



Agilent

**U1084A Digitizer with on
board processing**

PeakTDC

**User Manual: Agilent Acqiris
U1084A**

February 8, 2011

U1092-90048



Agilent Technologies

Notices

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WARNING

A **WARNING** notice denotes a hazard. It calls attention to an operating procedure, practice, or the like that, if not correctly performed or adhered to, could result in personal injury or death. Do not proceed beyond a **WARNING** notice until the indicated conditions are fully understood and met.

Introducing the Agilent U1084A Digitizer

Congratulations on having purchased a data conversion product! The Agilent Technologies U1084A digitizer are highly versatile high-speed data conversion modules designed for capturing high frequency electronic signals. To get the most out of these products, we recommend that you carefully read this manual carefully. We trust that the product you have purchased as well as the accompanying software will meet with your expectations and provide you with a high quality solution for your data conversion applications.

You can download the latest version of this manual from <http://www.agilent.com/> by clicking on Manuals in the Technical Support section and then entering a model number. You can also visit our web site at <http://www.agilent.com/find/acqiris>. At Agilent we appreciate and encourage customer input. If you have a suggestion related to the content of this manual or the presentation of information, please contact your local Agilent Acqiris product line representative or the dedicated Agilent Acqiris Technical Support (ACQIRIS_SUPPORT@agilent.com).

For further information, please call:

Acqiris Product Line Information

USA (800) 829-4444

Asia - Pacific 61 3 9210 2890

Europe 41 (22) 884 32 90

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1 Introduction

Using this Manual

This guide assumes you are familiar with the operation of a personal computer (PC) running a Windows 2000/XP/Vista/7 (32/64) or other supported operating system. It also assumes you have a basic understanding of the principles of data acquisition using either a waveform digitizer or a digital oscilloscope.

The manual is divided into 4 separate sections. To understand the elements of operation for the module it is essential that you read them all.

Chapter 1 "Introduction" describes what to do when you first receive your new Acqiris product. Special attention should be paid to sections on safety, packaging and product handling. Before installing your product please ensure that your system configuration matches or exceeds the requirements specified.

Chapter 2 "Installation" covers all elements of installation and performance verification. Before attempting to use your Acqiris product for actual measurements we strongly recommend that you read all sections of this chapter.

Chapter 3 "Product Description" provides a full description of all the functional elements of the digitizer.

Chapter 4 "Running the AcqirisLive Application", describes the operation of AcqirisLive, an application that enables basic operation of Acqiris Digitizers and Averagers in a Windows 2000/XP/Vista/7 (32/64) environment. Note: **AcqirisMAQS** is an alternate software application offering many interesting possibilities for the control of acquisition systems in a single or multi-machine environment. Ask your sales representative or Agilent for more information.

For information necessary for writing your own software to control Acqiris products you should refer to the **Programmer's Guide** and the **Programmer's Reference Manual**.



Conventions Used in This Manual

The following conventions are used in this manual:

NOTE

Denotes a note, which alerts you to important information.

<i>Italic</i>	text denotes a warning, caution, or note.
<i>Bold Italic</i>	text is used to emphasize an important point in the text or a note
<code>mono</code>	text is used for sections of code, programming examples and operating system commands.
B,KB,MB,GB	is for Byte, KiloByte = 1024 bytes, MegaByte = 1024*1024 bytes, GigaByte = 1024*1024*1024 bytes

Disclaimer and Safety

The U1084A modules have been designed to operate in a standard PCIExpress slot found inside most personal computers. Power for the modules is provided by plugging them into a free slot (refer to the installation procedure).

CAUTION

Do not exceed the maximum input voltage rating! The maximum input voltage for 50 W input impedance is ± 5 V.

Warning Regarding Medical Use

The U1084A modules are not designed with components and testing procedures that would ensure a level of reliability suitable for use in treatment and diagnosis of humans. Applications of these cards involving medical or clinical treatment can create a potential for accidental injury caused by product failure, or by errors on the part of the user. These cards are *not* intended to be a substitute for any form of established process or equipment used to monitor or safeguard human health and safety in medical treatment.

WARNING

The modules discussed in this manual have not been designed for making direct measurements on the human body. Users who connect an Agilent module to a human body do so at their own risk.

Packaging and Handling

Your Digitizer is shipped with the following components:

- A compact disc in an Agilent Technologies paper CD envelope that includes
 - o 10 product User Manuals in electronic form (8-bit Digitizers, 10-bit Digitizers, 12-bit Digitizers, Averagers, Analyzers, Signal Analyzers, Streamer Analyzers, Time-to-Digital Converters, 3-, 5-, and 8-slot CompactPCI Crates, and the 21-slot CompactPCI Crate),
 - o 1 Programmer's Guide and 1 Programmer's Reference Manual,
 - o device drivers with sample software for different operating systems, environments and languages,
 - o the Analyzer Demo application, a demonstration program for the AC/SC Analyzer products,
 - o the AcqirisLive application, a demonstration program for our digitizer and averager products,
 - o the SSR Demo application, a demonstration program for the Acqiris AP235/AP240 Analyzers,
 - o the APX01 Demo application, a demonstration program for the Acqiris AP101/AP201 Analyzers,
 - o the TC Demo application, a demonstration program for the Acqiris TC840/TC842/TC890 Time-to-Digital Converters,
 - o full installation procedures for use with Microsoft Windows, National Instruments LabVIEW RT, Wind River VxWorks, IVI-COM/C, and Linux software.
- A declaration of conformity
- Optional documentation such as a model-dependent document giving Specifications & Characteristics, a Calibration Certificate, or a Performance Verification

After carefully unpacking all items, inspect each to ensure there are no signs of visible damage. Also check that all the components received match those listed on the enclosed packing list. Agilent cannot accept responsibility for missing items unless we are notified promptly of any discrepancies. If any items are found to be missing or are received in a damaged condition please contact the Agilent service center or your local

supplier immediately. Retain the box and packing materials for possible inspection and/or reshipment.

Warranty

All Agilent Acqiris Digitizer products are warranted to operate within specification, assuming normal use, for a period of at least one year from the date of shipment. Units sold before April 2008 had three year warranties, as do some more recent ones; in case of doubt examine your invoice. It is recommended that yearly calibration be made in order to verify product performance. All repairs, replacement and spare parts are warranted for a period of 3 months. Warranty extensions are available as an option.

Agilent endeavors to provide leading edge technology that includes the latest concepts in hardware and software design. As such software and firmware used with the products is under continual refinement and improvement. All software and instrument firmware is supplied "as is" with no warranty of any kind. Software and firmware is thoroughly tested and thought to be functional at the time of shipment. At Agilent's discretion software and firmware may be revised if a significant operational malfunction is detected.

In exercising this warranty, Agilent will repair or replace any product returned to the Agilent service center, within the warranty period. The warranty covers all defects that are a result of workmanship or materials. This excludes defects that are caused by accident, misuse, neglect, or abnormal operation.

The purchaser is responsible for returning the goods to the nearest Agilent service center. This includes transportation costs and insurance. Agilent will return all warranty repairs with transportation prepaid.

Warranty and Repair Return Procedure, Assistance and Support

Agilent acquired Acqiris SA and its product lines in December 2006. Please contact your nearest Agilent Service Center before returning any product for repair.

You can find information about technical and professional services, product support, and equipment repair and service on the Web, see <http://www.agilent.com/find/service> (or <http://www.agilent.com/> and after selecting your country click on **Contact Us**). The service center will ask for your name, company, phone number and address, the model and serial numbers of the unit to be repaired, and a brief description of the problem.

Before issuing a Service Order the service center may ask you to communicate with us by phone or eMail so that we can learn as much as needed about the problems observed. If a unit returned under guarantee is found to be working normally and this procedure was not followed we reserve the right to charge you for the work done.

For your nearest customer support center please contact Acqiris Technical Support (ACQIRIS_SUPPORT@agilent.com) or come visit our web site at <http://www.agilent.com/find/acqiris>. Alternatively, contact Acqiris at 1-800 829-4444 in the USA, +41 22 884 32 90 in Europe or +61 3 9210 2890 in the Asia-Pacific region. The Agilent Support Centers can also help redirect you for any questions concerning the installation and operation of your equipment.

