CRYSTAL
INSTRUMENTS

SPIDER-20 SERIES
DYNAMIC SIGNAL ANALYZER

WWW.CRYSTALINSTRUMENTS.COM

Spider-20, Spider-20E, & Spider-20i Dynamic Signal Analyzers

www.crystalinstruments.com/spider-20-dynamic-signal-analyzer

Spider-20/20E Handheld Analyzer

Spider-20i Industrial Version

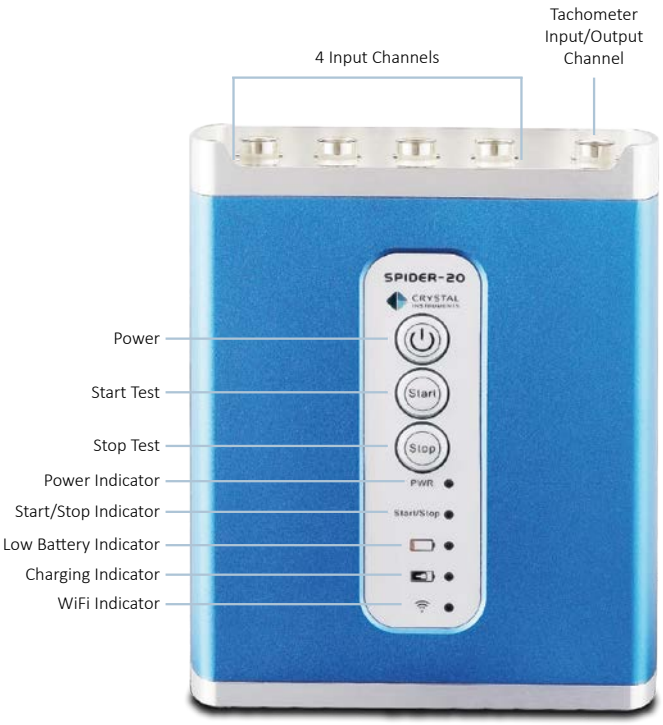
Compact Testing Solutions

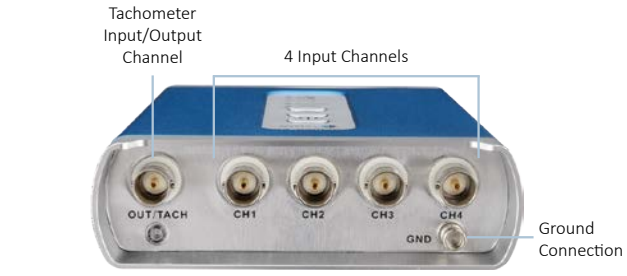
The Spider-20 series from Crystal Instruments are compact yet powerful dynamic signal analyzers and digital data recorders. These handheld units provide four 24-bit precise high-fidelity input channels and a unique software-selectable tachometer-input/signal-source output channel (all using conventional BNC connectors). Each input is individually programmable to accept AC or DC voltage or output from an IEPE (ICP) sensor with built-in electronics.

The Spider-20 model is a diminutive 5.3 x 4.3 x 1 inch tool weighing only 18 ounces. It has only three push-button controls and five LED status indicators. This little powerhouse can run over 6 hours on its internal rechargeable battery which can be replaced in field with a backup battery. It can also record data on its built-in 4 GB flash memory at the simple push of a button.

The newly released 2020 hardware version provides a blazingly fast 256 kHz sampling rate for all 4 input channels.

The Spider-20 series communicates with the world through its built-in Ethernet or Wi-Fi interface. Link the Spider-20 to your laptop or PC operating on Windows and enjoy the full repertoire of functionality provided by our EDM (Engineering Data Management) software including FFT analyzer, modal testing, 1/nth octave acoustic functions, order tracking for rotating machinery, shock response spectra for drop testing, or digital filtering for special purpose analysis.





(**Spider-20 Top**)

(**Spider-20 Bottom**)

(**Spider-20E Bottom**, *replaces WiFi connection with Ethernet*)

SPIDER-20 & SPIDER-20E

Features:

- Weighs only 18 ounces
- Built-in Ethernet (Spider-20E & Spider-20i)
- Built-in Wi-Fi (Spider-20)
- 4 GB flash memory
- 4 input channels
- Up to 256 kHz sampling rate
- 1 tachometer channel
- PC independent
- 6 hour battery life (Spider-20 & Spider-20E)

The Spider-20E features a wired Ethernet connection whereas the Spider-20 is the Wi-Fi version. The Spider-20E and Spider-20 use the same ultra-compact form factor.

The Spider-20i is the industrial version of Spider-20 that comes with a rugged enclosure. It uses an Ethernet connection and requires an external DC power supply.

EDM can program the Spider-20 to perform a custom measurement or measurement sequence at the touch of its START button, making it an unintimidating and user-friendly tool. No computer, tablet or phone is required; just use your thumb and operate your Spider-20 in Black Box mode. Use our flexible Automated Schedule and Limiting software to turn this Spider into an intelligent unattended monitor capable of responding to data conditions or networked instructions, notifying users of significant conditions via e-mail.

Industry and Product Applications

Machinery Diagnosis

Four inputs and a tachometer channel are the perfect size for many machinery monitoring tasks. Simultaneously measure two perpendicular proximity probes or horizontal and vertical bearing cap accelerations at both ends of a machine. Record this along with a 1/rev tachometer during startups and shutdowns to plot waterfalls and Campbell diagrams identifying resonances, critical speeds and unusual forcing functions. Use the same signal inputs to balance the machine. Place accelerometers on either side of a coupling to aid alignment.

Machine/Process Monitoring

Load a custom monitoring program employing our Automated Schedule and Limiting software and leave your Spider-20 to monitor speed and four dynamic inputs. Upon detecting an alarm-level limit (in the time or frequency domain), it can send you an email reporting the finding and make an immediate recording for more detailed analysis. For longer stays, leave the accessory AC power unit plugged in. This allows Spider-20 to draw power (6 Watts, maximum) from any 100 to 240 VAC (50/60 Hz) power line. Alternatively, you can provide a battery backup of 15 VDC (±10%) for more remote applications.

Modal Analysis

Four signal inputs allow you to measure a force and three accelerations. Use a fixed tri-axial accelerometer or up to 3 separate reference accelerometers and a force-transduced hammer to perform impulse studies (with redundant measurements). Alternatively, turn on the output channel and let the Spider drive a shaker with random noise while you rove a tri-axial around the structure, measuring 3 degrees of response freedom at a time. Switch the shaker drive to a sinewave at a detected resonance frequency to do a quick hand-and-ear mode shape analysis on the spot.

The Spider-20 handheld analyzer supports the following EDM Modal Software applications:

- Geometry
- Hammer Impact Modal Testing
- Modal Analysis
- Correlation Analysis
- Single/Multiple (MIMO) FRF Testing

Crystal Instruments Spider Systems

Spider-HUB Industrial Ethernet Switch

Vehicle Dynamics

Record speed and four DC-coupled accelerometers to fully document chassis handling characteristics. Record any combination of acceleration, displacement, strain and sound to characterize annoying operational periods. Monitor engine and driveline vibration on your remote screen during road tests, whether you are the driver, a passenger or a standing observer.

Temporary Monitor

Let's face it – sometimes things just go wrong and we don't know why. This can happen in the factory or at a remote installation and occurs even with brand new products. The problem may be sonic or something shaking or breaking. The mission is always the same – find out what's causing the problem and correct it. A few simple measurements made over the course of a day or a week may provide the necessary clue to solve this annoying mystery. The Spider-20 is ideal for such "detective work". Through EDM it has a very flexible measurement repertoire and the ability to take various actions based upon instantaneous data conditions and other (networked) stimuli. The Spider-20 is small, silent, draws little power, and s inexpensive to replace. It's the right kind of instrument to lock down in an unexpected place for an exploratory "look-and-see". A standard shipping package will include a Spider-20 unit with batteries installed, a pair of backup batteries, a battery charger, one 3ft BNC cable, an AC power adapter, CD for software, and the calibration certificate.

