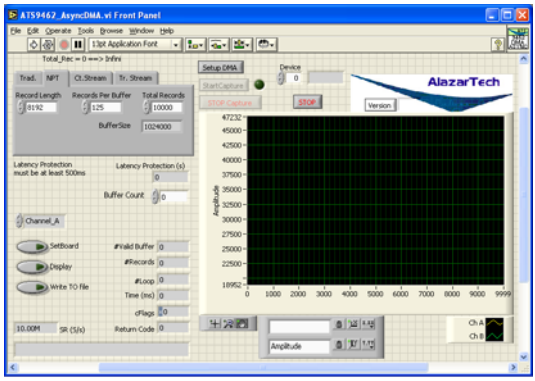
ATS-VI Software Manual

Use AlazarTech PCI and PCI Express Waveform Digitizers
in LabVIEW® Programming Environment



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AlazarTech Contact Information

AlazarTech, Inc.
6600 Trans-Canada Highway, Suite 310
Pointe-Claire, Quebec
Canada H9R 4S2

Telephone: (514) 426-4899

Fax: (514) 426-2723

E-mail: info@alazartech.com

Web site: www.alazartech.com

To comment on the documentation for ATS-VI, send e-mail to support@alazartech.com.

Information required when contacting AlazarTech for technical support:

Owned by: _____

Serial Number: _____

Purchase Date: _____

Purchased From: _____

Software Driver Version: _____

SDK Version: _____

AlazarDSO Version: _____

Operating System: _____

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Table of Contents

Preface

It is assumed that the reader is familiar with the LabVIEW® graphical programming methodology and application development environment. It is further assumed that the reader is fully familiar with the concepts of data acquisition and sampling theorem.

Note that only LabVIEW® versions 7.1 and higher are supported by ATS-VI.

It should also be noted that ATS-VIs were developed using LabVIEW® 7.1. Also, the illustrations used are from ATS-VI version 5.7.1.

This manual is printed in black & white and does not fully depict the LabVIEW® colored elements and attributes fully. For this reason, a PDF version of this manual is included in the release and can also be downloaded from the AlazarTech website at URL http://www.alazartech.com/support/downloads.htm.

Understanding This Manual

This manual is designed such that both novice and expert users can quickly reference the various ATS-VI LabVIEW® components. It is meant as a reference manual and explains the various VIs that comprise the ATS-VI.

The manual is subdivided into 4 sections: ATS_Easy, ATS_Advanced, ATS_DMA and ATS_Async.

Each section is defined as follows:

ATS_Easy VIs will satisfy many customer applications. The advantage of using ATS_Easy VIs is that we have incorporated all the necessary protection in our VI. For example, ATS_Easy VIs will not let you read data until the acquisition is completed.

ATS_Advanced VIs need only be used in applications that need maximum performance out of the VIs. Note that it is the user's responsibility to call the various VIs in the correct order. Only users who are very familiar with the ATSApi Application Programming Interface should attempt using the ATS_Advanced VIs. This set of VIs provides an entry point to the ATSApi set of functions. The details of each ATSApi function call are described in the AlazarTech *ATS-SDK Software Manual*.

ATS_DMA VIs are reserved for use with the AlazarTech ATS460, ATS-660, ATS-860. They are related strictly to using these devices with the Alazar Synchronous DMA mechanism. For new designs, AlazarTech recommends using ATS_Async VIs (see below).

ATS_Async VIs are reserved for use with the AlazarTech ATS460, ATS660, ATS860, and ATS9462 devices. They are related strictly to using these devices with the Alazar Asynchronous DMA mechanism.

Details about the Synchronous and Asynchronous DMA mechanism can be found in the *ATS-SDK Software Manual***.**

A PDF version of the *ATS-SDK Software Manual* can be downloaded from http://www.alazartech.com/support/downloads.htm website. The Synchronous and Asynchronous DMA mechanisms are explained in detail.

Installing ATS-VI

Install from CD

ATS-VI is shipped with an installation CD that will copy all the necessary files to your hard disk. Note that this CD has the auto-run feature enabled, so all you should have to do is insert the disk into your CD drive.

In case the installation does not start automatically, use Explorer to navigate to the CD and run the Setup.exe program on the CD. Follow the instructions on the screen.

All files will be installed to **[drive]:\AlazarTech\ATS-VI\V5_7_1** folder. Future versions will be installed in their own folder. This will provide you with the ability to go back and forth between various versions, if necessary.

Install from Download

You can also install ATS-VI by downloading the installation file from the AlazarTech web site.

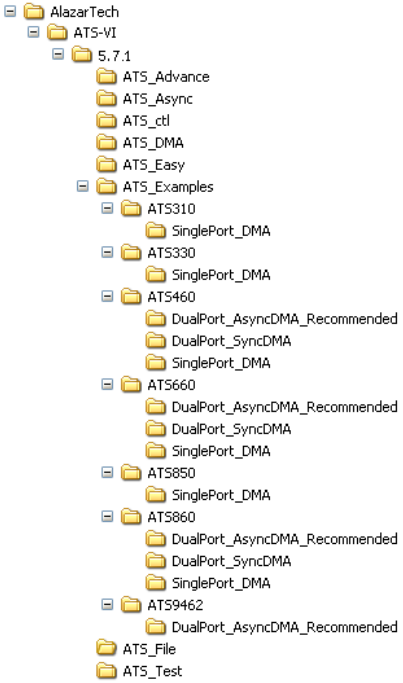
Note that the downloaded file is a password protected ZIP file.

The uncompressed file will be called ATS-VI_V*.exe, where "*" refers to the version number of the ATS-VI release. For example, it will be 5_7_1 for version 5.7.1.

Simply run this uncompressed file and follow the instructions on the screen.

All files will be installed to the **[drive]:\AlazarTech\ATS-VI\V5_7_1** folder. Future versions will be installed in their own folder. This will provide you with the ability to go back and forth between various versions, if necessary.

Once installed, the following directory structure is created on the disk drive:



As you can see, the sets of VIs are clearly defined. Also, there is a directory of examples for each of the AlazarTech digitizers.

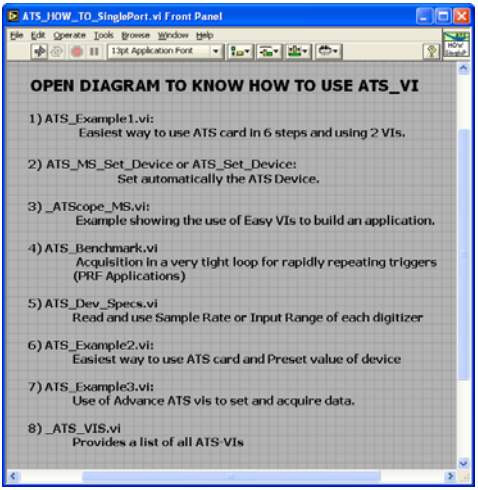
For a description of DualPort_Async_DMA, DualPort_Sync_DMA, and SinglePort_DMA please refer to the *ATS-SDK Software Manual***.**

Program Using ATS_Easy VI Set

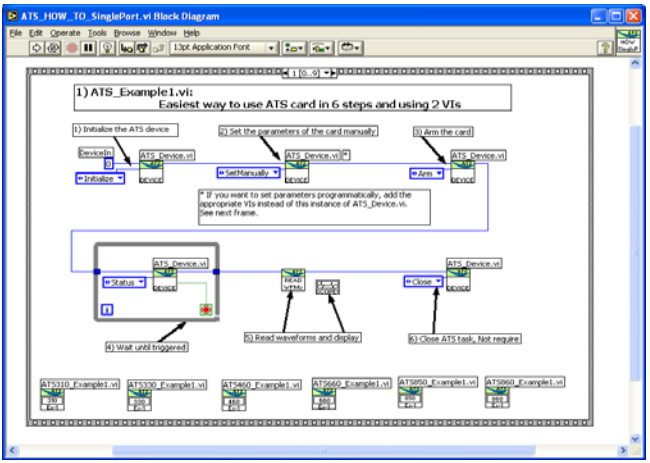
ATS class digitizers, such as the ATS460, ATS660, ATS860, ATS850, ATS330 and ATS310 are designed for ease of integration into user programs.

As such, the ATS-VI features a very simple and easy-to-use set of VIs.

At the simplest level, all you have to do to acquire data is explained in the ATS_HOW.VI included with the ATS-VI. Note that ATS9462 is not supported by the examples listed below.



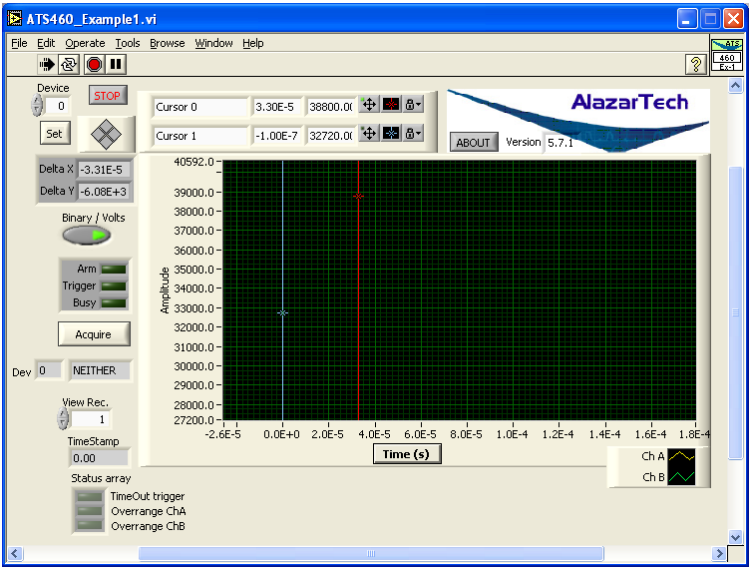
Opening the diagram of the ATS_HOW_TO_SinglePort.VI will reveal all of the examples as listed 1 through 8. You can select the case statement that best approximates your experiment requirements.



For illustration purposes, VI **ATS460_Example1.vi** will be used.

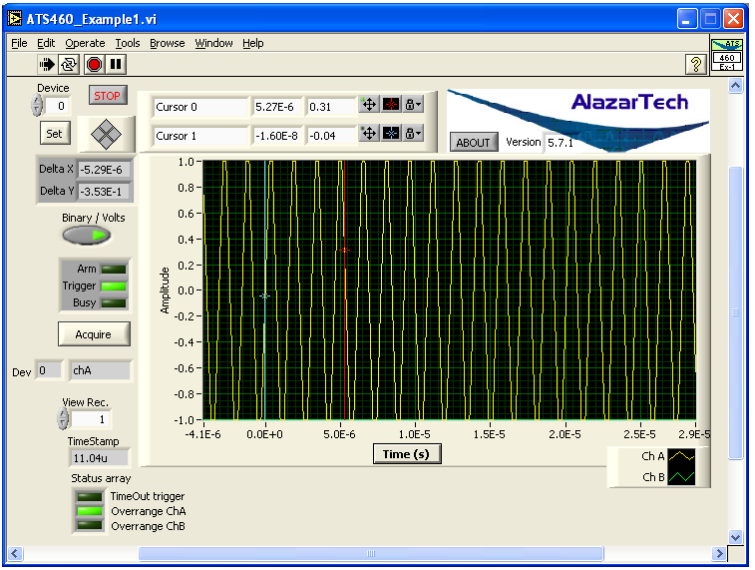
Running **ATS460_Example1.vi** will result in the display of a dialog box that allows you to set the ATS digitizer parameters according to the needs of the experiment:

Once you click on **Continue**, a front panel will be displayed that looks as follows:



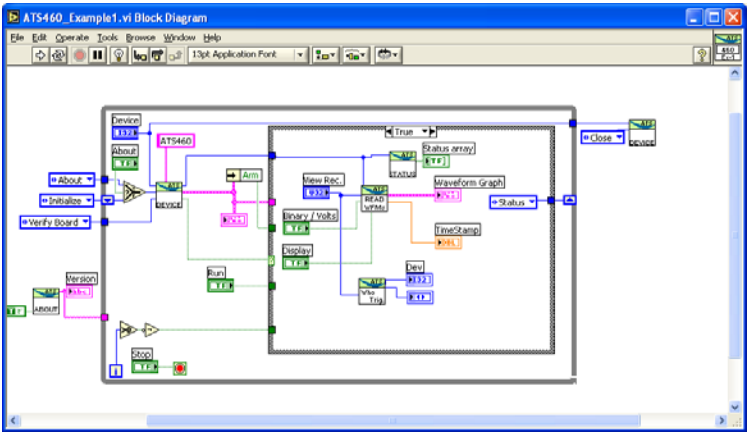
If you are programming a Master/Slave system, you can select the next board by incrementing the **Device** number (in the top-left corner) and going back to the ATS_Set_Device VI to setup that board. Click on **Continue** to download all the controls to the next board.

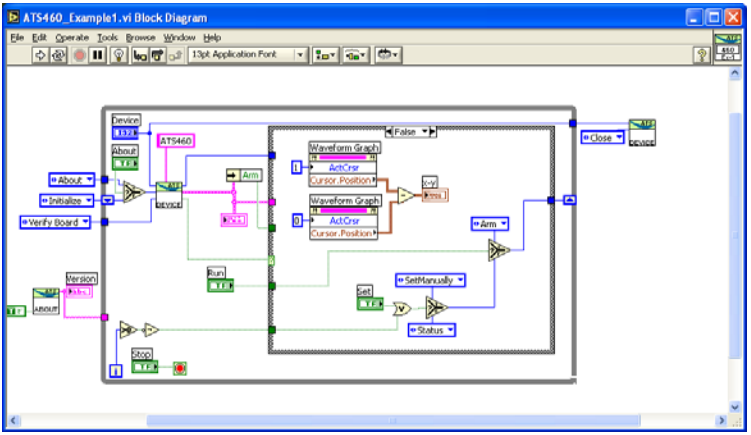
If you click on **Acquire** button, the ATS digitizer will be armed once. After a trigger occurs, the resulting signals will be displayed on the screen.



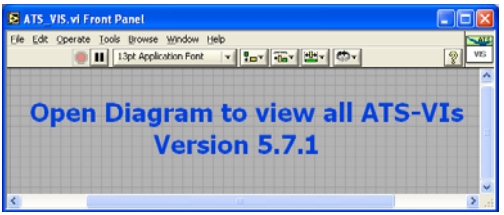
This example shows the ease with which ATS digitizers can be integrated into an existing VI.

The diagram of **ATS_Example 1** VI is shown below:

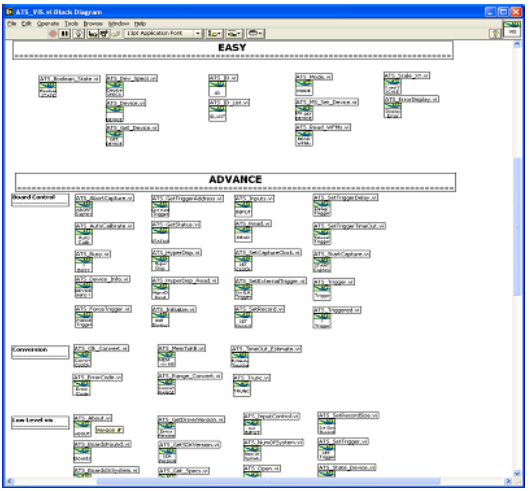




You can also review other VIs supplied with the ATS-VI by opening ATS_VIS.vi and viewing the diagram.



When you view the diagram, you will see a list of VIs:



You can scroll down to see the rest of the VIs.

Device Control VIs

ATS-VI uses a number of controls that you may want to be aware of if you intend to do Advanced level programming.

ATS_Card_Spec

_____AlazarTech, Scope_____

Description

Specification of the ATS board.

Includes: Name, Sampling rate and Input Range in text array.

Also the 50 ohms limit or option associated with the device.

Connector Pane

ATS_Cards_GBL

_____AlazarTech, Scope_____

Description

Specifications of Cards and Pre-set value at Initialization.

Cards_Specs: array of specifications of card

- Name: name of the card
- Rate: text array of the possible clock rate of the card.
- Range: text array of the possible input range of the card.

Cards_Pre-Set: array of pre-set value for each board.

Connector Pane

ATS_Channel

_____AlazarTech, Scope_____

Description

Channel selection on the device.

Connector Pane

ATS_DMA_Channel

_____AlazarTech, Scope_____

Description

Channel selection on the device.

Connector Pane

ATS_DMA_Ctrl

_____AlazarTech, Scope_____

Description

Connector Pane

ATS_Global

_____AlazarTech, Scope_____

Description

Device parameters control.

Connector Pane

ATS_Global_Ctrl

_____AlazarTech, Scope_____

Description

Control of the ATS_State_Device.vi.

- Init_Device: create initial value.
- Clear_All: reset to Null all Device parameters.
- Set: set Device parameters with the input value.
- Get: get Device parameters.

Connector Pane

ATS_Query

_____AlazarTech, Scope_____

Description

Trigger setup of the card.

TrigOperation:

- Timeout (s): waiting time if no trigger (0 = no timeout)
- Trig. Delay: delay before recording data after trigger.
- Engine X: setup of the trigger source X
- Engine Y: setup of the trigger source Y.
- ExtTrigContol: setup of the external trigger (Coupling, Range)

Connector Pane

ATS_ReadSamples

_____AlazarTech, Scope_____

Description

Read Samples Parameters Offset and Length.

Connector Pane

ATS_Set_Value

_____AlazarTech, Scope_____

Description

ATS_Set_Value format for reference value.

Connector Pane

ATS_Sys_Board

_____AlazarTech, Scope_____

Description

System and Board selection.

- System: system identification (number >0)
- Board: board identification number (number>0)

Connector Pane

Bandwidth

_____AlazarTech, Scope_____

Description

Bandwidth selection on the device, if available.

Connector Pane

CaptureMode

_____AlazarTech, Scope_____

Description

Capture mode for the ATScope example.

- Auto: continuous acquisition with timeout trigger activate.
- Normal: continuous acquisition without timeout trigger.
- Single: one acquisition without timeout trigger.

Connector Pane

Channel

_____AlazarTech, Scope_____

Description

Channel selection on the device.

Connector Pane

Clock

_____AlazarTech, Scope_____

Description

Device's Clock parameters.

- ClckSource: Internal, External
- ClckRate: sampling rate of the Device
- ClckEdge: Rising, Falling.
- Decimation:

Connector Pane

ClockEdge

_____AlazarTech, Scope_____

Description

Synchronisation on the clock pulse, Rising or Falling edge.

Connector Pane

ClockRate

_____AlazarTech, Scope_____

Description

Sampling rate of the device.

Connector Pane

ClockSource

_____AlazarTech, Scope_____

Description

Selection of the clock source.

- Internal or External.

Connector Pane

Coupling

_____AlazarTech, Scope_____

Description

Input coupling, AC or DC.

Connector Pane

Device_Ctrl

_____AlazarTech, Scope_____

Description

Operation using the ATS_Device.vi

- Status: read the status of the Device (Arm, Trigger, Busy)
- About: display the version of the software on all Device.
- Arm: arm the Device
- ForceTrig: force the trigger of the device.
- Abort: stop any action of the device including trigger and acquisition.
- Initialize: check for all device, open communication and reset parameters.
- Info: get the info of the device
- Close: end communication with all device and clear parameters.
- Calibrate: start the autocalibration procedure of the device.
- SetManually: open front panel and set parameters manually.

