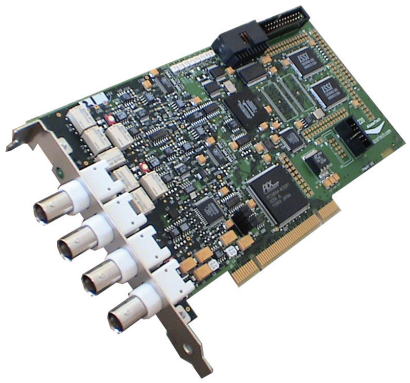
ATS310
20 MS/s 12-Bit PCI Digitizer

- 2 channels sampled at 12-bit resolution
- 20 MS/s simultaneous real-time sampling rate on each input
- ±40mV to ±20V input range
- Up to 8 Million samples of on-board acquisition memory per channel
- AlazarDSO Oscilloscope Software
- Software Development Kit supports C/C++, C#, MATLAB and LabVIEW.
- Linux drivers available



RoHS compliant
2002/95/EC

Product	Bus	Operating System	Channels	Sampling Rate	Bandwidth	Memory Per Channel	Resolution
ATS310	PCI 32 bit 33 MHz	Win XP/Vista/7, Linux 2.6+ 32bit/64 bit	2	20 MS/s to 1 KS/s	10 MHz	128K Std. or 8M Optional	12 bits

Overview

ATS310 is a dual-channel, 12 bit, 20 MS/s waveform digitizer card for PCI bus, capable of storing up to 8 Million samples per channel of acquired data in its on-board memory.

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

It should be noted that it is not possible for ATS310 acquisition memory to be dual-ported. For applications that require dual port memory, consider using ATS460.

For scientific customers who want to record multiple analog inputs simultaneously, ATS310 offers the best price-performance ratio for multi-channel data acquisition systems of up to 16 channels. Even higher channel counts are possible as a special order item.

ATS310 is supplied with AlazarDSO oscilloscope software that lets the user get started immediately without having to write any software.

Users who need to integrate the ATS310 in their own program can purchase a Windows based software development kit, ATS-SDK for C/C++, C# and VB, or ATS-VI for LabVIEW for Windows or a Linux based ATS-Linux.

All of this advanced functionality is packaged in a low power, half-length PCI card available at a very aggressive price point.

Applications

Ultrasonic & Eddy Current NDT/NDE

Motor Winding Testing

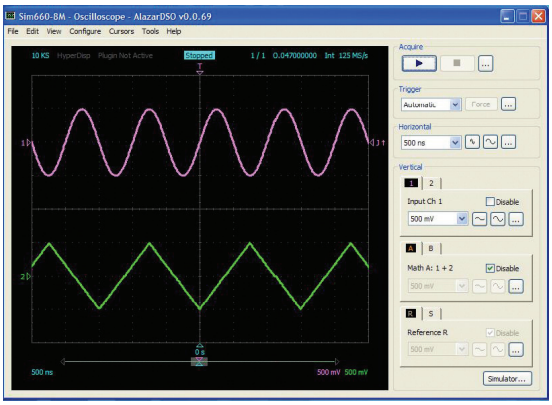
Radar/RF Signal Recording & Analysis

High Resolution Oscilloscope

Lidar

Spectroscopy

Multi-Channel Transient Recording



ATS310
20 MS/s 12-Bit PCI Digitizer

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.

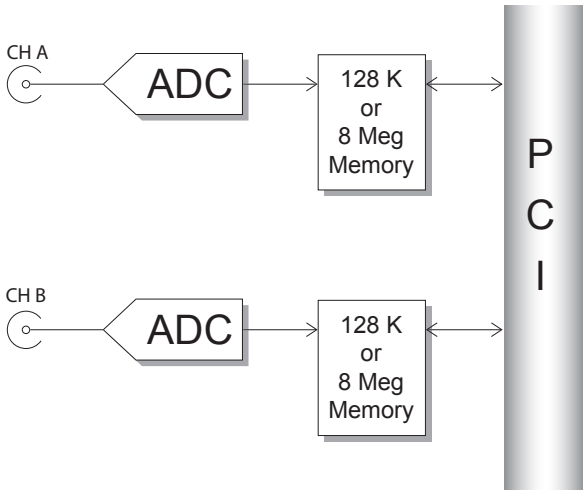
Examples of such applications include ultrasonic testing, NMR spectroscopy, motor testing and lightning test.

