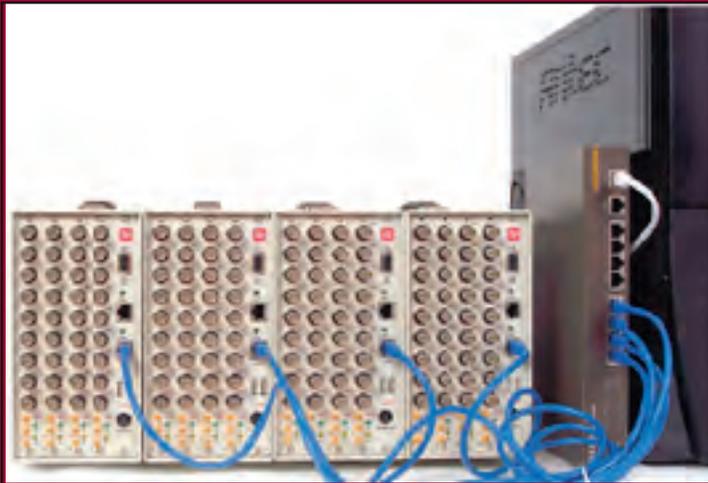


ABACUS™

The first scalable DSPcentric signal analysis engine



ABACUS

While there are many instruments that use 24 bit ADC and DAC chips, Abacus is the first system to incorporate analog components and design considerations that can take advantage of the higher sampling dynamic range. The result is a consistent set of higher specifications for all measures of performance including Signal to Noise Ratio and Total Harmonic Distortion.

The inclusion of a floating point DSP processor capable of 1 Gigaflop DSP with optimized data streaming to disk makes the hardware uniquely suited for realtime signal analysis and vibration control applications.

The architecture allows 8 channel boards to be combined to make 32 channel subsystems which in turn can be connected on a 1 Gigabit network to make a thousand channel system. The modularity allows a dynamics laboratory to use portable instruments of varying sizes which can be united to form a large channel count system for occasional use in larger applications.

Scalable - from 8 to 1024 channels without loss of performance

A single Abacus chassis is a portable instrument that connects to the host computer via Ethernet. The chassis may contain from 1 to 4 modules, each module consisting of 8 input channels, 2 output channels and 2 tachometer channels. Each module contains a Megaflop Digital Signal Processor to provide the computational power. The input and output channels use 24 bit ADCs and DACs. The chassis uses a Pentium processor to supervise traffic and supports streaming data to a 100 Gbyte local disk at an aggregate rate of 20Mbytes/sec.

When more than 32 input channels are required, multiple Abacus chassis are connected in a star configuration to the host. Ethernet provides a convenient solution to the connectivity and

synchronization problems. To enable all channels in the multiple chassis to be simultaneously sampled, a clock signal is distributed via a synchronizing cable. By using the same technology as Ethernet, the synch cable is able to distribute the sampling clock at speeds up to 200 kHz from chassis to chassis. The synch cables come in calibrated lengths up to a maximum of 31 meters and a delay compensation circuit in each Abacus chassis applies the precise delay to align the samples within the specification for channel to channel match.

Realtime - measurements on all channels, while recording to disk at full bandwidth

Abacus is a significant architectural advance. Each module contains its own signal processor. The DSPcentric design is essential to the high realtime analysis bandwidth of the system. Even after decimation filtering the 1 Gigabit DSP has plenty of spare capacity to always maintain realtime measurements. Whether operating at its maximum bandwidth of 49 kHz or a low 1 kHz, you can measure the tri-spectrum average in realtime and with selectable overlap.

