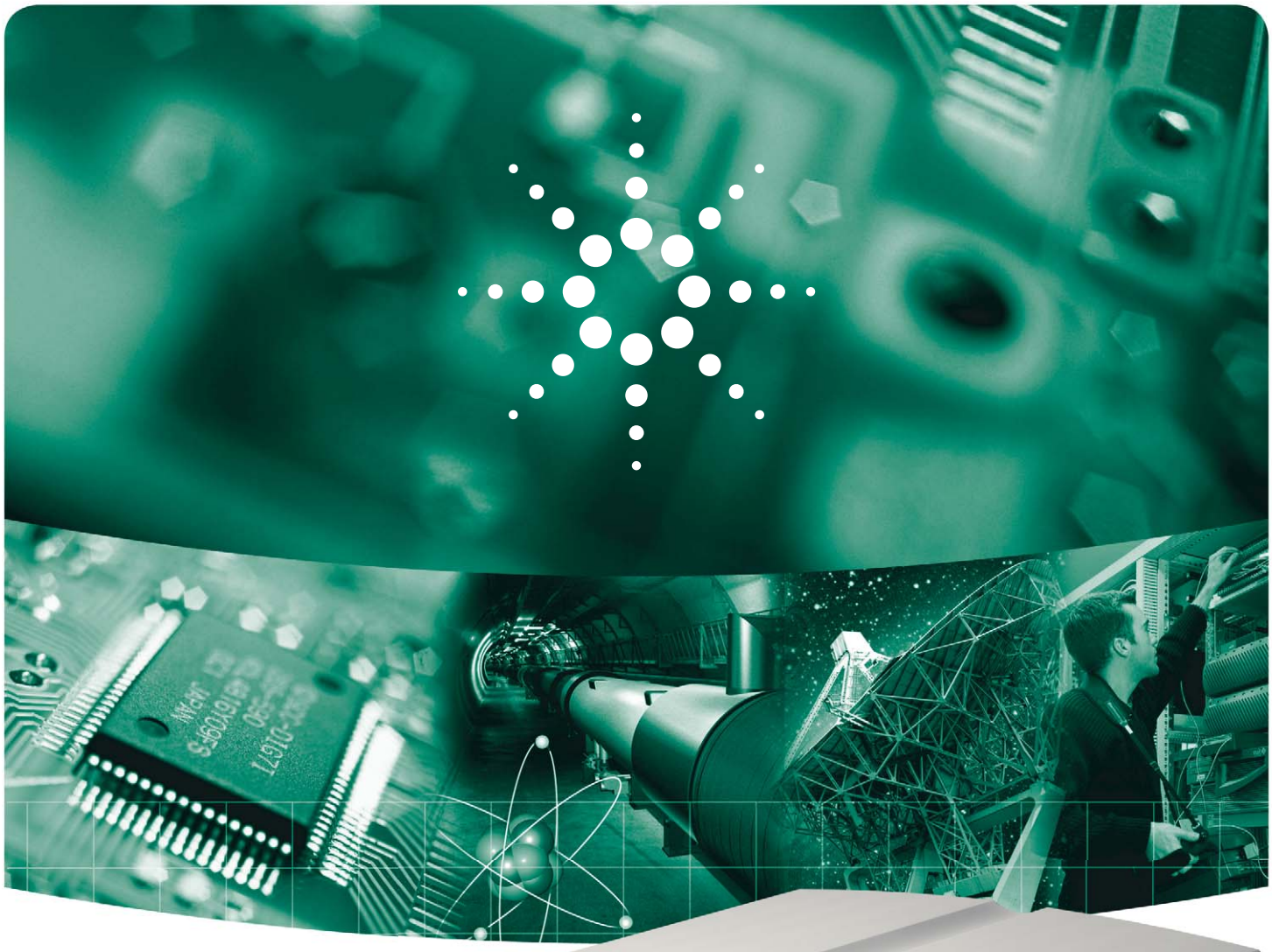


Agilent U1056B

Acqiris High-Speed Data Converter Systems

Anticipate ___Accelerate ___Achieve

Agilent Technologies

Main Features

- **Turnkey solutions for measurement and analysis of 1 to 80 high-speed signals in a single system**
- **Mix and match data acquisition modules to build tailor made instrumentation for specific applications**
- **Synchronization of multiple cards as one single instrument**
- **Interface to laptop or desktop PC, or operation as a standalone system**
- **Optional turnkey software for easy control of multiple channels and multiple systems**
- **Device drivers for Windows®, VxWorks, LabVIEW RT, and Linux, with application code examples for MATLAB, C/C++, Visual Basic, LabVIEW, and LabWindows/CVI**

