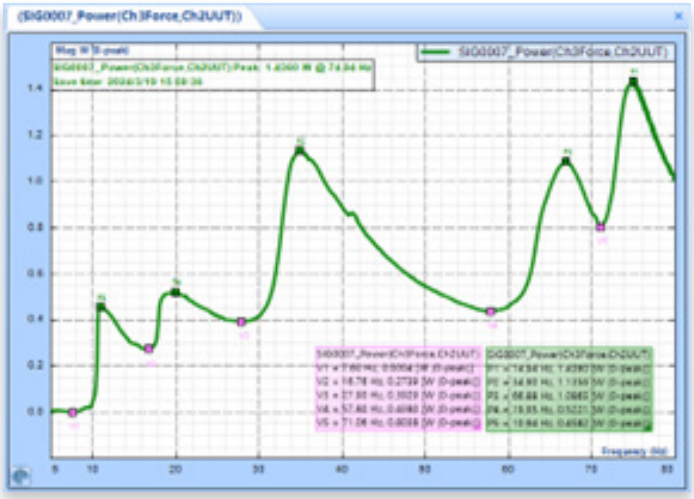
Crash Control

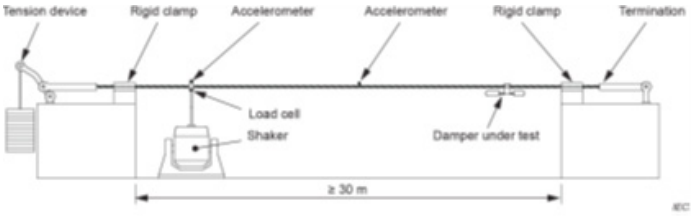
- A specialized version of TTH control.
- Designed for vehicular incident testing standards.
- Simulates vehicular braking or crash incidents.
- Manages post-pulse armature positioning for long-displacement shakers.



Blade Fatigue Testing

- A specialized version of RSTD control.
- Designed for testing turbine and compressor blades.

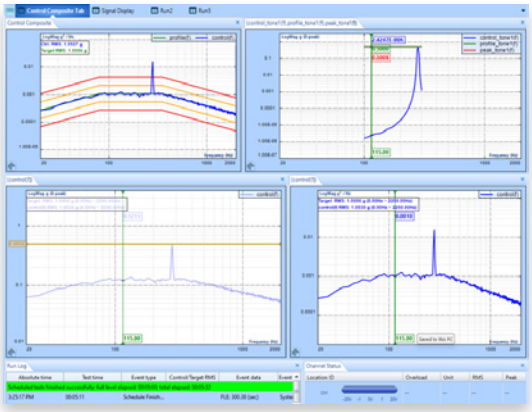


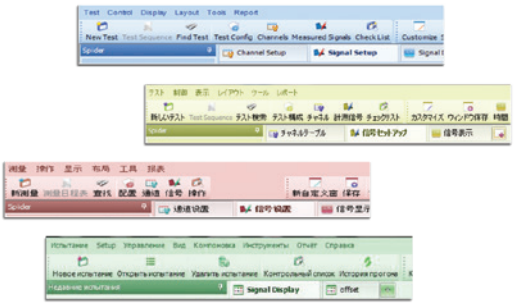


Stockbridge Damper Testing

- A specialized version of RSTD control.
- **DLT 1099-2021** and **IEC 61897:2020** compliant.
- Evaluates vibration dampers for power transmission lines and cable-stayed bridges.
- Assesses **energy absorption efficiency** and **mechanical impedance**.
- Calculates **protected length** and evaluates **fatigue resistance** of the damper.

Software Solutions





Crystal Instruments' Engineering Data Management (EDM) software offers versatile, user-friendly solutions for vibration control, signal analysis, and data management. Designed to support a wide range of applications, EDM provides seamless integration with Spider hardware systems, enabling powerful testing, analysis, and reporting.

Comprehensive Vibration Control and Signal Analysis

- Supports Spider hardware configurations from **2 input channels** to **512 input channels** with multi-output capabilities.
- Vibration control functions include:
  - **Random, Sine-on-Random (SoR), Random-on-Random (RoR), Sine and Random-on-Random (SRoR).**
  - **Sine, Resonance Search Track & Dwell (RSTD), Multi-Sine, Sine Oscillator**
  - **Classical Shock, Transient Time History, Transient Random, Shock Response Spectrum (SRS)** Synthesis and Control, Earthquake Testing
- Advanced options include: **Sine Reduction, Time Waveform Replication, Crash Control, Sine Beat Seismic, Acoustic Control, Turbine Blade Fatigue Testing, Stockbridge Damper Testing, Resonance Search**
- Fully integrated with test environments to measure **temperature, humidity, pressure, strain, torque,** and more.
- Dynamic data acquisition and processing include: **FFT, FRF,** real-time filters, octave analysis, order tracking, transducer calibration, and modal testing.

Easy Network Configuration

- Intelligent network tools detect and access hardware with minimal effort.
- Security Access Code (SAC) protects systems from unauthorized access

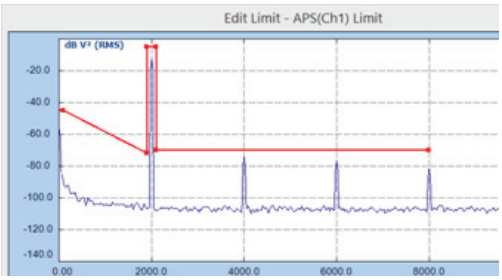
Multi-Tab and Multi-Screen Support

- Designed for **high-channel count** systems displaying hundreds of signals.
- Expandable displays with customizable layouts across multiple tabs/screens.

Multi-Language Support

- Available in **English, Japanese, Simplified Chinese, Traditional Chinese,** and **Russian.**
- Change languages seamlessly without reinstallation.

Step 1:
EDM sets the alarm limit together with a special message string, such as "Exceeding Limit".



Step 2:
When an alarm event happens, the customized string, "Exceeding Limit" will be sent to the EDM Cloud email service.

Step 3:
User will receive an alarm email

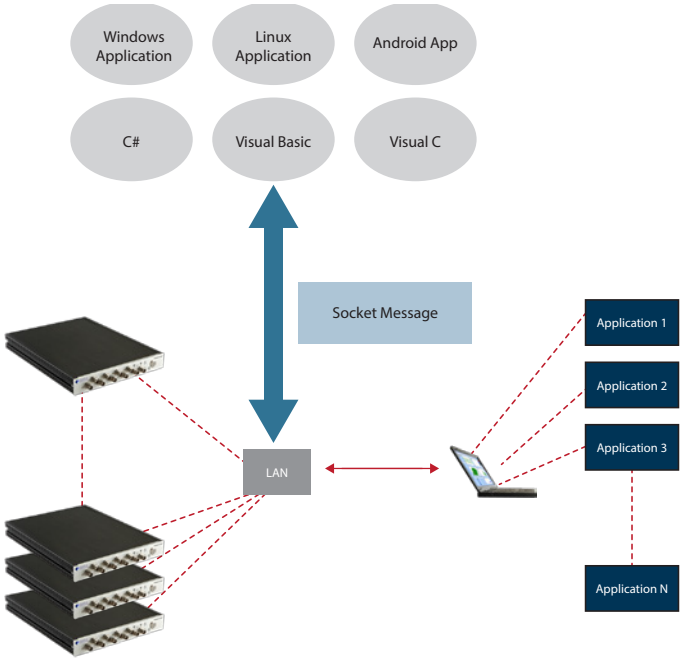
EDM or EDM Cloud Email Service

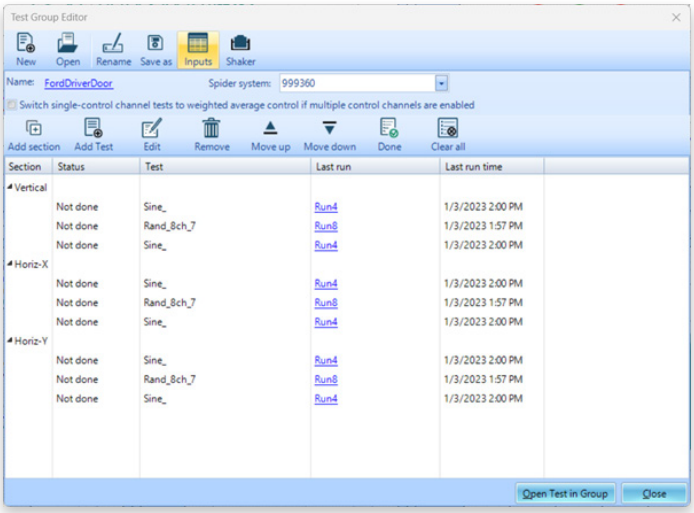
Safety First

- Pretest checks verify sensor connections and amplifier status before test start.
- Continuous monitoring during closed-loop control includes:
- **RMS and line-by-line abort checks.**
- **Sigma clipping,** drive limitation, and open-loop condition detection.
- Emergency shutdown upon sensor failure, overloads, or shaker limit violations.

Multi-Tasking Capability

- Real-time measurement and control processes run on Spider hardware.
- The host computer remains available for other tasks without impacting vibration control.
- Network or PC failures do not interrupt ongoing tests, ensuring safety and reliability.





