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CRYSTAL INSTRUMENTS

MIMO CONTROLLER: SPIDER-80M
HARDWARE SPECIFICATIONS (v7.7.1)

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INTRODUCTION

The Spider-80M is built based on the popular Spider-80Xi architecture and is dedicated to MIMO Control and MIMO structure testing applications.

In a Spider-80M hardware chassis a master module with 8-inputs and 8-outputs will always be installed. This master module takes the space of two slots of Spider-80Xi module in the S80M-A35-8N chassis. Up to 6 additional Spider-80Xi front-end modules can be inserted to form a system with 8 outputs and up to 56 inputs.

Multiple Spider-80M or Spider-80Xi chassis can be chained to form a very large system with up to 504 input channels, all sampled simultaneously. Accurate time synchronization results in excellent phase match in the frequency domain between all channels, either on the same Spider front-end or across different front-ends. Channel phase match, even between separate Spider front-ends, is within 1.0 degree at 20 kHz which is suitable for high quality structural and acoustics applications requiring cross channel measurement.

The Spider-80M chassis with 56 input channels is powered by AC power, 100 to 240 V_{AC}. Input channels of Spider-80Xi front-ends are equipped with IEPE power source to power IEPE sensors in addition to standard voltage input which makes it ideal for shock, vibration, acoustic, or general purpose voltage measurements. The Spider product line performance is the best in class with the highest dynamic range of any similar product. With patented technology, each measurement channel can detect signals as small as 6 µV and as large as ±20 V. Proprietary hardware technology delivers more than 160 dBFS dynamic range. The extremely high dynamic range eliminates the need for multiple front-end gain settings.

Besides MIMO vibration control and MIMO modal testing that requires more than 1 output source, Spider-80M is equipped with powerful and flexible data acquisition functions. Continuous time data recording and spectral analysis can be initiated by many events including user operation, pre-set run schedule, alarm limit trigger, input trigger or digital input trigger. A high-performance removable 2.5-inch hard disk is used as a storage media inside Spider-80Xi. The default capacity of hard disk is 250GB. When recorded, data will be written in the NTFS file format. Data is extracted from the hard disk using Crystal Instruments PC software to transfer data to the PC, or the hard disk can be physically removed and connected to another PC.

HARDWARE SPECIFICATIONS

The Spider-80M hardware has fixed 8-inputs and 8-outputs in the chassis. A master module takes the space of two slots of Spider-80Xi module in the S80M-A35-8N chassis. Up to 6 Spider-80Xi front-end modules can be added to form a system with 8 outputs and up to 56 inputs.

Input Channel Specifications

- **Number of Input Channels per Chassis:** 16, 24, 32, 48 or 56 when ordered with S80M-A35-8N; This is only factory configurable.
- **Maximum Input Channels per Spider-80M System:** 504
- **Connector Type:** isolated BNC
- **TEDS:** IEEE 1451.4 compliant
- **Coupling:** AC, DC, IEPE (ICP®)
- **IEPE Power:** 4.2 mA at 21 V
- **Input Range:** ±20 Vpk
- **Input Impedance:** 1MΩ for differential and 500kΩ for single- end
- **Input Protection Voltage:** ±220V
- **AC Coupling:** analog high-pass filter at 0.375 Hz @ (-3 dB) and 0.7 Hz @ (-0.1 dB)
- **A/D Resolutions:** 2 x 24-bit (patented dual A/D technology per input channel)
- **Anti-Aliasing Filter:** analog anti-aliasing filters plus digital decimation technique
- **Digital Filter:** high-pass filters (user programmable)
- **Input Dynamic Range:** 160 dBFS
- **Sampling Rate:** 0.48 Hz to 102.4 kHz, with 54 stages
- **Maximum Useful Bandwidth:** 46.08 kHz
- **THD:** -95 dB (SV sine, DC to 1kHz)
- **Amplitude Channel Match (1 kHz, 1V input):** 0.02 dB
- **Channel Phase Match:** < ±1.0 degree up to 20 kHz across the whole system
- **Crosstalk:** less than -100 dB
- **Frequency Accuracy:** ±250ppm (typically ±0.25Hz margin at 1 kHz)
- **Common Mode Range:** ±20 Vpk
- **Common Mode Rejection:** better than 70 dB (typical)
- **Amplitude Accuracy (1 kHz, 1V input):** ± 0.1%
- **LED Indicator:** displays the status of each channel in red or green

