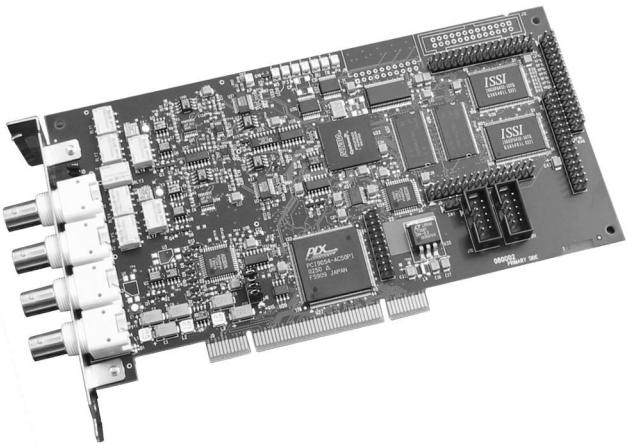
AlazarTech

ATS850 User Manual

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



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Owned by: _____

Serial Number: _____

Purchase Date: _____

Purchased From: _____

Software Driver Version: _____

SDK Version: _____

ATScope Version: _____

Operating System: _____

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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 Alazar Technologies In. 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.

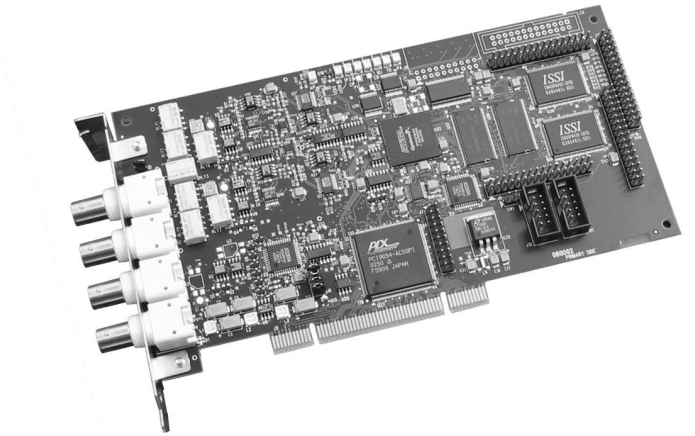
* Certain exemptions may apply in the USA, see FCC Rules §15.103 **Exempted devices**, and §15.105(c). Also available in sections of CFR 47.

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

Table of Contents

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

All ATS850 devices 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 devices on all platforms using a Master/Slave SyncBoard.

Detailed specifications of the ATS850 devices 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 ATScope software.

If you want to integrate the ATS850 in your test and measurement or embedded OEM application, you can program the device 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.

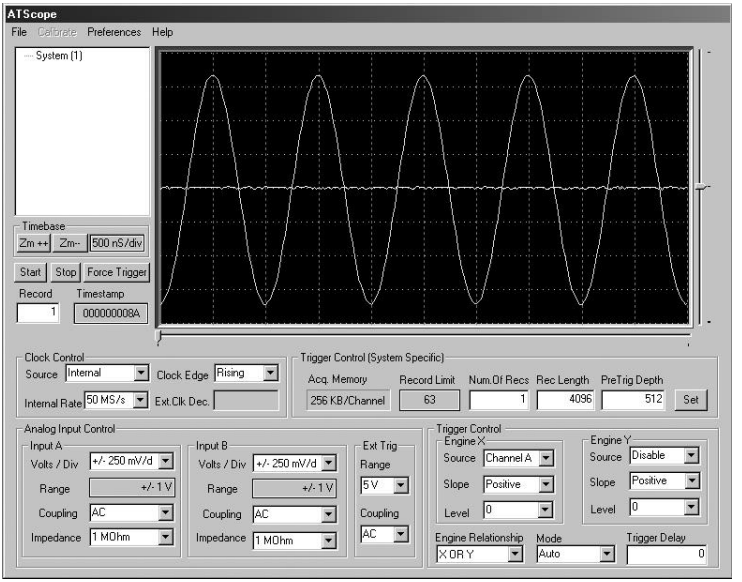
For programming in LabVIEW, you must purchase the ATS-VI virtual instrument library that comes with a high-level, easy-to-use VI that makes integrating the ATS850 into your own system a cinch.

