AlazarTech

ATS310

10 MHz, 20 MS/s
12-Bit Waveform Digitizer for PCI Bus

- 2 channels simultaneously sampled at 12-bit resolution
- 20 MS/s real-time sampling rate
- 10 MHz full power bandwidth
- ±40mV to ±20V input range
- Acquisition memory of 128K samples per channel or 8M samples per channel
- API Panel software allows quick start-up without any software development process
- Software Development Kit supports C/C++, VB and LabVIEW



Product	Bus	Operating System	Channels	Sampling Rate	Bandwidth	Memory Per Channel	Resolution
ATS310	PCI	Windows 2000/XP Windows 98SE	2	20 MS/s to 10 KS/s	10 MHz	128K Std 8M Optional	12 bits

Overview

ATS310 is a dual-channel 20 MS/s waveform digitizer card for PCI bus. Using an ATS310 low-noise, deep-memory digitizer, you can build faster performance automated test systems at low cost.

ATS310 PCI digitizers are also an ideal solution for cost sensitive OEM applications that require a digitizer to be embedded into the customer's equipment.

More than one ATS310 PCI digitizers can be configured as a Master/Slave system to create a truly simultaneous data acquisition system of up to 16 inputs.

ATS310 is supplied with API Panel software that lets the user get started immediately without having to go through a software development process. Users who need to integrate the ATS310 in their own program can purchase a Windows based software development kit, ATS-SDK for C/C++ and VB or ATS-VI for LabVIEW.

Analog Input

An ATS310 features two analog input channels with extensive functionality. Each channel has 10 MHz of full power analog input bandwidth. With software selectable attenuation, you can achieve an input voltage range of ±40mV to ±20V. Attenuating probes (sold separately) can extend the voltage range even higher.

Software selectable AC or DC coupling further increases the signal measurement capability. Software selectable 50Ω input impedance makes it easy to interface to high speed RF signals.

Acquisition System

ATS310 PCI digitizers use a pair of 20 MS/s, 12-bit ADCs to digitize the input signals. The real-time sampling rate ranges from 20 MS/s down to 10 KS/s. The two channels are guaranteed to be simultaneous, as they share the exact same clock.

An acquisition can consist of multiple records, with each record being captured as a result of one trigger event. Minimum number of records is 1 and maximum is 1000. A record may contain both pre-trigger and post-trigger data.

In between the multiple records being captured, the acquisition system is re-armed by the hardware within 8 sampling clock cycles. This mode of capture, sometimes referred to as Multiple Record or Pre-Trigger Multiple Record, is very useful for capturing data in applications with a very rapid trigger rate.

Acquisition Memory

The standard ATS310 PCI digitizer features a total of 512KB onboard memory, providing up to 128,000 points of acquisition memory for each channel.

The High Memory version of ATS310 features a total of 32MB of onboard memory, providing 8 Million points of acquisition memory for each channel.

Data is acquired into the onboard memory before being transferred to the host PC memory. This transfer is performed using Direct Memory Access (DMA), which uses scatter-gather bus mastering technology.

Triggering

The ATS310 is equipped with sophisticated triggering options, such as programmable trigger thresholds and slope on any of the input channels or the External Trigger input.

While most oscilloscopes offer only one trigger engine, ATS310 offers two trigger engines (called Engines X and Y). This allows the user to combine the two engines using a logical OR, AND or XOR operand.

Both pre-trigger and post-trigger points can be captured in a given record. The user can specify the number of records to capture in an acquisition, the length of each record and the amount of pre-trigger data. The amount of Post-trigger data can be calculated by subtracting pre-trigger depth from the record length.

A programmable trigger delay can also be set by the user. This is very useful for capturing the signal of interest in a pulse-echo application, such as ultrasound, radar, lidar etc.

Trigger Time Stamp

A 40-bit time stamp counter comes standard with the ATS310. This counter is initialized to a zero value when an acquisition session is started and increments once for every two samples captured, thus providing a 2-clock timing accuracy. The value of this counter is latched into on-board memory for each trigger, i.e. once per record.

This allows the user to find out the timing of each trigger in a multiple record acquisition relative to the start of the acquisition.

Multiple-Digitizer Synchronization

ATS310 features a Master/Slave connector that allows synchronization of multiple digitizers to allow truly synchronous sampling across as many as 16 channels.

A SyncBoard (sold separately) is required to connect the Master/Slave connectors on multiple digitizers in the system together. Such a system is called a Master/Slave system.

SyncBoard is a board-level product that features controlled impedance, equal length traces to deliver clock, trigger and initialization signals to each ATS310 in the system.

A Master/Slave system is guaranteed to sample simultaneously across all channels in that system. Triggering is also guaranteed to be simultaneous across all digitizers in the system.