Figure 1. U1056B data converter system linked to display and keyboard

Acqiris High-Speed Data Converters

The proprietary ADC chipsets in Agilent Technologies Acqiris high-speed digitizers are designed for the specific purpose of optimizing high-speed ADC performance. The analog front-end technology provides signal conditioning, amplification, and interleaving functions essential for achieving high-speed data acquisition at giga-sample per second (GS/s) rates. The digital data handling components provide vital clock and synchronization signals to capture and memorize acquired data with maximum data throughput. Together these ASICS make low-power, high-fidelity data acquisition much more accessible and provide maximum data throughput to the host PC or processor to reduce the time and cost of measurement.

The Acqiris product line provides a range of high-speed digitizer cards[1] with 8-, 10-, and 12-bit resolution, wide bandwidth, and large acquisition memory. These products in PCI/PCIe, PXI/PXIe, cPCI, AXIe and VME formats, are used in research, and in ATE and OEM applications in industries such as biotechnology, semiconductors, aerospace, physics, and astronomy.

Mix and Match Performance and Functionality in to One System

The U1056B configured systems allow you to generate a complete data acquisition system with a combination of CompactPCI (cPCI) high-speed data converter modules. Each system includes a choice of PC interfaces or embedded single board computers, with crates and software to create a turn-key system with up to 80 digitizer acquisition channels.

The range of cPCI digitizers provide 8-, 10-, and 12-bit resolution, with the one, two, or four channel 8-bit resolution digitizers providing bandwidths up to 1 GHz and sampling rates to 4 GS/s. The 10-bit digitizers provide up to 8 GS/s sampling rates and an ultra-wide analog bandwidth up to 3 GHz, while the 12-bit units offer two channels and sampling rates to 400 MS/s, with an analog bandwidth to 300MHz.

The high-speed cPCI analyzers (digitizers with on-board FPGA technology) provide up to 2 GS/s sampling rates. The analyzer can be ordered with either a real time FFT processing firmware, or a firmware development kit (FDK) that opens the FPGA to custom algorithms for real time processing, and/or data streaming with the modules optional fiber optic data ports.

The time-to-digital converters (TDC) provide precise timing measurements between up to 12 input channels per card, and with 50 ps timing resolution.

Full product descriptions and brochures for the system components are available at
www.agilent.com/find/digitizers

1) 500 MS/s, 1 GS/s, 2 GS/s, 4 GS/s and 8 GS/s high-speed digitizer cards

High-Speed Data Converters

Digitizers

Choose from the selection of cPCI (6U) digitizers with 8-, 10-, and 12- bit resolution. Thanks to its modularity, the U1056B system not only allows you to mix different digitizer types in the same system, but also offers the possibility to acquire just the hardware you need. If you want to add more channels, simply insert another digitizer. This scalability means that you can even build up larger systems over time.

		Size	*Channels*	*Bandwidth*	*Max Sample Rate*	*Max Memory*
12-bit High-Speed Digitizers						
	**U1066A**					
	U1066A-001	6U	2 ch	100/300 MHz	420 MS/s	8 MS
	U1066A-002	6U	2 ch	100 MHz	200 MS/s	8 MS
10-bit High-Speed Digitizers						
	**U1065A**					
	U1065A-001	6U	1 ch	2-3 GHz	8 GS/s	1 GS
	U1065A-002	6U	2 ch	2-3 GHz	4-8 GS/s	0.5-1 GS
	U1065A-004	6U	4 ch	1-2 GHz	2-8 GS/s	0.25-1 GS
8-bit High-Speed Digitizers						
	**U1064A**					
	U1064A-001	6U	1 ch	1 GHz	4 GS/s	32 MS
	U1064A-002	6U	2 ch	1 GHz	2-4 GS/s	16-32 MS
	U1064A-004	6U	4 ch	1 GHz	1-4 GS/s	8-32 MS
	U1063A					
	U1063A-001			DISCONTINUED		
	U1063A-002			This product is no longer available See U1064A for replacement		

Table 1. Supported cPCI digitizers

Analyzers

The cPCI (6U) analyzer is a high-speed digitizer with on-board FPGA processing. Sampling at up to 2 GS/s and with 1 GHz analog bandwidth it features signal processing capabilities ideal for radar, electronic warfare and ELINT. The U1080A-002 also provides real-time data streaming through front panel optical links, for data recording applications.