Interactively Controlling your ATS850 with the ATScope Soft Front Panel

The ATScope 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 » ATScope

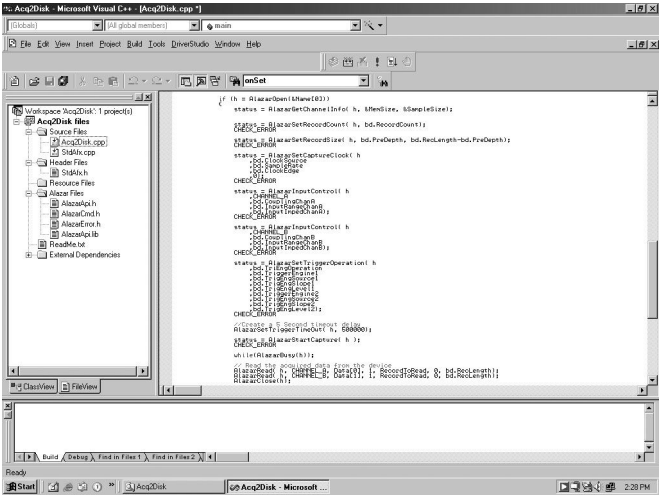
The following screen will be displayed. If you connect the input to a signal generator and click on **Start** button, you should see the signal on the screen.



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

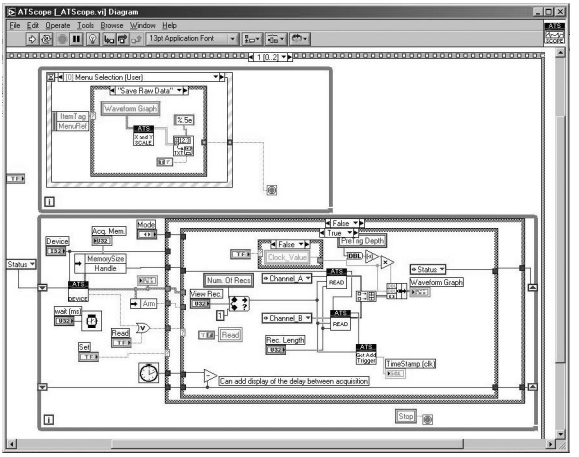
ATS-SDK API

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 ATScope software. To help you get started, ATS-SDK comes with examples you can use or modify.



ATS-VI LabVIEW VI

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



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

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 cards
- ATS850 Driver Disk
- ATScope Installation Disk

Unpacking

Your device is shipped in an antistatic package to prevent electrostatic damage to the device. Electrostatic discharge can damage several components on the device. To avoid such damage in handling the device, 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 device from the package.
- Remove the device from the package and inspect the device for loose components or any other sign of damage. Notify AlazarTech if the device appears damaged in any way. Do *not* install a damaged device 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 card in your computer
2. Install ATS850 software driver, when prompted
3. Install ATScope 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 or ATS-VI LabVIEW VI, which enables you to programmatically control the ATS850

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

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

   Make sure that your computer is powered off before you attempt to insert the ATS850 card 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 card 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.

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

2. **Install ATS850 software driver, when prompted**

   The following instructions guide you through the process of installing the ATS850 in a computer running Windows 2000 or Windows XP operating systems. Operating systems such as Windows NT and Windows 98 are not covered here.

Installing ATS850 Driver In Windows 98SE

When you first plug in an ATS850 card into a computer, the plug-n-play Windows 98SE operating system will detect the presence of a new PCI card and ask you to provide the device driver.

a) Operating System will display the **Welcome to the Found New Hardware Wizard**

   Click **Next**.

b) Operating system will display the **Install Hardware Device Driver** dialog box

   Select the radio button next to the text *Display a list of the known drivers for this device so that I can choose a specific driver.* Click **Next**.

c) Operating system will display the **Hardware Type** dialog box

   Select **System devices**

d) Operating system will display the **Select a Device Driver** dialog box

   Click on **Have Disk**

e) Operating system will display the **Install from Disk** dialog box

   Make sure the path points to **A:**, or wherever the ATS850.INF file resides. If you are using a floppy disk or a CD, make sure the disk is inserted in the drive.

   Select the ATS850.INF file and click **Open**

   The operating system may display **Install from Disk** dialog box again. If it does, Click **OK**, otherwise continue to the next step

f) Operating system will display the **Select a Device Driver** dialog box again.