Connector Pane

Device_Info

_____AlazarTech, Scope_____

Description

Information of the device.

- Handle: communication refnum
- Board: identification
- CPLD: version of the device software.
- MemorySize: size of the memory on the board in bytes.
- SampleSize: number of bit of the digitizer.

Connector Pane

ExtTrigger

_____AlazarTech, Scope_____

Description

External trigger setup.

- Coupling: AC, DC
- Range: X1, Div5

Connector Pane

ExtTrigRange

_____AlazarTech, Scope_____

Description

Set External Trigger Input Range

- X1 (+/- 1V) or Div5 (+/- 5 Volt)

Connector Pane

Impedance

_____AlazarTech, Scope_____

Description

Input impedance: 50 Ohms or 1 MegaOhms.

Connector Pane

InputCtrl

_____AlazarTech, Scope_____

Description

Control of the Input Channel.

- Coupling: AC, DC
- Range: sensitivity of the device.
- Impedance: 50ohms, 1Mohms.

Connector Pane

Range

_____AlazarTech, Scope_____

Description

Full scale of the input channel.

- Text Ring type.

Connector Pane

Record

_____AlazarTech, Scope_____

Description

Setup of the record on the device.

- Count: number of the record (1-1000)
- Presize: number of pretrigger point.
- Length: number of record point, including presize.

Connector Pane

Trigger

_____AlazarTech, Scope_____

Description

Trigger setup of the card.

- TrigOperation:
    - Timeout (s): waiting time if no trigger (0 = no timeout)
    - Trig. Delay: delay before recording data after trigger.
    - Engine X: setup of the trigger source X
    - Engine Y: setup of the trigger source Y.
    - ExtTrigContol: setup of the external trigger (Coupling, Range)

Connector Pane

Triggered

_____AlazarTech, Scope_____

Description

Trigger setup of the card.

- TrigOperation:
    - Timeout (s): waiting time if no trigger (0 = no timeout)
    - Trig. Delay: delay before recording data after trigger.
    - Engine X: setup of the trigger source X
    - Engine Y: setup of the trigger source Y.
    - ExtTrigContol: setup of the external trigger (Coupling, Range)

Connector Pane

TriggerEngine

_____AlazarTech, Scope_____

Description

Trigger engine setup.

- Source: Channel A, Channel B, External, Disable.
- Slope: positive, Negative.
- Level: 0- 255 (8 bits)
    - Level of 128 corresponds to zero volts
    - Level of 255 corresponds to positive full scale input
    - Level of 0 corresponds to negative full scale input

Connector Pane

TriggerOperation

_____AlazarTech, Scope_____

Description

Trigger operation with the X and Y engine.

- Operation:
    - Only X
    - Only Y
    - X or Y
    - X and Y
    - X xor Y
    - X and not Y
    - not X and Y.

Connector Pane

ATS_Easy VI Description

ATS_Easy is a set of LabVIEW® 7.1+ compatible VIs that provide an easy-to-use interface to ATS digitizer cards.

ATS_Boolean_State

_____AlazarTech, Scope_____

Description

Boolean status:

- Rising
- Falling
- Change

Connector Pane

Controls and Indicators

BooleanIn

BooleanOut

Rising

Falling

Change

ATS_Dev_Specs

_____AlazarTech, Scope_____

Description

Get the Specification of the DeviceIn board.

Dev_Spec indicates the name of the device and all sampling rates and input ranges of the device in an array of text.

This array can be use to set the String[] in property node of a Text selector.

Input

"DeviceIn" = Board to get the specification

"Rate_In" = Sampling rate to select in Device specifications

"Range_A" = Input range of channel A to select in Device specifications

"Range_B" = Input range of channel B to select in Device specifications

Output

"Specifications" = specification of the board.

"Name" = string of the ATS board identification

"Rate" = list of available Sampling Rate in a string array format

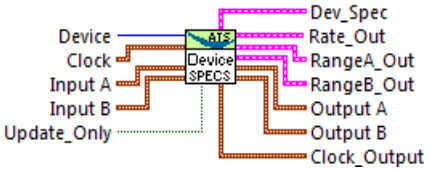
"Rate_Out" = sampling rate in text format and corresponding rate#.

"Range" = list of available Input range in a string array format

"RangeA_out" = Value in text and Range #

"RangeB_out" = Value in text and Range #

Connector Pane



Controls and Indicators

Device Device # identification.

Rate_In

Input A

Coupling Input coupling, AC or DC.

Range Full scale of the input channel.

Impedance Input impedance: 50ohms, 1Mohms.

Bandwidth Channel selection.

Input B Control of the Input Channel.

Coupling: AC, DC

Range: sensitivity of the device.

Impedance: 50ohms, 1Mohms.

Coupling Input coupling, AC or DC.

Range Full scale of the input channel.

Impedance Input impedance: 50ohms, 1Mohms.

Bandwidth Channel selection.

Dev_Spec

Name

Rate

String

Range

String

RangeLim(50)

Bandwidth

Rate_Out

Text

Rate

RangeA_Out

Text

Range

RangeB_Out

Text

Range

Output A

Coupling Input coupling, AC or DC.

Range Full scale of the input channel.

Impedance Input impedance: 50ohms, 1Mohms.

Bandwidth Channel selection.

Output B Control of the Input Channel.

Coupling: AC, DC

Range: sensitivity of the device.

Impedance: 50ohms, 1Mohms.

Coupling Input coupling, AC or DC.

Range Full scale of the input channel.

Impedance Input impedance: 50ohms, 1Mohms

Bandwidth Channel selection.

ATS_Device

_____AlazarTech, Scope_____

Description

Control of the device.

Input

"DeviceCtrl option"

-Status: read the status of the Device (Arm, Trigger, Busy)

-About: display the version of the software on all Device.

-Arm: arm the Device

-ForceTrig: force the trigger of the device.

-Abort: stop any action of the device including trigger and acquisition.

-Initialize: check for all device, open communication and reset parameters.

-Info: get the info of the device

-Close: end communication with all device and clear parameters.

-Calibrate: start the autocalibration procedure of the device.

-SetManually: open front panel and set parameters manually.

"DeviceIn" = board to access

"System" = On initialize only, select the system to access.

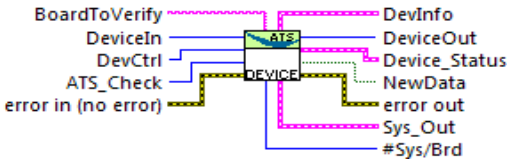
Output

"#Sys/Brd" = on Initialize indicate the number of System on computer, otherwise it indicate the number of board in System.

"DeviceOut" = On Initialize indicate the number of board in System, otherwise duplicate of DeviceIn

"Device_Status" = status of the board (Arm, Triggered, Busy)

Connector Pane



Controls and Indicators

DeviceIn Device # identification.

DevCtrl Status: read the status of the Device (Arm, Trigger, Busy)

About: display the version of the software on all Device.

Arm: arm the Device

ForceTrig: force the trigger of the device.

Abort: stop any action of the device including trigger and acquisition.

Initialize: check for all device, open communication and reset parameters.

Info: get the info of the device

Close: end communication with all device and clear parameters.

Calibrate: start the autocalibration procedure of the device.

SetManually: open front panel and set parameters manually.

error in (no error) The **error in** cluster can accept error information wired from VIs previously called. Use this information to decide if any functionality should be bypassed in the event of errors from other VIs.

The pop-up option **Explain Error** (or Explain Warning) gives more information about the error displayed.

status The **status** boolean is either TRUE (X) for an error, or FALSE (checkmark) for no error or a warning.

The pop-up option **Explain Error** (or Explain Warning) gives more information about the error displayed.

code The **code** input identifies the error or warning.

The pop-up option **Explain Error** (or Explain Warning) gives more information about the error displayed.

source The **source** string describes the origin of the error or warning.

The pop-up option **Explain Error** (or Explain Warning) gives more information about the error displayed.

System Device # identification.

error out The **error out** cluster passes error or warning information out of a VI to be used by other VIs.

The pop-up option **Explain Error** (or Explain Warning) gives more information about the error displayed.

status The **status** boolean is either TRUE (X) for an error, or FALSE (checkmark) for no error or a warning.

The pop-up option **Explain Error** (or Explain Warning) gives more information about the error displayed.

code The **code** input identifies the error or warning.

The pop-up option **Explain Error** (or Explain Warning) gives more information about the error displayed.

source The **source** string describes the origin of the error or warning.

The pop-up option **Explain Error** (or Explain Warning) gives more information about the error displayed.

DevInfo Handle: communication refnum

Board: identification

CPLD: version of the device software.

MemorySize: size of the memory on the board in bytes.

SampleSize: number of bit of the digitizer.

Handle

Board

CPLD

MemorySize

SampleSize

ID

Device_Status Status of the device.

Arm

Trigger

Busy

NewData Indicate if a NewData has been acquire foloowing an Arm and Trigger operation.

DeviceOut Same as DeviceIn

#Sys/Brd

ATS_ErrorDisplay

_____AlazarTech, Scope_____

Description

Display the error value.

- End: output set to TRUE
- Continue: End set to False.

Connector Pane

Controls and Indicators

error IN The **error in** cluster can accept error information wired from VIs previously called. Use this information to decide if any functionality should be bypassed in the event of errors from other VIs.

The pop-up option **Explain Error** (or Explain Warning) gives more information about the error displayed.

status The **status** boolean is either TRUE (X) for an error, or FALSE (checkmark) for no error or a warning.

The pop-up option **Explain Error** (or Explain Warning) gives more information about the error displayed.

code The **code** input identifies the error or warning.

The pop-up option **Explain Error** (or Explain Warning) gives more information about the error displayed.

source The **source** string describes the origin of the error or warning.

The pop-up option **Explain Error** (or Explain Warning) gives more information about the error displayed.

End Out

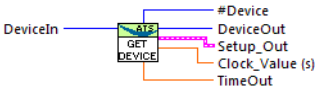
ATS_Get_Device

_____AlazarTech, Scope_____

Description

Get ATS device parameters.

Connector Pane



Controls and Indicators

DeviceIn

Setup_Out Device parameters cluster.

Record

Count

Presize

Length

Clock Device's Clock parameters.

ClckSource: Internal, External

ClckRate: sampling rate of the Device

ClckEdge: Rising, Falling.

Decimation:

ClckSource Selection of the clock source, Internal or External.

ClckRate Sampling rate.

ClckEdge Synchronisation on the clock pulse, Rising or Falling edge.

Decimation

Input A

Coupling Input coupling, AC or DC.

Range Full scale of the input channel.

Impedance Input impedance: 50ohms, 1Mohms.

Bandwidth Channel selection.

Input B Control of the Input Channel.

Coupling: AC, DC

Range: sensitivity of the device.

Impedance: 50ohms, 1Mohms.

Coupling Input coupling, AC or DC.

Range Full scale of the input channel.

Impedance Input impedance: 50ohms, 1Mohms.

Bandwidth Channel selection.

Trigger Trigger setup of the card.

TrigOperation:

Timeout (s): waiting time if no trigger (0 = no timeout)

Trig. Delay: delay before recording data after trigger.

Engine X: setup of the trigger source X

Engine Y: setup of the trigger source Y.

ExtTrigContol: setup of the external trigger (Coupling, Range)

TrigOperation Trigger operation with the X and Y engine.

Operation:

Only X

Only Y

X or Y

X and Y

X xor Y

X and not Y

not X and Y.

Timeout (s)

Trig. Delay

Engine X Trigger engine setup.

Source: Channel A, Channel B, External, Disable.

Slope: positive, Negative.

Level: 0- 255 (8 bits)

Source

Slope

Level

Engine Y Trigger engine setup.

Source: Channel A, Channel B, External, Disable.

Slope: positive, Negative.

Level: 0- 255 (8 bits)

Source

Slope

Level

ExtTrigControl External trigger setup.

Coupling: AC, DC

Range: X1, Div5

Coupling Input coupling, AC or DC.

Range Trigger Range: X1, Div5

DeviceOut

Clock_Value (s)

TimeOut

#Device

ATS_ID

_____AlazarTech, Scope_____

Description

Identify ALL System and there boards.

Input:

- None

Output:

"ATS_System" = systems identified

: System = System ID

: Handle = communication refnum

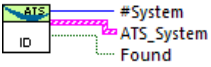
: Board = identification

: CPLD = version of the device software.

: MemorySize = size of the memory on the board in bytes.

: SampleSize = number of bit of the digitizer.

Connector Pane



Controls and Indicators

ATS_System

System

Devices

DevInfo_In Handle: communication refnum

Board: identification

CPLD: version of the device software.

MemorySize: size of the memory on the board in bytes.

SampleSize: number of bit of the digitizer.

Handle

Board

CPLD

MemorySize

SampleSize

ID

Found

#System

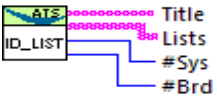
ATS_ID_List

_____AlazarTech, Scope_____

Description

Identify and list ALL boards in the System

Connector Pane



Controls and Indicators

Lists

Board

Title

Board

ATS_Mode

_____AlazarTech, Scope_____

Description

Indicates the next mode of the ATS board, Arm, trigger or Busy, and if trigger in single mode acquisition.

Status: read the status of the Device (Arm, Trigger, Busy)

Arm: arm the Device

Abort: stop any action of the device including trigger and acquisition.

Connector Pane

Controls and Indicators

Mode

Run

Device_Status

Arm

Trigger

Busy

DevCtrl Status: read the status of the Device (Arm, Trigger, Busy)

About: display the version of the software on all Device.

Arm: arm the Device

ForceTrig: force the trigger of the device.

Abort: stop any action of the device including trigger and acquisition.

Initialize: check for all device, open communication and reset parameters.

Info: get the info of the device

Close: end communication with all device and clear parameters.

Calibrate: start the autocalibration procedure of the device.

SetManually: open front panel and set parameters manually.

Single Done

ATS_MS_Set_Device

_____AlazarTech, Scope_____

Description

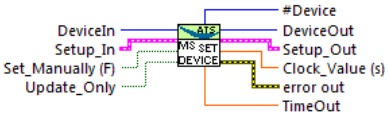
Set ATS device with Setup_In parameters.

If Set_Manually is TRUE : Front panel open and the user can change setting.

If Set_Manually is FALSE: Update using input parameters.

If UPDATE_Only is TRUE: Update from previously set parameters

Connector Pane



Controls and Indicators

Setup_In Device parameters cluster.

Record Setup of the record on the device.

Count: number of the record (1-1000)

Presize: number of pretrigger point.

Length: number of record point, including presize.

Count

Presize

Length

Clock Device's Clock parameters.

ClckSource: Internal, External

ClckRate: sampling rate of the Device

ClckEdge: Rising, Falling.

Decimation:

 **ClckSource** Selection of the clock source, Internal or External.

 **ClckRate** Sampling rate.

 **ClckEdge** Synchronisation on the clock pulse, Rising or Falling edge.

 **Decimation**

 **Input A**

 **Coupling** Input coupling, AC or DC.

 **Range** Full scale of the input channel.

 **Impedance** Input impedance: 50ohms, 1Mohms.

 **Bandwidth** Channel selection.

 **Input B** Control of the Input Channel.

Coupling: AC, DC

Range: sensitivity of the device.

Impedance: 50ohms, 1Mohms.

 **Coupling** Input coupling, AC or DC.

 **Range** Full scale of the input channel.

 **Impedance** Input impedance: 50ohms, 1Mohms.

 **Bandwidth** Channel selection.

 **Trigger** Trigger setup of the card.

TrigOperation:

Timeout (s): waiting time if no trigger (0 = no timeout)

Trig. Delay: delay before recording data after trigger.

Engine X: setup of the trigger source X

Engine Y: setup of the trigger source Y.

ExtTrigContol: setup of the external trigger (Coupling, Range)

TrigOperation Trigger operation with the X and Y engine.

Operation:

Only X

Only Y

X or Y

X and Y

X xor Y

X and not Y

not X and Y.

Timeout (s)

Trig. Delay

Engine X Trigger engine setup.

Source: Channel A, Channel B, External, Disable.

Slope: positive, Negative.

Level: 0- 255 (8 bits)

Source

Slope

Level

Engine Y Trigger engine setup.

Source: Channel A, Channel B, External, Disable.

Slope: positive, Negative.

Level: 0- 255 (8 bits)

Source

Slope

Level

ExtTrigControl External trigger setup.

Coupling: AC, DC

Range: X1, Div5

Coupling Input coupling, AC or DC.

Range Trigger Range: X1, Div5

DeviceIn

Set_Manually (F)

Update_Only

Setup_Out Device parameters cluster.

Record Setup of the record on the device.

Count: number of the record (1-1000)

Presize: number of pretrigger point.

Length: number of record point, including presize.

Count

Presize

Length

Clock Device's Clock parameters.

ClckSource: Internal, External

ClckRate: sampling rate of the Device

ClckEdge: Rising, Falling.

Decimation:

ClckSource Selection of the clock source, Internal or External.

ClckRate Sampling rate.

ClckEdge Synchronisation on the clock pulse, Rising or Falling edge.

Decimation

Input A

Coupling Input coupling, AC or DC.

Range Full scale of the input channel.

Impedance Input impedance: 50ohms, 1Mohms.

Bandwidth Channel selection.

Input B Control of the Input Channel.

Coupling: AC, DC

Range: sensitivity of the device.

Impedance: 50ohms, 1Mohms.

Coupling Input coupling, AC or DC.

Range Full scale of the input channel.

Impedance Input impedance: 50ohms, 1Mohms.

Bandwidth Channel selection.

Trigger Trigger setup of the card.

TrigOperation:

Timeout (s): waiting time if no trigger (0 = no timeout)

Trig. Delay: delay before recording data after trigger.

Engine X: setup of the trigger source X

Engine Y: setup of the trigger source Y.

ExtTrigContol: setup of the external trigger (Coupling, Range)

TrigOperation Trigger operation with the X and Y engine.

Operation:

Only X

Only Y

X or Y

X and Y

X xor Y

X and not Y

not X and Y.

Timeout (s)

Trig. Delay

Engine X Trigger engine setup.

Source: Channel A, Channel B, External, Disable.

Slope: positive, Negative.

Level: 0- 255 (8 bits)

Source

Slope

Level

Engine Y Trigger engine setup.

Source: Channel A, Channel B, External, Disable.

Slope: positive, Negative.

Level: 0- 255 (8 bits)

Source

Slope

Level

ExtTrigControl External trigger setup.

Coupling: AC, DC

Range: X1, Div5

Coupling Input coupling, AC or DC.

Range Trigger Range: X1, Div5

DeviceOut

Clock_Value (s)

TimeOut

error out The **error out** cluster passes error or warning information out of a VI to be used by other VIs.

The pop-up option **Explain Error** (or Explain Warning) gives more information about the error displayed.

status The **status** boolean is either TRUE (X) for an error, or FALSE (checkmark) for no error or a warning.