Black Box Mode

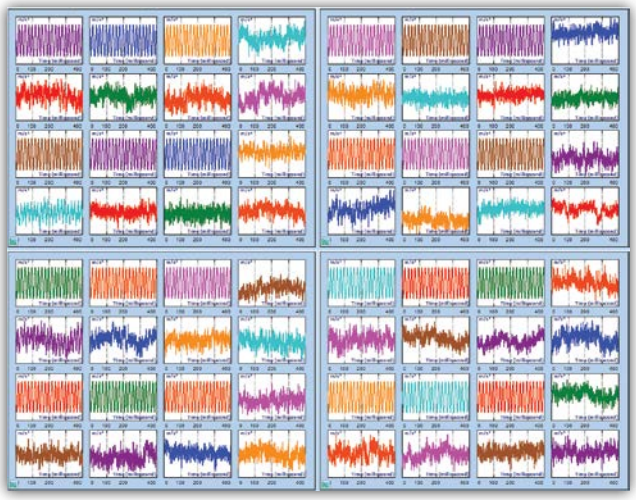
The Spider platform from Crystal Instruments operates as a real-time data acquisition and analysis system while connected to a desktop PC. It can also function as a stand-alone data recording system that does not require a separate computer. This second mode is called Black Box Mode and it is unique to Crystal Instruments' products. A computer is used to set up test parameters and to download test data after the test has been run. While running, the Spider operates autonomously according to a pre-set run schedule. Only single module systems can run in Black Box mode.

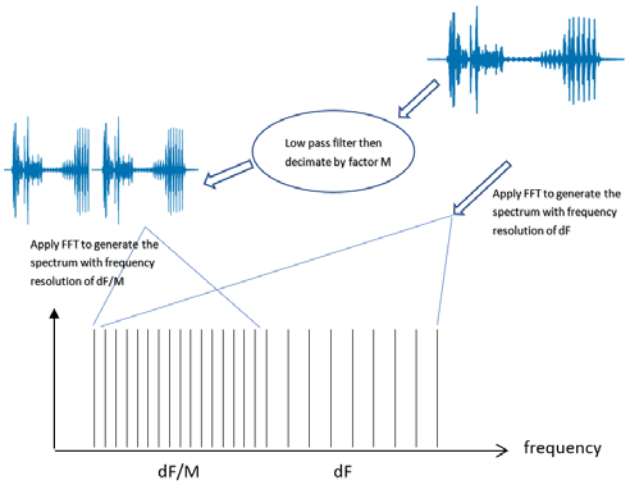
The options to run the Spider-20 in Black Box Mode are:

- Use a PC to re-connect to the Spider module.
- Use the front-panel buttons of the hardware

Network with Spider-HUB Ethernet Switch

The Spider-HUB Ethernet switch made by Crystal Instruments supports the latest IEEE 1588v2 technology. The Spider-HUB guarantees time-stamping accuracy within 50 nanoseconds. Users can chain together multiple Spider-20E or Spider-20i units with the Spider-HUB to construct a high channel system.





Comprehensive Data Acquisition with the Spider System
The FFT Spectral Analysis provides comprehensive data acquisition and FFT analysis functions. ***Acquisition Mode*** controls how the data is acquired block-by-block and processed with the signal analyzer functions. These time blocks can be either gap-free, overlapped, or with gaps, depending on the acquisition mode selection. ***Sampling Rate*** can be set from control panel directly. 54 sampling rate stages available and can be changed without stopping data acquisition. 3D waterfall processing allows the data acquired and processed in real time with either RPM or time as additional axis. Output has a dozen of signal source types to excite the testing articles.

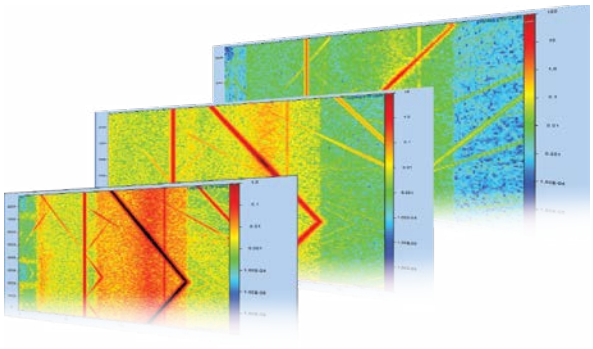
With the ***Frequency Analysis Functions*** the FFT with block size from 256 to 32,768 for all input channels can be applied simultaneously.

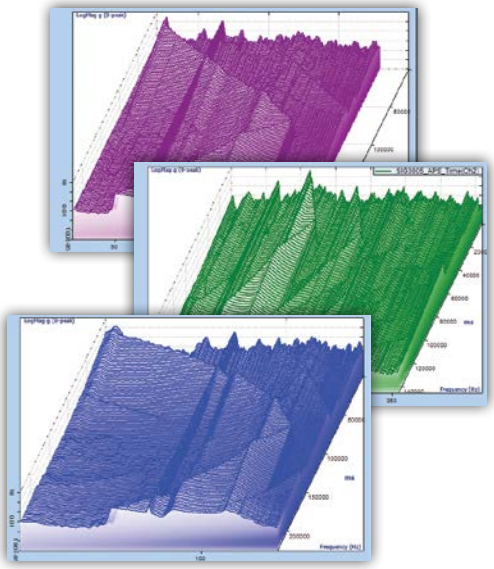
The data window type includes Hann, Hamming, Flattop, Uniform, Kaiser-Bessel, Blackman, Force, Exponential and Force-Exponential. The Spectrum Types include linear spectrum, auto power spectrum, frequency response function, coherence, cross power spectrum and phase spectrum. Hundreds of FRF signals with MIMO model can be computed simultaneously.

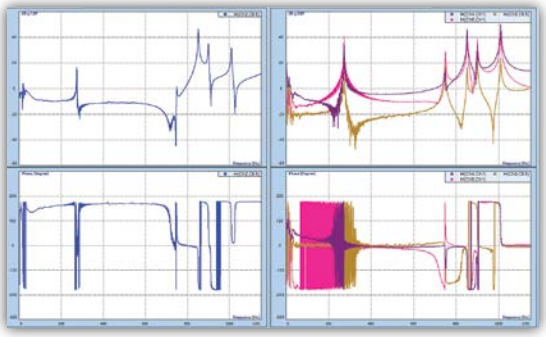
With extremely fast DSP, the processing overlap ratio can go as high as 75% or 90%. A special function enables to search the resonant frequency on any FRF signals.

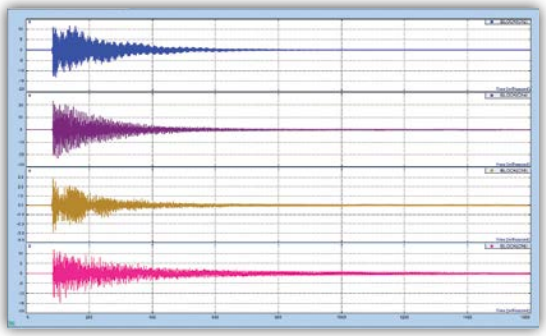
Acquisition Mode includes free-run, continuous after trigger, single shot with trigger, single shot without trigger, auto-arm trigger and manual-arm trigger.

Multi-Resolution Spectrum provides the ability to use different spectral resolutions at low frequencies and high frequencies within the same spectrum. When analysis requires a denser frequency resolution in the lower frequencies compared to the higher frequencies, multi-resolution spectrum can be used. The need for a higher block size (for better frequency resolution) is eliminated because the spectral resolution is eight times higher below the user selected cut-off frequency.









Variable Sampling Rate in the FFT Analysis provides a convenient way to select sampling frequencies of each module in a high channel count system. Measurement quantities such as strain, temperature or pressure often require a much lower sampling rate when compared to acceleration or sound pressure. The variable sampling rate could be efficiently used to select a user defined sampling rate for each front-end while acquiring synchronized data from all channels in the system.

3D signal waterfall displays are available for block signals in all types of tests. 3D signals can be plotted with reference to Time or RPM (when tachometer input is available). User customizable trace number and reference axis settings are available for both Time and RPM reference axes.

With Spider some statistics signals can be computed and recorded into PC with “infinite time”. **RMS:** apply RMS estimation to an input data stream and generate a continuous output time stream; **Peak:** extract the peak or peak-peak value over a period of time and generate a time stream.

Math Functions applied to the signals includes operations such as abs, +, -, *, /, square, square-root, log, and offset scale.

Test Sequence creates a list of tests and run them sequentially. Test sequences can be initiated and controlled by a user command, digital input event, or Windows socket message.

Send Emails and IM as Event-Actions is the ability to send emails or instant messages as custom actions in response to a system or user event. Content of emails can be customized.

Remote Operation Communication using Socket Messages allows to communicate with and control Spider systems remotely with Window socket messages. Socket messages also allow communication with other hardware, such as temperature chambers. Please refer to the Socket Message document for detailed specifications.

The Spider has strong System Failure Protection. With its ***Power Loss Emergency Shutdown***, when a power loss is detected, the system will save all test data into non-volatile flash memory and safely shut down. With its ***Ethernet Connection Loss Detection***, when a network loss is detected, the system can be configured to either save all data and ramp down the test or continue running the test in Black Box mode.

