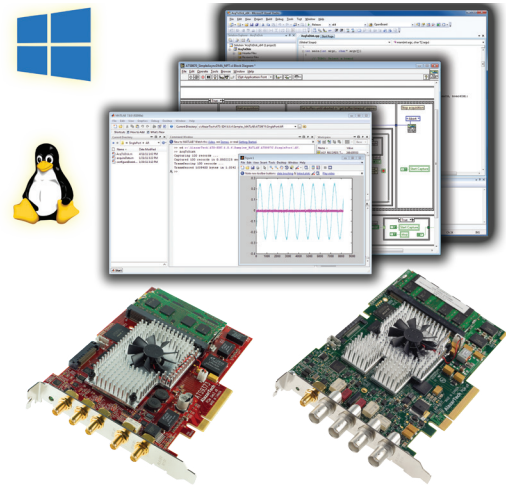


- Software Development Kit for C/C++, C#, MATLAB®, LabVIEW® and Python
- Supports all AlazarTech® waveform digitizers
- Fully supports asynchronous DMA for highest data transfer rates
- Supports single-board and multi-board Systems
- Many example programs
- Thread-safe DMA routines
- Compatible with 32/64-bit Windows® and 64-bit Linux®



Product	Supported Operating Systems	Language Support	C Compiler Compatibility
ATS-SDK	Windows 10, Windows 8.x, Windows 7 with SHA-2 Code Signing Support, Windows Server 2012/2010/2008 R2 - 32/64-bit, Linux - 64-bit	C/C++, C#, LabVIEW, MATLAB, Python	Windows: Microsoft Visual Studio® 2012 or later. Linux: GCC v. 4.4.7 or later

### Overview

AlazarTech ATS®-SDK is a Windows and Linux compatible software development kit created by AlazarTech to allow users to programmatically control and acquire data from its line of waveform digitizers.

With full support for C/C++ (Visual Studio, GCC or Clang) and C#, MATLAB, LabVIEW, and Python environments, ATS-SDK is the most powerful, efficient, and high-performance development kit.

For data streaming applications using AlazarTech's PCI Express waveform digitizers, ATS-SDK supports up to 6.8 GB/s sustained data throughput to computer memory or even disk, as long as the disk storage data rate is faster than acquisition throughput.

Since the device driver is able to lock down user buffers for DMA purposes, no memory copy commands are necessary in order for the user application to have access to acquired data. This allows customers to build real-time imaging and signal processing systems, even though Windows and Linux are non-real-time operating systems.

ATS-SDK supports single-card and multi-card Master/Slave or Multiple-Independent systems.

ATS-SDK includes all necessary header files and function prototypes to allow the use of ATSApi DLL supplied by AlazarTech as part of the driver disk.

ATS-SDK manual, freely downloadable from AlazarTech website, provides complete details for all API functions.

When users purchase a license of ATS-SDK, they acquire a permanent license. AlazarTech's OEM-friendly licensing policy means that customers who embed the waveform digitizer in their own machine do not have to pay any royalties or other licensing fees for ATS-SDK. In other words, ATS-SDK is a one-time purchase.

### Typical ATS-SDK Application

A typical ATS-SDK based user application that uses AutoDMA consists of the following minimum sections:

- 1) Setup waveform digitizer hardware parameters  
This includes input range, coupling and impedance, trigger parameters and on-FPGA FFT etc.
- 2) Setup DMA and create a queue of buffers  
Most imaging applications use No Pre Trigger (NPT) triggered acquisition, whereas most radio applications use continuous streaming
- 3) Start data capture  
User can initialize other system components before starting the capture
- 4) Wait for a buffer to be ready
- 5) Consume the buffer  
For highest performance, make sure data consumption is faster than the rate at which buffers are supplied by ATS-SDK.
- 6) Re-post consumed buffer to the buffer queue  
This allows an application to run infinitely, allowing 24/7 operation
- 7) Repeat steps 4, 5 and 6 until all result buffers have been consumed or the application has to be closed

### Support for 32 & 64-bit Windows and 64-bit Linux Operating Systems

ATS-SDK provides full support for 32-bit and 64-bit Windows, and 64-bit Linux operating systems.

