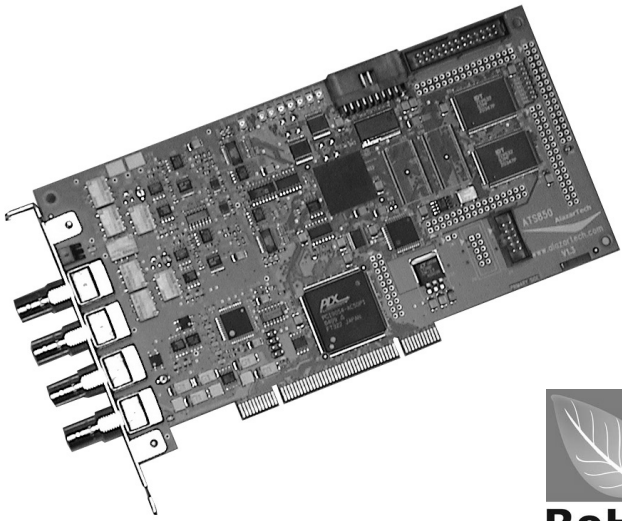
AlazarTech

ATS850 User Manual

8 Bit, 50 MS/s
Waveform Digitizer for PCI Bus



RoHS compliant
2002/95/EC

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Owned by: _____

Serial Number: _____

Purchase Date: _____

Purchased From: _____

Software Driver Version: _____

SDK Version: _____

AlazarDSO™ Version: _____

Operating System: _____

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Compliance

FCC/Canada Radio Frequency Interference Compliance*

Determining FCC Class

The Federal Communications Commission (FCC) has rules to protect wireless communications from interference. The FCC places digital electronics into two classes. These classes are known as Class A (for use in industrial-commercial locations only) or Class B (for use in residential or commercial locations). Depending on where it is operated, this product could be subject to restrictions in the FCC rules. (In Canada, the Department of communications (DOC), of Industry Canada, regulates wireless interference in much the same way.)

Digital electronics emit weak signals during normal operation that can affect radio, television, or other wireless products. By examining the product you purchased, you can determine the FCC Class and therefore which of the two FCC/DOC Warnings apply in the following sections. (Some products may not be labeled at all for FCC; if so, the reader should then assume these are Class A devices.)

FCC Class A products only display a simple warning statement of one paragraph in length regarding interference and undesired operation. Most of our products are FCC Class A. The FCC rules have restrictions regarding the locations where FCC Class A products can be operated.

FCC Class B products display either a FCC ID code, starting with the letters **EXN**, or the FCC Class B compliance mark.

Consult the FCC web site http://www.fcc.gov for more information.

FCC/DOC Warnings

This equipment generates and uses radio frequency energy and, if not installed and used in strict accordance with the instructions in this manual and the CE Mark Declaration of Conformity**, may cause interference to radio and television reception. Classification requirements are the same for the Federal Communications Commission (FCC) and the Canadian Department of Communications (DOC).

Changes or modifications not expressly approved by AlazarTech Inc. could void the user's authority to operate the equipment under the FCC Rules.

Class A

Federal Communications Commission

This equipment has been tested and found to comply with the limits for a Class A digital device, pursuant to part 15 of the FCC Rules. These limits are designed to provide reasonable protection against harmful interference when the equipment is operated in a commercial environment. This equipment generates, uses, and can radiate radio frequency energy and, if not installed and used in accordance with the instruction manual, may cause harmful interference to radio communications. Operation of this equipment in a residential area is likely to cause harmful interference in which case the user will be required to correct the interference at his own expense.

Canadian Department of Communications

This Class A digital apparatus meets all requirements of the Canadian Interference-Causing Equipment Regulations. *Cet appareil numérique de la classe A respecte toutes les exigences du Règlement sur le matériel brouilleur du Canada*.

Compliance to EU Directives

Readers in the European Union (EU) must refer to the Manufacturer's Declaration of Conformity (DoC) for information** pertaining to the CE Mark compliance scheme. The Manufacturer includes a DoC for most every hardware product except for those bought for OEMs, if also available from an original manufacturer that also markets in the EU, or where compliance is not required as for electrically benign apparatus or cables.

To obtain the DoC for this product, click **Declaration of Conformity** at http://www.alazartech.com/support/documents.htm. This web page lists all DoCs by product family. Select the appropriate product to download or read the DoC.

* Certain exemptions may apply in the USA, see FCC Rules §15.103 **Exempted devices**, and §15.105(c). Also available in sections of CFR 47.

** The CE Mark Declaration of Conformity will contain important supplementary information and instructions for the user or installer.

Environmental Compliance

Alazar Technologies Inc., hereby certifies that this product is 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 has been done using RoHS-compliant components and lead-free soldering.

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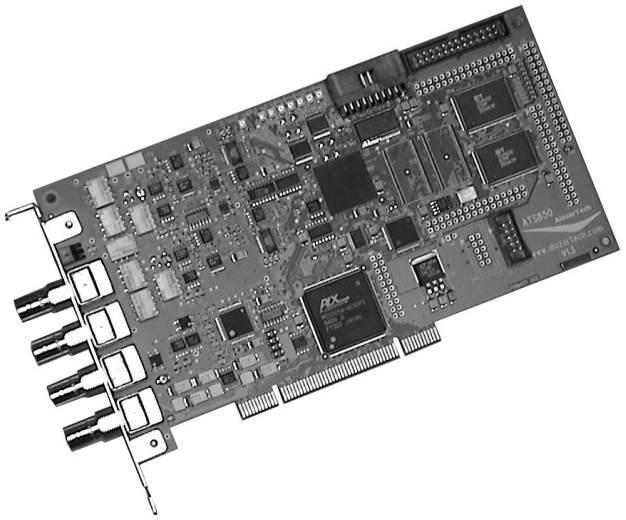
Chapter 1 - Introduction

This chapter describes the ATS850 and lists additional equipment.



