

USER MANUAL
AGILENT ACQIRIS
8-BIT DIGITIZERS

For Use with DP and DC Series Digitizers

Models covered:

DP105 / DP106 / DP110 / DP111 / DP210 / DP211 / DP212
DP214 / DP235 / DP240 / DP1400 / DC110 / DC135 / DC140
DC211 / DC211A / / DC241 / DC241A / DC271 / DC271A / DC271AR
DC240 / DC265 / DC270
U1061A / U1063A / U1064A / U1067A / U1068A / U1069A / U1071A
U1091A

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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> and download the latest manuals or software from the Technical Support section. 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).

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1. Out of the Box

1.1. Message to the User

Congratulations on having purchased an Agilent Technologies Acqiris data conversion product. Acqiris digitizers are high-speed data acquisition modules designed for capturing high frequency electronic signals. To get the most out of the products we recommend that you read this manual carefully. We trust the product you have purchased will meet with your expectations and provide you with a high quality solution to your data conversion applications.

1.2. 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 5 separate sections. To understand the elements of operation for the module it is essential that you read them all.

- Chapter 1 ***OUT OF THE BOX***, 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 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.
- Chapter 5 ***RUNNING THE GEOGRAPHIC MAPPER APPLICATION***, describes the purpose and operation of the Geographic Mapper application which is needed for some AS bus Multi-instrument systems.

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**.

1.3. Conventions Used in This Manual

The following conventions are used in this manual:

	This icon to the left of text warns that an important point must be observed.
WARNING	Denotes a warning, which advises you of precautions to take to avoid being electrically shocked.
CAUTION	Denotes a caution, which advises you of precautions to take to avoid electrical, mechanical, or operational damage.
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

Certain features are common to several different modules. For increased readability we have defined the following families:

DC271-FAMILY	U1061A/U1064A/U1069A	DC135/DC135HZ/DC140/DC140HZ/DC211/ DC211A/DC241/DC241A/DC271/DC271A/ DC271AR/DP214/DP235/DP240
U1071A-FAMILY	all U1071A variants, DP1400, U1091AD28	

1.4. Model Names

Agilent Technologies Inc. acquired Acqiris SA and its product lines in December 2006. Use the tables below to cross reference new Agilent numbers with options to the legacy model name. The legacy model name is what is used in the Acqiris applications and the API.

Agilent Model Number	Acqiris Model Name
U1061A-001-F50	DC135
U1061A-001-FHZ	DC13HZ
U1061A-002-F50	DC140
U1061A-002-FHZ	DC140HZ
U1063A-001	DC265
U1063A-002	DC270
U1064A-001-F50	DC211
U1064A-001-FHZ	DC211A
U1064A-002-F50	DC241
U1064A-002-FHZ	DC241A
U1064A-004-F50	DC271
U1064A-004-FHZ	DC271A
U1067A	DP110
U1067A	DP105
U1068A	DP210
U1068A	DP211
U1069A	DP240
U1069A	DP235
U1069A	DP214
U1071A-001-F50	DP1400
U1071A-001-FHZ	U1071AHZ1
U1071A-002-F50	U1071A002
U1071A-002-FHZ	U1071AHZ2
U1071A-004-F50	U1071A004
U1071A-004-FHZ	U1071AHZ4
U1091A	DC110
U1091A	DP106
U1091A	DP212

Agilent Model Number	Acqiris Model Name
U1091A	DC110
U1061A-001-F50	DC135
U1061A-001-FHZ	DC135HZ
U1061A-002-F50	DC140
U1061A-002-FHZ	DC140HZ
U1064A-001-F50	DC211
U1064A-001-FHZ	DC211A
U1064A-002-F50	DC241
U1064A-002-FHZ	DC241A
U1063A-001	DC265
U1063A-002	DC270
U1064A-004-F50	DC271
U1064A-004-FHZ	DC271A
U1067A	DP105
U1091A	DP106
U1067A	DP110
U1068A	DP210
U1068A	DP211
U1091A	DP212
U1069A	DP214
U1069A	DP235
U1069A	DP240
U1071A	DP1400
U1071A-002-F50	U1071A002
U1071A-004-F50	U1071A004
U1071A-001-FHZ	U1071AHZ1
U1071A-002-FHZ	U1071AHZ2
U1071A-004-FHZ	U1071AHZ4

1.5. Disclaimer and Safety

The DP Series PCI digitizer cards have been designed to operate in a standard PCI slot found inside most personal computers. The model DC Series CompactPCI/PXI digitizers have been designed to operate inside a CompactPCI/PXI crate. The crate provides the modules with all needed power. Agilent does not recommend operation of the DC Series modules outside of a CompactPCI/PXI crate.



CAUTION: *Do not exceed the maximum input voltage rating! The maximum input voltage for 50 Ω input impedance is ± 5 V. The maximum input for 1 M Ω input impedance is ± 100 V (dc + ac) except for the DC2x1A/AR models where it is ± 300 V (dc + ac).*

1.6. Warning Regarding Medical Use

The Digitizer cards 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 Acqiris module to a human body do so at their own risk.*

1.7. Packaging and Handling

Your Digitizer is shipped with the following components:

- A compact disc in an Agilent Technologies paper CD envelope that includes
 - 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),
 - 1 Programmer's Guide and 1 Programmer's Reference Manual,
 - device drivers with sample software for different operating systems, environments and languages,
 - the Analyzer Demo application, a demonstration program for the AC/SC Analyzer products,
 - the AcqirisLive application, a demonstration program for our digitizer and averager products,
 - the SSR Demo application, a demonstration program for the Acqiris AP235/AP240 Analyzers,
 - the APX01 Demo application, a demonstration program for the Acqiris AP101/AP201 Analyzers,
 - the TC Demo application, a demonstration program for the Acqiris TC840/TC842/TC890 Time-to-Digital Converters,
 - full installation procedures for use with Microsoft Windows, National Instruments LabVIEW RT, Wind River VxWorks, IVI-COM/C, and Linux software.
- For many products a declaration of conformity is still included. However, in an increasing number of cases the Declaration can be viewed at <http://www.agilent-pra.com>.
- 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.

1.8. 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.

1.9. 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.

1.10. System Requirements

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

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.

1.11. Transport & Shipping



CAUTION: Cards can be safely transported in their original shipping packages. DC cards can be transported when properly mounted in a CompactPCI crate. The transport of DP 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. DP cards held only in the front and on the bottom should not be shipped in their PC. However, properly mounted DP cards with XP103 or XP105 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

Notes

1. Place the instrument in its original packaging materials.

• If the original packaging materials are not available, use a professional packaging service. Contact your Agilent Service Center for more information.

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 Service Center.
 7. Retain copies of all shipping papers.
- 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.*

1.12. Maintenance

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

1.13. 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.

1.14. Disposal and Recycling

Electronic equipment should be properly disposed of. Acqiris digitizers 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 Acqiris hardware and software for Windows, National Instruments LabVIEW RT, Linux, or Wind River VxWorks.



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

2.1. U1091AK02 IC414 Installation



NOTE: If you are going to install an IC414 interface for the first time and are running Windows 2000/XP you should follow the procedure below **before** installing the Acqiris hardware.

2.1.1. IC414 Hardware installation hints

The PCI-8570/PXI-8570 User's Manual (Rev. 1.00) section 2.5 gives Hardware Installation instructions.



CAUTION: Turn off the power of the PC; the PC may have to be unplugged to ensure that the PCI bus has no power available. Please ignore the PCI-8570 instruction to leave the power cord plugged in; Ground the chassis differently!



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

The standard cable pair provided each have a red connector on one end and a black connector on the other. Therefore the correct connection can be made by plugging the Red connector into the L0Rx socket and the Black connector into the L0Tx socket on the PXI module and the other Red connector into the PCI module socket furthest from the PCI card internal base connector and the Black connector into the next socket.

If you intend to use 64-bit 66 MHz transfer to maximize data transfer speed you should cable a “bundled link” using two standard cable pairs and both the L0 and L1 pairs of connectors. You should also make sure that you configure the PXI-8570 M66EN Jumper correctly.

2.1.2. IC414 Windows software installation

Windows Vista/7 (32/64), XP64 and Linux users do not need to read any further since there is no special software installation.

Windows users should have the hardware installed as noted above. This software installation should be done before any Acqiris modules are placed in the CompactPCI crates. This may mean that you have to remove the module from the crate *as delivered*.

The crate should be turned on first followed by the PC. If the cabling and start-up sequence is done correctly there will be no LED illuminated on the PCI unit connected pair and the LED's of the PXI connected pair will be lit.

For **Windows XP** installation, Select the **Control Panel** under Settings in the **Start** menu. Then, if you are using the **Category View** select **Printers and Other Hardware**. After this, for both **Category** and **Classic** views, go to **System** and then display the **Hardware** tab to get access to the **Driver Signing** menu. Since neither the AdLink nor the Acqiris driver has been submitted for **Windows Logo testing** you must select either the **Ignore** or **Warn** action. The resulting menu looks as shown:



The PCI-8570/PXI-8570 User's Manual (Rev. 1.00) section 2.4 contains the software installation instructions. These should be executed before allowing the hardware installation process to look for the driver. If you have an AdLink CD Version 2004A4 or later you can use it; if not you should download the latest driver from the WEB site (<http://www.adlinktech.com/>). You can then continue with the Hardware Installation. A reboot will then be necessary. At this point the Stargen Fabric PCI Adapter and the Stargen Aruba Fabric-to-PCI Bridge should appear correctly installed under System Devices in the Device Manager.



NOTE: If you have an AdLink CD Version 2005A3 or later you can find 8570install.exe in the folder X:\Driver Installation\PXI Platform\PXI Extension\PCI_PXI-8570\Wnt2kxp and the starfab1.inf file in the folder X:\Driver Installation\PXI Platform\PXI Extension\PCI_PXI-8570\Win98.

2.2. Installing the Software under Windows

2.2.1. Warnings

If Setup detects a previous installation of Acqiris software on your system, a warning screen will be displayed. It is recommended to exit Setup and uninstall older versions.

The installer from software releases prior to **Acqiris Software 2.0** installed the Digitizer Driver DLL files into the System 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 bin subdirectory of the Acqiris software root, and the corresponding path will be added to the PATH environment variable.

2.2.2. Multiple Versions

With the software installation from **Acqiris Software 2.0** or above, 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 PATH environment variable and reinstall the Kernel driver.

1. Copy the SYS file from <old_AcqirisSoftware_root>\bin\kernel to the Windows\System32\drivers directory.
2. Change the AcqirisDxRoot, AcqirisDxDir and PATH environment variables to the old root.
3. Reboot the computer.

2.2.3. Installation

For a first time installation on your computer Agilent recommends that you install the software BEFORE installing the hardware on your system. When upgrading to a new version, you should leave your modules installed and powered during installation.



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

Complete the following steps to install the software for Windows 2000/XP/Vista/7 (32/64).

1. Insert the *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.
2. Choose **Install AcqirisSoftware for Windows 2000/XP/2003 Server/Vista/7** (or run *Setup.exe* from the *AcqirisSoftware\Windows* folder). After several seconds for initialization the first of many screens will appear.

Please note the following points:

- It is good practice to remove any previously installed version of Acqiris software. If the program finds that there is still Acqiris software installed on your machine a warning panel will appear.
- When upgrading from an old version under Windows 2000, you must uninstall all Agilent Acqiris devices manually prior to running the installer.
- In the **Select Install Type** window selecting **Custom** installation will let you select individual packages for loading. The space indicated for LabVIEW, Firmware and UserManual packages is incorrect. The correct values are 7 MB, 40 MB, and 30 MB respectively. A full installation requires just under 300 MB of disk.
- If MATLAB is installed on your machine, you will be asked to point the installer to the MATLAB root directory. You should do this if you want the installer to modify the standard startup.m file to add the paths for the MEX interface.
- In the **Installation Folder** window you will give the name of the root directory of the Acqiris software installation. If User Manuals (30 MB) and Firmware (40 MB) are loaded more space than indicated here will be required on the drive. For the case of a Tornado 2.2 installation the folder name should not contain any spaces.
- AcqirisLive needs the LabWindows/CVI 8.0 Run-Time Engine to run. If Setup has detected that a LabWindows/CVI Run-Time Engine is already installed on your system, it will ask you if you would like to install it locally for AcqirisLive anyway. If you are not sure about the version of the CVI Run-Time Engine on your system, it is recommended to install it locally.
- The **Installation Summary** window will be shown to allow you to check what you have asked for. At this point it is not too late to go back and make changes. The actual installation will only be started after clicking on “Install” in the next window.
- Please read the **IMPORTANT Information** window text. It could help you avoid serious problems.
- Registration of your installation will help Agilent provide you with better support. You will also be notified of updates and upgrades. 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.

2.3. Installing the Software for Linux

Please refer to the README file on the Acqiris Software CD-ROM (*AcqirisSoftware/linux* folder) for detailed instructions to install the software for linux systems.

2.4. Installing the Hardware

1. Turn off the power of the PC and the crate in the case of a CompactPCI module.



CAUTION: *For PCI modules the PC may have to be unplugged to ensure that the PCI bus has no power available. However, CompactPCI crates can be left plugged in since this ensures proper grounding.*



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

2. Module in a PC: open the PC, identify a free PCI slot and carefully insert the DP Series card into it. Be sure to ground yourself by touching the grounded PC frame and avoid touching any components on the DP Series 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.

Module in a CompactPCI crate: Follow the instructions of the crate manufacturer to insert the DC Series card into a free CompactPCI peripheral slot. Be sure to ground yourself by touching the grounded crate and avoid touching any components on the DC Series card. Be sure to tighten both front panel mounting screws to lock the module into place and insure proper grounding of the frame.



NOTE: To ensure the best possible performance, users of Acqiris CC121 Crates with AS bus systems should respect the module placement rules to be found in the Agilent Acqiris 21-slot CompactPCI Crate User Manual.

PCI Bus extension module in a PC: Consult the manufacturer's documentation for any special instructions. Open the PC, identify a free PCI 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. Close the PC. Connect the module to the CompactPCI crate controller.

3. Turn on the power of the crate(s), if present, and then the PC and start the operating system.



NOTE: Acqiris digitizers 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.



NOTE: For proper system operation when using the IC200, IC414, or other PCI extension interface to connect a CC10X crate to a remote PC, the crate **must** be powered on before the PC in order for the PC BIOS to recognize the presence of the CompactPCI crate.

4. If devices were installed using a previous version of Acqiris software the instruments in these logical positions may still appear as *Unknown Devices*. This can be changed to the new Acqiris type category with the Grey Diamond icon by **Uninstalling** the device and then **Installing** again. Instructions on this procedure can be found in the **ReadMe.txt** file in the **manuals** folder of your Acqiris software installation.

2.5. After Restarting

2.5.1. Windows 2000

Under Windows 2000, 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 Acqiris digitizer(s) with normal privileges.

At the first boot following the hardware installation, Windows will detect the new hardware and will install the devices automatically. The following image will appear.




NOTE: In some systems an application program (such as AcqirisLive) will not yet work correctly at this point. One additional boot cycle may be needed if this is the first time that a hardware board is being installed.

2.5.2. Windows XP/Vista/7

Under these Windows versions, 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 Acqiris digitizer(s) with normal privileges.

If you login with administrator privileges after the first boot following the hardware installation, Windows will detect the new hardware and start the "Found New Hardware Wizard" after a few seconds. There is no need to use Windows Update to search for the software. You can "Install the software automatically". The final screen should appear as shown here:



 **NOTE:** In some systems an application program (such as AcqirisLive) will not yet work correctly at this point. One additional boot cycle may be needed if this is the first time that a hardware board is being installed.

2.6. 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 Shortcut folder under **Start** → **P**rograms.

There is only one Acqiris Driver. It supports all 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 MAX application,
- right click on the target
- 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 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 MAX Explorer and you should have Acqiris digitizers detected in your PXI system.

2.7. Installing the IVI-COM/C Driver

Please install Acqiris software for Windows first. Then the *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.

2.8. Uninstalling devices under Windows

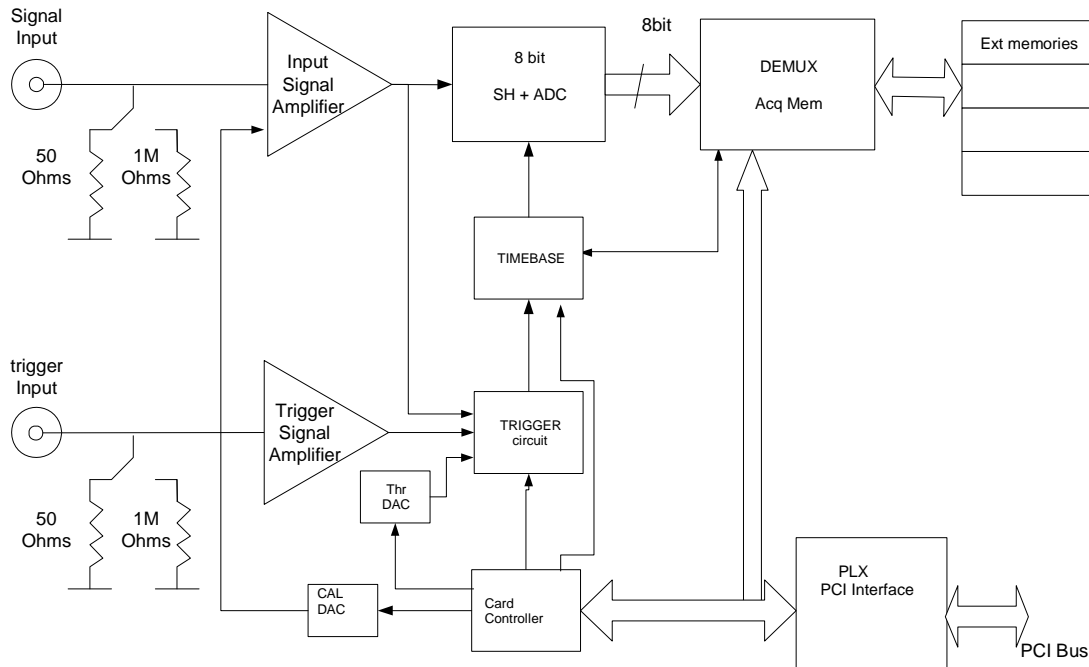
In the Device Manager, select the instrument to be uninstalled. Choose “Uninstall” from the “Action” menu. After all desired instruments have been uninstalled select “Scan for hardware changes” from the “Action” menu, or reboot the computer. Note that only those devices that are actually physically present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

2.9. 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.

3. Product Description

3.1. Overview



Acqiris digitizers are available in two popular industry standards. The DP series digitizers are PCI modules that plug directly into a vacant PCI slot in a PC. The PCI Bus is a well-defined industry standard. The DC series products are CompactPCI/PXI compliant and require an appropriate CompactPCI crate. The digitizers are all fully programmable over the PCI bus and deliver oscilloscope-like performance. Data captured by the digitizers can be transferred to a host processor, either in the PC, in the crate, or interfaced to the crate, over the PCI bus using a 32-bit bus operating at 33 MHz, at speeds up to 100 MB/s. The U1071A-FAMILY can use the PCI bus at 66 MHz thus allowing transfer rates up to 200 MB/s.

DC1XX series digitizers occupy a single slot of a 3U CompactPCI crate and they comply with the 3U Compact PCI standard (PXI compliant). DC2XX series digitizers occupy a single slot of a 6U CompactPCI crate and they comply with the 6U CompactPCI standard (PXI compliant).

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 overall 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 (15 W typical for a single channel 1 GS/s card).

The block diagram above is a simplified representation of a single channel unit. 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.

