VCS Random Testing

Create Test

To create a new test, first open up EDM. On the VCS Start Page, select **Random** under the **Create a test** tab.

EDM Spider-VCS Start Page	? ×
CRYSTAL INSTRUMENTS Engineerin	g Data Management System 11.1.0.15
Recent tests	Account login
<u>Open Test</u>	Account Admin Password: Please login to VCS. Keep me logged in Login
Create a test	Spider connection status
Random Sine on Random Random on Random SROR Acoustic Control MIMO Random MESA RoRSoR MDOF Random Swept Sine Resonance search and tracked dwell Multi Sine Sine Oscillator Sine Reduction	Spider-80X (SN: 2597504 (IP: 192.168.1.153)) detected.
Blade Fatique Test Resonance Search MIMO Sine MDOF Sine	Detect more Spiders
Classical Shock <u>Transient Time History Control</u> <u>SRS</u> <u>Earthquake</u> <u>Transient Random</u> <u>Sine Beat Seismic</u> <u>Crash Control</u> <u>MIMO Shock</u> <u>MIMO TTH</u> <u>MIMO SRS</u> <u>Time waveform replication</u> <u>MIMO TWR</u>	New Edition Spider-80XI With LCD 3/64 Channels Dynamic Data Acquisition System

The New Test Wizard will now open up. From here, select Random again and then press Next.

? ×

New Test Wizard

Select test type This test will be applied to the configured default system

	Vibration	Control (VCS)	MIMO Vibration Control	All Templates
\diamond	Random	Random vibration control full ver	sion (Random Control)	
	Sine on Random Random on Random	Channels: 8 Frequency range: up to 46kHz		
\diamond	Swept Sine	 Long waveform recording: Enable Max FFT lines: up to 25600 lines Random response limiting: Enable 	ed ; led	
\bigcirc	Resonance Search and Dwell	 Kurtosis control: Enabled Profile importing and editing: Enabled 	nabled	
\bigcirc	Multi Sine	Advanced functions:		
\diamond	Sine Oscillator (Sweep Sine FRF)	Sine on Random control: Enable Random on Random control: En	d abled	
\bigcirc	Shutdown System (with tracking filters)	If either Sine on Random or Rando you may select the tab on the left	om on Random is enabled, to create SoR or RoR tests.	
\diamond	Classical Shock			
\odot	Transient Time History			
\diamond	Crash Control			
\bigcirc	Sine Beat Seismic			
\Diamond	Transient Random			
\diamond	Shock Response Spectrum Synthesis			
_	**			
				< Back Next > Cancel

Finally, give the test a name and select the Spider system that will be used to run the test. Once all is complete, press **Create**.

New lest Wizard (×						
Fill in the basic information for this test Note: you will be able to search for this test by "Test name" or "Test description".							
Create a new Random test: RandomTest							
Test name: RandomTest DAppend the sequence number							
Test description:							
Use the default libraries of the previous test of the same type. If default libraries were not applied before the manufacturing settings will be used.							
Create test by Using a template.							
Select Template name Description							
Spider system: SYS_2397504							
Test directory: C:\Users\Drew\Documents\EDM\demo\RandomTest Choose							
Create new run folder for each run							
< Back Create test C	ancel						

Test Configuration

The test will now need to be configured to run. This includes inputting information regarding the shaker, creating the schedule for the test to follow, and determining the parameters for the frequency analysis. To access the **Test Configuration** menu, press the **Config** button that can be found on the right side of the screen.



Shaker Parameters

Click on **Edit Parameters** and enter the information from the shaker specifications. This is important for the safety of the shaker and testing unit.

