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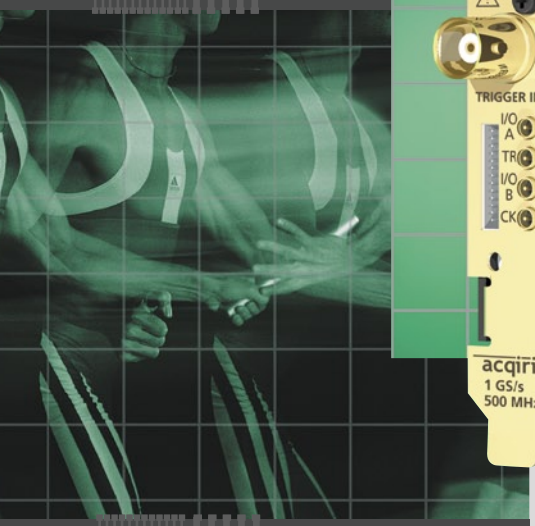
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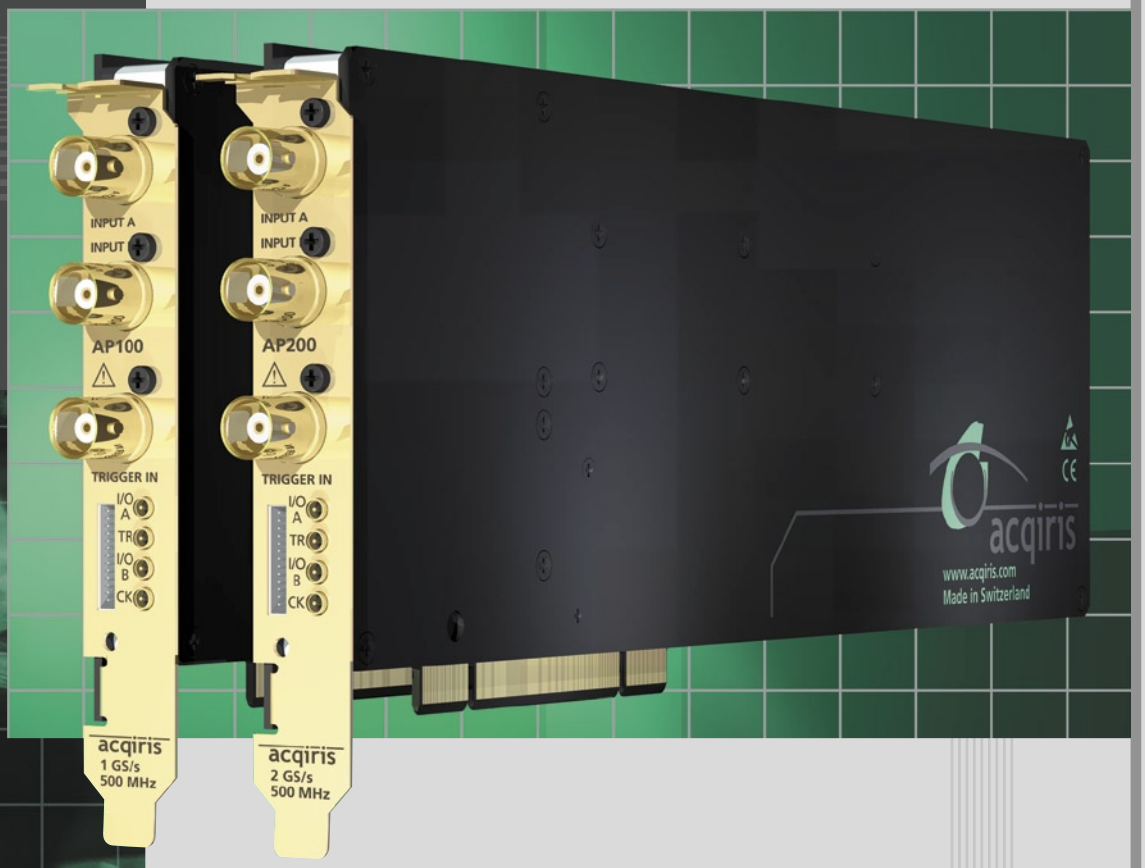
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Find the *Keysight / Agilent / Acqiris AP200 / U1081A-003* at our website: *Click HERE*

