SPIDER-81

THE FOURTH GENERATION VIBRATION CONTROL SYSTEM

Dedicated Mini Computer

Ctrl loop

A/Ds D/A

1st generation
Standalone

PC

Ctrl loop

DSP A/Ds DSP A/Ds DSP D/A

2nd generation
PC-based

PC

Ctrl loop

DSP A/Ds DSP A/Ds DSP D/A

3rd generation
PC-tethered

Wireless PDA PC

Network with time sync.

Ctrl loop

DSP A/Ds DSP A/Ds DSP D/A

4th generation
Networked

Architecture of four generations of VCS

CRYSTAL instruments

START

SPIDER-81

Running: Random_12   connected   14:38:14
%IRMS 1.512 Target 1.500 (s)
Level 100%   Elapsed 00:34:56
Drive 2.31(v) Remaining 00:25:04

Enter

ABORT

...rable vibration control system. First controller that directly integrates time-synchronized Ethernet connectivity with embedded DSP technology.

INCLUDES A COMPLETE SUITE OF VIBRATION CONTROL MODULES

INTEGRATES TIME-SYNCHRONIZED ETHERNET CONNECTIVITY WITH EMBEDDED DSP TECHNOLOGY

HIGHLY MODULAR, DISTRIBUTED, SCALABLE VIBRATION CONTROL SYSTEM

CRYSTAL
instruments

SPIDER-81

The Spider-81 is a highly modular, distributed, scalable vibration control system developed by Crystal Instruments. It represents the fourth generation of vibration control systems because of its advanced technology not seen in the current generation.

DSP CENTRALIZED ARCHITECTURE

Unlike traditional controllers that rely heavily on an external computer for real-time operation, the Spider-81 is the first controller that directly integrates time-synchronized Ethernet connectivity with embedded DSP technology. This strategy greatly increases the control performance, system reliability and failure protection of the controller. It also allows a large number of channels to be configured without sacrificing system performance.

LATEST HARDWARE DESIGN

Spider-81 modules have voltage, charge, TEDS, and IEPE inputs which are ideal for shock, vibration and acoustic measurement or general purpose voltage measurement. The internal flash memory stores test configuration data for controlling up to 64 channels simultaneously in addition to storing real-time analysis data. Multiple output channels provide various signal output waveforms that are synchronized with the input sampling rate. A bright LCD screen displays testing status information. Ten monitoring connections on each unit are used to read signals of analog inputs and outputs. Built-in isolated digital I/O and RS-485 serial ports enable interfacing with other hardware.

SIMPLE NETWORK CONNECTION

Ethernet connectivity allows the Spider-81 to be physically located far from the host PC. This distributed structure greatly reduces the noise and electrical interference in the system. One PC can monitor and control multiple controllers over the network. Since all the control processing and data recording are executed locally inside the controller, the network connection won't affect the control reliability. With wireless network routers, the PC can easily connect to the Spider remotely via Wi-Fi.

TIME SYNCHRONIZATION BETWEEN MULTIPLE MODULES

The Spider-81 is built on IEEE 1588 time synchronization technology. Spider modules on the same network can be synchronized with up to 50ns accuracy, which guarantees ±1 degree cross channel phase match up to 20 kHz. With such unique technology and high-speed Ethernet data transfer, the distributed components on the network truly act as one integrated system.
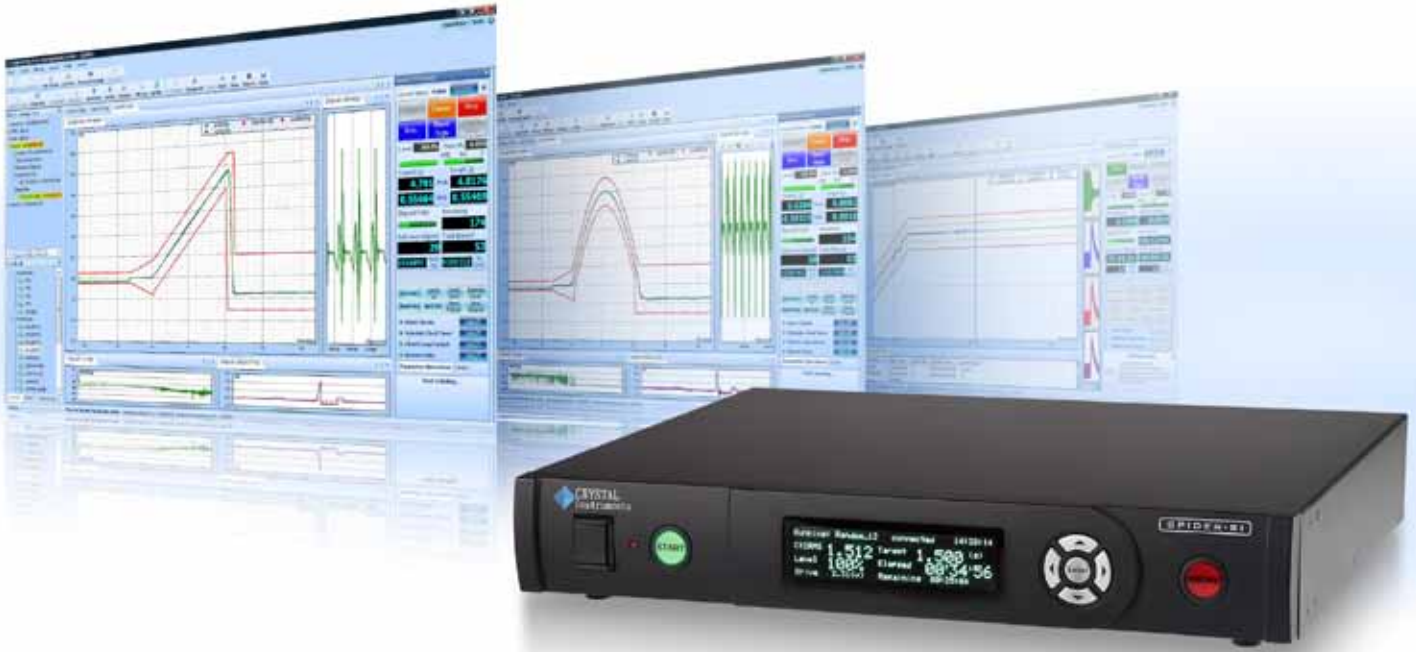
RANDOM