Automated Test Management

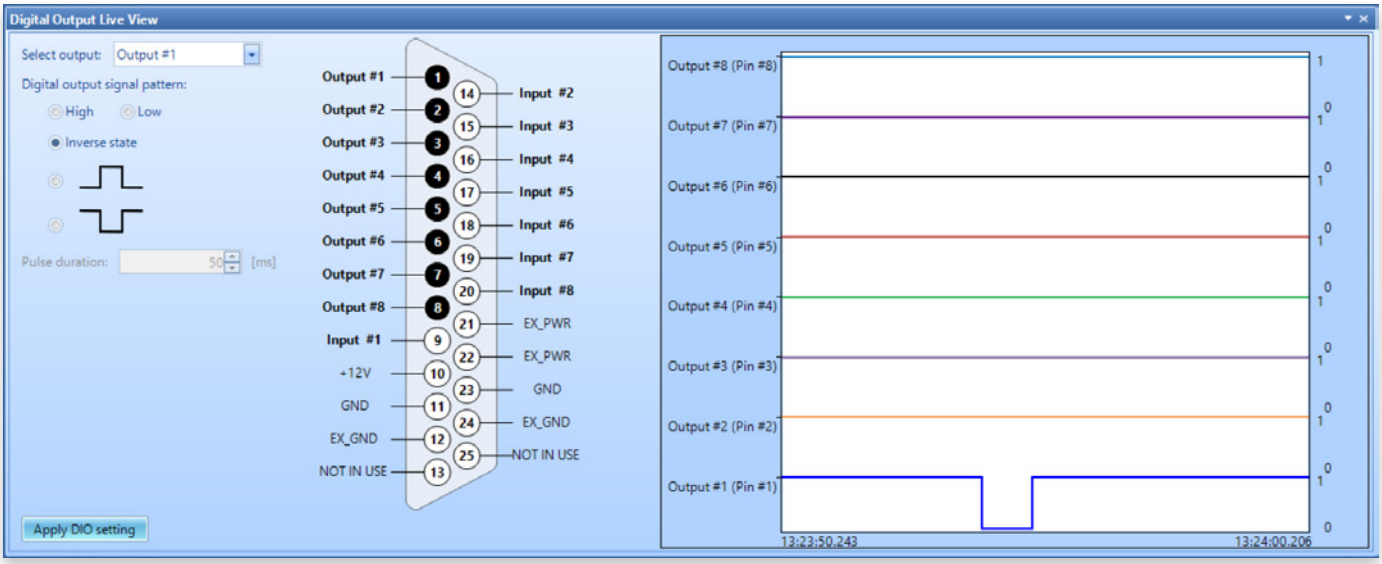
- **Test Sequence:** Automatically execute and log a series of tests with **Run, Pause,** and **Stop** options.
- **Test Group:** Create and manage multiple tests with consistent settings for channels, shakers, and hardware.

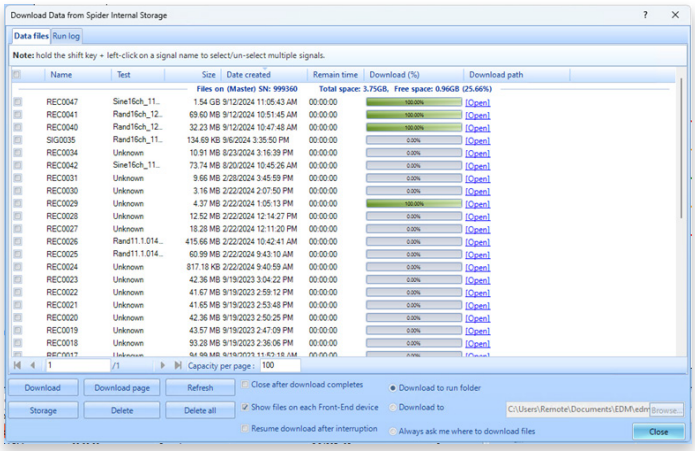
Customizable Event-Action Rules

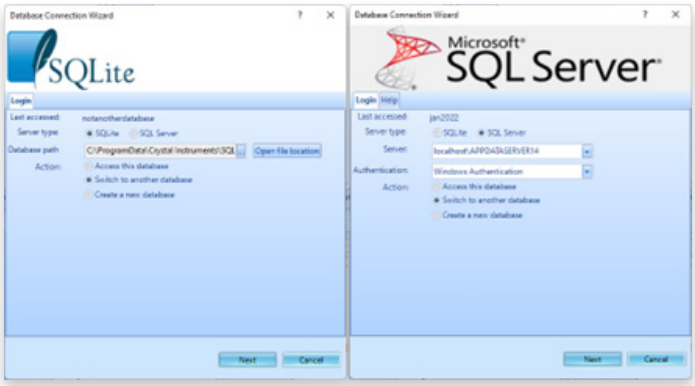
- Automate responses to test events, such as:
- Limits exceeded or specific response levels reached.
- Actions include **save signals, sending emails, triggering digital outputs,** or **stopping tests.**

Seamless Connectivity

- **Digital I/O Interface:** Integrates with external devices.
- **CAN Bus Interface:** Monitors DUT status and applies alarm/abort limits in real time.
- **MQTT Integration:** EDM may serve as a MQTT client or MQTT broker to communicate with other MQTT clients or brokers over LAN or the Internet.
- **Spider API Support:** APIs for Python, C#, C++, and LabVIEW for custom control and monitoring.
- **Test Notifications:** Send **email** or **SMS updates** when tests stop.





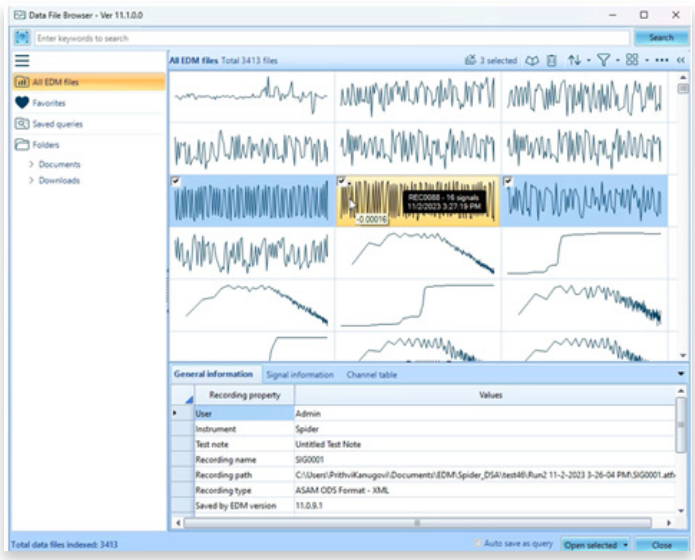


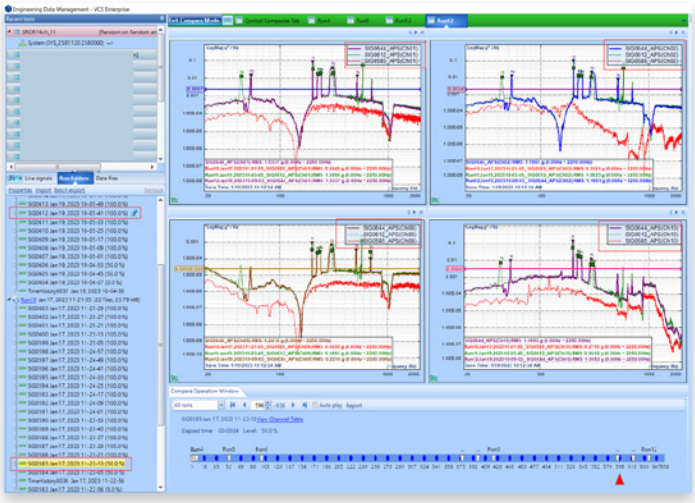
Data Recording Capabilities

- **High Channel Count:** Record raw time data from up to **512 input channels** with sample rates up to **512 kHz.** (record 8 channels per front-end at up to 102.4 kHz or record 1 channel per front-end at up to 512 kHz)
- **Storage Options:**
  - **Internal Flash Memory:** Convenient on-board storage.
  - **Spider-NAS Devices:** Provide external storage of up to **2 TB per 64 channels**, expandable to **16 TB**. Each Spider-NAS can optionally be configured with RAID 1 for enhanced data redundancy and safety.
  - **Local PC Storage:** Direct recording with built-in safety and redundancy.
  - **Parallel Recording:** Continuous data recording runs seamlessly alongside vibration control without impact.
- **High Accuracy:**
  - **IEEE 1588 Time Synchronization:** Ensures 50 ns accuracy across front-end modules.
  - **Dynamic Range:** Up to **175 dB.**
  - **Frequency Resolution:** As fine as **0.001 Hz.**
  - **Post-Processing:** Analyze data using **EDM Post Analysis Software** for detailed insights.

Advanced Data Management

- **Database Technology:** Quickly search, index, and organize test setups, data, and history.
- **Share databases** across testing stations on a company network.
- **Location ID and Signal Labeling:** Rename signals with meaningful labels (e.g., "Top" or "Front").





Data File Browser

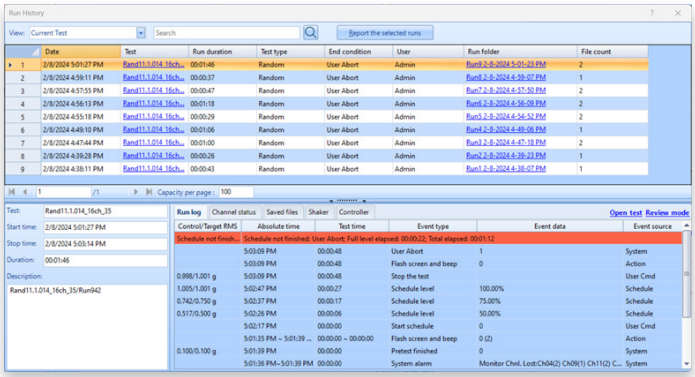
Save time and simplify your workflow.

- **Streamlined Navigation:** Quickly locate saved recordings and signal files without digging through file directories.
- **Integrated Access:** Available by default with EDM/PA during recording or signal import.
- **User-Friendly Interface:** Displays recordings with essential details like name, time, and date.
- **Drag-and-Drop Simplicity:** Drag files directly into your source list from the UI.