About Your ATS850

Thank you for your purchase of an ATS850. The ATS850 PCI based waveform digitizer has the following features:

- Two 8-bit resolution analog input channels
- Half length PCI bus card
- Real-time sampling rate of 50 MS/s to 10 KS/s
- 25 MHz analog input bandwidth
- Analog trigger channel with software-selectable level, slope, and hysteresis
- Software-selectable AC/DC coupling and 1MΩ/50Ω input impedance
- 262,140 sample onboard memory, standard
- Pre-trigger and Post-Trigger Capture with Multiple Record capability
- NIST traceable calibration
- Optional Trigger Out Upgrade for Ultrasonic Applications

All ATS850 digitizers follow industry-standard Plug and Play specifications on all platforms and offer seamless integration with compliant systems. If your application requires more than two channels for data acquisition, you can synchronize multiple digitizers on all platforms using a Master/Slave SyncBoard.

Detailed specifications of the ATS850 digitizers are listed in Appendix A, Specifications.

Acquiring Data with Your ATS850

You can acquire data either programmatically by writing an application for your ATS850 or interactively with the AlazarDSO™ software.

If you want to integrate the ATS850 in your test and measurement or embedded OEM application, you can program the digitizer using C/C++, Visual BASIC or LabVIEW.

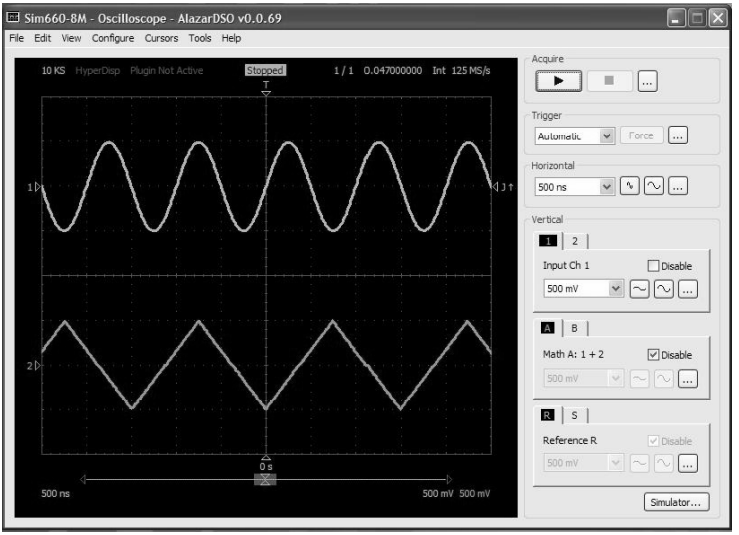
For programming in C/C++ or Visual BASIC, you must purchase the ATS-SDK software development kit that comes with sample programs and a reference manual describing the API.

For programming in LabVIEW, you must purchase the ATS-VI virtual instrument library that comes with a high-level, easy-to-use VI that makes integrating the ATS850 into your own system very simple.

Interactively Controlling your ATS850 with AlazarDSO™
The AlazarDSO™ Soft Front Panel allows you to interactively control your ATS850 as you would a desktop oscilloscope. To launch the Scope Soft Front Panel, select

Start » Programs » AlazarTech » AlazarDSO™

The following screen will be displayed. If you connect the input to a signal generator and click on **Start** button, you should see the signal on the screen.

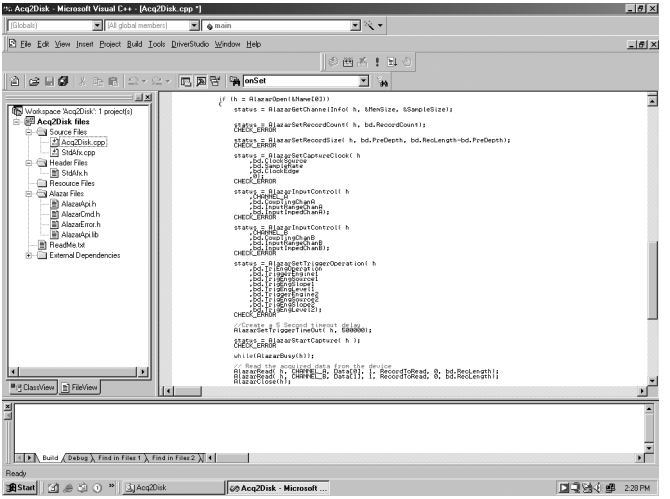


AlazarDSO™ has been designed to be very intuitive and uses the same user interface as most of today's digital oscilloscopes.

- Note that AlazarDSO™ does not support Windows 98. If you are using Windows 98SE, you can use the legacy API Panel software for acquiring signals interactively.

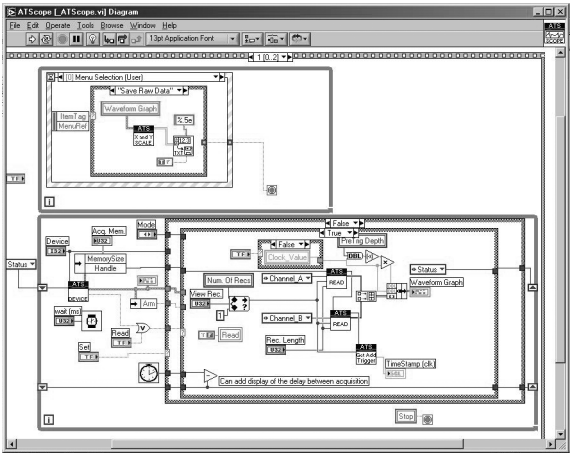
ATS-SDK API

The ATS-SDK API is used for programming the ATS850 in C/C++ or Visual BASIC. It provides the exact same API that is used for writing AlazarDSO™ software. To help you get started, ATS-SDK comes with examples you can use or modify.