The pop-up option **Explain Error** (or Explain Warning) gives more information about the error displayed.

code The **code** input identifies the error or warning.

The pop-up option **Explain Error** (or Explain Warning) gives more information about the error displayed.

source The **source** string describes the origin of the error or warning.

The pop-up option **Explain Error** (or Explain Warning) gives more information about the error displayed.

#Device

ATS_Read_WFMs

_____AlazarTech, Scope_____

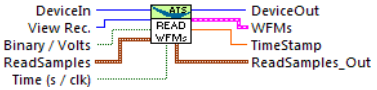
Description

Read number of sample indicate by length from the record ViewRec from channel A and B starting at Offset position.

The output is a WFM and the Y scale is binary or volts as per the Binary/Volts selector.

The X scale is in clock number or time in second as per Time(s/clk) selector.

Connector Pane



Controls and Indicators

View Rec.

DeviceIn Selected Device

Binary / Volts

Time (s / clk)

ReadSamples Number of Samples data to read (Length) starting at Offset position.

Offset Starting position to read samples data. Limited by the PreTrigDepth and Record Length of samples.

Length Number of Samples Data to read.

Limited by the Record Length of samples.

TimeStamp

WFMs

DeviceOut Same as the DeviceIn

ReadSamples_Out Number of Samples data to read (Length) starting at Offset position.

Offset Starting position to read samples data. Limited by the PreTrigDepth and Record Length of samples.

Length Number of Samples Data to read.

Limited by the Record Length of samples.

ATS_Set_Device

_____AlazarTech, Scope_____

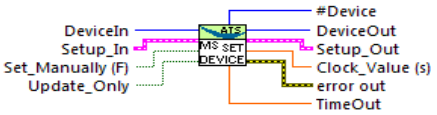
Description

Set ATS device with Setup_In parameters.

If Set_Manually is TRUE : Front panel open and the user can change setting.

If Set_Manually is FALSE: update using input parameters.

Connector Pane



Controls and Indicators

Setup_In Device parameters cluster.

Record

Count

Presize

Length

Clock Device's Clock parameters.

ClckSource: Internal, External

ClckRate: sampling rate of the Device

ClckEdge: Rising, Falling.

Decimation:

ClckSource Selection of the clock source, Internal or External.

ClckRate Sampling rate.

ClckEdge Synchronisation on the clock pulse, Rising or Falling edge.

Decimation

Input A

Coupling Input coupling, AC or DC

Range Full scale of the input channel.

Impedance Input impedance: 50ohms, 1Mohms.

Bandwidth Channel selection.

Input B Control of the Input Channel.

Coupling: AC, DC

Range: sensitivity of the device.

Impedance: 50ohms, 1Mohms.

Coupling Input coupling, AC or DC.

Range Full scale of the input channel.

Impedance Input impedance: 50ohms, 1Mohms.

Bandwidth Channel selection.

Trigger Trigger setup of the card.

TrigOperation:

Timeout (s): waiting time if no trigger (0 = no timeout)

Trig. Delay: delay before recording data after trigger.

Engine X: setup of the trigger source X

Engine Y: setup of the trigger source Y.

ExtTrigContol: setup of the external trigger (Coupling, Range)

TrigOperation Trigger operation with the X and Y engine.

Operation:

Only X

Only Y

X or Y

X and Y

X xor Y

X and not Y

not X and Y.

Timeout (s)

Trig. Delay


Engine X Trigger engine setup.

Source: Channel A, Channel B, External, Disable.

Slope: positive, Negative.

Level: 0- 255 (8 bits)


Source


Slope

Level


Engine Y Trigger engine setup.

Source: Channel A, Channel B, External, Disable.

Slope: positive, Negative.

Level: 0- 255 (8 bits)


Source


Slope

Level


ExtTrigControl External trigger setup.

Coupling: AC, DC

Range: X1, Div5

 **Coupling** Input coupling, AC or DC.

 **Range** Trigger Range: X1, Div5

 **DeviceIn**

 **Set_Manually (F)**

 **Setup_Out** Device parameters cluster.

 **Record**

 **Count**

 **Presize**

 **Length**

 **Clock** Device's Clock parameters.

ClckSource: Internal, External

ClckRate: sampling rate of the Device

ClckEdge: Rising, Falling.

Decimation:

 **ClckSource** Selection of the clock source, Internal or External.

 **ClckRate** Sampling rate.

 **ClckEdge** Synchronisation on the clock pulse, Rising or Falling edge.

 **Decimation**

 **Input A**

 **Coupling** Input coupling, AC or DC.

 **Range** Full scale of the input channel.

 **Impedance** Input impedance: 50ohms, 1Mohms.

Bandwidth Channel selection.

Input B Control of the Input Channel.

Coupling: AC, DC

Range: sensitivity of the device.

Impedance: 50ohms, 1Mohms.

Coupling Input coupling, AC or DC.

Range Full scale of the input channel.

Impedance Input impedance: 50ohms, 1Mohms.

Bandwidth Channel selection.

Trigger Trigger setup of the card.

TrigOperation:

Timeout (s): waiting time if no trigger (0 = no timeout)

Trig. Delay: delay before recording data after trigger.

Engine X: setup of the trigger source X

Engine Y: setup of the trigger source Y.

ExtTrigContol: setup of the external trigger (Coupling, Range)

TrigOperation Trigger operation with the X and Y engine.

Operation:

Only X

Only Y

X or Y

X and Y

X xor Y

X and not Y

not X and Y.

Timeout (s)

Trig. Delay

Engine X Trigger engine setup.

Source: Channel A, Channel B, External, Disable.

Slope: positive, Negative.

Level: 0- 255 (8 bits)

Source

Slope

Level

Engine Y Trigger engine setup.

Source: Channel A, Channel B, External, Disable.

Slope: positive, Negative.

Level: 0- 255 (8 bits)

Source

Slope

Level

ExtTrigControl External trigger setup.

Coupling: AC, DC

Range: X1, Div5

Coupling Input coupling, AC or DC.

Range Trigger Range: X1, Div5

DeviceOut

Clock_Value (s)

TimeOut

error out The **error out** cluster passes error or warning information out of a VI to be used by other VIs.

The pop-up option **Explain Error** (or Explain Warning) gives more information about the error displayed.

status The **status** boolean is either TRUE (X) for an error, or FALSE (checkmark) for no error or a warning.

The pop-up option **Explain Error** (or Explain Warning) gives more information about the error displayed.

code The **code** input identifies the error or warning.

The pop-up option **Explain Error** (or Explain Warning) gives more information about the error displayed.

source The **source** string describes the origin of the error or warning.

The pop-up option **Explain Error** (or Explain Warning) gives more information about the error displayed.

#Device

Advanced VI Description

The following pages describe each of the Advanced VIs used by ATS-VI.

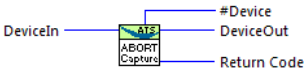
ATS_AbortCapture

_____AlazarTech, Scope_____

Description

Force the device to abort the capture.

Connector Pane



Controls and Indicators

I32 **DeviceIn** Device # identification.

U32 **Return Code**

I32 **DeviceOut** Same as the DeviceIn

I32 **#Device**

ATS_About.vi

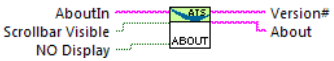
_____AlazarTech, Scope_____

Description

Display the ABOUT information until the OK button is activate unless NoDIsplay input is True then only the Version# output is read.

If Scrollbar is true a scrollbar will be display so the user can scroll on the text.

Connector Pane



Controls and Indicators

AboutIn

Scrollbar Visible

NO Display

AboutOut

Version#

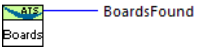
ATS_BoardsFound

_____AlazarTech, Scope_____

Description

Determine the total number of boards that are installed.

Connector Pane



Controls and Indicators

BoardsFound Number of board found on the computer

ATS_BoardsInSystem

_____AlazarTech, Scope_____

Description

Return the total number of configured devices for a given system.

Input:

"sid_In" = system identification number. Must be >0

Output:

"sid_Out" = system identification read

"Num_Board" = number of boards in system (configured devices)

Connector Pane

Controls and Indicators

U32 **sid_In**

U32 **Num_Of_Boards** Handle to Board ID.

U32 **sid_Out**

ATS_Busy

_____AlazarTech, Scope_____

Description

Query the devices's busy status.

Connector Pane

Controls and Indicators

DeviceIn Device # identification.

DeviceOut Same as the DeviceIn

Busy Indicate the Busy status.

#Device

ATS_Check

_____AlazarTech, Scope_____

Description

Check compatibility with the selected Board.

Input:

`NONE`: no limitation

`NO ATS9462` : ATS9462 cannot run in this application.

`ATS9462_Traditional` : ATS9462 cannot run in traditional mode.

Output:

`OK`: no problem found.

Connector Pane

Controls and Indicators

Device

ATS_Check

BoardToVerify

DeviceOut

OK

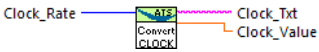
ATS_Clk_Convert

_____AlazarTech, Scope_____

Description

Convert the CLock Rate control to Numerical and Text value.

Connector Pane



Controls and Indicators

Clock_Rate Sampling rate.

Clock_Txt Clock rate in text format.

Clock_Value Clock rate in numerical format.

NOT RECOMMENDED FOR USE IN NEW DESIGNS

ATS_Close

_____AlazarTech, Scope_____

Description

Relinquish the handle for the device.

Connector Pane

Controls and Indicators

U32 **Handle** Handle to the BoardID

ATS_ErrorCode

_____AlazarTech, Scope_____

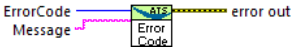
Description

Interpretation of the ErrorCode.

ErrorCode:

- 0: no error
- 511: No board found
- 512: no error
- 512++: see list of API error code

Connector Pane



Controls and Indicators

ErrorCode Error code number.

Message

error out The **error out** cluster passes error or warning information out of a VI to be used by other VIs.

The pop-up option **Explain Error** (or Explain Warning) gives more information about the error displayed.

status The **status** boolean is either TRUE (X) for an error, or FALSE (checkmark) for no error or a warning.

The pop-up option **Explain Error** (or Explain Warning) gives more information about the error displayed.

code The **code** input identifies the error or warning.

The pop-up option **Explain Error** (or Explain Warning) gives more information about the error displayed.

source The **source** string describes the origin of the error or warning

The pop-up option **Explain Error** (or Explain Warning) gives more information about the error displayed.

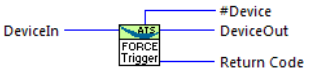
ATS_ForceTrigger

_____AlazarTech, Scope_____

Description

Force the Device to perform a software trigger.

Connector Pane



Controls and Indicators

I32 **DeviceIn** Device # identification.

U32 **Return Code** This value is equivalent to the return codes that are listed in the ATS-SDK manual

I32 **DeviceOut** Same as the DeviceIn

I32 **#Device**

ATS_Get_Specs

_____AlazarTech, Scope_____

Description

Get the Specification of the board ID.

Input:

"ID" = Board to get the specification

"Rate_In" = select the sampling rate

(value limited by the max of the Card_Spec)

can be Index or Sampling Rate in Hz.

"Range_In" = select the input range

(value limited by the max of the Crad_Spec

can be Index or Voltage value in mV.

Output

"Card_Spec" = specification of the board.

"Name" = string of the ATS board identification

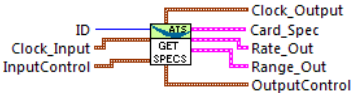
"Rate" = list of available Sampling Rate in a string array format

"Range" = list of available Input range in a string array format

"Rate_Out" = sampling rate selected by Rate_In in text and value format

"Range_Out" = input range selected by Range_In in text and value format

Connector Pane



Controls and Indicators

 **ID** Device # identification.

 **Rate_In**

 **Range_In**

 **Impedance** Input impedance: 50ohms, 1Mohms.

 **Card_Spec**

 **Name**

 **Rate**

 **String**

 **Range**

 **String**

 **RangeLim(50)**

 **Bandwidth**

 **Rate_Out**

 **Text**

 **Rate**

 **Range_Out**

 **Text**

 **Range**

ATS_GetBoardBySystemId

_____AlazarTech, Scope_____

Description

Retrieve the handle for a given device.

Input:

"sid_In" = system identification number. Must be >0

"brdNum_In" = board identification number

Output:

"sid_Out" = system identification read

"brdNum_Out" = board identification read

"Handle" = handle of the board

A System can be one board or many board in a master slave configuration.

In master/slave configuration the System indicate the group starting at 1 and the Board select the device in that group of board starting at 1 up to the number of board in the system..

If multi board are in one computer (not in master/slave configuration) then the identification for each board will be:

System = id of the board starting at 1 up to number of board in the computer and Board=1.

Connector Pane

Controls and Indicators


Sys/Board_In


System


Board


Handle


Sys/Board_Out


System


Board

ATS_GetChannelInfo

_____AlazarTech, Scope_____

Description

Retrieve channel memory size as well as the sample size.

Connector Pane

Controls and Indicators

U32 **HandleIn** Handle to the BoardID

U32 **Return Code** This value is equivalent to the return codes that are listed in the ATS-SDK manual

U32 **HandleOut** Same as the HandleIn

U32 **MemSize (Sample)** Memory size in Samples.

SampleSize = 8 : Memory in U8 (Byte)

Sample >8 : Memory in U16 (2x Bytes)

U8 **SampleSize** Number of bit of the digitizer.

ATS_GetCPLDVersion

_____AlazarTech, Scope_____

Description

Retrieve the CPLG version number.

Input:

"HandleIn" = device to retrieve information

Output:

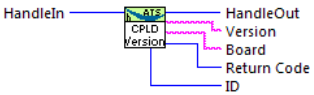
"HandleOut" = device information

"Version" = version

"Board" = board name

"ID" = board identification

Connector Pane



Controls and Indicators

HandleIn Handle to the BoardID

Return Code This value is equivalent to the return codes that are listed in the ATS-SDK manual

HandleOut Same as the HandleIn

Version Version of the API.

Board Version of the API.

ID Version of the API.

ATS_GetDriverVersion

_____AlazarTech, Scope_____

Description

Retrieve the CPLG version number.

Input:

"HandleIn" = device to retrieve information

Output:

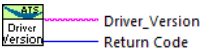
"HandleOut" = device information

"Version" = version

"Board" = board name

"ID" = board identification

Connector Pane



Controls and Indicators

Return Code This value is equivalent to the return codes that are listed in the ATS-SDK manual

Driver_Version Version of the API.

ATS_GetSDKVersion

_____AlazarTech, Scope_____

Description

Retrieve the DLL version number.

Input:

"HandleIn" = device to retrieve information

Output:

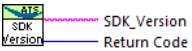
"HandleOut" = device information

"Version" = version

"Board" = board name

"ID" = board identification

Connector Pane



Controls and Indicators

Return Code This value is equivalent to the return codes that are listed in the ATS-SDK manual

SDK_Version Version of the ATSApi DLL being used.

ATS_GetStatus

_____AlazarTech, Scope_____

Description

Get the status information from hardware.

If Error = TRUE : No board found or Bad Handle.

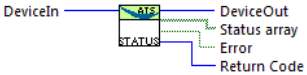
Bit 0: Timeout Occured

Bit 1: Over range ChA

Bit 2: Over range ChB

Bit 3: PLL locked

Connector Pane



Controls and Indicators

DeviceIn Device # identification.

Return Code This value is equivalent to the return codes that are listed in the ATS-SDK manual

DeviceOut

Status array Bit 0: Timeout Occured

Bit 1: Over range ChA

Bit 2: Over range ChB

Error

ATS_GetTriggerAddress

_____AlazarTech, Scope_____

Description

Retrieve timestamp for a given record.

TimeStamp: time between Arm and trigger in second or clcok count

Presize: pretrigger value in second or clock count

Clock: sampling rate in second or clcok (1).

Connector Pane

Controls and Indicators

DeviceIn Device # identification.

Record Record number to read information.

Time (s / clk) Set the TimeStamp in second or clock count.

ReadSamples Number of Samples data to read (Length) starting at Offset position.

Offset Starting position to read samples data. Limited by the PreTrigDepth and Record Length of samples.

Length Number of Samples Data to read.

Limited by the Record Length of samples.

Return Code This value is equivalent to the return codes that are listed in the ATS-SDK manual

DeviceOut Same as the DeviceIn

Presize (s / clk) Value of the pretrigger in second or in clock count

TimeStamp (s / clk) Time between the Arm and the trigger.

TimeStamp can be in second or clock count.

Clock (s / clk) Clock rate un second or count (1)

ATS_HyperDisp

_____AlazarTech, Scope_____

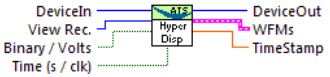
Description

Read record #ViewRec from channel A and B.

The output is a WFM and the Y scale is binary or volts as per the Binary/Volts selector.

The X scale is in clock number or time in second as per Time(s/clk) selector.

Connector Pane



Controls and Indicators

View Rec.

DeviceIn

Binary / Volts

Time (s / clk)

TimeStamp

WFMs

DeviceOut Same as the HandleIn

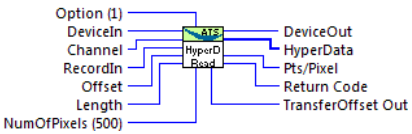
ATS_HyperDisp_Read

_____AlazarTech, Scope_____

Description

Find the Min and Max value in the recorded data from the device.

Connector Pane



Controls and Indicators

DeviceIn Device # identification.

Channel Channel selection.

RecordIn Record to read.

Offset

Length Memory length to read. If 0 then read pre-set record length.

Option (1)

NumOfPixels (500)

Return Code This value is equivalent to the return codes that are listed in the ATS-SDK manual

DeviceOut Same as the DeviceIn

HyperData Record Data from the device.

Pts/Pixel

TransferOffset Out

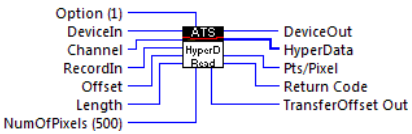
ATS_HyperDisp_Read_8bits

_____AlazarTech, Scope_____

Description

Find the Min and Max value in the recorded data from the device.

Connector Pane



Controls and Indicators

DeviceIn Device # identification.

Channel

RecordIn Record to read.

Offset

Length Memory length to read.

If 0 then read pre-set record length.

Option (1)

NumOfPixels (500)

Return Code This value is equivalent to the return codes that are listed in the ATS-SDK manual

DeviceOut Same as the DeviceIn

HyperData Record Data from the device.

Pts/Pixel

TransferOffset Out

ATS_InputControl

_____AlazarTech, Scope_____

Description

Configure an input channel for acquisition.

- Channel

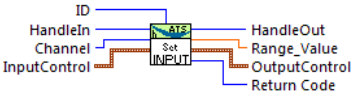
- Coupling

- Range

- Impedance

- Bandwidth (if applicable)

Connector Pane



Controls and Indicators

HandleIn Handle to the BoardID

InputControl Control of the Input Channel.

Coupling: AC, DC

Range: sensitivity of the device.

Impedance: 50ohms, 1Mohms.

Coupling Input coupling, AC or DC.

Range Full scale of the input channel.

Impedance Input impedance: 50ohms, 1Mohms.