The **output channels** provide signal sources and generate user determined waveforms. Output Types include Sine, Triangle, Square, White noise, DC, Chirp, Swept sine, Arbitrary waveform, Shaped random, Playback

Spider system software can compute the **Shock Response Spectrum (SRS)** for all channels using maxi-max, maximum negative, and maximum positive analysis techniques.

Octave Analysis & Sound Level Meter

www.crystalinstruments.com/acoustics-measurement

Acoustic Measurements with the Spider Series

Acoustics measurements are performed for a variety of reasons, including: product design, production testing, machine performance, and process control. Crystal Instruments' Spider series has capable acoustic measurement facilities including real-time octave, 1/3 octave filters, and sound level meter functions. Crystal Instruments provides an easy to use yet powerful toolbox for acquiring and viewing acoustic signals. Digital octave band filters and raw time data recording can be performed simultaneously for a detailed investigation of noise problems.

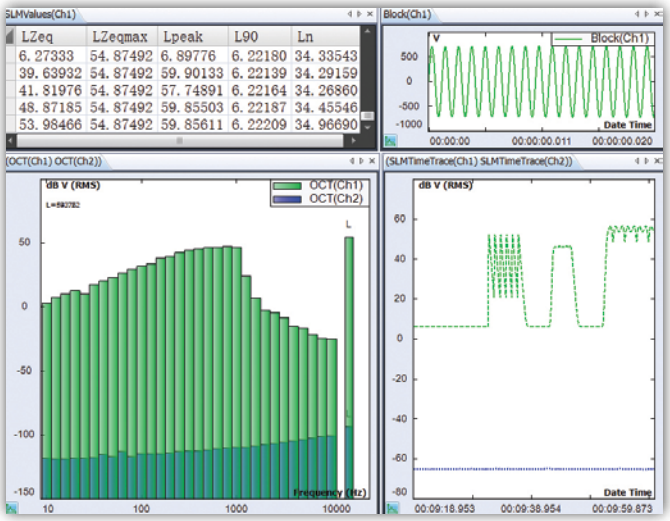
Onboard IEPE (ICP®) transducer power capability allows for direct connection to pre-polarized microphones when used with an ICP microphone preamplifier. Traditional condenser microphones are also easily accommodated by connecting the direct voltage signal from the microphone power supply into an input channel. White and pink noise signals can be produced using the waveform generator. This feature is very useful when performing absorption measurements using a speaker.

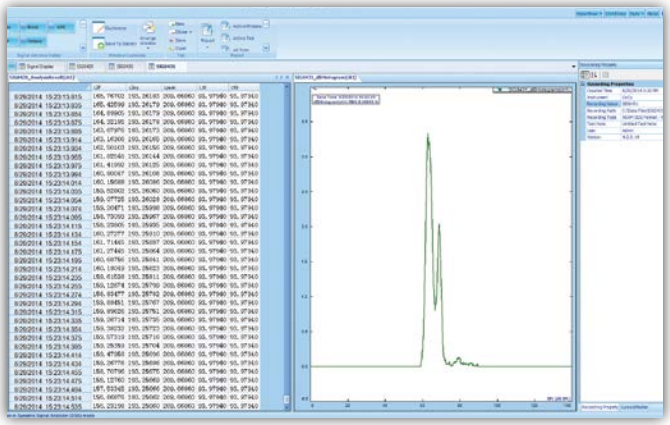
Real-time Octave Analysis

The acoustic data acquisition software option for Spider hardware includes real-time octave filters, sound level meters, and microphone calibration functions. These three operations allow users to perform many acoustic measurement operations.

The octave analysis option applies a bank of real-time filters with 1/1, 1/3rd, 1/6th, or 1/12th octave resolution. The input time stream is split into fractional frequency-band signals (octave bands) which can be saved. Frequency weighting can be applied to the octave bands to simulate human hearing, and time weighting can be applied to adjust sensitivity to short duration events. The resulting octave spectra can be saved periodically and displayed on a waterfall plot to observe how the spectrum changes in time. The RMS time history can also be saved as a time trace of a given octave band.

The 1/1 and 1/3 octave analysis is implemented using a real-time band-pass filtering with decimation technique. The data stream is processed continuously, and fed into a bank of decimation filters. Band-pass filters are then applied to the output of each stage of the decimation filters. This provides extremely accurate filter shapes that comply with worldwide acoustic standards: ANSI std. S1.11:2004, Order 3 Type 1-D and IEC 61260-1995.





Acoustic Measurement: Sound Level Meter

The Sound Level Meter (SLM) is a related application in the acoustic data acquisition software. This module is also referred to as an Overall Level Meter. The SLM applies a frequency weighting filter to the input signal and time weighting to the filter's output. Various acoustic measurements are then extracted from both the input and output signals of this frequency weighting filter.

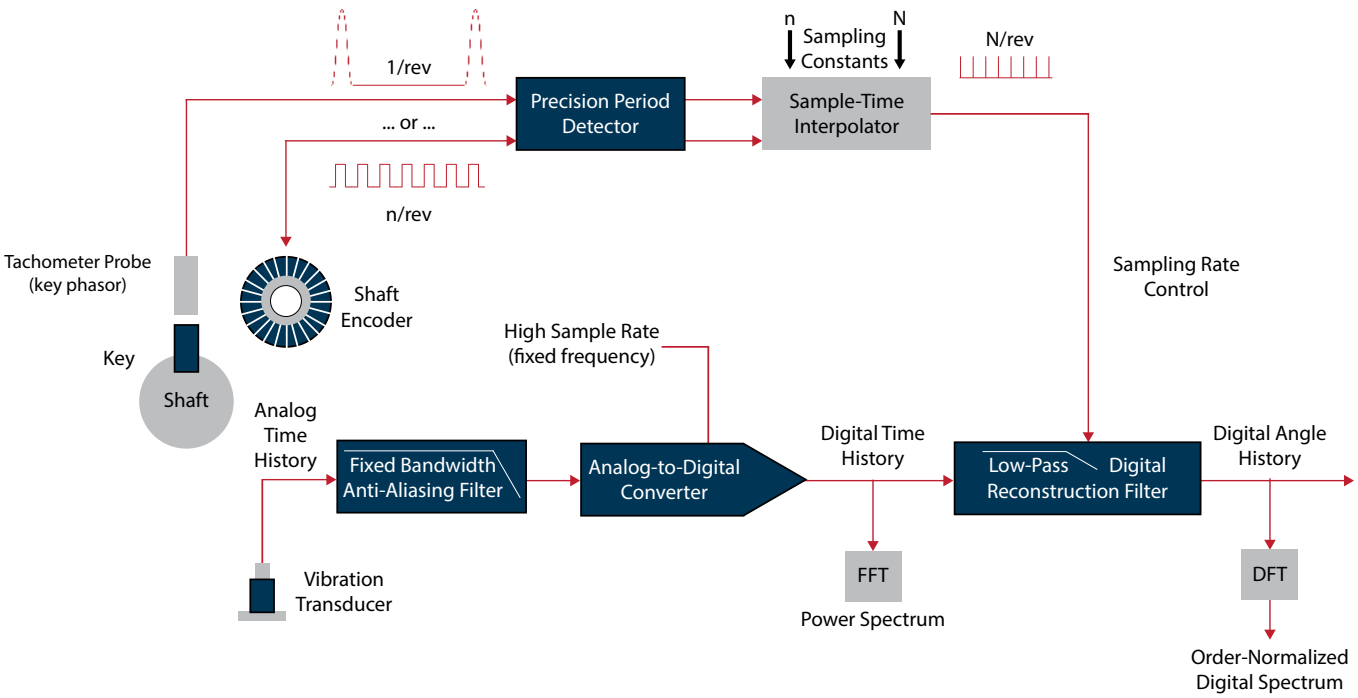
All of the features that you would expect from an acoustic measurement device are present…and then some! A, B, C, and linear weighting functions; fast, slow, impulse, and peak detectors; and user selectable high and low-pass filtering. The tremendous dynamic range that all Crystal Instruments products offer take the worry out of setting voltage ranges precisely to avoid under-range or overload conditions.

Built-in Microphone Calibration

Microphone calibration is easily handled by using a traditional microphone calibrator together with the online calibration feature. Simply define the frequency and amplitude of the reference signal, and the Crystal Instruments system will automatically detect the input channel that the calibration signal is applied to and then calculate the necessary calibration constants. Offsets are calculated and stored for later reference.

Simultaneous Recording and Octave Analysis

The raw time data of all input channels can be recorded at full analysis frequency band. After recording, the saved files can be processed by using EDM Post Analyzer which provides the identical analysis algorithm to those available in the real time mode.