Review/Compare Mode

Effortless Signal Comparison

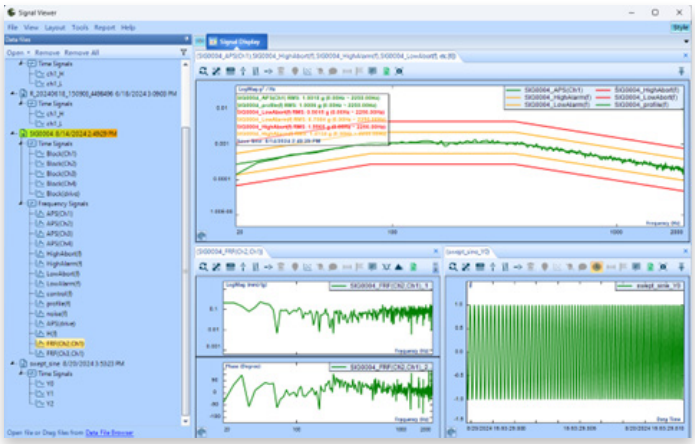
- **Streamlined Signal Display:** View signals of the same type across files or runs, even in high-channel systems.
- **Customizable Setup:** Configure display settings (windows, formats, ranges, peak markers, cursors) just once.
- **Quick Switching:** Instantly load signals of the same type from another file with a single click.
- **Comparison Made Easy:** Compare signals between two test runs in a single view.



Run History

Comprehensive Test Run Tracking

- **Effortless Search:** Quickly find tests by name or description using specific text.
- **Flexible Viewing Options:** Access run history for the current test, selected test, or all tests of the same type.
- **Detailed Insights:** View test descriptions, run logs, channel statuses, saved files, shaker parameters, and controller configurations.

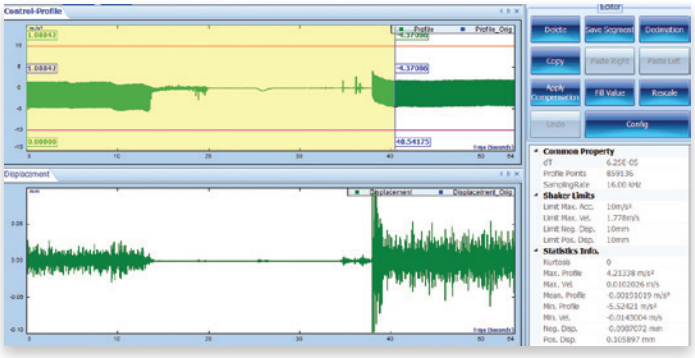


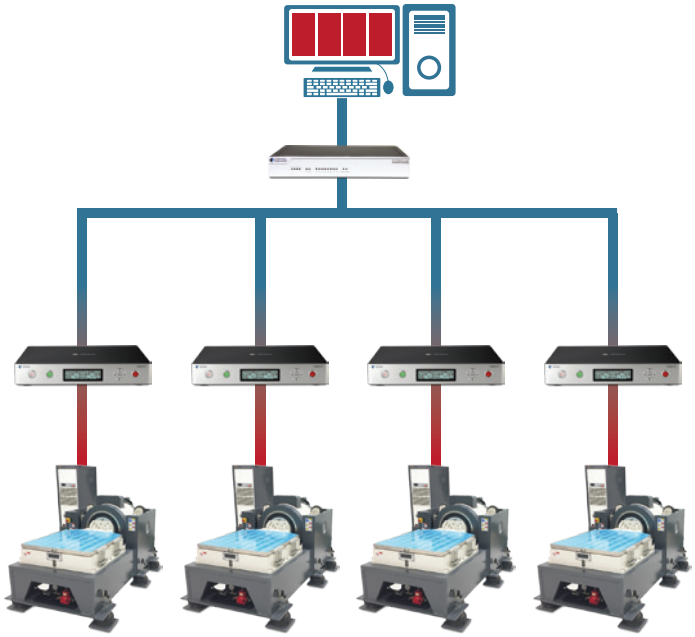
Signal Viewer

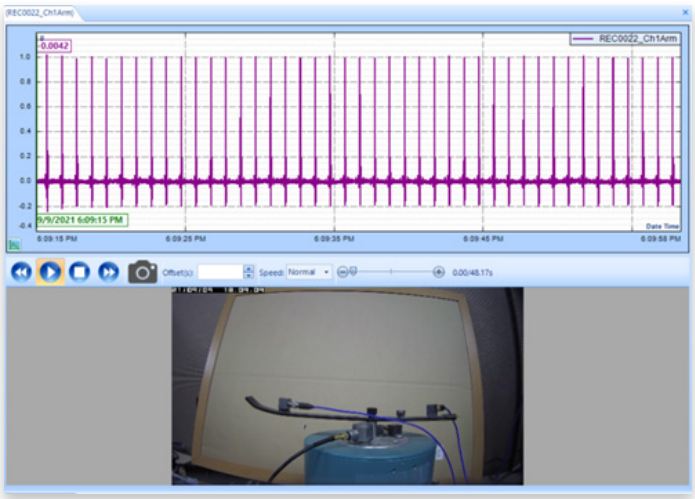
- Fast and intuitive interface for instant analysis.
- Import and view signals from **ATFX, CSV, UFF,** and **UNV** files.
- **Lightweight** alternative to full EDM suites.
- Features similar to EDM's "Data Files" menu.

Versatile Reporting

- Generate reports from customizable templates in **PDF, Word,** or **OpenXML** formats.
- Add company logos and customize layouts.
- Active reports allow for interactive graph adjustments like zooming and scaling.







Additional Features

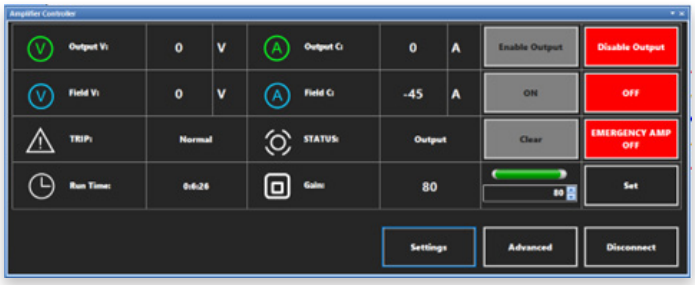
- **Flexible Math Functions:** Perform arithmetic operations (+, -, *, /) on signals in both time and frequency domains.
- **Non-Acceleration Measurements:** Measure physical signals like **displacement, temperature,** or **pressure.**
- **Shaker Parameter Library:** Save and reuse shaker parameters; export/import to **Excel.**
- **Multiple VCS Instances:** Run multiple vibration tests on a single PC, each connected to separate controllers.

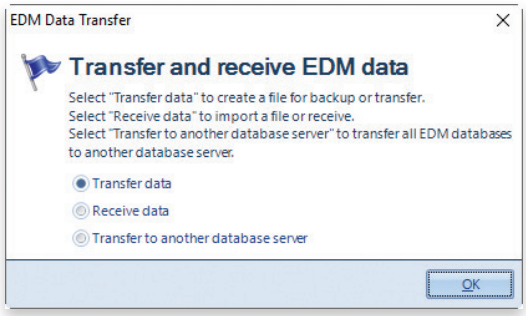
Check List for the Initial Startup

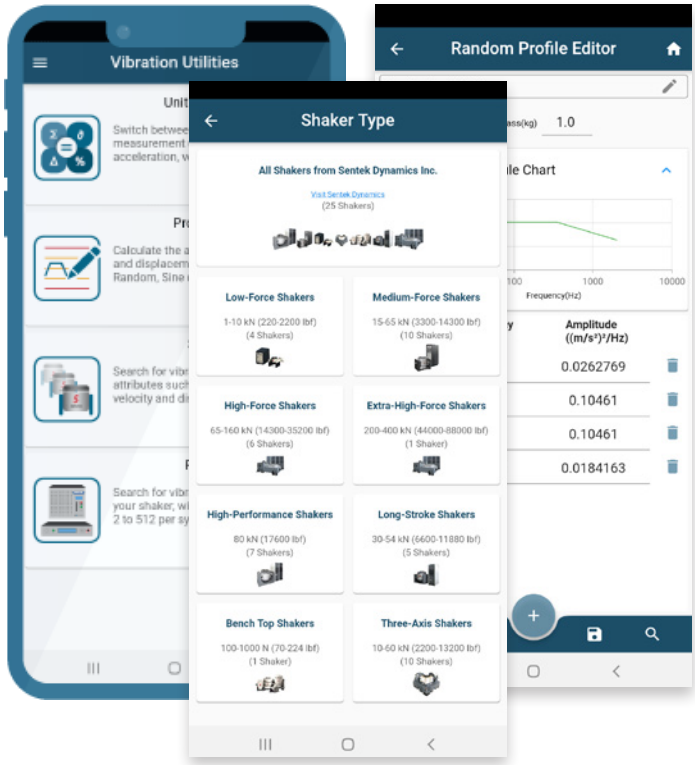
EDM can show an overview of the critical parameters to be verified before a test is started.

Video Capture

Integrates video recording for synchronized monitoring and documentation during tests.







Amplifier Control and Energy Efficiency

- Compatible with Sentek Dynamics amplifiers for **power control** and **energy savings.**
- Prevents operation if the amplifier is not ready, ensuring safety.
- Recorded amplifier status for troubleshooting

Data Transfer Tool

- Transfer EDM databases across computers, storage devices, or **SQL servers.**
- Functions as a backup and recovery tool with guided step-by-step wizards.