Make sure the **AlazarTech ATS850 Board** is selected. Then click **Next**.

g) Operating system will display the **Update Driver Warning**. This warning is meant to tell you that Windows does not recognize the hardware.

Click **Yes**.

h) Operating system will display the **Start Device Driver Installation** dialog box.

Click **Next**. System will copy all necessary files to the appropriate folders.

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

Click **Finish**.

Installing ATS850 Driver in Windows 2000

When you first plug in an ATS850 card into a computer, the plug-n-play Windows 2000 operating system will detect the presence of a new PCI card and ask you to provide the device driver.

j) Operating System will display the **Welcome to the Found New Hardware Wizard**

   Click **Next**.

k) Operating system will display the **Install Hardware Device Driver** dialog box

   Select the radio button next to the text *Display a list of the known drivers for this device so that I can choose a specific driver.* Click **Next**.

l) Operating system will display the **Hardware Type** dialog box

   Select **System devices**

m) Operating system will display the **Select a Device Driver** dialog box

   Click on **Have Disk**

n) Operating system will display the **Install from Disk** dialog box

   Make sure the path points to **D:**, or wherever the ATS850.INF file resides. If you are using a floppy disk or a CD, make sure the disk is inserted in the appropriate drive.

   Select the ATS850.INF file and click **Open**

   The operating system may display **Install from Disk** dialog box again. If it does, Click **OK**, otherwise continue to the next step

o) Operating system will display the **Select a Device Driver** dialog box again.

   Make sure the **AlazarTech ATS850 Board** is selected. Then click **Next**.

p) Operating system will display the **Update Driver Warning**. This warning is meant to tell you that Windows does not recognize the hardware.

   Click **Yes**.

q) Operating system will display the **Start Device Driver Installation** dialog box.

   Click **Next**. System will copy all necessary files to the appropriate folders.

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

   Click **Finish**.

Installing ATS850 Driver In Windows XP

When you first plug in an ATS850 card into a computer, the plug-n-play Windows XP operating system will detect the presence of a new PCI card and ask you to provide the device driver.

a) Operating System will display the **Welcome to the Found New Hardware Wizard**

   Click on the radio button next to the text *Install from a list or specific location (Advanced)*.

   Click **Next**.

b) Operating System will display the **Please choose your search and installation options** dialog box.

   Click on the radio button next to the text *Don't search. I will choose the driver to install*.

   Click **Next**.

c) Operating system will display the **Hardware Type** dialog box

   Select **System devices**

d) Operating system will display the **Select the device driver you want to install for this hardware** dialog box

   Click on **Have Disk**

e) Operating system will display the **Install from Disk** dialog box

   Make sure the path points to **D:**, or wherever the ATS850.INF file resides. If you are using a floppy disk or a CD, make sure the disk is inserted in the drive.

   Click **OK**.

f) Operating system will display the **Select the device driver you want to install for this hardware** dialog box again.

Make sure the **AlazarTech ATS850 Board** is selected (highlighted).

Click **Next**.

g) Operating system will display the **Update Driver Warning**. This warning is meant to tell you that Windows does not recognize the hardware.

Click **Yes**.

h) System will copy all necessary files to the appropriate folders.

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

Click **Finish**.

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

   If you are installing off the CD shipped with the ATS850 board:

   - Insert the AlazarTech Installation CD
   - Use Windows Explorer to navigate to the ATScope folder on the Installation Disk. Run Setup.exe program
   - Follow the instructions on the screen.

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

   - Download ATScope 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, say ATScope_V_2_0_2.exe
   - Run this executable file and follow the instructions on the screen.