Windows support includes Windows 10, Windows 8.x, Windows 7 SP1 with security update KB3033929 (SHA-2 Code Signing Support), Windows Server 2012, Windows Server 2010, and Windows Server 2008 R2.



# ATS-SDK

## Software Development Kit

Microsoft support for Windows 7 and Windows Server 2008 R2 ends on January 14, 2020. As such, AlazarTech is ceasing development on Windows 7 and Windows Server 2008 R2 as of this date. We will continue to support customers using Windows 7 and Windows Server 2008 R2 until December 31, 2020. After this date, no support will be provided.

Due to lack of demand and due to the fact that Microsoft no longer supports these operating systems, AlazarTech no longer supports Windows XP, Windows Vista, and Windows Server 2008.

ATS-SDK also supports Linux, as long as a device driver exists for a particular distribution. Binary drivers are available for the following Linux distributions: CentOS, Debian, and Ubuntu. A complete list of available drivers can be found here:

<ftp://release@ftp.alazartech.com/Outgoing/Linux>

Other Linux distributions may also be supported on a case by case basis. Please contact [support@alazartech.com](mailto:support@alazartech.com) for more details. You must include the full output of `uname -a` command from your target Linux system in your email.

### Example Programs

A vast array of example programs are supplied with ATS-SDK.

Example programs are classified according to programming languages supported: C/C++, MATLAB, C#, LabVIEW, and Python.

For any of the programming languages, each AlazarTech PCI Express Waveform Digitizer has its own set of sample programs.

This makes it very easy for programmers to use an appropriate example program as a starting point for their design without having to worry about specific board capabilities, as that has already been taken care of.

The list of sample programs provided is constantly evolving. As such, users should consult the latest Release Notes for ATS-SDK, which are available on AlazarTech's website.

### Thread Safety

All API calls related to DMA have been verified to be thread safe in the sense that it is safe to post and consume buffers from different threads.

Board configuration functions that are usually called during the initial setup of the board are not guaranteed to be re-entrant or thread safe.

Note that multiple applications are not allowed to make calls to the same hardware device, as that can result in the hardware being put into an unstable or even unusable state.

For high-performance applications, the simplest (and most efficient) model is to dedicate one thread to handling the board(s) and use other threads or processes to consume the acquired data.

### C/C++ Support

C/C++ Windows programmers can use Microsoft Visual Studio 2012 (v.11.0) and higher.

Note that if users want to use a project designed for Professional Edition under Express, they must download an appropriate SDK from Microsoft.

Linux programmers should use a GCC (version 4.4.7 or later) compiler for their distribution. Clang is also supported.

### MATLAB Support

Users can programmatically control AlazarTech waveform digitizers from MATLAB using m-files. All API functions are available to MATLAB programmers using the *loadlibrary* function.

MATLAB support has been fully verified under Windows for versions R2016a through R2019b. Example programs should run properly under Linux as well, but this has not been tested by AlazarTech.

### C# Support

C# programmers can access the ATS-SDK API via a very thin wrapper implemented as a separate library called AlazarApiNet. This wrapper defines all the functions and constants that are of interest of users of the ATS-SDK. There is a one-to-one mapping between API calls in the C/C++ DLL and on the C# side, which means that C# programmers can use the regular ATS-SDK guide as a reference.

C# example programs have been tested under MS Visual Studio 2012 up to 2019.

### LabVIEW Support

Starting with ATS-SDK v7.0, AlazarTech has included support for LabVIEW in ATS-SDK. It is no longer necessary for customers to purchase a license of ATS-VI.

All development has been halted for ATS-VI, i.e. future AlazarTech digitizers will not have ATS-VI support.

AlazarTech no longer supports ATS-VI. As noted in previous versions of this document, support for existing ATS-VI releases ended as of January 1, 2018.

ATS-SDK includes LabVIEW VI's that act as wrappers around AlazarTech API functions. This method improves the efficiency of customer-written VIs and also provides superior documentation to LabVIEW users.

LabVIEW 2016 and higher have been tested with the example VIs. LabVIEW NXG is not supported.