3.2. Channel Input

3.2.1. Coupling

Both AC and DC coupling modes are available. The AC mode couples signals capacitively thus removing the input signal's DC component and filtering out any signal component below 16 Hz for the DC2x1A digitizers, 32 Hz for the DC271-FAMILY and 10 Hz for all other models. DC mode allows all signal components to be passed through to the digitizer.

3.2.2. Impedance

The input channels of the DP and DC Series digitizers offer termination into 50 Ω and, sometimes 1 M Ω . The 50 Ω coupling mode offers high quality termination with better than $\pm 1\%$ precision. It is ideally suited to use with 50 Ω transmission lines (coax), high bandwidth low impedance (typically 500 Ω) probes, or active probes. The 1 M Ω coupling mode provides a high impedance (low load) capability that is suited for use with most standard high impedance probes. The high impedance mode also features low (typically ~ 10 pF, see table) capacitance that helps to minimize loading effects that can occur when probing high frequency circuits.

3.2.3. Input Protection

The input amplifiers are fully protected against over-voltage signals. Input signals, up to ± 300 V for the DC271A, DC271AR, DC241A, and DC211A and ± 100 V otherwise (DC + peak AC < 10 KHz) at 1 M Ω and up to ± 5 V DC at 50 Ω , can be input without damaging the front-end electronics.

The front-end also provides an overload protection that will automatically switch the coupling from 50 Ω to 1 M Ω if the signal is greater than ± 5 V DC. This is implemented for most modules (not the DC2x1A) that have the 1M Ω impedance possibility.

3.2.4. 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.

3.2.5. 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:

$$\tau_{10-90}^2 = \tau_{10-90\text{real}}^2 + \tau_{\min}^2 \quad \text{where} \quad \tau_{\min} (\text{ns}) \approx 0.35 (\text{GHz}\cdot\text{ns}) / \text{BW} (\text{GHz})$$

The following table indicates the bandwidth and rise time performance of the DP and DC Series digitizers. For many digitizers, the bandwidth can be limited with hardware bandwidth limiters as shown in the tables below. For many of the older models the bandwidth at 50 mV FS, BW_{50} , is not as high as that of the other sensitivities.

Model Agilent #	Bandwidth into 50 Ω	Bandwidth/ Capacitance into 1 M Ω	Minimum Rise Time	BW Limiter selections	Maximum Offset	Other particularities
DP105 U1067A	150 MHz	150 MHz 8 pF	2.3 ns	NA	20 V	BW ₅₀ = 90 MHz
DP106	250 MHz	NA	1.4 ns	NA	NA	BW ₅₀ = 200 MHz Max FS = 0.5 V
DP110 U1067A	250 MHz	250 MHz 8 pF	1.4 ns	NA	20 V	BW ₅₀ = 200 MHz
DP111	500 MHz	NA	0.7 ns	25 MHz	NA	BW ₅₀ = 200 MHz Max FS = 0.5 V
DP210 U1068A	500 MHz	400 MHz 8 pF	0.7 ns	NA	20 V	BW ₅₀ = 200 MHz
DP211 U1068A	500 MHz	NA	0.7 ns	25 MHz	NA	BW ₅₀ = 200 MHz Max FS = 0.5 V
DP212	500 MHz	NA	0.7 ns	25 MHz	NA	BW ₅₀ = 200 MHz Max FS = 0.5 V
DP214 U1069A	1 GHz	NA	0.35 ns	20, 200, 700 MHz	5 V	DC271 FAMILY
DP235 U1069A	500 MHz	NA	0.7 ns	20, 200 MHz	5 V	DC271 FAMILY
DP240 U1069A	1 GHz	NA	0.35 ns	20, 200, 700 MHz	5 V	DC271 FAMILY
DP1400 U1071A -001-F50	1 GHz	NA	0.35 ns	20, 200, 700 MHz	5 V	U1071A-FAMILY
U1071A002 U1071A -002-F50	500 MHz	NA	0.7 ns	20, 200 MHz	5 V	U1071A-FAMILY
U1071A004 U1071A -004-F50	150 MHz	NA	2.3 ns	20 MHz	5 V	U1071A-FAMILY
U1071AHZ1 U1071A -001-FHZ	1 GHz	300 MHz typical 18 pF	0.35 ns (50 Ω) (1.2 ns 1 M Ω)	20, 200, 700 MHz (see remark below)	5 V (50 Ω) 20 V (> 0.5 V FS & 1M Ω) 200 V (> 5V FS & 1M Ω)	U1071A-FAMILY Max FS = 50 V (1 M Ω)
U1071AHZ2 U1071A -002-FHZ	500 MHz	300 MHz typical 18 pF	0.7 ns (50 Ω) (1.2 ns 1 M Ω)	20, 200 MHz (see remark below)	5 V (50 Ω) 20 V (> 0.5 V FS & 1M Ω) 200 V (> 5V FS & 1M Ω)	U1071A-FAMILY Max FS = 50 V (1 M Ω)
U1071AHZ4 U1071A -004-FHZ	150 MHz	150 MHz typical 18 pF	2.3 ns 50 Ω & 1 M Ω	20 MHz	5 V (50 Ω) 20 V (> 0.5 V FS & 1M Ω) 200 V (> 5V FS & 1M Ω)	U1071A-FAMILY Max FS = 50 V (1 M Ω)

Model Agilent #	Bandwidth into 50 Ω	Bandwidth/ Capacitance into 1 M Ω	Minimum Rise Time	BW Limiter selections	Maximum Offset	Other particularities
U1091AD28	500 MHz	NA	0.7 ns	20, 200 MHz	5 V	U1071A-FAMILY
DC110 U1091A	250 MHz	250 MHz 8 pF	1.4 ns	NA	20 V	BW ₅₀ = 200 MHz
DC135 U1061A -001-F50	500 MHz	NA	0.7 ns	20, 200 MHz	5 V	DC271 FAMILY FC Option
DC135HZ U1061A -001-FHZ	500 MHz	300 MHz typical 18 pF	0.7 ns (50 Ω) (1.2 ns 1 M Ω)	20, 200 MHz (see remark below)	5 V (50 Ω) 20 V (> 0.5 V FS & 1M Ω) 200 V (> 5V FS & 1M Ω)	DC271 FAMILY FC Option Max FS = 50 V (1 M Ω)
DC140 U1061A -002-F50	1 GHz	NA	0.35 ns	20, 200, 700 MHz	5 V	DC271 FAMILY FC Option
DC140HZ U1061A -002-FHZ	1 GHz	300 MHz typical 18 pF	0.35 ns (50 Ω) (1.2 ns 1 M Ω)	20, 200, 700 MHz (see remark below)	5 V (50 Ω) 20 V (> 0.5 V FS & 1M Ω) 200 V (> 5V FS & 1M Ω)	DC271 FAMILY FC Option Max FS = 50 V (1 M Ω)
DC211 U1064A	1 GHz	NA	0.35 ns	20, 200, 700 MHz	5 V	DC271 FAMILY
DC211A U1064A	950 MHz (1 GHz typical)	300 MHz typical 14 pF	0.35 ns (50 Ω) (1.2 ns 1 M Ω)	20, 200, 700 MHz (see remark below)	5 V (50 Ω) 20 V (> 0.5 V FS & 1M Ω) 200 V (> 5V FS & 1M Ω)	DC271 FAMILY Max FS = 50 V (1 M Ω)
DC240	500 MHz	400 MHz 11 pF	0.7 ns	NA	20 V	BW ₅₀ = 200 MHz
DC241 U1064A	1 GHz	NA	0.35 ns	20, 200, 700 MHz	5 V	DC271 FAMILY
DC241A U1064A	950 MHz (1 GHz typical)	300 MHz typical 14 pF	0.35 ns (50 Ω) (1.2 ns 1 M Ω)	20, 200, 700 MHz (see remark below)	5 V (50 Ω) 20 V (> 0.5 V FS & 1M Ω) 200 V (> 5V FS & 1M Ω)	DC271 FAMILY Max FS = 50 V (1 M Ω)
DC265 U1063A	150 MHz	150 MHz 11 pF	2.3 ns	NA	20 V	BW ₅₀ = 90 MHz
DC270 U1063A	250 MHz	250 MHz 11 pF	1.4 ns	NA	20 V	BW ₅₀ = 90 MHz
DC271 U1064A	1 GHz	NA	0.35 ns	20, 200, 700 MHz	5 V	DC271 FAMILY
DC271A U1064A DC271AR	950 MHz (1 GHz typical)	300 MHz typical 14 pF	0.35 ns (50 Ω) (1.2 ns 1 M Ω)	20, 200, 700 MHz (see remark below)	5 V (50 Ω) 20 V (> 0.5 V FS & 1M Ω) 200 V (> 5V FS & 1M Ω)	DC271 FAMILY Max FS = 50 V (1 M Ω) The AR has only 2 channels

For 1 M Ω coupling in the DC2x1A/AR, DC140HZ, and U1071AHZ1 the 700 MHz Bandwidth Limiter cannot be used. Furthermore, in the DC2x1A/AR, DC1xxHZ, and U1071AHZn with FS gain > 5V the 200 MHz Bandwidth Limiter is always active.

3.2.6. 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 (except as shown above) 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. 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 \pm Maximum Offset for FS settings above 500 mV. The raw 8-bit ADC data values are in the range [-128, +127] with the first and last values reserved for underflow and overflow respectively. The midpoint value, 0, of the range corresponds to the negative of the offset voltage. Thus the Full Scale Range (FSR) goes from

$$-\text{Offset Voltage} - (\text{FS}/2) \quad \text{to} \quad -\text{Offset Voltage} + (\text{FS}/2)$$

Signals going outside of the FSR will be clipped and data values for the clipped portion of a signal should be regarded as erroneous.

The maximum input voltage for 50 Ω input impedance is ± 5 V. The maximum input for 1 M Ω input impedance is ± 100 V (dc + ac) except for the DC2x1A/AR models where it is ± 300 V (dc + ac).

3.2.7. Vertical Resolution


The digitizers described in this manual use an ADC system with 8 bits of vertical resolution (256 levels). The dynamic range of the ADC covers the Full Scale Range (FSR) of the Input Voltage setting. For example, if the Input Voltage is set to 1 V then the ADC resolution is equivalent to 3.91 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 FSR setting.

3.2.8. DC Accuracy and Linearity

The DP and DC Series digitizers use low noise front-end electronics in order to ensure voltage measurement is made with accuracy and precision. DC voltage accuracy, at 0 V offset, is better than $\pm 2\%$ ($\pm 1\%$ typical) of the input voltage full scale. The differential linearity is better than ± 0.7 LSB (± 0.8 LSB for DC135/DC140 digitizers and ± 0.9 LSB for other DC271-FAMILY digitizers).

3.2.9. Using Probes

The 50 Ω and 1 M Ω input impedance settings make it possible to use Acqiris digitizers with a wide variety of probes. The 50 Ω setting is most commonly used for active probes and low impedance (500 Ω) passive probes. The 1 M Ω setting is normally used for high impedance probes. Before using any passive probe with a digitizer care should be taken to check that the probe has been correctly adjusted (refer to the Probe's Calibration procedure).

 **NOTE:** Passive high impedance probes are not suitable for high fidelity measurements above 100 MHz. The non-negligible (5-10 pF) tip capacitance loads the signal causing distortion and/or ringing when combined with the ground lead inductance.

3.3. Data Acquisition

The table below summarizes the characteristics discussed in the sections that follow:

Model	Max. Sampling Rate	Max. CONVERTERS PER CHANNEL/ CHANNELS	Default Memory samples/channel	Maximum Optional Memory samples/channel	Maximum Segments	TTI Resolution	Timebase Accuracy	External Clock Max./Min. Thresh.
DP105	500 MS/s	1 / 1	128K	8M	8000	80 ps	50 ppm	± 2 V
DP106	500 MS/s	1 / 1	128K	2M	4000	80 ps	50 ppm	± 2 V
DP110	1 GS/s	1 / 1	128K	8M	8000	80 ps	50 ppm	± 2 V
DP111	1 GS/s	1 / 1	128K	2M	4000	5 ps	2 ppm	± 3 V

Model	Max. Sampling Rate	Max. CONVERTERS PER CHANNEL/ CHANNELS	Default Memory samples/channel	Maximum Optional Memory samples/channel	Maximum Segments	TTI Resolution	Timebase Accuracy	External Clock Max./Min. Thresh.
DP210	2 GS/s	1 / 1	256K	16M	8000	5 ps	2 ppm	± 3 V
DP211	2 GS/s	1 / 1*	256K	16M	8000	5 ps	2 ppm	± 3 V
DP212	2 GS/s	1 / 1	256K	16M	8000	5 ps	2 ppm	± 3 V
DP214	2 GS/s	1 / 1	256K	16M	8000	5 ps	2 ppm	± 2 V
DP235	1 GS/s	2 / 2	128K	2M	4000	5 ps	2 ppm	± 2 V
DP240	2 GS/s	2 / 2	128K	8M	8000	5 ps	2 ppm	± 2 V
DP1400 U1071AHZ1	2 GS/s	2 / 2	128K	128M	64000	~13ps	2 ppm	AC 0 V
U1071A002 U1071AHZ2	2 GS/s	2 / 2	128K	128M	64000	~13ps	2 ppm	AC 0 V
U1071A004 U1071AHZ4	1 GS/s	2 / 2	128K	128M	64000	~13ps	2 ppm	AC 0 V
U1091AD28	2 GS/s	2 / 2	128K	N/A	1000	~13ps	2 ppm	AC 0 V
DC110	1 GS/s	1 / 1	128K	8M	8000	5 ps	50 ppm	± 2 V
DC135 DC135HZ	1 GS/s	2 / 2	64K	2M	4000	5 ps	2 ppm	± 2 V
DC140 DC140HZ	2 GS/s	2 / 2	128K	8M	8000	5 ps	2 ppm	± 2 V
DC211	4 GS/s	1 / 1	512K	32M	8000	5 ps	2 ppm	± 2 V
DC211A	4 GS/s	1 / 1	128K	8M	8000	5 ps	2 ppm	± 2 V
DC240	2 GS/s	1 / 2	256K	16M	8000	5 ps	2 ppm	± 3 V
DC241	4 GS/s	2 / 2	256K	16M	8000	5 ps	2 ppm	± 2 V
DC241A	4 GS/s	2 / 2	128K	8M	8000	5 ps	2 ppm	± 2 V
DC265	500 MS/s	1 / 4	128K	2M	4000	5 ps	2 ppm	± 2 V
DC270	1 GS/s	1 / 4	128K	8M	8000	5 ps	2 ppm	± 2 V
DC271	4 GS/s	4 / 4	128K	8M	8000	5 ps	2 ppm	± 2 V
DC271A	4 GS/s	4 / 4	128K	8M	8000	5 ps	2 ppm	± 2 V
DC271AR	2 GS/s	2 / 2	128K	8M	8000	5 ps	2 ppm	± 2 V

The * indicates a Dual Input module where there is one channel which can digitize the signal on one of the two BNC inputs

3.3.1. Sampling Rate

All Acqiris digitizers contain an analog-to-digital conversion (ADC) system that can sample waveforms, in a real time sampling mode, at rates from the maximum allowed rate down to 100 S/s (10 ms per point). The lowest allowed sampling rate for U1071A-FAMILY modules is set to 10 MS/s. The sampling rate can be programmed and is selectable in a 1, 2, 2.5, 4, 5 sequence (i.e. 1 MS/s, 2 MS/s, 2.5 MS/s, 4 MS/s, 5 MS/s, 10 MS/s, ... 1 GS/s, 2GS/s, 4 GS/s). The maximum sampling rate shown above sometimes exploits the possibility of combining channels.

3.3.2. Acquisition Memory

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 1 point to the full amount of acquisition memory available.

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, the number of segments (in Sequence mode), as well as the required memory overhead.

To ensure maximum sampling rate and high timing resolution, we strongly recommend the use of long acquisition memories whenever possible. For example, the model DC110 or DP110 with 2 Mpoints of memory can record a signal over a 2 ms period with a sampling rate of 1 GS/s (1 ns per point). The fast sampling rate ensures that all high frequency signal components, up to the full 250 MHz bandwidth of the digitizer, are accurately recorded. If the memory were reduced to just 20 Kpoints then the sampling rate would need to be reduced to just 10 MS/s (20,000/2 ms) to record the same 2 ms period. All frequencies above 5 MHz would then be incorrectly digitized and important signal characteristics may be distorted or even completely missed.

3.3.3. Single and Sequence Acquisition Modes

Digitizers acquire waveforms in association with triggers. Each waveform is made of a series of measured voltage values (sample points) that are made by the ADC at a uniform clock rate. To maximize sampling rates and utilize memory as efficiently as possible, the digitizers include both Single and Sequential storage modes. For both of these modes 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.

The Single Acquisition mode is the normal operation of most digitizer products. In this mode an acquisition consists of a waveform recorded with a single trigger. The user selects the sampling rate and acquisition memory size and sets the number of segments to 1 (default value).

The Sequence Acquisition mode allows the capture and storage of consecutive “single” waveforms. Sequence Acquisition mode is useful as it can optimize the digitizer's sampling rate and memory requirements for applications where only portions of the signal being analyzed are important. The mode is extremely useful in almost all impulse-response type applications (RADAR, SONAR, LIDAR, Time-of-Flight, Ultrasonics, Medical and Biomedical Research, etc.).

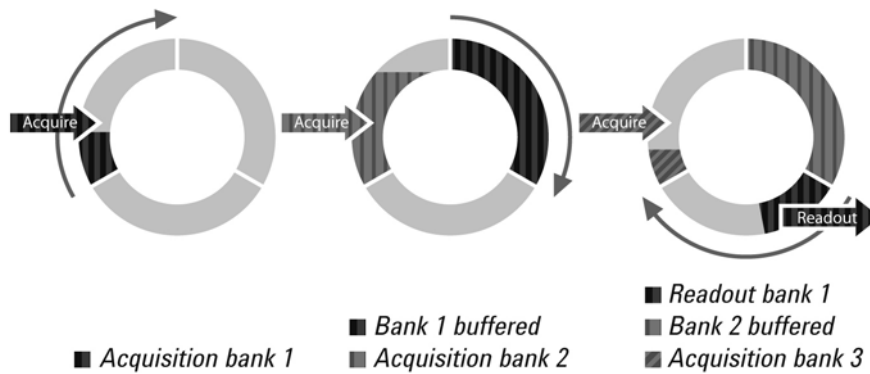
In Sequence Acquisition mode the acquisition memory is divided into a pre-selected number of segments. Waveforms are stored in successive memory segments as they arrive. Each waveform requires its own individual trigger. For most modules the memory can be divided into any number of segments between 2 and 200 (up to 8000 segments with options M32, M16, M8M and M4M, 4000 segments with option M2M, 2000 with option M1M). The U1071A-FAMILY can have up to 1000 segments for the standard memory and up to 64000 with option -256. In Sequence Acquisition mode the user needs to specify the sampling rate, the total acquisition memory, and the number of segments. Note that the Single Acquisition mode is just a special case of the Sequence Acquisition mode with the number of segments set to 1.

Sequence acquisition enables successive events, which can occur within a very short time, to be captured and stored without loss. A crucial feature of Sequence Acquisition mode is that it has a very fast trigger rearm time. A fast trigger rearm helps produce very low “dead time” (less than 800 ns for the highest available sampling rates in most units, however 350 ns for the U1071A-FAMILY internal memory and 1.8 μ s for its external memory) between the segments of a sequence acquisition. The “dead time” is the period after the end of an event when the card cannot digitize data for a new trigger event. To complement this mode of operation the digitizer can also measure and store the arrival time of each trigger using the information from the on board Trigger Time Interpolator (TTI). Readout of the individual trigger time stamps makes it possible to determine the time from one trigger to any other trigger in the sequential acquisition. The TTI resolution sets the resolution of the trigger time stamps (see section 3.3.5 **Timing** and the table above).