AP100
500 MHz
1 GS/s

AP200
500 MHz
2 GS/s





High Speed Signal
Averaging Cards



Ctrl I/O

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Main Features

- **2 GS/s real time sampling and averaging (1 GS/s with the AP100)**
- **500 MHz analog bandwidth**
- **Dual Inputs (software selectable) with gain and offset**
- **12 Bit dynamic range and resolution in SuperRes mode**
- **2 to 8 Mpoint averaging memories**
- **Low dead-time (< 1 µs) between acquisitions**
- **Averaging rates up to 2 Gpoints/s (e.g. 8,000 x 250 kpoint records/s)**
- **Average from 1 to 65,536 events (> 4,000,000 in sequence mode)**
- **Trigger and clock synchronization modes for improved accuracy**
- **Digital and analog front panel control lines**
- **Single slot PCI card with 100 Mbytes/s transfer speed**
- **Device drivers for Windows 95/98/NT4.0/ 2000/XP, VxWorks and Linux**
- **Auto-install software with application code examples for C/C++, Visual Basic, National Instruments LabVIEW and LabWindows/CVI**

High Speed Signal Averaging Card

High Speed and Precision

The Model AP100/200 Signal Averaging Cards set new standards for data acquisition in high-speed signal averaging applications. Averaging signals reduces random noise effects, improving the signal-to-noise ratio, as well as increasing resolution and dynamic range (up to 12 bits in SuperRes mode). The cards plug directly into any vacant computer long PCI slot and perform averaging functions in "real-time" at rates up to 1 GS/s for the AP100 and 2 GS/s for the AP200. They combine an ultra-fast real-time summing capability with exceptionally high data transfer rates to the host processor. The result is products that set a new standard for signal averaging throughput, and also allow the averaged data to be accessed faster than ever before.

The AP100/200 deliver fast real-time sampling rate with 500 MHz of analog bandwidth. Fast sampling rate and wide bandwidth are essential to ensure the accurate capture of all the high frequency components of complex signals. The fast sampling rate is achieved with a single trigger and acquisition, and it does not require the use of equivalent-time sampling techniques. In contrast to Averagers that use equivalent-time sampling, the AP100/200 maintain maximum averaging speed and do not require additional triggers that reduce the total data throughput.

The fast sampling rate is combined with a large acquisition memory of 2 Mpoints (optionally 8 Mpoints). The large memory makes the cards suitable for applications where very long acquisition times are encountered. For example, the AP200 can be used for acquiring signals up to 1.0 ms (opt. 4 ms) long while running at the real-time sampling rate of 2 GS/s (one data point every 500 ps). Large acquisition memory preserves the fast sampling rate and maintains high temporal resolution.

The AP100/200 Averagers use Acqiris' high-level integrated circuit technology to acquire individual signals and transfer them to the averaging memory. They include all the required input signal conditioning such as gain (from 50 mV to 500 mV Full Scale), offset adjustment and 50 Ω DC coupling. The two software selectable inputs are fully protected when using the optional overvoltage protection kit. Calibration is a user controlled feature that is activated via software. A crystal controlled time base and advanced trigger circuits are used to allow fast and stable acquisitions. The Averagers are fully programmable over the PCI bus using simple Windows based software (Drivers included).

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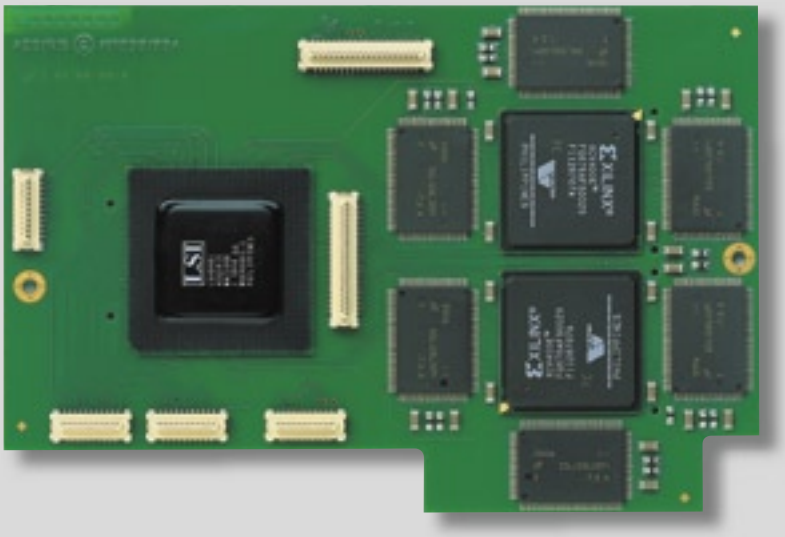
Improved Timing

The AP100/200 feature state-of-the-art timing capabilities. In order to provide superior timing accuracy for successively summed acquisitions, the Model AP100/200 systems include two sampling modes, (**Synchronized** and **Non-Synchronized**) with respect to the input trigger.