On-Board Acquisition Memory
The standard ATS310 PCI digitizer features 128 Kilo samples of acquisition memory for each channel.

Acquisition memory can optionally be upgraded to provide 8 Million samples per channel of signal storage.

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.

It should be noted that ATS310 does not offer dual port memory.



Triggering
The ATS310 is equipped with sophisticated digital 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.

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.

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. By default, 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. At 20 MS/s sample rate, this counter will not roll over for well over 2 hours.

The value of this counter is latched into trigger memory for each trigger, i.e. once per record, for up to specified number of records.

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

It is also possible to configure the timestamp counter to reset for the first acquisition only and never again, until a software reset is issued. This feature enables users to obtain precise timing information about multiple acquisitions.

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 for gain and offset accuracy to NIST-traceable standards, using a Fluke 5820A oscilloscope calibrator. To recalibrate an ATS310, the digitizer must either be shipped back to the factory or a qualified metrology laboratory.

RoHS Compliance

ATS310 units built after June 2007 are fully RoHS compliant, as defined by Directive 2002/95/EC of the European Parliament and of the Council of 27 January 2003 on the restriction of the use of certain hazardous substances in electrical and electronic equipment.

All manufacturing is done using RoHS-compliant components and lead-free soldering.

AlazarDSO Software

ATS310 is supplied with basic version of AlazarDSO software at no extra charge. AlazarDSO allows the user to setup the acquisition hardware and capture, display, process and archive the acquired signals.

AlazarDSO (32-bit) is fully compatible with Windows XP x86 (32bit) as well as Windows Vista (32-bit). AlazarDSO is not compatible with Windows 98 SE.

AlazarDSO (64-bit) requires a 64-bit operating system, such as Windows XP x64. AlazarTech recommends Windows XP x64 for Master/Slave systems.

AlazarDSO also allows FFT, cursors, math functions, histograms, unattended archiving, signal file recall, on-line help, dual-port memory support and numerous other powerful features.

Finally, AlazarDSO capabilities can be expanded using a Plug-In DLL that can do custom control and processing functions on captured data. AlazarDSO Plug-In Development Kit (sold separately) is required for writing a custom Plug-In.

AlazarDSO Plug-Ins

AlazarDSO capabilities can be expanded using a Plug-In DLL that can do custom control and processing functions on captured data. AlazarDSO Plug-In Development Kit (sold separately) is required for writing a custom Plug-In.

This unique capability can be very useful for customers who want to create custom data analysis and display applications without investing months of software development effort.

The user-selected Plug-In DLL is called by AlazarDSO each time it receives a new buffer of data. The Plug-In can then modify the data in any way it wants and have AlazarDSO display it.

An example of such a Plug-In is the Averaging Plug-In supplied with AlazarDSO. It can average multiple records captured by AlazarDSO into a single record.

Another example is the Acquire-At-Time Plug-In that allows the user to set an acquisition time based on GPS clock derived from a Trimble GPS module.

Other potential Plug-Ins can include FIR filtering, Co-adding for spectroscopy, Software DDC and so on.

It should be noted that a Plug-In DLL can only be a listener that responds to a call from AlazarDSO. It cannot initiate an action on its own.

ATS-SDK Software Development Kit

ATS-SDK Windows compatible software development kit (sold separately) allows programs written in C/C++/C# and Visual BASIC to fully control the ATS310.

Sample programs are provided to show how users can acquire data using single-port memory as well as dual port memory.

Asynchronous DMA sample programs are also supplied with ATS-SDK.

ATS-VI for LabVIEW

A set of high performance VIs for LabVIEW 7.1 and higher, called ATS-VI, can also be purchased. These vis support single-port memory access as well as all modes of dual-port memory (AutoDMA) accesses.