ATS-VI LabVIEW VI

ATS-VI allows you to integrate the ATS850 into your own LabVIEW program. A high level VI is supplied that requires very few controls to get started.



ATS-Linux
ATS-Linux allows you to integrate the ATS850 into a Linux application written in C.

Linux drivers are provided as source code. Note that a Non Disclosure Agreement must be executed between AlazarTech and the end customer for this source code to be released.

All sample programs are supplied in C source code.

Drivers are compatible with kernel versions up to and including 2.6 and are tested with Fedora Core 5.

Optional Upgrades

AlazarTech offers the following upgrades and accessories for use with your ATS850 digitizer:

- ATS850: External Clock Upgrade
- ATS850: Master/Slave SyncBoard 2 position
- ATS850: Master/Slave SyncBoard 4 position
- ATS850: Master/Slave SyncBoard 8 position
- ATS850: Trigger Out Upgrade

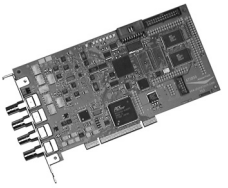
Chapter 2 - Installation and Configuration

This chapter describes how to unpack, install, and configure your ATS850.

What You Need to Get Started

To set up and use your ATS850, you will need the following:

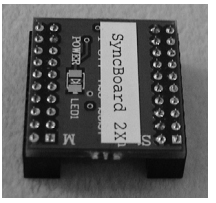
- One or more ATS850 digitizers



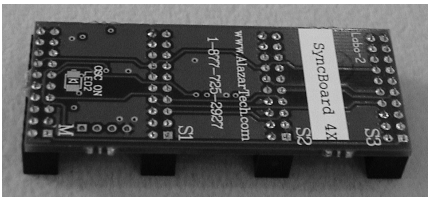
- ATS850 Install Disk

- For Master/Slave operation only:
  SyncBoard of appropriate width

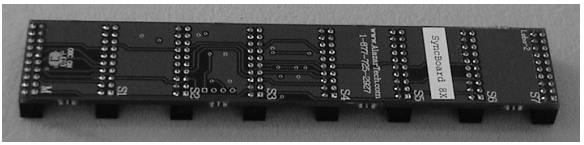
SyncBoard 2X for up to 2 digitizers



SyncBoard 4X for up to 4 digitizers



SyncBoard 8X for up to 8 digitizers



Unpacking

Your digitizer is shipped in an antistatic package to prevent electrostatic damage to the digitizer. Electrostatic discharge can damage several components on the digitizer. To avoid such damage in handling the digitizer, take the following precautions:

- Ground yourself via a grounding strap or by holding a grounded object.
- Touch the antistatic package to a metal part of your computer chassis before removing the digitizer from the package.
- Remove the digitizer from the package and inspect the digitizer for loose components or any other sign of damage. Notify AlazarTech if the digitizer appears damaged in any way. Do *not* install a damaged digitizer into your computer.
- *Never* touch the exposed pins of the connectors.

Installing the ATS850

There are four main steps involved in installation:

1. Physically install the digitizer(s) and SyncBoard, if any, in your computer.
2. Install ATS850 software driver
3. Install AlazarDSO™ software that allows you to setup the hardware, acquire signals and view and archive them
4. Optionally, install the ATS-SDK software development kit or ATS-VI LabVIEW VI, which enables you to programmatically control the ATS850

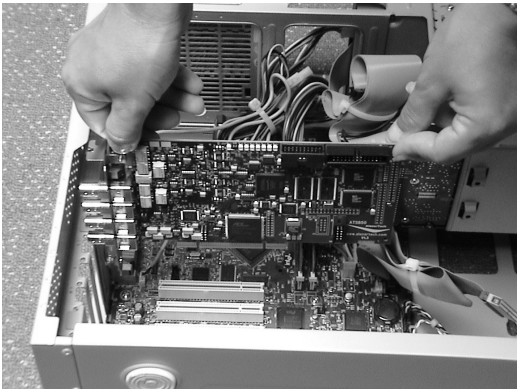
Thanks to the flexible nature of AlazarTech's driver installation software, you can either install the hardware first or install the software driver first.

The following paragraphs will guide you through this process in a step-by-step manner.

1. **Physically install the digitizer in your computer**

   Make sure that your computer is powered off before you attempt to insert the ATS850 digitizer in one of the free PCI slots.

   For best noise performance, leave as much room as possible between your ATS850 and other hardware.

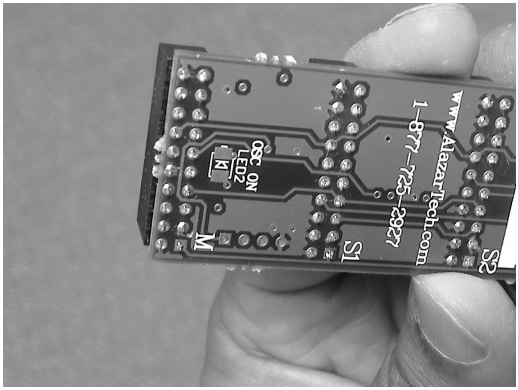


   Always screw the digitizer bracket to the chassis in order to create a stable and robust connection to chassis ground.

   In the absence of such a connection, ATS850 is not guaranteed to operate within the specifications listed elsewhere in this manual.