Sine on Random

Sweeping Mode: Free sweeping mode where each sine tone can have its own schedule and sweeping speed, and harmonic mode where the first tone controls the sweeping speed

Number of Sine Tones: 1 – 12 in free-sweeping mode; 1 – 20 in harmonic mode

Random on Random

Sweeping Mode: Free sweeping mode where each narrow random band can have its own schedule and sweeping speed

Number of Bands: 1 – 12

Operation Controls: Band On and Band Off controlled by run schedule, external events or user commands

SINE

Resonance Search and Tracked Dwell

The search function determines the resonant frequencies using a transmissibility signal. In real-time control, the tracked dwell entry tracks each resonant frequency.

Resonant Frequency Search

Uses Q or amplitude of transmissibility to automatically search the resonances within certain range.

**Tracked Dwell Entry**

Resonant frequencies can be manually entered or loaded from the search table. Dwelling continues until time duration is reached, resonant frequency changes out of limits, or amplitude changes out of limits.

SHOCK

Transient & SRS

The SRS vibration control package provides controls to meet a target Required Response Waveforms are automatically synthesized from a user-specified SRS reference profile using sine wavelets. The Transient Control option allows control of imported transient files. High frequency waveforms, Alarm and Abort tolerances may be applied to any active channel to provide an extra degree of safety for delicate test articles.
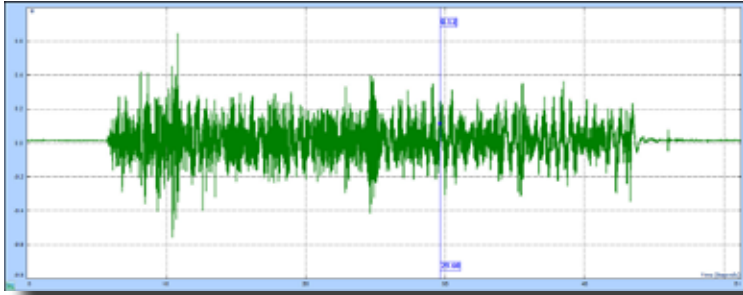
TIME WAVEFORM REPLICATION

Time Waveform Replication (TWR) provides precise, real-time, multi-channel control and analysis. Up to 64 channels can be enabled for limit monitoring and data acquisition. Long waveforms can be duplicated precisely on the shaker just as they were recorded. Includes flexible importing and editing tools for long waveform signals. Recording option allows recording time stream data at the full sample rate on all input channels, regardless of the total channel number. A unique hardware design provides a fast loop time of less than 10 ms.