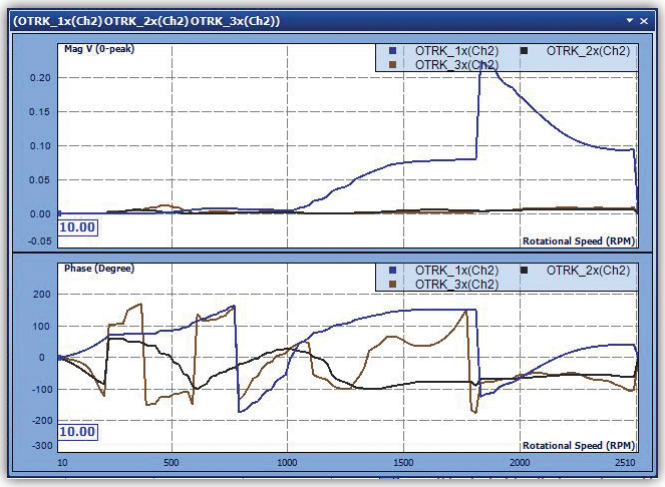
Providing Real-Time Order Tracking

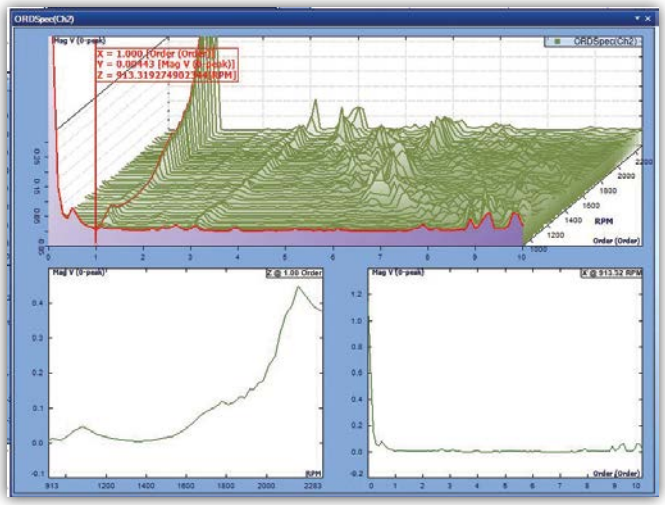
The high channel count Spider systems provide a wide range of real-time order tracking capability to understand the noise and vibration induced within rotating and reciprocating machines. Fixed and variable speed machines are accommodated as are both structural vibration and condition monitoring diagnostics. Multiple tachometer inputs can be processed for accurate speed tracking during analysis. Spectral mapping, order tracking, time history and orbit data analysis are all available.

Additionally, Crystal Instruments provides post processing order tracking capability in its Post Analyzer (PA) that generates the same analysis results as real-time order tracking. The user can simply record the raw data together with tachometer signals and process them later.

Advanced Digital Processing

All measurements in the order domain are derived from an advanced digital resampling method. High speed DSP processing allows synchronization of the analyzer's sampling rate to a tachometer signal. The analyzer's sampling rate continuously adjusts to track variation in shaft speed. After data sampling, a flexible radix FFT converts the time/angle data into the frequency/order domain. The flexible radix algorithm provides a much broader choice of resolutions and spans than does a power-of-2 FFT for extraction of the order amplitude values as a function of RPM.





Order tracking extracts the amplitude at a single order and plots it against machine speed (RPM). Real-time order tracking offers advantages over fixed sample rate techniques. It provides better tracking performance when the RPM varies quickly. Additionally, it provides precise control over the order resolution of the measurement. For instance, users can specify that the order resolution be 1/10 of an order for all measurements.

Real-Time Order Tracks and Order Spectra

Real-Time order tracks are the amplitude history signals of certain “rotational orders” graphed against the machine’s RPM. Multiple order tracks can be measured, displayed, and saved. Order spectra are auto power spectra that are normalized to orders. All order tracks can have the optional phase which is phase measurement relative to the tachometer signal.

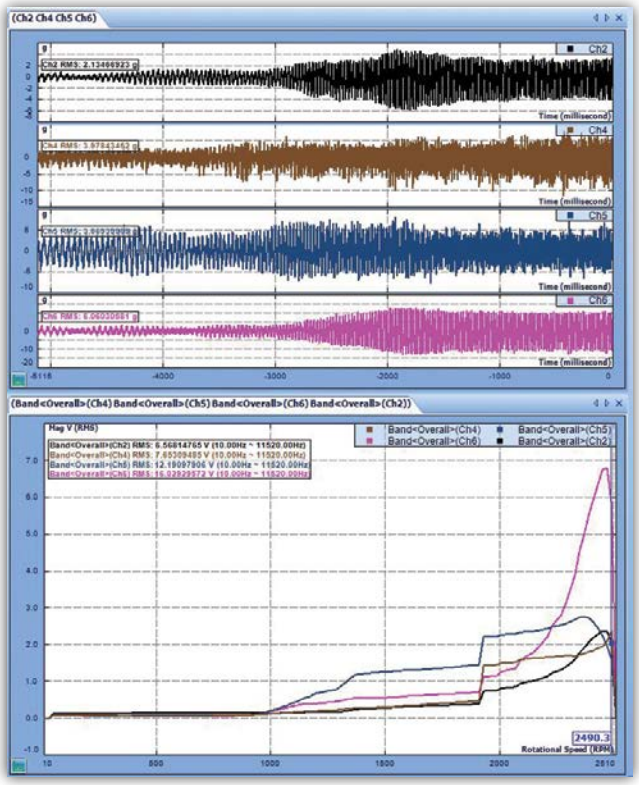
The RPM range can be from 10 to 10,000. The acquisition modes include: Free Run, Run Up, Run Down, Run Up and Down, Run Down and Up order tracks can be scaled with linear peak, linear RMS, or power scaling.

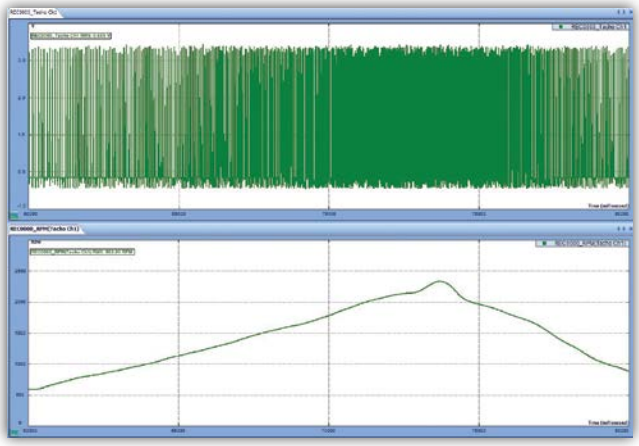
Constant Band Frequency Spectra

Constant band frequency spectrum displays the auto power spectrum of the selected fixed band of frequencies and is computed using FFT analysis within the fixed band of interest. 3D plots using time or RPM as the reference are available along with 3D extractions of desired orders of interest. The available spectrum amplitude units includes EU_{pk}, EU_{rms}, EU^2_{rms}, EU^2/Hz, and EU^2•s/Hz

Order Tracks with Phase

Order tracks with phase are order spectra with the associated phase measurement relative to the tachometer signal. All the measurement specifications are the same as real-valued order tracks, except that order tracks with phase can also be displayed as Bode, Polar, or Nyquist plots. Furthermore, with this option the orbit display can be enabled for any two data channels.





Tachometer Processing

The tachometer is stored as a time history. The user may view either the original tachometer input waveform or the resulting RPM-versus-time translation. A tachometer channel can be used to extract the order track of any input channel or channels. Tachometer signal processing automatically eliminates any “glitches” in the tachometer pulse train and reconstructs the best estimate pulse signal for phase measurement.

Orbit Analysis

Online orbits can be displayed and monitored on a standard two-channel orbit diagram chart. For advanced analysis a throughput recording including a tachometer or vibration signal can be post-processed using the orbit analysis tool in Post Analyzer. This provides averaging, filtering and order based orbit displays with a replay feature for visualizing changes over a change in machine speed.

Display Flexibility

Measurements can be viewed in real time as the data is being acquired and analyzed. On line displays include the time histories, orbit plots, order spectra, order tracks, waterfalls, spectrograms, and contour plots. Users can also view the instantaneous RPM as a function of time.

