# **VCS Shock Testing**

# **Create New Test**

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

EDM Spider-VCS Start Page		7 X
	ing Data Manageme	ent System
Percent fasts	1	Accountionin
Open Test		
	Account Adm	in
	Password:	Please login to VCS.
	🔲 Keep me logged in	Login
Create a test	Sp	oider connection status
Random	Spider-80X (SN: 2597504 (IP: 192	.168.1.153)) detected.
Sine on Random Random on Random		
SROR Acoustic Control MIMO Bandom		
MESA RoRSoR MDOF Random		
Swept Sine		
Resonance search and tracked dwell Multi Sine		
Blade Fatique Test Resonance Search MIMO Sine MDOF Sine	Detect more Spiders	Do not show this start page
Classical Shock		
Transient Time History Control SRS Earthquake	New Edition	
Transient Random Sine Beat Seismic Crash Control MIMO Shock MIMO TTH	Spider-80XI With LCD	
MIMO SRS	Saver Channes Opeanis Data Argo	
Time waveform replication MIMO TWR		

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



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 Test V	Wigard										?	$\times$
Fill in the Note: you	e basic ia u will be	aformation for t able to search for	this test or this test by "Test name" or "Tes	t description".								
Create a n	ew Class	ical Shock test: I	DemoShock									
Test name		DemoShock				Append the se	quence number		1			
Test descri	iption											
Use t	he defau	It libraries of the	previous test of the same type. I	f default libraries were not ap	lied before th	e manufacturing se	ttings will be used	L.				
Cont	e test bu	uning a terrolat										
Contract	e test by	using a templat	с.									
Select	Temp	late name	Description									
Spider syst	tem	SYS_2597504										
Test direct	torys	C:\Users\Drew\I	Documents\EDM\demo\DemoSh	hock		Choose						
Create	new run	folder for each r	un									
									< Back	Create test	Can	cel

# 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.

Control panel 4				
Connect	Off	line		
Run	Pause	Stop		
Check only	Save	Config		
Level (%):	Drive P	k (V):		
	0.0	0.0000		
Ctrl RMS (V): Target RMS (V):				
0.0	000	0.0000		

#### **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.

Shaker parameters Manufi Test parameters Shaker Pre-test parameters Shaker Test profile Payloa SRS analysis Fixture Shock abort limit Limit channels Actual Run schedule Force p Site directory Acceler Save/Recording setup Max. vp	acturer Ar mame Dr id mass emass emass eshaker limits used in this peak ration peak	nonymous efault Shaker 0.22046 0 test 100.0	ib b		
Test parameters Shaker Pre-test parameters Shaker Test profile Payloa SRS analysis Fixture Shock abort limit Limit channels Actual Run schedule Event actions Force p File directory Accele Save/Recording setup Max. v Duttout ettions	name D d mass mass shaker limits used in this peak ration peak	efault Shaker 0.22046 0 test 100.0	ib ib ib		
Pre-test parameters Shaker Fest profile Payloa SRS analysis Fixture Shock abort limit Limit channels Actual Run schedule Force p Event actions Force p File directory Acceler Save/Recording setup Max. vp	name D d mass e mass shaker limits used in this peak ration peak	efault Shaker 0.22046 test 100.0	÷ в		
Test profile Payloa SRS analysis Fixture Shock abort limit Limit channels Actual Run schedule Force p Event actions Force p File directory Accele Save/Recording setup Max. vp	d mass e mass shaker limits used in this peak ration peak	0.22046 0 test	÷ њ	2 2	
SRS analysis Fixture Shock abort limit Limit channels Actual Run schedule Force p Event actions Force p File directory Acceler Save/Recording setup Max. w	e mass shaker limits used in this peak ration peak	0 test	÷ Ib	2	
shock abort limit Limit channels Run schedule Event actions File directory Save/Recording setup Max. w Durbut settions	shaker limits used in this peak ration peak	test			
Imit channels Actual Un schedule Force p Vent actions ile directory Accele ave/Recording setup Max. v	shaker limits used in this peak ration peak	test			
un schedule Force p vent actions Accele ile directory Accele ave/Recording setup Max. ve lutruit settings	peak ration peak	100.0			
vent actions ile directory ave/Recording setup Max. vi	ration peak		LBF	- <b>O</b>	
ave/Recording setup Max. w		5	0	9	
aver recording setup Max. w					
	elocity	1.77	m/s	s 🕑	
Max. p	ositive displacement	6.3	mm	n 🤨	
Max. n	regative displacement	6.3	mm	0	
Shaker	orientation	Vertica			
Max. d	Irive voltage peak	1	v		
Min. dr	rive frequency		Hz		
Max. d	trive frequency	250	Hz		
Shaker	moving mass	0.4409	lb		
Note: limit is Actua	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. )				
Мак.	Max. drive frequency should not be set too high, the recommended range within 10240 Hz.				
Edit p	parameters				
Load fro	om library Save to library	Import manufacturer sh	aker lis	st Export manufacturer shaker list Import default library	