Each chassis contains its own disk storage. The local bus disk is essential to the high realtime recording rate of the system. The system uses the 132 MHz PCI bus within each chassis for optimum performance and availability of off-the-shelf components. The ubiquitous interface standard, Ethernet, provides the system connectivity within the system and to the wide area networks. Whether you use a mere eight channels of data acquisition in a single chassis or a thousand channels distributed over 32 chassis the system retains the same high specifications

Precise - 120 dB dynamic range consistently and 150 dB in selected conditions

The solution to the problem of a simultaneously sampled really large system has not been obtained by relaxing requirements of accuracy. When you look closely at the specifications for

INPUT

8 to 32 per chassis
ADC Resolution (Analog AAF): 24-bit
Sample Resolution (Digital AAF): 32-bit floating point
Coupling: AC/DC, DIFF/SE, ICP, TEDS
Anti-alias Filters: 110 dB protection, all ranges
Dynamic Range: 120 dB to 150 dB
Input Ranges: 1/2/5/10 V full scale
Input Impedance: 1 MOhm to GND, 50 SE shield to GND
Max Input Voltage: 80vPeak, 2.5vRmsShield (SE)
CMRR: 60 dB (typical), $f < 40$ kHz
Amplitude Accuracy: ± 0.020 dB (0.2%FS) at 1kHz for 15degC < $T < 40$ degC
Amplitude Ripple: (Digital AAF) - 0.001dB for $0 < f < f_s / 2.56$
Amplitude Droop: (Analog AAF) - 0.005dB at 5kHz; 0.010dB at 25kHz; 0.050dB at 49kHz
Residual Offset: $\pm 0.1\%$ FS AND not larger than 3mvDC
Phase Accuracy: 0.05deg to 0.5deg for DC to 40kHz
Crosstalk between Inputs: < -100 dB
Crosstalk between inputs and source: < -90 dB
Input Noise:
1 V range: 20 nV/ Hz, 3 μ Vrms @20 kHz BW
10 V range: 160 nV/ Hz, 24 μ Vrms @20 kHz BW
THD: 100 dB
Overload Detection: Both pre-filter and post-filter
Minimum SampleRate: less than 1Sps
Maximum SampleRate: 107.42kSps (214.82kSps optional)
Sample rates: 83 steps, down to 1 Hz
Frequency Accuracy: 25ppm
Time Accuracy: 25ppm

Dynamic Range, Signal to Noise ratio, Total Harmonic Distortion, Alias Rejection and Channel to Channel match, you can see that Abacus is an analog front end that does justice to the 24 bit digitizers. It is the first time that a dynamic signal analyzer is able to deliver a 150 dB dynamic range in a spectrum, the entire potential of the 24 bit ADC. At its full bandwidth, the input dynamic range is 120 dB, a testament to the analog design and the 24 bit Delta Sigma technology. At smaller bandwidths the dynamic range increases, reaching 150 dB at bandwidths below 1000 Hz. The answer lies in signal processing; onboard DSP is used for decimation filtering with selective noise rejection.

TACHOMETER INPUT

2 to 8 per chassis
Pulses Per Revolution (PPR): 0.01 to 4096
Pulses per minute: 1 - 300,000
Input Range: ± 24 V FS
Adjustable threshold, hysteresis, holdoff, prescaling

OUTPUT

2 to 8 per chassis
Dynamic Range: greater than 120 dB
Resolution: 24-bit
Voltage range: 0.1/0.2/0.5/1/2/5/10 V Full Scale
Output Current: 10 mA Max; continuous short
THD: -100 dB (typical), -90 dB max, $f < 40$ kHz
Reconstruction Filter: 100 dB image rejection
Output Waveforms: 65536 max blocksize for arbitrary; unlimited for recorded (optional)

NETWORK PERIPHERAL CHASSIS

Disk Capacity: 100 GB
Disk Rate: 20MB/s streaming (32+8 channels 32 bit floating point samples @ 107.42kSps)
Dimensions: 4 x 10 x 18 in without trims
Weight: 20 pounds
Operating Temperature: 0 to 55° C
Power: 130 Watts

NETWORK TOPOLOGY

100 Mbps Ethernet to chassis, 100/1000 Mbps Ethernet to host
Sampling: Common clock across chassis for synchronous sampling

NOTE: All specs hold both within and across chassis. Continued product improvement necessitates that Data Physics reserve the right to modify these specifications without notice.