Bandwidth Channel selection.

 **Channel** Channel selection.

 **ID** Device # identification.

 **Return Code** This value is equivalent to the return codes that are listed in the ATS-SDK manual

 **HandleOut** Same as the HandleIn

 **Range_Value** Range setting in numerical value.

 **OutputControl** Control of the Input Channel.

Coupling: AC, DC

Range: sensitivity of the device.

Impedance: 50ohms, 1Mohms.

 **Coupling** Input coupling, AC or DC.

 **Range** Full scale of the input channel.

 **Impedance** Input impedance: 50ohms, 1Mohms.

 **Bandwidth** Channel selection.

ATS_Inputs

_____AlazarTech, Scope_____

Description

Configure the input channels.

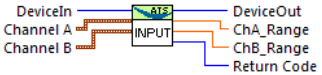
- Channel

- Coupling

- Range

- Impedance

Connector Pane



Controls and Indicators

DeviceIn Device # identification.

Channel A Setup of the Input Channel A.

Coupling: AC, DC

Range: sensitivity of the device.

Impedance: 50ohms, 1Mohms.

Coupling Input coupling, AC or DC.

Range Full scale of the input channel.

Impedance Input impedance: 50ohms, 1Mohms.

Bandwidth Channel selection.

Channel B Setup of the Input Channel B.

Coupling: AC, DC

Range: sensitivity of the device.

Impedance: 50ohms, 1Mohms.

 **Coupling** Input coupling, AC or DC.

 **Range** Full scale of the input channel

 **Impedance** Input impedance: 50ohms, 1Mohms.

 **Bandwidth** Channel selection.

 **Return Code** This value is equivalent to the return codes that are listed in the ATS-SDK manual

 **DeviceOut** Same as DeviceIn.

 **ChA_Range** Channel A range in numerical format.

 **ChB_Range** Channel B range in numerical format.

ATS_MemToKB

_____AlazarTech, Scope_____

Description

Convert the MemorySize input from Byte to KB.

Connector Pane

Controls and Indicators

MemorySize

Mem. (KB)

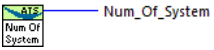
ATS_NumOfSystem

_____AlazarTech, Scope_____

Description

Return the total number of Master/Slave and independent board system.

Connector Pane



Controls and Indicators

U32 **Num_Of_System** Handle to Board ID.

NOT RECOMMENDED FOR USE IN NEW DESIGNS

ATS_Open

_____AlazarTech, Scope_____

Description

Retrieve a handle to an existing board.

This routine also initialize the device.

Connector Pane

Controls and Indicators

BoardNameID Board Identification to open the Handle.

HandleOut Handle to Board ID.

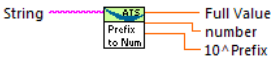
ATS_Prefix_to_Numeric

_____AlazarTech, Scope_____

Description

Convert the input String with prefix in Real number.

Connector Pane



Controls and Indicators

String

10^Prefix

Full Value

number

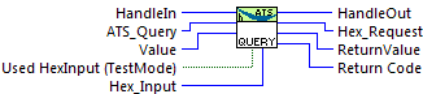
ATS_QueryCapability

_____AlazarTech, Scope_____

Description

Query information from hardware.

Connector Pane



Controls and Indicators

HandleIn Handle to the BoardID

Value

ATS_Query

Hex_Input

Used HexInput (TestMode)

Return Code This value is equivalent to the return codes that are listed in the ATS-SDK manual

HandleOut Same as the HandleIn

Hex_Request

ReturnValue

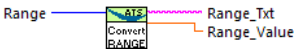
ATS_Range_Convert

_____AlazarTech, Scope_____

Description

Convert the Range control to Numerical and Text value.

Connector Pane



Controls and Indicators

Range Full scale of the input channel.

Range_Txt Range in text format.

Range_Value Range in numerical format.

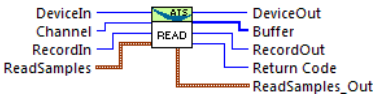
ATS_Read

_____AlazarTech, Scope_____

Description

Read the recorded data from the device.

Connector Pane



Controls and Indicators

DeviceIn Device # identification.

Channel Channel selection.

RecordIn Record to read.

ReadSamples Number of Samples data to read (Length) starting at Offset position.

Offset Starting position to read samples data. Limited by the PreTrigDepth and Record Length of samples.

Length Number of Samples Data to read.

Limited by the Record Length of samples.

Return Code This value is equivalent to the return codes that are listed in the ATS-SDK manual

DeviceOut Same as the DeviceIn

Buffer Record Data from the device.

RecordOut

ReadSamples_Out Number of Samples data to read (Length) starting at Offset position.

Offset Starting position to read samples data. Limited by the PreTrigDepth and Record Length of samples.

Length Number of Samples Data to read.

Limited by the Record Length of samples.

ATS_Search_Spec

_____AlazarTech, Scope_____

Description

Search, in the StringArray the ValueIn.

If the Value input is higher than threshold, then search the closest value.

If not, search the Index "Value_In" limited by the Maximum index in the StringArray input.

Result is of same "type" as the ValueIn, Index if lower than Threshold or Out_Value otherwise.

Connector Pane

Controls and Indicators

Value In

StringArray

String

Treshold (30)

Rate / Range

String Clock rate in text format.

Out_Value Clock rate in numerical format.

Index Clock rate in numerical format.

Result Clock rate in numerical format.

>Treshold

ATS_Search_Value

_____AlazarTech, Scope_____

Description

Search for the closest Value IN and if it is in the String Array indicate its position.

Retirve the value at the Value IN position of the String Array.

Connector Pane

Controls and Indicators

Value In

Search_Mode

StringArray

String

String Clock rate in text format.

Out_Value Clock rate in numerical format.

Index Clock rate in numerical format.

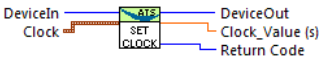
ATS_SetCaptureClock

_____AlazarTech, Scope_____

Description

Configure the capture clock circuitry.

Connector Pane



Controls and Indicators

DeviceIn Device # identification.

Clock Device's Clock parameters.

ClckSource: Internal, External

ClckRate: sampling rate of the Device

ClckEdge: Rising, Falling.

Decimation:

ClckSource Selection of the clock source, Internal or External.

ClckRate Sampling rate.

ClckEdge Synchronisation on the clock pulse, Rising or Falling edge.

Decimation

Return Code This value is equivalent to the return codes that are listed in the ATS-SDK manual

DeviceOut Same as the DeviceIn

Clock_Value (s) Sampling rate in numerical format.

ATS_SetExternalTrigger

_____AlazarTech, Scope_____

Description

Configure the external trigger circuitry.

- Coupling

- External Trigger Range

Connector Pane

Controls and Indicators

DeviceIn Device # identification.

ExtTrigControl External trigger setup.

Coupling: AC, DC

Range: X1, Div5

Coupling Input coupling, AC or DC.

Range Trigger Range: X1, Div

Return Code This value is equivalent to the return codes that are listed in the ATS-SDK manual

DeviceOut Same as the DeviceIn

ATS_SetLED

_____AlazarTech, Scope_____

Description

Turn ON or OFF the LED found on the devices panel.

Input:

"Handle" = handle of the board

"State" = On or Off

Output:

"Return_Code"= 512

Connector Pane

Controls and Indicators

Handle

state

Return_Code

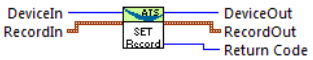
ATS_SetRecord

_____AlazarTech, Scope_____

Description

Configure the number of records for the device to capture.

Connector Pane



Controls and Indicators

DeviceIn Device # identification.

RecordIn Setup of the record on the device.

Count: number of the record (1-1000)

Presize: number of pretrigger point.

Length: number of record point, including presize.

Count

Presize

Length

Return Code Code return from the function.

DeviceOut Same as the DeviceIn

RecordOut Setup of the record on the device.

Count: number of the record (1-1000)

Presize: number of pretrigger point.

Length: number of record point, including presize.

U32 **Count**

U32 **Presize**

U32 **Length**

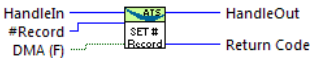
ATS_SetRecordCount

_____AlazarTech, Scope_____

Description

Configure the number of records for the device to capture.

Connector Pane



Controls and Indicators

HandleIn Handle to the BoardID

#Record Number of record to set.

DMA (F) Set the #Record for the DMA mode. (No limitation)

Return Code This value is equivalent to the return codes that are listed in the ATS-SDK manual

HandleOut Same as the HandleIn

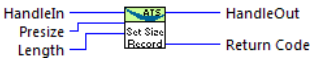
ATS_SetRecordSize

_____AlazarTech, Scope_____

Description

Configure the record size information

Connector Pane



Controls and Indicators

HandleIn Handle to the BoardID

Presize Pretrigger count.

Length Number of point to acquire including presize.

Return Code This value is equivalent to the return codes that are listed in the ATS-SDK manual

HandleOut Same as the HandleIn

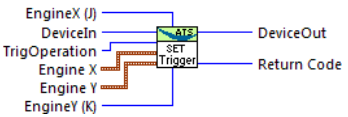
ATS_SetTrigger

_____AlazarTech, Scope_____

Description

Configure the trigger circuitry.

Connector Pane



Controls and Indicators

DeviceIn Device # identification.

Engine X Trigger engine setup.

Source: Channel A, Channel B, External, Disable.

Slope: positive, Negative.

Level: 0- 255 (8 bits)

Source

Slope

Level

TrigOperation Trigger operation with the X and Y engine.

Operation:

Only X

Only Y

X or Y

X and Y

X xor Y

X and not Y

not X and Y.

Engine Y Trigger engine setup.

Source: Channel A, Channel B, External, Disable.

Slope: positive, Negative.

Level: 0- 255 (8 bits)

Source

Slope

Level

EngineX (J) Engine selection.

EngineY (K) Engine selection.

Return Code This value is equivalent to the return codes that are listed in the ATS-SDK manual

DeviceOut Same as the DeviceIn

ATS_SetTriggerDelay

_____AlazarTech, Scope_____

Description

Set the Trigger delay

Connector Pane

Controls and Indicators

DeviceIn Device # identification.

Delay Delay to acquire data after trigger.

Return Code This value is equivalent to the return codes that are listed in the ATS-SDK manual

DeviceOut Same as the DeviceIn

ATS_SetTriggerTimeOut

_____AlazarTech, Scope_____

Description

Specify a timeout for a trigger event. If no trigger occurs in the specified amount of time, the board automatically forces a trigger.

If Timeout input is < 0, a Timeout = Clock x Length x TimeX(100) will be used.

Minimum value is 10e-6s.

Maximum 3600s (1hour).

Connector Pane

Controls and Indicators

DeviceIn Device # identification.

Timeout (-1s) Delay to set.

TimeX (1000) Use if Timeout is -1 (Self estimate Timeout mode)

Return Code This value is equivalent to the return codes that are listed in the ATS-SDK manual

DeviceOut Same as the DeviceIn

Timeout_Set Time out set value.

ATS_SetTriggerTimeOut_Brd

_____AlazarTech, Scope_____

Description

Specify a timeout for a trigger event for one Board. If no trigger occurs in the specified amount of time, the board automatically forces a trigger.

If Timeout input is < 0, a Timeout = Clock x Length x TimeX(100) will be used.

Minimum value is 10e-6s.

Maximum 3600s (1hour).

Connector Pane

Controls and Indicators

DeviceIn Device # identification.

Timeout (-1s) Delay to set.

TimeX (1000) Use if Timeout is -1 (Self estimate Timeout mode)

Return Code This value is equivalent to the return codes that are listed in the ATS-SDK manual

DeviceOut Same as the DeviceIn

Timeout_Set Time out set value.

ATS_SetTriggerTimeOut_HDL

_____AlazarTech, Scope_____

Description

Specify a timeout for a trigger event. If no trigger occurs in the specified amount of time, the board automatically forces a trigger.

If Timeout input is < 0, a Timeout = Clock x Length x TimeX(100) will be used.

Minimum value is 10e-6s.

Maximum 3600s (1hour).

Connector Pane

Controls and Indicators

I32 **DeviceIn** Device # identification.

DBL **Timeout (-1s)** Delay to set.

U32 **TimeX (1000)** Use if Timeout is -1 (Self estimate Timeout mode)

U32 **Return Code** This value is equivalent to the return codes that are listed in the ATS-SDK manual

I32 **DeviceOut** Same as the DeviceIn

DBL **Timeout_Set** Time out set value.

ATS_Specs

_____AlazarTech, Scope_____

Description

Get the Specification of the DeviceIn board.

The Dev_Spec indicate the name of the device and all sampling rate and input range of the device in array of text.

These array can be use to set the String[] in property node of a Text selector.

Input:

"DeviceIn" = Board to get the specification

"Rate_In" = Sampling rate to select in Device specifications

"Range_A" = Input range of channel A to select in Device specifications

"Range_B" = Input range of channel B to select in Device specifications

"Update_Only" = Read actual setting.

Output

"Specifications" = specification of the board.

"Name" = string of the ATS board identification

"Rate" = list of available Sampling Rate in a string array format

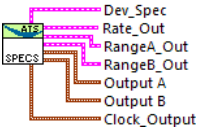
"Rate_Out" = sampling rate in text format and corresponding rate#.

"Range" = list of available Input range in a string array format

"RangeA_out" = Value in text and Range #

"RangeB_out" = Value in text and Range #

Connector Pane



Controls and Indicators

- **Dev_Spec**
  - **Name**
  - **Rate**
    - **String**
  - **Range**
    - **String**
  - **RangeLim(50)**
  - **Bandwidth**
- **Rate_Out**
  - **Text**
  - **Rate**
- **RangeA_Out**
  - **Text**
  - **Range**
- **RangeB_Out**
  - **Text**
  - **Range**
- **Output A**
  - **Coupling**


Range Full scale of the input channel.


Impedance


Bandwidth


Output B


Coupling


Range


Impedance


Bandwidth


Clock_Output Device's Clock parameters.

ClckSource: Internal, External

ClckRate: sampling rate of the Device

ClckEdge: Rising, Falling.

Decimation:


ClckSource Selection of the clock source, Internal or External.


ClckRate Sampling rate.


ClckEdge


Decimation

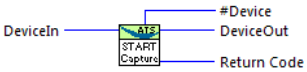
ATS_StartCapture

_____AlazarTech, Scope_____

Description

Arm the device to initiate an acquisition.

Connector Pane



Controls and Indicators

DeviceIn Device # identification.

Return Code This value is equivalent to the return codes that are listed in the ATS-SDK manual

DeviceOut Same as the DeviceIn.

#Device

ATS_State_Device

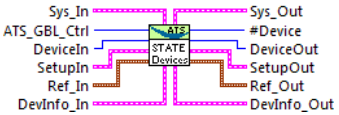
_____AlazarTech, Scope_____

Description

State of all ATS device.

DO NOT MODIFY.

Connector Pane



Controls and Indicators

SetupIn ATS Board setup parameters In.

Record Setup of the record on the device.

Count: number of the record (1-1000)

Presize: number of pretrigger point.

Length: number of record point, including presize.

Count

Presize

Length

Clock Device's Clock parameters.

ClckSource: Internal, External

ClckRate: sampling rate of the Device

ClckEdge: Rising, Falling.

Decimation:

 **ClckSource** Selection of the clock source, Internal or External.

 **ClckRate** Sampling rate.

 **ClckEdge** Synchronisation on the clock pulse, Rising or Falling edge.

 **Decimation**

 **Input A**

 **Coupling** Input coupling, AC or DC.

 **Range** Full scale of the input channel.

 **Impedance** Input impedance: 50ohms, 1Mohms.

 **Bandwidth** Channel selection.

 **Input B** Control of the Input Channel.

Coupling: AC, DC

Range: sensitivity of the device.

Impedance: 50ohms, 1Mohms.

 **Coupling** Input coupling, AC or DC.

 **Range** Full scale of the input channel.

 **Impedance** Input impedance: 50ohms, 1Mohms.

 **Bandwidth** Channel selection.

 **Trigger** Trigger setup of the card.

TrigOperation:

Timeout (s): waiting time if no trigger (0 = no timeout)

Trig. Delay: delay before recording data after trigger.

Engine X: setup of the trigger source X

Engine Y: setup of the trigger source Y.

ExtTrigContol: setup of the external trigger (Coupling, Range)

TrigOperation Trigger operation with the X and Y engine.

Operation:

Only X

Only Y

X or Y

X and Y

X xor Y

X and not Y

not X and Y.

Timeout (s)

Trig. Delay

Engine X Trigger engine setup.

Source: Channel A, Channel B, External, Disable.

Slope: positive, Negative.

Level: 0- 255 (8 bits)

Source

Slope

Level

Engine Y Trigger engine setup.

Source: Channel A, Channel B, External, Disable.

Slope: positive, Negative.

Level: 0- 255 (8 bits)

Source

Slope

Level

ExtTrigControl External trigger setup.

Coupling: AC, DC

Range: X1, Div5

Coupling Input coupling, AC or DC.

Range Trigger Range: X1, Div5

DeviceIn

ATS_GBL_Ctrl

DevInfo_In ATS Board information.

Handle

Board

CPLD

MemorySize

SampleSize

ID

Ref_In ATS Reference setup of the board.

Clock in seconde.

Channel Input in volts.

Clock (s)

RangeA (v)

RangeB (v)

#Device

SetupOut ATS Board setup parameters Out.

Record Setup of the record on the device.

Count: number of the record (1-1000)

Presize: number of pretrigger point.

Length: number of record point, including presize.

Count

Presize

Length

Clock Device's Clock parameters.

ClckSource: Internal, External

ClckRate: sampling rate of the Device

ClckEdge: Rising, Falling.

Decimation:

ClckSource Selection of the clock source, Internal or External.

ClckRate Sampling rate.

ClckEdge Synchronisation on the clock pulse, Rising or Falling edge.

Decimation

Input A

Coupling Input coupling, AC or DC.

Range Full scale of the input channel.

Impedance Input impedance: 50ohms, 1Mohms.

Bandwidth Channel selection.

Input B Control of the Input Channel.

Coupling: AC, DC

Range: sensitivity of the device.

Impedance: 50ohms, 1Mohms.

Coupling Input coupling, AC or DC.

Range Full scale of the input channel.

Impedance Input impedance: 50ohms, 1Mohms.

Bandwidth Channel selection.

Trigger Trigger setup of the card.

TrigOperation:

Timeout (s): waiting time if no trigger (0 = no timeout)

Trig. Delay: delay before recording data after trigger.

Engine X: setup of the trigger source X

Engine Y: setup of the trigger source Y.

ExtTrigContol: setup of the external trigger (Coupling, Range)

TrigOperation Trigger operation with the X and Y engine.

Operation:

Only X

Only Y

X or Y

X and Y

X xor Y

X and not Y

not X and Y.

Timeout (s)

Trig. Delay

Engine X Trigger engine setup.

Source: Channel A, Channel B, External, Disable.

Slope: positive, Negative.

Level: 0- 255 (8 bits)

Source

Slope

Level

Engine Y Trigger engine setup.

Source: Channel A, Channel B, External, Disable.

Slope: positive, Negative.