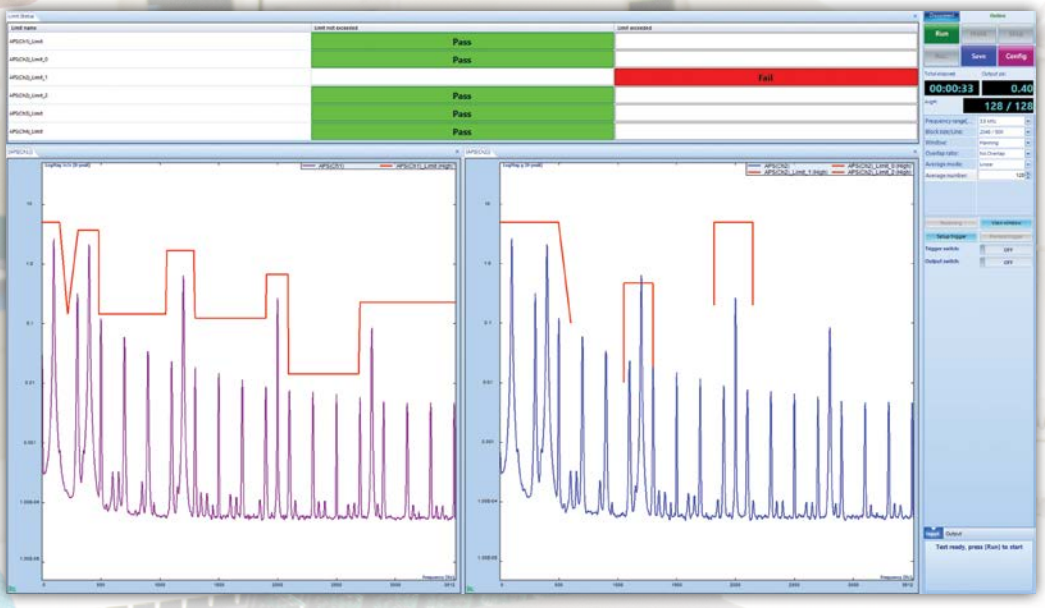
Waterfall displays include a “slice” mode that provides a plot of a cut across the order or RPM axes. To view a particular slice, simply position the 3D cursor. Users can view the order track for a given order, or fractional order, or view the amplitude-versus-order spectrum at a given RPM. This capability allows the user to quickly zero in on the problem’s root cause.

Color map presentations further enhance problem diagnosis capabilities. For example, spectrograms, or color intensity plots make it very easy to differentiate order related responses from excitation due of a structural resonance. Color contour, or topographic maps, also provide added graphic insight into the nature of a vibration or acoustic response.

A full complement of cursors – single, dual, peak, valley, harmonic and sideband provide precise numeric readout of critical data features. Users also have complete and easy control of the orientation, scaling, colors, etc., enabling the creation of insightful data visualizations.

Automated Production Testing Solutions

www.crystalinstruments.com/automated-production-testing

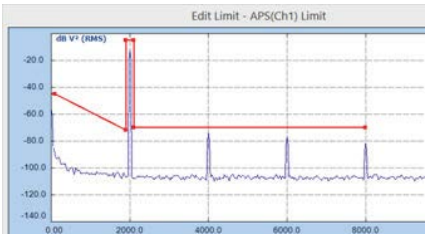


Automated Production Testing Solutions

Automated production testing is critical in today's competitive manufacturing environment. Companies can no longer rely on variable costs, non-uniformity, and potential health hazards that come with a laborer-based manufacturing line. This is no less true for sound and vibration tests , ranging from in-process burn- in tests to product validation and verification tests. The measure- ment tools and intelligence behind present day manufacturing include data acquisition equipment as well as closed-loop control. And while these systems may not take part in the assembly of any goods, they are just as important to ensure quality control for both components coming into an assembly line and products going out.

The PC can (optionally) be disconnected and tests run in "Black Box" mode without an attached computer.

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.

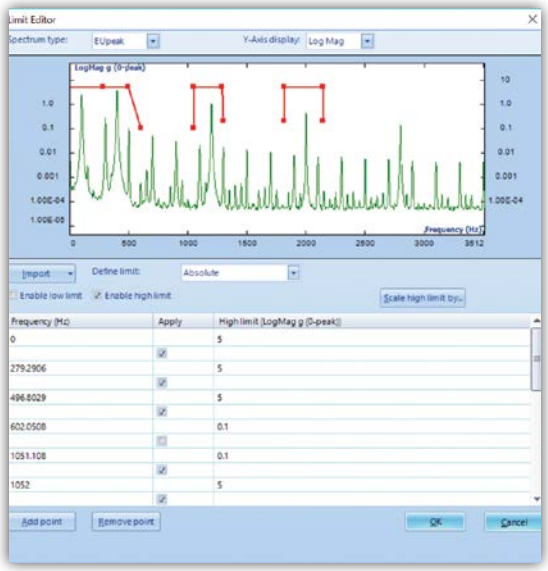
Step 3:
User will receive an alarm email

EDM or EDM Cloud Email Service

Testing status can be viewed on any PC, laptop, or even smart phone.

Black Box mode provides the ability to run Spiders without an attached computer. The Spider API, when used along with Black Box mode, is the gateway to integration with LabView, Mat-lab and other scripting software. A cellular phone, tablet or PC can control multiple Spider front-ends at distributed locations running disparate tests from a single control screen.

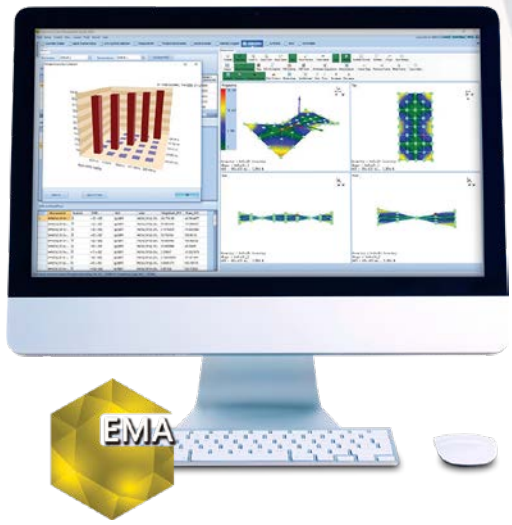
Limit Configuration
Alarm limits could be defined independently and multiple limits could be defined to each channel and may be applied to a Time Block, Auto Spectrum, FRF, Coherence, Octave Spectrum, Sound-Level Measurements, RMS, or Peak value. Spectra and time histories are tested by comparing against a custom test signal; a template which must bound the measured signal. Each test signal may be either an upper or lower limit and may contain up to 64 segments. Up to 64 test signals may be applied to a single measurement.



Customize Actions for Specific Events
Event-Action Rules (EAR) allows users to customize the system's response to every test event. User defined events include: signal exceeds a limit profile, signal is less than a limit profile, normal end-of-test, loss-of-signal or any of number of the events encountered during a VCS test. Responses include: halting a test, starting a different test, flashing the control screen, initiating a recording, sending a screen message, sending a text message, or sending an email. Users can program loops using EAR. Every event is logged on a cloud server and is identified by the text of a customized event string (only on EDM Cloud).

EDM Modal Testing & Analysis

www.crystalinstruments.com/edm-modal-testing-and-analysis-software

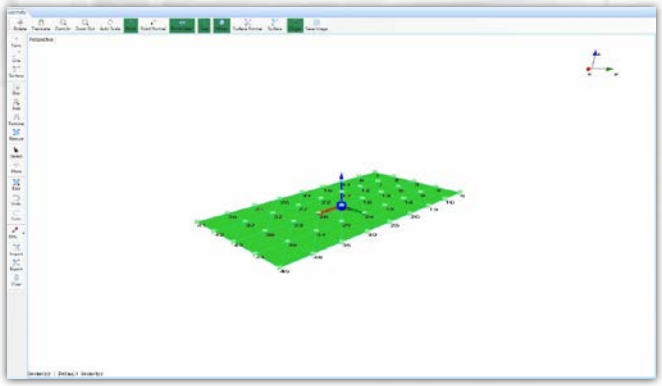


Overview

EDM Modal is a complete Modal Testing and Modal Analysis suite for Experimental Modal Analysis (EMA). EDM Modal was developed based upon the sophisticated technologies of modern modal analysis theory and technique. With its intuitive controls and powerful features, EDM Modal is the ultimate tool for modal analysis applications. An intuitive interface allows users to manage highly complicated tests that can involve hundreds of measurement points and multiple excitations. This interface also allows for simple tests to be conducted quickly and with little effort. Regardless of how complicated the modal test is, EDM Modal provides the precise tools to achieve your goal.