ATS310 based master/slave systems provide the best price-performance for high channel count systems.

Optional External Clock

While the ATS310 features a low jitter, high reliability 40 MHz crystal oscillator as the source of the timebase system, there may be occasions when digitizing has to be synchronized to an external clock source.

ATS310 External Clock option provides a BNC input for a TTL compatible external clock signal with a frequency between 20 MHz and 1 MHz.

This clock signal is terminated on the ATS310 printed circuit board using a 50Ω resistor. As such, the external clock circuitry must have sufficient drive (± 66mA) to inject the clock signal properly.

The active edge of the external clock is software selectable between the rising or falling edge.

Users can also set a decimation factor for the external clock. For example, if the user wants to digitize the input signal on every tenth clock edge, this factor can be set to 10. Minimum decimation value is 1 and maximum is 100,000.

Optional Trigger Output

ATS310 can be optionally equipped with a Trigger Output capability. This option uses the ECLK BNC connector to output a TTL signal synchronous to the ATS310 Trigger signal, allowing users to synchronize their test systems to the ATS310 Trigger.

When combined with the Trigger Delay feature of the ATS310, this option is ideal for ultrasonic and other pulse-echo imaging applications.

Customers who want both External Clock and Trigger Output options on their ATS310 digitizers should contact the factory for arriving at an appropriate cabling solution.

Calibration

Every ATS310 digitizer is factory calibrated and is shipped with a calibration certificate verifying that it meets NIST-traceable standards. To recalibrate an ATS310, the digitizer must either be shipped back to the factory or a qualified metrology lab.

Software

ATS310 is supplied with the API Panel software that allows the user to setup the acquisition hardware and capture, display and archive the signals. With this software, users can get started quickly and effortlessly without going through a software development process.

A Windows compatible software development kit, ATS-SDK is also offered. It allows programs written in C/C++ and VisualBASIC to fully control the ATS310.

A set of high performance VIs for LabVIEW 6.1, called ATS-VI, can also be purchased.

System Requirements

Pentium based computer with at least one free PCI slot, 128 MB RAM, 20 MB of free hard disk space, SVGA display adaptor and monitor with at least a 800 x 600 resolution. ATScope requires Internet Explorer 5.0 or higher.

Power Requirements

+5V	1.5 A, typical +5V voltage level must remain between the range of 4.75V to 5.20V at all times after power-on

Physical

Size	Single slot, half length PCI card (4.2 inches x 7.2 inches)
Weight	500 g

I/O Connectors

CH A, CH B, EXT, ECLK	BNC female connectors

Environmental

Operating temperature	0 to 55 ^{o} C
Storage temperature	-20 to 70 ^{o} C
Relative humidity	5 to 95%, non-condensing

Acquisition System

Resolution	12 bits
Bandwidth (-3dB)	
DC-coupled, 1MΩ	DC - 10 MHz
DC-coupled, 50Ω	DC - 10 MHz
AC-coupled, 1MΩ	10 Hz - 10 MHz
AC-coupled, 50Ω	100KHz - 10 MHz
Bandwidth flatness:	± 1dB
Number of channels	2, simultaneously sampled
Maximum Sample Rate	20 MS/s single shot
Minimum Sample Rate	10 KS/s single shot
Full Scale Input ranges	±40mV, ±50mV, ±80mV, ±100mV, ±200mV, ±400mV, ±500mV, ±800mV, ±1V, ±2V, ±4V, ±5V, ±8V, ±10V and ±20V, software selectable
DC accuracy	±2% of full scale in all input ranges
Input coupling	AC or DC, software selectable
Input impedance	50Ω or 1MΩ ±1% in parallel with 30 pF ±10pF, software selectable
Input protection	
1MΩ	±28V (DC + peak AC for CH A, CH B and EXT only without external attenuation)
50Ω	±8V (DC + peak AC for CH A, CH B and EXT only without external attenuation)

Acquisition Memory System

Onboard acquisition memory	512 KB standard, or 32MB with High Memory Option
Acquisition Memory/channel	Up to 128,000 samples per channel standard, or Up to 8 Million samples per channel with High Memory Option
Record Length	Software selectable with 4 point resolution. Record length must be a minimum of 256 points. Maximum record length is limited by the acquisition memory per channel.
Number of Records	Software selectable from a minimum of 1 to a maximum of 1,000 or (Acquisition Memory Per Channel / (Record Length+4)), whichever is lower
Pre-trigger depth	0 to (Record Length-64), software selectable with 4 point resolution
Post-trigger depth	Record Length - Pre-trigger depth

Timebase System

Timebase options	Internal Clock or External Clock (Optional)
Internal Sample Rates	20 MS/s, 10 MS/s, 5 MS/s, 2 MS/s, 1 MS/s, 500 KS/s, 200 KS/s, 100KS/s, 50 KS/s, 20KS/s, 10KS/s
Internal Clock accuracy	±25 ppm

Dynamic Parameters

Typical values measured using a randomly selected ATS310 in ±1V input range, DC coupling and 50Ω impedance. Input was provided by a HP8656A signal genarator, followed by a 9-pole, 1 MHz band-pass filter. Input frequency was set at 1 MHz and amplitude was 650 mV rms (92% of full scale input).