System Requirements

Acqiris products need the following minimum PC System Requirements in order to obtain reasonable performance from your averager:

Processor: 500 MHz Pentium (higher recommended). Some PowerPC systems running Wind River VxWorks are supported; please contact us for details.

Memory: 256 MB RAM. The previous number is a very rough estimate. Assuming that you are using AcqirisLive or an application of your own that operates on the acquired data it seems reasonable to ask for 10 times the total acquisition memory that you will be using at the same time in the application. Performance is likely to be degraded if less memory is available.

Display resolution: At least 1024 x 768 pixels and 256 colors for use of AcqirisLive or Demo applications.

Operating System: Microsoft Windows Vista, Vista 64-bit, 7, 7 64-bit, 2000/XP including 2003 Server, Wind River VxWorks 5.5.1 and 6.4, and Linux with kernels 2.4 and 2.6. Users with previous Windows OS versions (i.e. NT4) can download AcqirisSoftware 3.1 from the Agilent WEB site.

NOTE

Windows 2000 will not be supported in future releases.

NOTE

Wind River VxWorks 5.5.1 will not be supported in future releases.

Hard Drive Space: 300 MB for the Complete installation.

CD Drive (or any method to copy the software installation files from CD to the hard drive such as LAN, floppy drive, etc.)

LabVIEW: Full driver implementations are available for National Instruments LabVIEW versions 8.5, 8.2.1, and 8.0. LabVIEW 7.1 is frozen at the level of Acqiris Software 3.2 with support for all instruments.

LabVIEW RT: National Instruments LabVIEW RT is supported for the same versions as shown above. The VISA driver must be version 3.0 or higher.

MATLAB: The MEX interface can be used with MathWorks MATLAB 7.3 or a newer version.

Visual BASIC: The interface files and examples are available for Microsoft Visual Basic .NET.

Tornado: The example files are useable with Wind River Tornado 2.2.1

Transport & Shipping

CAUTION

Cards can be safely transported in their original shipping packages. The transport of U1084A cards mounted in a PC is a more delicate issue. Because of their mass the cards can vibrate loose unless they are properly secured and braced. However, properly mounted cards with fans can be sufficiently well held; the Adjustable retainer must be used so as to hold the card in place.

To package the instrument for shipping:

Step

1. Place the instrument in its original packaging materials.
2. Surround the instrument with at least 3 to 4 inches (8 to 10 cm) of its original packing material or bubble-pack to prevent the instrument from moving in its shipping container.
3. After wrapping it with packing material, place the instrument in its original shipping container or a strong shipping container that is made of double-walled corrugated cardboard with 159 kg (350 lb) bursting strength.
4. Seal the shipping container securely with strong nylon adhesive tape.
5. Mark the shipping container "FRAGILE, HANDLE WITH CARE" to help ensure careful handling.
6. Use the address obtained from your Agilent Technologies Service Center.
7. Retain copies of all shipping papers.

Notes

- If the original packaging materials are not available, use a professional packaging service. Contact your Agilent Service Center for more information.
- The shipping container must be large and strong enough to accommodate your instrument and allow at least 3 to 4 inches (8 to 10 cm) on all sides for packing material.

CAUTION

Damage can result if the original packaging materials are not used. Packaging materials should be anti-static and cushion the instrument on all sides. NEVER USE STYRENE PELLETS IN ANY SHAPE AS PACKAGING MATERIALS. They do not adequately cushion the instrument or prevent it from moving in the shipping container. Styrene pellets can also cause equipment damage by generating static electricity or by lodging in fan motors.

Maintenance

The cards do not require any maintenance. There are no user serviceable parts inside. A periodic calibration can be obtained on request.

Cleaning

Cleaning procedures consist only of exterior cleaning.

Clean the exterior surfaces of the module with a dry lint-free cloth or a soft-bristle brush. If any dirt remains, wipe with a cloth moistened in a mild soap solution. Remove any soap residue by wiping with a cloth moistened with clear water. Do not use abrasive compounds on any parts.

Disposal and Recycling



Electronic equipment should be properly disposed of. Averagers and their accessories must not be thrown out as normal waste. Separate collection is appropriate and may be required by law.



2 Installation

This chapter describes how to install the Agilent Acqiris hardware and software for Windows, National Instruments LabVIEW RT, Wind River VxWorks, or Linux.

Agilent Acqiris instruments are supported on the following operating systems:

- Microsoft Windows
- National Instruments LabVIEW RT
- Wind River VxWorks
- Linux

The list of the specific operating system versions supported by each release is provided in the Release Notes section of the ReadMe file on the CD-ROM (ReadMe.txt in the *AcqirisSoftware\Windows* folder for the Windows distribution, README in the *AcqirisSoftware\Linux* folder for the Linux distribution).

The development support for the real-time operating systems LabVIEW RT and VxWorks is provided for development on a Windows host and installed with the Windows installer.

NOTE

For a first time installation we strongly recommend installing the software before inserting the hardware into the PC.

Installing the Software under Windows

Warnings

If Setup detects a previous installation of Acqiris software on your system, a warning screen will be displayed. It is an empty directory. These will be removed by Setup. If you wish to keep the old installation on your system, you should exit Setup, and move all Acqiris driver files (acqiris*, acqrs* and acqir*) to some archive directory.

The DLL files will be installed into the Acqiris\bin subdirectory of the Agilent software root, and the corresponding path will be added to the PATH environment variable.



Multiple Versions

With the software installation from *Acqiris Software 2.0* or later, it is possible to keep multiple versions on the same system, but you must specify a different root directory (i.e. Install Folder). If you keep the same directory, Setup will overwrite your previous installation.

To go back to a previous version, you must change the AcqirisDxRoot, AcqirisDxDir and PATH environment variables and reinstall the device driver.

Installation

Before installing the Agilent Acqiris hardware, you should complete the following steps to install the software for Windows.

NOTE

You will need administrator privileges to complete the software installation under Windows.

Insert the *Agilent Acqiris Software CD* into the CD-ROM drive of your computer. If the Autorun program does not start automatically (Autoplay disabled), you can start it manually, or navigate to the *AcqirisSoftware\Windows* folder in order to display the files included.

Choose **Install AcqirisSoftware for Windows** (or run *Setup.exe* from the *AcqirisSoftware\Windows* folder) and follow the instructions carefully.

Registration of your installation will help Agilent provide you with better support. All information submitted will be treated in accordance with Agilent's privacy policy. Setup will prepare a registration e-mail in your e-mail client application upon termination of the setup procedure. You can then decide whether or not you wish to send it. You may also add comments. Uncheck the box if you do not want to register your installation.

After the software installation is complete you can either accept the suggestion to restart the computer or you should shutdown your computer and proceed with the hardware installation.

Installing the Software for Linux

The Agilent Acqiris software for Linux systems is available for current versions of the Linux kernel and GNU gcc compiler, or as package files for some popular Linux distributions. Please refer to the README file on the CD-ROM (*AcqirisSoftware\Linux* folder) for the detailed list for each Release.

To install, follow the instructions provided in the appropriate section of the README file.

Installing the Hardware

Turn off the power of the PC.

CAUTION

For PCIe modules the PC may have to be unplugged to ensure that the PCIe bus has no power available.

CAUTION

Touch the antistatic package to a grounded object before removing the card from the package. Electrostatic discharge can damage the card.

Open the PC, identify a free PCI/PCIe slot and carefully insert the card into it. Be sure to ground yourself by touching the grounded PC frame and avoid touching any components on the card. Make sure that the grounding of the card's mounting bracket to the back panel rail of the computer is done correctly. If present make sure that the fan's adjustable retainer is correctly positioned and tightened for mechanical support. Close the PC.

Turn on the power of the PC and start the operating system.

NOTE

Agilent Acqiris modules are equipped with a LED. If this LED is not glowing orange or red when the power is applied there is a severe problem. Either the module is broken or the necessary voltages for its use are not available.