3.3.4. U1071A-FAMILY Simultaneous multibuffer Acquisition and Readout (SAR)

For this module the internal memory has a dual-port structure which can be exploited to permit simultaneous data acquisition and read out. When the special SAR option is present the internal memory can be turned into a circular buffer of a chosen number of banks, between 2 and 1000. Data can be read out of one bank while data is acquired into any available free banks. This mechanism, together with sequence acquisition, helps achieve a high maximum continuous event rate in spite of interrupts due to the computer operating system. The maximum continuous event rate is the maximum value of the trigger frequency that can be accepted without the loss of any event. It will work for both 1 and 2 converter/channel modes. It does not work if the ‘Start on Trigger’ mode of acquisition is selected nor

when the AS bus is present. The number of segments (Ns) available per bank (Nb) must respect the constraint that the total $N_b * N_s < 1000$.



3.3.5. Timing

A crystal-controlled timebase is used to clock the ADC system of the digitizers. The timebase accuracy is guaranteed as shown in the table at the beginning of this section. The digitizers 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 approximate TTI resolution is also given in the table at the beginning of this section.

3.3.6. Timebase Range

The timebase range defines the time period over which data is being acquired. For example, the DC110 has a standard acquisition memory of 128 Kpoints and maximum sampling rate of 1 GS/s. Therefore, at the maximum sampling rate, the digitizer can record a signal over a timebase range of up to 130 μ s (approx. 130,000 points * 1 ns/point). The timebase range can be adjusted by varying the amount of acquisition memory or the sampling rate of the digitizer.

3.3.7. Combining channels

The DC135/DC135HZ/DC140/DC140HZ/DC241/DC241A/DC271/DC271A/DC271AR/DP235/DP240/U1071A-FAMILY digitizers offer the possibility of combining the converters (and their memories) from two or four channels to analyze a single input channel. With this feature the maximum sampling rate and the maximum amount of acquisition memory can be doubled or quadrupled if all of the input channels are not of immediate interest.

3.3.8. Sparkle Code Rate

Acqiris digitizers contain analog-to-digital conversion (ADC) systems that sample waveforms at high sampling rates. A data value from any ADC will often differ from the ideal code that would best represent the input signal. This happens for many reasons including noise, non-linearity, and harmonic distortion. Furthermore, all ADC circuits also exhibit an effect called “sparkle code”, which is due to a (rare) error in the binary coding of the output value. A sparkle code error is generated when the ADC erroneously sets a 1 instead of a 0 (or a 0 instead of a 1) in the binary output code. The frequency of such errors may be specified as a probability of a deviation above a defined threshold per converted data value. E.g. a sparkle code rate (sometimes also called BER, bit error rate) of 10^{-9} would indicate that 1 data value out of 1 billion is a sparkle code, on average. Modern digitizing systems offer both large memory and high transfer rates to the host computer. This allows large quantities of data to be easily examined and the sparkle codes become obvious. Depending on ADC design details, the frequency of sparkle code errors can be diminished.

Most of the time, a sparkle code is quite easily recognizable as a rare, but large, deviation of the output from the expected value. The error is often in a single bit so the deviation is 2^m . The signal therefore shows an unexpected sharp “spike” in an otherwise smooth waveform. In some 8-bit ADCs, the effect is most likely to occur around specific output levels such as 0, 64, and -64, and the deviation is typically ± 64 or ± 32 . In applications that are particularly sensitive to sparkle code it is recommended to avoid such levels, and adjust the digitizer offset such that the baseline (if any) does not fall on the specific code values shown above.

For example, if a ~500 mV peak-peak input signal is usually right at 0 V and occasionally at 500 mV, it makes sense to program the vertical gain at 1 V full scale and the offset at -200 mV which puts the baseline at -51 and the peak at

+77; both values here are away from the danger points. It would not be recommended to put the offset at -250 mV with a 1 V full scale, as this would set the baseline around -64, and peak at +64 where we are more likely to see sparkle codes, and erroneous data.

3.4. Trigger

Normally the trigger settings applied to the digitizer are used to determine the time at which the device will stop acquiring data. Some models are also capable of a 'Start on Trigger' mode of acquisition (see the Programmer's Guide for further details). The various trigger settings are outlined below.

3.4.1. Trigger Source

The trigger source can be a signal applied to either an Input Channel (internal triggering) or the External Trigger Input. For the DC135/DC135HZ/DC140/DC140HZ/DC211/DC211A/DC241/DC241A/DC271/DC271A/DC271AR modules, a standardized trigger in signal can also be routed via the PXI Bus Star Trigger line.

Most digitizers provide a separate front panel input BNC connector that can be used as an External Trigger Input. The External Input provides a fully functional trigger circuit with selectable level and slope as for the Internal Triggering source; however it does not include coupling choices nor HF, Window, and Spike Stretcher triggers. The external trigger termination (1 M Ω or 50 Ω) is also selectable on many modules. In modules with this feature, the circuit also provides an overload protection that will automatically switch the coupling from 50 Ω to 1 M Ω if the signal is greater than ± 5 V DC.

The DC271-FAMILY digitizers have a fixed 50 Ω termination impedance. They also allow the same BW limiter selections as can be found for the channels. The DC271-FAMILY digitizers' external trigger circuit has diode protection against overload.

The U1071A-FAMILY also gives the choice of 50 Ω or 1 M Ω termination impedance for the MCX external input and has diode protection against overload. However, there are no BW limiters and only DC trigger coupling is available.

In all 50 Ω cases a ± 5 V limit on trigger signals should be respected, although somewhat higher voltages for short time periods will not damage the unit. For 1 M Ω input signals up to ± 100 V (DC + peak AC < 10 KHz) are allowed.

3.4.2. Trigger Coupling

Trigger coupling is used to select the coupling mode applied to the input of the trigger circuitry. Modes available include AC LF Reject and DC. The AC LF Reject mode couples signals capacitively and removes the input signal's DC component and signals below 50 KHz (50 Hz for DC271-FAMILY digitizers). DC mode allows all signal components to be passed through to the trigger circuit. The DC271-FAMILY digitizers have an HF Reject mode that removes signal components above 50 KHz.

3.4.3. 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, the level is set with respect to the midpoint voltage ($V_m = \text{Offset voltage}$) of the digitizer's vertical scale. Internal trigger level settings (expressed in %) must be within $V_m \pm 0.6$ FS (0.5 FS for DC271-FAMILY digitizers), where FS is the channel Full Scale. All trigger circuits have sensitivity levels that must be exceeded in order for reliable triggering to occur.

For most digitizers, the AC coupled mode is implemented with an auto-level trigger. Only the DC271-FAMILY digitizers allow trigger levels to be selected in connection with the AC coupling choices.

The DC271-FAMILY digitizers allow the user to choose the external trigger Full Scale from the set of values 0.5, 1.0, 2.0 or 5.0 V. The external trigger level can then be set to values in the range ± 0.5 FS. The U1071A-FAMILY has a single external Trigger Full Scale of 10 V. All other digitizers have an external trigger range of ± 3 V.

The DC271-FAMILY digitizers will trigger on signals with a peak-peak amplitude > 15% FS from DC to their bandwidth limit.

3.4.4. Edge Trigger Slope

The trigger slope defines which one of the two possible transitions will be used to initiate the trigger 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.

3.4.5. Window Trigger

The DC271-FAMILY digitizers and the 2 channels of the U1071A-FAMILY implement a Window trigger. Two trigger level thresholds are used to define the desired range. The trigger can then be chosen to occur either when the signal exits or enters the window range. This mode can be thought of as the appropriate OR of two edge triggers of opposite slope.

3.4.6. HF Trigger

The DC271-FAMILY digitizers and the 2 channels of the U1071A-FAMILY implement an HF trigger that allows triggers to be reliably accepted at rates above ~ 1 GHz. In this mode, triggers occur on every fourth positive edge. The window trigger mode is not available.

3.4.7. Spike Stretcher

The trigger circuit of the 2 channels of the U1071A-FAMILY also has a Spike Stretcher mode which ensures that even very short pulses are capable of generating triggers. This mode is useful if the time interval during which the trigger signal satisfies the threshold condition is less than 0.5 ns and the trigger frequency is less than 10 MHz. The trigger slope is positive in this mode.

3.4.8. U1071A-FAMILY Multi-source Trigger

This digitizer permits triggers that require a pattern condition including one of the trigger channels and the external trigger. The trigger condition defined above, on each of the inputs, defines the TRUE/FALSE state of each input. These states can be logically combined with AND, OR, NAND, or NOR to define the overall trigger condition. Potential triggers can then occur on the FALSE to TRUE transitions of the combined signal.

There is a small (~ns) delay between the times at which two simultaneous inputs arrive at the logical element that defines the overall trigger condition. If necessary, this must be corrected for by cable delay on the external input; the delay will depend on the overall configuration and therefore must be determined by the user.

3.4.9. Pre- and Post-Trigger Delay

To increase trigger flexibility a pre- or post-trigger delay can be applied to the trigger position.

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 200 million samples. The U1071A-FAMILY allows a post trigger delay of up to $2^{34} - 1$ 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 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 Guide.

3.4.10. 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. For the U1071A-FAMILY a yellow LED is an indication of a timeout when the PC tried to communicate with the module. The user can override the default functions and program the LED color in an application-specific manner.

3.5. 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, either an External Clock or an External Reference signal can be used. The Clock or Reference signals can be entered into the digitizer either by the dedicated MMCX (DC271-FAMILY), MCX (U1071A-FAMILY), or BNC (DC240) connector or via the shared External Input connector on the front panel (all other models). In addition, for the DC135/DC135HZ/DC140/DC140HZ/DC211/DC211A/DC241/DC241A/DC271/DC271A/DC271AR models, the PXI Bus 10 MHz system clock signal (PXI_CLK10) can be used as the reference.

With External Clock two operating modes are possible; Continuous for the case in which the clock signals are always present and Start/Stop for the situation where the user needs complete control of the sampling process. The Start/Stop mode is not available for the U1071A-FAMILY. When using a Continuous External Clock, the user must ensure that the input signal has a frequency between 20 MHz and 2 GHz (U1071A-FAMILY and DC271-FAMILY) or between 10 MHz and 500 MHz (all other models). For the Start/Stop mode the input signal frequency must be less than 1 GHz (DC271-FAMILY) or 500 MHz (all other models). In all cases it must have a minimum peak to peak amplitude into 50 Ω at the front of the digitizer of at least

- 0.5 V for DC135/DC135HZ/DC140/DC140HZ/DC211A/DC241A/DC271A/DC271AR/U1071A-FAMILY
- 1 V all other DC271-FAMILY and
- 2 V for other models.

The U1071A-FAMILY has a fixed threshold and uses AC coupling. Otherwise, the transitions of the clock are defined with the aid of a threshold that is user selectable in the range [-2.0 V, 2.0 V] ([-3.0 V, 3.0 V] for the DC240). The signals should not exceed ± 5 V amplitude. For a detailed discussion on the programmed use of the external clock, refer to the Programmer's Guide.

For applications that require greater timing precision and long-term stability than is obtainable from the internal clock, a 10 MHz Reference signal can be used. The External Reference is nominally at 10 MHz. However, frequencies in the range [9.0 MHz, 10.2 MHz] will be accepted for all models other than the U1071A-FAMILY. If you do this you may need to correct for the difference in your application since the digitizer and the driver have no way to know about such deviations. The amplitude and threshold conditions, for an External Reference, are the same as for the External Clock. If synchronization between several digitizers is required, the reference signal should be applied to all of them.

3.6. 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 model DC and DP series 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 of digitizer operation after power on). Further calibration should not be necessary unless temperature variations occur.

A full internal calibration of a digitizer can be very time consuming (> 100 s/digitizer), in particular for the DC2x1A models. Therefore, several other options are available. They are documented in the **Programmer's Reference Manual**. A program can always be started with the digitizer in an uncalibrated state and data taken can be used for many kinds of testing. However, as soon as good data respecting the specifications of the instrument is required a calibration of at least the current acquisition state is needed. The full internal calibration has the advantage that it generates the calibration constants needed for any possible configuration of the instrument; its disadvantage is the time taken. If a more selective calibration is done it will allow the generation of good data in the current acquisition state. This calibration will remain useable whenever that acquisition state is used again for as long as the temperature of the instrument does not change significantly. A fast calibration of a channel in a configuration can be done in around a second. Many applications can save time by only performing calibration for the configurations that will actually be used. 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.

3.7. AS bus

The DC Series digitizers may be used in applications that require many data acquisition channels. In such cases it is possible to use more than one digitizer in a standard CompactPCI/PXI crate. Each DC Series digitizer, except the DC135 and DC140 models, includes AS bus, a proprietary high bandwidth auto-synchronous bus system that allows multiple digitizers to work together synchronously.

The AS bus distributes both the clock and trigger signals along a plug-in front panel bus, between all the digitizers that participate in the system. It allows any digitizer to act as the trigger source and any other digitizer to act as the clock source (acquisition master), enabling all the digitizers to be clocked at the same time. Synchronizing the clock signals between the devices improves the accuracy of cross-channel measurements and is essential for accurate time correlation between signals on different channels.

The AS bus is intended to connect modules of the *same type*, i.e. of the same model number, although some exceptions to this rule might be possible. If modules with the same model number, but different memory length options, are connected only the shortest memory length can be used.

The AS bus connector is located on the front panel of each cPCI module. Bridges are used to connect adjacent modules for synchronization, which is then activated through software by defining a master module and the trigger source. Up to 7 modules may be synchronized with the AS bus. More detailed information and the commands required to setup the AS bus clock and trigger distribution are included in the **Programmer's Guide** and **Programmer's Reference Manual**.

The U1071A-FAMILY uses the AS bus 2 system with a connector on the top of each card to achieve the same functionality. It works for up to 3 modules.

3.8. Special Front Panel Input and Output (U1071A-FAMILY & DC271-FAMILY)

Connector	Function
CLK IN	50 Ω External Reference or External Clock Input
I/O A	User configurable (see below)
TR OUT	Signal occurs after an accepted TRIGGER.
I/O B	User configurable (see below)

The DC271-FAMILY uses MMCX connectors for these functions; the U1071A-FAMILY uses the MCX type. The I/O A and I/O B 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 I/O A or B connectors can be used for an *Enable trigger input* or the following output signals: *10 MHz reference clock*, *Acquisition skipping to next segment*, *Acquisition is active*, *Trigger is armed*. If either of the AS bus systems is being used the MMCX connectors of the master module are active.

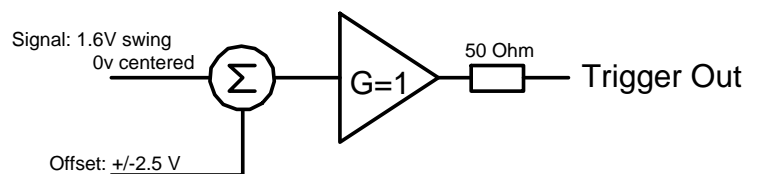
3.9. External Trigger Output (U1071A-FAMILY & DC271-FAMILY)

When the digitizer 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 or MMCX connector. The pulse ends when the data acquisition for the trigger in question is complete.



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 *AcqrsDI_forceTrigger*. However, *AcqrsDI_forceTriggerEx* does generate the signal.

Trigger Output Block diagram:

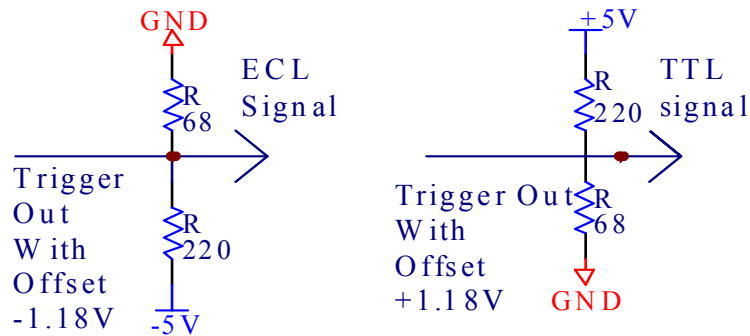


The output swing is 1.6 V (± 0.8 V) when unloaded and 0.8 V when terminated on 50 Ω . The rise and fall times are 2.5 ns typical. The offset can be adjusted, by software control in the range [-2.5 V, +2.5 V] unloaded, or [-1.25 V, +1.25 V] into 50 Ω . The maximum output current capability is ± 15 mA. 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 shown here can be used:



For the DC135/DC135HZ/DC140/DC140HZ/DC211/DC211A/DC241/DC241A/DC271/DC271A/DC271AR modules, a standardized trigger out signal can also be routed to the PXI Bus Star Trigger line.

For the U1071A-FAMILY the offset control range is reduced slightly. It is [-2.3 V, +2.3 V] unloaded, or [-1.15 V, +1.15 V] into 50 Ω.

3.10. Frequency Counter mode

The DC140 and DC135 digitizers offer an optional Frequency Counter (FC) mode. This option allows the measurement of the average frequency or period of a signal for frequencies up to 400 MHz over a user-selectable aperture between 1 ms and 1000 s. The accuracy is limited by that of the timebase, < 2 ppm; the short term stability is of ~ 0.1 ppm. The accuracy can be improved if an appropriate external reference clock is used. Frequencies in excess of 100 MHz will be measured using the HF divide by four feature of the trigger circuit.

A digitizer with the FC option can also totalize the number of triggers during a chosen time interval or a user-provided gate signal. This can be done for trigger frequencies under 125 MHz and for total counts up to 2⁴⁸. The time interval is measured using the same clock as is being used to drive the digitizer. The user gate signal has to be made available on one of the Control I/O inputs.

3.11. Electrical, Environmental and Physical Specifications

3.11.1. Electrical

Model	PCI Rev	DMA Transfer Rate (MB/s)	Max. Power Consumption (W)		Current Requirements (A) (with Memory option)			
			Standard	WITH MEMORY OPTION	+12 V	+5 V	+3.3 V	-12 V
DP105 DP106	2.1	~100	14.4	16.1	0.55	1.3(1.6)	NA	NA
DP110	2.1	~100	15.7	16.8	0.46	1.7(1.9)	NA	0.02
DP111	2.1	~100	18.0	21.3	0.75	1.4 (2.0)	NA	0.03
DP210	2.1	~100	21.8	24.0	0.6	2.4 (2.8)	NA	0.05
DP211 DP212	2.1	~100	18.0	21.3	0.75	1.4 (2.0)	NA	0.05
DP214 DP235 DP240	2.2	~100	24.4	27.3	0.8	1.2	1.8 (2.6)	0.05

			Max. Power Consumption (W)		Current Requirements (A) (with Memory option)			
DP1400 U1071A002 U1071A004 U1071AHZ1 U1071AHZ2 U1071AHZ4 U1091AD28	2.3	~200	16.3	20.3	0.09	1.4	1.9(3.0)	0.04
DC110	2.1	~100	16.7	18.6	0.7	1.1	0.4 (0.9)	NA
DC135 DC135HZ	2.2	~20	13.1	14.6	0.46	0.46	1.1 (1.5)	0.04
DC140 DC140HZ	2.2	~20	14.2	17.1	0.46	0.46	1.4 (2.2)	0.04
DC211 DC211A	2.2	~100	45.7	52.5	1.5	2.6	3.0 (4.9)	0.05
DC240	2.1	~100	40.9	46.4	1.3	3	2 (3.5)	NA
DC241 DC241A	2.2	~100	45.7	52.5	1.5	2.6	3.0 (4.9)	0.05
DC265	2.1	~100	37.1	43.0	1.2	2.5	1.9 (3.5)	0.05
DC270	2.1	~100	40.4	51.7	1.2	2.5	2.8 (5.9)	0.05
DC271 DC271A DC271AR	2.2	~100	45.7	52.5	1.5	2.6	3.0 (4.9)	0.05

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

The U1071A-FAMILY can use the PCI Bus at frequencies up to 66 MHz. All other 8-bit Acqiris digitizers use the PCI Bus at 33 MHz only. All modules are compatible for either V I/O = 3.3 V or 5 V.