Output Channel Specifications

- **Number of Channels:** 8 channels per chassis
- **Connector Type:** BNC
- **D/A Resolution:** 24-bits
- **Sampling Rate:** up to 102.4 kHz per channel, synchronized with input channels
- **Dynamic Range:** 100 dB
- **Output Impedance:** 50 Ω
- **Maximum Output Current:** 250 mA
- **Amplitude Accuracy (1 kHz, 1Vrms):** ±0.2%
- **Anti-Imaging Filtering:** 160 dB/oct digital plus analog filters
- **Output Range:** ± 10 Volts

Mass Storage

A high-performance removable Serial ATA (SATA) 2.5-inch hard disk is used as storage media. When recorded, data will be written in NTFS file format. Data is extracted from the Spider-NAS using Crystal Instruments software to transfer data to the PC. Alternatively, the SATA hard disk can be physically removed and connected to extract data to the PC.

When it is shipped, a solid state hard-drive with a capacity of 250GB is installed internally. The solid state drive performs very well in the high shock and vibration environment. A special error-checking al-

gorithm developed by Crystal Instruments detects and avoids any errors that may occur in the data transfer and storage.

Time Synchronization

Through the Ethernet connection, multiple Spider-80Xi or Spider-80M chassis can be synchronized through the IEEE 1588v2 protocol. The synchronization accuracy is better than ±50ns when a specified network switch is used. The data acquired by all the measurement channels will be on the same time base. Phase match between channels across different Spider front-ends is within 1.0 degree at 20 kHz.

Environmental and General Specifications

- **Ethernet:** 100Base-T Ethernet. RJ 45 connector
- **Digital Input and Output:** 2 digital inputs and 2 digital outputs
- **Hard Buttons:** Power, Fan On/Off, Start measurement, Stop measurement
- **LCD Display**: 128 x 64 dot; Monochrome; Display size: 61 x 31.3mm. Displays the IP addresses, connection status and input status of the system
- **Cooling Fan:** Controlled by software
- **Grounding:** Connect to common ground of power amplifier to reduce ground-loop interference.
- **Hardware Abort:** Hardware Abort 2 pin port is provided which can be connected to a switch to force turn off the output of the front-end.
- **Connector Type:** 2 pin LEMO
- **Safety Standard:** electromagnetic compatibility and sensitivity: EN 61326:1997+A1:1998+A2:2001, EN61000-3-2: 2000, EN61000-3-3: 1995+A1:2001
- **Operational Temperature:** -10 °C to +55 °C
- **Storage Temperature:** -20 °C to +70 °C
- **Shock:** 50 g's, 315 in/sec, tested at 6 sides, non-operational test
- **Vibration:** 5 – 500 Hz, 0.3 g_{rms}, tested at 3 sides, operational test
- **Vibration:** 5 – 500 Hz, 2.42 g_{rms}, tested at 3 sides, non-operational test

SPIDER-80M CHASSIS (S80M-A35-8N)

- **Enclosure:** rugged sealed metal box, electrical safety compliant, and internal EMI shielding
- **Power Supply:** 100 – 240 VAC (47 – 440 Hz)
- **Power Consumption:** less than 90W when 56 input channels configured
- **Size:** 278.4 X 257 X 304 mm (W x H x L)
- **Total Weight:** 12 kg when 56 channels configured
- The chassis S80M-A35-8N can host:
  - 1 Spider-80M module
  - Up to 6 Spider-80Xi front-end modules
  - 1 Spider-NASi
  - 1 Spider-HUBi