On Windows, if devices were installed using a previous version of Acqiris software the instruments in these logical positions may still appear as *Unknown Devices*. In that case, you should uninstall and reinstall the devices. Instructions on this procedure can be found in the **ReadMe.txt** file in the **manuals** folder of your Agilent Acqiris software installation.

After Restarting

Windows

Under Windows, you *must* login with administrator privileges after the first boot following the hardware installation; the Plug&Play system must have the appropriate privileges to be able to complete your hardware installation successfully. After a successful hardware installation, you will be able to use your Agilent Acqiris module(s) with normal privileges.

LabVIEW RT

During program development you can choose whether you use LabVIEW or LabVIEW RT compatible libraries by switching the version present in **National Instruments\LabVIEW m.n\instr.lib**. This swap can be facilitated by using the **Install VI library for LabVIEW or LabVIEW Real-Time** shortcut available in the Agilent Acqiris Shortcut folder.

There is only one Agilent Acqiris Driver. It supports all Agilent Acqiris instruments. The instructions below concern LabVIEW RT as used in NI PXI processors.

The Aq_RT.inf and AqRT_4.ini files must be uploaded to the target. To do this,

- start the NI MAX application,
- right click on the target and select file transfer
- select the Aq_RT.inf file on your host machine and upload ('To Remote') to the LabVIEW RT working directory (/NI-RT/system) on the target
- select the Aq_RT.ini file on your host machine and upload ('To Remote') to the LabVIEW RT working directory (/NI-RT/system) giving it the name AqDrv4.ini

For Agilent Acqiris modules which need FPGA files you should,

- create the folder \firmware in the /NI-RT/system directory using the file transfer application
- select the FPGA files (from <AcqirisDxRoot>\Firmware) you want to copy to the target and upload them into the firmware directory

Restart the target after finishing the file transfers.

Restart the NI MAX application and you should have Agilent Acqiris instruments detected in your PXI system.

Installing the IVI-COM/C Driver

Please install Agilent Acqiris software for Windows first. Then the *Agilent Acqiris Software CD* Autorun program gives access to two installers:

IVI Shared Components 1.4

IVI-COM/C IviAqD1 driver

These must be installed in the order shown above. For more information you can then consult the Readme.txt file in the IVI\Drivers\IviAqD1 folder or the documentation through the program shortcut present under Ivi/IviAqD1.

Uninstalling devices under Windows

In the Device Manager, select the instrument to be uninstalled. Choose "Uninstall" from the "Action" menu. After all desired instruments have been uninstalled select "Scan for hardware changes" from the "Action" menu, or reboot the computer. Note that only those devices that are actually physically present are visible in the Device Manager.

Distribution for Windows 2000/XP/Vista/7 (32/64) and Linux

The manuals/ReadMe.txt file contains a list of files to be found after a complete installation of Acqiris software on Windows systems. Similarly the ReadMeLinux file gives the list of files corresponding to that installation.

2 Installation



3 Product Description

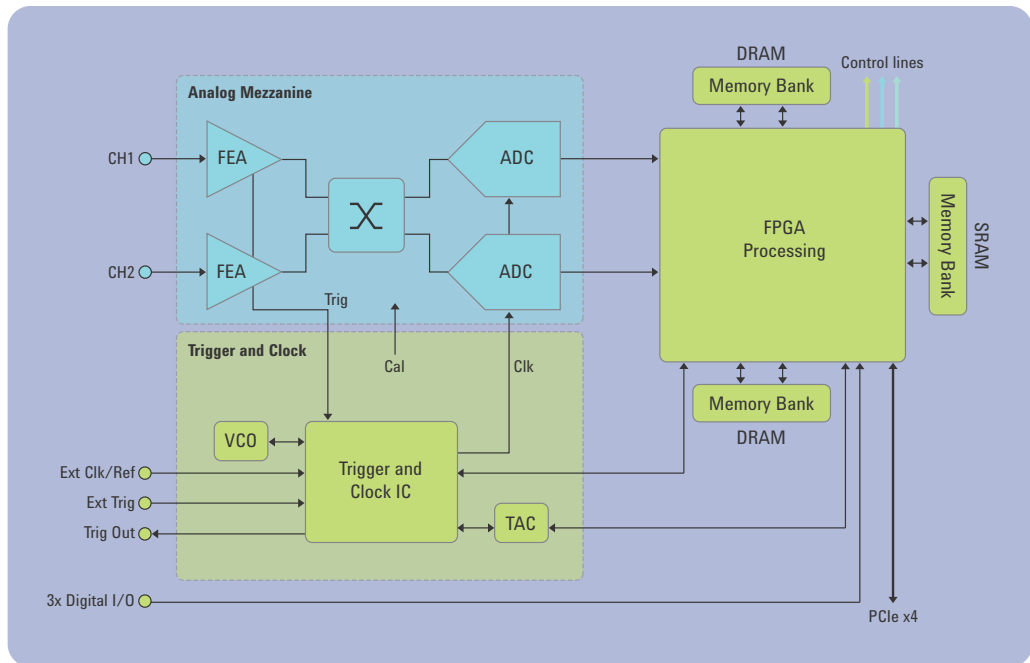
Overview

Acqiris Digitizers are designed to provide superior measurement precision and accuracy. Key acquisition specifications (such as DC accuracy, integral and differential non-linearity) have been optimized to deliver maximum measurement fidelity. Careful circuit layout, custom IC's, and special packaging techniques have all been employed to reduce the overall random and correlated system noise. The use of custom IC's also dramatically reduces the total number of discrete components required. This has tremendous benefits on reliability and also allows the modules to use a minimal amount of power.

The U1084A series Digitizers are PCI Express modules that plug directly into any vacant long PCIe slot in a PC. They are fully programmable over the PCIe bus and deliver 4 GS/ real-time peak histogram performance. Signals on 1 channels with an Analog bandwidth limit at 1.5 GHz (Typical 1.8 GHz) can be analyzed at sampling rates up to 4GS/s. Peak histogram Data can be transferred to a host processor over the PCIe bus at speeds up to 520Mbytes/s.

For complete technical specifications concerning your particular digitizer please refer to the product's Specifications & Characteristics. In addition, we maintain up-to-date versions of all product data sheets on our web site (<http://www.agilent.com/find/acqiris>). The data sheets are available in pdf format and are best viewed using Adobe Acrobat software. If you have trouble accessing our web site, or viewing the data sheets, please contact your nearest sales office.





Key features

High Speed and Precision – All Digitizers models provide both an ultra-fast real-time histogram capability and exceptionally high data transfer rates to the host processor.

The two-channel U1084A delivers a real-time sampling rate of up to 2 GS/s with 1.5 GHz of analog bandwidth simultaneously on both channels. Alternatively it can be used as a one channel instruments with double the sampling rate.

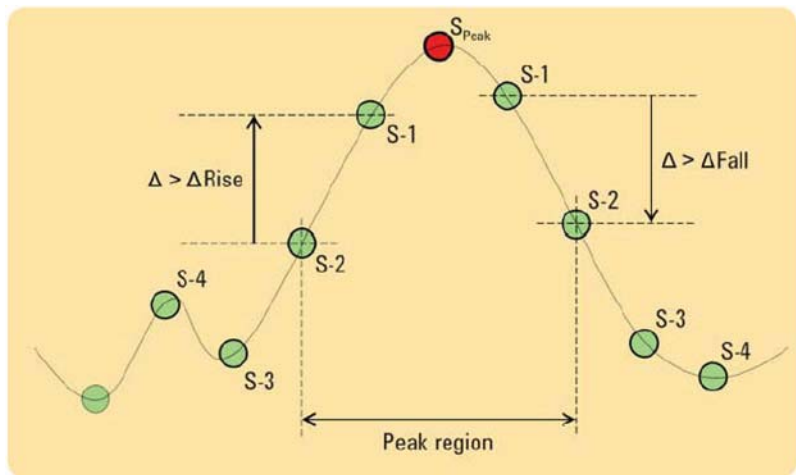
The high sampling rate is achieved in real time for each trigger and does not require the use of interleaved sampling techniques. Compared to real-time sampling, interleaved techniques significantly reduce the total data throughput.

