Spider-81/81B

The Spider-81 is the flagship model; all other Crystal Instruments controllers have evolved from it. This 4th generation hardware is highly modular, distributed and scalable. Each Spider-81 has 8 analog input and 4 analog output channels. Analog monitoring channels serve an attached oscilloscope. Eight digital I/O pairs are provided for custom applications.

The Spider-81 features a bright front panel LCD that displays system status and test information.

Real-time status such as control RMS or sweeping frequency is instantly viewed on the LCD.

The Spider-81 does not just use Ethernet for data communication, it employs IEEE 1588v2 time-synchronized Ethernet connectivity. This technology allows (more than 100 meters!) remote input modules to be connected solely by Ethernet (no dedicated “sync” cable required), yet still provides sampling and triggering synchronized within the accuracy of 50 ns. The Spider-80X front-ends and the Spider-HUB industrial Ethernet switch may be used to expand the Spider-81 controller up to 512 input channels. All input channels across the system are amplitude matched within 0.1 dB and phase matched within 1° over 20 kHz bandwidth.

All Spider front-ends contain a 4 GB flash memory for the storage of data and test processing instructions. If the longer recording is required, the Spider-NAS (Network Attached Storage) provides 250 GB of solid state disk (SSD) storage in a removable SATA cartridge. One Spider-NAS records streamed time waveforms and spectra from up to eight Spider front-ends at the speed of 102.4 kHz per channel. The rapid transfer rate allows continuous recording of all channels at a measurement front-end’s highest sample rate.

Multiple Spider-81 front-ends and the Spider-80X front-ends can integrate to construct a higher channel system. The Spider-81B front-ends is not expandable by design.

The Spider-81B front-end is a smaller, simplified system featuring 4 input channels and 1 output.

This system provides everything needed to run Sine, Random or Shock tests measuring the control and up to 3 monitor signals. The Spider-81B has 4 pairs of DIO. This basic system actually provides a very comprehensive facility with the same control quality, safety assurance, measurement precision, expandability and human interface that distinguish all Crystal Instruments controllers. The Spider-81B is ideal for educational institutions and small R&D laboratories. The Spider-81 series is a highly modular, distributed, scalable vibration control system developed by Crystal Instruments. It represents the fourth generation of vibration control systems with advanced technology unavailable in the current generation.

Unlike traditional controllers that rely heavily on an external computer for real-time operations, the Spider-81 is the first controller that directly integrates time-synchronized Ethernet connectivity with embedded DSP technology. This 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.

The Spider-81 hardware modules have voltage, charge, 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 hundreds of channels simultaneously and stores real-time analysis data. Multiple output channels provide various signal output waveforms that

are synchronized with the input sampling rate. A bright LCD displays testing status information. Ten monitoring connections on each unit are used to read signals of analog input and output. The front panel has intuitive function buttons. There is a built-in isolated digital I/O to interface with other hardware.

Ethernet connectivity allows the Spider-81 to be located far from the host PC. This distributed structure greatly reduces noise and electrical interference in the system. One PC monitors and controls multiple controllers over the network. Since the control processing and data recording are executed locally inside the controller, the network connection does not affect control reliability. With wireless network routers, a PC connects easily to the Spider-81 remotely via Wi-Fi.

The Spider-81 is built on IEEE 1588 PTP time synchronization technology (PTP-Precision Time Protocol). Spider-81 modules on the same network can be synchronized with up to 100 ns 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.

The Spider-81 in Black Box mode enables operation without a PC. In this mode, a PC is used only to configure the control system before the system starts operation and to download data after the test is completed. During the test, the controller operates according to a preset schedule or from a connected iPad. Black Box mode is included with every Spider-81/81B.

For hardware with version 5.8 and lower, up to 4 tests are uploaded and stored on each module.

For hardware with version 7.3 and higher, up to 8 tests are uploaded and stored on each module.

Each Spider-81 is equipped with a bright front-panel LCD that displays system status and test information. Real-time status such as control RMS or sweeping frequency is instantly viewed on the LCD.

The Spider-81 is the very first vibration control system designed for fail-safe operation even in the event of network or power loss. Advanced safety routines allow sensor failures to be detected within milliseconds. All Spider-81 hardware passes strict environmental tests including EMI, temperature, drop shock, sine and random vibration. The system is built to withstand the rigors of the testing environment with long-lasting durability. The unique floating ground design reduces ground loop problems typically found in testing laboratories. A power-backup circuitry based on super-capacitor is installed to prevent the unexpected power loss.

Using a patented dual parallel A/D design, the Spider-81 is the first vibration control system that achieves 160 dBFS input dynamic range. Each measurement channel can detect signals as small as 6 µV and as large as 20 V. This design completely eliminates the need for the input range or gain settings found on traditional controllers.

The Spider-81B is designed to meet the requirements of basic vibration testing applications. It has 4 inputs, 1 output, and 4 pairs of digital I/O.

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Last update: **2023/02/16 01:04**