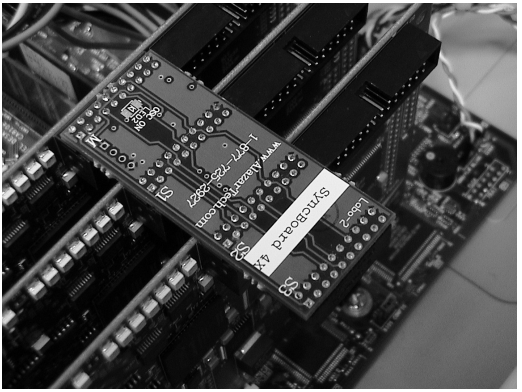
For Master/Slave Installation
If you are installing multiple ATS850 digitizers that will be configured as a Master/Slave system, make sure that you insert all cards in adjacent slots.

The connector on the SyncBoard that is labeled as “M” (Master), must be inserted into the Master/Slave connector of the left-most digitizer, if you are facing the BNC connectors of the ATS850 digitizers.



If you are installing fewer than the maximum number of digitizers supported by your SyncBoard, the unused SyncBoard connectors must be on the right-hand side of the digitizers, if you are facing the BNC connectors of the ATS850 digitizers.

Zoomed in, this should look as shown below:



Once you have completed this step, you should power the computer on.

2. **Install ATS850 software driver**

The following instructions guide you through the process of installing the ATS850 in a computer running Windows Vista, Windows XP or Windows 2000 operating systems.

Other operating systems, such as Windows NT, Windows 95 and Windows 98SE are not covered here.

Note that the images of the dialog boxes shown below were taken from a Windows XP computer. Computers running Vista may have slightly different dialog boxes.

Installation of Multiple ATS850 Digitizers
If you are installing multiple ATS850 digitizers, the operating system will detect one card at a time and you will have to go through the driver installation setup as many times as you have cards.

Installing ATS850 Hardware First

If you decided to install the ATS850 hardware before installing the ATS850 software driver, then when you first boot up the computer, the plug-n-play Windows operating system will detect the presence of a new PCI card and ask you to provide the device driver.

a) When you power on for the first time, Windows will display the **Welcome to the Found New Hardware Wizard**

Click **Cancel**.

b) Insert the installation CD. If it does not auto-run, manually run the Setup.exe program on the ATS850 Driver Disk.

Click **Next**.

c) The following dialog box will be displayed showing the progress of installation of ATS850 driver files in the operating system driver store.

d) The following final screen will confirm that the driver has been installed.

Now your ATS850 is fully installed and is ready to use.

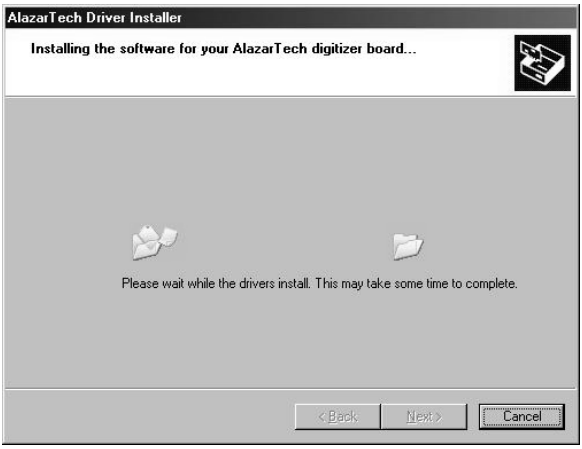
Installing ATS850 Driver First

If you decided to install the ATS850 software driver before installing the ATS850 hardware, then you must follow the following sequence to make sure your operating system recognizes ATS850 as an installed device.

a) Insert the installation CD. If it does not auto-run, manually run the Setup.exe program on the ATS850 Driver Disk.

Click **Next**.

b) The following dialog box will be displayed showing the progress of installation of ATS850 driver files in the operating system driver store.



c) The following final screen will confirm that the driver has been installed.

d) Power down your computer

e) Physically install your ATS850 card(s).

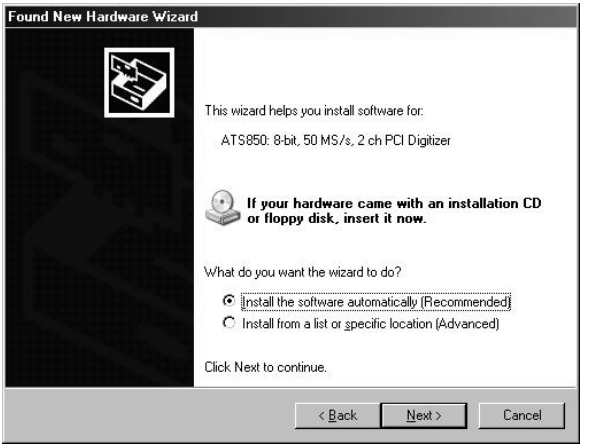
If you are installing a Master/Slave system, also install the SyncBoard.

f) Power on your computer

g) Windows will display the **Welcome to the Found New Hardware Wizard**

Click **Next**

h) The following dialog box will be displayed:



i) Choose to install the software automatically. Click **Next**

Operating system will copy the appropriate files to its system folders. The following dialog box will be displayed:

j) Operating system will display the **Completing the Found New Hardware Wizard** message.

Click **Finish**. Now your ATS850 is fully installed and is ready to use.

3. **Install AlazarDSO™ software that allows you to setup the hardware, acquire signals and view and archive them**

   If you are installing from the CD shipped with the ATS850 digitizer:

   - Insert the ATS850 Install disk
   - Use Windows Explorer to navigate to the appropriate AlazarDSO™ folder on the ATS850 Install Disk. Run Setup.exe program.
   - Follow the instructions on the screen.

   If you are installing AlazarDSO™ after having downloaded the installation file from AlazarTech web site:

   - Download AlazarDSO™ installation file from www.alazartech.com/support/downloads.htm
   - Unzip the file downloaded in the previous step.
   - Browse to the folder that contains the unzipped file, Setup.exe
   - Run this executable file and follow the instructions on the screen.