In **Non-Synchronized Mode**, the trigger signal starts the digitizing clock. The trigger is not synchronized with respect to the internal sampling clock, and the jitter, when adding one acquisition to another, is within the range of ± one half of the sampling clock cycle. The jitter in Non-Synchronized mode varies from a minimum of ±500 ps at the fastest sample rate of the card to a maximum of ±1.25 ns at sample rates ≤ 400 MS/s.

The Synchronized Mode is the preferred method for applications where the jitter between the traces being summed must be reduced to as small an amount as possible. The synchronized mode works as follows: Upon receipt of the external trigger signal, the Averager starts the digitizing clock. The Averagers internal timing circuitry is then used to synchronize the sampling clock to the trigger to within ±200 ps when sampling at 2 GS/s for AP200. Therefore, each acquired event that is to be summed in real time, has samples positioned to within 400 ps of the samples in successive acquisitions. This mode has the additional benefit of minimizing the overall loss of system bandwidth often associated with the higher jitter levels that are encountered with non-synchronized modes of acquisition.

For applications where an outside signal source must be synchronized with the internal sampling clock, the AP100/200 Averagers provide a trigger output with its edge synchronized to the sample clock (to ≤ ±100 ps). The trigger output accurately preserves the sample timing with respect to the event of interest from shot to shot. Ideally, the trigger output is used to synchronously activate an external event serving as the zero-time reference for the time-dependent phenomena measured in each accumulated shot. As an example, the trigger output could activate the application of an electric or magnetic field to a sample under test. Using this method ensures that the application of the field is identically synchronized to the sample clock for each shot contained within the average. It also insures that each sample in the accumulated sum is identically positioned shot-to-shot with respect to a fixed zero-time reference (provided that the time between the trigger output and the event waveform is kept constant).



AP200 Averager Mezzanine Card.

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The Signal Averagers generate a ready pulse (ACQRDY) whenever the units are armed and ready to acquire data. The ready pulse is normally used to activate an external event (such as the firing of a laser). This event in turn can produce a trigger pulse applied to the Trigger Input connector of the Averager. The trigger input pulse then starts the acquisition after a predetermined delay.

Better Accuracy

The AP100/200 Signal Averagers use high quality front-end electronics to ensure excellent accuracy, low noise and full 8 bit vertical resolution. Vertical resolution can be further extended using Acqiris' **SuperRes** acquisition mode. SuperRes uses a special high speed dithering circuit that can increase the dynamic range from 8 to 12 bits (when averaging more than 256 spectra). Dithering a signal involves the application and subtraction of a small (but pseudo-random) amount of digital offset to the acquired signal. The dithering range is user selectable allowing the averaged signals to be recorded using the full dynamic range of the ADC. SuperRes improves measurement resolution and can dramatically reduce the errors associated with ADC effects such as differential non-linearity.

Fast Averaging

The AP100/200 have 2 Mpoints (8 Mpoints optional) of averaging memory. The averaging memory receives the converted data from the digitizer. A high-speed on-board computing circuit is used to perform the retrieve, add and store functions necessary to average the signal in real time at the maximum sampling rate.

Summed events can be acquired with less than 1µs dead-time between them. For example, multiple acquisitions made at 2 GS/s sampling rate and containing 250 kpoints can be summed at sustained rates of up to 8000 shots per second. If 100 kpoints records are used, the sustained summing rate can reach 20,000 shots per second. Once a sum is accumulated (number of events selectable from one to 65,536) the signal is read out over the PCI bus and the division function necessary to obtain the average is performed inside the PC (if desired).

Sequences of Fast Averages

In time resolved applications where multiple averaged waveforms must be acquired with very low deadtime (less than 2.5 µs), the averaging memory can also be partitioned. This allows the user to store from 1, up to 8192 separate accumulations of summed data. The length of each segment is adjustable from 200 points up to the maximum 1 Mpoints (in steps of 1 point).