Level: 0- 255 (8 bits)

Source

Slope

Level

ExtTrigControl External trigger setup.

Coupling: AC, DC

Range: X1, Div5

Coupling Input coupling, AC or DC.

Range Trigger Range: X1, Div5

DeviceOut

DevInfo_Out ATS Board information Out.

Handle

Board

CPLD

MemorySize

SampleSize

ID

Ref_Out

Clock (s)

RangeA (v)

RangeB (v)

ATS_TimeOut_Estimate

_____AlazarTech, Scope_____

Description

Evaluate the Ideal TimeOut in Auto mode.

Connector Pane

Controls and Indicators

Clock_Value Sampling rate value in second.

Rec.Length (B) Data length to record.

Mult (20) Multiply value to get better estimate

TimeOut Estimate Timeout value.

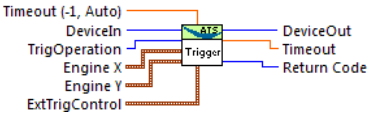
ATS_Trigger

_____AlazarTech, Scope_____

Description

Set the trigger parameters.

Connector Pane



Controls and Indicators

DeviceIn Device # identification.

Engine X Trigger engine setup.

Source: Channel A, Channel B, External, Disable.

Slope: positive, Negative.

Level: 0- 255 (8 bits)

Source

Slope

Level

TrigOperation Trigger operation with the X and Y engine.

Operation:

Only X

Only Y

X or Y

X and Y

X xor Y

X and not Y

not X and Y.

Engine Y Trigger engine setup.

Source: Channel A, Channel B, External, Disable.

Slope: positive, Negative.

Level: 0- 255 (8 bits)

Source

Slope

Level

Timeout (-1, Auto) Time out for the trigger. -1 set auto setup.

ExtTrigControl External trigger setup.

Coupling: AC, DC

Range: X1, Div5

Coupling Input coupling, AC or DC.

Range Trigger Range: X1, Div5

Return Code This value is equivalent to the return codes that are listed in the ATS-SDK manual

DeviceOut Same as the DeviceIn

Timeout

ATS_Triggered

_____AlazarTech, Scope_____

Description

Query the devices's triggered status.

Connector Pane

Controls and Indicators

I32 **DeviceIn** Device # identification.

I32 **DeviceOut** Same as the DeviceIn

TF **Triggered** Trigger status.

ATS_Trunc

_____AlazarTech, Scope_____

Description

Truncate the input value to the lower nearest TruncValue.

NewValue= Trunc(Value/TruncValue) * TruncValue

Connector Pane

Controls and Indicators

Value

TruncValue

NewValue

ATS_Value_in_StringArray

_____AlazarTech, Scope_____

Description

Convert the CLock Rate control to Numerical and Text value.

Connector Pane

Controls and Indicators

Clock_Rate Sampling rate.

Clock_Txt Clock rate in text format.

Clock_Value Clock rate in numerical format.

ATS_WhoTriggered

_____AlazarTech, Scope_____

Description

Determine Triggered status of all boards in the System.

Input:

"sid_In" = system id

"recNum" = record number for which the query is being made

Output:

"brd_Trig" = device # of the first Triggered (-1 if no board has trig)

"Triggered" = indicate triggered event

"All_Trig" = list all status event of all board

"Found_Trig" = if TRUE indicate that at least one board had trigger.

Output:

"ATS_System" = systems identified

: System = System ID

: Handle = communication refnum

: Board = identification

: CPLD = version of the device software.

: MemorySize = size of the memory on the board in bytes.

: SampleSize = number of bit of the digitizer.

Connector Pane

Controls and Indicators

sid_In

recNum

Found_Trig

brd_Trig

Triggered

All_Brds

Triggered

Synchronous DMA VI Description

NOT RECOMMENDED FOR USE IN NEW DESIGNS

Synchronous DMA VIs are provided with ATS-VI, so customers who own ATS digitizers equipped with Dual Port Memory and AutoDMA can control the digitizers from within LabVIEW®.

The example VI for AutoDMA operation is the ATS_AutoDMA VI included in the ATS_Examples folder.

Details about the Synchronous DMA mechanism can be found in the *ATS-SDK Software Manual***.**

A PDF version of the *ATS-SDK Software Manual* can be downloaded from http://www.alazartech.com/support/downloads.htm website.

NOT RECOMMENDED FOR USE IN NEW DESIGNS

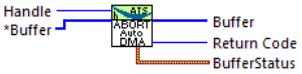
ATS_AbortAutoDMA

_____AlazarTech, Scope_____

Description

Stop the DMA mode.

Connector Pane



Controls and Indicators

Handle

Device handle.

***Buffer**

Supplied buffer to be used for the acquisition.

Elements of the array.

Return Code

This value is equivalent to the return codes that are listed in the ATS-SDK manual

Buffer

Data buffer array containing the acquired data

Elements of the array

BufferStatus

RecordsTransfered

Number of valid records that have been returned in the buffer.

U32 **AUTODMA_Status**

U32 **r1** (not used)

U32 **r2** (not used)

U32 ***r3** (not used)

U32 ***r4** (not used)

NOT RECOMMENDED FOR USE IN NEW DESIGNS

ATS_CloseAutoDMA

_____AlazarTech, Scope_____

Description

Stop the DMA mode.

Connector Pane

Controls and Indicators

U32 **Handle**

Input the Handle to access the device.

U32 **Return Code**

This value is equivalent to the return codes that are listed in the ATS-SDK manual

U32 **Handle_Out**

Same as Handle input. Used for VI chaining.

NOT RECOMMENDED FOR USE IN NEW DESIGNS

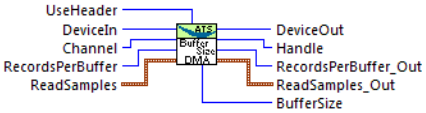
ATS_DMA_Buffer

_____AlazarTech, Scope_____

Description

Evaluate the Buffer size required for the AutoDMA transfer mode.

Connector Pane



Controls and Indicators

U32 **RecordsPerBuffer**

Number of records that fit in 1 buffer.

ReadSamples

I32 **Offset** Starting position to read samples data. Limited by the PreTrigDepth and Record Length of samples.

U32 **Length** Number of Samples Data to read.

Limited by the Record Length of samples.

I32 **DeviceIn** Device # identification.

U32 **UseHeader**

If 0=> no header

If 1=> header is active

Channel

Channel selection.

For single channel mode -> CHANNEL_A or CHANNEL_B

For Dual channel mode -> CHANNEL_A | CHANNEL_B

BufferSize

Size of the buffer in bytes.

ReadSamples_Out

Offset Starting position to read samples data. Limited by the PreTrigDepth and Record Length of samples.

Length Number of Samples Data to read.

Limited by the Record Length of samples.

RecordsPerBuffer_Out

Propagated RecordsPerBuffer parameter used for VI chaining.

Handle

Device handle determined using the VI.

DeviceOut

Propagated device used for chaining VIs.

NOT RECOMMENDED FOR USE IN NEW DESIGNS

ATS_DMA_Buffer_Size

_____AlazarTech, Scope_____

Description

This VI is the same as ATS_DMA_Buffer. It is included because previous versions of the ATS-VI were released with this VI.

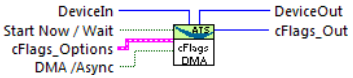
ATS_DMA_cFlags

_____AlazarTech, Scope_____

Description

Create the cFlags parameter on the StartAutoDMA and Asynchronous DMA transfer mode.

Connector Pane



Controls and Indicators

Start Now / Wait

Start immediately acquisition or wait for ATS_StartCapture

cFlags_Options

UseHeader

If 0 ==> No header

If 1 ==> Header with acquired records.

Continuous Capture

If 1 ==> Stream data across the bus without waiting for a trigger.

ReadSamples

Offset Starting position to read samples data. Limited by the PreTrigDepth and Record Length of samples.

Length Number of Samples Data to read.

Limited by the Record Length of samples.

Triggered Stream

If 1 ==> Stream data across the bus after trigger has occurred.

DeviceIn

Device # identification.

DMA /Async

Set in DMA only mode or Asynchronous DMA mode.

cFlags_Out

Propagated cFlags parameter used for chaining VIs.

DeviceOut

Propagated device used for chaining VIs.

NOT RECOMMENDED FOR USE IN NEW DESIGNS

ATS_DMA_cFlags_NoCont

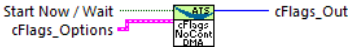
_____AlazarTech, Scope_____

Description

Create the cFlags parameter on the StartAutoDMA transfer mode.

Continuous mode is not Active.

Connector Pane



Controls and Indicators

Start Now / Wait

Start immediately acquisition or wait for ATS_StartCapture

cFlags_Options

UseHeader

If 0 ==> No header

If 1 ==> Header with each acquired record.

Continuous Capture

Always 0

ReadSamples

Offset Starting position to read samples data. Limited by the PreTrigDepth and Record Length of samples.

Length Number of Samples Data to read.

Limited by the Record Length of samples.

Triggered Stream

If 1 ==> Stream data across the bus after trigger has occurred

cFlags_Out

Propagated cFlags parameter used for VI chaining

NOT RECOMMENDED FOR USE IN NEW DESIGNS

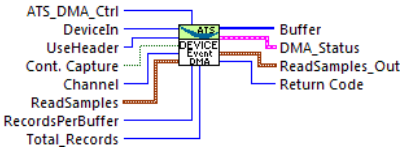
ATS_DMA_Device_Event

_____AlazarTech, Scope_____

Description

Control of the AutoDMA configuration.

Connector Pane



Controls and Indicators

U32 **UseHeader**

If 0 ==> No header

If 1 ==> Header with each acquired record.

Channel

Channel selection.

For single channel mode -> CHANNEL_A or CHANNEL_B

For Dual channel mode -> CHANNEL_A | CHANNEL_B

U32 **RecordsPerBuffer**

Number of records that fit in 1 buffer.

ReadSamples

I32 **Offset** Starting position to read samples data. Limited by the

PreTrigDepth and Record Length of samples.

Length Number of Samples Data to read.

Limited by the Record Length of samples.

ATS_DMA_Ctrl

DeviceIn

Device # identification.

Total_Records Number of Records to acquire in DMA mode.

It must be in RecordsPerBuffer step.

If 0 : continuously acquire data.

Cont. Capture

Return Code This value is equivalent to the return codes that are listed in the ATS-SDK manual

DMA_Status

Start DMA

If True: The Start DMA failed.

StartCapture

If True: Start capture failed.

Valid

If True: The current buffer returned is valid.

Completed

If True: The capture completed successfully.

InProgress

If True: The capture/transfer is in progress.

Timeout

If True: The transfer has timed out. This may happen if no trigger has been received.

Overflow

If True: The acquisition has filled up the buffers and none are available to continue. The most likely reason for this error is that you are trying to transfer data faster than what your computer bus can handle.

Error

If True: Indicating that an error has occurred.

Buffer

element

ReadSamples_Out

Offset Starting position to read samples data. Limited by the PreTrigDepth and Record Length of samples.

NOT RECOMMENDED FOR USE IN NEW DESIGNS

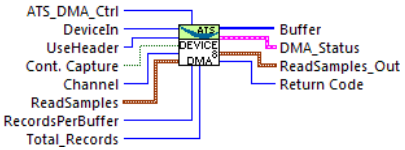
ATS_DMA_Device_U8

_____AlazarTech, Scope_____

Description

Control of the AutoDMA configuration.

Connector Pane



Controls and Indicators

UseHeader

Channel

Channel selection.

For single channel mode -> CHANNEL_A or CHANNEL_B

For Dual channel mode -> CHANNEL_A | CHANNEL_B

RecordsPerBuffer

Number of records that fit in 1 buffer.

ReadSamples

Offset Starting position to read samples data. Limited by the PreTrigDepth and Record Length of samples.

Length Number of Samples Data to read.

Limited by the Record Length of samples.

ATS_DMA_Ctrl

DeviceIn Device # identification.

Total_Records Number of Records to acquire in DMA mode.

It must be in RecordsPerBuffer step.

If 0 : continuously acquire data.

Cont. Capture

Return Code This value is equivalent to the return codes that are listed in the ATS-SDK manual

DMA_Status

Status conditions of the acquisition.

Start DMA

If True: The Start DMA failed.

StartCapture

If True: Start capture failed.

Valid

If True: The current buffer returned is valid.

Completed

If True: The capture completed successfully.

InProgress

If True: The capture/transfer is in progress.

Overflow

If True: The acquisition has filled up the buffers and none are available to continue. The most likely reason for this error is that you are trying to transfer data faster than what your computer bus can handle.

Error

If true then an error has occurred.

Buffer

element

ReadSamples_Out

Offset Starting position to read samples data. Limited by the PreTrigDepth and Record Length of samples.

Length Number of Samples Data to read.

Limited by the Record Length of samples.

NOT RECOMMENDED FOR USE IN NEW DESIGNS

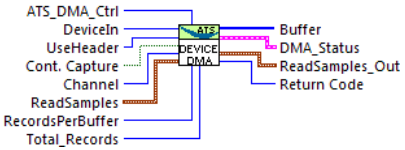
ATS_DMA_Device

_____AlazarTech, Scope_____

Description

Control of the AutoDMA configuration.

Connector Pane



Controls and Indicators

UseHeader

Channel

Channel selection.

For single channel mode -> CHANNEL_A or CHANNEL_B

For Dual channel mode -> CHANNEL_A | CHANNEL_B

RecordsPerBuffer

Number of records in 1 data buffer

ReadSamples

Number of Samples data to read (Length) starting at Offset position.

Offset Starting position to read samples data. Limited by the PreTrigDepth and Record Length of samples.

Length Number of Samples Data to read.

Limited by the Record Length of samples.

ATS_DMA_Ctrl

DeviceIn Device # identification.

Total_Records Number of Records to acquire in DMA mode.

It must be in RecordsPerBuffer step.

If 0 : continuously acquire data.

Return Code This value is equivalent to the return codes that are listed in the ATS-SDK manual

DMA_Status

Start DMA

If True: The Start DMA failed.

StartCapture

If True: Start capture failed.

Valid

If True: The current buffer returned is valid.

Completed

If True: The capture completed successfully.

InProgress

If True: The capture/transfer is in progress.

Timeout

If True: The transfer has timed out. This may happen if no trigger has been received.

Overflow

If True: The acquisition has filled up the buffers and none are

available to continue. The most likely reason for this error is that you are trying to transfer data faster than what your computer bus can handle.

Error

If True: Indicating that an error has occurred.

Buffer

element

Elements of the data array.

ReadSamples_Out

Number of Samples data to read (Length) starting at Offset position.

Offset

Starting position to read samples data. Limited by the PreTrigDepth and Record Length of samples.

Length

Number of Samples Data to read.

Limited by the Record Length of samples.

NOT RECOMMENDED FOR USE IN NEW DESIGNS

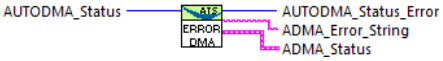
ATS_DMA_Errors

_____AlazarTech, Scope_____

Description

Reports any errors encountered by AutoDMA vis.

Connector Pane



Controls and Indicators

AUTODMA_Status

AUTODMA_Status_Error

ADMA_Error_String

ADMA_Status

ADMA_No_Error

If TRUE: No error

Buf1_Invalid

If TRUE: A bad buffer was used. The buffer was probably not allocated properly.

Buf2_Invalid

If TRUE: A bad buffer was used. The buffer was probably not allocated properly.

Handle_Invalid

If TRUE: The handle provided is invalid.

Int_Buf1_Invalid

If TRUE: A bad buffer was used. The buffer was probably not allocated properly.

Int_Buf2_Invalid

If TRUE: A bad buffer was used. The buffer was probably not allocated properly.

Overflow

If True: The acquisition has filled up the buffers and none are available to continue. The most likely reason for this error is that you are trying to transfer data faster than what your computer bus can handle.

Invalid Channel

If True: The channel parameter is invalid.

Inprogress

If TRUE: The DMA transfer is still progressing.

NOT RECOMMENDED FOR USE IN NEW DESIGNS

ATS_Events

_____AlazarTech, Scope_____

Description

Control the Events setting.

Connector Pane

Controls and Indicators

U32 **Handle**

Device handle.

U32 **Enable**

If 0 => events are disabled.

If 1 => events are enabled.

U32 **Return Code**

This value is equivalent to the return codes that are listed in the ATS-SDK manual.

U32 **Handle Out**

Propagated device handle used for VI chaining.

NOT RECOMMENDED FOR USE IN NEW DESIGNS

ATS_GetNextBuffer

_____AlazarTech, Scope_____

Description

In the AutoDMA mode get the available Records.

Connector Pane

Controls and Indicators

U32 **Handle**

Handle to the BoardID

U32 **BufferSize**

Size of the buffer in bytes.

U16 **Buffer_In**

Buffer space to transfer the Records.

U16 **element**

Access point to the array of elements.

TF **FirstCall**

U32 **Return Code**

This value is equivalent to the return codes that are listed in the ATS-SDK manual

U16 ***Buffer**

Buffer of the transferred Records


Access point to the array of elements.


***WhichOne** Indicate the buffer used in the AutoDMA mode.


BufferStatus


RecordsTransfered

The total number of records that have already been transferred.


AUTODMA_Status


r1 (No used)


r2 (No used)


TriggersOccured

The total number of triggers that have already occurred.


***r4** (No used)

NOT RECOMMENDED FOR USE IN NEW DESIGNS

ATS_Header

_____AlazarTech, Scope_____

Description

Extract the setting of the ATS board from the 16 bytes header.

A detailed explanation of the header is available in the ATS-SDK manual.

Connector Pane

Controls and Indicators

Header_U16

element

Access to the U16 word elements that make the header.

Header

SerialNumber

Device serial number

SystemNumber

Device system number

WhichChannel

The channel which this header refers to:

0 = CHANNEL_A

1 = CHANNEL_B

BoardNumber

Device id .

SampleResolution

Resolution in bits of the device:

ATS860 = 8bits

ATS460 = 14 bits

ATS660, ATS9462 = 16 bits

DataFormat

00 = Straight binary

01 = 2's compliment

10 = Signed binary

11 = Gray code

RecordNumber

The record that this header belongs to.

BoardType

One of the AlazarTech device codes.

TimeStamp_Low

Lower 32 bits of the TimeStamp.

TimeStamp_High

Upper 8 bits ot the TimeStamp

ClockSource

Internal, external, or PLL clock

ClockEdge

0 = Falling edge

1 = Rising edge

SampleRate

Refer to AlazarTech Sample Rate constants in the ATS-SDK manual.

InputRange

Refer to AlazarTech Input Range constants in the ATS-SDK manual.

InputCoupling

Refer to AlazarTech Input Coupling constants in the ATS-SDK manual.

InputImpedance

Refer to AlazarTech Input Impedance constants in the ATS-SDK manual.

ExternalTriggered

0 = External Trigger circuitry did not trigger the device.

1 = External Trigger circuitry did trigger the device.

ChannelBTriggered

0 = Channel B trigger circuitry did not trigger the device.

1 = Channel B trigger circuitry did trigger the device.

ChanelATriggered

0 = Channel A trigger circuitry did not trigger the device.

