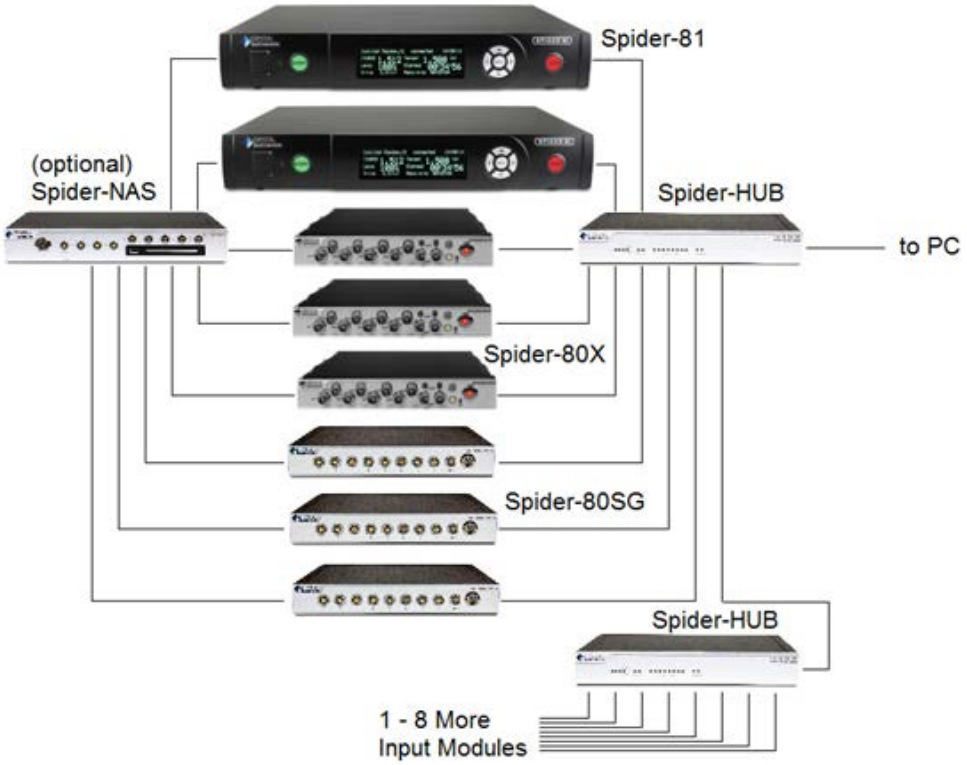
CRYSTAL INSTRUMENTS

What am I going to do with 128 channels?

Application Note 026



An important application of Dynamic Signal Analysis is characThe short answer is, “a lot!” DSA users will immediately be able to do more of what they already do, faster and easier. Conduct SIMO modal tests with 127 simultaneous response measurements! Use half a dozen shakers and measure 122 response degrees-of-freedom (DOF) in MIMO tests. Those added DOF’s cut your testing time dramatically. Machinery monitoring systems can grow, allowing more support equipment to be monitored (and more tachometers to be recorded). Add some Spider-80SG modules to your mix and continuously monitor strain of dynamically cycled pressure vessels, at critical structural support points and in important piping lines. Now you can double the scale of your production audit-testing of cell phones or other electronic products. If you do drop or explosive transient testing you can now monitor and record strain, acceleration and scores of process signals, while measuring Shock Response Spectra at over 100 points on your vessel or other DUT.

VCS users will discover new and safer ways of testing products to requirement specifications. Having more response channels allows the generous use of Limit channels to Alarm (publish a warning), Abort (stop the test) and Notch (assume Control to protect a DOF) during Random and Sine tests. Having more than sufficient channels available makes Multiple Channel Control (Weighted Average, Maximum or Minimum) practical. Use these to compensate for shaker table flexing and fixture resonances.(Figure 1.1)

Using strain gages liberally distributed and permanently affixed to your expensive lead prototype makes real sense. These light and compliant sensors don’t mass load the structure as an equal number of accelerometers would. Recording strains during an

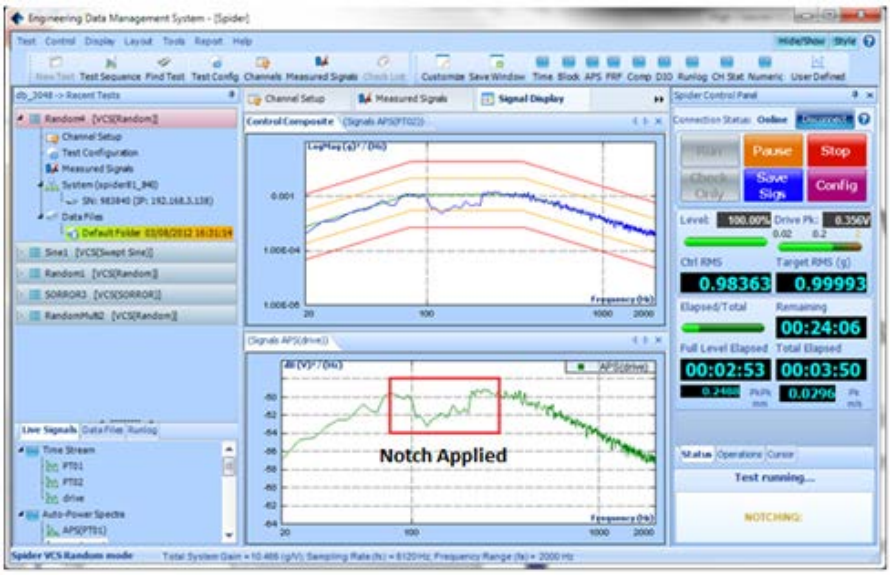


Figure 1.1 Protective Limit Channels may be used to Alarm, Abort and Notch.