4. **Optionally, install the ATS-SDK software development kit or ATS-VI LabVIEW VI, which enables you to programmatically control the ATS850**

   Insert the ATS-SDK or ATS-VI CD. Software installation will start automatically.

   If, for any reason, installation does not start automatically, run the SETUP.EXE program.

   Follow the instructions on the screen.

   Note that you must have already installed the ATS850 drivers for any of the sample programs included with the ATS-SDK or ATS-VI to work properly.

Installing the ATS850 in a Linux System

ATS850 is fully compatible with the popular Linux operating system.

AlazarTech supplies binary Linux drivers that have been compiled for Fedora Core 5 (kernel 2.6).

Customers who require drivers for another version of Linux must contact the factory to obtain source code for the drivers (requires a Non-Disclosure Agreement). AlazarTech will not provide software support for compiling drivers for other versions of Linux, i.e. customers will be fully responsible for compiling drivers for their own Linux operating system.

To install Linux drivers in a Fedora Core 5 system, follow the instructions listed below:

1. Copy the supplied RPM file to the target machine
2. Double-click on the RPM icon. This will install the driver as well as associated applications.
3. Reboot the PC.
   Note that if you do not reboot the PC, the driver will not be loaded.

The RPM file will also install an application called AlazarDSO™. This is a Graphical User Interface (GUI) using which you can setup and acquire data from the ATS850.

Note that AlazarDSO™ has been compiled using GTK 2.4 libraries. If you intend to use an operating system other than Fedora Core 5, make sure that the GTK 2.4 libraries have been installed on your machine.

Linux version of AlazarDSO™ does not have all the features of the Windows based AlazarDSO™.

Compiling the ATS850 Linux Driver

If you need to compile the ATS850 driver for a version of Linux other than Fedora Core 5, follow the following steps:

1. Install the Linux kernel header files.
2. Extract the driver sources using the command "tar xvfz PlxLinux-2006.01.10.tgz". This will create a folder names "PlxLinux" with the driver files inside.
3. Set the shell environment variable PLX_SDK_DIR to the root location where the "PlxLinux" directory was created. For example, if using bash and the PlxLinux directory is in your home directory, then add the following line to the ~/.bashrc :

   declare -x PLX_SDK_DIR=$HOME/PlxLinux

4. To build the ATS850 driver, type

   ```
   cd PlxLinux/linux/driver
   ./builddriver 850
   ```

   This will create the file Pci9054/ATS850.ko, the loadable driver file. You can change build defines in PlxLinux/linux/makefiles/Gcc.def. Copy the driver to /usr/local/AlazarTech/bin.

5. Load the driver by rebooting the computer or typing:

   ```
   cd /usr/local/AlazarTech/bin
   ATS850.rc start
   ```

   The customer should be able to run the AlazarDSO™ application or Acq2Disk sample in /usr/local/AlazarTech/samples/ATS850.

6. If it is necessary to rebuild the library, type

   ```
   cd PlxLinux/linux/api
   make
   ```

This will create SharedLibrary/libPlxApi.so.0.0. Copy the file to /usr/local/AlazarTech/lib and then run ldconf

Configuring Internet Security and Virus Protection Software to Allow Proper Operation of ATS Class Digitizers

Some of the recent releases of internet security and virus protection software packages, such as Norton Anti-Virus, disable any unused parallel or serial ports as well as any PCI devices that have not been assigned to a software application by the user. Users of AlazarTech PCI digitizers must configure their security software to allow access to the PCI digitizers.

The problem exhibits itself as a blue-screen crash and a "STOP Error".

Typically, this error message is:

```
STOP:   0x0000000A
        (0x00000016, 0x0000001C, 0x00000000, 0x804E5DEB)
```

For more details on this problem with anti-virus software packages, refer to the technical note on Microsoft's support site :

http://support.microsoft.com/kb/892000/EN-US

Also refer to the knowledgebase article on Symantec's web site:

http://service1.symantec.com/SUPPORT/sharedtech.nsf/0/2671ef6e5d72d3cd88256d26006699d5?OpenDocument

This article explains that the root of the problem is one of the files updated by the Symantec anti-virus software.

Symantec suggests that users should upgrade their internet security software using Live Update, but our customers' experience has been that this does not always work.

The solution that always works is:

- Remove Norton Anti-Virus software
- Reboot the PC after removing Norton Anti-Virus.
- Make sure AlazarTech hardware and software are fully functional
- Re-install Norton Anti-Virus software

AlazarTech PCI digitizer products are fully compatible with all internet security and anti-virus software. Users must make sure that their security software has been updated and configured properly.

Updating ATS850 Driver

From time to time, AlazarTech updates the device drivers for its products. These updates may be required for product enhancements or for bug fixes.

This section of the manual takes you through the steps required to update the device driver for the ATS850 PCI digitizer.

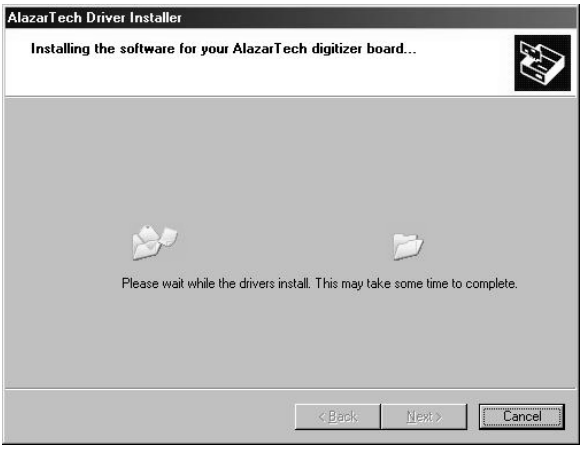
In other words, this section shows you how to install a newer version of the driver, when you already have a previous version of the driver installed on your machine.