EDM Modal supports the following applications:

- Supports Spider Systems with up to 512 input channels
- Geometry creation/import/export/animation
- Operational Deflection Shape analysis
- Impact hammer modal testing
- Single/Multiple shaker modal testing
- Operational Modal testing and analysis
- Single reference (LSCE), Poly reference (PTD), Poly-X and SSI modal analysis

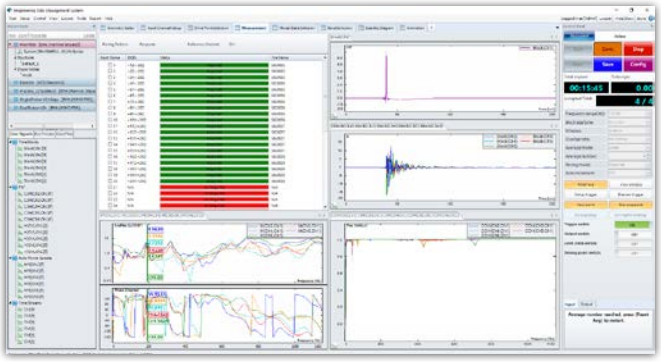


Geometry

EDM Modal Geometry is the primary EDM Modal software module, is required for every EDM Modal system. This option provides quick and ease of use structural model creation and full 3D visualization of test and analysis results.

Features:

- Basic elements: point, line, surface; editing graphically or through editor table entry
- Built in component library: line, plane, cube, sphere, cylinder and circle
- Geometry model save/open/clear
- Geometry model import: UFF (.unv), CAD (.dxf, .stl, .obj, .3ds), Nastran (.nas), 3D modle (.vvm), and .xml
- Geometry model display: point, line, surface; point directions, point number; surface norm; origin
- Geometry view: Perspective, Quad (perspective, Top, Side, Front)

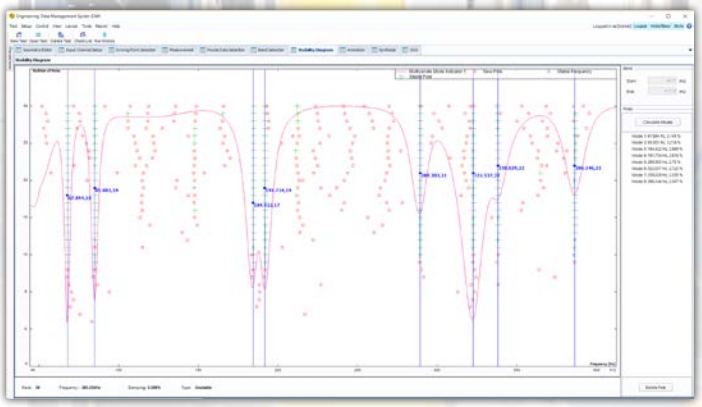


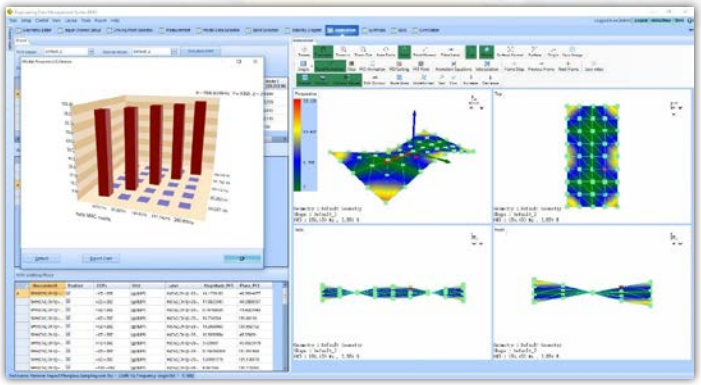
Hammer Impact Testing

EDM Modal Hammer Impact Testing provides the necessary features for a single-operator experimental modal test. The Hammer Impact GUI features an intuitive step-by-step process, allowing a user to easily go through the setup and then the testing.

Features:

- Intuitive testing process – Testing plan
- Roving hammer or response
- Manual/Auto trigger arming
- Resizable preview window for DOFs, frame counts, impact/response waveforms
- Double hit detection on/off, auto/manual reject





Modal Analysis

EDM Modal provides the user with a complete arsenal of tools, from FRF data selection and parameter identification to results validation and mode shape animation for the modal analysis. MIF functions help to determine where are the natural frequencies. A Stability Diagram is employed with modal parameter identification.

With the Standard Modal Analysis option, the proven Least Square Complex Exponential (LSCE) fitter is implemented for pole identification. The advanced curve fitter for the poly-reference case is the Poly-reference time domain (PTD) method. More efficient and neat curve fitter, Poly-X (p-LSCF) is also available. For the OMA data, the unique Stochastic Subspace identification fitter can be helpful.

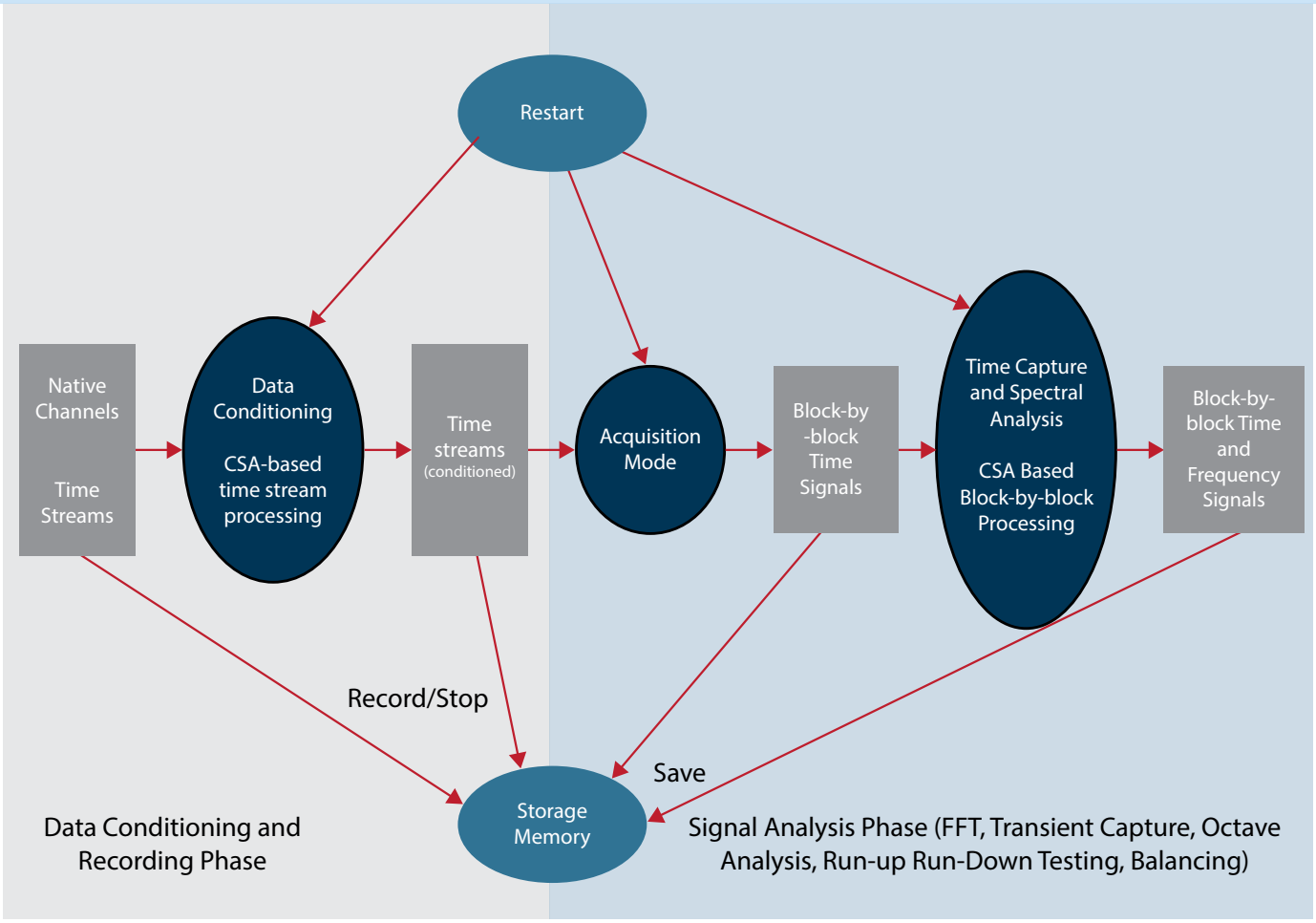
The resulting mode shape table can be saved and used for mode shape animation. Modal Assurance Criterion (MAC) function and FRF synthesis are also available. These provide means for modal parameter validation.