1 = Channel A trigger circuitry did trigger the device.

TimeoutOccurred

0 = The device did not issue a trigger due to a timeout.

1= The device issued a trigger due to a timeout.

ThisChannelTriggered

Used for multiple device Master/Slave systems. This is used to indicate that the trigger circuitry of the current device for which

this record belongs to, was the source of the system trigger.

0 = This device was not the source of the system trigger.

1 = This device was the source of the system trigger.

NOT RECOMMENDED FOR USE IN NEW DESIGNS

ATS_Record

_____AlazarTech, Scope_____

Description

Extract information from the Data_Buffer.

- Record_Number,

- TimeStamp, whose units are in Sample clocks resolution,

- The digitized signal and the setting of the ATS board from the 16 bytes header.

Connector Pane

Controls and Indicators

U16 **Data_Buffer** Record of data and Header

U16 **element**

Access to the U16 word elements that make the header.

I32 **WhichRecord**

Which record (index to 0) to look in the Data_Buffer.

I32 **#Channel**

Number of channel per record in the Data_Buffer.

I32 **SampleLength**

Number of sample per Channel.

Records

RecordNumber

This record's id number.

TimeStamp_Clk

The 40 bit computation of ((TimeStamp_High << 32) + TimeStamp_Low)

Data

Array of U16 type containing the data.

element

Header

SerialNumber

Device serial number

SystemNumber

Device system number

WhichChannel

The channel which this header refers to:

0 = CHANNEL_A

1 = CHANNEL_B

BoardNumber

Device id .

SampleResolution

Resolution in bits of the device:

ATS860 = 8bits

ATS460 = 14 bits

ATS660, ATS9462 = 16 bits

DataFormat

00 = Straight binary

01 = 2's compliment

10 = Signed binary

11 = Gray code

RecordNumber

The record that this header belongs to.

BoardType

One of the AlazarTech device codes.

TimeStamp_Low

Lower 32 bits of the TimeStamp.

TimeStamp_High

Upper 8 bits ot the TimeStamp

ClockSource

Internal, external, or PLL clock

ClockEdge

0 = Falling edge

1 = Rising edge

SampleRate

Refer to AlazarTech Sample Rate constants in the ATS-SDK manual.

InputRange

Refer to AlazarTech Input Range constants in the ATS-SDK manual.

InputCoupling

Refer to AlazarTech Input Coupling constants in the ATS-SDK manual.

InputImpedance

Refer to AlazarTech Input Impedance constants in the ATS-SDK manual.

ExternalTriggered

0 = External Trigger circuitry did not trigger the device.

1 = External Trigger circuitry did trigger the device.

ChannelBTriggered

0 = Channel B trigger circuitry did not trigger the device.

1 = Channel B trigger circuitry did trigger the device.

ChanelATriggered

0 = Channel A trigger circuitry did not trigger the device.

1 = Channel A trigger circuitry did trigger the device.

TimeoutOccurred

0 = The device did not issue a trigger due to a timeout.

1= The device issued a trigger due to a timeout.

ThisChannelTriggered

Used for multiple device Master/Slave systems. This is used to indicate that the trigger circuitry of the current device for which this record belongs to, was the source of the system trigger.

0 = This device was not the source of the system trigger.

1 = This device was the source of the system trigger.

Valid True: WhichRecord is in the Data_Buffer.

NOT RECOMMENDED FOR USE IN NEW DESIGNS

ATS_Record_Header

_____AlazarTech, Scope_____

Description

Extract the setting of the ATS board from the 16 bytes header.

Connector Pane

Controls and Indicators

Header_U16

element

Access to the U16 word elements that make the header

Header

SerialNumber

Device serial number

SystemNumber

Device system number

WhichChannel

The channel which this header refers to:

0 = CHANNEL_A

1 = CHANNEL_B

BoardNumber

Device id .

SampleResolution

Resolution in bits of the device:

ATS860 = 8bits

ATS460 = 14 bits

ATS660, ATS9462 = 16 bits

DataFormat

00 = Straight binary

01 = 2's compliment

10 = Signed binary

11 = Gray code

RecordNumber

The record that this header belongs to.

BoardType

One of the AlazarTech device codes.

TimeStamp_Low

Lower 32 bits of the TimeStamp.

TimeStamp_High

Upper 8 bits ot the TimeStamp

ClockSource

Internal, external, or PLL clock

ClockEdge

0 = Falling edge

1 = Rising edge

SampleRate

Refer to AlazarTech Sample Rate constants in the ATS-SDK manual.

InputRange

Refer to AlazarTech Input Range constants in the ATS-SDK manual.

InputCoupling

Refer to AlazarTech Input Coupling constants in the ATS-SDK manual.

InputImpedance

Refer to AlazarTech Input Impedance constants in the ATS-SDK manual.

ExternalTriggered

0 = External Trigger circuitry did not trigger the device.

1 = External Trigger circuitry did trigger the device.

ChannelBTriggered

0 = Channel B trigger circuitry did not trigger the device.

1 = Channel B trigger circuitry did trigger the device.

ChanelATriggered

0 = Channel A trigger circuitry did not trigger the device.

1 = Channel A trigger circuitry did trigger the device.

TimeoutOccurred

0 = The device did not issue a trigger due to a timeout.

1= The device issued a trigger due to a timeout.

ThisChannelTriggered

Used for multiple device Master/Slave systems. This is used to indicate that the trigger circuitry of the current device for which this record belongs to, was the source of the system trigger.

0 = This device was not the source of the system trigger.

1 = This device was the source of the system trigger.

TimeStamp_Clk

The 40 bit computation of ((TimeStamp_High << 32) + TimeStamp_Low)

RecordNumber

This record's id number.

NOT RECOMMENDED FOR USE IN NEW DESIGNS

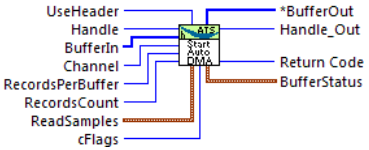
ATS_StartAutoDMA

_____AlazarTech, Scope_____

Description

Start the AutoDMA mode.

Connector Pane



Controls and Indicators

UseHeader

Add the Header to the Records. (16 bytes)

Channel

Channel selection.

For single channel mode -> CHANNEL_A or CHANNEL_B

For Dual channel mode -> CHANNEL_A | CHANNEL_B

RecordsPerBuffer

The number of records that comprise 1 buffer.

Handle Handle to the BoardID

ReadSamples Number of Samples data to read (Length) starting at Offset position.

Offset Starting position to read samples data. Limited by the PreTrigDepth and Record Length of samples.

Length Number of Samples Data to read.

Limited by the Record Length of samples.

BufferIn

Buffer to be used in the first AutoDMA transfer.

cFlags

Control Flags used for the acquisition. The C-language equivalent values follow:

#define ADMA_EXTERNAL_STARTCAPTURE	0x00000001
#define ADMA_TRADITIONAL_MODE	0x00000000
#define ADMA_CONTINUOUS_MODE	0x00000100
#define ADMA_NPT	0x00000200
#define ADMA_TRIGGERED_STREAMING	0x00000400
#define ADMA_FIFO_ONLY_STREAMING	0x00000800

RecordsCount

Total number of records for the acquisition.

Return Code

This value is equivalent to the return codes that are listed in the ATS-SDK manual

***BufferOut**

BufferStatus

RecordsTransfered

AUTODMA_Status

 **r1** (not used)

 **r2** (not used)

 ***r3** (not used)

 ***r4** (not used)

NOT RECOMMENDED FOR USE IN NEW DESIGNS

ATS_StartCaptureDMA

_____AlazarTech, Scope_____

Description

Start the Capture of records in the DMA mode.

Connector Pane

Controls and Indicators

U32 **Handle**

Device handle.

U32 **Return Code**

This value is equivalent to the return codes that are listed in the ATS-SDK manual.

NOT RECOMMENDED FOR USE IN NEW DESIGNS

ATS_WaitForBufferReady

_____AlazarTech, Scope_____

Description

Stop the DMA mode.

Connector Pane

Controls and Indicators

U32 **Handle**

Device handle.

U32 **TMS**

Timeout in Seconds.

U32 **Return Code**

This value is equivalent to the return codes that are listed in the ATS-SDK manual

U32 **Handle Out**

Propagated device handle used for VI chaining.

Asynchronous DMA VI Description

Asynchronous DMA is a unique feature found on the ATS9462, ATS460, ATS660, and ATS860 digitizers.

A rich set of AsyncDMA VIs are provided to take advantage of this transfer mode. The following is a detailed explanation of each.

ATS_Async_Buffer_Size

_____AlazarTech, Scope_____

Description

Evaluate the Buffer size require for the AsyncDMA transfer mode.

The uBytesToRead parameter must be equal to the size of the AutoDMA transfer in bytes, which can be calculated as follows:

- If the ADMA_ENABLE_HEADERS flag was set, then the size the record header in samples is:

  record_header_size_samples = 16 bytes / bytes_per_sample;

  If the ADMA_ENABLE_HEADERS flag was not set, then the size of the record the size of the record header in samples is zero.

  record_header_size_samples = 0;

- The number of bytes per record is given by:

  bytes_per_record = bytes_per_sample *

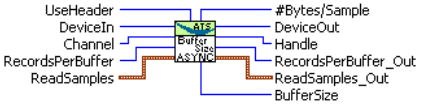
  (record_header_size_samples + samples_per_record);

- The number of bytes per transfer is given by:

  bytes_per_transfer = number_of_enabled_channels *

  bytes_per_record * records_per_transfer;

Connector Pane



Controls and Indicators

RecordsPerBuffer

Number of record that make up one buffer.

ReadSamples

Number of Samples data to read (Length) starting at Offset position.

Offset Starting position to read samples data. Limited by the PreTrigDepth and Record Length of samples.

Length Number of Samples Data to read.

Limited by the Record Length of samples.

DeviceIn

Device # identification.

UseHeader

1 = Instructs the device hardware to prepend a header to each record. The header is explained below.

0 = Instructs the device hardware not to prepend a header to each record.

Channel

Channel selection.

For single channel mode -> CHANNEL_A or CHANNEL_B

For Dual channel mode -> CHANNEL_A | CHANNEL_B

BufferSize

Buffer length needed, as determined with the information above.

ReadSamples_Out Number of Samples data to read (Length) starting at Offset position.

Offset Starting position to read samples data. Limited by the PreTrigDepth and Record Length of samples.

Length Number of Samples Data to read.

Limited by the Record Length of samples.

RecordsPerBuffer_Out

Propagated number of record that make up one buffer used for VI chaining.

Handle

Device handle

DeviceOut

Device id used for chaining VIs.

#Bytes/Sample

2 = number of bytes in one sample on ATS460, ATS660 and ATS9462.

1 = number of bytes in one sample on the ATS860.

ATS_Async_Code

_____AlazarTech, Scope_____

Description

Interpret the return codes generated by the AsyncDMA routines in the DLL.

The following codes are supported:

512: no error

518: Api DMA In progress

579: API Wait Timeout

582: Api Buffer Overflow

589: API transfer completed

Connector Pane

Controls and Indicators

AsyncCode

Status/Error codes listed above.

Async_Status_In

Return value, if not Valid or Complete then an error has occurred.

Start DMA

If True: The Start DMA failed.

StartCapture

If True: Start capture failed.

Valid

If True: The current buffer returned is valid.

Completed

If True: The capture completed successfully.

InProgress

If True: The capture/transfer is in progress.

Timeout

If True: The transfer has timed out. This may happen if no trigger has been received

Overflow

If True: The acquisition has filled up the buffers and none are available to continue. The most likely reason for this error is that you are trying to transfer data faster than what your computer bus can handle.

Error

If True: Indicating that an error has occurred.

Async_Status_Out

(PROPAGATED VALUE)

Return value, if not Valid or Complete then an error has occurred.

If True: **Start DMA**

The Start DMA failed.

StartCapture

If True: Start capture failed.

Valid

If True: The current buffer returned is valid.

Completed

If True: The capture completed successfully.

InProgress

If True: The capture/transfer is in progress.

Timeout

If True: The transfer has timed out. This may happen if no trigger has been received

Overflow

If True: The acquisition has filled up the buffers and none are available to continue. The most likely reason for this error is that you are trying to transfer data faster than what your computer bus can handle.

Error

If True: Indicating that an error has occurred.

ATS_AsyncDMA_cFlags

_____AlazarTech, Scope_____

Description

Create the cFlags parameter on the StartAutoDMA and Asynchronous DMA transfer mode.

Connector Pane

Controls and Indicators

Start Now / Wait Start immediately acquisition or wait for ATS_StartCapture

cFlags_Options Options available trough the cFlags parameter in the Auto DMA mode.

UseHeader

If 0 ==> No header

If 1 ==> Header with each acquired record.

Traditional

Configure the device in Traditional AsyncDMA capture mode.

NPT

Configure the device in Non-Pretrigger AsyncDMA capture mode.

Continuous

Configure the device in Streaming capture mode without a

trigger event.

Triggered

Configure the device in Streaming capture mode with a trigger event.

DMA /Async

Set in DMA only mode or Asynchronous DMA mode

Alloc_Buffers

Set in DMA only mode or Asynchronous DMA mode.

DeviceIn

Device # identification.

ReadSamples

Number of Samples data to read (Length) starting at Offset position (pretrigger).

Offset Starting position to read samples data. Limited by the PreTrigDepth and Record Length of samples.

Length Number of Samples Data to read.

Limited by the Record Length of samples.

cFlags_Out

Propagated cFlags parameter used in VI chaining.

DeviceOut

Device id used for chaining VIs.

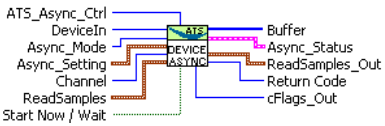
ATS_AsyncDMA_Device

_____AlazarTech, Scope_____

Description

Control of the AsyncDMA configuration. Used for ATS460, ATS660 and ATS9462 devices.

Connector Pane



Controls and Indicators

Channel

Channel selection.

For single channel mode -> CHANNEL_A or CHANNEL_B

For Dual channel mode -> CHANNEL_A | CHANNEL_B

ReadSamples Number of Samples data to read (Length) starting at Offset position.

Offset Starting position to read samples data. Limited by the PreTrigDepth and Record Length of samples.

Length Number of Samples Data to read.

Limited by the Record Length of samples.

ATS_Async_Ctrl

DeviceIn

Device # identification.

Async_Mode

Selection between Traditional, Non-PreTrigger, Continuous, and Triggered Streaming AsyncDMA modes.

Async_Setting

UseHeader

If 0 ==> No header

If 1 ==> Header with each acquired record.

Rec/Buffer

The number of records that will be returned in 1 buffer.

Total_Rec Number of Records to acquire in DMA mode.

It must be in RecordsPerBuffer step.

If 0 : continuously acquire data.

Start Now / Wait

Start immediately acquisition or wait for ATS_StartCapture.

Return Code

This value is equivalent to the return codes that are listed in the ATS-SDK manual.

Async_Status

Return value, if not Valid or Complete then an error has occurred.

Start DMA

If True: The Start DMA failed.

StartCapture

If True: Start capture failed.

Valid

If True: The current buffer returned is valid.

Completed

If True: The capture completed successfully.

InProgress

If True: The capture/transfer is in progress.

Timeout

If True: The transfer has timed out. This may happen if no trigger has been received

Overflow

If True: The acquisition has filled up the buffers and none are available to continue. The most likely reason for this error is that you are trying to transfer data faster than what your computer bus can handle.

Error

If True: Indicating that an error has occurred.

Buffer

element

Individual elements in the Buffer Array.

ReadSamples_Out

Number of Samples data to read (Length) starting at Offset position.

Offset

Starting position to read samples data. Limited by the PreTrigDepth and Record Length of samples.

Length

Number of Samples Data to read.

Limited by the Record Length of samples.

cFlags_Out

Propagated cFlags parameter used in VI chaining.

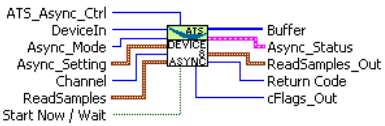
ATS_AsyncDMA_Device_U8

_____AlazarTech, Scope_____

Description

Control of the AsyncDMA configuration. Used on ATS860 devices.

Connector Pane



Controls and Indicators

Channel

Channel selection.

For single channel mode -> CHANNEL_A or CHANNEL_B

For Dual channel mode -> CHANNEL_A | CHANNEL_B

ReadSamples

Number of Samples data to read (Length) starting at Offset position.

Offset

Starting position to read samples data. Limited by the PreTrigDepth and Record Length of samples.

Length

Number of Samples Data to read.

Limited by the Record Length of samples.

ATS_Async_Ctrl

DeviceIn

Device # identification.

Async_Mode

Selection between Traditional, Non-PreTrigger, Continuous, and Triggered Streaming AsyncDMA modes.

Async_Setting

UseHeader

If 0 ==> No header

If 1 ==> Header with each acquired record.

Rec/Buffer

Number of records in one buffer.

Total_Rec

Number of Records to acquire in DMA mode.

It must be in RecordsPerBuffer step.

If 0 : continuously acquire data.

Start Now / Wait

Start immediately acquisition or wait for ATS_StartCapture

Return Code

This value is equivalent to the return codes that are listed in the ATS-SDK manual

Async_Status

Return value, if not Valid or Complete then an error has occurred.

Start DMA

If True: The Start DMA failed.

StartCapture

If True: Start capture failed.

Valid

If True: The current buffer returned is valid.

Completed

If True: The capture completed successfully.

InProgress

If True: The capture/transfer is in progress.

Timeout

If True: The transfer has timed out. This may happen if no trigger has been received

Overflow

If True: The acquisition has filled up the buffers and none are available to continue. The most likely reason for this error is that you are trying to transfer data faster than what your computer bus can handle.

Error

If True: Indicating that an error has occurred.

Buffer

element Individual elements in the Buffer Array

ReadSamples_Out

Number of Samples data to read (Length) starting at Offset position.

Offset

Starting position to read samples data. Limited by the PreTrigDepth and Record Length of samples.

Length

Number of Samples Data to read.

Limited by the Record Length of samples.

cFlags_Out

Propagated cFlags parameter used in VI chaining.

ATS_AsyncGetSetBufCount

_____AlazarTech, Scope_____

Description

Get or Set&Get the Buffer Count used in the AsyncDMA mode. By default, 64 buffers are assigned to each digitizer device. This has proven to be a sufficient amount for most AsyncDMA applications. However, in the case where the acquisition system overflows prematurely, due to an unpredictable increase in overall system activity, the user can increase the number accordingly. It is not unusual to use this API to set a buffer count as high as 128.

Connector Pane

Controls and Indicators

DeviceIn

Device # identification.

BuffCount

The total number of allocated buffers.

Get / Set&Get

If 0 => get the number of buffers

If 1=> Set the number of buffers and return the value in BufCount_Out

BufCount_Out

The total number of allocated buffers.

Return Code

This value is equivalent to the return codes that are listed in the ATS-

SDK manual

I32 **DeviceOut**

Device id used for chaining VIs.

Detailed explanation

In an attempt to minimize the effects of the nondeterministic nature of the Windows® OS, we keep a queue of buffers that the board and driver populate via an interrupt service routine.