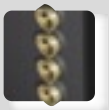


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High Data Throughput

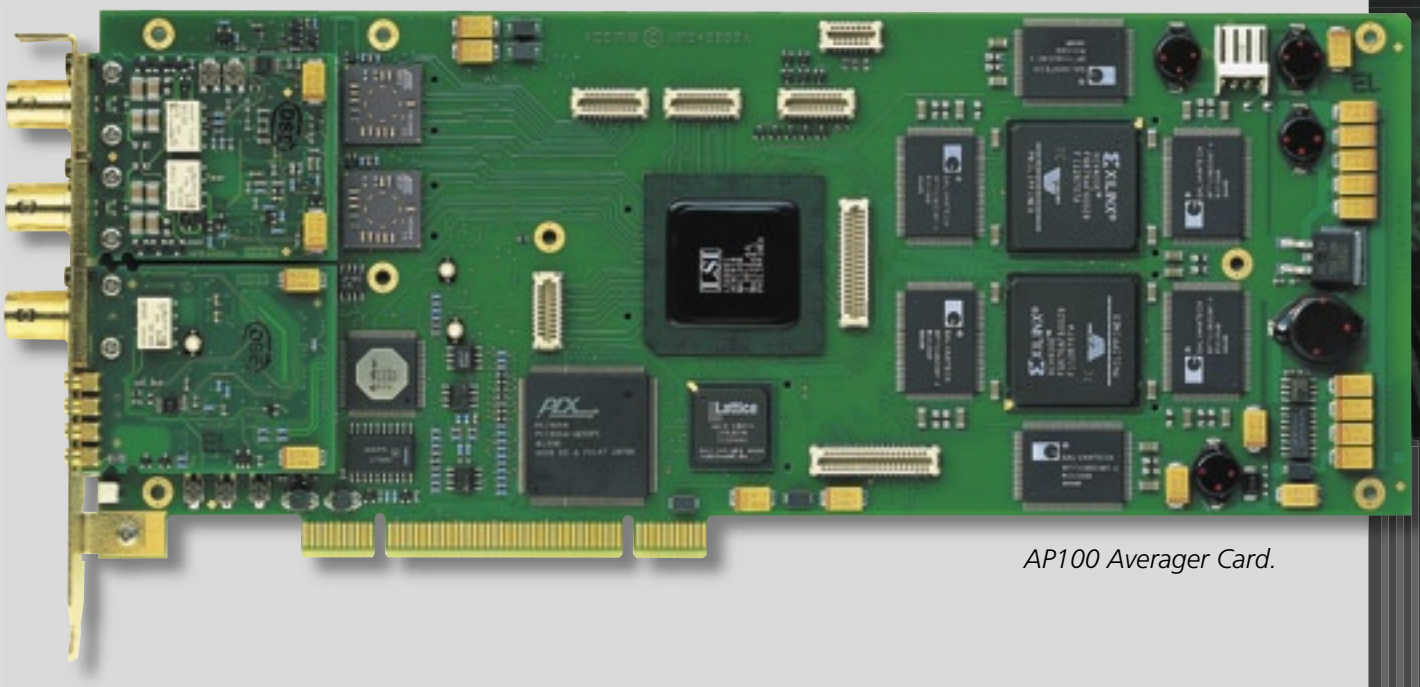
The AP100/200 can easily be integrated into any standard computer with one vacant full-lenght PCI slot. The AP100/200 cards are designed to take advantage of the high-speed PCI bus connection. Averaged signals can be transferred, in DMA mode, directly to the processor over the bus at rates of up to 100 Mbytes per second (4 ms for a 100 kpoint record, 10 ms for a 250 kpoint record, including DMA set up time overhead).

Front Panel Multi I/O Ports



Ctrl I/O

The control over the trigger and time base is made even more flexible by the addition of high density, high-frequency front panel connectors. The four MMCX-type connectors enable the use of an external clock (up to 500 MHz) or reference signal (10 MHz), trigger output and two additional I/O digital control lines. They can be used for monitoring or modifying the averager's status and configuration. Examples of the control available are trigger gating, 10 MHz reference clock output and acquisition states.



AP100 Averager Card.