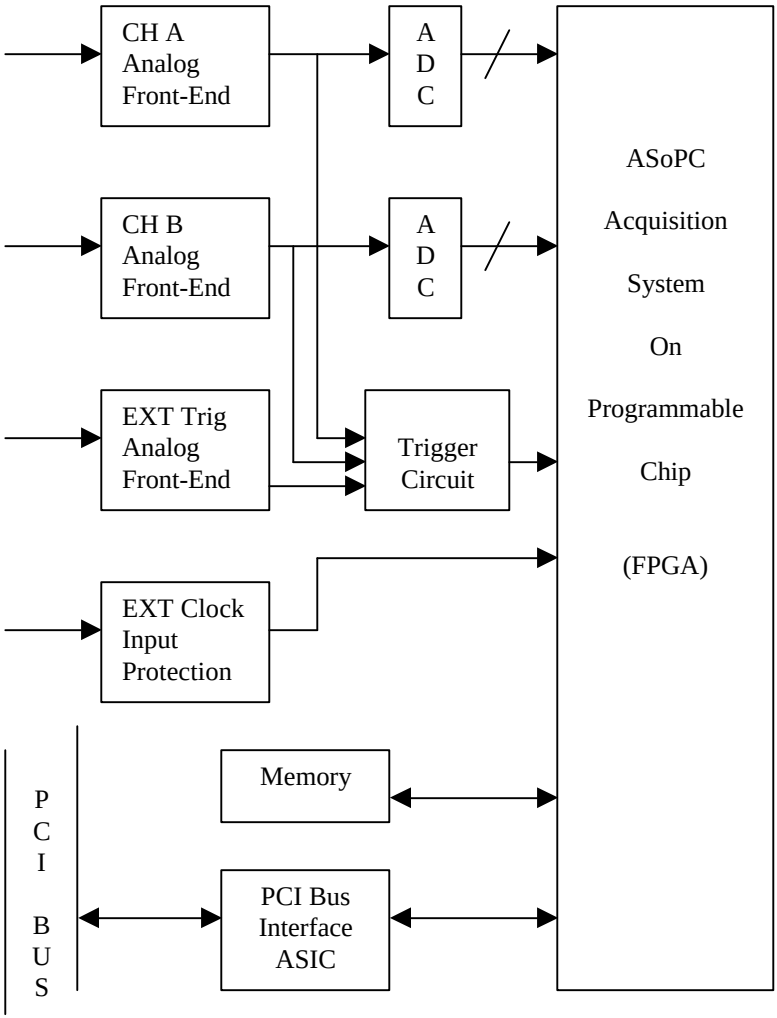
4. **Optionally, install the ATS-SDK software development kit or ATS-VI LabVIEW VI, which enables you to programmatically control the ATS850**

   Insert the ATS-SDK or ATS-VI CD and run the SETUP 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.

Chapter 3 - Hardware Overview

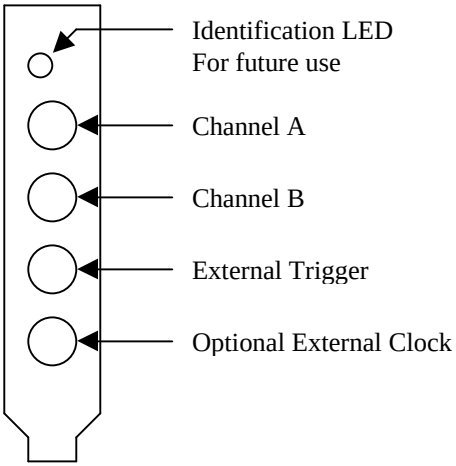
This chapter includes an overview of the ATS850, explains the operation of each functional unit making up your ATS850, and describes the signal connections. Following is a high-level block diagram of ATS850.



Input Connectors

These ATS850 devices 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 card 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.

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. The pipelined architecture introduces a dependency between the sampling clock rate and input offset. The ATS850 automatically adjusts for any offset errors when you use the internal clock.

However, if you use an external clock, you must provide a free-running clock to ensure reliable operation and perform a NULL OFFSET command in order to remove the offset.

Finally, You 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 board.

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 devices using the appropriate SyncBoard.

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

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

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

- You must connect the appropriate SyncBoard to all of the ATS850 devices in your system.

- You must set up the Master/Slave system using the software program supplied with the SyncBoard

Chapter 4 – Using ATScope Software

This chapter provides a Quick Start Guide to the **ATScope** software supplied with your ATS850.

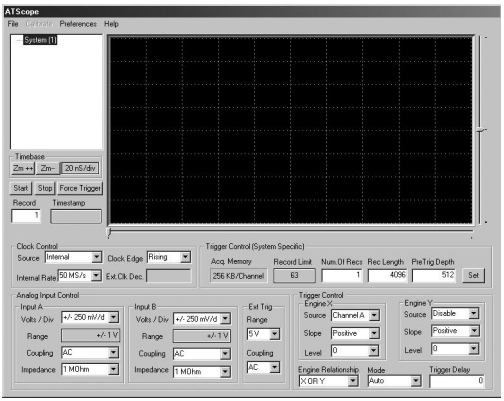
ATScope Installation
For installing ATScope software, refer to the installation section of this manual.