By default, for the LabVIEW® AsyncDMA VI, we allocate 64 buffers. So in terms of memory usage, the VI makes the dll/driver allocate 64 buffers, where each buffer is RecordLength*RecordsPerBuffer*2 for single channel and twice that for dual channel. With the exception for the ATS860, which is an 8 bit board, so, RecordLength*RecordsPerBuffer, is sufficient.

As the capture is occurring, buffers are maintained as a circular queue. When one of the buffers is fully populated by the DMA, its contents are copied by the ATSApi dll into the LabVIEW® array used by the VI and then it is posted to the back of the circular queue. This circular activity continues until the capture is finished.

The Latency that is needed is to make sure that the Windows OS activities that are unrelated to the capture do not interrupt the capture. In your case, as you increase the buffer size, you spend more time populating the buffer for the capture in the interrupt service routine. If we get to a point that the board is trying to send data to a buffer that is not available, (that is - none of the 64 buffers have been set up for a transfer) then the system will overflow.

We have found that generally on our systems, with a latency of greater than a few seconds, Windows OS's don't inadvertently disrupt the capture.

So the theory on Latency is as follows:

Latency Protection = (1/fs) * BufferCount * BufferSize / 2

where Buffer size is in bytes

The size of each buffer must be at least 512 KB and less than 16 Mbytes.

If we use your numbers:

Latency = (1 / 20MS/s) * 64 * 4096000 / 2 = 6 Sec.

Latency with buffer size of 128000 is 0.2 sec.

One important point is that if a computer system only has 1 or 2 Gigabytes of memory, having 64 buffers of 16 MB each may not be possible.

ATS_AsyncGetPendingEmptyBufStatus

_____AlazarTech, Scope_____

Description

Get the number of buffers that contain no data.

Connector Pane

Controls and Indicators

DeviceIn

Device # identification.

Empty

The number of empty buffers.

Return Code

This value is equivalent to the return codes that are listed in the ATS-SDK manual

DeviceOut

Device id used for chaining VIs.

ATS_AsyncGetPendingFullBufStatus

_____AlazarTech, Scope_____

Description

Get the number of buffers that contain valid data.

Connector Pane

Controls and Indicators

DeviceIn

Device # identification.

BufCount_Out

The number of buffers.

Return Code

This value is equivalent to the return codes that are listed in the ATS-SDK manual

DeviceOut

Device id used for chaining VIs.

ATS_AsyncGetPendingBufStatus

_____AlazarTech, Scope_____

Description

Get the number of pending buffers that are still available for the capture.

Connector Pane

Controls and Indicators

DeviceIn

Device # identification.

BufCount_Out

The number of pending buffers

Return Code

This value is equivalent to the return codes that are listed in the ATS-SDK manual

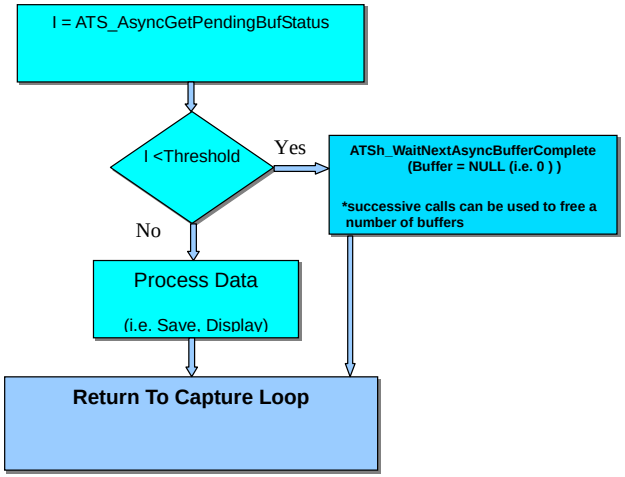
DeviceOut

Device id used for chaining VIs.

Detailed Description

A user can use the Pending buffer status to prevent an overflow condition. This is done by, selecting a threshold limit and testing if the current number of Pending buffers is lower than the threshold.

If the threshold is exceeded, each ATSh_WaitNextAsyncBufferComplete call with a NULL buffer parameter will free a buffer.


I = ATS_AsyncGetPendingBufStatus
I <Threshold
Yes
No
ATSh_WaitNextAsyncBufferComplete
(Buffer = NULL (i.e. 0))
*successive calls can be used to free a number of buffers
Process Data
(i.e. Save, Display)
Return To Capture Loop

ATSh_AbortAsyncRead

_____AlazarTech, Scope_____

Description

Aborts any in-progress transfers, and cancels any pending transfers on the board.

A call to this VI is mandatory when exiting or closing an application.

Connector Pane

Controls and Indicators

Handle

Device handle.

Return Code

This value is equivalent to the return codes that are listed in the ATS-SDK manual

Handle_Out

Propagated device handle used for chaining VIs.

ATSh_AsyncBuffer

_____AlazarTech, Scope_____

Description

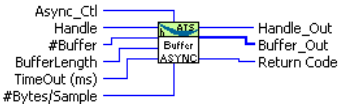
Control of the Buffer in the Async.

States

"InitBuffer" : initialize the array buffer to read the data in U16 format.

"Wait" : transfer the data in the buffer if available.

Connector Pane



Controls and Indicators

Handle

Device handle.

TimeOut (ms)

The amount of milliseconds to wait before determining that the capture is not progressing and the VI returns with an underflow error.

#Buffer

Buffer identification number.

Async_Ctl

BufferLength

Size of the Buffer in bytes.

#Bytes/Sample

The number of bytes that make one sample of data.

Handle_Out

Propagated Handle used for VI chaining.

Buffer_Out

Resulting data buffer after the data for that buffer has been captured and transferred.

Elements of the Array that comprise the buffer.

Return Code

This value is equivalent to the return codes that are listed in the ATS-SDK manual

ATSh_AsyncBuffer_U8

_____AlazarTech, Scope_____

Description

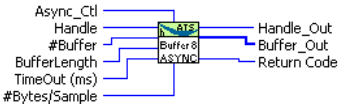
Control of the Buffer in the Async.

States

"InitBuffer" : initialize the array buffer to read the data in U8 format.

"Wait" : transfer the data in the buffer if available.

Connector Pane



Controls and Indicators

Handle

Device handle.

TimeOut (ms)

The amount of milliseconds to wait before determining that the capture is not progressing and the VI returns with an underflow error.

#Buffer

Buffer identification number.

Async_Ctl

BufferLength

Size of the Buffer in bytes.

#Bytes/Sample

The number of bytes that make one sample of data.

Handle_Out

Propagated Handle used for VI chaining.

Buffer_Out

Resulting data buffer after the data for that buffer has been captured and transferred.

Elements of the Array that comprise the buffer.

Return Code

This value is equivalent to the return codes that are listed in the ATS-SDK manual

ATSh_BeforeAsyncRead

_____AlazarTech, Scope_____

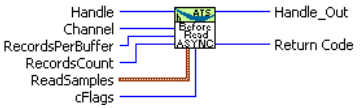
Description

Configures a board for asynchronous AutoDMA transfers to host memory.

The ATS860, ATS460 and ATS660 use the on-board memory in combination with the device's FPGA circuitry to create a FIFO that is used to overcome system latencies. This is required since the PCI bus transfer rate is typically less that 120MB/s.

For the ATS9462, transfers take place directly to the host memory using a FIFO that resides in the FPGA. On-board memory is not required because of the higher speed performance of the PCIe bus as compared to the PCI bus. Typically, the ATS9462 can transfer ate rates of 1GB/s.

Connector Pane



Controls and Indicators

Channel

Channel selection.

For single channel mode -> CHANNEL_A or CHANNEL_B

For Dual channel mode -> CHANNEL_A | CHANNEL_B

RecordsPerBuffer

Number of records that comprise 1 buffer.

Handle

Handle to the BoardID

ReadSamples

Number of Samples data to read (Length) starting at Offset position.

Offset

Starting position to read samples data. Limited by the PreTrigDepth and Record Length of samples.

Length

Number of Samples Data to read.

Limited by the Record Length of samples.

cFlags

Control Flags used for the acquisition. The C-language equivalent values follow:

#define ADMA_EXTERNAL_STARTCAPTURE 0x00000001

#define ADMA_ENABLE_RECORD_HEADERS 0x00000008

#define ADMA_TRADITIONAL_MODE 0x00000000

#define ADMA_CONTINUOUS_MODE 0x00000100

#define ADMA_NPT 0x00000200

#define ADMA_TRIGGERED_STREAMING 0x00000400

#define ADMA_FIFO_ONLY_STREAMING 0x00000800

RecordsCount

Total number of records for the acquisition.

Return Code

This value is equivalent to the return codes that are listed in the ATS-SDK manual

Handle_Out

Propagated device handle used for chaining VIs.

ATSh_StartCaptureAsync

_____AlazarTech, Scope_____

Description

Start the Capture of records in the DMA mode.

Connector Pane

Controls and Indicators

Handle

Device handle.

Return Code

This value is equivalent to the return codes that are listed in the ATS-SDK manual

ATSh_WaitNextAsyncBufferComplete

_____AlazarTech, Scope_____

Description

Wait for an asynchronous transfer from on-board to host memory to complete. Used on the ATS460, ATS660 and ATS9462 devices.

This API can also be used to purposely discard a number of captured data buffers in an attempt to avoid an OVERFLOW situation. To discard a buffer, set the pBuffer_In parameter to NULL (0). This action can be performed any time the user believes that an OVERFLOW situation is about to happen.

Connector Pane

Controls and Indicators

U32 **Handle**

Device Handle.

U32 **uTimeout_ms**

The amount of milliseconds to wait before determining that the capture is not progressing and the VI returns with an underflow error.

U16 **pBuffer_In**

Buffer provided for the data transfer.

U16 Elements of the Array that comprise the buffer.

U32 **uBytesPerBuffer**

Number of bytes that comprise 1 record.

U32 **Return Code**

This value is equivalent to the return codes that are listed in the ATS-SDK manual

Handle_Out

Propagated device handle used for VI chaining.

pBuffer_Out

Resulting data buffer after the data for that buffer has been captured and transferred.

U16 Elements of the Array that comprise the buffer.

ATSh_WaitNextAsyncBufferCompleteU8

_____AlazarTech, Scope_____

Description

Wait for an asynchronous transfer from on-board to host memory to complete. Used on the ATS860 device.

This API can also be used to purposely discard a number of captured data buffers in an attempt to avoid an OVERFLOW situation. To discard a buffer, set the pBuffer_In parameter to NULL (0). This action can be performed any time the user believes that an OVERFLOW situation is about to happen.

Connector Pane

Controls and Indicators

U32 **Handle**

Device handle.

U32 **uTimeout_ms**

The amount of milliseconds to wait before determining that the capture is not progressing and the VI returns with an underflow error.

U8 **pBuffer_In**

Buffer provided for the data transfer.

U8 Elements of the Array that comprise the buffer.

U32 **uBytesPerBuffer**

Number of bytes that comprise 1 record.

U32 **Return Code**

This value is equivalent to the return codes that are listed in the ATS-SDK manual

Handle_Out

Propagated device handle used for VI chaining.

pBuffer_Out

Resulting data buffer after the data for that buffer has been captured and transferred.

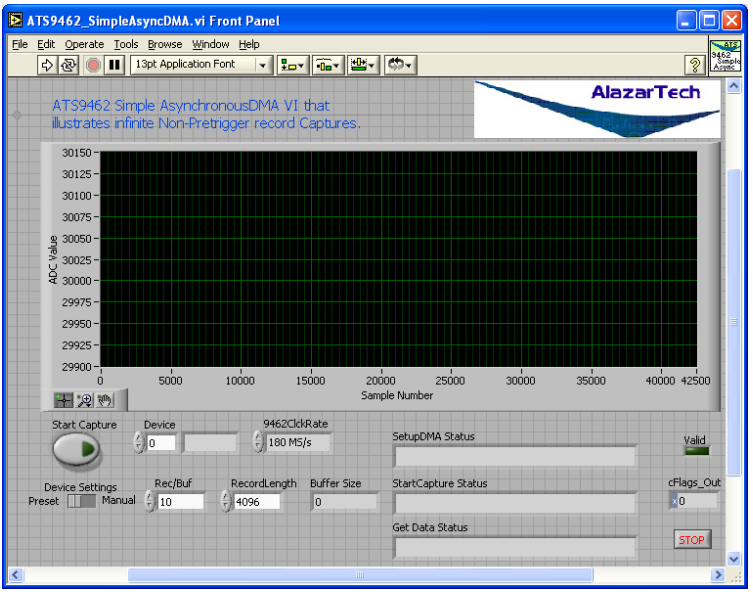
U8 Elements of the Array that comprise the buffer

ATS9462_SimpleAsyncDMA Example

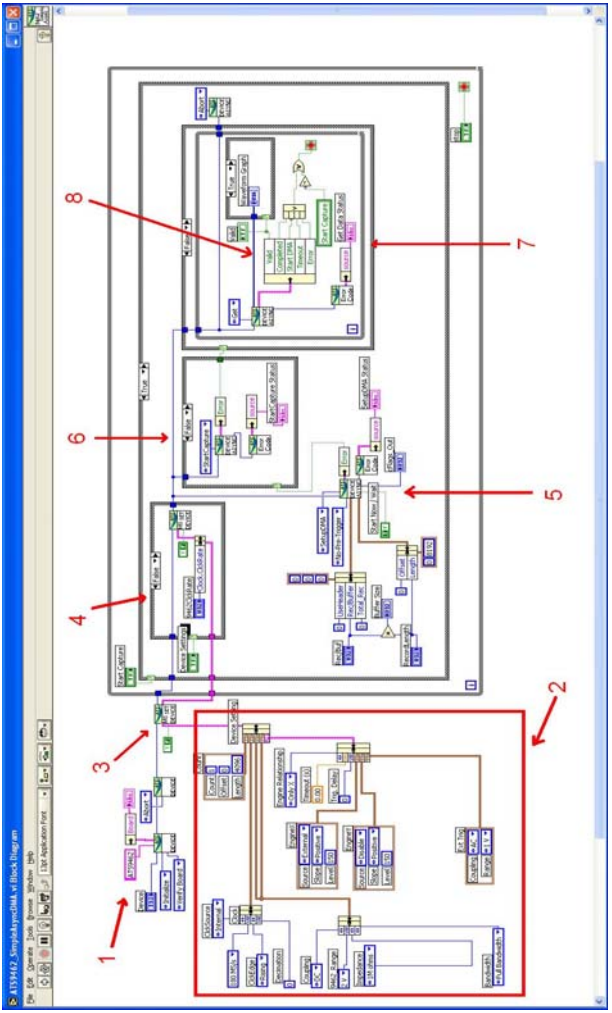
This VI demonstrates how easy it is to use the Asynchronous DMA.

It can be used to perform a “No-Pretrigger Infinite Records AsyncDMA” capture.

This type of data capture is very useful for ultrasonic or bio-medical scanning and imaging systems.



There are 8 key sections in this VI. The wire diagram below has 8 indicators that identify each section. Each section is described below.


1
2
3
4
5
6
7
8

Section 1:

Identify the ATS9462 device. If the device is found, issue an AsyncDMA Abort to make sure that the device is in a known state.

Section 2:

Set the device's configuration parameters to be used for the capture. This includes the Sample Rate, Input Range, Input Impedance, and Trigger information.

Section 3:

Perform the board setup based on the collection of data from Section2.

Section 4:

This section is optional.

If the *DeviceSettings* variable is TRUE, then the ATS_MS_Set_Device VI will execute. This will give you the option of dynamically changing any of the capture parameters. A detailed explanation of this VI is provided in the following sample description.

Section 5:

This section passes the buffer parameters that are used to create the LabVIEW® buffers list. By default, 64 buffers are created. The buffers list is maintained in the ATSApi.DLL and is hidden from direct manipulation.

Also, this section is responsible in setting the Capture Mode as NPT, i.e. "No Pre Trigger".

Please review the detailed notes in the ATS_AsyncGetSetBufCount description.

Section 6:

Start the capture.

Section 7:

Now that the data is captured, the data is displayed on the graph. If any error occurred, then the buffer will not be displayed, an error string will be displayed on the front panel and the capture will stop.

Section 8:

At this point, valid data can be manipulated. You may choose to save, view or operate on the data via the U16 buffer array.

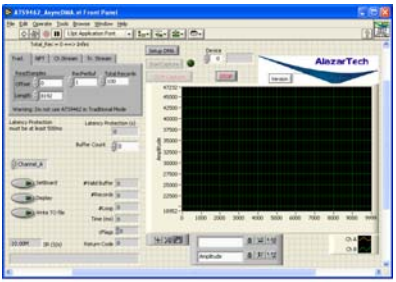
AsyncDMA Example

The AsyncDMA VI demonstrates all the Asynchronous DMA capabilities of the ATS460, ATS660, ATS860 and ATS9462 AlazarTech devices in the LabVIEW® development environment.

The VI supports all four modes of AsyncDMA operation. These are Traditional, No-Pretrigger (NPT), Continuous Streaming and Triggered Continuous Streaming. Even though the VI always illustrates the Traditional mode, it is NOT currently available on the ATS9462.

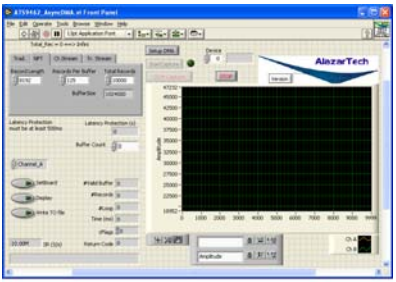
Traditional mode

This mode is used when the user wants to capture data both before and after the trigger event.



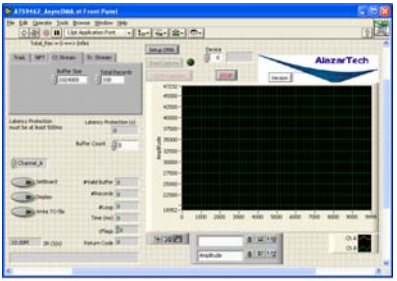
No-PreTrigger mode

This mode (also known as NPT) is used when the user does not expect to capture data before the trigger event. Only post-trigger data is captured.



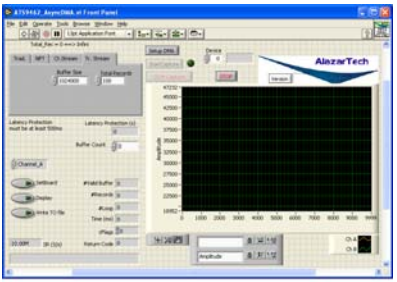
Continuous Streaming mode

This mode is used when the user wants a gapless data capture without any pre-trigger data. All triggering is disabled.



Triggered Continuous Streaming mode

This mode is identical in almost all regards to Continuous Streaming with the exception that data stream starts only after a trigger event has been received.



Usage

The ATS9462_AsyncDMA.VI uses the NI State Machine design.

Each user action adds a new “state” to the State Machine queue, which controls the program’s execution.

Before starting the VI, it is necessary to select the Device using the “Device” control number. By default if there is only one board then device 0 is set. The first device is always device number 0.