An AsyncDMA vi is also provided to show how users can take advantage of Asynchronous DMA.

ATS-Linux

AlazarTech offers ATS310 binary drivers for CentOS 6.3 x86_64 with kernel 2.6.32-279.5.2.el6.x86_64. These drivers are also 100% compatible with RHEL 6.3.

Also provided is a GUI application called AlazarFrontPanel that allows simple data acquisition and display.

Source code example programs are also provided, which demonstrate how to acquire data programmatically using a C compiler.

If customers want to use ATS310 in any Linux distribution other than the one listed above, they must purchase a license for Linux driver source code and compile the driver on the target operating system. A Non-Disclosure Agreement must also be executed between the customer's organization and AlazarTech.

All such source code disclosures are made on an as-is basis with limited support from the factory.

ATS310
20 MS/s 12-Bit PCI Digitizer

System Requirements

Personal computer with at least one free PCI slot, 512 MB RAM, 100 MB of free hard disk space

Power Requirements

+5V	1.5 A, typical for ATS310-128K 1.7 A, typical for ATS310-8M +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 Data is returned as MSB-justified 16 bit unsigned integers
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	1 KS/s single shot for internal clocking
Full Scale Input ranges	
1 MΩ input impedance:	±40mV, ±50mV, ±80mV, ±100mV, ±200mV, ±400mV, ±500mV, ±800mV, ±1V, ±2V, ±4V, ±5V, ±8V, and ±10V, software selectable
50 Ω input impedance:	±40mV, ±50mV, ±80mV, ±100mV, ±200mV, ±400mV, ±500mV, ±800mV, ±1V, ±2V, and ±4V, 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 50 pF ±10pF, software selectable
Input protection	
1MΩ	±28V (DC + peak AC for CH A, CH B and EXT only without external attenuation)
50Ω	±4V (DC + peak AC for CH A, CH B and EXT only without external attenuation)

On-Board Acquisition Memory System

Onboard acq memory	512 Kilobytes for ATS310-128K 32 Megabytes for ATS310-8M
Acquisition Memory/ch	Up to 128,000 samples per channel for ATS310-128K Up to 8 Million samples per channel for ATS310-8M
Record Length	Software selectable with 16 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 1000 or (Acquisition Memory Per Channel / (Record Length+4)), whichever is lower
Pre-trigger depth	0 to (Record Length-64), software selectable with 16 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, 5 KS/s, 2 KS/s, 1KS/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.

ATS310
20 MS/s 12-Bit PCI Digitizer

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	20 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
Comparator Type	Digital comparators for internal (CH A, CHB) triggering and analog comparators for TRIG IN (External) triggering
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

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

ORDERING INFORMATION

ATS310-128K	ATS310-001
ATS310-8M	ATS310-002
ATS310: 128K to 8 Meg Upgrade	ATS310-003
ATS310: External Clock Upgrade	ATS310-004
ATS310: Trigger Output Upgrade	ATS310-005
SyncBoard 310 2X	ATS310-006
SyncBoard 310 4X	ATS310-007
SyncBoard 310 8X	ATS310-008
C/C++/C#/MATLAB SDK for ATS310	ATS-SDK
LabVIEW VI for ATS310	ATS-VI
Linux Driver Source for ATS310	ATS310-Linux
AlazarDSO: Plug-In Dev Kit	ATS-DSO-PDK

Materials Supplied

ATS310 PCI Card

ATS310 Installation Disk (on USB Flash Drive)

Certification and Compliances

CE Mark Compliance

RoHS compliant

All specifications are subject to change without notice

Manufactured By:

Alazar Technologies Inc.

6600 TRANS-CANADA HIGHWAY, SUITE 310
POINTE-CLAIRE, QC, CANADA H9R 4S2

TOLL FREE: 1-877-7-ALAZAR
TEL: (514) 426-4899 FAX: (514) 426-2723

E-MAIL: info@alazartech.com