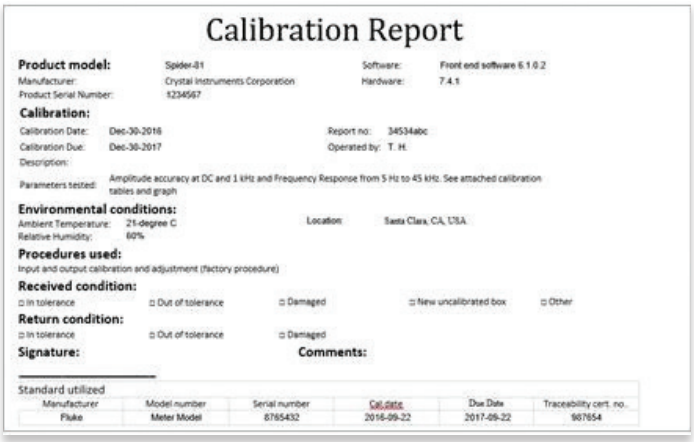
CI Data File Reader API

- Enables third-party applications to access signal data in **ATFX, TS,** and **GPS** formats.
- Supports programming in **Python, C#, MATLAB,** and **LabVIEW.**

Vibration Utility App

- Includes unit converters, vibration profile editors, and a searchable catalog of vibration tables.
- Estimate acceleration, velocity, and force requirements for specific vibration profiles and find compatible shaker systems.

Calibration Solutions



Calibration Report

Product model: Spider-81 | Software: Front end software 6.1.0.2
Manufacturer: Crystal Instruments Corporation | Hardware: 7.4.1
Product Serial Number: 1234567

Calibration:
Calibration Date: Dec-30-2016 | Report no: 34534abc
Calibration Due: Dec-30-2017 | Operated by: T. H.
Description:
Parameters tested: Amplitude accuracy at DC and 1 kHz and Frequency Response from 5 Hz to 45 kHz. See attached calibration tables and graph

Environmental conditions:
Ambient Temperature: 21-degree C | Location: Santa Clara, CA, USA
Relative Humidity: 60%

Procedures used:
Input and output calibration and adjustment (factory procedure)

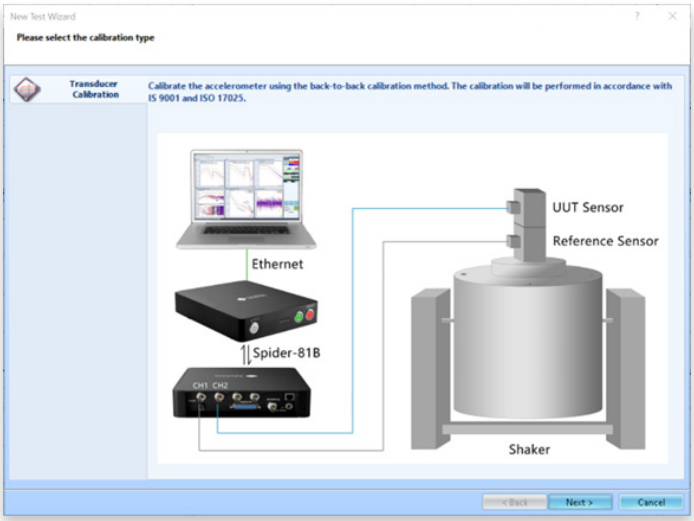
Received condition:
☐ In tolerance ☐ Out of tolerance ☐ Damaged ☐ New uncalibrated box ☐ Other

Return condition:
☐ In tolerance ☐ Out of tolerance ☐ Damaged

Signature: **Comments:**

Standard utilized

Manufacturer	Model number	Serial number	Cal date	Due Date	Traceability cert. no.
Fluke	Meter Model	8765432	2016-09-22	2017-09-22	987654

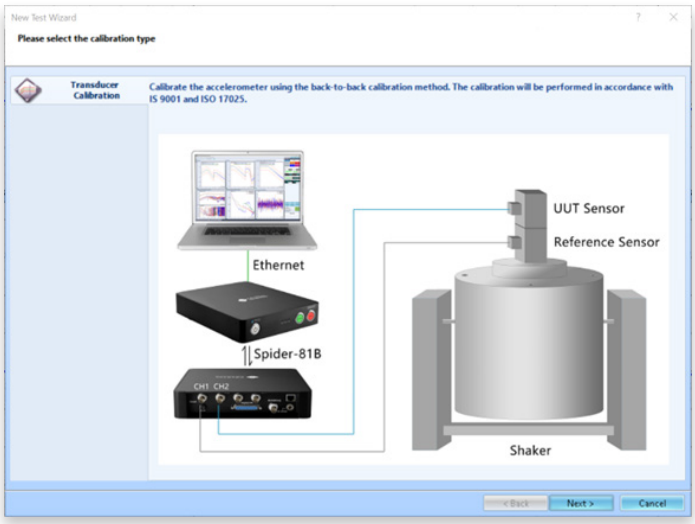


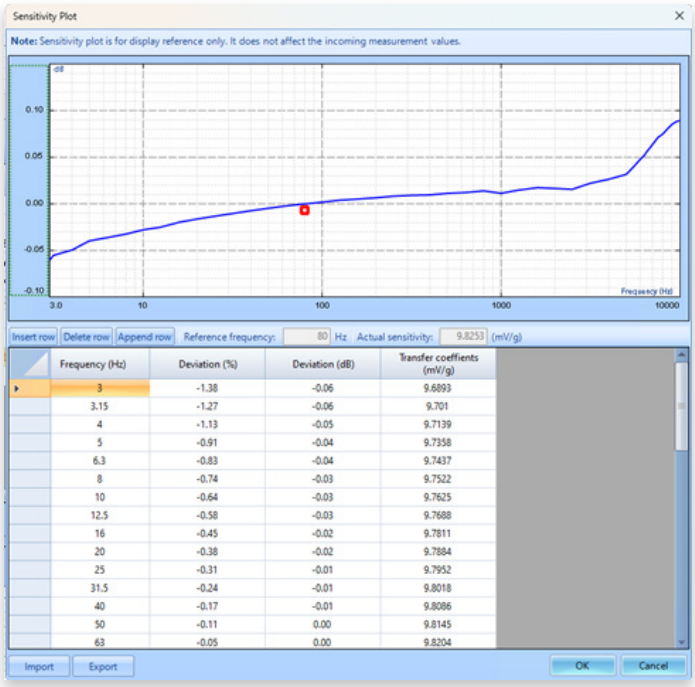
Front-End Calibration Tool (FECT) for Spider Systems

- **Annual Calibration:** All products are factory calibrated and require annual recalibration by authorized services.
- **User-Friendly Tool:** Replaces the previous calibration tool (pre-EDM 6.1) and offers basic adjustments operable by users or specialists.
- **Comprehensive Calibration Process:**
  - Signal source calibration.
  - Adjustment of **DC/AC** gains and offsets.
  - Input channel calibration for all coupling types.
  - Include **DC/AC measurements** before and after adjustment
- **Reporting:**
  - Generate detailed calibration reports via EDM or FECT.
  - Reports include meter details, calibrated front-end data, and measurement results.
- **Automation Options:**
  - Supports automatic measurements with compatible meters (e.g., **Fluke 8845A, Keithley DMM6500**).
  - Optional calibration fixtures streamline output channel switching.
  - For advanced calibration reports with more "as-found" and "as-left" data, contact Crystal Instruments or authorized providers.

Transducer Calibration Software (TCS)

- **Back-to-Back Calibration Method:**
  - Compliant with **ISO 16063** standards.
  - Uses a shaker system, reference sensor, and sensor under test.
- **Customizable Options:**
  - Compatible with various shaker systems and reference sensors.
  - Allows selection of calibration frequencies and levels.
- **Key Features:**
  - Verify sensor performance before tests.
  - Generate deviation charts and uncertainty measurements.





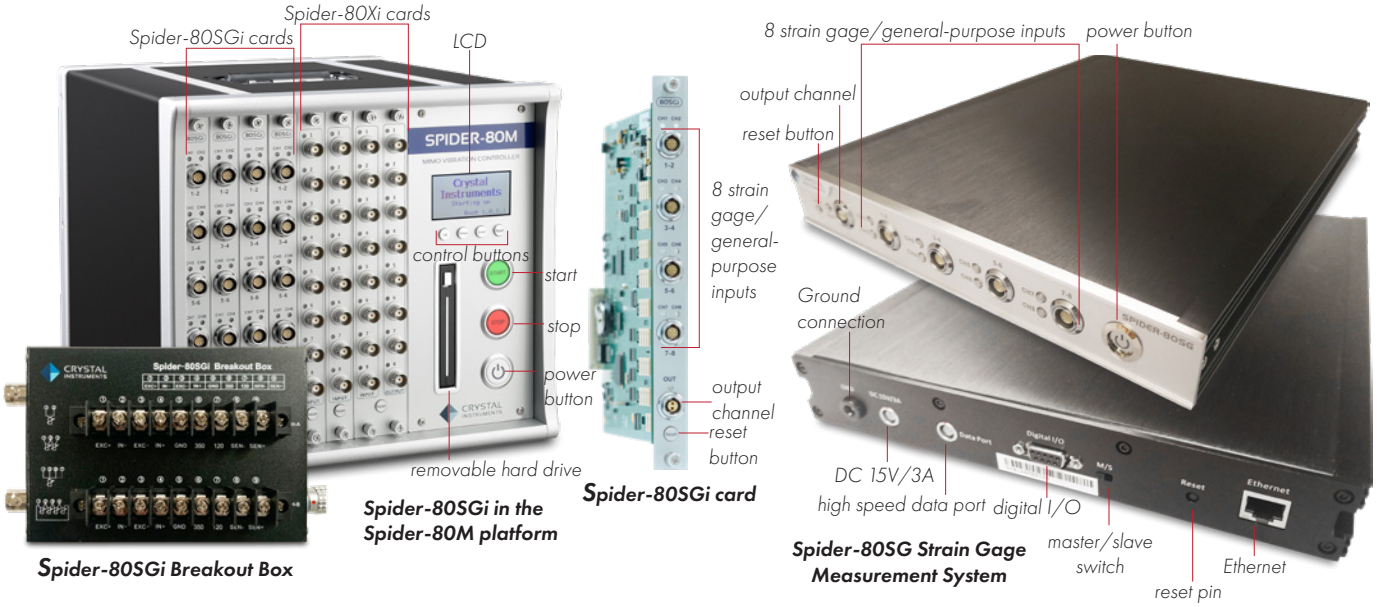
Sensor Calibration

- **External Calibrator Method:**
  - Calibrates sensor sensitivity using a fixed-frequency sine-wave input.
- **User Inputs:**
  - Calibration signal frequency.
  - RMS readings or dB RMS values.
  - Reference (0 dB) value.
- **Process:**
  - Automatically calculates RMS levels and updates sensitivity tables.
  - Users can review, accept, or reject calibration results.