8-bit High-Speed Digitizers with On-Board Signal Processing

	Size	*Channels*	*Bandwidth*	*Max Sample Rate*	*Max Memory*
U1080A					
U1080A-001	6U	2 ch	1 GHz	1-2 GS/s	512 MB
U1080A-002	6U	2 ch	1 GHz	1-2 GS/s	512 MB

Table 2. Supported cPCI analyzers

Time-to-digital converters

The time-to-digital converters provide precise timing measurements from a common start event to single or multiple stop events with high timing resolution. These products provide timing measurements from 6 or 12 input channels in single-hit or multi-hit mode.

The U1050A can be viewed as a free-running, high-resolution 50 ps counter with each individual channel capable of recording the time of arrival of trigger signals and storing this data in the local memory. The time base contains a stable, high-accuracy 10 MHz reference. This time base can also be referenced to an external 10 MHz source through an auxiliary input.

The U1051A module records multiple events or hits on each of its six input channels, with a timing resolution of 50 ps and a mean dead time between sequential pulses on the same input (double pulse resolution) of less than 15 ns. Running at full speed, the U1051A offers a massive 25 million events-per-second data-throughput rate. The U1051A enables event counting or histogram creation for easy data and spectra comparison.

Time-to-Digital Converters

	Size	*Channels*	*Time Resolution*	*TDC function*
U1050A				
U1050A-001	6U	12 ch	50 ps	Single hit, wide range 20 sec
U1050A-002	6U	6 ch	5 ps	Single hit, wide range 20 sec
U1051A				
U1051A	6U	6 ch	50 ps	Multi hit, to 4 million events

Table 3. Supported cPCI time-to-digital converters

System Crates

The 6U cPCI crates of the U1056B use the highest quality components, high output power supplies, and cooling in order to maximize system performance reliability. These universally applicable cPCI crates are carefully designed to yield high performance test systems for bench, lab, and manufacturing test applications.

The crates come in 3-, 5-, 8-, and 21-slot versions. They can be used free standing on the bench or rack-mounted in standard 19" inch instrumentation racks. As any system will require an associated interface or embedded PC, these crates provide the necessary slots for 2, 4, 7, and 20 data converter cards respectively.

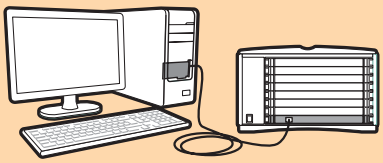
	Size (w x d x h)	*Required Rackmount space*	*Slots*	*Free slots for data converters*	*Power supply*
U1091AC30 	342 mm x 346 mm x 106 mm 13.47" x 13.62" x 4.17"	3U	3	2	400 W
U1091AC50 	342 mm x 346 mm x 146 mm 13.47" x 13.62" x 5.75"	4U	5	4	400 W
U1091AC83 	342 mm x 346 mm x 212 mm 13.47" x 13.62" x 8.35"	5U	8	7	800 W
U1091AC21 	483 mm x 440 mm x 399 mm 19.02" x 17.32" x 15.71"	9U	21	20	1260 W

Table 4. Choice of cPCI crates

PC Interfaces and Embedded Processors

Data acquired with a U1056B system can be processed with the latest, high-speed processors. Select from an embedded single-board computer, or a choice of interfaces that will link the system to a laptop or desktop PC. Choose from PCI or PCI Express interface modules for desktop, or ExpressCard interfaces for laptop PCs.

Interface to Desktop PC



to PCI

U1091AK02 [1]
includes 5 m copper cable
Up to 250 MB/s

to PCIe

U1091AK13 [2]
includes 5 m copper cable
Up to 300 MB/s

Interface to Laptop PC

to PCIe Expresscard

U1091AK04
includes 3 m copper cable
Up to 110 MB/s

Embedded Processor

CompactPCI single-board computer

U1091AK12
2.5 GHz Intel Core 2 Duo processor, 320 GB HDD, and up to 8 GB RAM

Table 5. Choice of cPCI interfaces and processors

1) The U1091AK02 interface cannot be used in systems that contain only U1065A high-speed digitizers when operating under Windows 7, Vista or Linux operating systems. The same hardware combination will work under 32- or 64-bit Windows XP.