### Example Programs as Starting Point for Software Development

ATS-SDK is shipped with many example programs, which are meant to act as a starting point for customer's software development process. The code is written in a way that customers can easily include it in their own software with minimal effort.

The exact example program to use depends on the customer's application. The most common starting point for customers who want to capture data from a rapidly occurring trigger signal is the **NPT** example program (NPT stands for No Pre Trigger).

### Example Program for Imaging Applications

Many users of AlazarTech waveform digitizers are involved in some kind of imaging, which requires acquisition of a two dimensional (2-D) image, also known as a *Frame*.

ATS-SDK includes example programs that shows how users can acquire 2-D images using a *Trigger Enable* signal (also called *Frame Trigger*) and an *External Trigger* (also called *Line Trigger*).

AlazarTech recommends the **NPT\_Scan** example program as a good starting point for imaging applications.



# ATS-SDK Software Development Kit

## Example Programs for Parallel Computing

ATS-SDK includes a C example program for Windows that show how users can use multi-core CPUs to do real time averaging of acquired data at rates up to 1.5 GB/s.

This example program is called **NPT\_AverageMultithreaded**. Customers in Spectroscopy and Quantum Computing applications can use this innovative technique to replace hardware averaging digitizers from other suppliers at a fraction of their cost.

The same functionality is also available in a DLL called **ATS\_Average**. AlazarTech has created example programs in LabVIEW and MATLAB that call this DLL to do real time averaging. Customers can download this DLL and example programs from the following link:

[ftp://release@ftp.alazartech.com/Outgoing/Windows/ATS\\_Average](ftp://release@ftp.alazartech.com/Outgoing/Windows/ATS_Average)

## Example Programs for Gapless Data Streaming

ATS-SDK includes some example programs that show how users can acquire gapless data and stream it to user memory for real time signal processing or storage. This mode is also called Continuous Mode.

It should be noted that if data consumption (storage or real time signal processing) is slower than the gapless data throughput, a buffer overflow error will be generated.

AlazarTech recommends example programs called **CS** as the starting point for such applications.

A slightly different mode of operation is called Triggered Streaming, where the digitizer board waits for a trigger event before starting a gapless data streaming. Customers should use example programs called **TR** for these applications.

## Example Programs for Capturing into Very Large Buffer

Windows and Linux operating systems limit the amount of physical memory that can be locked down for DMA purposes. A further limit of 64 Megabytes is imposed by AlazarTech device driver for the maximum size of a DMA buffer.

Some customer applications require data to be captured into one very large (10s of Gigabytes) buffer.

AlazarTech has created an example program called **NPT\_Segments** that shows how users can DMA gapless data into a very large buffer without violating any of the restrictions mentioned above. This code can be made available to customers on a case-by-case basis.

## Example Programs for Using On-FPGA FFT

Some of the latest waveform digitizer boards from AlazarTech include on-FPGA FFT calculation capability. This feature can be very useful for customers involved in Optical Coherence Tomography (OCT).

ATS-SDK includes example programs on how to use this on-FPGA FFT circuit. Users should use the **NPT\_on-FPGA\_FFT** as the starting point.

## Software Licensing Policy

Users are allowed to freely distribute ATSApi dynamically linked library (DLL) and any compiled code generated using ATS-SDK, as long as there is an AlazarTech PCI Express waveform digitizer present in the same computer.

If an AlazarTech PCI Express waveform digitizer is not present in the computer, users must purchase a separate license for each computer on which ATS-SDK is installed.

In no case is the user allowed to distribute or share the source code of ATS-SDK with other users.

## Extended Support and Maintenance

ATS-SDK is a constantly evolving product, with new functionality being added on a regular basis.

The purchase of a license of ATS-SDK automatically allows customers to obtain technical support and download updates from the AlazarTech website for a period of 12 months from the date of purchase.

Customers who want to receive technical support and download new releases beyond this 12-month period must purchase extended support and maintenance (order number ATS-SDK-1YR).

The purchase must be made before expiration of the standard subscription (or before expiration of an extended subscription). Extended Support & Maintenance can only be purchased while there is a valid subscription in place.