Last update: 2024/05/22 19:32

G Test Configurations for Random	Test [Random]								?	Х
Shaker parameters «	Shaker information —	Shaker information								
Shaker parameters	M. C.									
Test parameters	Manufacturer	Anonyn	nous							
Pre-test parameters	Shaker name	Default	Shaker							
Test profile	Payload mass		0.22046	lb						
RMS limits	Eivture macs			а Пъ						
Run schedule	Fixture mass		0							
Limit channels	Actual shaker limits used in t	his test								
Event actions	Force RMS		100.02	IRE						
File directory	TOICE NWD		100.02	LUI						
Save/Recording setup	Acceleration RMS		16.667	g						
Output settings	Max. velocity		1.778	m/s	0					
	Max. positive displacement		6.35	mm	0					
	Max. negative displacement		6.35	mm	0					
	Shaker orientation		Vertical							
	Max. drive voltage peak		10	۷						
	Min. drive frequency		1	Hz						
	Max. drive frequency		2500	Hz						
	Shaker moving mass		0.44092	lb						
Note: The parameters listed above are for reference only. Click "Edit parameters" to view or edit shaker parameters. The acceleration limit is adjusted by the following factor: Actual Acc. = Min(Shaker param. Force / (Armature mass + Payload mass + other mass), Shaker param. Acc.)							on			
	wax. drive frequency should	la not be	set too nign, the rec	omm	ended range within 1024	+U HZ.				
	Edit parameters									
	Load from library Save to libra	ary Imp	ort manufacturer shal	cer lis	Export manufacturer	shaker list	Import defa	ault library		
Config. library 🔻							(<u>o</u> ĸ	<u>C</u> anc	el

2025/05/28 09:48

Shaker Limits			? ×
Shaker details			
Manufacturer Anonymous		Shaker name Default Shaker	
Force and acceleration			
Random Max. Force RMS (LBF)	100.022 🜩	Random Max. Acc. RMS (g)	16.66667
Sine Max. Force Peak (LBF)	2205.866 ≑	Sine Max. Acc. Peak (g)	75 🖨
Shock Max. Force Peak (LBF)	100.022	Shock Max. Acc. Peak (g)	50 🌲
Displacement			
Max. positive displacement (mm)	6.35	Max. negative displacement (mm)	6.35
General settings			
Max. drive voltage peak (V)	10	Max. velocity (m/s)	1.778 🜲
Min. drive frequency (Hz)	1 🛉	Max. drive frequency (Hz)	2500 🌩
Shaker orientation	Vertical 🔹		
Shaker moving mass			
Armature mass (Ib)	0.4409245	Header expander (lb) <u>]</u>	0
Slip table (lb) ↔	0 🔺	Drive bar (Ib) \leftrightarrow	0
Calc. acc. using force			
Note: the Payload Mass can be entered in	the shaker parameters page. Ac	ctual acceleration limits used in each	test will be re-adjusted by
following factor: Actual Acc. = Min(Shaker param. force / (/	Armature mass + Payload mass	+ other mass), Shaker param. acc.)	
Max. drive frequency should not be set to	oo high, the recommended rang	je within 10240 Hz.	
			OK <u>C</u> ancel

Test Parameters

The **Test parameters** section in the **Test Configuration** window has settings for the analysis parameters, abort sensitivities and control strategy.

Last update: 2024/05/22 19:32

G Test Configurations for Random	Test [Random]				? ×
Test parameters «	Lines	DOF	Av	/erage	Overlap ratio
Shaker parameters	400	•	120	60 ‡	50%
Test parameters	Delta frequency (Hz)	Control strategy	Sic	ama clipping	Drive limit (Volt Pk)
Pre-test parameters	5 00000	Single channel		sind copping	2
Test profile	5.00000	Single channel		- C	
RMS limits	Frequency range (fa)(Hz)				
Run schedule	Calculated by profile	 Advanced settings 			
Limit channels					
Event actions	Abort sensitivity —				
File directory	9		- Custo	tomize	
Save/Recording setup	0.0	0.5	1.0		
Output settings	Not sensitive		Very sensitive	e	
	Low control RMS level		40.00 dB		
	Max RMS change		13.00 dB		
	Percent of lines past abo	ort	10.00 %		
	Displacement limit tolera	ance ratio	1.50		
	Summary —				
	Block T = 0.2 s	dT = 0.	000195313 s		
	Sampling rate (fs) = 512	0.00 Hz Freque	ncv range (fa) =	= 2000.00 Hz	
	Sumpling face (13)	oround rieque	incy range (ia)	200000112	
			2000.).00 Hz	
Config. library 🔻					<u>O</u> K <u>C</u> ancel

Lines- The useful number of spectral lines, proportional to block size. Increasing the lines / block size will improve the resolution of the frequency spectrum (allowing better detection of lower frequencies) at the tradeoff of increased calculation time and slower response.



Control Strategy- Determines whether one or multiple control channels are used, and how the composite control signal is generated (if multiple channels are used). **Test Profile** The test profile is defined in the Test Profile section of the Test Configuration window. A graphical preview of the profile plot is displayed above, with a breakpoint table below for entering the profile. CSV import / export is also supported as an alternative to profile editing.