Signal conditioning – The U1084A models include all the required input signal conditioning such as gain, from 50 mV to 5 V Full Scale, offset adjustment and 50 Ω DC coupling. The inputs are fully protected, and calibration is a built-in feature. A crystal controlled time base and advanced trigger circuits are used to allow fast and stable acquisitions.

Improved Timing – In order to preserve the timing accuracy of successively summed acquisitions, U1084A Digitizers include a precise real-time measure of the trigger position relative to the sampling clock. In **Non-Resync** mode, the jitter (trigger positioning with respect to the clock from acquisition to acquisition) is as low as \pm one-half clock cycle (\pm 125ps @ 4GS/s). For systems that can be externally triggered, the clock synchronized trigger output signal (synchronized with the internal clock to less than \pm 60ps) can be available on the front panel MCX.

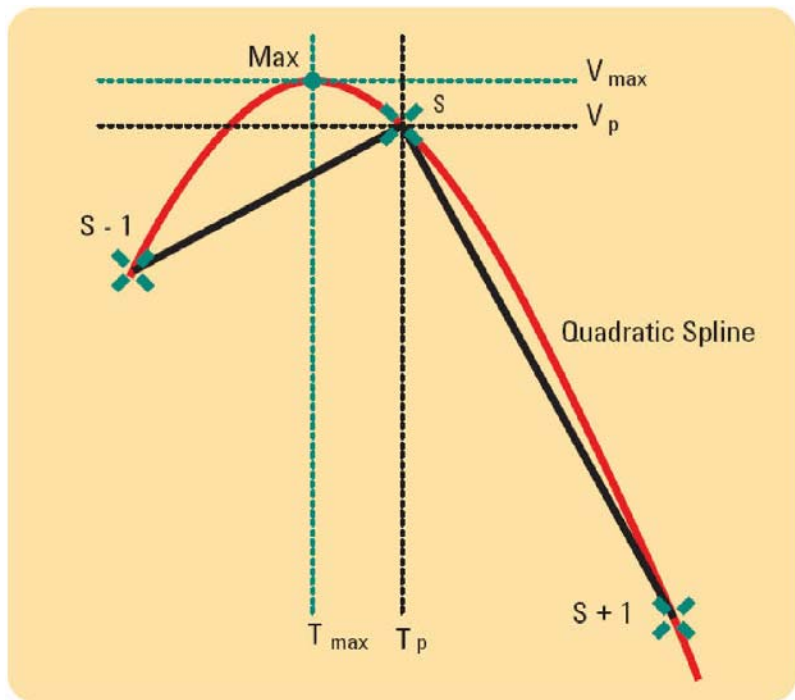
Fast Peak TDC detection- Due to the incredible sampling speeds of the U1084A, the peak analysis firmware uses a very simple yet powerful algorithm to detect signal peaks at full 4 GS/s sampling rate.

Nine samples are used to validate if a sample corresponds to a peak; the sample itself, along with the samples before and after that sample are considered.



The sample will be considered as a peak, if within the 9 samples analyzed: a rising edge is found before the sample that exceeds the programmable delta Δ_{Rise} , a falling edge is found after the sample that exceeds the programmable delta Δ_{Fall} , and the sample is the maximum of all points between the two defined rising and falling edges. There is additional verification to make sure that only one peak is found within the rising and falling edge region.

Peak TDC Interpolation mode - To improve the measurement, peak time and amplitude can be determined using an interpolation routine. Fitting a 12-bit quadratic spline to the 3 points around the extrema found by the peak detection algorithm, the position of a peak maximum is found and defined by its time (T_{max}) and amplitude (V_{max}).



Peak TDC Histogram – The interpolation method provides measurements with improved time and vertical resolution. The resulting histogram that is created can contain up to 2Mbins of data, with each bin width down to 1/16th of the sampling period, peak amplitude encoded with the bins, to 1/16th of the ADC resolution.

Adjustable through software commands, the user can balance the increased timing and vertical resolution against increased memory usage and reduced measurement throughput, to best fit requirement.

Numerous front panel control signals – In order to ease the integration and synchronization of the Digitizer in a large variety of systems, a number of signals are made available on MCX connectors on the instruments front panel. The following high-speed timing signals are available : Inputs for Clock, Reference Clock, and Accumulation Start Enable, Outputs for Trigger, Trigger Ready, Acquisition state, and Reference Clock.

High Data Throughput – The U1084A Digitizer can easily be integrated into any standard computer with 1 free long PCIe x4 slot (minimum, can also be inserted in a x8 or a x16 slot) that provides the 3.3 V and 12 V supply voltages at adequate power as required by the card. The histogram can be transferred, in DMA mode, directly to the processor over the PCIe bus at rates of up to 520 Mbytes per second (3.9 ms for a 500 KS record, including DMA setup time overhead).

Base Line Subtraction – The Digitizer implements a fixed base line subtraction feature that is applied to the data values that are over the threshold. This can be used to greatly reduce the occurrence of data overflows. Therefore many more events can be accumulated before running the risk of data overflow.

Channel Input

The principle characteristics of the input channels are given in the table below:

Agilent Model	Bandwidth into 50 Ω	Minimum Rise Time	BW Limiter selections	Maximum Full Scale	Maximum Offset	Other particularities
U1084A	1.5 GHz	0.23 ns	20, 200, 700 MHz	5 V	5 V	2 channels

Coupling & Impedance

The U1084A is a two channel module with the choice of BNC or SMA connectors. The 50 Ω coupling offers high quality termination with better than 1% precision and is ideally suited for use with 50 Ω transmission lines.

The U1084A provides DC coupling and AC coupling with a 32 Hz cutoff frequency.

Input Protection

The input amplifiers are fully protected against overvoltage signals. The device is built to tolerate the following without damage to the front-end electronics:

- IEC61000-4-2 (ESD): ± 15 KV (air/contact)
- IEC61000-4-4 (EPT): 40 A (5/50 ns)
- IEC61000-4-5 (surge): 5 A (8/20 μ s)

For extreme cases, such as detector sparking, an external coaxial spark gap and attenuator can be supplied on request (See TBD),

Mezzanine Front-end

The front-end electronics are all mounted on a removable mezzanine card. In the event of accidental damage or as components fatigue over time (e.g. relays in high duty cycle automated testing applications), the mezzanine card allows for fast and efficient replacement.

Bandwidth and Rise Time

The bandwidth specification indicates the frequency at which an input signal will be attenuated by 3 dB (approximately 30% loss of amplitude). The bandwidth also affects the minimum rise and fall times that can be passed through the front-end electronics. A pulse with a very sharp edge will be observed to have a minimum rise time (τ_{\min}) determined by the front-end electronics. In general a pulse with a given 10-90% rise time ($\tau_{10-90\text{real}}$) will be observed with a slower value given by:

$$\tau_{10-90}^2 = \tau_{10-90\text{real}}^2 + \tau_{\min}^2$$

where τ_{\min} (ns) = 0.35 (GHz·ns) / BW (GHz)

If desired, hardware bandwidth limiters can be selected.

Input Voltage and Offset

The input channel provides a fully programmable amplifier with variable input voltage and offset. Full Scale (FS) input voltages are selectable from 50 mV to 5 V in a 1, 2, 5 sequence. Care should be taken to select an input voltage range that will allow the signal to be recorded using as much dynamic range of the digitizer as possible. Signals going outside of the FS Range will be clipped and data values for the clipped portion of a signal should be regarded as erroneous. The Variable Offset is programmable in the range of ± 2 V when using an FS Input Voltage setting of 500 mV or below, increasing to ± 5 V for FS settings above 500 mV.

Vertical Resolution

The U1084A Digitizer uses an ADC system with 8 bits of vertical resolution (256 levels). The dynamic range of the ADC covers the Full Scale (FS) of the Input Voltage setting. For example, if the Input Voltage is set to 500 mV then the ADC resolution is equivalent to 1.95 mV. To obtain the best dynamic range from the ADC care should be taken to ensure that the input signal varies over more than 50% of the Input Voltage Full Scale (FS) setting. The highest and lowest levels of the ADC correspond to underflow and overflow conditions. For the Averaging mode, any sums that contain such data are subject to unknown errors.