Features:

- Ease of use modal data selection
- MIF: Multivariate MIF, Complex MIF, Real MIF, Imag sum MIF
- User selectable frequency band for parameter identification
- Stability Diagram
- Proven curve fitting method: LSCE, PTD, Poly-X, SSI
- Least square frequency domain (LSFD) algorithm for mode shape calculation
- Auto/Cross MAC calculation and display
- Import/export modes: UFF format
- Mode Shape Animation: wireframe, surface contour, FFD, animation with interpolation
- Contour edit, Contour value
- Animation smoothing
- Node lines
- Animation with un-deformed elements
- Mode Shape Animation speed control (fast, slow), magnitude control (increase, decrease)
- Animation format: Single, Left/Right, Upper/Lower
- Modal Shape video saving, graph saving
- Synthesized FRF vs. measured FRF, with Correlation and Error values

Continuous Data Recording & Post Analysis

www.crystalinstruments.com/data-recording-for-dynamic-signals



In a time-critical test, it is highly desirable to record the raw time data continuously, so that the data can be analyzed later when more time is available for a complete review. Integral raw data recording eliminates the need for a separate recording device so necessary just a few years ago.

The Spider platform simultaneously performs both real-time processing and continuous data recording. In most of real-time applications, the raw data can be recorded at any desired sampling rate with full 32-bit floating point precision. To increase the reliability of data recording, a special check sum algorithm is always applied to the measurements.

For example in a typical FFT process, the raw data time streams (full bandwidth, sampled at the instrument's highest sample rate) and/or the continuous output of a bandwidth-reducing data conditioning process can be recorded at a lower sample rate on the system's storage media while the real-time filtering and spectral analysis is in progress. This same design philosophy is incorporated in the Spider high channel count systems.

While being recorded, the measured values can be graphically displayed as y/t or y/x diagrams, as bar charts, as waterfalls, FFT, PSD, tachometer speed, or numerical statistics displays with a simple mouse-click. EDM software allows users to design an individual graphical visualization for each desired real-time measurement.

The recording function is driven by user-defined events. On Spider front-ends the recording "action" can be initiated via various events, including: hard button press, user software command, defined trigger-condition event, digital input event, third party software command, defined alarm limit event, fixed timer, etc.

EDM Post Analyzer Software

www.crystalinstruments.com/edm-post-analyzer-software

Crystal Instruments EDM PA

EDM - PA Bundles	
Part Number	**Description**
EDM-01	PA Viewer: View data, export data to UFF, BUFF, MATLAB, user-defined ASCII, and wave files. Generate reports. Includes File Converter and Waveform Editor.
EDM-02	PA Basic Bundle: In addition to functions of PA Viewer, PA Basic includes 3D display, File import, File export, trigger, FFT post-analysis.
EDM-03	PA Premium Bundle: In addition to PA Basic, PA Premium includes signal conditioning, digital filter and resampling, SRS, octave analysis and SLM, order tracking, offline sine reduction.

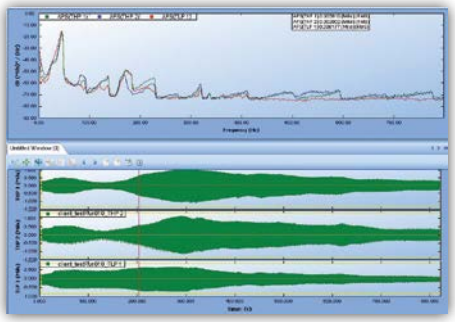
Crystal Instruments offers EDM Post Analyzer software, a powerful adjunct to your Spider-based analysis tool kit, allowing you to analyze Time Stream recordings made using your Dynamic Signal Analyzer. The beauty of this approach is that it lets you analyze and reanalyze digitally recorded data after the recording event.

To offer a complete package of both real-time analysis and post processing, Crystal Instruments developed three separate but related software modules: Post Analyzer, Waveform Editor, and File Converter. Post Analyzer (PA) contains many powerful post processing tools with batch processing capability. Post Analyzer is an independent Windows application that analyzes recorded data files on a computer using various algorithms. Most of the algorithms implemented in PA are identical to those used in the real-time DSP of the Spider hardware. The user should expect the same or very similar calculation results using PA to those computed in the hardware in real-time. This document describes the PA functions.

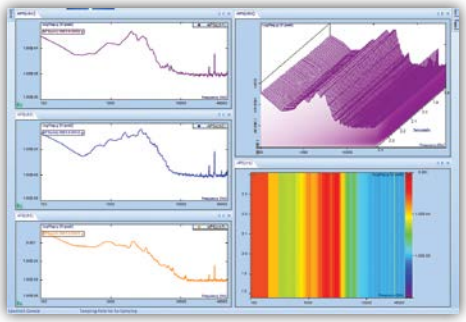
Waveform Editor is an independent Windows application that allows the user to cut, edit or merge the time waveforms. File Converter is an independent Windows application that converts files in various data formats to standard ATFX format.

For convenience of ordering, we also created three bundles of PA: PA Viewer allows the user to view data and create reports; PA Basic has FFT spectral analysis, curve fitting, demodulation spectrum and 3D signal display functions; PA Premium has more advanced functions including Waveform Editor, File Converter, offline sine reduction, real-time filters, octave filters and order tracking.

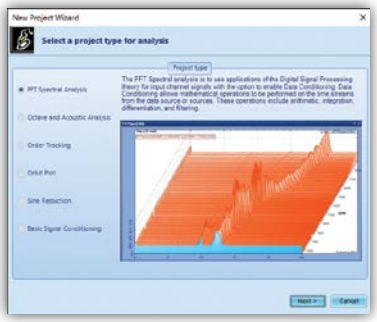
Engineering Data Management (EDM) is a complete suite of turn-key solutions for both real-time processing and post analysis. Shown in the next page are typical screen shots of EDM PA functions, in the following order: Post Processing, PA Spectra, and PA Projects.



Post Processing



PA Spectra



PA Projects

Function	PA Viewer	PA Basic	PA Premium
Browse, display, and edit long waveform files	√	√	√
Signal display with different spectrum unit and X-Y scale	√	√	√
Signal annotation, cursor, play sound, calculate RMS, THD, ZOOM-in, ZOOM-out, auto scaling	√	√	√
Create template-based report in HTML, Excel, Word or PDF	√	√	√
Engineering unit conversion, dB reference	√	√	√
Export to standard formats including ASAM-ODS, UFF, BUFF, MATLAB, user-defined ASCII, and wave files	√	√	√
3D display: waterfall, colormap	√	√	√
Import user-defined ASCII file, wave file, Pacific Instrument file		√	√
Acceleration, velocity and displacement conversion		√	√
Polynomial Curve Fit		√	√
FFT Spectral analysis: FFT, auto power spectra, cross power spectra, frequency response function		√	√
Math Functions: abs, +, -, *, /, square, square root, log, integration, differentiation, RMS, peak, offset and scale		√	√
User defined data conditioning modules (PA-05)			√
Digital Filters: IIR, FIR, Low-pass, High-pass, Band-pass (PA-06)			√
Shock Response Spectra (SRS) (PA-07)			√
Fractional octave filters and SLM: 1/1, 1/3, 1/6, 1/12 (PA-08)			√
Order Tracking: RPM spectra, order spectra (PA-09)			√
Offline Sine Data Reduction (PA-10)			√