Launching ATScope
You can launch ATScope by the following two methods:

1. By double-clicking on the ATScope desktop icon

2. By running **Start » Programs » AlazarTech » ATScope**

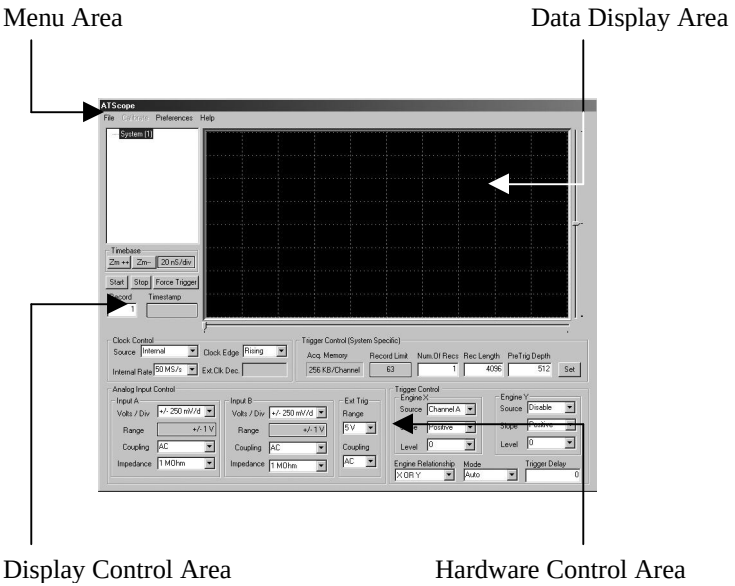
You will hear the clicking of some on-board relays, as ATScope initializes the hardware and places it in a known state. Then, the ATScope screen will be displayed. Note that no signals will be displayed until you click on the **Start** button.



Exiting ATScope
As a data acquisition application, ATScope has been designed to be very robust. As such, the user is allowed to exit the program only through the File menu.

ATScope screen is divided into four sections:

1. Data Display Area
2. Hardware Control Area
3. Display Control Area
4. Menu Area



Data Display Area is an oscilloscope style grid of 8 vertical and 10 horizontal divisions. There are exactly 256 rows of pixels in the display, allowing 8-bit data to be displayed without any loss of data.

Every single bit of noise is thus visible on the display, allowing the user to verify the true performance of the ATS850. Note that most software packages supplied by other manufacturers usually use scaling to hide the noise, i.e. they use less than 256 rows of pixels to display 8-bit data.

By default, all signals are overlapped, with the zero-level being the vertical mid-point of the area.

Hardware Control Area provides the user complete control over the hardware parameters of the ATS850. ATScope also performs complete error checking on all user selections to make sure that only valid settings are passed on to the hardware.

The following controls are included in this area:

Sampling Clock Control

The Clock Source drop-down selection allows the user to select between the internal clock oscillator and the optional ECLK input.

Note that ECLK frequency must be between 50 MHz and 10 KHz and that it should be a free-running signal.

The Sample Rate field selects the specified sampling rate when Internal Clock is selected.

Note that If External Clock is selected, the Sample Rate field causes the digitized data to be decimated based on the ratio of the sample rate to 50 MHz, i.e. if user selects 10 MS/s sample rate after having selected External Clock, ATScope will decimate the digitized data by a factor of (50 MS/s divided by 10 MS/s) = 5.

Clock Edge field allows the user to specify either the rising or the falling edge of the clock for sampling. While it has very little meaning for Internal Clock, this can be a very useful feature if External Clock is selected.

Decimation Ratio field is reserved for future use.

Channel A Input Control

ATScope allows the user to set the vertical scale, input coupling and input impedance for Channel A. Note that the full-scale input range is defined as being +/- 4 divisions. Therefore, a vertical scale of 250 mV/div results in full scale input range of +/- 1V.

Further note that ATScope does not allow the user to set a vertical scale greater than 2 V/div (+/- 8 V full scale) if 50Ω input impedance is selected for Channel A.

Channel B Input Control

ATScope allows the user to set the vertical scale, input coupling and input impedance for Channel B. Note that the full-scale input range is defined as being +/- 4 divisions. Therefore, a vertical scale of 250 mV/div results in full scale input range of +/- 1V.