For the Averaging mode, vertical resolution increases as the number of acquisitions per average increases. It can be improved to up to 12 bits when averaging 256 or more traces.

DC Accuracy

The U1084A Digitizer uses low noise front-end electronics in order to ensure voltage measurement is made with accuracy and precision. DC voltage accuracy is better than $\pm 2\%$ ($\pm 1\%$ typical) of the input voltage full-scale.

Linearity and Dithering

For raw ADC values the differential linearity is better than ± 0.9 LSB. In the Averaging mode, an offset dither of up to ± 12 ADC codes can be added to the input signal. This dithering improves the Accumulation's differential and integral non-linearity and can reduce quantization non-linearity errors for low noise signals

The dithering range is selectable and has a resolution of $1/8$ of the ADC Least Significant Bit (LSB). The dithering is added as a controlled offset at the input of the ADC. The offset amount is different for each successive acquisition of a waveform. The offset sequence is

$0, -1/8, 1/8, -2/8, 2/8, -3/8, 3/8, \dots, -(N-1/8), (N-1/8), -N, N, 0, -1/8, 1/8, \text{ etc}$

N is programmable between 0 (no dithering) and 15. There are $16 \cdot N + 1$ states in the complete cycle.

Underflow/overflow conditions must be avoided.

Trigger

Trigger Source

The trigger source can be a signal applied to either of the Input Channels (for internal triggering) or the External Trigger Input.

The modules provide a front panel MCX External Trigger Input. The External Input provides a fully functional trigger circuit with selectable coupling, level and slope. It allows either 50Ω or $1 \text{ M}\Omega$ termination impedance with diode protection against overload. A $\pm 5 \text{ V}$ limit on trigger signals should be respected, although somewhat higher voltages for short time periods will not damage the unit.

Trigger Coupling

Trigger coupling is used to select the coupling mode applied to the input of the trigger circuitry. The AC LF Reject mode couples signals capacitively and removes the input signal's DC component and frequencies below 50 Hz. DC mode allows all signal components to be passed through to the trigger circuit. There is also an HF Reject mode that removes signal components above 50 KHz.

Trigger Level

The trigger level specifies the voltage at which the selected trigger source will produce a valid trigger. The trigger level is defined as a set voltage. Using the internal trigger with DC coupling, the level (expressed in %) is

set with respect to the midpoint voltage ($V_m = -\text{Offset voltage}$) of the digitizer's vertical scale. All trigger circuits have sensitivity levels that must be exceeded in order for reliable triggering to occur.

The U1084A offers level control for all trigger coupling modes. Internal trigger level settings must be within $V_m \pm 0.5 \text{ FS}$, where FS is the channel Full Scale.

The external trigger level can be set to values in the range $\pm 5\text{V}$.

The Digitizers will trigger on signals with a peak-peak amplitude $> 10\% \text{ FS}$ from DC to their bandwidth limit.

Trigger Slope

The trigger slope defines the direction of the signal that will be used to initiate the acquisition when it passes through the specified trigger level. Positive slope indicates that the signal is transitioning from a lower voltage to a higher voltage. Negative slope indicates the signal is transitioning from a higher voltage to a lower voltage.

External Trigger Output

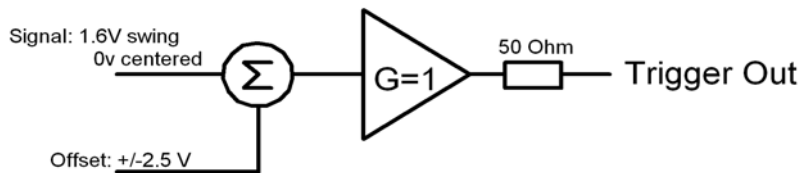
When the module is ready to be triggered and a valid trigger signal occurs, a trigger output is generated for external use. It is always available on the Front Panel Trigger Out MCX connector.

NOTE

The External Trigger Output functionality is implemented in the hardware. No Trigger Out signal occurs for software-generated triggers such as those of the AUTO mode of AcqirisLive or through the use of the function `AcqrsD1_forceTrigger`.

Normally, the trigger output signal occurs when the module is ready to be triggered and a valid trigger signal occurs. As an aid in applications where a complete system has to be warmed-up before use, the digitizer can be put into a mode (**TrigAlways**) in which triggers received when the digitizer is not in use are passed through and used to generate a trigger output. This mode is controlled using the function `AcqrsD1_configAvgConfig`.

Trigger Output Block diagram:

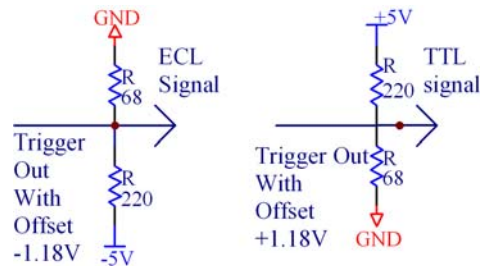


The output swing is 1.6 V (± 0.8 V) when unloaded and 0.8 V when terminated on 50 Ω . The rise and fall times are 2.5 ns typical. The offset can be adjusted, by software control in the range [-2.5 V, +2.5 V] unloaded, or [-1.25 V, +1.25 V] into 50 Ω . The maximum output current capability is ± 15 mA. As the output is retro-terminated, it is possible to drive a 50 Ω line unterminated (HiZ) without loss of performance.

For a TTL compatible signal, set the offset to 1.0 V and the swing at destination will be +0.2 to +1.8 V.

For an ECL compatible signal, terminated on 50 Ω to -1.2 V, set the offset to -1.2 V and the output will be in the range [-0.8 V, -1.6 V]).

Alternatively, to reduce the current drawn from the digitizer, the terminations here can be used:



Trigger Status

The front panel includes a tri-color LED indicator to show the status of the trigger. When the LED is green it indicates the trigger is armed and waiting for a valid trigger to occur. Red indicates that the trigger has occurred, the acquisition is complete and the data is waiting to be readout.

Data Acquisition – Common

The U1084A Digitizers can be used either for averaging or for normal digitizer data acquisition. These two modes are quite different in their functioning. After describing some common characteristics they will be treated individually in the sections below. The digitizer mode is particularly useful when trying to configure a module for later use as an Averager.

Timing

A crystal controlled time base is used to generate the clock of the digitizer. Clock accuracy is better than ± 2 ppm, and individual sample points are recorded with better than ± 10 ps (< 2 ps rms) of sampling jitter.

Sampling Rate

The U1084A Digitizers include an analog-to-digital converter (ADC) that can sample waveforms in real time, at rates from 2 GS/s (0.5 ns per point) down to 488.28 kS/s (~2 μ s per point) in binary steps. The data of all of the active channels is acquired synchronously; all of the ADC's are acquiring data at the same time, to within a small fraction of the maximum sampling rate. Alternatively, the digitizer can be run in a single-channel mode with sampling rates up to 4 GS/s.

Data Acquisition - Digitizer Mode

Acquisition Memory and Time Base Range - Digitizer Mode

Data from the ADC is stored in on-board acquisition memory. The amount of memory in use for acquisition can be programmed and is selectable from 2 samples to 16KS in combined channel mode. Note that the Accumulation's memory is much greater. The raw ADC data is treated as a value in the range [-128, +127], which corresponds to the voltage range $[-FS/2 - \text{Offset}, +FS/2 - \text{Offset}]$.

For technical reasons, a certain memory "overhead" is required for each waveform, reducing the available memory by a small amount. In order to simplify programming, an interface function recommends the best sampling rate and the maximum possible number of data points, taking into account the available memory, the requested time window, as well as the required memory overhead.

The Time Base Range defines the time period over which data is being acquired. For example, the U1084A in the dual channel digitizer mode has an acquisition memory of just under 8 KS and maximum sampling rate of 2 GS/s. Thus, at the maximum sampling rate, the digitizer can record a signal over a time period of up to ~4 μ s (~8 KS * 0.5 ns/point). The time base range can be adjusted by varying the amount of acquisition memory or the sampling rate of the digitizer.

Pre- and Post-Trigger Delay - Digitizer Mode

To increase trigger flexibility a pre- or post-trigger delay can be applied to the trigger position. However, pre-trigger is not available in the Averaging mode.