Spider-20i: Ruggedized Platform for Remote Condition Monitoring

www.crystalinstruments.com/remote-condition-monitoring-software

Remote Condition Monitoring Features

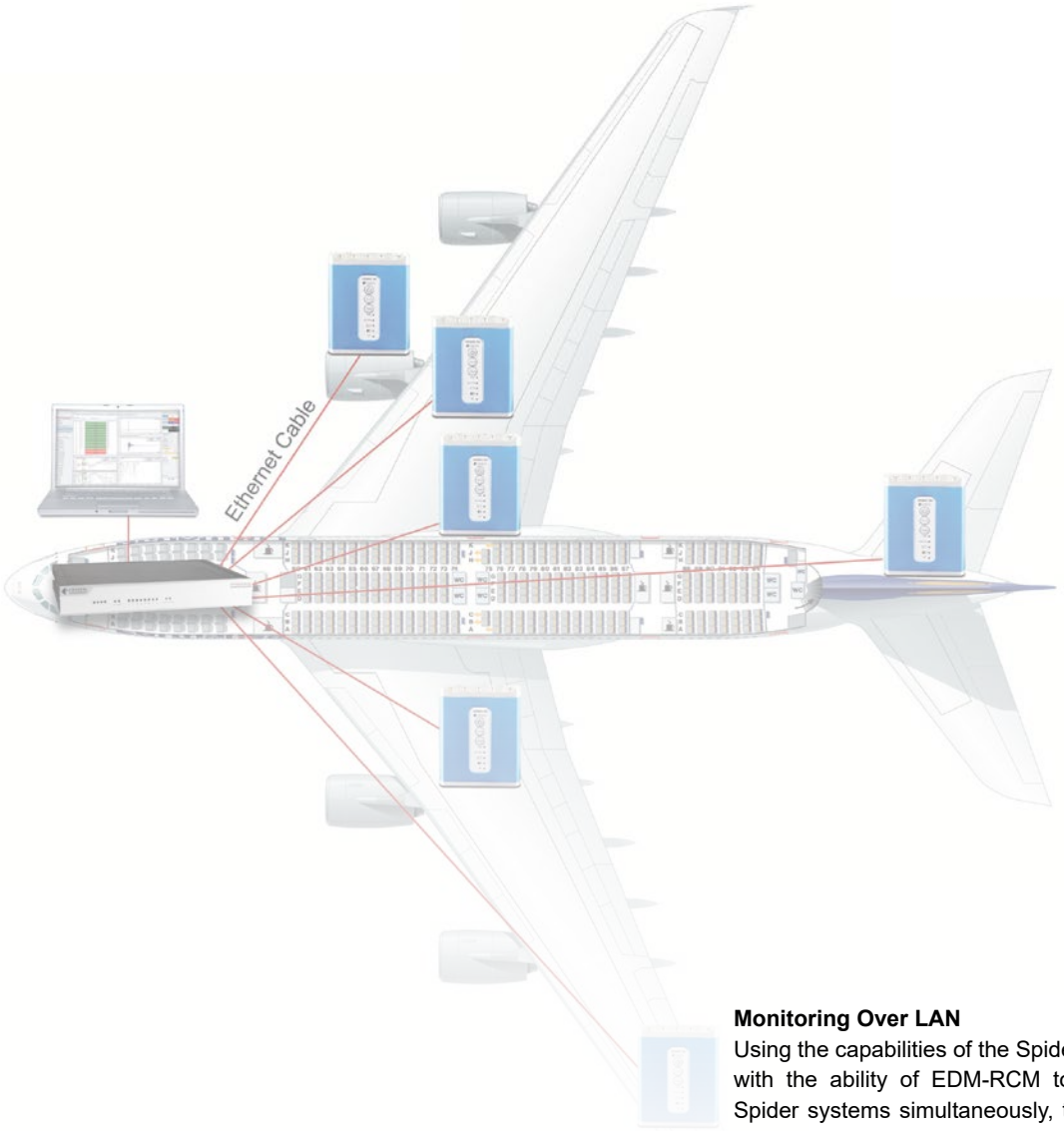
- Simultaneously monitor status of multiple Spider systems
- Simultaneously download data from all Spider systems
- View generated alarms across all Spiders
- Low power consumption
- 160 dbFS dynamic range
- “Black Box” mode (no PC required)
- Reliable in all circumstances

Hardware and Software Solutions

Sometimes a test conducted at a proving ground in Michigan needs to be controlled by engineer in California or a wind turbine in Germany requires observation by designers in Japan or vibrations on an orbiting space station need to be remotely evaluated. That’s when remote condition monitoring is the tool of choice. A Crystal Instruments Spider system remotely deployed can be wirelessly linked to a PC in an office which is running EDM-RCM (Remote Condition Monitoring Software).

EDM-RCM provides a convenient interface to setup multiple single and high channel count systems and simultaneously monitor all the systems together.

Power consumption is a big concern for remote monitoring and the Spider excels in this area. A Spider has an internal flash memory that stores all the software code, configuration parameters and the measurement data. This design runs the system at a low power consumption. The four input Spider-20E only consumes about 6 watts of power.

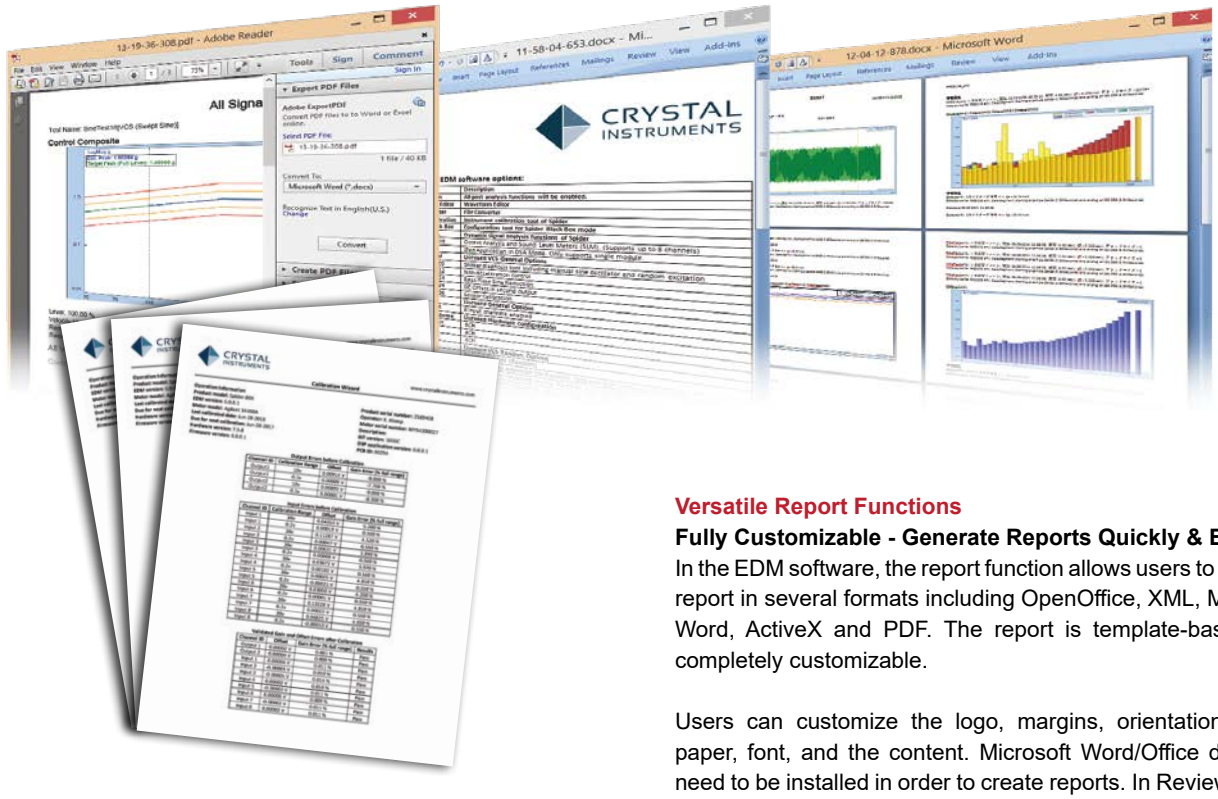


Monitoring Over LAN
Using the capabilities of the Spider's Black Box mode together with the ability of EDM-RCM to efficiently monitor multiple Spider systems simultaneously, the Spider systems could be deployed in a plant or a factory where continuous monitoring of several machines are needed.

Each Spider front-end is configurable to continuously monitor the input channels and can be set to save data or generate specific events when certain user defined limits on time or spectral data is exceeded. The generated alarms are then passed to the EDM-RCM software for the user to diagnose.

Remotely Manage Power to a Spider System
The active power consumption of one eight channel Spider front-end is less than 10 watts. It is feasible to use battery power, or solar assisted power source to power the units.

In the events where the Spiders need to save power when data acquisition is not needed, users can put the system into power saving mode using an intelligent power control module developed by Crystal Instruments. The power module uses Ethernet messages which can transmit to the Spider using a local network or through the internet. The power module can also be used to remotely power recycle the Spider.



Versatile Report Functions

Fully Customizable - Generate Reports Quickly & Easily

In the EDM software, the report function allows users to create a report in several formats including OpenOffice, XML, Microsoft Word, ActiveX and PDF. The report is template-based and completely customizable.

Users can customize the logo, margins, orientation of the paper, font, and the content. Microsoft Word/Office does not need to be installed in order to create reports. In Review Mode, batch reports can be made for the signals saved in multiple runs. Using ActiveX reporting, signal displays in the report can be rescaled, analyzed, and zoomed.

- User can select from various templates for creating reports
- Plot reports can be generated by simply right-clicking the mouse
- Company logos can be inserted into the template header or footer
- Reports can be in WORD, XML or PDF format
- “Active Report” allows the user to ZOOM in and out like a graph on the report
- Generate typical hardware calibration reports

Monitoring Through EDM Cloud

EDM Cloud allows users to continuously monitor input channels and status information. Crystal Instruments provides user accounts with convenient cloud storage space for uploading data. All tests in EDM-DSA support status are checked through EDM Cloud.

The EDM Cloud website is located at https://cloud.go-ci.com. Users can access EDM Cloud from anywhere in the world to check the status of past and current tests. A secure login flow ensures the status can only be checked by authorized personnel with proper credentials. Multiple logins for accessing the same Cloud account is available.

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