Once the VI is executed the following actions take place:

- The board ID (also known as the Device Type) is determined and displayed near the device number,
- The VI’s version number is updated in the AlazarTech logo.
- State actions: [Initialize], [PreSet], [Update], [BuffCount], [Default] state (wait for user action) are done automatically

At this point a user can manually configure the board settings with the *SetBoard* control.

SetBoard allows the user to:

Define the record length and number of records

Define the capture clock

Configure the Channel Inputs

Setup the necessary Trigger scheme and operational parameters.

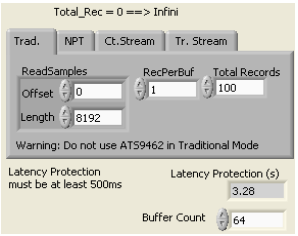
Mode Selection

Before pressing the *Start Async* button to perform the acquisition, the user must select the AsyncDMA mode to use. By default the ATS9462 AsyncDMA VI uses NPT mode.

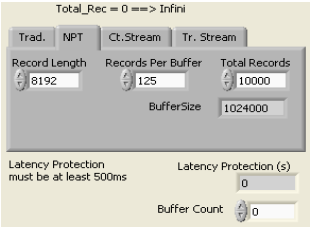
Note that on the ATS9462 only NPT, Continuous Stream and Triggered Stream are available. The Traditional mode is not available for the ATS9462 board.

Once the mode is selected the appropriate parameters need to be assigned a value. The default values are listed below.

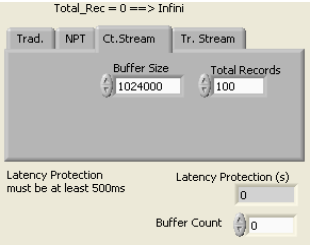
Traditional Streaming mode Configuration Parameters:



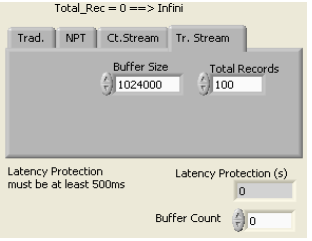
No-Pretrigger mode Configuration Parameters:



Continuous Streaming mode Configuration Parameters:



Triggered Continuous Streaming mode Configuration Parameters:



Save To File

To save the captured data to a file the user must open the file before starting the acquisition.

When activating the “Write To File” control, the standard open file dialog box will be displayed and the user must select a working directory and provide a file name.

If a file has already been defined, using this control again will close the file.

A green-lit indicator shows the state of the file saving feature. When lit, the file saving is active and when grayed-out the file saving is inactive.

Saving to file is not optimized for disk streaming applications, as it uses standard file write commands. Users who need faster file saving under LabVIEW® should contact National Instruments directly for support.

Display

This button controls whether the captured signal will be plotted on the display graph. A green-lit indicator shows the state of the Display feature. When lit, the Display is active and when grayed-out the Display is inactive.

For best performance, the displayed number of points is limited to only 10,000 points.

For optimal high speed data capture, it is recommended that the waveform not be displayed.

Starting The Capture

Before an acquisition can be started, the user must setup the DMA engine using the *StartAsync* control.

If the board is set correctly the green LED will flash and the *StartCapture* control will be enabled.

Clicking on *StartCapture* will start the acquisition.

During the acquisition it is possible to display the data, limited to the first 10,000 points, using the “Display” control. For faster data capture, it is recommended that the waveform not be displayed.

The changing *#Loop* value shows that the VI is running and collecting data buffers.

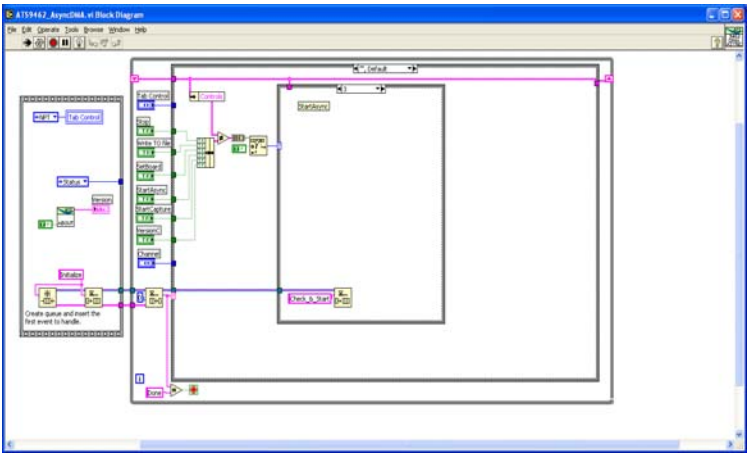
The acquisition is stopped when one of the following events occur:

- The total number of records has been acquired correctly.
- An Error occurred during the acquisition
    - The Return Code and the text of the error will be display below the SR (Sample Rate) field
- The user stopped the acquisition using the “STOP Capture” control.

[“”, Default]

The VI is waiting for user action. When selected, the Control is detected and the corresponding action is added to the queue for the next loop.

Diagram

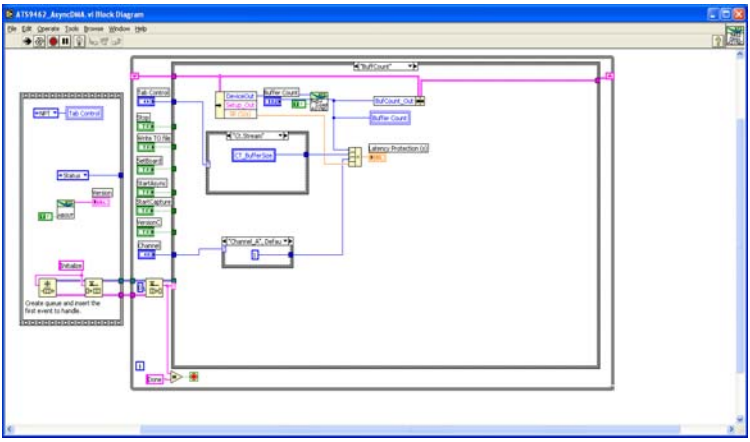


[BuffCount]

Evaluate the latency based on the record per buffer, sampling rate and record length for the selected mode.

NOTE: *Refer to the detailed explanation under the ATS_AsyncGetSetBufCount description.*

Diagram



[Capture]

This VI defines the acquisition state. The data is acquired and read when available. It is the core of the VI for acquiring data.

It is responsible for the following:

Data is acquired and read when available.

Data, when valid, is shown, if the Display Waveform is active.

User data processing can be added to the TRUE case.

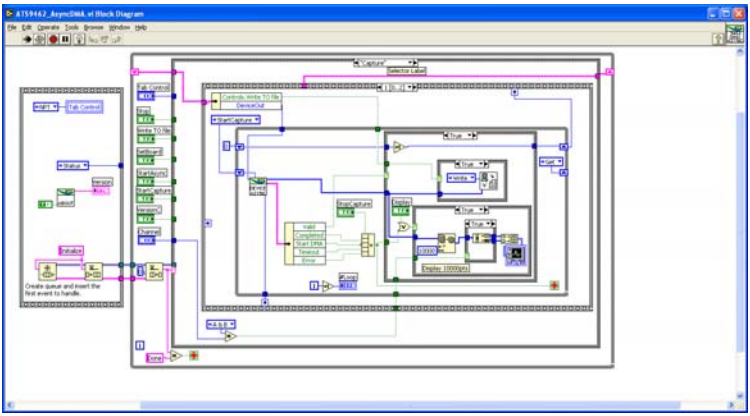
The data capture will end when one of the following conditions is true

The total number of records has been acquired.

An error occurred during the acquisition.

The user stops the acquisition using “Stop Capture” control.

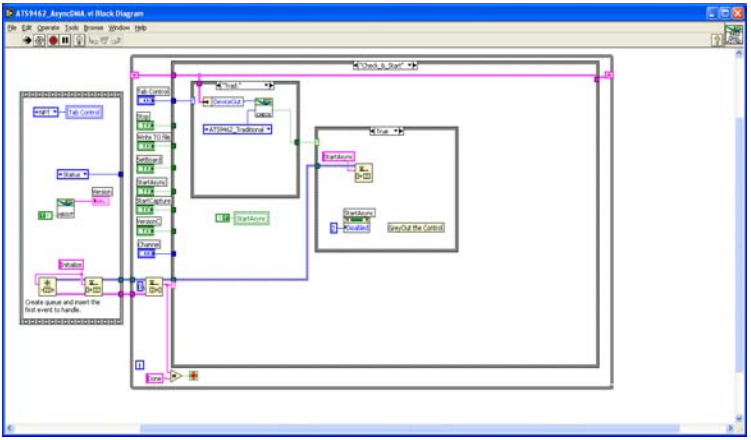
Diagram



[Check_&_Start]

Verify the mode and the board type and, only if valid, activate the AsyncDMA mode.

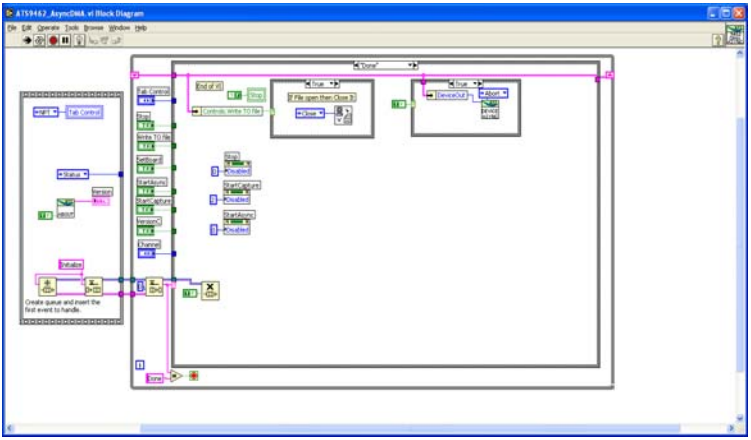
Diagram



[Done]

This frame stops the VI after closing the data file. It will abort any pending transfers and delete the Queue.

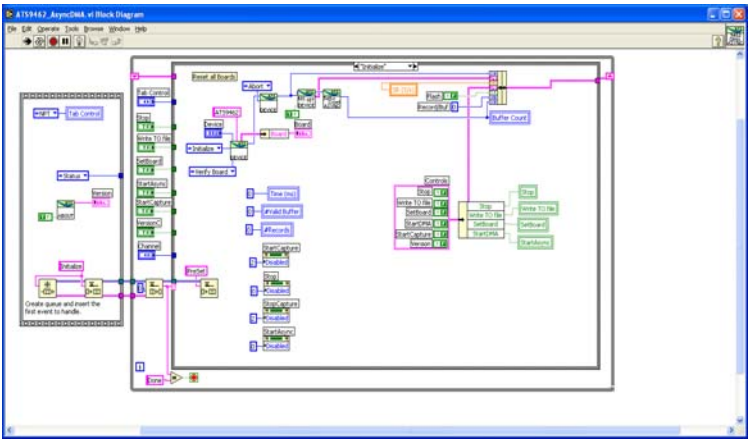
Diagram



[Initialize]

This is the first frame to run when the VI is started. The device is initialized and the compatibility with the VI is verified. It the board is not compatible, the VI will stop and a pop-up will be displayed. If the VI is compatible with the device, then control will be transferred to the Preset frame.

Diagram



[OpenFile]

This frame will open or close the data file as required by the user. The format of the data is equivalent to the data type of the device. For example, ATS860 data will be treated as unsigned 8bits, and ATS660, ATS460 or ATS9462 data will be treated as unsigned 16bits.

For single channel operation the data is stored as follows:

Channel A

A1,A2,A3,A4,....,An

Channel B

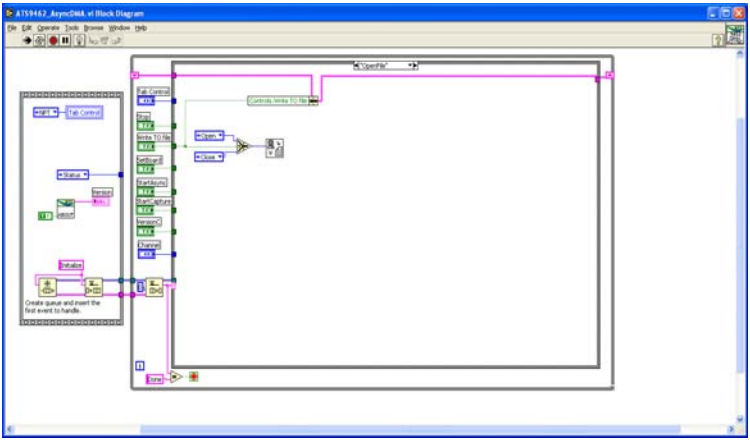
B1,B2,B3,B4,....,Bn

When both channels are being captured and saved, the data will be stored as follows:

A1,A2,A3,A4,....,An,B1,B2,B3,B4,....,Bn

It is the responsibility of the user to record the number of points per waveform in addition to any other specific information for the experiment. This should include, sampling rate, record count, record size, etc.

Diagram

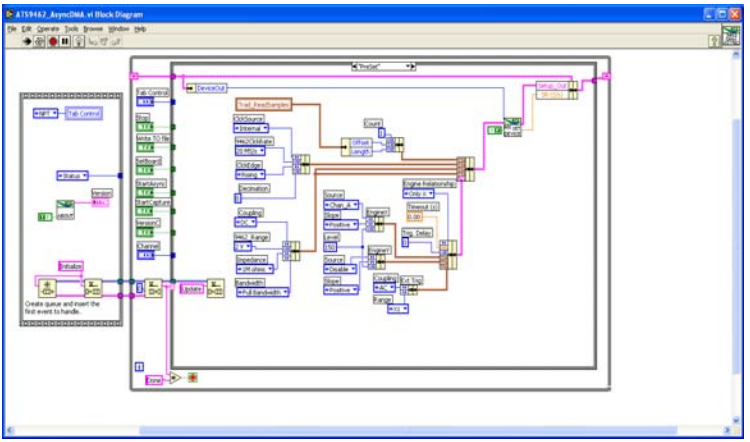


[PreSet]

Set the device with the preset values. The user can change the default values but the VI must be saved with these new values for future use.

It is recommended that the VI is saved using a different name.

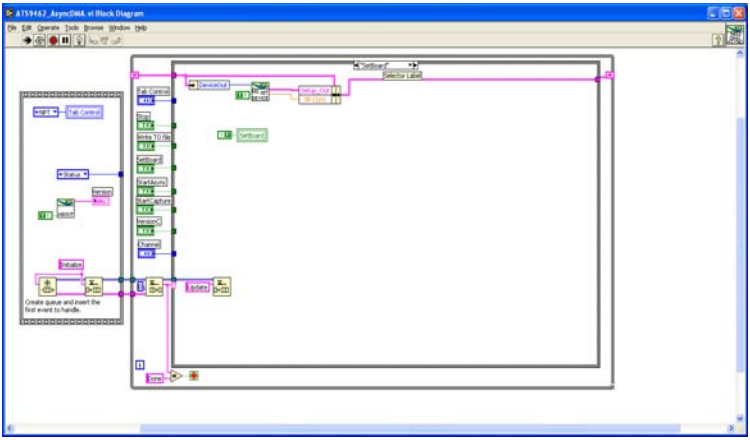
Diagram



[SetBoard]

Open the interface to manually set the board. Add the Update state in the queue.

Diagram

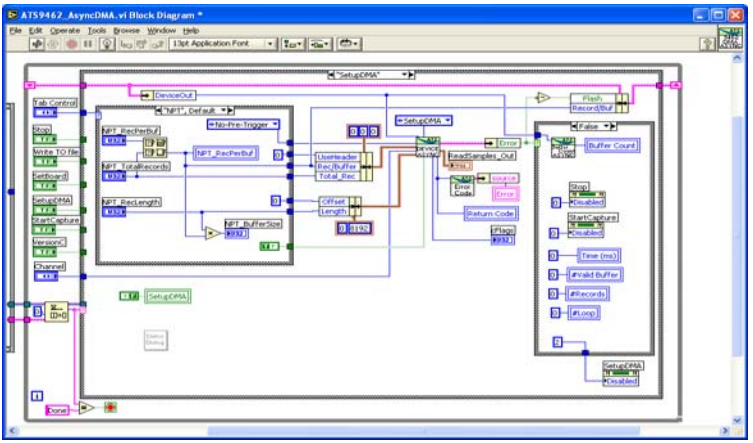


[SetupDMA]

Configure the board for the selected AsyncDMA mode. The main objective of this frame is to test if the required number of buffers is properly allocated.

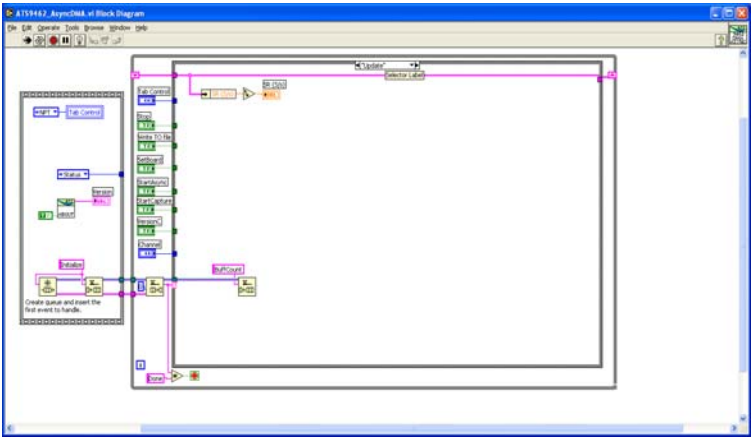
If the AsyncDMA mode is set correctly (i.e. no error is displayed), then the StartCapture control will become active and the green LED will begin blinking.

Diagram



[Update]

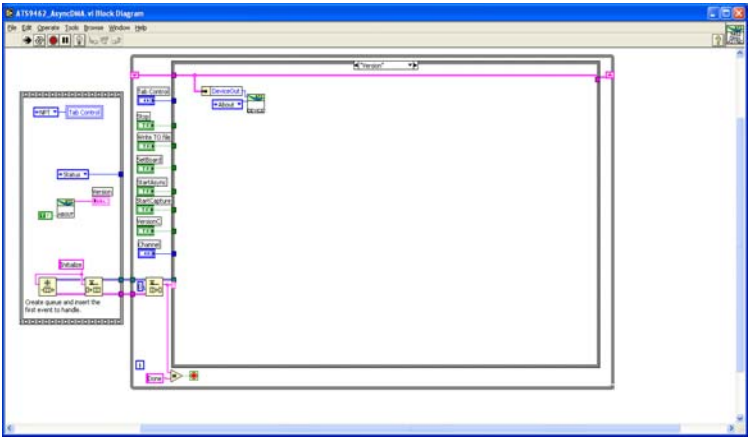
Diagram



[Version]

Display the actual version of the driver and other software.

Diagram



ALAZAR TECHNOLOGIES INC.
6600 Trans-Canada Highway, Suite 310
Pointe-Claire, QC
CANADA H9R 4S2
Telephone: (514) 426-4899
Facsimile: (514) 426-2723
E-mail: info@alazartech.com
Web site: www.alazartech.com