Open-Loop Calibration

- **Sine Oscillator Method:**
  - Calibrates objects using a predefined sine-wave drive signal.
  - Allows manual control of drive voltage and frequency.
- **Applications:**
  - Ideal for calibrating sensors with known frequency and peak values.

Strain Gage Measurement



Spider-80SGi Breakout Box

Spider-80SGi in the Spider-80M platform

Spider-80SGi card

Spider-80SG Strain Gage Measurement System

Key Features of the Spider-80SG

- **Channel Count:** 8 strain gage/general-purpose inputs per front-end, scalable to 512 channels with multiple front-ends.
- **High Precision:** Features **24-bit ADC channels** with low **DC drift (<1.5 µV/V in 48 hours).**
- **Dual Excitation Modes:**
  - Precision Excitation Voltage: ±2.5 V or ±5 V for accurate resistance measurement.
  - Configurable DC Power Supply: 2.5 V, 5 V, or 10 V for sensor excitation.
- **Remote Sensing:**
  - Supports strain gages up to 1000 ft away using remote sensing with minimal error (**<1.5% up to 10 kHz**).
- **Strain Configurations:**
  - Supports **Quarter Bridge (Type 1, 2, 3 wire), Half Bridge (Type 1 & 2),** and **Full Bridge (Type 1 & 2)** configurations.
- Allows **Rosette configurations** by combining user-selected channels.
- **Multiple Trigger Modes:** Ensures synchronized acquisition for complex tests.
- **Compact and Portable:** Designed for ease of use in laboratory and field environments.

Wide Range of Supported Sensors

- **MEMS-based sensors.**
- **Strain gage-based sensors.**
- **Precision excitation DC sensors.**
- **IEPE sensors.**
- **In-line charge amplifiers.**

Measurement Quantities

- Strain, Force, Pressure, Torque, Acceleration, Displacement, Velocity, Sound Pressure, Voltage, Current.

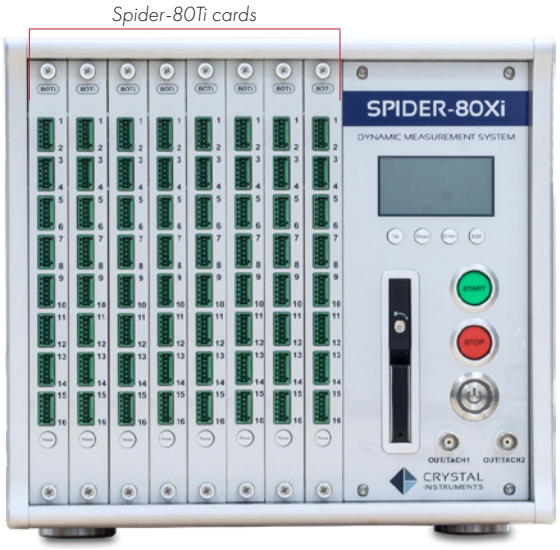
Seamless Integration with Spider Platform

- Fully supported by **EDM-DSA** and **EDM VCS** software for advanced testing operations.
- Synchronizes with other Spider-80Xi devices for high-channel-count systems.
- Enables combined acquisition of vibration and strain data in **vibration control systems**.

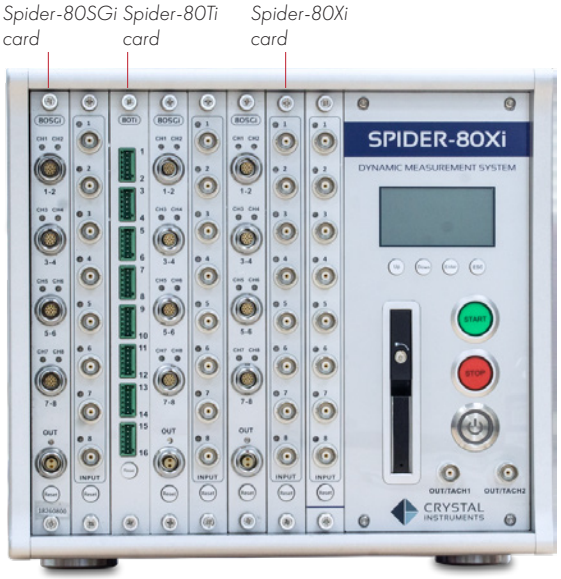
Applications and Benefits

- Ideal for structural testing, material analysis, and dynamic signal measurement.
- Streamlined integration of strain measurement with other physical quantities such as force, torque, and displacement.
- Ensures precision and reliability for demanding test environments.

Temperature Measurement



Spider-80Ti Setup



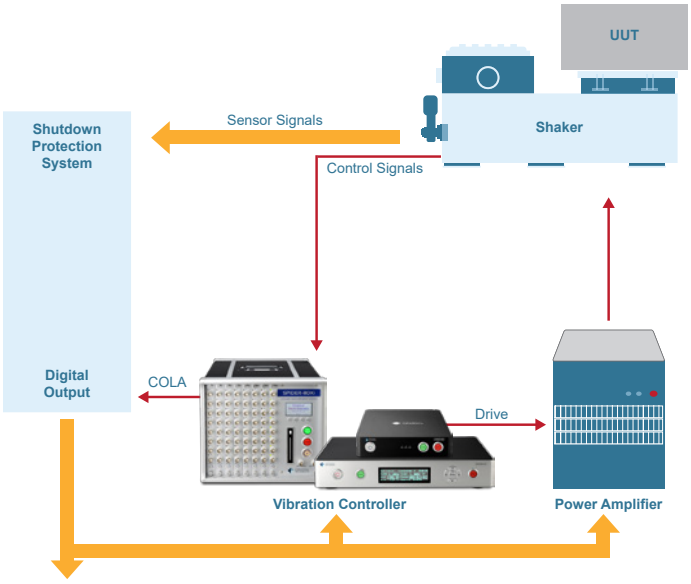
Multi-module Setup

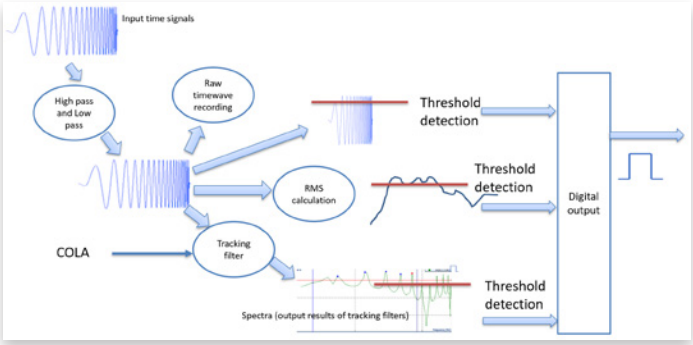
Key Features of Spider-80Ti

- **Channel Count:** One module adds **16 temperature measurement channels** to a Spider-80Xi system.
- **High Precision:** Utilizes **24-bit Sigma-Delta ADCs** for accurate temperature measurements.
- **Sensor Support:**
  - Compatible with **PT100 RTD sensors** and **K, J, T, S, R thermocouples.**
  - Supports mixed configurations of RTDs and thermocouples within the same system.
- **Scalability:**
  - Combine multiple Spider-80Ti front-ends to form systems with up to **1024 channels**, all sampled simultaneously.
  - Integrate with Spider-80Hi, Spider-80Ci, or Spider-80SGi for mixed-signal acquisition.

Advanced Measurement Capabilities

- **RTD Non-Linearity Correction:**
  - Implements **IEC 751 RTD equations** with user-definable coefficients.
  - Custom coefficients support RTD sensors with varying alpha values, enhancing accuracy.
- **Thermocouple Cold Junction Compensation:**
  - Measures cold junction temperature using a high-precision internal sensor.
  - Offsets cold junction temperature for accurate readings.
- **Multi-Point Sensor Correction:**
  - Linearizes offset corrections using user-specified temperature breakpoints.

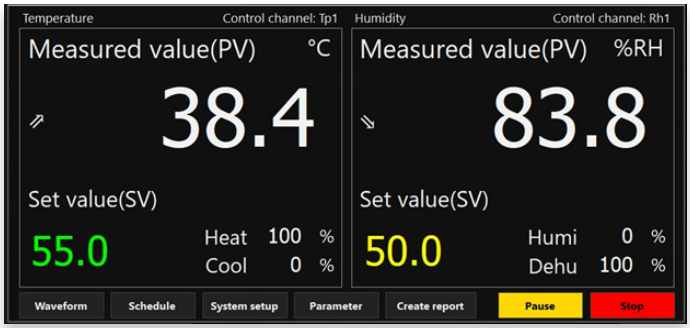




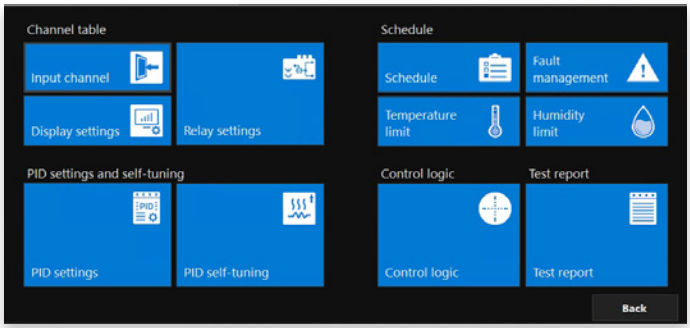
Shutdown Protection System

- **Fast Response:**
  - Reacts to abort conditions in **<10 ms** for single-module systems and **<20 ms** for high-channel-count systems.
  - Protects the DUT from damage by triggering system shutdown.
- **User-Defined Limits:**
  - Configure limits for raw time-domain signals, RMS values, and frequency signals to trigger alarms.
- **Event Capture:**
  - Logs time, channel, and event details for comprehensive analysis.
  - Captures the time at which alarm is triggered
  - Captures the channels for which alarms have triggered
  - Captures the time and details of all other events
- **Channel Status Display:**
  - Provides real-time status of all channels, highlighting errors and alarms.