TRANSIENT TIME HISTORY

Using template based importing tools, Time Waveform History (TTH) in various formats can be imported into EDM. Scaling, editing, digital resampling, high-pass, low-pass filtering and compensation will tailor the waveform so it can be duplicated on the shaker. Compensation method includes pre-pulse, post-pulse, DC removal and highpass filters. Pre-stored profiles include Bellcore Z1 & Z2, Bellcore Z3, Bellcore Z4, Sine, Chirp, Burst Sine, and others.
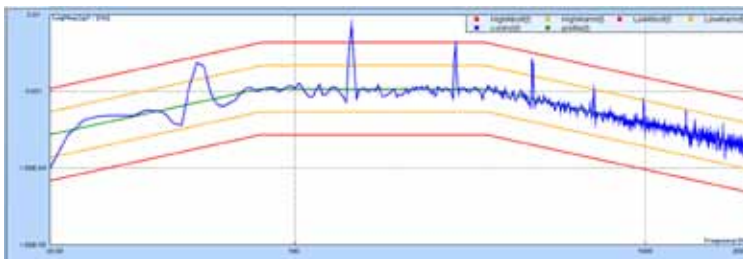
LIMITING AND NOTCHING

Limiting can be applied to control or monitor channels. Available limiting types are notching limit and abort limit. Limiting profiles may be edited by amplitudes and frequencies of breakpoints or imported from saved spectra. The max expected peak acceleration, velocity, and displacement of profile is calculated.

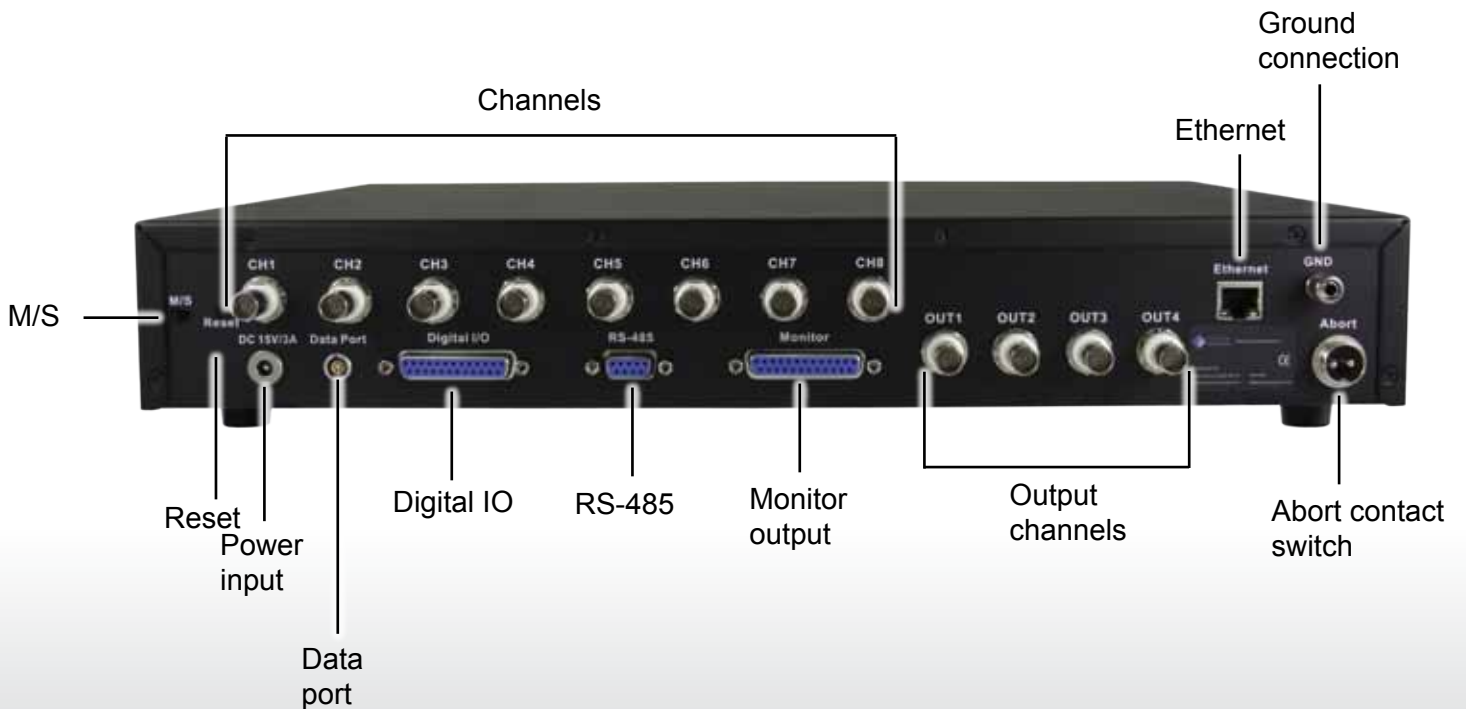## DATA RECORDING & SIGNAL ANALYSIS

Record long waveform signals from all input channels during all types of tests. Data is recorded to the internal flash memory.

Typical Continuous Recording Time: 4 hours for 4 input channels with frequency range 2,000 Hz with 4 GB flash memory installed.