3.11.2. Environmental and Physical

The U1071A-FAMILY modules have a Declaration of Conformity according to EN ISO/IEC 17050-1:2004 and the EMC Directive 2004/108/EC and carry the **CE** Marks of Compliance. This Declaration can be viewed at <http://www.agilent-pra.com>. All other modules have a Declaration of Conformity according to EN ISO/IEC 17050-1:2004 and the EMC Directive 2004/108/EC and carry the **CE** Marks of Compliance.

The front panels of the CompactPCI modules are in compliance with the IEEE 1101.10 standard.

Operating Temperature

0° to 40°C – for the DC271-FAMILY modules

0° to 50°C – all other modules

For the DCxxx compactPCI modules the above values are for the ambient temperature of the room (or equivalent) where the CompactPCI crate is located. For DPxxx PCI modules, located in a PC (or equivalent), it is the cooling air temperature inside the box that is of interest. This can be significantly higher than the ambient air temperature of the room. In both cases the temperature as measured on the board may well be significantly higher. On-board temperatures above 60°C should be avoided. If a PCI module indicates a temperature > 60°C ventilation should be added or improved if possible.

Relative Humidity

Type tested at 95%, +40°C (non-condensing)

Dimensions

All DP modules conform to the PCI standard. The DP214/DP235/DP240 and DP211/DP212/DP111 modules are 107 mm × 210 mm and require a long card slot. If used with the XP103 fan they can be adjusted to conform to the full 342 mm length. The U1071A-FAMILY measures 107 mm × 170 mm without its fan. If used with the XP104 fan it can be adjusted to conform to the full long card length of 342 mm; when the XP105 fan is used the overall length is 235 mm. All other cards require a short card slot (107 mm × 175 mm). An XP100 fan will add 45 mm to the length of any card.

The DC110, DC135, DC135HZ, DC140, and DC140HZ conform to the 3U CompactPCI standard (100 mm × 160 mm × 20 mm). All other DC modules conform to the 6U CompactPCI standard (233 mm × 160 mm × 20 mm).

EMC Immunity & Emissions

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 à la norme NMB-001 du Canada.

Required Airflow

> 2 m/s in situ for units dissipating > 30 W

In order to guarantee the above performance and specifications, PCI digitizer cards must be installed in a PCI metal frame with adequate cooling. The card's front panel must be screwed to lock the digitizer into place and insure proper grounding of the frame. The frame must not be used without closing all vacant front panel slots to guarantee EMC shielding and cooling. Similarly cPCI modules must be screwed to lock them into place and insure proper grounding. The crate must not be used without closing all vacant front panel slots to guarantee EMC shielding and cooling.

4. Running the AcqirisLive Application

AcqirisLive is an application to control and demonstrate the capabilities of Acqiris digitizers on a single machine. **AcqirisMAQS** is more advanced application offering many interesting possibilities for the control of acquisition systems in a single or multi-machine environment. Ask your sales representative or Agilent Acqiris Support for more information.

4.1. Getting Started with AcqirisLive

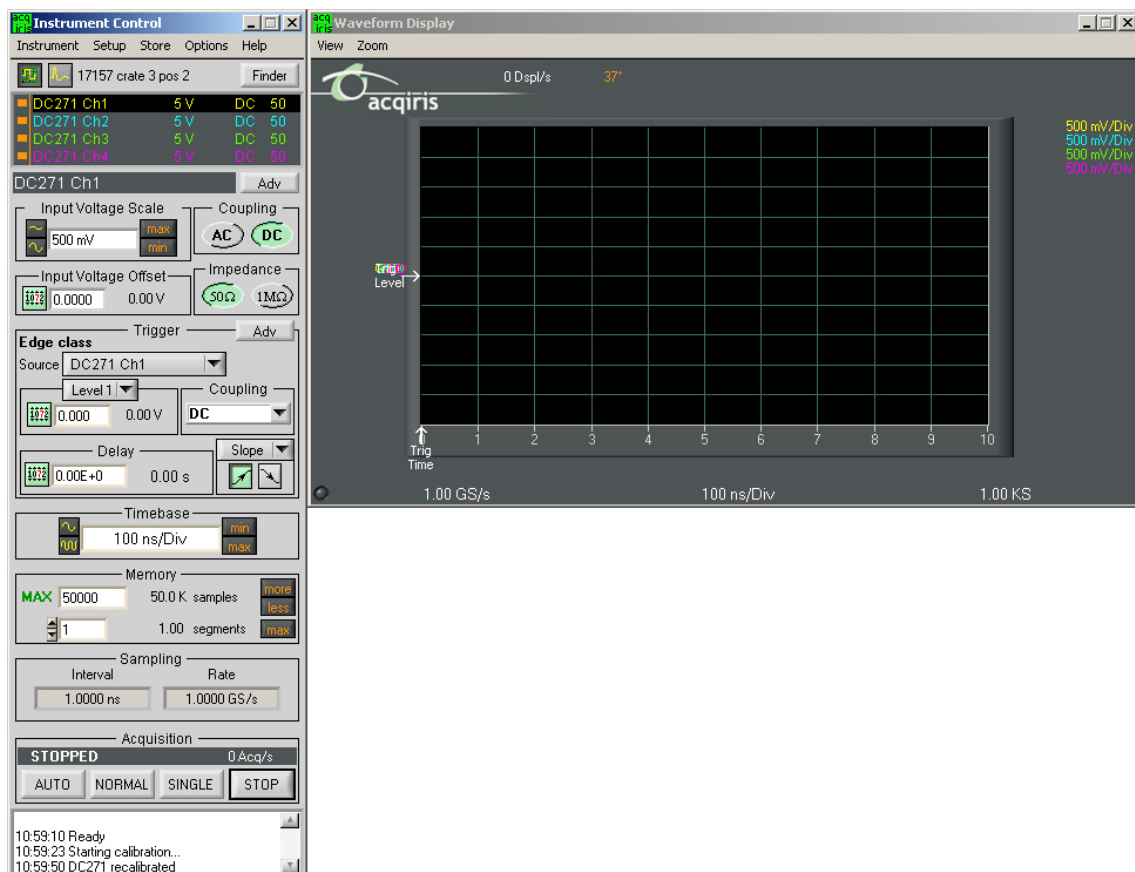
Once the software and hardware installation described in Section 2 of this manual is complete, you will find AcqirisLive in the start menu of your computer. Start AcqirisLive from the menu. An initial AcqirisLive load screen will appear followed by a panel of controls and a waveform display window.

During startup, AcqirisLive searches for all Acqiris digitizers on the PCI bus. If no digitizers are found on the PCI bus, AcqirisLive will display an error message indicating that no digitizers were found, and the program will continue in simulation mode. If this is not wanted, turn off the computer, install and turn ON the hardware on the PCI bus and, then, restart the computer.

AcqirisLive is intended to verify the functionality of the card and to serve as an easy to use and convenient program for capturing, displaying, and archiving captured data into the format of your choice, binary or ASCII. AcqirisLive is provided free with the purchase of any Acqiris digitizer.

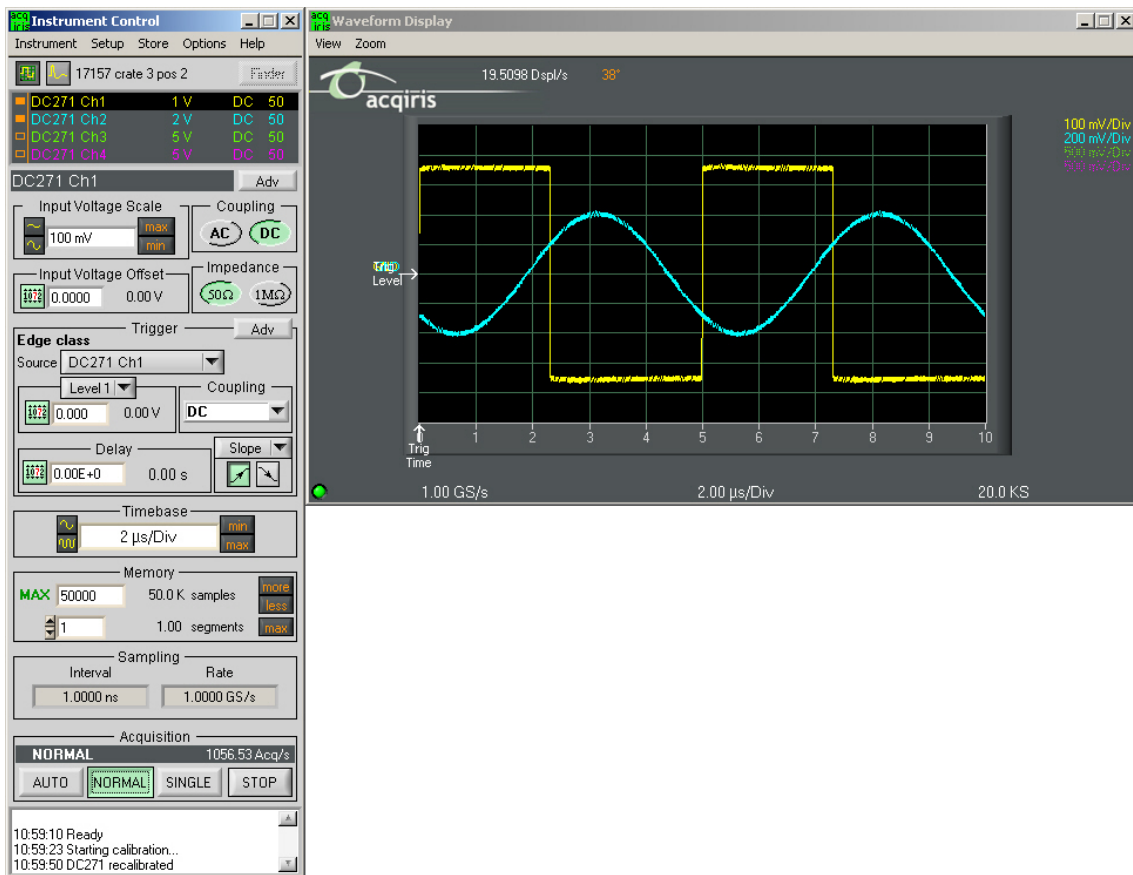
We supply drivers on the CDROM for National Instruments LabWindows/CVI, LabVIEW, Microsoft Visual C++, and Visual Basic. We also provide some examples (GetStarted applications) as a guide or starting point for programmers developing their own applications to interface with the DC or DP series digitizer cards.

When you start AcqirisLive a display like that shown below appears.



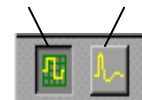
AcqirisLive displays two independent windows, a control window and a display window. The control window contains functions that allow you to manipulate the acquisition parameters of the card. In order to display an acquired waveform, connect a signal to the input, and then select the Auto acquisition mode at the bottom of the control panel. A waveform should appear in the display.

Other controls in the control panel allow you to select the optimal acquisition settings for your particular signal. Each of the other control panel functions will be discussed in detail in the following Control Panel Functions section. Here is a sample result.



4.2. Control Panel and Functions

4.2.1. Control Panel Mode



In AcqirisLive there are two control panel modes available, Oscilloscope Mode and Transient Recorder Mode. The choice of mode is entirely determined by the preference of the user.

Both modes provide the same set of functional capabilities but display the settings slightly differently. For example in Transient Recorder Mode, the user selects the Full Scale Range of the amplifier whereas in Oscilloscope Mode the user selects the input voltage scale set in Volts/Div. The desired mode is selected using one of the two buttons shown at the top of the control panel. The distinction between the control panels for the two operating modes can be seen in the images below.

In both modes it is possible to set the memory depth and the sample speed independently within the limits of the maximum available memory. However the two modes differ in the following way.

In Oscilloscope Mode, the user selects the time window (time per div) and the sampling rate will be adjusted to the fastest possible within the limits of the available memory. The maximum available memory is programmable.

In Transient Recorder Mode, the user selects the capture time window, the sampling rate, or the number of samples. When selecting the capture time window, the number of samples is adapted, keeping the current sampling rate and number of segments, up to the maximum available memory on the card. When selecting the sampling rate, the number of samples is adapted, keeping the current capture time window and number of segments, up to the maximum available memory on the card. When selecting the number of samples, the capture time window is adapted, keeping the current sampling rate and number of segments.

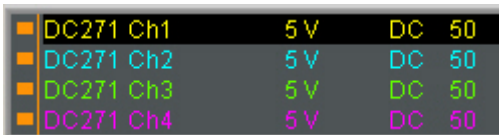


4.2.2. Displaying Multiple Traces

If multi-channel modules, or several single channel modules, are installed on the PCI bus, multiple waveform displays, one from each installed channel, are overlaid on the display.

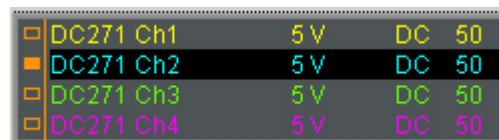
The **current channel** is selected by clicking on the channel name within the upper portion of the control panel. The vertical settings of the current channel and the timebase and trigger of the correspondent digitizer are then indicated. A unique name is given to each channel installed on the PCI bus. The current channel is indicated by a dark highlight over the name. Settings changed on the main control panel will only affect the active channel. Always verify proper acquisition setting for each channel prior to collecting data.

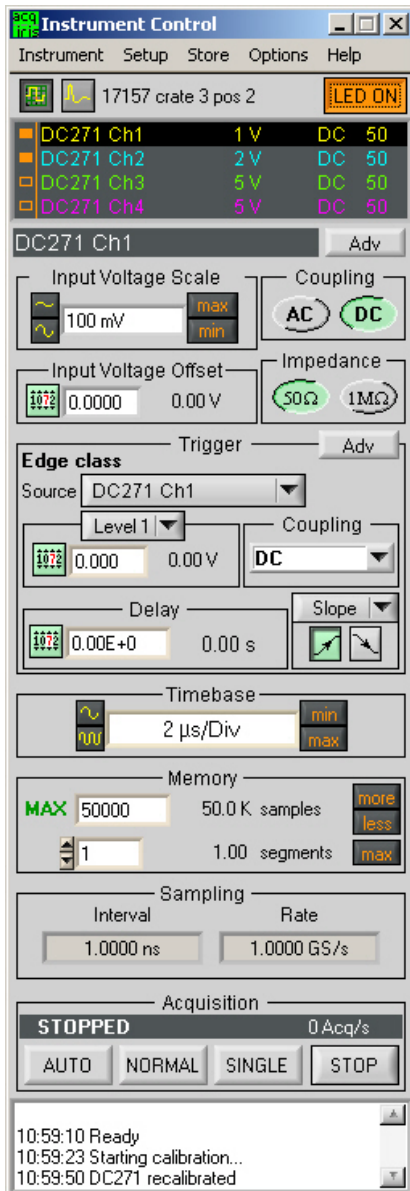
There is a small rectangular indicator button to the left of each channel name in the channel list. If this indicator is filled in, the channel waveform is active; the channel is turned on and displayed in the display window. Clicking on this indicator once turns it transparent. This deactivates the reading of the data from the channel and clears the waveform display. Clicking once again on the indicator turns the channel back on and the indicator is filled in. After making such changes the channel data will not be displayed until after the next acquisition.



The image at the left shows a channel list with four active channels in the system. All are turned on and displayed in the display window as indicated by the orange indicators at the left. The DC271 Ch1 is the currently selected channel.

The channel list image at the right shows the same system with the DC271 Ch2 selected as the current channel. The other indicators are transparent and therefore their channels are turned off and not displayed.





As an alternative to controlling the channels to be displayed from the control panel you can also control them by selecting the desired channels from the list of channel gains shown at the right hand side of the display window.

Pressing the Finder button at the top of the control panel will identify the module associated with the current channel. When the finder button is depressed, the LED on the front panel lights up yellow on the digitizer module with the current channel.

4.2.3. Numeric Editor



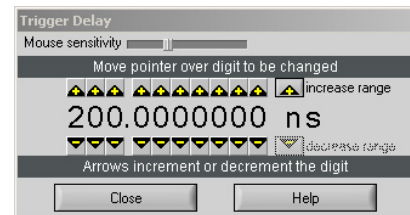
The numeric editor is shown in the control window at locations where numeric values are set. The Acqiris Numeric Editor enables easy input of numeric values, particularly those ranging over many decades. The numeric value can be changed in multiple ways.

A number can be typed directly into the white number display area or alternatively, the Acqiris Numeric Editor may be used. In order to use the Acqiris Numeric Editor, click on the green numeric editor icon at the left of the number display. A numeric editor control will appear as shown.

The methods to change the values are:

1. Increment or decrement any digit with the arrow buttons by pressing the increment or decrement button. When the button is held down, the digit will continue to increment or decrement automatically.
2. Click on a digit and drag the mouse up or down to increase or decrease the value.
3. Type a new value with the keyboard for any highlighted digit.

The value is constrained to fall within its allowed range whenever the user attempts to enter a larger or smaller value. Digits that are below the resolution or granularity cannot be modified. A



message is displayed in the numeric setting control window when the pointer is positioned over a digit that is below the allowed granularity and cannot be changed.

4.2.4. Keyboard shortcuts

Two shortcuts have been defined to simplify applying changes of a parameter to a group of channels. When the mouse is over the control of a channel parameter -

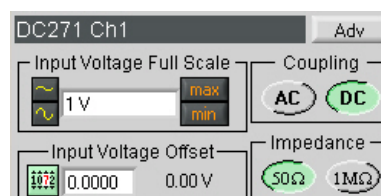
- 's' can be used to set the current value to all channels of all available instruments
- 'c' can be used to set the current value to all channels of the current instrument.

Other shortcuts are:


- 'Ctrl-S' as a synonym for 'Save Setup'
- 'Ctrl-R' as a synonym for 'Recall Setup'
- 'Ctrl-C' as a synonym for 'Calibrate all (active) instruments'
- 'Ctrl-E' functions as a toggle between 'Internal Clock' and 'External Clock' operation.

4.2.5. Input Voltage Scale, Offset and Coupling

Settings for input voltage scale, offset, coupling and impedance are available in the portion of the control panel shown to the right. The selected channel is shown in the upper section of the display. Only this channel will be affected by changes in any settings on



the control panel. The input voltage scale is set by one of three possible methods:

1. Clicking on the white numeric display of the voltage scale will show a pop-up list. Select the desired gain setting with the mouse pointer.
2. Clicking on the Decrement / Increment icons will step the voltage scale up or down to the next level for each click of the mouse. 
3. Clicking Max / Min will toggle to the least sensitive gain setting or to the most sensitive gain setting.

The input *Coupling* can be set for AC or DC. The selected setting is shown as an actuated indicator with a green backlight. AC coupling blocks DC signal components from the input. The AC coupling mode acts as a high pass filter passing frequencies above 10 Hz. In DC coupling all frequency components are passed through the input.