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Signal Averager

Model AP100

500 MHz, 8 bit, 1 GS/s, 2 or 8 Mpoint memories, single-channel

Model AP200

500 MHz, 8 bit, 2 GS/s, 2 or 8 Mpoints memories, single-channel

Signal Input

Bandwidth (-3 dB)
DC to 500 MHz at 100, 200, and 500 mV full scale
DC to 300 MHz at 50 mV full scale

Full Scale (FS)
50 mV, 100 mV, 200 mV, and 500 mV

Impedance
50 Ω DC ±0.5%

Connectors
2 input (BNC)
Trigger in (BNC) and Trigger out (MMCX)

Offset
±2 V

Channels
Two software selectable inputs

Coupling
DC

Maximum Input Voltage
±5 V DC (500 mW) or 5 V RMS at 50 Ω

Maximum Current
40 A/1 µs clamped at ±5 V

Digital Conversion

Conversion Rate
100 S/s to 2 GS/s
(1 GS/s for the AP100)
in 1, 2, 2.5, 4, 5 sequence

Resolution
8 bits
12 bits in SuperRes Mode

Differential Non-Linearity
±0.7 LSB for single acquisition

Sampling Jitter
< 2 ps rms

Time Base

Range
Up to 2 ms at 1 GS/s (AP100)
Optional: 8 ms (AP100)
Up to 1 ms at 2 GS/s (AP200)
Optional: 4 ms (AP200)

Clock Accuracy
Better than ±2 ppm

Trigger Time Interpolator
80 ps resolution

Trigger Time Stamps
Available for the first trigger of each accumulated sum.

Acquisition Modes
Single shot, real time averaging and sequences of fast averages
Sequence: 1 to 8192 segments
Dead-Time: for successive segments or acquisitions < 1.0 µs (AP100), < 1.2 µs (AP200)

Trigger (Internal + External)

Slope
Positive and negative

Coupling
AC LFReject and DC

Posttrigger
Adjustable up to 16 M/conversion rate in steps of 16/conversion rate (AP100)
Adjustable up to 32 M/conversion rate in steps of 32/conversion rate (AP200)

External Trigger Input
Impedance: 50 Ω or 1 MΩ
Threshold range: ±3 V
Max. input voltage:
±5 V (500 mW) into 50 Ω

Sensitivity

	Internal	External
DC to 1 MHz	> 5% FS	> 0.5 Vpp
DC to 300 MHz	> 20% FS	> 1.6 Vpp
DC to 500 MHz	> 70% FS	> 3.0 Vpp

System Performance

DC Accuracy
< ±2% FS at 0 V offset
< ±1% Typical

Integral Non-Linearity
< ±1% FS

Effective Bits (at 2 GS/s)
DC-20 MHz: > 6.5
20-200 MHz: > 6.0

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Trigger Synchronization

Clock Synchronization to Trigger Input (Synchronized Mode)

Sample Rate	AP100	AP200
2 GS/s	--	±200 ps
1 GS/s	±200 ps	±325 ps
500 MS/s	±325 ps	±325 ps
≤ 400 MS/s	±400 ps	±400 ps

Clock Synchronization to Trigger Input (Non-Synchronized Mode)

Sample Rate	AP100	AP200
2 GS/s	--	±500 ps
1 GS/s	±500 ps	±1 ns
500 MS/s	±1 ns	±1 ns
≤ 400 MS/s	±1.25 ns	±1.25 ns

Trigger Output Synchronization to Sampling Clock: < ±100 ps

Averaging Memory

Memory Size
2 Mpoints of 24 bits
Optional: 8 Mpoints of 24 bits

Averaging Speed
Up to 1 GS/s (AP100)
Up to 2 GS/s (AP200)

Transfer to PCI
Up to 32 Mpoints/sec of 24 bits

Acquisition Length
Programmable
from 16 to 2 Mpoint in steps of 16 points (AP100)
from 32 to 2 Mpoint in steps of 32 points (AP200)

Acquisition Depth
Programmable from 1 to 65,536

Memory Segmentation
Programmable from 1 to 8192

PC System Requirements

Processor
150 MHz Pentium (or higher)

Operating system
Windows 95/98/NT4/XP or 2000

Memory
64 Mbytes RAM (more is recommended when working with several cards)

CD Drive

Hard Drive Space
20 Mbytes minimum

PCI Slot
Full length PCI Standard with 3.3 V supply

General

Power
< 34 W (AP100)
< 52 W (AP200)