The amount of pre-trigger delay can be adjusted between 0 and 100% of the acquisition time window (i.e. sampling interval x number of samples), whereas the post-trigger delay can be adjusted between 0 and ~2 billion samples.

Pre- or post-trigger delays are just different aspects of the same trigger positioning parameter:

The condition of 100% pre-trigger indicates that all data points are acquired prior to the trigger, i.e. the trigger point is at the **end** of the acquired waveform.

The condition of 0% pre-trigger (which is identical to a post-trigger of 0) indicates that all data points are acquired immediately after the trigger, i.e. the trigger point is at the **beginning** of the acquired waveform.

The condition of a non-zero post-trigger delay indicates that the data points are acquired after the trigger occurs, at a time that corresponds to the post-trigger delay, i.e. the trigger point is **before** the acquired waveform.

The digitizer hardware accepts pre- and post-trigger adjustments in increments of 16 samples. By definition post-trigger settings are a positive number and pre-trigger settings are a negative number.

Thus it is only natural that the software drivers provided treat pre- and post-trigger delays as a single parameter in seconds that can vary between $-nbrSamples * samplingInterval$ (100% pre-trigger) and $+maxPostTrigSamples * samplingInterval$ (max post-trigger). Since the Acqiris software drivers provide very accurate trigger position information upon waveform readout, the accepted resolution of the user-requested pre-/post-trigger delay is much better than 16 samples. For more details, refer to the **Programmer's Reference Manual**.

Single Acquisitions - Digitizer Mode

Digitizers acquire waveforms in association with triggers. Each waveform is made of a series of measured voltage values (sample points) provided by the ADC at a uniform clock rate. An acquisition consists of a waveform recorded with a single trigger. The user selects the sampling rate and acquisition memory size. The number of segments is always set to 1.

The modules also include a built-in Trigger Time Interpolator (TTI) that measures the time from the trigger point to the first sample point. This information is essential for determining the precise relation between the trigger or other event of interest and the digitized samples of the signal. The TTI resolution is ~ 8 ps.

Data Acquisition - Peak TDC Histogram Mode

Model - Mode	Channels	Maximum Sampling Rate	Maximum Segment length (Samples)	Memory Minimum / Increment (Samples)	Start Delay Stop Delay Maximum (Samples)	Histogram Maximum Bin Count (Samples)
U1084A– Single-channel*	1	4 GS/s	589824	Min. 64 Incr. 32	128M	2 M

* U1084-TDC firmware does not support synchronous dual-channel sampling

Peak Histogram Mode

In Peak Histogram mode, newly peak flows are summed in real time with the corresponding peaks of previous waveforms. The corresponding peaks are those with identical position calculated from the beginning (trigger time) of the acquisition. While the acquisition is running, the previous peak information is read from the histogram memory, added to the incoming peak information and written back to the histogram memory. Real-time peak detection, peak interpolation and peak histogramming are possible up to the maximum 4GS/s sampling rate. In Peak Histogram mode only post-trigger data are acquired. The sums are stored in a 32-bit deep histogram memory, allowing the summation of up to 16'777'216 waveforms, without overflow. ADC datum is treated as a value in the range [0, 255], which corresponds to the voltage range [-FS/2 - Offset, +FS/2 - Offset].

Time Base Range

The Time Base Range defines the time period over which data is being acquired. For example, the U1084A in peak TDC mode has an acquisition memory of maximum 589824 samples and maximum sampling rate of 4 GS/s. Thus, at the maximum sampling rate, the digitizer can record a signal over a time period of up to 147 μ s ($589824 * 0.25$ ns/point). The time base range can be adjusted by varying the amount of acquisition memory or the sampling rate of the digitizer.

Peak HistogramMemory

The histogram is an indication of the peak occurrence versus time, relatively to the trigger position. Peak Amplitude and Position determined by the Peak detector are used to increment the peak histogram in the on-board peak histogram memory. The actual peak histogram memory size used for each acquisition can be programmed. The maximum values are given in the table on the preceding page.

The histogram sums are stored in the 32-bit deep histogram memory, allowing the summation of up to 16,777,216 waveforms, without overflow.

Although the histogram memory permits to store a total of 2M bins, the number of bin in the histogram is limited to 589824 bins when interpolation is not used. It should be noticed this number is equal to the maximum number of sample that can be acquired in a segment in histogram mode. An histogram time stamp associated with the first trigger of each histogram and the necessary segment descriptors are also stored in memory.

To ensure the use of maximum sampling rate and high timing resolution, we strongly recommend the use of long peak histogram memory whenever possible. For example, the model can record 1 signal over a 100 μ s period at the full 4GS/s sampling rate. The fast sampling rate ensures that high frequency signal components are accurately recorded. If the averaging memory were reduced to just 50 KS then the sampling rate would need to be reduced to just 500 MS/s (50,000/100 μ s) to record the same 100 μ s period. All frequencies above 250 MHz would then be incorrectly digitized and important signal characteristics may be distorted or even completely missed.

Trigger Overview

Before the digitizer starts acquiring signals it must be armed and in a ready state. Arming the module is done by software (ACQUIRE command). The digitizer will then wait for a trigger to start an acquisition (see the timing diagram below).

When the **AcqrsD1_acquire** command is executed the module will receive the command after a time *Tst* which may vary between 50 μ s and even more than 100 ms, depending on the processor and the operating system used. The module will be ready to acquire after the optional hardware Enable Acquisition delay *Tenacq* and fixed delay *Tanarm*. The Acquisition Armed signal is then driven active and is optionally available on the front panel I/O MCX connector. It is normally used to enable external events, such as laser firings.

These external events in turn can produce signals that can be used to generate the triggers for the digitizer. The trigger-input pulse can have a delay *Ttrig* that can vary from zero to as long as required.

When the trigger is received, the digitizer generates a trigger output and starts the acquisition after a predetermined *StartDelay*. *StartDelay* is adjustable from its minimum as given in the table above, in steps of the time of the memory increment value, up to the maximum value given in the table above.

The digitizer can be used to limit the system's overall event rate. A rate adjustment delay *StopDelay* can be programmed in steps from zero to the model maximum with the same range and resolution as *StartDelay*. For maximum acquisition rates *StopDelay* should be set to zero.

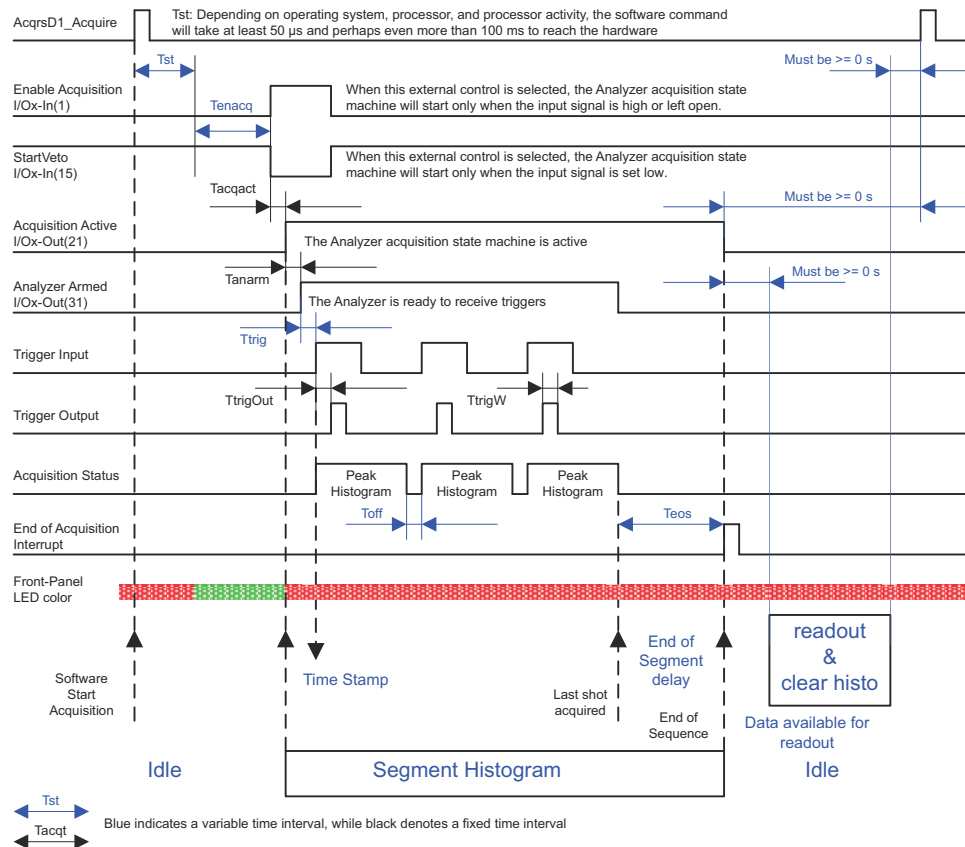
Single Histogram

The data associated with successive triggers is analyzed and peak information are summed in a single histogram until the desired depth, N_{succ} , is attained.