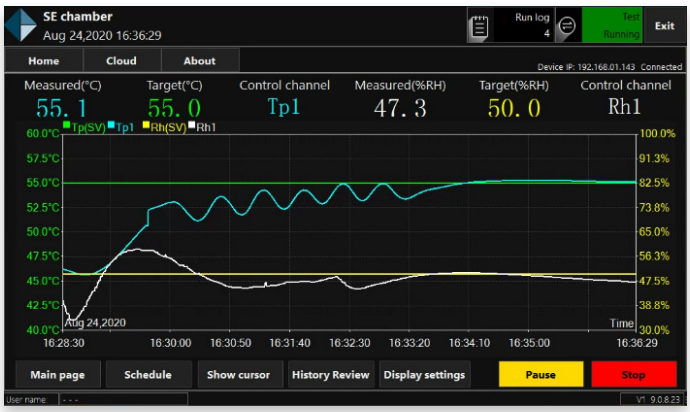
Combined Environmental Testing



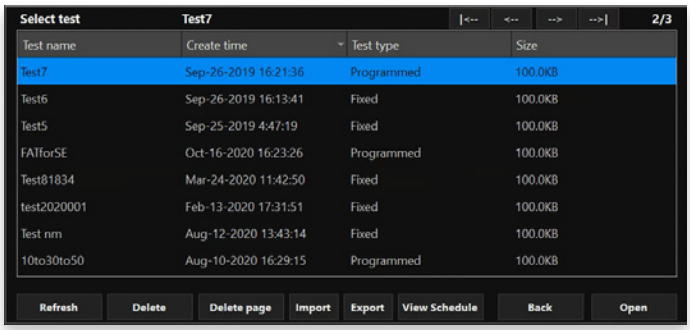
Test status page of EDC on a wireless, touchscreen terminal



Parameter page of EDC on a wireless, touchscreen terminal



Temperature & humidity signals are displayed on the same screen



Run log page of EDC on a wireless, touchscreen terminal

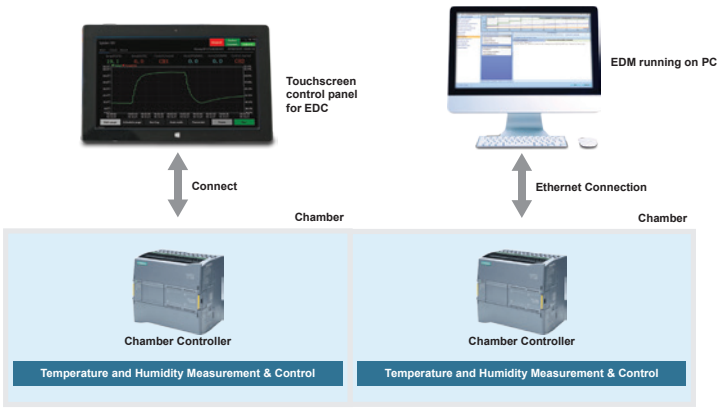
Integrated Testing Capabilities

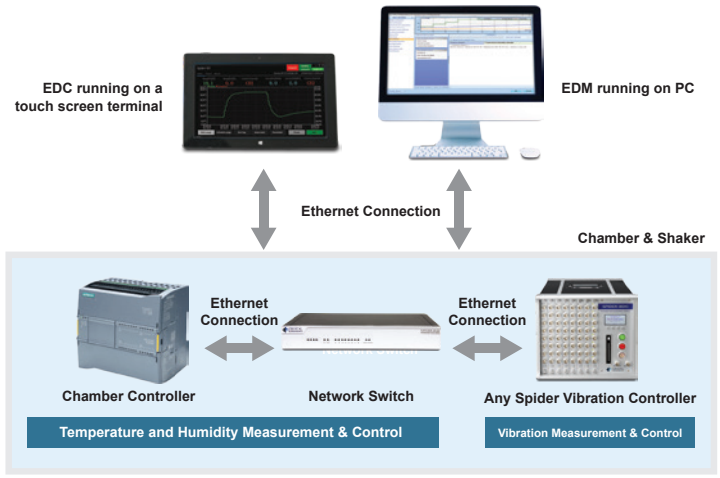
- Control multiple physical parameters including:
  - **Vibration** (acceleration, velocity, displacement)
  - **Temperature** and **humidity**
- Monitor multiple physical parameters including:
  - **Vibration** (acceleration, velocity, displacement)
  - **Temperature** and **humidity**
  - **Pressure, torque,** and **electrical signals** (e.g., CAN bus)
  - Expandable **temperature** and **humidity** channels
- **Ethernet Network** and **PTP Time Synchronization** enable all Spider hardware devices to function as a single system.

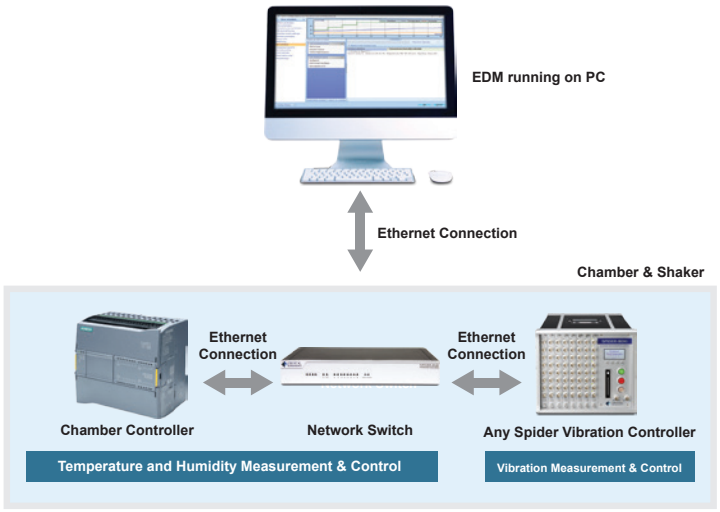
Unified User Interface

- Simplified access and setup for parameters and schedules.
- Conduct integrated vibration tests alongside temperature and humidity cycles.
- **Key Benefits:**
  - One integrated setup
  - One clock and schedule
  - One user interface
  - One testing report
  - One vendor for technical support

Temperature and Humidity Chamber with a shaker system







Software for Combined Environmental Testing

EDC (Embedded Device Controller)

- Lightweight, touchscreen-friendly Windows application.
- Runs on **Windows PCs** or tablets (mobile or fixed terminals).
- Supports **Temperature/Humidity (TH)** testing.
- Key Features:
  - Configure and operate tests.
  - Review logs, signals, and generate reports, with or without the chamber.
  - Wide compatibility with tablets (e.g., IP6X-rated devices).

EDM THV

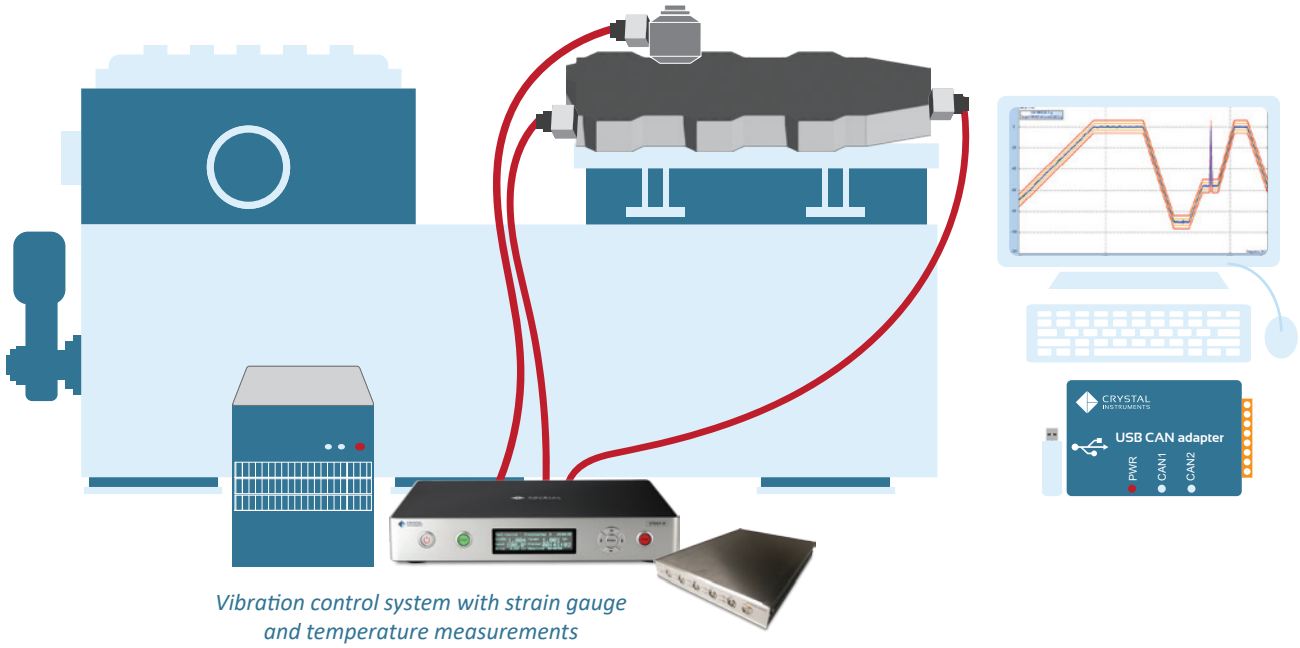
- Full-featured software for **Temperature, Humidity, and Vibration (THV)** control.
- Integrates with chamber controller and Spider vibration controllers.
- Runs as part of Crystal Instruments' **EDM** software suite.
- Allows real-time chamber monitoring using EDC while running THV tests.