vcs:shock

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	e Peak (LBF)	2205.866	Sine Max. Acc. Peak (g)	75 🚔			
Shock Max. Fo	rce Peak (LBF)	100.022 🚔	Shock Max. Acc. Peak (g)	50 ≑			
Displacement -							
Max. positive d	displacement (mm)	6.35	Max. negative displacement (mm)	6.35 🚔			
General setting	gs						
Max. drive volt	age peak (V)	10	Max. velocity (m/s)	1.778 🚔			
Min. drive freq	uency (Hz)	1 🗘	Max. drive frequency (Hz)	2500 🚔			
Shaker orientat	tion	Vertical 💌					
Shaker moving mass							
Armature mass	(lb)	0.4409245 ≑	Header expander (lb) 🧕	0 ≑			
Slip table (lb)	н	0	Drive bar (lb) 🙌	0			
Calc. acc. u							
Note: the Payle	and Mass can be entered in	the shaker parameters page. A	Actual acceleration limits used in each t	test will be re-adjusted by			
following factor	r: Min/Shaker narma force / //	Amatura mare + Pauload mar	c + other mars) Chalver parage are)				
Max. drive fre	quency should not be set to	o high, the recommended ran	ge within 10240 Hz.				
				OK Cancel			

## **Test Parameters**

The **Test parameters** section in the **Test Configuration** window has settings The analysis parameters, pulse interval, output drive voltage limit, and abort sensitivity settings.

G Test Configurations for DemoSh	ock [Shock]	?	×
Test parameters *	Average Interval between pulses (s)		
Shaker parameters	4		
Test parameters	Drive limit (Volt Pk) Level changing increment (%)		
Pre-test parameters	2 Advanced settings		
Test profile			
SRS analysis	Abort sensitivity		—
Shock abort limit	⊕⊕ Customize		
Limit channels	0.0 0.40 1.0		
Run schedule	Not sensitive Very sensitive		
Event actions	Depending of control/W points allowed outside of short limits60 00.9/		
File directory	Proportion or control (1) points allowed outside or abort limits 00.00%		
Save/Recording setup	Open loop sensitivity 34.00 %		
Output settings	Displacement limit tolerance ratio 1.60		
	Summary		
	Block T/Size = 0.64 s / 4096 dT = 0.00015625 s		
	Sampling rate (fs) = 6400.00 Hz Frequency range (fa) = 2500.00 Hz		
	064 ::		
Config. library •	QK	Cano	el

Interval Between Pulses: The time period between successive pulses. The value should be large enough for the system's response to dampen out after a pulse. It is effective when it is larger than block time.

	Interval between pulses (s)	
]		1 🌲

#### **Test Profile**

The Test Profile page is where the pulse shape and time characteristics are set. The window is divided into three sections: the top shows a plot of the pulse shape in acceleration, velocity, and displacement units. The bottom left has settings for the pulse parameters, and the right has settings for the compensation parameters and comparison to shaker parameters.