The *input voltage offset* control applies an offset to the input amplifier in order to better digitize and display signals offset away from 0 volts. Signals riding on a DC level can be most accurately characterized when the offset is adjusted so that the acquisitions are made about the midpoint of the digitizer's Full Scale Range, and when as much of the 8-bit ADC range is used as possible. The ability to select an offset voltage enables accurate measurement when offsets are present in the signal.

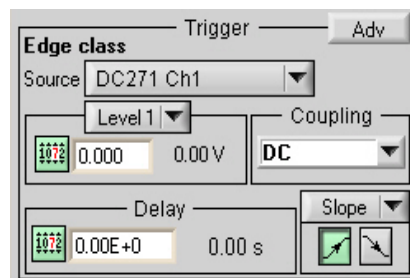
The *Impedance* selection allows the user to choose the appropriate internal input termination of 50 Ω or 1 M Ω .

The *Adv* button in this section gives access to the choice of hardware bandwidth limits for the channel.

4.2.6. Trigger

Trigger characteristics are set using the settings in the control panel *Trigger* section. The trigger *source* setting can be either Internal (trigger on any one of the input channels) or External (trigger on an external input). The trigger source is indicated in the display by the name appearing under *Source*.

In order to select the trigger source, click the drop-down source menu in the trigger *Source* section of the control panel and choose the desired one.



Notice that, for most digitizer models, when external trigger is selected, the controls for the trigger termination, 50 Ω or 1 M Ω , are enabled in the *Coupling* section. Select the desired termination for the external trigger.

The *Coupling* section also contains a selection for AC or DC coupling. AC coupling on the trigger sets the trigger circuit to an AC Low Frequency Reject mode.

Use the *Level* section to set the desired trigger level. The relationship between coupling, trigger source, and trigger level was discussed in section 3.4.3 **Trigger Level**. The DC271-FAMILY and the channels of the U1071A-FAMILY digitizers have two adjustable trigger levels associated with the range of the window trigger.

The trigger *Delay* setting positions the acquisition with respect to the trigger. Pre-trigger values are negative and are selectable in the range of [0 to $-(10 * \text{timebase})$]. The value $(10 * \text{timebase})$ is equivalent to the time window or capture-time. 100% pre-trigger is achieved by setting the Delay to $-\text{capture-time}$. A 100% pre-trigger delay means the trigger point is at the right edge of the display and all of the data in the acquired waveform were captured just prior to the trigger event.

Maximum Post trigger delay settings depend on the sample interval used. Post trigger delays are adjustable up to 200 Mpoints or more for the U1071A-FAMILY.

When a *Slope* box is shown next to the delay section, selecting the trigger slope is achieved by depressing either the positive or negative slope buttons. The DC271-FAMILY digitizers extend the functionality of the *slope* section to allow the choice of the window and HF divide trigger modes when the multiple mode slope button is selected. When the Window trigger is chosen buttons below it will allow the user to choose between trigger on entering or exiting the window trigger level range.

The *Adv* button in this section gives access to the choice of External Trigger range and Bandwidth Limiter for the DC271-FAMILY digitizers. It also allows the user to set the offset of the trigger out signal.

4.2.7. Acquisition Mode



The acquisition mode of the digitizers is selected using one of four acquisition mode buttons in the Acquisition section of the control panel. Available acquisition modes are Auto, Normal, Single and Stop.

This Acquisition section of the control panel also indicates the number of waveforms acquired per second by the digitizer. The use of each of the acquisition modes is described below. In the discussion, a valid trigger indicates a trigger signal meeting the trigger conditions at a time when the digitizer is armed and ready to acquire data. In Single and Normal modes the display will only be updated after each active digitizer has received a trigger.

Stop will stop the acquisition and hold the latest complete acquisition on the display.

Single mode is used in order to capture one event at the first valid trigger. It freezes the acquisition in the digitizer's memory, and on the display, until the user requests another acquisition. After an acquisition is taken in Single mode, the digitizer will ignore subsequent trigger events until the Single button is pressed again or another acquisition mode is selected. Pressing the single button re-arms the trigger and captures one acquisition at the next valid trigger.

Normal mode is used to continuously acquire waveforms into memory for valid trigger events. The display is updated with the new acquisitions in accordance with the Display Refresh Rate setting under the Options menu on the top line of the AcqirisLive Control window. Acquisitions will happen for each valid trigger until either single or Stop is pressed.

If the trigger indicator at the lower left of the waveform display does not blink green, the digitizer is not receiving valid triggers. Check the trigger settings or select Auto mode in order to obtain a display of the waveform.

Auto mode will acquire and display waveforms according to the trigger settings if a valid trigger is present within a timeout interval. If a valid trigger is not available within this interval, the digitizer generates its own trigger in order to digitize and display whatever signal is at the input at that time.

If valid triggers are received at a high enough rate, Auto mode behavior differs little from normal mode behavior on the display. However if the trigger rate is too low or trigger settings are not appropriate for the characteristics of the signal, the input signal will not be stable on the display. This occurs because the internal auto-trigger generated by the digitizer is asynchronous to the input signal.

Auto mode is often used to aid in setup when the input signal must be quickly characterized in order to determine proper trigger settings for Normal or Single mode acquisitions.

4.2.8. Timebase and Memory

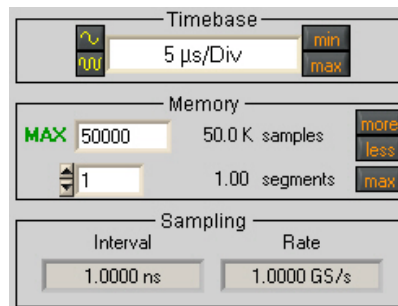
The timebase and memory settings should be chosen together in order to optimize the desired sample rate for the acquisition.

In Oscilloscope Mode the timebase settings range from 10 ns/div to 5 S/div. In Transient Recorder Mode time windows of 100 ns to 20 Ks are available when using a card with the 2 Mpoint memory option.



In order to change the timebase click on the white area in the timebase display window and select the desired timebase from the list. Alternatively, the Decrement / Increment timebase selection buttons may be used in order to

change the timebase in steps with each click of the mouse. The sample rate and sample interval resulting from the combination of memory and timebase are indicated under the *Sampling* section of the control panel.



The Memory setting shows the maximum number of points to be acquired. The actual number of points acquired could be less than the maximum number set if the acquisition time window selected fills less than the selected amount of memory at the full sample rate. Alternatively, in Oscilloscope Mode, if a slower timebase is selected, in order to ensure that the selected amount of memory will be filled before the acquisition is complete, the digitizer will reduce its sample rate as necessary. This action differs from the same case in Transient Recorder Mode where preference is given to the selected sample interval.

In Transient Recorder Mode, the digitizer will continue to allocate more memory with increasing capture times. This is done in order to maintain the selected sample interval for as long a time window as is possible given the available memory. When the card memory is fully utilized, the sample rate will decrease with increasing capture times.

4.2.9. Using digitizers of different models simultaneously

AcqirisLive features a single *timebase* (i.e. the set of acquisition parameters pertaining to the time axis of the waveform, such as the sampling rate and the number of samples). It is therefore not possible to specify different timebase settings for different digitizers. However, it is possible to run each digitizer at its maximum available sampling rate performance in the following way:

- Select the Oscilloscope Mode.
- In the channels list, select a channel from the fastest digitizer (that will make that digitizer the *current digitizer*).
- Make sure the maximum number of samples (*MAX samples* in *Memory* panel) is large enough.
- Select the desired time per division setting (*timebase* panel): the fastest sampling rate for the current digitizer, compatible with the maximum number of samples, will be selected and applied to all digitizers in the system. Any digitizer not capable to satisfy that sampling rate will run at its closest setting.

Finally, note that the sampling rate menu (visible in Transient Recorder Mode) contains the sampling rate capability of all digitizers currently in use. You must turn off the channels of 'slower' digitizers in order to view the highest sampling rates of the 'faster' digitizers.

4.2.10. Segmented Memory

Segmented memory enables the sequential acquisition mode. This feature is particularly useful when capturing impulse-response type waveforms in a variety of applications. Segmented memory is available in all acquisition modes. However, it is generally used in either Normal or Single mode. Waveform display occurs only after all segments are filled. Segments can be displayed sequentially on the display or they can be overlaid on top of each other. To select an overlaid display, select the item *Overlay Segments* under the *Options* menu. Segmented data can be archived to any storage device on the computer in a similar way to non-segmented acquisitions. If the acquisition needs to be stopped before all segments are filled, press the *Stop* button.

In order to set up the sequential acquisition mode, simply select more than 1 segment on the segment selection control under the *Memory* section of the control window and start the acquisition.



4.2.11. Display Features, Zoom and Persistence

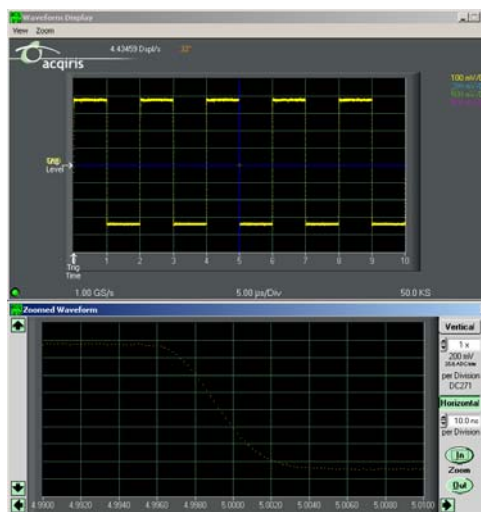
A waveform zoom feature is available under the *View* menu of the display window. The screen image below shows the normal display and the zoom window that appears when zoom is selected.

The zoom scale and center position are modified using the horizontal and vertical controls shown on the zoom display window. To the right side of the zoom window click on the “Horizontal” button, then modify the zoom expansion factor by clicking the “In” or “Out” buttons.

The vertical blue cursor, or box, (depending on the zoom factor), shown on the main display window indicates the center point and range of the zoom. The vertical box or line can be dragged right or left with the mouse in order to re-position the center point of the waveform displayed in the zoom display window.

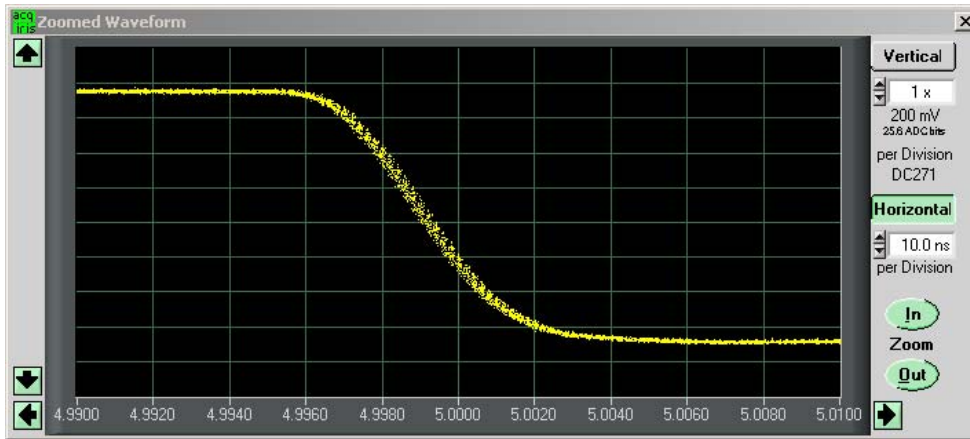
Alternatively, the right and left arrows at the bottom of the zoom display window will reposition the horizontal center of the zoom.

In order to expand the zoom region vertically, select the “Vertical” button on the zoom display and click the “In” / “Out” buttons. Alternatively, the up / down arrows on the scale indicator just below the vertical button can be used. When the vertical scale is expanded, the top and bottom lines forming the blue box in the main display window show the extent of the vertical zoom region. The vertical position of the box, and thus the data region shown on the zoom display, may be changed by moving the box vertically with the mouse or by clicking on the up and down arrows at the left of the zoom display window.



When expanding a waveform to the point where individual data points are seen, it may be desirable to use the “Connect data points” option under the Options menu in AcqirisLive. When this option is selected, larger data points are drawn on the display and a line connects each point.

The main display window contains a drop down selector that controls the display type for both the main display and the zoom window. There are two modes available, the Live Display, or the Persistence Display. When persistence display is selected, all points drawn to the display windows remain on while new points are added from subsequent acquisitions. This mode is particularly suited for examining the jitter on an edge of a periodic signal as shown in the image below.



To clear the display in persistence display mode, press the “Clear” button that appears on the main display window.

4.3. Top Line Menu of AcqirisLive

The top line menu contains functions offering additional utility to the AcqirisLive application. Provisions are included for storing instrument setups, waveforms, converting the format of stored data files, identifying models and versions and in the Options Menu, calibrating the digitizer, extended control of event acquisition and controlling the display properties. These possibilities are discussed in the next few sections.



4.4. Setup

The Setup menu allows you to store and recover instrument configurations. When you store a configuration the parameters used to configure each of the channels of each module together with the timebase and trigger configurations will be saved in a file. You will be asked to choose the destination directory for the file and be allowed to give it an appropriate name. When you choose to recover a file you will be asked to give the name or navigate to it using the browser functionality. If you are using many modules the settings in the configuration file will be associated preferentially with the digitizer that has that serial number or then with the digitizer in the same location.

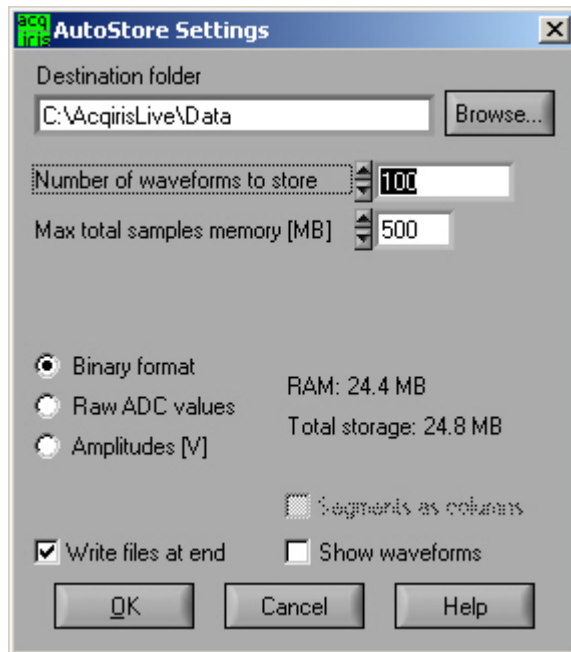
Only the parameters of the modules are stored in the configuration file. This means that parameters of the AcqirisLive program, such as channel activation and display mode choices are not included.

4.5. Store, Autostore and Conversion of Waveforms

The store menu gives you two mechanisms to store waveforms.

1. The Store Waveform option allows you to store the last acquired waveform for the current channel. To store the last acquired waveform for each of the active channels, you must sequentially select each one to make it the current channel and use the Store Waveform menu command. The title of the Store Waveform dialog indicates the name of the channel that will be stored. The data is stored in ASCII format, as Raw ADC values or Amplitudes (in Volts).

- The Autostore option allows you to store consecutively acquired waveforms from all of the active channels into files. Configuration of Autostore is achieved by selecting the Autostore item under the Store menu. Autostore brings up the dialog box shown here. Three formats are available for stored waveforms, Binary, Raw ADC values, and Amplitude values (in Volts). The destination folder can be selected or created on any system drive using the Browse button. Waveforms will be stored in a new folder under the destination folder. The new folder will be named **AcqirisRun_{date}_{time}**. Each waveform will be stored in a file with a name {channel identifier}_{i}.{suffix}, where i goes from 1 to N and the suffix indicates the data type. If the data is stored in Binary form, the suffix will be **.data** and an additional ASCII format **.awh** file is written which contains necessary details about each of the other files. Otherwise, the suffix will be **.awd**.



The number of generations of waveforms to be stored with this function is selectable from 1 to N. N is a maximum number dependent on the number of samples taken in each waveform. There is also a user selectable limit on the total amount of data allowed in any single Autostore acquisition series.

When using segmented memory with Autostore, a waveform is considered to be a complete set of acquired segments. When storing Amplitudes, it is possible to write each segment as a separate column of data in the waveform file. This is achieved by clicking the check box option *Segments as columns* in the Autostore settings window. Formatting with segments in columns, in Amplitude format, is limited to 200 segments.

The Binary file format selection provides the fastest storage performance and generates the smallest files on the hard drive. Binary files can be subsequently converted to either Raw ADC values or to Amplitude values using the Data Format Conversion utility provided with AcqirisLive.

Selecting the “Write files at end option” acquires all waveforms into memory first, before converting to the selected format and writing the data to disk. This option allows for faster data capture times. Selecting the “Show waveforms” allows the user to see the waveforms before writing them to disk.

When all parameters are selected, click OK, and then select Normal, Auto or Single acquisition mode. When the waveforms are recorded a progress bar will appear to show the status of the acquisition and of writing the data to disk. The Autostore function can be aborted from the progress bar.

Raw ADC values are the raw 8-bit ADC levels in ASCII format. The channel’s gain and offset are needed in order to obtain the signal level in Volts. The required information to convert the Raw ADC values to voltage is included in the header information of each Raw ADC ASCII file or in the **.awh** file accompanying the binary files. In order to convert the Raw ADC values into Volts the following formula should be used.

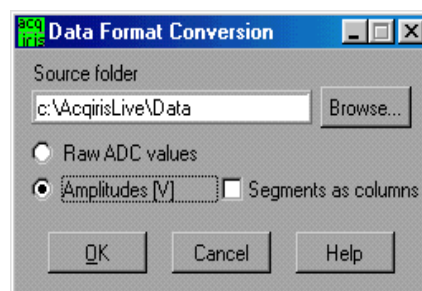
$$V = vGain * data - vOffset$$

The Amplitudes [V] selection stores the waveforms as voltage samples in ASCII format. This data has already been adjusted for gain and offset and can be directly read out as a voltage. However, it requires roughly twice as much space as Raw ADC value data.

For the sequential acquisition mode, the segment time stamps are also stored when waveforms are saved using the Autostore and Save Waveform functions.

Data stored in binary format with Autostore must be converted before it can be imported into a data processing package or a spreadsheet (e.g. Excel). The Data Format Conversion option is found under the Store menu. Select Data Format Conversion in order to bring up the following window. The acquisition must be stopped in order to access this menu.

To convert the binary data, simply select the source folder



where the data is located, select the output format and click OK.

All binary data files found in the source directory will be converted to the desired format. If you are writing amplitudes with multiple segments, formatting with segments in columns is limited to 200 segments.

4.6. Calibrate

The Calibrate item in the Options menu leads to a sub-menu where a particular type of calibration can be invoked. In order to use this item the acquisition must be stopped; otherwise the Calibrate option is not selectable. The possibilities are

- Calibrate instruments - to perform a self-calibration on the digitizers, calibrating the gain, offset, trigger level and the timing. Performing a calibration compensates for any drift in these properties, typically due to component temperature variations.
- Calibrate current combine configuration – to perform a calibration only at the current configuration in each instrument.
- Calibrate External Clock Timing – to do a calibration of the internal TDC in the Continuous External Clock mode.

4.7. Combine channels

The Combine Channels function in the Options menu gives the DC135/DC140/DC241/DC241A/DC271/DC271A/DC271AR/DP235/DP240/ U1071A-FAMILY user the control of how many converters will be used for each channel. This allows the memory size and the sampling rate to be increased in situations where not all of the input channels need to be acquired. Normally digitizer modules work with one converter/channel. If two or more converters/channel are desired, the identities of the channels to be used have to be chosen with the Active Channel control.