SPIDER-81 FRONT DIAGRAM

Power button

Start button

Indicator light

LCD Display

Directional & enter buttons

Abort button

SPIDER-81 BACK DIAGRAM

Ground connection

Channels

Ethernet

M/S

Reset

Power input

Data port

Digital IO

RS-485

Monitor output

Output channels

Abort contact switch

## ARCHITECTURE OF FOUR GENERATIONS OF VCS

In the past four decades, vibration control technology has gone through four generations:
1. Standalone controller
2. PC based
3. PC tethered
4. Fully networked

The Spider-81 represents the fourth generation - fully networked, built on Ethernet with IEEE 1588 time synchronization.

This configuration provides much greater flexibility, reliability, configurability, and scalability than products in the industry.

Unlike traditional controllers that rely heavily on an external computer for real-time operation, the Spider is the first controller that directly integrates time synchronized Ethernet connectivity with embedded DSP technology. This strategy greatly increases the control performance, system reliability, and failure protection of the controller. It also allows large numbers of channels to be configured without sacrificing system performance.
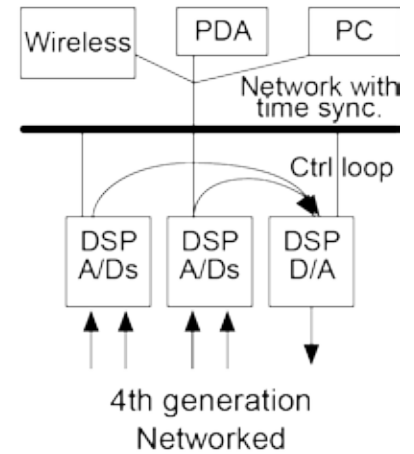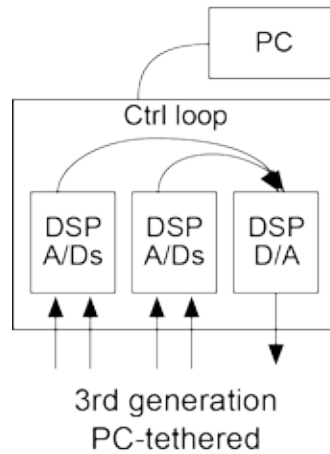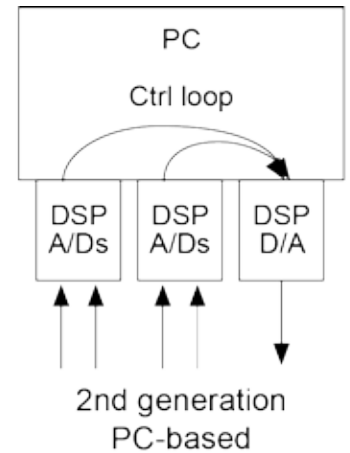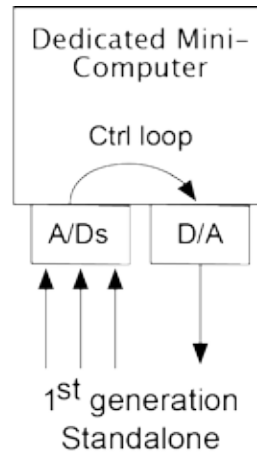
SPIDER-81B BASIC VERSION

The Spider-81B is developed to meet the requirements of basic vibration testing applications. It has 4 inputs, 1 output, and 4 pairs of digital I/O. The software includes the Random, Sine, Shock, and RSTD testing suites.

SPIDER-81 (16 CHANNEL VERSION)

The Spider-81 vibration controller is available in a 16 channel version. This 16 channel version features all the same capabilities of the 8 channel Spider-81 module. Please note that unlike the other Spider modules, this version is not scalable.

THE SPIDER FAMILY
FROM 4 CHANNELS
TO 64 CHANNELS

64 CHANNELS

16 CHANNELS

8 CHANNELS

4 CHANNELS

Analog Inputs
8 BNC connectors per Spider-81 module. Spider-81 and Spider-80X units can be networked to form up to 1024 inputs; charge, voltage or IEPE, single-ended or differential, AC or DC coupling, 150 dBFS dynamic range, dual 24 bit A/D converters, range ±20 volts, up to 102.4 kHz fs per channel. Supports TEDS.

Analog Outputs
2 BNC connectors per unit, 100 dB dynamic range, 24 bit A/D converters. ±10 volts

Channel Phase Match
Better than ±1.0 degree up to 20 kHz among all channels

Dimensions
440 x 66 x 330 mm (WxHxD)

Weight
4.2 kg

Power
Up to 18 watts during operation.

PC Connections
100base-T, RJ-45 female connector supports connection to PC or network switch

Internal Memory
Flash memory for data storage: 4 GB per unit

Working Mode
PC Tethered or Black Box

FOR DETAILS: SALES@GO-CI.COM OR VISIT WWW.THP-SYSTEMS.COM