When a single histogram is acquired, the series of events shown in the diagram below take place:

- After a software Start command, beginning of histogram can be delayed with external input control.
- The trigger starts the acquisition until the number of programmed triggers N_{succ} is attained.
- The U1084A will histogram the peaks of the successive acquisition in a single histogram and then stops.

Single Segment Histogram of 3 waveforms



T_{anarm} is typically 36ns.

$T_{trigOut}$ is typically 13 ns.

Although minimum value for T_{off} is 1.8 us and 0us for T_{eos} , both delay strongly depends on the number of peaks found in the acquisitions and also depends on when the peaks are encountered in the acquisition sequence.

When the average number of peaks to be analyzed exceed the rate of 125 Mpeaks/S, increase of T_{off} and/or increase of T_{eos} might occur. In this case, triggers can be skipped to prevent the internal peak fifo to overflow. All waveforms participating to the histogram are always entirely analyzed.

To complement the Histogram mode, the digitizer can also measure and store the times when the first trigger participating to the segment histogram occurred. Readout of the time stamps allows the determination of the time from the beginning of one Histogram to that of any other Histogram. Timing measurements between these trigger events are possible with a resolution of ~8 ns at the maximum sampling rate and ~16 ns otherwise.

The digitizer can also store the state of 3bits at the time of the first trigger of each segment of each acquisition. These bits, which will be called hardware markers, are those of logic signals at the MCX I/O A, MCX I/O B, and MCX I/O C inputs. See section **Front Panel Inputs and Controls**.

Histogram and Interpolation

When interpolation is not used, the histogram's horizontal bin width is equal to the sample rate period. If interpolated peaks are being calculated, the histogram's horizontal bin width can be selected to be a fraction of a sample interval. The allowed choices are 1/1, 1/2, 1/4, 1/8, and 1/16 of the nominal bin width. Similarly the granularity of the contents of each bin can be chosen to be 1/2, 1/4, 1/8, or 1/16 of an ADC LSB.

This table summarize the maximum possible acquisition length and maximum number of bin available in the histogram versus the time resolution setting of the interpolation.

Interpolation Mode	Resolution of interpolation (fraction of the Sample rate period)	Maximum Number of sample in the Waveform	Maximum Number of bins in the Histogram
Disabled	1/1	589'824	589'824
Enabled	1/1		1'179'648
	1/2	524'288	2'097'152
	1/4		
	1/8		
	1/16	131'072	

This table summarize the maximum possible number of waveforms participating to the histogram versus the amplitude resolution of the interpolation.

Interpolation Mode	Resolution of interpolation (fraction of the ADC LSB)	Maximum Number of waveform in the Histogram
Disabled	1/1	16'777'216
Enabled	1/1	
	1/2	8'388'608
	1/4	4'194'304
	1/8	2'097'152
	1/16	1'048'176

Random and Synchronized Triggers

In the normal mode the trigger output is a low jitter copy of the trigger input with a fixed delay, T_{trigOut} of aprox. 13 ns. This mode is also called the **Non-Resync** mode in analogy with the same mode of previous generation of Acqiris Averager.

In **Non-Resync** mode, start of the acquisition has a jitter, shot to shot of +/- half the sampling period relative to either the internal trigger or to the external trigger out signal.

In order to preserve the timing accuracy of successively summed acquisitions, the digitizer also offer the mode **SyncOnTrigOutSync**. In this mode the external trigger out signal is synchronized to the internal sampling clock to within < 50 ps. Any external event triggered synchronously to the external trigger out signal will show a jitter shot to shot below 50 ps.

The **SyncOnTrigOutSync** mode is the preferred method for applications where the acquisition jitter must be minimized to avoid loss of effective system bandwidth typically associated with the higher jitter found when using the **Non-Resync** mode. Ideally, the trigger output is used to synchronously activate an event serving as the zero-time reference for the time-dependent phenomena that are measured in each accumulated waveform. As an example, the trigger output could activate the application of an electric or magnetic field to a sample under test. This method ensures that the application of the field is identically synchronized to the sample clock for each shot contained within the average. It also means that each sample in the accumulated sum is identically positioned shot-to-shot with respect to a fixed zero-time reference, provided that the time between the trigger output and the event waveform is kept constant.

The jitter, i.e. the variation of the position of the trigger out signal with respect to the start of the acquisition, as a function of sampling rate is shown in the table below.

Start of acquisition synchronization with respect to Trigger Output				
Sample Rate	SyncOnTrigOutSync Mode		Non-Resynchronized Mode	
	Single-channel	Dual-channel	Single-channel	Dual-channel
4 GS/s	± 60 ps	--	± 125 ps	--
2 GS/s	± 60 ps		± 250 ps	± 250 ps
1 GS/s	± 60 ps	± 60 ps	± 250 ps	± 500 ps
500 MS/s	± 60 ps	± 60 ps	± 250 ps	± 500 ps
≤ 250 MS/s	± 60 ps	± 60 ps	± 250 ps	± 500 ps

Pre Acquisition Triggers

For applications where thermal effects must be taken into account, the digitizer module has the capability of generating trigger output pulses that can be used to activate the system even when the associated event will not be acquired. The trigger output pulses can be used to stabilize systems prior to starting the acquisition. A call to **AcqrsD1_configAvgConfig** using the parameter string "**TrigAlways**" will cause these pulses to be generated. The trigger rate should not exceed that which can normally be taken under the chosen acquisition conditions.

External Clock and Reference

For applications where the user wants to replace the internal clock of the digitizer, and drive the ADC with an external source, an External Clock or Reference signal input is available. The Clock or Reference signals can be entered into the digitizer via the MCX CK connector on the front panel.

When using an External Clock, the user must ensure that the input signal has a frequency of either 1 GHz or 2 GHz and a minimum amplitude of at least 1 V peak-to-peak. The External Clock allows the digitizer to make a voltage measurement when the clock signal passes through a predefined threshold.

Normally the external clock sampling rate is the same as the external clock frequency; however for the single-channel mode the sampling rate is twice the clock frequency. The threshold range is variable and user selectable between ± 2 V. The signals should not exceed ± 5 V amplitude.

For applications that require greater timing precision and stability than is obtainable from the internal clock, a 10 MHz Reference signal can be used. The amplitude and threshold conditions, for an External Reference, are the same as for the External Clock. If phase synchronization between several digitizers is required, the reference signal should be applied to all of them. The allowed frequency range is $\pm 0.3\%$.

Front Panel Inputs and Controls

NAME	FUNCTION	Connector
Channel 1	Channel 1 input	BNC 1
Channel 2	Channel 2 input	BNC 2
Trigger IN	Trigger input	MCX TR IN
TRIGOUT	Trigger output	MCX TR
I/O A	User configurable (see below)	MCX I/O A
I/O B	User configurable (see below)	MCX I/O B
I/O C	User configurable (see below)	MCX I/O C
CLKEXT	External Clock or Reference	MCX CLK IN

The I/O A, I/O B, and I/O C signals are 3.3 V compatible CMOS. This means that, on input, low is < 0.7 V and high must be in the range [1.7 V, 5.0 V]. An unconnected signal will be high. This definition ensures TTL compatibility. On output, the low level will be in the range [0 V, 0.7 V] and the high level in the range [1.7 V, 3.3 V] for HiZ. The high level output will typically give 0.8 V into 50 Ω . The Acquisition Active and Analyzer Armed signals can be observed on any of the I/O A, B, or C MCX connectors when appropriately configured. The Enable Acquisition or Start Veto signals can be sent in to the module by the same route.