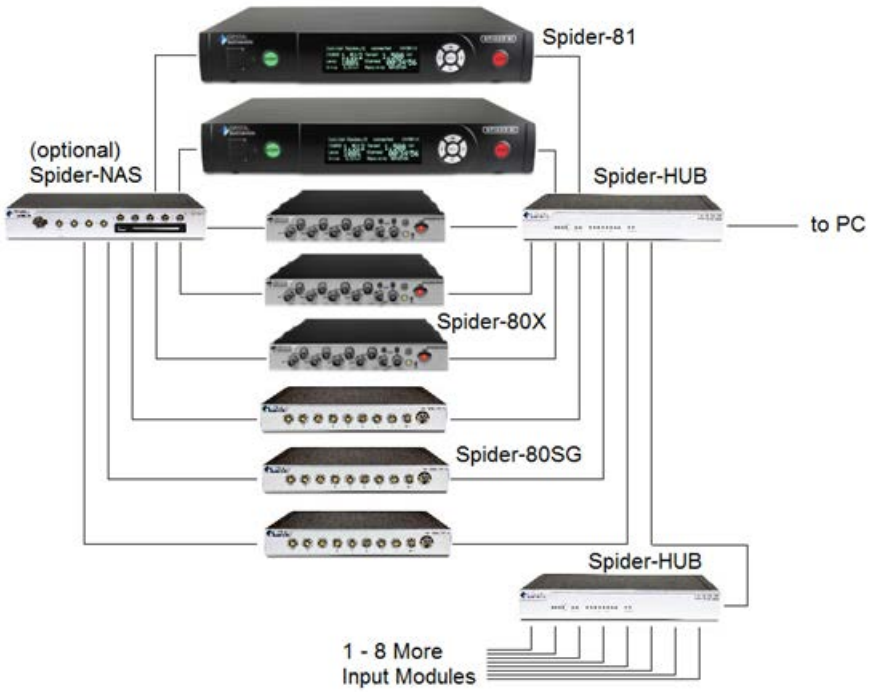


Figure 1.2 Building a 128 input channel system from Spider modules.

early “pre-qualification” shake at low intensity can spot troublesome resonant substructures and design weak points quickly, allowing the maximum time for corrective revisions. Such an early-in-program dynamic examination should be recognized as a non-destructive test that provides real insurance of a successful qualification shake. These same sensors can aid others during their development tests and they may be productively “worn” through the entire prototype evaluation effort. When it is finally comes to face its qualification shake, your expensive DUT will pass with flying colors owing to the pre-test dynamic refinements made with strain gage guidance. (Figure 1.2)

Can I use equipment I already own? Absolutely! Your Spider-81 controllers, Spider-80X input

modules and new Spider-80SG strain-gage modules can all serve as 8-input front-ends and you can use any combination of them that you choose. The only hardware restriction is that if your system includes a Spider-81 and you are planning to run VCS applications, the Spider-81 must be switch-designated as the "master unit" and it must provide the Drive/COLA signals and accept the Control inputs. For DSA applications, any desired unit may be designated as the master. One or more Spider-81 controllers may be employed as front-ends for DSA applications.

A Spider-HUB is used to integrate eight front-ends into a 64-channel "cluster". The Spider-HUB is far more than a simple Ethernet hub; it is an Industrial Ethernet Switch with IEEE 1588v2 Precision Time Protocol. While an Ethernet hub simply echoes any input to all of its connections, an industrial switch determines which connection (or connections) requires the message and sends the data only where it is needed. This provides a nearly ten-fold improvement in network throughput by removing extraneous clutter messages. Spider-HUB has ten (RJ45) Ethernet ports on its rear panel. Eight of these accept input from the cluster's front-ends, one networks to the controlling PC and the last accepts input from another cluster's Spider-Hub. Thus a 128 channel system consists of two clusters united by Ethernet. (Figure 1.3)

Figure 1.3 A compact 128-channel modular system in two S-80X-A35 Mainframes.

Each front-end contains 4 GB flash memory for measurement storage. For more massive applications a Spider-NAS (Network Attached Storage) may be added to each cluster. This provides 250 GB of solid-state memory in a removable 2.5" SATA cartridge. Each front-end communicates with the Spider-NAS through its own 480 MB/Second dedicated interface, leaving the system Ethernet channel free of such exchanges.

When only modular front-ends are used, the S-80X-A35 Mainframe provides a convenient way to package a cluster. This rugged chassis provides slots for eight Spider modules. It provides DC power to each module from its internal mains-connected power supply. It provides integral Spider-HUB and Spider-NAS equivalent facilities and provides cooling fans.

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