Warranty
3 years

Current Requirements	AP100	AP200
+12 V	< 0.7 A	< 0.9 A
+5 V	< 1.9 A	< 3.0 A
+3.3 V	< 4.5 A	< 7.6 A
-12 V	< 0.05 A	< 0.05 A

Front panel LED indicates digitizer status
Green: ready for trigger
Yellow: module identification
Red: trigger

Environmental and Physical

Operating Temperature
0° to 40°C

Required Airflow
XP102 Required

Relative Humidity*
5 to 95% (non-condensing)

Shock*
30 G, half-sine pulse

Vibration*
5-500 Hz, random

EMC Immunity
Complies with EN50082-1

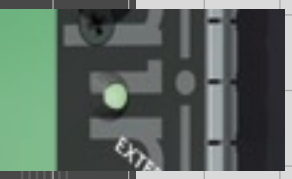
EMC Emissions
Complies with EN50081-1, EN55022 Class B for radiated emissions

Dimensions
PCI Standard
(full length card)

CE Certification and Compliance

* As defined by MIL-PRF-28800F Class 3

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Ordering Information

AP100

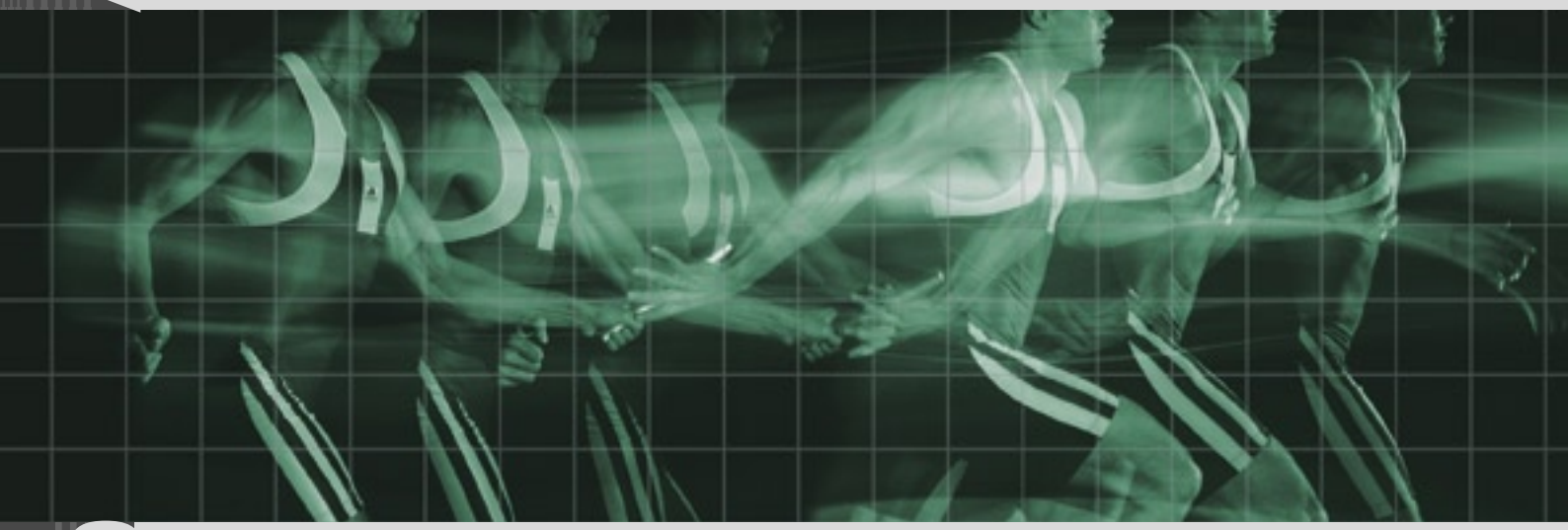
Model Number	Description
AP100	Single channel, 500 MHz, 1 GS/s, 2 Mpoint PCI Signal Averager
AP100-M8M	8 Mpoint acquisition memory option
AP100-W5	5 - year extented warranty
AP100-CAL	Calibration certificate

AP200

Model Number	Description
AP200	Single channel, 500 MHz, 2 GS/s, 2 Mpoint PCI Signal Averager
AP200-M8M	8 Mpoint acquisition memory option
AP200-W5	5 - year extented warranty
AP200-CAL	Calibration certificate

Accessories

XA100	Overvoltage protection for PCI Digitizers
XA200	Ctrl I/O MMCX to BNC cable (1m)



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