SNR	60 dB
SINAD	58 dB
THD	-61 dB
SFDR	-62 dB

Note that these dynamic parameters may vary from one unit to another, with input frequency and with the full scale input range selected.

Optional ECLK (External Clock) Input

Signal Level	TTL levels. Compatible with both 3.3V and 5V TTL
Input impedance	50Ω
Input current requirement	±66mA
Maximum frequency	50 MHz with 50% ±5% duty cycle
Minimum frequency	1 MHz with 50% ±5% duty cycle
Decimation factor	Software selectable from 1 to 100,000
Sampling Edge	Rising or Falling, software selectable

Triggering System

Mode	Edge triggering with hysteresis
Number of Trigger Engines	2
Trigger Engine Combination	OR, AND, XOR, selectable
Trigger Engine Source	CH A, CH B, EXT, Software or None, independently software selectable for each of the two Trigger Engines
Hysteresis	±5% of full scale input, typical
Trigger sensitivity	±10% of full scale input range. This implies that the trigger system may not trigger reliably if the input has an amplitude less than ±10% of full scale input range selected
Trigger level accuracy	±5%, typical, of full scale input range of the selected trigger source
Bandwidth	10 MHz
Trigger Delay	Software selectable from 0 to 9,999,999 sampling clock cycles
Trigger Timeout	Software selectable with a 10 us resolution. Maximum settable value is 3,600 seconds. Can also be disabled to wait indefinitely for a trigger event

EXT (External Trigger) Input

Input impedance	1 MΩ in parallel with 30pF ±10pF
Bandwidth (-3dB)	
DC-coupled	DC - 10 MHz
AC-coupled	10 Hz - 10 MHz
Input range	±5V or ±1V, software selectable
DC accuracy	±10% of full scale input
Input protection	±28V (DC + peak AC without external attenuation)
Coupling	AC or DC, software selectable

Certification and Compliances

CE Mark Compliance

All specifications are subject to change without notice

ORDERING INFORMATION

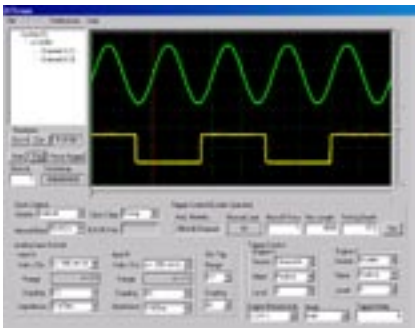
ATS310-128K (Standard)	ATS310-001
ATS310-8M (High Memory)	ATS310-002
ATS310: High Memory Option (only available for ATS310-128K)	ATS310-003
ATS310: External Clock Option	ATS310-004
ATS310: Trigger Output Option	ATS310-005
ATS310: SyncBoard 2X	ATS310-006
ATS310: SyncBoard 4X	ATS310-007
ATS310: SyncBoard 8X	ATS310-008
C/C++, VB SDK for ATS310	ATS310-SDK
LabVIEW VI for ATS310	ATS310-VI

SOFTWARE DEVELOPMENT FOR OEM APPLICATIONS

The ATS310 was designed with the needs of OEM customers in mind. These customers build capital equipment that has to incorporate an embedded waveform digitizer to handle high speed analog signals output by various sensors in the rest of the machine.

One of the major concerns of OEMs buying a waveform digitizer, as opposed to building it themselves, is the ease of integration of the digitizer in their existing software.

The design team of the ATS310 was able to draw upon decades of experience in the industry to formulate software development kits (SDKs) for C/C++, VB and LabVIEW that minimize integration time, without compromising data transfer speed.



One of the most important parts of the SDK is the API Panel software. This is a Win32 application program that uses the same API calls as the SDK to setup the hardware, capture data and then display it. Raw data can also be saved to an ASCII file for easy import into Excel, MATLAB etc.

Software developers can compare the data captured under their program control against that captured by API Panel to verify that their program works properly.

The ease of software development can also be taken advantage of by non-OEM customers. ATS310 can be integrated into customers' test systems just as easily as in OEM systems.

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