Get your subscription end date by registering your ATS-SDK at: [www.alazartech.com/UserHome?tab=2](http://www.alazartech.com/UserHome?tab=2). You will need the SDK serial number, which can be found on the CD envelope or, in the case of electronic delivery, in the email you received with your download link and password.

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## ORDERING INFORMATION

Software Development Kit	ATS-SDK
1 Year Subscription (Supports C/C++, Python, MATLAB, and LabVIEW)	
ATS-SDK-1YR: 1 year extended support and maintenance for ATS-SDK	ATS-SDK-1YR

### Manufactured By:

#### Alazar Technologies, Inc.

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

TOLL FREE: 1-877-7-ALAZAR OR 1-877-725-2927  
TEL: (514) 426-4899 FAX: (514) 426-2723

E-MAIL: [sales@alazartech.com](mailto:sales@alazartech.com)

### DATASHEET REVISION HISTORY

#### Changes from version 7.23a (May 2019) to version 7.30

#### Section, Page

Added Microsoft Visual Studio trademark information	Global change
Updated list of Supported Operating Systems and C Compiler Compatibility	Feature Table, pg. 1
Updated list of Windows Supported Operating Systems	Support for 32 & 64-bit Windows, pg. 1
Added end-of-support notice for Windows 7 and Windows Server 2008 R2	and Linux Operating Systems
Specified Linux distributions: CentOS, Debian, Ubuntu	
Updated Microsoft Visual Studio version to 2012 (v.11.0) and higher	C/C++ Support, pg. 2
Updated GCC version to version 4.4.7 or later	
Updated verified MATLAB versions to R2016a through R2019b	MATLAB Support, pg. 2
Updated tested versions: Visual Studio 2012 to 2019	C# Support, pg. 2
Updated tested versions: LabVIEW version to 2016 and higher	LabVIEW Support, pg. 2
Noted that LabVIEW NXG is not supported	

#### Changes from version 7.23 (Jan 2019) to version 7.23a

#### Section, Page

Added note about <i>Extended Support and Maintenance</i> purchasing conditions, and how to obtain your subscription end date	Extended Support and Maintenance, pg. 3
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#### Changes from version 7.15B (Feb 2018) to version 7.23

#### Section, Page

Added Trademark information	Global change
Updated latest supported MATLAB version to R2017b	MATLAB Support, pg. 2
Updated supported LabVIEW version and removed support for LabVIEW 7.0	LabVIEW Support, pg. 2

#### Changes from version 7.15A (Jan 2018) to version 7.15B

#### Section, Page

Specified 64-bit for Linux	Feature List, pg. 1
Specified 64-bit for Linux in Supported Operating Systems	Feature Table, pg. 1
Updated section name and specified 64-bit support for Linux Operating Systems	Support for 32 & 64-bit Windows, pg. 1 and 64-bit Linux Operating Systems

#### Changes from version 7.15 (Nov 2017) to version 7.15A

#### Section, Page

Removed Windows XP and Vista from list of Supported Operating Systems	Feature Table, pg. 1
Specified version R2 for Windows Server 2008 on list of Supported Operating Systems	Feature Table, pg. 1
Removed Windows XP and Vista from list of Supported Operating Systems	Support for 32 & 64-bit Windows, pg. 1 and Linux Operating Systems
Specified version R2 for Windows Server 2008 on list of Supported Operating Systems	Support for 32 & 64-bit Windows, pg. 1 and Linux Operating Systems
Added paragraph with list of Operating Systems no longer supported by AlazarTech	Support for 32 & 64-bit Windows, pg. 2 and Linux Operating Systems
Updated support status of ATS-VI, which was supported until the end of 2017	LabVIEW Support, pg. 2
Updated email address	Manufactured By, pg. 3

#### Changes from version 7.1 (Oct 2015) to version 7.15

#### Section, Page

Replaced section <i>Annual Subscription</i> with <i>Extended Support and Maintenance</i>	Extended Support and Maintenance, pg. 3
Replaced ATSSDK-ANN with ATS-SDK-1YR	Ordering Information System, pg. 3