Software Advantages

- **Dual Parameter Display:** Plot temperature and humidity on the same graph with adjustable Y-axes.
- **Live Display:** display the latest data of the specific duration (x-axis)
- **History View:** display data of the entire test duration and zoom into any part of the test during operation (x-axis)
- **Enhanced Analysis Tools:**
  - Place cursors to measure **delta X** and **delta Y.**
  - Fault history and diagnosis with suggested solutions.
- **Customizable Reports:**
  - Automatically generated at test completion.
  - Supports **letter/A4 layouts, Word,** and **PDF formats.**
- **Convenient Data Management:**
  - Backup and download configuration files.
  - Import and view data without connected hardware.
  - Export screenshots and historical data.
  - Historical data review on the panel directly
- **Third-Party Extension Support** for expanded functionality.

EV Battery Pack Testing

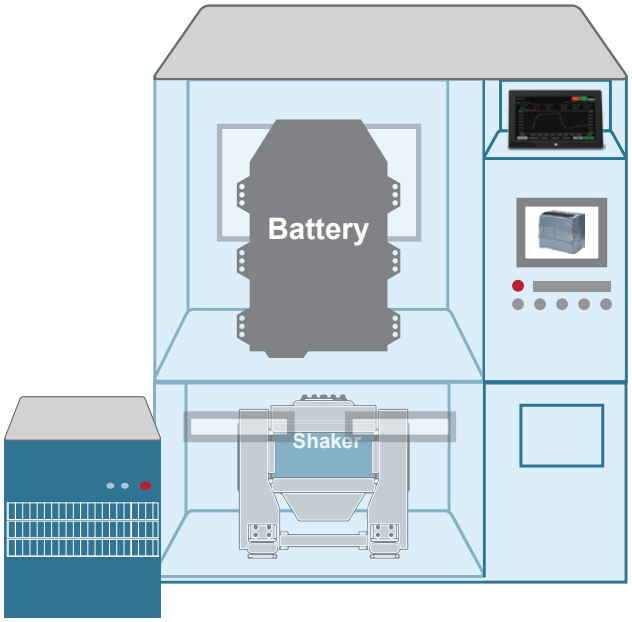
www.crystalinstruments.com/temperature-humidity-environmental-controller



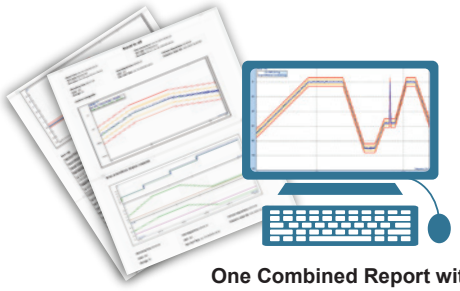
Vibration control system with strain gauge and temperature measurements

Crystal Instruments' ***EDM software platform*** *and* ***Spider hardware platform*** *provide advanced solutions for electric vehicle (EV) battery testing, meeting stringent standards for safety, durability, and performance.*

Supported Standards **International and Industry Standards**
BATSO 01 Manual for Evaluation of Energy Systems for Light Electric Vehicle (LEV) – Secondary Lithium Batteries
MIL-STD-810H - Released with Method 520.5 added to cover the testing of components in combined environments.
IEC 62133 - Safety Requirements for Portable Sealed Secondary Cells and Batteries Made from them
IEC 62660-2:2016 - Secondary Lithium-ion Cells for the Propulsion of Electrical Road Vehicles Reliability and Abuse Testing
IEC 62113-2:2017 - Secondary Cells and Batteries Containing Alkaline or other Non-Acid Electrolytes – Safety Requirements for Portable Sealed Secondary Cells, and for Batteries Made from Them, for Use in Portable Applications.
IEC 62660-3:2016 - Secondary Lithium-ion Cells for the Propulsion of Electrical Road Vehicles – Safety Requirements
ISO 12405-1 - Lithium-ion traction battery packs & systems
SAE J2464 - Electric Vehicle Battery Abuse Testing
SAE J2464:2009 - Electric and Hybrid Electric Vehicle Rechargeable Energy Storage System (RESS) Safety and Abuse Testing
SAE J2380 - Single battery durability testing
UL 2054 - Testing & Certification for Battery Packs
UL 2202 - Standard for Safety Electric Vehicle (EV) Charging System Equipment
UL 2231-2 - Standard for Safety Personnel Protection Systems for Electric Vehicle (EV) Supply Circuits: Particular Requirements for Protection Devices for Use in Charging Systems
UL 2271 - Batteries for Use in Light Electric Vehicle (LEV) Applications
UN 38.3 - Transport of dangerous goods
UN38.3:2015 - Recommendations on the Transport of Dangerous Goods – Manual of Tests and Criteria – Section 38.3 Lithium Batteries
GMW16390 - General Motors manufacturer standard



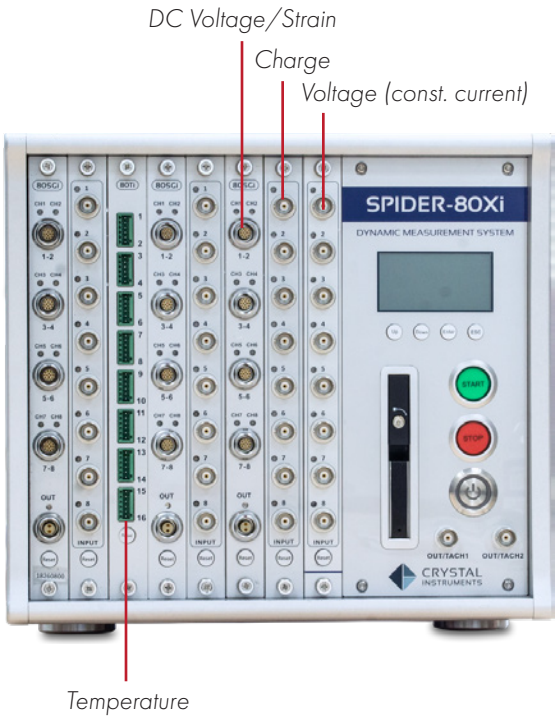
Temperature and Humidity Control



One Combined Report with CAN bus data

Vibration Control System

Comprehensive Testing Options	
Single Axis Vibration Testing	**Combined Environmental Testing**
Full suite of vibration control test types using EDM VCS.	Integrates vibration control with temperature and humidity control for complete environmental testing.



Data Acquisition Systems

Crystal Instruments' platforms enable precise, integrated data acquisition:

- **Spider-80 Series:** Vibration and general data acquisition.
- **Spider-80SG:** Strain gage and general data acquisition.
- **Spider-80Ti:** Temperature data acquisition.
- **Third-Party Systems:** Supported through EDM extensions.
- **Key Features:**
  - Unified control interface within EDM.
  - Manual or scheduled start/stop for all systems.

CAN Bus Integration

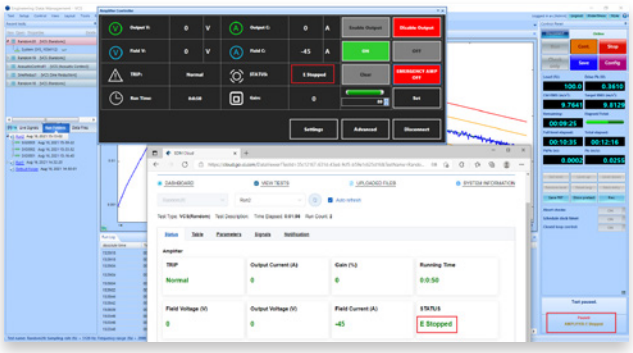
- **Customizable Alarms and Aborts:**
  - Configure CAN bus rules using a customer's DBC file and Crystal Instruments' USB CAN adapter.
  - Example: Monitor battery temperature during vibration tests and pause or stop tests when thresholds are met.

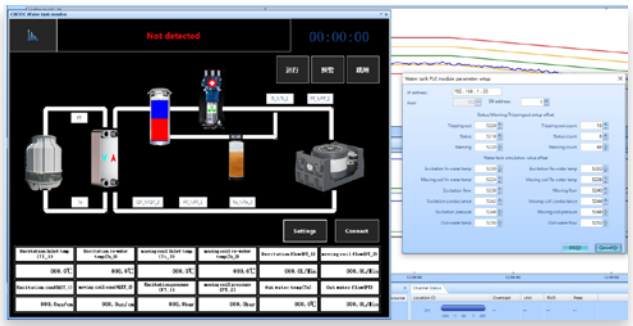
External Device Integration

- EDM Extensions: Seamlessly integrate third-party devices to collect, display, and store data in sync with Spider hardware for a comprehensive testing environment.

Extensions for Environmental Testing

www.crystalinstruments.com/temperature-humidity-environmental-controller





Crystal Instruments' **EDM Extensions** enhance environmental testing by integrating third-party products and communication protocols with EDM software and Spider hardware, providing a unified and efficient testing environment.

Comprehensive Device Integration

Environmental testing often involves multiple external devices that require precise coordination and control. EDM Extensions enable the usage of a centralized operation, streamlining and automating the testing process and reducing operational complexity. Key supported devices include:

- Amplifiers for shaker systems
- Cooling units for shaker systems
- CAN Bus
- Temperature and humidity chambers
- Charge cabinets
- Water chillers
- Pressure chambers

Advanced Data Acquisition Integration

Accurate data acquisition is crucial for meaningful analysis in environmental testing. EDM Extensions seamlessly integrate with various systems to provide a holistic view of the testing environment. Key integrations include:

- Third-party data acquisition systems.
- Cameras for video monitoring and recording.
- Ethernet-connected sensors.