4.8. External 10 MHz Reference and External Clock

Either one of the External 10 MHz Reference or External Clock options can be selected in the Options Menu. The external input threshold option, available in the options menu, must also be set appropriately. The 10 MHz Reference can be activated at the I/O B output.

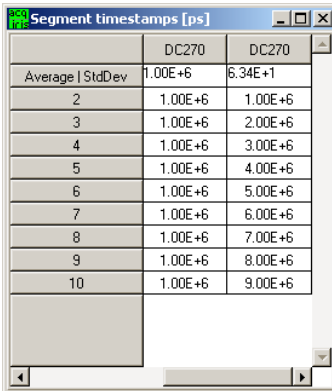
The External Clock function is available in AcqirisLive only when using the control panel in Transient Recorder Mode. The input frequency should be keyed into the clock frequency selector (outlined in red) on the control panel. Then the appropriate sampling frequency must be selected in order for the proper timebase to be displayed on the waveform display window. The time window displayed can be manipulated by allocating more or less memory to the acquisition.

The External 10 MHz Reference in AcqirisLive is designed to work either in Oscilloscope Mode or in Transient Recorder Mode. The timebase and sample rate for waveform capture is fully selectable when using the external reference, just as it is when using the digitizer's own internal reference clock.

4.9. Very Long Memory Autostore

This mode is only available for use when the waveform to be stored requires more space than currently available in the AcqirisLive waveform buffers. Each waveform will generate 2 readable descriptive files (..._metadata.txt, ..._timing.txt) and more than one binary data files (...aqData16 or ...aqData8). The size of the waveform buffer can be controlled with the -b command line option. The first segment and the first sample to read out can be specified. Note that if the buffer is large enough for at least 1 full segment, only full segments will be read (i.e. first sample control is ignored). When saving data to file, you will be prompted for a maximum number of segments per file.

4.10. Additional Waveform Information



	DC270	DC270
Average StdDev	1.00E+6	6.34E+1
2	1.00E+6	1.00E+6
3	1.00E+6	2.00E+6
4	1.00E+6	3.00E+6
5	1.00E+6	4.00E+6
6	1.00E+6	5.00E+6
7	1.00E+6	6.00E+6
8	1.00E+6	7.00E+6
9	1.00E+6	8.00E+6
10	1.00E+6	9.00E+6

The Options menu also includes possibilities to obtain additional information about the waveform. In both cases described below the display will be updated after each acquisition.

The “Show Segment Timestamps” option shows a display like the one below:

It gives you the information needed to better understand the trigger times of the individual segments of an acquisition. By definition the first trigger of an acquisition occurs at $t_1=0.0$. There are two columns for each digitizer. For the n'th row, the first column contains the difference $t_n - t_{n-1}$ and the second column contains t_n . The top line contains the average value of the t_n in the left column and the standard deviation of the t_n in the right one. The times are in ps.

The “Show Parameters” option activates a display of pulse parameters for each active channel. Inactive channels will have parameter values of 0.0. The parameters will be

calculated in a model in which the distribution of measured voltages has two distinct peaks. If this condition is not satisfied the results will be unreliable.

4.11. Display Features

Display features in the Options menu include items for

- turning the waveform display off (by de-selecting “Display Waveforms”),
- overlaying segments of a sequence,
- connecting displayed data points,
- modifying the display refresh rate,
- displaying the internal temperature of the currently selected module

4.12. Command Line Switches

When starting the AcqirisLive application, the executable's name in the command line can be followed by one or more switches to change the running conditions.

Syntax

The syntax of the command line is the following:

```
path\AcqirisLive.exe options
```

where *options* are chosen from the following list

```
[-a][-b][-B][-c][-d][-h][-i][-l][-m][-n][-p][-s][t][-v][-x]
```

Available Switches

List of available switches:

- a start in Averager mode
- b Buffer size for large waveforms
- B Number of banks for SAR mode
- c no initial calibration
- d use DMA for data transfers (default)
- h high priority process (default)
- i use acquisition interrupts
- l low priority process

- m** medium priority process
- n** no DMA for data transfers
- p** Use acquisition polling
- r** start in Transient Recorder (digitizer) mode
- s** simulation mode
- t** temperature update off
- v** show acquisition state
- x** disable automatic multi-instruments

Operation Mode

Acqiris averagers can be operated in *Averager Mode* or in standard *Digitizer Mode*.

AcqirisLive operates in either mode, but since these are mutually exclusive, only instruments that support the chosen mode are accessible in any given mode. E.g. only averagers are accessible in Averager Mode, while both digitizers and averagers are accessible in Digitizer Mode.

The operation mode can be switched within the application. By default, AcqirisLive starts in Digitizer Mode.

Buffer size

Upon startup of the application, the available physical memory on the computer is checked. The total data buffer size is then limited to the available memory minus 10% of the total memory. It is also possible to limit the total data buffer size to a fixed value with the **-bn** option (where n is the limit in MB, e.g. -b200 will limit the buffer to 200 MB). The data buffer is then shared among the active channels.

When the total acquisition memory (sum over all active channels) exceeds the data buffer size limit, readout of the data will be partial. The special operation modes such as Segments Average, Average, Digital Filter and FFT are not supported with partial data readout.

Partial readout is controlled with the Very Long Memory panel (menu Options ->Very Long Memory...). The first segment and the first sample to read out can be specified. Note that if the buffer is large enough for at least 1 full segment, only full segments will be read (i.e. first sample control is ignored).

When saving data to file, you will be prompted for a maximum number of segments per file.

Banks for SAR

The U1071A-FAMILY and some of the 10-bit FAMILY modules are capable of acquiring data and being read out simultaneously. The **-Bn** option allows the internal memory of the digitizer to be divided into n banks. To observe the improved acquisition trigger rate achievable in this mode it is suggested to set up the desired conditions and then turn the event display off. The trigger out signal can be used to monitor the trigger rate; an interval width trigger can be used to check if triggers are missing.

Calibration

Before operation, the instruments must undergo an internal calibration. As this calibration can only proceed sequentially for each channel, the initialization time of AcqirisLive can become significant for systems with many channels. Therefore, it can sometimes be desirable to be able to start the application quickly by skipping the calibration (which must then be done "manually" before collecting correct data).

DMA Data Transfers

By default, data transfers on the PCI bus between the digitizer memory and the PC are done in DMA (Direct Memory Access) mode, which allows the fastest transfer speeds (up to about 130 MB/s peak, 100 MB/s sustained acquisition data rate). These very high data rates are not well supported by all hardware configurations (PC motherboard), and system hangs due to endless retries on the PCI bus have been observed on some machines. Such problems disappear when switching DMA mode off (data transfer rate is then about 2.8 MB/s).

*Please note that switching DMA data transfer mode off precludes the use of acquisition interrupts. The **-i** switch will therefore be ignored when **-n** is used.*

Process Priority

When the program checks for an event from the operating system (e.g. to react to user input), it can put itself to sleep for a specified period of time. This gives other applications more processor time, but limits the performance of AcqirisLive in terms of maximum acquisition rate. The default is not to go to sleep, but this can be overridden to allow better performance for other applications. Note that this sleep policy is only in effect while the acquisition is running. When the acquisition stops, the sleep policy is always reset to the longest sleep period.

Acquisition Interrupts

When performing acquisitions, there are 2 possible ways to wait for the acquisition to complete: *polling* or using a *hardware interrupt*.

- **-p Polling:** AcqirisLive runs as a single thread process. After an acquisition is started, the instruments are regularly polled to check when the acquisition is complete. The user interface is still alive, but the latency for reading the data after the acquisition may vary.
- **-i Hardware interrupt:** In this mode, AcqirisLive is run as a multi-thread process. After starting an acquisition, a new thread is created to wait for the hardware interrupt indicating that the acquisition completed. This thread is put to sleep and wakes up upon reception of the interrupt from the instrument, or after a 2 seconds timeout.

Please note that switching the DMA data transfer mode off precludes the use of acquisition interrupts. The `-i` switch will therefore be ignored when `-n` is used.

Transient Recorder mode

The application will start in the Transient Recorder mode as opposed to the oscilloscope mode

Simulation Mode

Simulation mode allows you to run AcqirisLive without having any digitizer installed in the PC.

Temperature Update

The internally measured temperature of the currently selected module is normally displayed. Using this switch turns this feature off.

Acquisition State

This switch turns on the display of the current acquisition state (Stopped, Ready, Started, Reading, Data ready). This is helpful when running with time-consuming settings (e.g. many segments overlaid, many channels, large records, etc.), but will slow down the overall performance.

Multi-instruments

By default, AcqirisLive tries to detect instruments connected through AS bus, and will initialize any connected digitizers as a multi-instrument. This behavior can be inhibited by the `-x` switch, in which case any AS bus connector will be ignored.

5. Running the Geographic Mapper Application

5.1. Who needs a Geographical Map of Modules

The Geographic Mapper application gives the user the possibility of telling the Acqiris driver crucial details of the physical position of modules when this information cannot be deduced directly. It allows the driver to correctly adjust trigger and clock delays between the different modules of an AS bus multi-Instrument and arrange the modules in an intuitive order.

The Geographic Mapper application has been implemented as a Wizard with the goal of learning the physical position of each module of a multi-bus system. The driver already knows the logical Bus and logical Slot numbers of each Acqiris unit present. However, because of varying conventions for the compactPCI slot arrangement on a bus, this is not sufficient to determine the physical position. Furthermore, with the aid of the map, the software can ensure that the modules of an Auto-defined multi-Instrument will be ordered to correspond to increasing physical slot number.



NOTE: The unusual slot numbering convention of the CC121 is documented in the CC121 CompactPCI Crate User Manual. The CC10X crates have a simpler slot numbering convention that the Acqiris driver already takes into account. CompactPCI Crates from other manufacturers represent an unknown element.



NOTE: The Geographic Mapper is of use for some AS bus systems in CC121 crates and, perhaps, crates from other manufacturers. CC121 crate configurations with both an Acqiris acquisition module in one of the last 7 slots and with the PC running under Windows 2000 or XP will not need the Geographic Mapper. Geographic Mapper is also needed for U1071A-FAMILY AS bus 2 systems in some PCI configurations. Users who do not need Geographic Mapper do not need to read this chapter any further.

5.2. When should the Geographic Mapper Application be used

The application needs to be used whenever the bus or slot configuration of the system changes in a fundamental way. The most obvious trouble symptom is that an expected multi-Instrument was not found. Alternatively the driver can issue error messages that the AcqirisLive application and other programs will see. Among them are

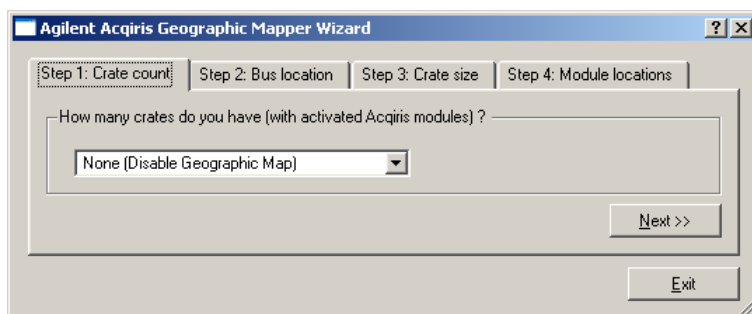
Modules are not contiguous in AS bus combination	ACQIRIS_ERROR_MODULES_NOT_CONTIGUOUS
AS bus Candidate Modules not on same bus	ACQIRIS_ERROR_MODULES_NOT_ON_SAME_BUS
'AcqGeo.map' file is invalid or corrupted	ACQIRIS_ERROR_INVALID_GEOMAP_FILE

In all of these cases the Geographic Mapper application should be run to ensure that the map file is up to date.

If desired the Geographic Mapper application will generate a default configuration in which it allows the driver to make all of the choices. This is done by specifying "None (Disable Geographic Map)" as the desired configuration in "Step1: Crate count" of the application.

5.3. How to run Geographic Mapper

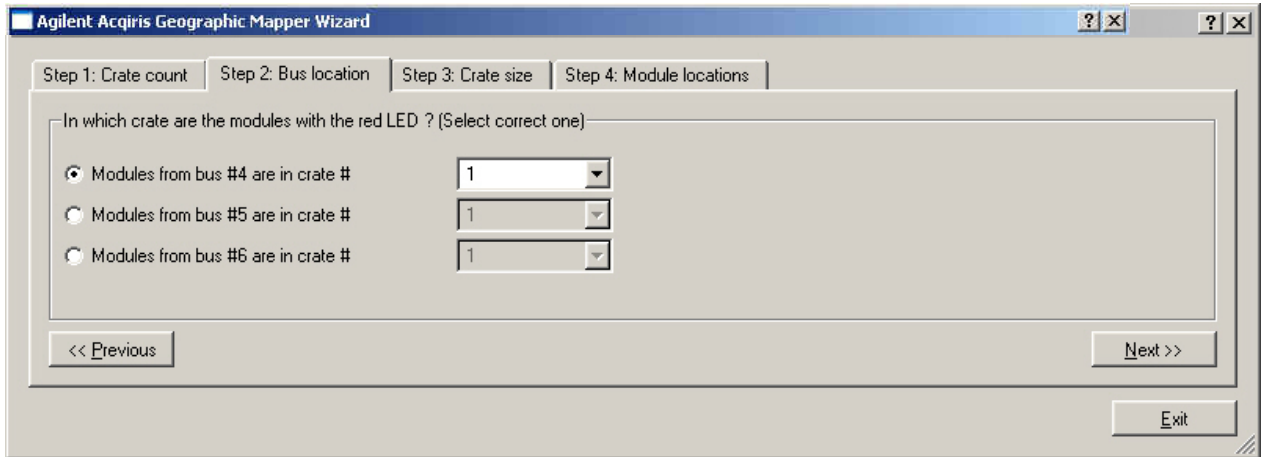
After software installation you will find Geographic Mapper in the AcqirisApp directory of the installation directory. After being started the program will learn about the Acqiris devices present and then show a screen like the one below:



The choice of the number of crates ranges from None up to the number of bus segments that the driver has found containing Acqiris modules. If you choose None and save the resulting AqGeo.map file the system will behave in its natural way without any additional user provided information. If you want to give the driver information on the physical position of modules you should select the appropriate number of crates. If the number of crates does not

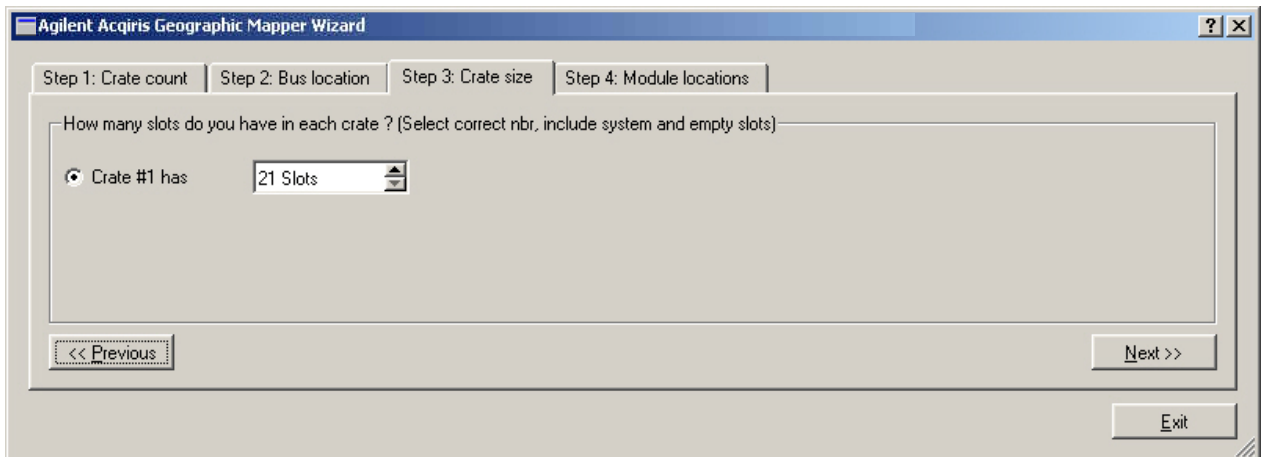
correspond to your expectations you may have hardware problems (unpowered, broken, or badly cabled crates or modules).

The next step is to associate each bus segment with a physical crate. The menu to do this is shown below:

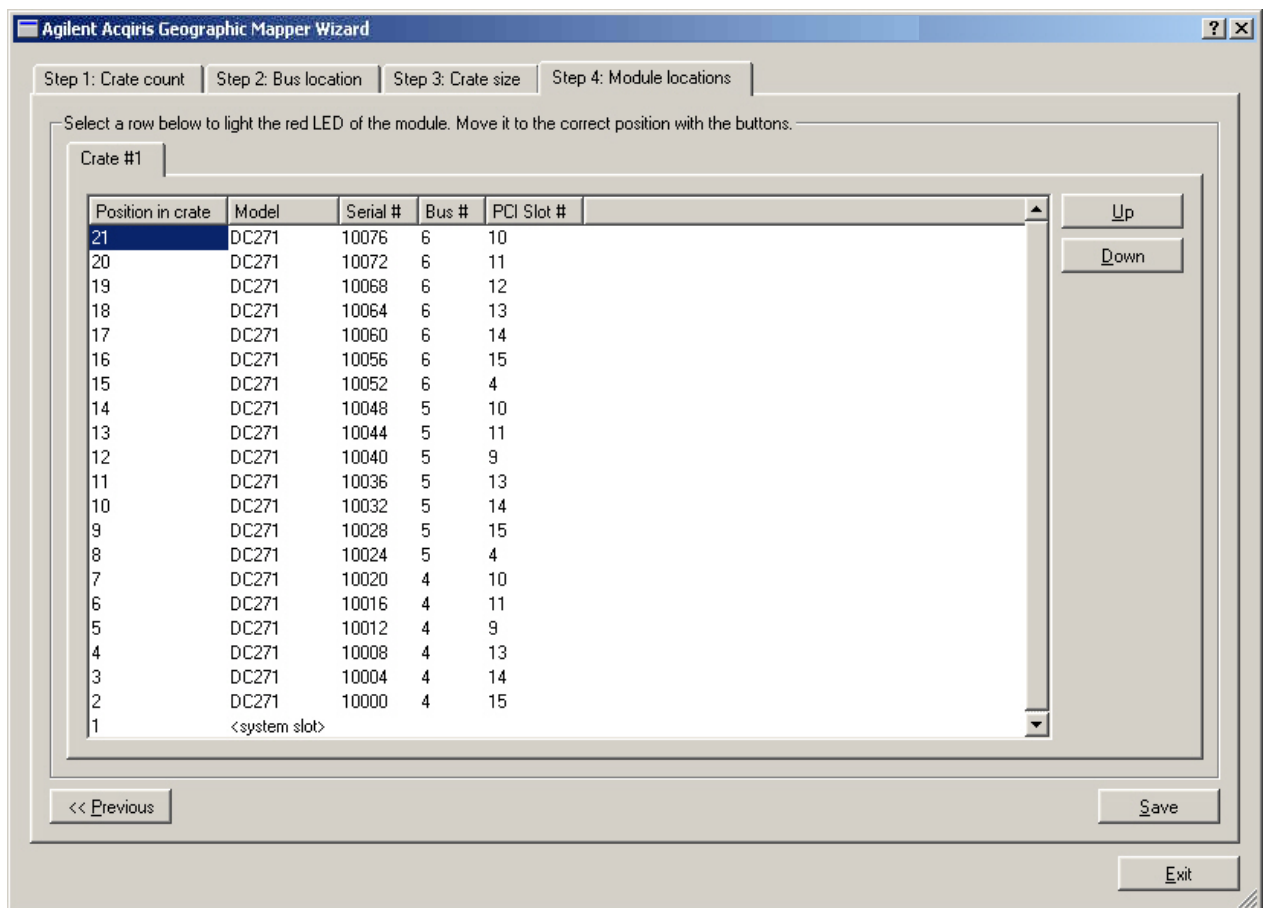


Selecting a row will cause all of the LED's of modules in that Bus to be turned on RED. This should make it easy to identify which crate the modules are in.