1. Download the latest driver from AlazarTech's web site:
   www.alazartech.com/support/downloads.htm
2. Unzip the downloaded file to a local folder
3. Run the resulting installation file (*.exe extension). For example, the installation file for driver version 5.6.9 is called **ATS850_Driver_V5.6.9.exe**.

   The following welcome screen will be displayed:

   Click **Next**.

4. The following dialog box will be displayed showing the progress of installation of ATS850 driver files.



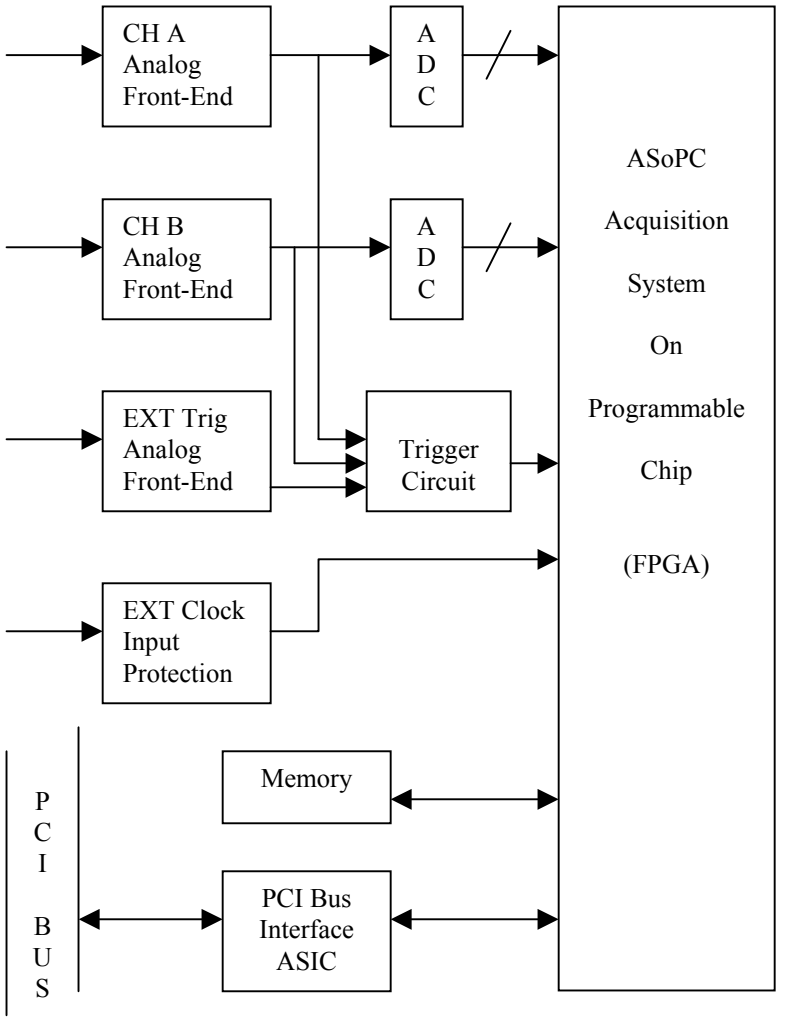
5. The following final screen will confirm that the driver has been installed.

6. Click **Finish**.

   ATS850 driver has now been updated.

Chapter 3 - Hardware Overview

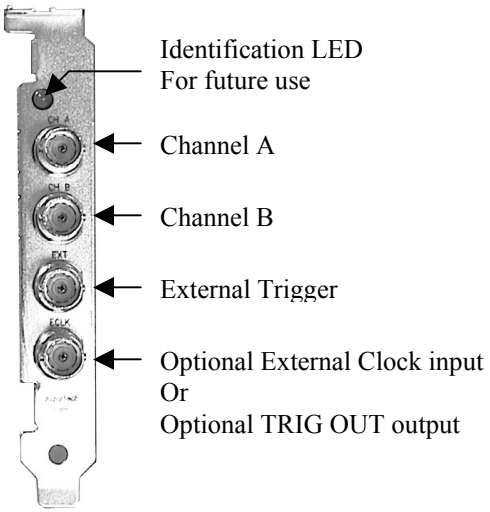
This chapter includes an overview of the ATS850, explains the operation of each functional unit making up your ATS850, and describes the signal connections. Following is a high-level block diagram of ATS850.



Input Connectors

These ATS850 digitizers have two standard BNC female connectors for CH A and CH B analog input connections, one standard BNC female connector for the EXT (External Trigger) input and one standard BNC female connector for the optional ECLK (External Clock) input.

The following pictorial shows the various connectors available on the digitizer bracket.



Signal Connections

You can use CH A and CH B to digitize data as well as to trigger an acquisition.

Use the EXT input for an external analog trigger only; data on the TRIG channel cannot be digitized.

If External Clock Upgrade is installed on your ATS850, use the ECLK input for clocking the ATS850 in applications that require an external clock. Note that the frequency of the signal injected into the ECLK connector must remain between 50 MS/s and 10 KS/s.

Analog Input

The two analog input channels are referenced to common ground in bipolar mode. These settings are fixed; therefore, neither the reference nor the polarity of input channels can be changed. You cannot use CH A or CH B to make differential measurements or measure floating signals unless you subtract the digital waveforms in software.

For accurate measurements, make sure the signal being measured is referenced to the same ground as your ATS850 by attaching the probe's ground clip to the signal ground.

The EXTernal Trigger input has a programmable input range of ±5 V or ±1 V.