To ensure proper operation of the segment recording of hardware markers, the logical state of MCX I/O A, MCX I/O B, and MCX I/O C inputs, the input must be stable for a time interval starting 30 ns before the trigger and continuing until 30 ns after it. This implies that the HF Reject trigger coupling should not be used. If the individual inputs are not in the disable state the corresponding bits will be useless.

The TRIGOUT Signal occurs after an accepted TRIGGER. It can be chosen to be either synchronous to the Trigger IN or synchronous to the acquisition Clock and, in this case, can be used to trigger events synchronously to the acquisition clock.

Internal Calibration

The software drivers supplied include calibration functions for the timing, gain and offset settings, which can be executed upon user request. The digitizers are never calibrated in an “automatic” way, i.e. as a side effect of another operation. This ensures programmers have full control of all calibrations performed through software in order to maintain proper event synchronization within automated test applications.

The Digitizers include a high precision voltage source and a 16-bit DAC, used to determine the input voltage and offset calibration.

For accurate time and voltage measurements it is recommended to perform a calibration once the module has attained a stable operating temperature (usually reached with a few minutes after power on). Further calibration should not be necessary unless temperature variations occur. Calibration can usually be performed with signals present at the channel, external, and clock inputs. However, if the calibration is found to be unreliable, as shown by a calibration failure status, it may be necessary to remove such signals.

Trigger Time Calibration

The trigger position is dynamically calibrated each time the sample rate changes from 4GS/s to 2GS/s or less, or back to 4GS/s when the module is configured as a single channel module.

The trigger position is also dynamically calibrated each time the sample rate changes from 2GS/s to 1GS/s or less, or back to 2GS/s when the module is configured as a single channel module.

Electrical, Environmental and Physical Specifications

Electrical

Model	Power Consumption (W) Maximum / Typical	CURRENT REQUIREMENTS (A)	
		+12 V	+3.3 V
U1084A	38 / 32	2.3	1.2

The Maximum Power Consumption has been increased by 10% over the value calculated with the currents shown to take into account higher allowed values for the PCI voltages.

Except for the high total power consumption all modules conform to Revision 1 of the PCI express Specification. All of these modules are capable of DMA transfers at rates ~520 MB/s.

Environmental and Physical

The modules have a Declaration of Conformity according to ISO/IEC Guide 22 and EN45014 and **CE** Marks of Compliance.

Operating Temperature

5° to 40°C

The above values are for the ambient temperature of the room (or equivalent) where the PC is located. The temperature as measured on the board may well be significantly higher.

Relative Humidity

Type tested at 80% (non-condensing)

Dimensions

PCIe full-length standard

EMC

Complies with European EMC Directive 2004/108/EC

- IEC/EN 61326-2-1
- CISPR Pub 11 Group 1, class A
- AS/NZS CISPR 11
- ICES/NMB-001

This ISM device complies with Canadian ICES-001.

Cet appareil ISM est conforme a la norme NMB-001 du Canada

Required Airflow

U1084 Fan unit required. The digitizers are delivered with this Fan unit.



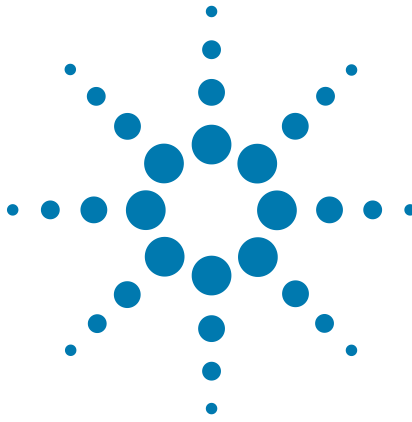
4 Running the AcqirisLive Application

AcqirisLive is an application to control and demonstrate the capabilities of Acqiris digitizers and averagers on a single machine.

It is not yet available for peakTDC. If you need to demonstrate or test an U1084A in peak TDC mode please contact Agilent support.



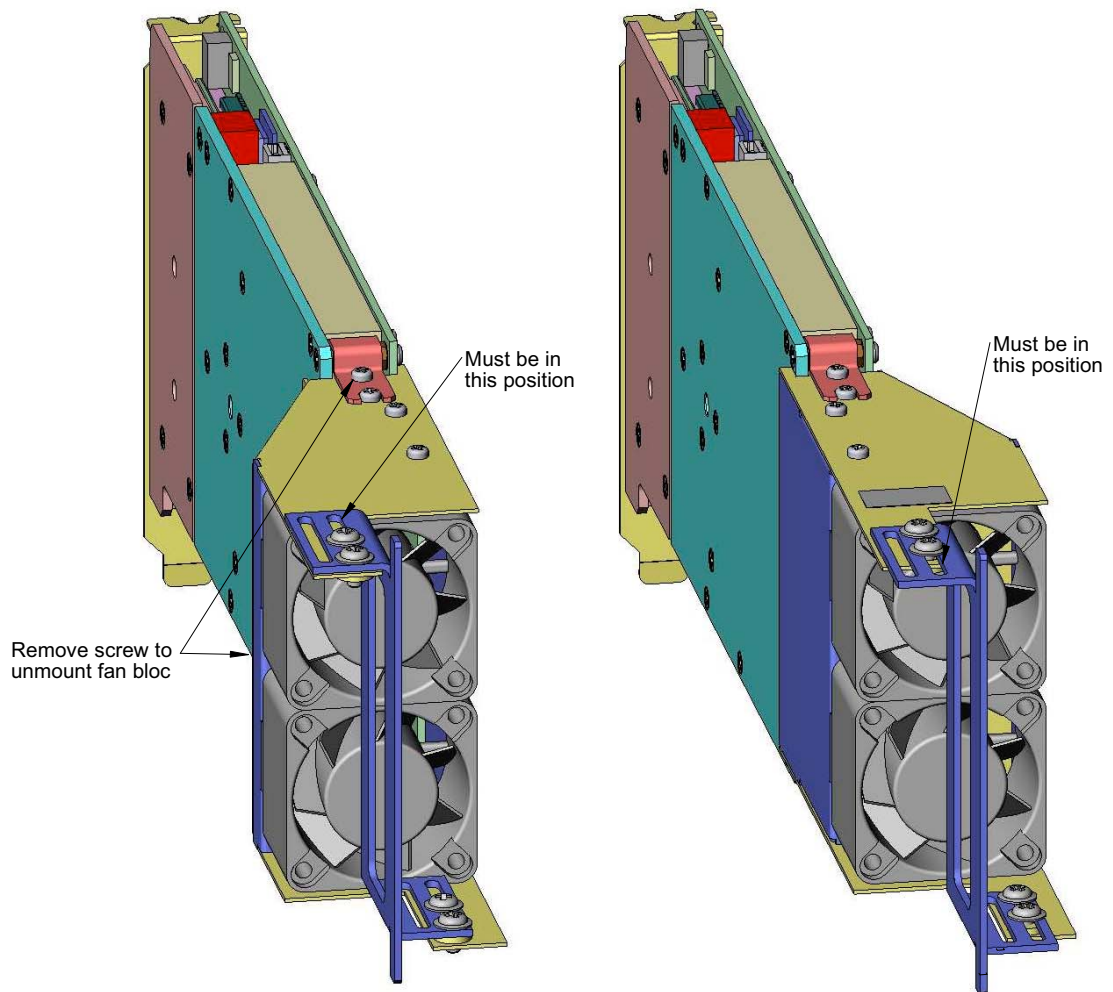
4 Running the AcqirisLive Application



5 Appendix

Fan Assembly

Depending on the PC or chassis, it might be useful to turn the FAN assembly by 180 degree. If you need to do so, please respect the following indications.



Both cable for fan power supply should be inserted before assembly of the fan bloc.
Position for each connector is not important, either above or below.