The third step is to specify the number of slots in each crate. This is shown below:



The 4th step consists of arranging the modules of each crate into the correct order. The menu shown below is one in which all of this work has been done for the modules of a fully populated CC121. Selecting a position will cause a module to have its red LED turned on. Then the Up and Down buttons will allow you to move the module in question to the desired "Position in crate". For the PCI case physical position increases from left to right when looking at the front panels of the digitizers with the connector towards the bottom. This numbering convention also applies to cPCI crates from other manufacturers.



The final step is to actuate the Save button so that the final configuration will be memorized and made available to the driver.

The Geographic Mapper application will always work with the standard AqGeo.map file. If you need to have several such files corresponding to different configurations it is up to you to either rename the files or transfer them to other directories in an appropriate manner.

6. Appendix A: U1093A (U1056A) AS bus for CompactPCI/PXI Digitizers

Specification and User Instructions for AS1, AS2, AS3, AS4

SPECIFICATIONS :

ASBus Bridges allow the connection and synchronization of up to 7 DC series digitizers (up to 28 channels). Acqiris recommends having the master digitizer in the center of the group in order to obtain the best performance possible.
 Clock synchronization accuracy : $\pm 100\text{ps}$.

Install/Remove the ASBus Bridges as follows :

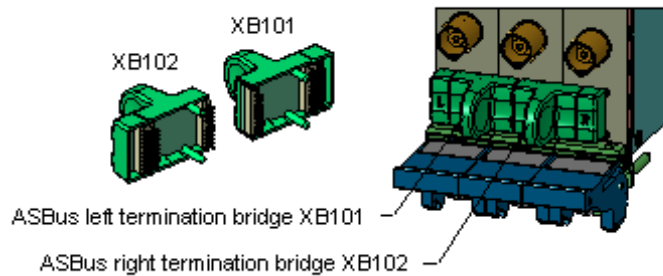
- Make sure that the screws securing each of the modules to the crate are not completely tightened.
- Before inserting the ASBus bridge, manually adjust any difference in the module separation, such that the distance between the center of the connectors corresponds to that of the ASBus bridge.
- Carefully insert/remove the ASBus bridges between each pair of modules. Force should not be required.
- Tighten the screws of each of the modules.
- If desired, add an XB104 Retainer on each handle to secure the ASBus bridge against vibration. It clicks into place when fully inserted. It can be easily removed by pulling on the lower half of the Retainer while sliding it off.

User Instructions for 2 digitizers :

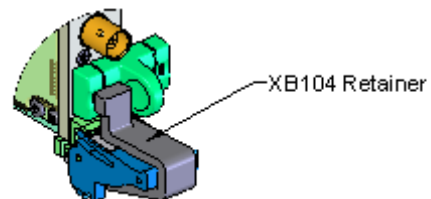
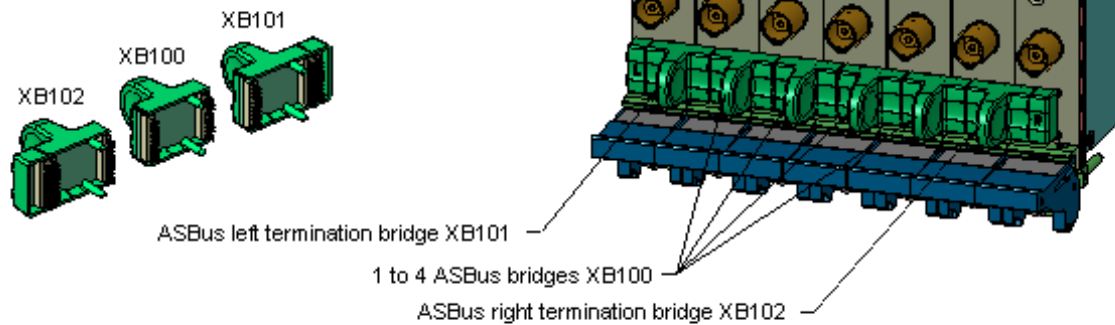
ASBus dual termination bridge XB103



User Instructions for 3 digitizers :



User Instructions for 4 to 7 digitizers :



7. Appendix B: U1093A-AS6 (U1056A-A06) AS bus 2 for PCI Digitizers

SPECIFICATIONS :

ASBus² Bridges allow the connection and synchronization of up to 3 DP1400 PCI digitizers

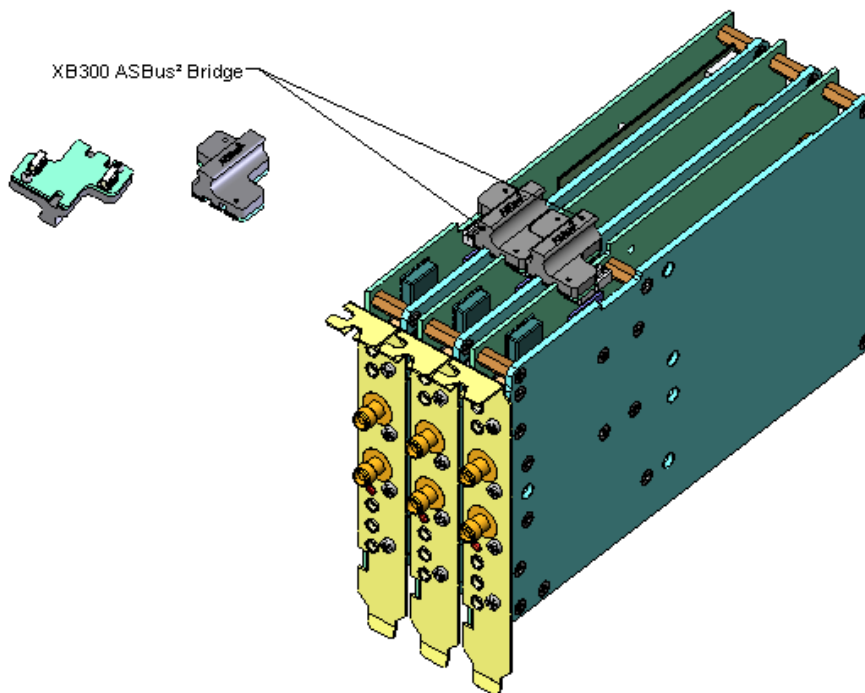
Clock synchronization accuracy : ± 100 ps.

USER INSTRUCTIONS :

Bridges can be installed/removed on units when they are powered. An application using the digitizers must be restarted after such changes are made.

Install/Remove the XB300 ASBus² Bridges as follows :

- Make sure that the front panel screws securing each of the modules to the crate are not completely tightened.
- Carefully insert/remove the XB300 bridges between each pair of modules. Force should not be required while inserting the XB300, manually adjust any difference in the module separation, such that the distance between the center of the connectors corresponds to that of the XB300.
- Tighten the screws of each of the modules.



8. Appendix C: -BB1 Battery Backup for CompactPCI Digitizers

Specification and Assembly Instructions -BB1 Option

SPECIFICATIONS :

Time to charge the battery : <2.5 h (digitizer powered)

Backup duration time : without long memory option : >120 h

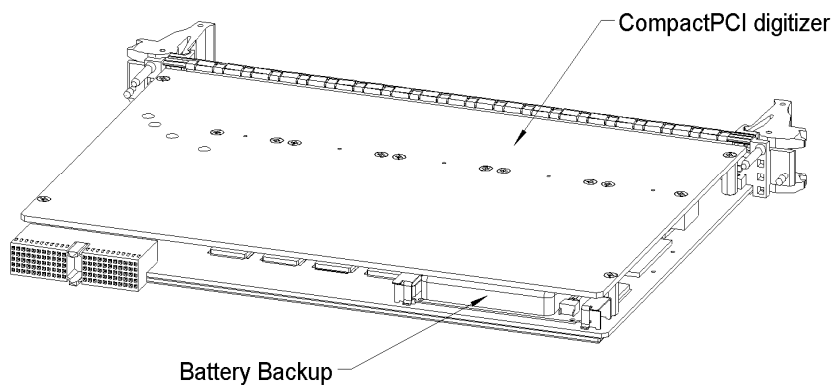
with long memory option : >12 h

Lifetime : 75% of battery capacity after 500 cycles

Note: This option is available for U1063A, U1064A, U1065A, and U1066A series digitizers.

It was formerly known as XA001

Please refer to the Programmer's Guide for more detailed information on the use of the battery backup.



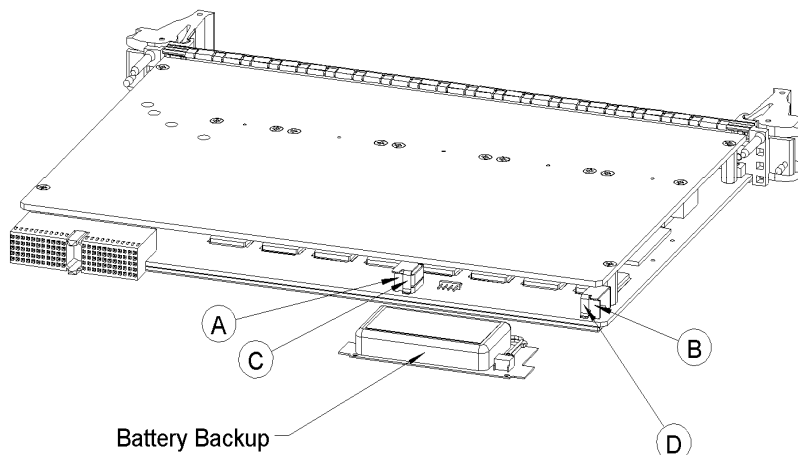
CAUTION: *The CompactPCI digitizer must always be powered off before either introducing or removing the battery backup and care must be taken in order to avoid electrostatic discharges.*

INSTALLATION AND REMOVAL OF THE BATTERY BACKUP

The following steps are necessary to install the battery backup into a CompactPCI digitizer :

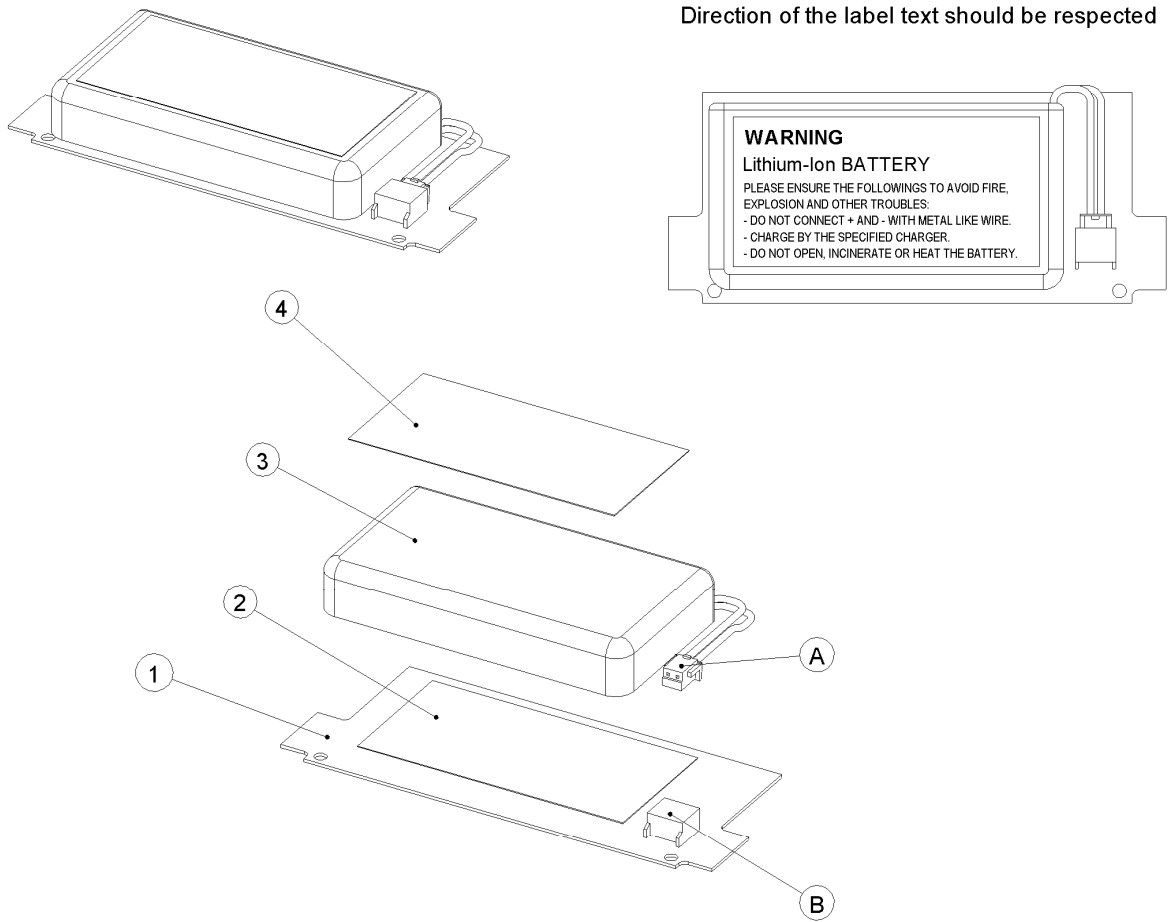
1. Position the battery backup between the guides "A" and "B" ensuring that the orientation matches the figure below.
2. Lift the two strips "C" and "D" in order to introduce the circuit board of the battery backup into the guides "A" and "B".
3. Push the battery backup in the direction of the card until it hits the stop blocks and ensure that the strips "C" and "D" are correctly and securely attached.

Proceed in the reverse order to remove the battery backup.



PROCEDURE FOR REPLACING THE BATTERY:

1. Disconnect the battery connector A from the PCB connector B.
2. Remove the battery 3.
3. Remove the label 4.
4. Reglue this label on the new battery, respecting the direction of the text.
5. Change the adhesive film 2.
6. Reconnect the new battery. connector A to connector B on the PCB.
7. Restick the new battery by pressing it onto the PCB; ensure that it holds well.



Pos	Supplier	Description	Manufacturer N°
1	Agilent	PCB battery back-up	A01-MP030040A
2	3M	Adhesive transfer tape 5mil 22mmx45mm	468MP
3	Sanyo	LithiumIon 3.7V 650mAH 4.2V 27.3x50.5x8.6mm	UF311/C
4	Agilent	45x22mm polycarbonate red, A4 sheet, 52 labels	A01-GL010002A

9. Appendix D: U1092A-HVB XA100 BNC Input Overvoltage Protection Specifications and User Instructions

The XA100 Acqiris option contain two elements :

- 3dB BNC Attenuator
- 90V BNC Spark Gap

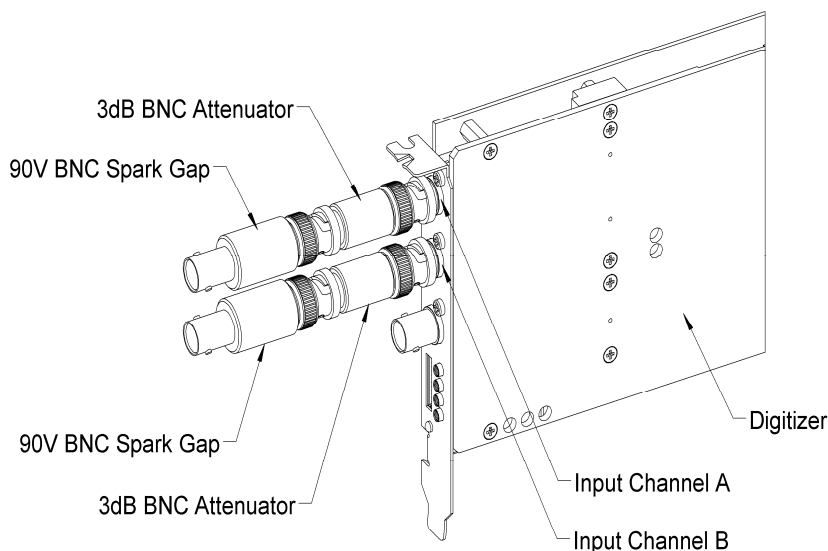
The XA100 overvoltage protection kit allows the digitizers with 50 Ohm only input (without high impedance input) to withstand a high voltage surge of up to 5 kV.

XA100 SPECIFICATIONS :

- Frequency range : DC to 1GHz
- Input impedance : 50 Ohm
- Attenuation : 3 dB
- VSWR, DC to 1GHz : < 1.25
- Impulse discharge current (8/20 us pulse) : 10 kA
- Weight : 60 g
- Length : 85 mm

ATTENTION :

- **BOTH** the 90V spark gap and the 3dB attenuator **MUST** be used in order to absorb very high current.
- In order to limit the input current, the attenuator **MUST** be inserted between the spark gap and the input of the module, as shown in the figure below.



10. Appendix E: U1091AX01 XP100 Fan Unit for DP1xx/DP2xx units Specification and Assembly Instructions - XP1 Option

SPECIFICATIONS :

Airflow : 6 m³/h, typical speed 6000 rpm, maximal noise 35 dB(A).

Nominal Voltage : 5 VDC.

Power input : 0.8 W.

With electronic protection against reverse polarity, impedance-protected against blocking and overloading.

Operating temperature : 0 °C to 70 °C.

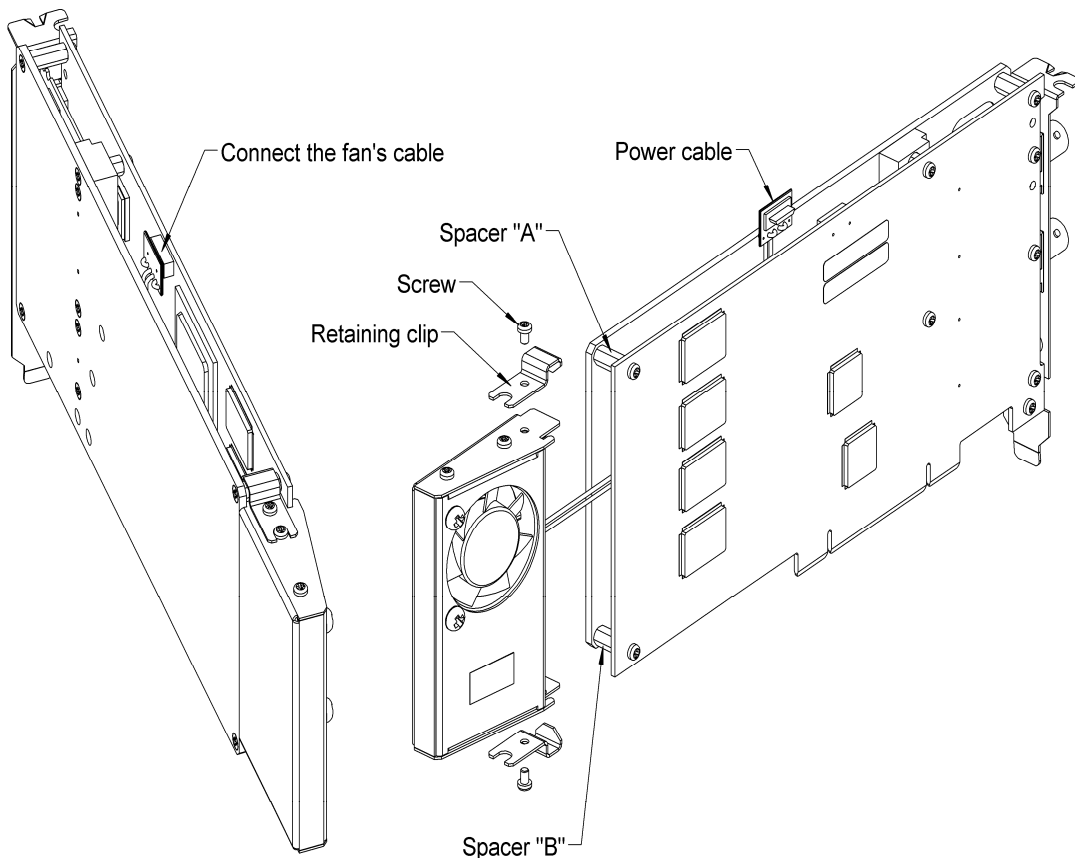
Life expectancy (at 25 °C) : 45000 hours.