The CH A, CH B, and EXT inputs have a software-programmable coupling selection between AC and DC. Use AC coupling when your AC signal contains a large DC component. Without AC coupling, it is difficult to view details of the AC component with a large DC offset and a small AC component, such as switching noise on a DC supply. If you enable AC coupling, you remove the large DC offset for the input amplifier and amplify only the AC component. This technique makes effective use of dynamic range to digitize the signal of interest.

The *low-frequency corner* in an AC-coupled circuit is the frequency below which signals are attenuated by at least 3 dB. The low-frequency corner is approximately 10 Hz with 1 MΩ input impedance and 100 KHz with 50Ω input impedance.

Pipelined ADC
The ADC on the ATS850 is a pipelined flash converter with a maximum conversion rate of 50 MS/s.

If you use an external clock, you must provide a free-running clock to ensure reliable operation. You also must follow all the timing specifications on the external clock as described in Appendix A, Specifications.

Using a pipelined architecture also introduces a lower limit on the sampling rate. For the ATS850, the accuracy starts to degrade below 10 KS/s.

Pre-Trigger Multiple Record Acquisition
The ATS850 allows the capture of multiple records into the on-board memory. This allows you to capture rapidly occurring triggers in lightning test, ultrasound or radar applications.

Unlike other digitizers on the market, users are allowed to acquire both pre- and post-trigger data when acquiring more than one record in an acquisition session. This feature can be very useful in lightning test, power line monitoring and other applications that feature rapidly occurring transient signals.

Specifying Record Length
Record Length is specified in number of sample points. It must be a minimum of 64 points and can be specified with a 4-sample resolution up to a maximum of the per-channel on-board memory.

Record Length thus specified determines the maximum number of records you can capture in one acquisition session. The relationship is given by:

Max. Records = (Per-Channel Memory) / (Record Length + 4)

Note that, unlike other products in its class, ATS850 allows you to capture multiple records into the on-board memory without requiring software-assisted re-arming of the digitizer.

Specifying Pretrigger Depth
ATS850 acquires a certain number of samples, called the pretrigger depth, *before* it allows the trigger circuitry to operate, thereby guaranteeing that the required number of sample points will be captured before trigger occurs.

User is allowed to set pretrigger depth for an acquisition session. Same values are used for all records captured in that session.

Pretrigger depth can be a minimum of 0 points and can be specified with a 4 sample resolution up to a maximum of (Record Length –64).

Specifying Record Count
User can specify the number of records that must be captured in one acquisition session. The minimum value must be 1 and the maximum value is given by:

Max. Records = (Per-Channel Memory) / (Record Length + 4)

Calibration

Calibration is the process of minimizing measurement errors by making small circuit adjustments.

All ATS850 digitizers come factory calibrated to the levels indicated in Appendix A, Specifications. Note that AlazarTech calibration is fully NIST traceable.

However, your digitizer needs to be periodically recalibrated in order to maintain its specified accuracy. This calibration due date is listed on the CALIBRATION sticker affixed to your ATS850 digitizer.

Externally recalibrate the ATS850 when this calibration interval has expired.

This requires three very simple steps:

1. Verify whether or not ATS850 is still within its specifications. If it is, then your calibration can be extended by another one-year period
2. If not, perform calibration, i.e. make adjustments to the circuit until it is within specifications again
3. If any adjustments have been made, verify if the ATS850 is within specifications

Verification and Calibration procedures are available to all registered users of ATS850 upon request.

Master/Slave Operation

You can use two or more ATS850 digitizers in one system to increase the number of channels for your application by synchronizing digitizers using the appropriate SyncBoard.

Currently, up to 16 channel (8 board) systems are supported for ATS850. For higher channel counts, contact the factory for special system configuration.

Unlike other products on the market, ATS850 does not suffer from clock jitter between master and slave digitizers.

The unique design of the ATS850 clock circuit provides a buffered copy of the Master digitizer's clock to itself and all the slave digitizers, thereby maintaining a very low skew between Master and Slave digitizer clocks.

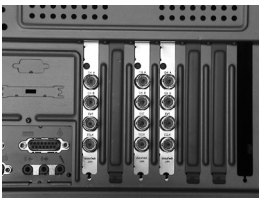
Note that an ATS850 Master/Slave system is capable of triggering from any one of its input channels. This is valuable in multi-channel detector applications that cannot predict the input channel that is going to receive the first pulse.

With fully synchronous A/D conversion, arming and triggering, an ATS850 based Master/Slave system is an ideal multi-channel transient analyzer.

Restrictions
To ensure proper master/slave operation of your ATS850 digitizers, you must observe the following restrictions:

- All Master/Slave digitizers must be installed in adjacent slots, i.e. there should be no gap between the digitizers that are to be configured as a Master/Slave system

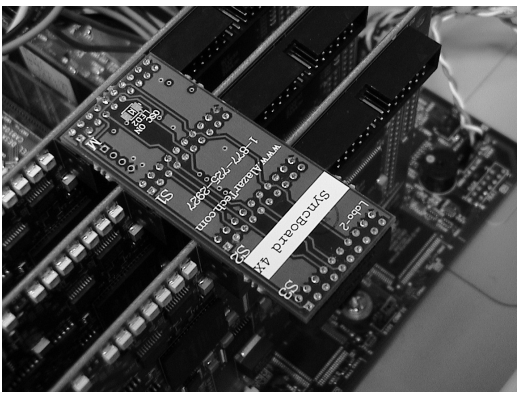
Good Installation



Bad Installation

- You must connect the appropriate SyncBoard to all of the ATS850 digitizers in your system. Note that all SyncBoards are polarized, so you cannot make a mistake in inserting them

- If you are using fewer than the maximum number of digitizers allowed by the SyncBoard, make sure that the connector labeled “M” (Master) on the SyncBoard is connected to one of the ATS850 digitizers. Any over-hang of the SyncBoard should be beyond the last slave board in your system



The presence of a SyncBoard is detected by the ATS850 driver when the ATSApi DLL is loaded. This DLL gets loaded when you run any application program written for ATS850. Examples of such application programs are AlazarDSO™, one of the sample programs supplied with ATS-SDK or ATS-VI or any custom software written using ATS-SDK or ATS-VI.