Pulse Type: Pulse Type is the shape of the main pulse. The options are half-sine, terminal-peak sawtooth, initial-peak sawtooth, triangle, rectangle, trapezoid, and haver-sine. The shapes have different frequency characteristics and are suitable for simulated different impulse conditions. Many testing standards specify the pulse shape to be used.



Amplitude/Width: Amplitude sets the peak acceleration value of the pulse. Pulse width sets the width of the pulse in milliseconds. Narrower pulses have greater high-frequency components.

Amplitude (g)	Pulse width(ms)
5.000000 🚔	11.00 🚔

Pulse Tails: Main pulse tails are the compensation tails described below. The time length of the preand post-tails can be set according to five standards: MIL-STD-810, MIL-STD-202F, MIL-STD-810H, the ISO 8568 mechanical shock test standard, and the IEC 60068-2-27 mechanical shock test standard. They can also be set to custom lengths as a percentage of the main pulse width.

Main	pulse tails
MIL-STD-810F	MIL-STD-810H
ISO 8568	MIL-STD-202F
O IEC 60068-2-27	Customized
Pre pulse tail(%)	30.00
Post pulse tail(%)	0.00

Min/Max Values: Real Max/Min Value table, the characteristics of the pulse are shown and compared with the shaker limits. Each row has an icon that is either green if the associated pulse characteristic is less than 50% of the shaker limit, yellow if is great than 50%, and red if it is 100% or over the limit. Before starting a shock test, all these icons should be green or yellow.

	Shaker limits			
Pos. displacement: 6	5.35 mm			
Neg. displacement:	6.35 mm			
Velocity: 1.778 m/s				
Acceleration: 50 g				
Force: 100.02 LBF				
Re	eal max/min val	lue		
Max Vel: 0.23109 m/s 13%				
Min Vel: -0.13194 m/s 7%				
Max Disp: 2.4255 mm 38%				
Min Disp: -2.5036 mm 39%				
Max Acc: 5 g 10% 📀				
Min Acc: -0.74931 g 1% 📀				
Max force: 3.3069 LBF 3%				

#### **Run Schedule**

When a test is run, it executes the entries in the run schedule. These entries define test stages at certain levels and durations.

G Test Configurations for DemoSh	iock [Shock]		?	×
Run schedule «	Select an item to insert:	Schedule		
Run schedule       *         Shaker parameters       *         Test parameters       *         Pre-test parameters       *         Test profile       *         SRS analysis       *         Shock abort limit       *         Limit channels       *         Run schedule       *         Event actions       *         File directory       *         Save/Recording setup       *         Output settings       *	ock [Shock] Select an item to insert: Test schedule entries  Start a loop Level and Pulses Invert pulse Start manual output control Start Recording Stop Recording User defined events  My Report Flash Screen and Beep Save Signals to PC Templates  Incremental ramp levels	Schedule Edit entry Remove entry Enable/Disable entry Move up Move down More • Schedule begin Loop number: 1 Level 50.00%, Pulses 2 Level 100.00%, Pulses 2 Level 100.00%, Pulses 100 End loop My Report (Create report)	?	×
	(Land Joseph Description)			
	Load from library Save to library			
Config. library •		QK	Can	cel 🛛

Level and Pulses: Level and Pulses output the set number of pulses at the set level, given in percent.

Pulses and Level	×
Pulses:	100 🛱
Level (%):	100.00
	<u>O</u> K <u>C</u> ancel

Inverse Pulse: Inverse Pulse will make all subsequent pulses inverted.

## 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.

Measurement quantity Acceleration Acceleration Velocity Displacement Pressure Force Voltage Current Sound Pressure Time Frequency Angular Acceleratio Angular Velocity MASS Angle Moment Strain Temperature Resistance Humidity

## 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 (DC-

blocking) 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 v	
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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