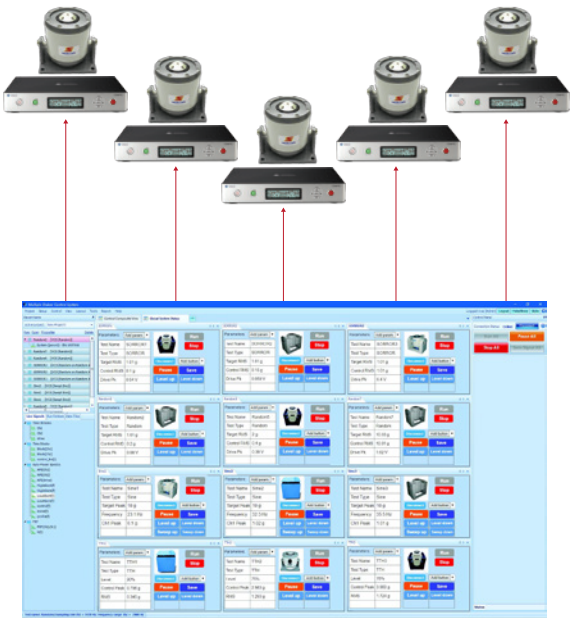
Flexible Communication Protocols

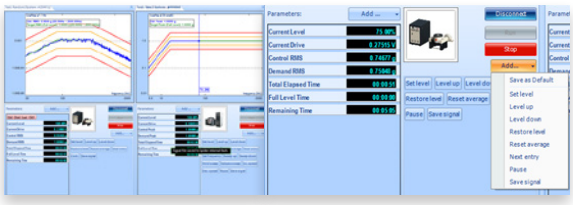
Modern testing setups demand interoperability with diverse software and hardware solutions. EDM Extensions facilitate this through robust communication protocols, enabling smooth data exchange and system control. Supported protocols include:

- Modbus and Profibus:
  - Sends test status from EDM or Spider hardware.
- MQTT Protocol:
  - MQTT Broker/Server: EDM acts as a server to receive commands and test statuses.
  - MQTT Client: EDM sends commands and test statuses to an MQTT server.

Multi-Shaker Control

www.crystalinstruments.com/multiple-shaker-control-software





Centralized Control for Multiple Shakers

- Monitor and control up to **12 shaker systems** from a single PC station.
- View testing statuses and individual signals for each shaker system in real time.
- Send commands to individual controllers or all controllers simultaneously.
- Ideal for production environments, increasing efficiency and simplifying processes.

Run Different Test Types Simultaneously

- Combine different test types, such as **Random** and **Sine**, within the same application.
- Customize the status display for each controller:
  - Example: Show **Peak values** for Sine controllers and **RMS values** for Random controllers.
  - Display composite views for one test and detailed status views for others.

Customizable Command Panels

Configure individual command panels to match testing needs:

- Include options such as Start/Stop/Pause, Sweep Up/Down, Increase Level, and Reset Average.
- Add or remove test-related commands as required.

Common Commands for Unified Control

- Execute commands across all controllers simultaneously using the main control panel.
- Start or stop all tests with a single button press.

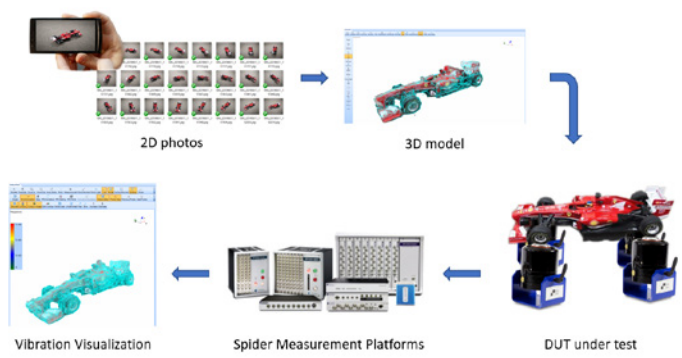
Robust, Fault-Tolerant Design

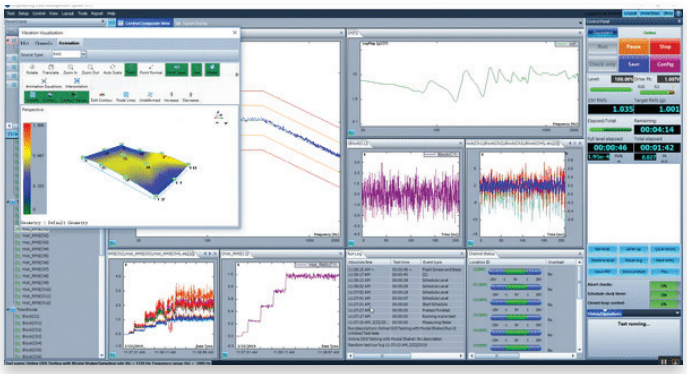
Ensure uninterrupted testing:

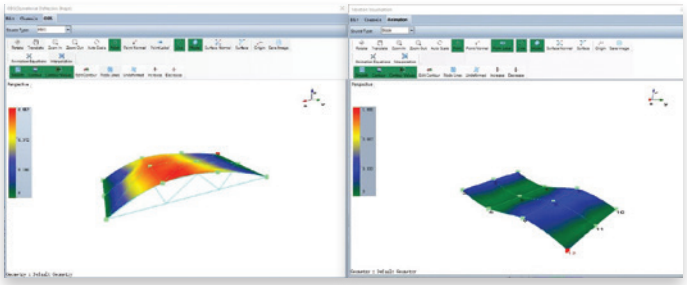
- If one test fails, others continue running independently until stopped by the operator.
- Designed for reliability in complex, multi-system environments.

Vibration Visualization

www.crystalinstruments.com/vibration-visualization







Crystal Instruments' Vibration Visualization feature provides fast and efficient 3D visualization of vibration patterns, enhancing the understanding of structural behavior during testing. Available across all test types in EDM VCS software, this feature simplifies structural model generation and operational deflection shape (ODS) analysis.

Comprehensive Visualization Workflow

Geometry Model Creation:

- Build structural models using built-in tools or import models from **FEA/CAD** files.
- Utilize **3D model reconstruction software** to generate geometry from a sequence of photos.

Input Channel Mapping:

Assign Degrees of Freedom (DOF) information to input channels through an intuitive interface.

Operational Deflection Shape Animation:

- View real-time deformation animations of the test structure.
- Utilize data from input channels for **Block Data** (instantaneous visualization) or **RMS Data** (maximum and minimum deformation analysis).

Key Features

Integrated Tabs for Workflow Management:

1. **Editor Tab:** Create or import geometric models for ODS visualization.
2. **Channels Tab:** Map input channels to DOF information.
3. **Animation Tab:** Visualize real-time deformation using Block or RMS data.

Flexible Data Visualization:

- Block Data for instantaneous structural insights
- RMS Data for detailed deformation analysis

Comprehensive Technology Service Agreement

www.crystalinstruments.com/technology-service-agreement

Crystal Instruments understands the enormous investment our clients put into our products. We match their investment by offering the most comprehensive technical support agreement in the industry. From support calls to staff training, Crystal Instruments provides solutions to our customers' needs.

The "Comprehensive Technology Support Agreement" offered by Crystal Instruments is fairly priced as a small percentage of the total purchase value. The services offered and included in the agreement are for the duration of 1 year. The agreement is renewable at a locked in rate as a subscription. Rates are subject to increase if a subscription is not continued at the time of renewal and signed up for at a later time. Please contact Crystal Instruments for pricing information.

Services offered are:

- Annual software upgrade program - accessible by convenient online downloads
- Annual hardware calibration
- Priority phone/email/live video support from highly trained engineers
- Temporary replacement unit for hardware in 48 hours
- Data recovering services
- Hardware repair when the total service hours required is less than 4 hours per incident

Annual Hardware Calibration

Crystal Instruments DMS is certified by ISO:9001. Hardware calibrations are also performed at the customer's site upon request. Customers with a Premier Technology Service Agreement will receive standard annual hardware calibration services at no additional cost (a $1500 value).

Annual Software Upgrades

Crystal Instruments provides convenient solutions for software upgrades. Users are able to download the latest versions of Crystal Instruments' Engineering Data Management (EDM) software through the support website.

Other options include emailed links to download software updates, physical CD-ROMs sent to your location, and installation instructions provided over the phone by our highly qualified Applications Engineers. Customers with a Premier Technology Service Agreement will receive standard software update services at no additional cost.

Temporary Replacement Units

Crystal Instruments strives to minimize any inconvenience to our customers' operations. Temporary replacement units are often provided to customers as a solution. Units will usually be assigned to customers within 48 hours or less.

Live Product Support

Crystal Instruments support staff is based in Santa Clara, CA at our corporate headquarters. Our support staff provides phone and email support from 8am to 5pm PST, Monday through Friday. All support is provided by highly trained engineers, not technicians. After hours support is also available upon request.

Crystal Instruments' highly diverse staff provides native language support in English, Spanish, Mandarin, Cantonese, Japanese, Taiwanese, Persian, Hindi, and Vietnamese.

Hardware Repair Services

Crystal Instruments provides hardware repair for units estimated to have a 4 hour or less repair service period. Additional hours required for repairs are charged at an hourly rate. Replacement parts are discounted by 30% under the Premier Technology Support Agreement. All hardware repair takes place at Crystal Instruments headquarters in Santa Clara, CA. Our highly trained technicians will accurately and efficiently repair your equipment in our ISO:9001 certified facilities.

Data Recovery Services

Crystal Instruments understands the importance of recovering any lost data safely and securely. Our staff is ready and available to assist you through any data loss crisis.

Crystal Instruments Corporation 2090 Duane Avenue Santa Clara, CA 95054	Crystal Instruments Testing Lab 15661 Producer Lane, STE H Huntington Beach, CA 92649	Crystal Instruments Testing Lab 1548A Roger Dale Carter Boulevard Kannapolis, NC 28081	Phone: +1 (408) 986-8880 Fax: +1 (408) 834-7818 www.crystalinstruments.com