If you run AlazarDSO™ or your own software that loads the ATSApi DLL, after having installed a SyncBoard, the ATS850 driver will automatically recognize that the digitizers are now configured as Master/Slave.

As such, there is no need to have your hardware upgraded or modified in any way to go from a set of independent boards to Master/Slave and vice-versa.

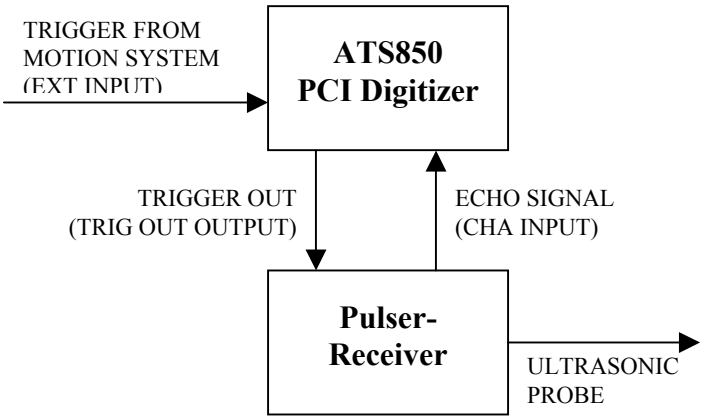
Optional Trigger Out Upgrade

Many ultrasound applications require the digitizer to generate a Trigger Output signal synchronous with its internal sampling clock.

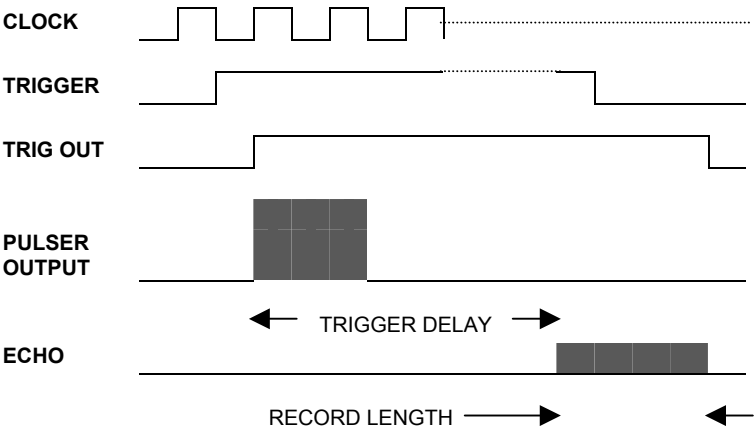
Such synchronization is almost essential if multiple acquisitions have to be averaged.

> ATS850 uses a high quality crystal-controlled clock oscillator as its timebase.
>
> It should be noted that crystal oscillators are one of the most reliable and repeatable types of clock source available.
>
> Crystal oscillators also provide far superior long-term jitter performance compared to PLL based clocking schemes.
>
> The same qualities that make crystal oscillators such an ideal clock source also make it impossible to synchronize them to an external signal, such as an external trigger input or a 10 MHz reference clock.

As such, the best way to fully synchronize the acquisition system to a signal source, such as a pulser-receiver, is to trigger the pulser-receiver with a trigger signal that has already been synchronized to the ADC sampling clock. Hence the Optional Trigger Out Upgrade.



When connected as shown in the diagram above, the system works as follows:



Appendix A - Specifications

This appendix lists the specifications of the ATS850. These specifications are typical at 25 °C unless otherwise stated. The operating temperature range is 0 to 50 °C.

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 an 800 x 600 resolution. AlazarDSO™ requires Internet Explorer 5.0 or higher for Windows systems.

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	8 bits
Bandwidth (-3dB)	
DC-coupled, 1MΩ	DC - 25 MHz
DC-coupled, 50Ω	DC - 25 MHz
AC-coupled, 1MΩ	10 Hz - 25 MHz
AC-coupled, 50Ω	100KHz - 25 MHz
Bandwidth flatness:	± 1dB, from DC to 10 MHz with DC coupling ± 1dB, from 50Hz to 10 MHz with AC, 1 MΩ ± 1dB, from 200 KHz to 10 MHz with AC, 50Ω

Number of channels	2 simultaneously sampled
Maximum Sample Rate	50 MS/s single shot
Minimum Sample Rate	10 KS/s single shot
Full Scale Input ranges	±20mV, ±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

Acquisition Memory/channel	Up to 262,140 samples per channel
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	50 MS/s, 25 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	±100 ppm

Dynamic Parameters

Typical values measured using a randomly selected ATS850 in ±1V input range, DC coupling and 50Ω impedance. Input was provided by a HP8656A signal generator, 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	42 dB
SINAD	40 dB
THD	-46 dB
SFDR	-45 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	10 KHz 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 fixed hysteresis
Number of Trigger Engines	2
Trigger Engine Combination	OR, AND, XOR, software 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	±10%, typical, of full-scale input range of the selected trigger source
Bandwidth	25 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 - 25 MHz
AC-coupled	10 Hz - 25 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

Optional TRIG OUT Output

Output Signal Level	5V TTL
Output Drive	±100mA. Capable of driving 5V into 50Ω
Synchronization Clock	Sampling Clock

Certification and Compliances

CE Mark Compliance

Materials Supplied

One ATS850 Digitizer

One ATS850 Install Disk (CD)

One ATS850 User Manual

All specifications are subject to change without notice

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