Safety approvals : CE, VDE, UL, and CSA.

Materials : Box of stainless steel and fan of fiberglass reinforced plastic, PBT housing, PA impeller.

HOW TO INSTALL/REMOVE THE FAN UNIT ON A DIGITIZER :

1. Remove the digitizer from the PC, prior to installing or removing the fan unit.
2. Unscrew the screw of the retaining clips on each side of the fan unit.
3. Twist the fan's cable a few times in order for the 2 wires to stay together.
4. Introduce the cable between the spacers "A" and "B" at the back of the digitizer.
5. Push the fan unit into the back of the digitizer until the fan's box is in contact with the digitizer cover.
6. Place the two retaining clips on the spacers "A" and "B" and screw again the two screws. Insure that the fan unit is safely attached on the two spacers.
7. Connect the fan's cable as shown in the figure below. The position of the power connector can vary for different model of digitizers.
8. To remove the fan unit, first unplug its power cable and next unscrew and remove the two retaining clips. Pull the fan unit away from the digitizer.



11. Appendix F: XP101 Fan Unit for DP Digitizers (Obsolete)

Specification and Assembly Instructions

SPECIFICATIONS :

Airflow : 16 m³/h, typical speed 6500 rpm, maximal noise 30 dB(A).

Nominal Voltage : 5 VDC.

Power input : 2.1 W.

With electronic protection against reverse polarity, impedance-protected against blocking and overloading.

Operating temperature : 0 °C to 70 °C.

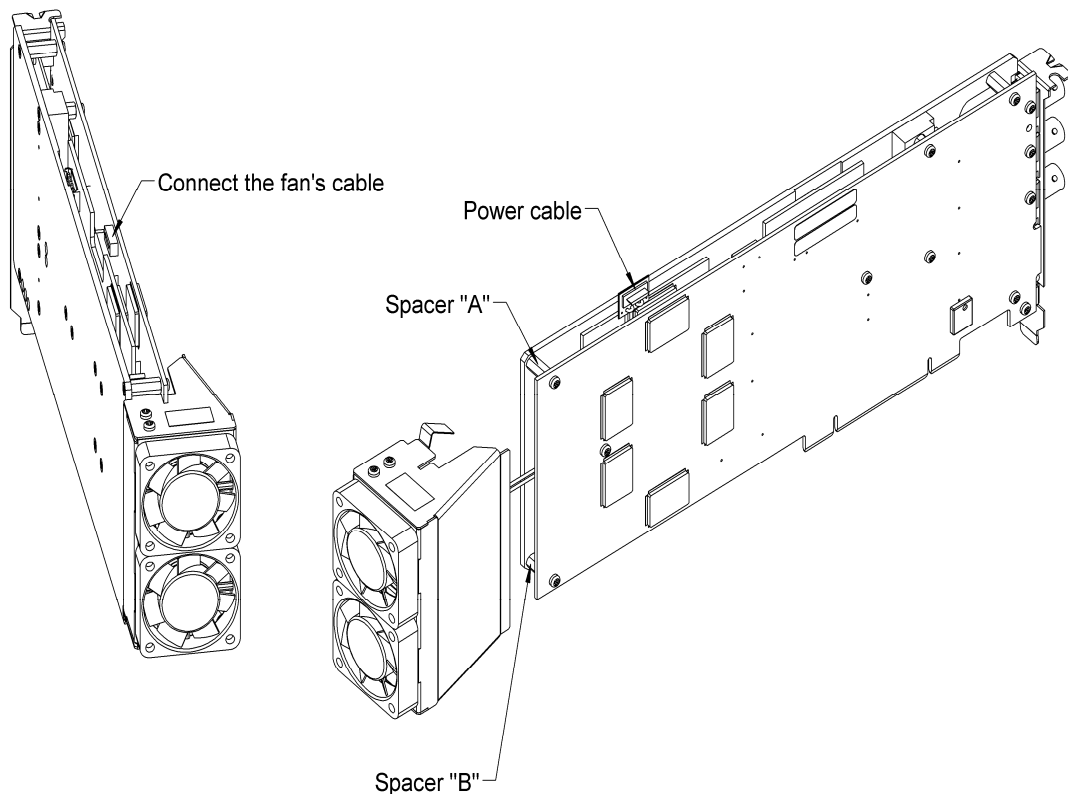
Life expectancy (at 25 °C) : 50000 hours.

Safety approvals : CE, VDE, UL, and CSA.

Materials : Box of stainless steel and fan of fiberglass reinforced plastic, PBT housing, PA impeller.

HOW TO INSTALL/REMOVE THE FAN ON A DIGITIZER :

1. Remove the digitizer from the PC, prior to installing or removing the fan unit.
2. Twist the fan's cable a few times in order for the 2 wires to stay together.
3. Introduce the cable between the spacers "A" and "B" at the back of the digitizer.
4. Push the fan unit into the back of the digitizer so that the two springs lock into place.
5. Insure that the two springs are safely attached behind the two spacers and that the fan's box is in contact with the digitizer cover.
6. Connect the fan's cable as shown in the figure below. The position of the power connector can vary between different digitizer models.
7. To remove the fan unit, first unplug its power cable and then press on both fan springs and pull it away from the digitizer.



12. Appendix G: U1091AX03 XP103 Fan Unit for the DPxxx Modules

Specification and Assembly Instructions - XP3 Option

SPECIFICATIONS :

Airflow : 16 m³/h, typical speed 6500 rpm, maximal noise 30 dB(A).

Nominal Voltage : 5 VDC.

Power input : 2.1 W.

With electronic protection against reverse polarity, impedance-protected against blocking and overloading.

Operating temperature : 0 °C to 70 °C.

Life expectancy (at 25 °C) : 50000 hours.

Safety approvals : CE, VDE, UL, and CSA.

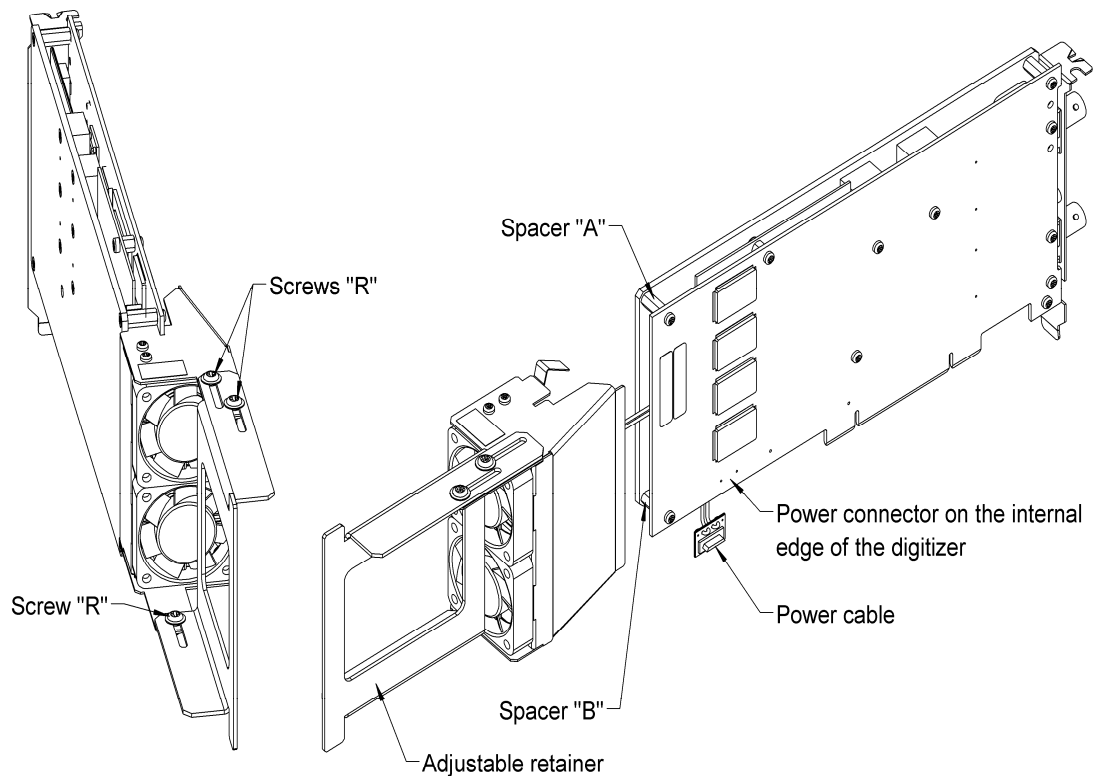
Materials : Box of stainless steel, aluminium and fan of fiberglass reinforced plastic, PBT housing, PA impeller.

HOW TO INSTALL/REMOVE THE FAN ON A DIGITIZER :

1. Remove the digitizer from the PC, prior to installing or removing the fan unit.
2. Twist the fan's cable a few times in order for the 2 wires to stay together.
3. Introduce the cable between the spacers "A" and "B" at the back of the digitizer.
4. Push the fan unit into the back of the digitizer so that the two springs lock into place.
5. Insure that the two springs are safely attached behind the two spacers and that the fan's box is in contact with the digitizer cover.
6. Connect the fan's cable. The position of the power connector can vary between different digitizer models.
7. To remove the fan unit, first unplug its power cable and then press on both fan springs and pull it away from the digitizer.

HOW TO INSTALL/REMOVE THE DIGITIZER IN A PCI SLOT OF A PC :

1. Install the fan on the digitizer as described above.
2. Release the three screws "R" from the adjustable retainer and move the retainer against the fans.
3. Introduce the digitizer into the PCI slot and tighten the front panel screw.
4. Push the retainer into the PCI slot guide and tighten the three screws "R". The digitizer is now installed.
5. To remove the digitizer it is necessary to first release the three screws "R" and pull back the adjustable retainer.



13. Appendix H: U1091AX04 XP104 Fan Unit for U1071A-FAMILY

SPECIFICATIONS:

Airflow : 14 m³/h, typical speed 4500 rpm, maximum noise 25 dB(A).

Nominal Voltage : 5 VDC.

Power input : 1 W

With electronic protection against reverse polarity, impedance-protected against blocking and overloading.

Operating temperature : 0 °C to 70 °C.

Life expectancy (at 40 °C) : 55000 hours.

Safety approvals : CE, VDE, UL, and CSA.

Materials : Box of stainless steel, aluminum and fan of fiberglass reinforced plastic, PBT housing, PA impeller.

HOW TO INSTALL/REMOVE THE FAN UNIT ON A DIGITIZERS:

(Refer to the figures on the next page)

1. Remove the digitizers from the PC, before installing or removing the fan unit.
2. Unscrew the screws "E" and "F" of the retaining clips "C" and "D" on each side of the fan unit.
3. Twist the fan's cables a few times so that the 2 wires stay together.
4. Connect the fan's cables to the Digitizer "1" connectors as shown in the figure below.
Either cable can be connected to either connector.
5. Push the fan unit into the back of Digitizer "1" so that the two springs lock into place.
6. Place the two retaining clips "C" on the spacers "A" and "B" and insert and tighten the two screws "E".
7. Ensure that the fan unit is safely attached to the two spacers.
8. If the optional digitizer is present, install the retaining clips "D" with the screws "F".

(Refer to the figures attached on sheet 2 of 2)

HOW TO INSTALL/REMOVE THE DIGITIZERS IN A PCI SLOT OF A PC:

1. Remember to cut all power and take the usual precautions against static discharges.
2. Install the fan on the digitizer as described above.
3. Loosen the two screws "R" from the adjustable retainer and move the retainer toward the fans.
4. Introduce the digitizers into the PCI slot and tighten the front panel screw.
5. Push the retainer into the PCI slot guide and tighten the two screws "R". The digitizer is now installed.
6. To remove the digitizers it is necessary to first loosen the two screws "R" and then pull back the adjustable retainer.

CAUTION:

It is dangerous to transport a PC with a Digitizer installed without correct positioning of the retainer.

It is dangerous to mount a single Digitizer in position "2".

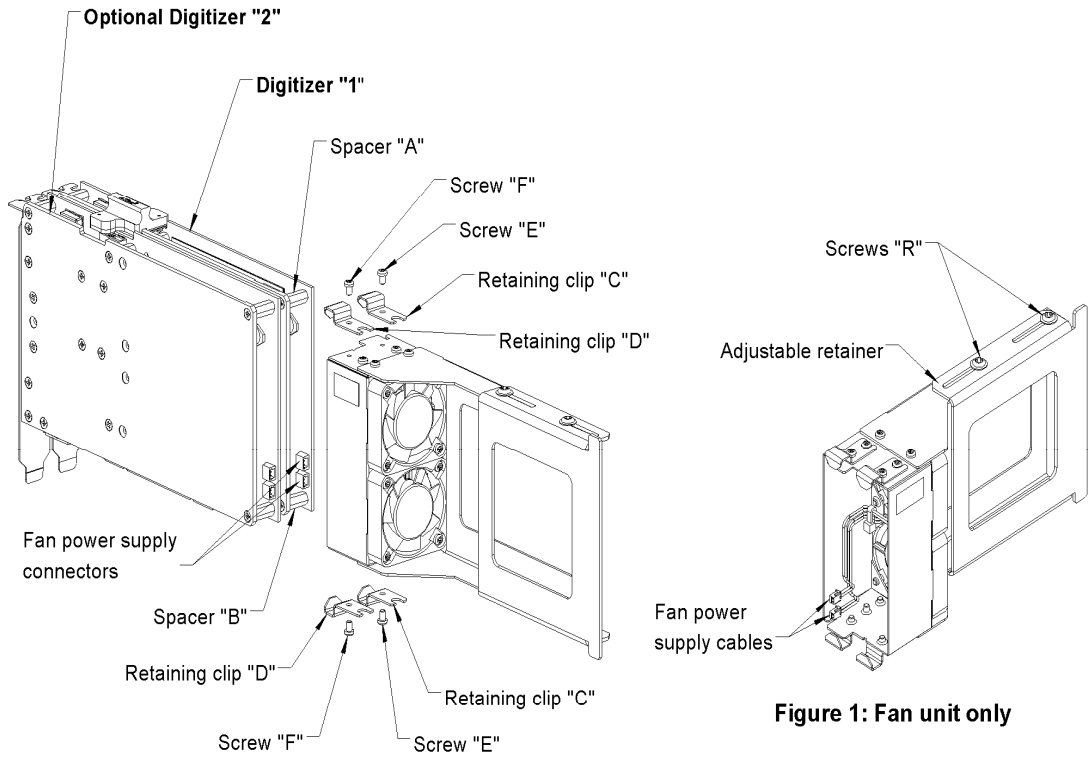


Figure 1: Fan unit only

Figure 2: Exploded view of Fan unit assembly

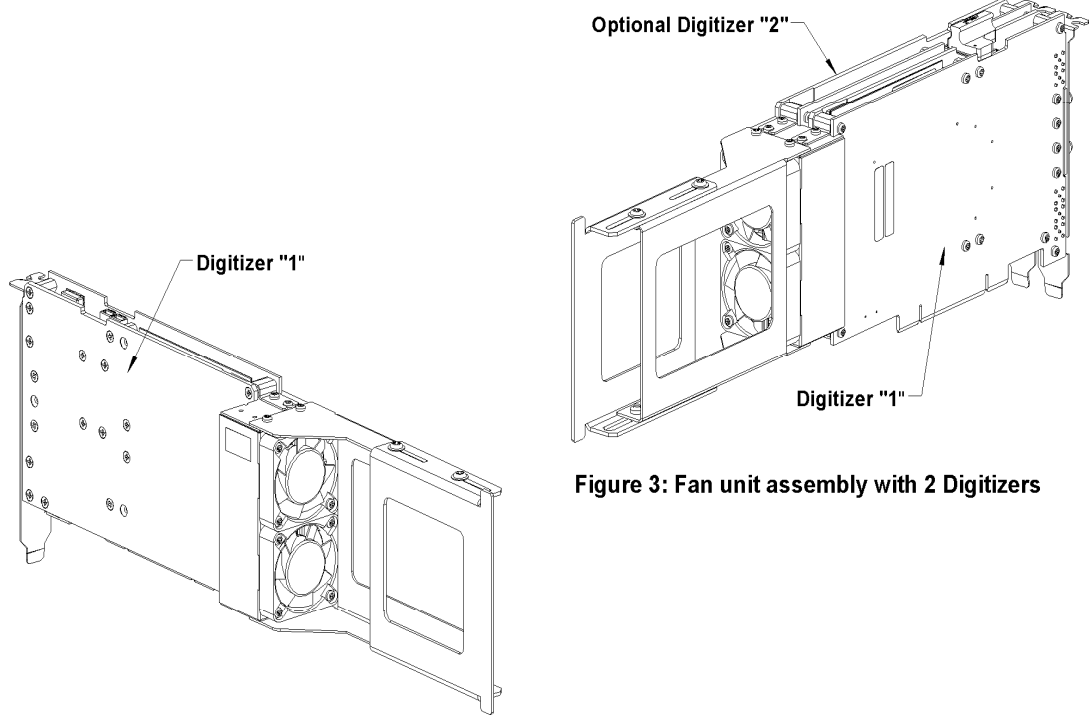


Figure 3: Fan unit assembly with 2 Digitizers

Figure 4: Fan unit assembly with Digitizer "1" only

14. Appendix I: U1071A-XP5(U1091AX105) XP105 Fan Unit for U1071A-FAMILY

SPECIFICATIONS:

Airflow : 8 m³/h, typical speed 4500 rpm, maximum noise 25 dB(A).

Nominal Voltage : 5 VDC.

Power input : 1 W

With electronic protection against reverse polarity, impedance-protected against blocking and overloading.

Operating temperature : 0 °C to 70 °C.

Life expectancy (at 40 °C) : 55000 hours.

Safety approvals : CE, VDE, UL, and CSA.

Materials : Box of stainless steel and fan of fiberglass reinforced plastic, PBT housing, PA impeller.

HOW TO INSTALL/REMOVE THE FAN UNIT ON A DIGITIZER:

1. Remember to cut all power and take the usual precautions against static discharges.
2. Remove the digitizer from the PC, before installing or removing the fan unit.
3. Unscrew the screw of the retaining clips on each side of the fan unit.
4. Twist the fan's cables a few times so that the 2 wires stay together.
5. Connect the fan's cables to the Digitizer connectors as shown in the figure below.
Either cable can be connected to either connector.
6. Push the fan unit into the back of the digitizer until the fan's box is in contact with the digitizer cover.
7. Place the two retaining clips on the spacers "A" and "B" and insert and tighten the two screws.
Ensure that the fan unit is safely attached to the two spacers.

CAUTION:

It is dangerous to transport a PC with a digitizer installed as shown.