Further note that ATScope does not allow the user to set a vertical scale greater than 2 V/div (+/- 8 V full scale) if 50Ω input impedance is selected for Channel B.

External Trigger Input Control

ATScope allows the user to select the input coupling and full scale input range of the External Trigger input.

Trigger Control

ATScope supports the dual-engine triggering featured on the ATS850. These trigger engines are called Engine X and Engine Y.

For each engine, the user can select a trigger source, a trigger level and the trigger slope. User is allowed to set the same source on both engines for Windowed triggering applications.

User can also select the Trigger Mode. The default mode is Auto, but the user can also select Normal and One-Shot. The definitions of these terms are exactly the same as on most digital oscilloscopes, except that ATS850 supports each trigger mode in Multiple Record captures as well as Single Record captures:

In Auto-Trigger mode, the trigger system generates a software trigger after waiting a pre-determined amount of time. In Multiple Record captures, each record can generate its own timeout. This mode is usually

employed during the part of experimentation in which you are not aware of what exact signals you are trying to capture.

In Normal Trigger mode, the trigger system waits indefinitely for trigger to occur. No software triggers are generated. Once the required number of trigger events has occurred, data is displayed and the ATS850 is re-armed to capture data again. This mode is usually employed for capturing transient signals that occur repeatedly.

In Single-Shot mode, the trigger system waits indefinitely for one (single-record capture) or more (multiple record capture) trigger events. Once all triggers have occurred, data is captured and displayed and no further acquisitions are allowed.

Acquisition Memory Control

ATScope allows the user to set Record Length, Pre-Trigger Depth and Number of Records to Capture. Due to various dependencies between these three settings, the Set button must be clicked by the user for the input to be verified and then set on the hardware.

Verification of the settings is done based on the following dependencies:

- Record Length must be a minimum of 64 points
- Record length must not exceed 262,140 points for the 256K model and 16,776,960 points for the 16M model
- Record length must be a multiple of 4 points for the 256K model and 64 points for the 16M model
- Pre-Trigger Depth must not exceed (Record Length – 64)

- Number of Records to Capture must not exceed (262,144 / (Record Length + 4)) for the 256K version and (16,777,216 / (Record Length + 64)) for the 16M version

If any settings are found to be illegal, an error message is generated and the user is asked to enter the selections again.

Display Control Area allows the user to select the View Record and the display timebase. It also displays the 40-bit timestamp for the record selected. This area also includes the Start, Stop and Force Trigger command buttons.

The user is not allowed to set View Record to be greater than the number of records captured. Note that ATScope checks View Records against the number of records captured in the last capture and not the current selection of Number of Records to Capture field in the Acquisition Memory Control section. This feature is very useful if you are capturing signals using One-Shot trigger mode.

The minimum setting of the timebase depends on the sampling clock frequency. The timebase limits are given by:

Minimum Timebase = $1 / f_s$,
where f_s is the frequency of the sampling clock

Maximum Timebase = $2 * \text{Record Length} * (1 / f_s) / 10$

In other words, the user is not allowed to set a timebase that results in displaying less than 10 points or more than 200% of record length.

The 40-bit timestamp is displayed as a 40-bit hexadecimal number. Each count of the timestamp corresponds to 4 sample clocks. This count is initialized to zero when the software instructs the ATS850 to start acquiring data and start looking for a trigger.

Menu Area provides the standard Windows menus.

File menu allows the user to save acquired signals as comma separated ASCII values.

File menu also provides the only mechanism for exiting ATScope program. Select Exit command from the file menu to terminate ATScope.

Preferences menu allows the user to select whether the individual points should be displayed as circles or they should be connected by a straight line.

Help menu allows the user to check which version of ATScope, ATS850 driver and SDK are being used. This feature is very useful for technical support.

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. ATScope requires Internet Explorer 5.0 or higher.

Power Requirements

+5V	1.1 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
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. Exceeding the full-scale input range by more than 100% may result in signal distortion due to phase reversal of amplifier stage.
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 262,140 samples per channel standard, or Up to 16 M 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	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, 5 MHz low pass filter. Input frequency was set at 4 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	±5%, 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

Certification and Compliances

CE Mark Compliance

Materials Supplied

One ATS850 Card

One AlazarTech Installation CD

One ATS850 User Manual

All specifications are subject to change without notice