Cal Test Configurations for RandomTest [Random] ? X								
Test profile «	RMS (V):	1.00063	Scale RMS					
Shaker parameters		LogMag V ² / Hz					1	
Test parameters								
Pre-test parameters	0.001							
Test profile	0.0001							
RMS limits	1.00E-05							
Run schedule							1000	"Frequency (Hz)
Limit channels		20	100				1000	2000
Event actions		Delete row Annend row					V avia LogMag	
File directory	Insert row	Delete row Append row		iport/Analyze			Y axis Logiviag	
Save/Recording setup		Frequency	Voltage	Slope	High abort	High alarm	Low alarm	Low abort
Output settings		20	V /HZ 0.000273233	db/Oct	6	3	-3	-6
		20	0.000275255	3	U C		-5	, in the second
	2	80	0.00108776	5	6	2	-3	-6
			0.00100110	0	U.S.	5	5	
	3	350	0.00108776	•	6	3	-3	-6
		550		-3	•			
	4	2000	0.000191497		6	3	-3	-6
	4	2000	0.000131431		U	5	-5	~
	Limit forma	t dB 💌 S	lope unit dB/Oct	▼ Tolerar	nces			
	To calculate	the cross-over breakpoin	t, enter "?" in any breakp	oint line.				
	Load from lil	orary Save to library						
Contig. library 🔻							<u>0</u> K	<u>C</u> ancel

Breakpoint Table: Breakpoints can be added via **Insert row**, **Delete row** and **Append row**. Use **Clear table** to clear out all rows except for the first and last row. Breakpoint Calculation: In the profile editor, EDM can calculate the crossover point given a specified slope and point value. If a '?' is entered as a Frequency or Amplitude value, EDM will interpolate that value given the slope before and after that point.

RMS Limits

The overall RMS level of the control channel(s) is monitored with alarm and abort limits. These limits are set under the **RMS Limits** section of the **Test Configuration** window. The table displays the expected RMS and peak values for the configured broadband profile, compared to the shaker limits as a percentage.

2025/05/28 09:48

🕝 Test Configurations for Random	Test Configurations for RandomTest [Random] ? X							×		
RMS limits «	Warning: The expected values are estimated. The actual shaker demand values may be significantly higher. Narrowband RMS and									
Shaker parameters	profiles.	narrowbands and s	ine tones the	at will be turned	on in schedule.	Does not include all ha	mowpands and	i sine toi	ies	
Test parameters	Check AVD against sh	heck AVD against shaker limits ————————————————————————————————————								
Pre-test parameters			Desfile a			Europeter d/Shale		1		
Test profile	Physical quantity	Profile RMS	values	cpected	Shaker limits	limits	er			
RMS limits	Acceleration (g)	0.102	0.3061 (Pe	eak) S	50 (Peak)	0.6%				
Run schedule	Velocity (m/s)	0.0008846	0.002654	(Peak)	1.778 (Peak)	0.1%				
Limit channels	Displacement (mm)	0.003273	0.01964 (F	Pk-Pk)	12.7 (Pk-Pk)	0.2%				
Event actions	Force (LBF)	0.06749	0.2025 (Pe	eak)	100 (RMS)	0.1%				
File directory										
Save/Recording setup]		
Output settings	Control RMS limits du	iring test ———						-		
	Calculate based on	the table								
	Enter manually (g)									
	Enter manually (dB)									
	© Enter manually (00)									
	Criter manually (%)									
		(a)		(dB)		(%)				
	High abort	0.2036	(+)	6.00	* *	199.5				
	High alarm	0.1441	(+)	3.00	* *	141.3				
	Profile RMS	0.102								
	Low alarm	0.07224 💌	(-)	-3.00	×	70.8				
	Low abort	0.05114 💌	(-)	-6.00	×	50.1 🚔				
Config. library 🔻							<u>о</u> к	<u>C</u> an	cel	

Run Schedule

The **Run Schedule** defines how the test is run automatically through a preset routine. This schedule can support loops and periods of running at a specified level and duration. The **Run Schedule** can also include user-defined events in **Event Action Rules**.



Start a loop- Adds a new loop to the schedule – EDM will open a prompt for how many times to loop. Double-click on an existing loop number to edit the number of times for that entry.

Run at Level- Adds a new entry to run the test profile at a specified level. Schedule duration must be specified, as well as level as a percentage or dB of the target profile.



Input Channels

The input channels will now need to be set up. All sensors will to be properly configured before testing. The **Input Channels** menu can be found through **Setup** \rightarrow **Input Channels**.



Channel Type

Control vs. **Monitor**. When running a test, there will need to be at least one control sensor. The control sensor is used to monitor the actual vibration levels that the shaker is producing. It then sends this data to the controller so that it maintains the targeted profile. This sensor should be mounted somewhere on the shaker/slip table itself, not the Device Under Test (DUT). Monitor sensors will show the levels that the DUT itself is experiencing.

On/Off	Channel type	Location ID
🔽 On	Control 🗸	Ch1
🔽 On	Monitor ~	Ch2
Off	Monitor 🗸 🗸	Ch3
Off	Monitor 🗸 🗸	Ch4
Off	Monitor 🗸 🗸	Ch5
Off	Monitor 🗸 🗸	Ch6
Off	Monitor	Ch7
Off	Monitor	Ch8

Measurement Quantity

Defines the physical unit that will be measured by the sensor connected to the channel.

Sensitivity

Sets the proportionality factor for the measurement (millivolts per engineering unit) given as a parameter of the sensor.

Input Mode

There are five modes in which the inputs can operate:

DC-Differential- In the DC-Differential mode, neither of the input connections is referenced to the local ground. The input is taken as the potential difference between the two input terminals, and any potential in common with both terminals is canceled out. The Common Mode Voltage (CMV) will be rejected as long as the overall input voltage level does not saturate the input gain stage. Beware that very high CMV will cause clipping and may damage the input circuitry. Signals with a nonzero mean (DC component) can be measured in this mode.

DC-Single End- In single-ended mode, one of the input terminals is grounded and the input is taken as the potential difference of the center terminal with respect to this ground. Use this mode when the input needs to be grounded to reduce EMI noise or static buildup. Do not use this mode when the signal source is ground referenced or ground loop interference may result. This mode also allows signals with a non-zero mean to be measured.

AC-Differential- AC-Differential is a differential input mode that applies a low-frequency high-pass (DCblocking) analog filter to the input. It rejects common mode signals and DC components in the input signal. Use this when DC and low-frequency AC voltage measurements are not required or when a DC bias voltage is present. The analog high-pass filter has a cutoff frequency of -3dB at 0.3 Hz, and -0.1dB at 0.7 Hz for the IEPE input mode.

AC-Single End- AC-Single End grounds one of the input terminals and enables the DC-blocking analog filter. Use this mode for non-ground referenced sources where measuring the DC or low-frequency components are not required. It shares the same high-pass filter as that of AC-Differential.

IEPE (ICP)- All Crystal Instruments products support IEPE (Integral Electronic PiezoElectric) constant current output type input channels. IEPE refers to a class of transducers that are packaged with built-in voltage amplifiers powered by a constant current. These circuits are powered by a 4 mA constant current source at roughly 21 Volts.

Charge- Some sensors provide a high-impedance charge output. Usually, these are high-sensitivity piezoelectric units that lack a built-in voltage mode amplifier (i.e. IEPE), allowing them to be used in high-temperature environments. The Spider-81 front-end module has a built-in charge amplifier that allows the system to read the output of these sensors

Sensitivity	Input mode
100 (mV/g)	IEPE 🗸 .
100 (mV/g)	IEPE 🗸 🗸
100 (mV/g)	IEPE
100 (mV/g)	DC-Single End
100 (mV/g)	AC-Differential
100 (mV/g)	In-Line Charge Converte
100 (mV/g)	External Charge Amplifi
100 (mV/g)	AC-Single End

Running the Test

Now that all of the parameters for the test have been setup, the test is ready to run. Here are the final steps to start the test.

- 1. Press the **Connect** button to connect to the controller.
- 2. Press the **Run** button.
- 3. The **Spider Check List** will now appear. Here you can check the settings of the test and verify that all is set up properly. Press **Start** once this has been verified.
- 4. The Pre-Test will now begin. This will verify that the control loop is properly established and provide data that the control loop needs.
- 5. The test is now running

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Last update: 2024/05/22 19:32