2) The U1091AK13 interface is compatible with PCIe 1.0 slots in host computers using 64-bit Windows 7 or Linux. For information on other configurations contact an Agilent expert.

Accessories

Synchronizing multiple modules
Autosynchronous bus (AS bus) bridges cover the various setup needs in order to allow the connection from 2 up to 7 digitizers together (up to 28 channels). The system takes care of the distribution of all necessary trigger and clock signals.

AS bus allows all the digitizers to be clocked at precisely the same time. The position of a card into the crate is automatically detected therefore enabling the system to calibrate the channel timing information. Synchronous digitizing improves the accuracy of cross-channel measurements and is essential for accurate time correlation. The AS bus system can be used to phase-synchronize all digitizers to an external standard (such as a 10 MHz reference), or to improve trigger flexibility, by allowing any trigger input (channel or external trigger input) to be used as the trigger source for all the other digitizers in the system.

For the U1056B systems, two versions of the AS bus can be used. Up to 7 units of U1064A, U1066A, or U1080A data converters can be synchronized using the original AS bus connectors. AS bus 2 is designed for use with the 10-bit U1065A and can synchronize up to 5 units, each with sampling rates of up to 8 GS/s.

A simple software function allows the combination of the digitizers connected by the hardware connector, so that they appear as a single instrument with more channels.

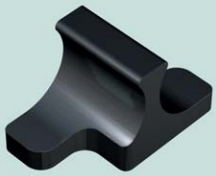
Number of Modules	**AS bus**  Compatible Modules: U1064A U1066A U1080A	**AS bus 2**  Compatible Modules: U1065A
2	1x **U1093A-AS4**, double termination, XB103	1x **U1093A-AS5**, AS bus 2 connector, XB200
3	1x **U1093A-AS2**, left termination, XB101 1x **U1093A-AS3**, right termination, XB102	2x **U1093A-AS5**, AS bus 2 connector, XB200
4	1x **U1093A-AS2**, left termination, XB101 1x **U1093A-AS3**, right termination, XB102 1x **U1093A-AS1**, simple bridge, XB100	3x **U1093A-AS5**, AS bus 2 connector, XB200
5	1x **U1093A-AS2**, left termination, XB101 1x **U1093A-AS3**, right termination, XB102 2x **U1093A-AS1**, simple bridge, XB100	4x **U1093A-AS5**, AS bus 2 connector, XB200
6	1x **U1093A-AS2**, left termination, XB101 1x **U1093A-AS3**, right termination, XB102 3x **U1093A-AS1**, simple bridge, XB100	N/A
7	1x **U1093A-AS2**, left termination, XB101 1x **U1093A-AS3**, right termination, XB102 4x **U1093A-AS1**, simple bridge, XB100	N/A

Table 6. Autosynchronous bus connector configurations

Crate accessories
The 3-, 5- and 8-slot crates can be configured with accessories for specific applications. Ergonomically designed handles and feet allow systems to be easily moved from one location to another, providing a truly portable digitizer solution. They are ideal for applications where data acquisition is required at multiple site locations, in the field, outside of the lab, and off of the bench. The lateral handle system can be used with the crates rack-mount kit. The basic kit contains all that is required to mount a crate in a standard 19" instrumentation rack. Complemented with two lateral handles, the systems are easily moved allowing trouble-free organization of rack space.

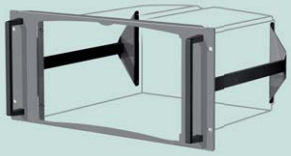
	Handle and Feet Kit	Rack-Mount Kit	Rack-Mount Kit with Lateral Handles
			
3-Slot Systems	U1092A-C32	U1092A-C31	U1092A-C33
5-Slot Systems	U1092A-C52	U1092A-C51	U1092A-C53
8-Slot Systems	U1092A-C82	U1092A-C81	U1092A-C83

Table 7. Choice of cPCI crate accessories

Finishing touches
A number of accessories make the system fully operational and ready for turn-key measurement. These accessories include high-voltage protection, and blanking panels that are designed for the closing of empty slots, while maintaining the operating environment for the selected data converter cards.

	System Accessories
U1092A-C02	6U cPCI blanking panel
U1092A-HVB	High-voltage protection for data converter BNC connectors
U1092A-HVS	High-voltage protection for data converter SMA connectors

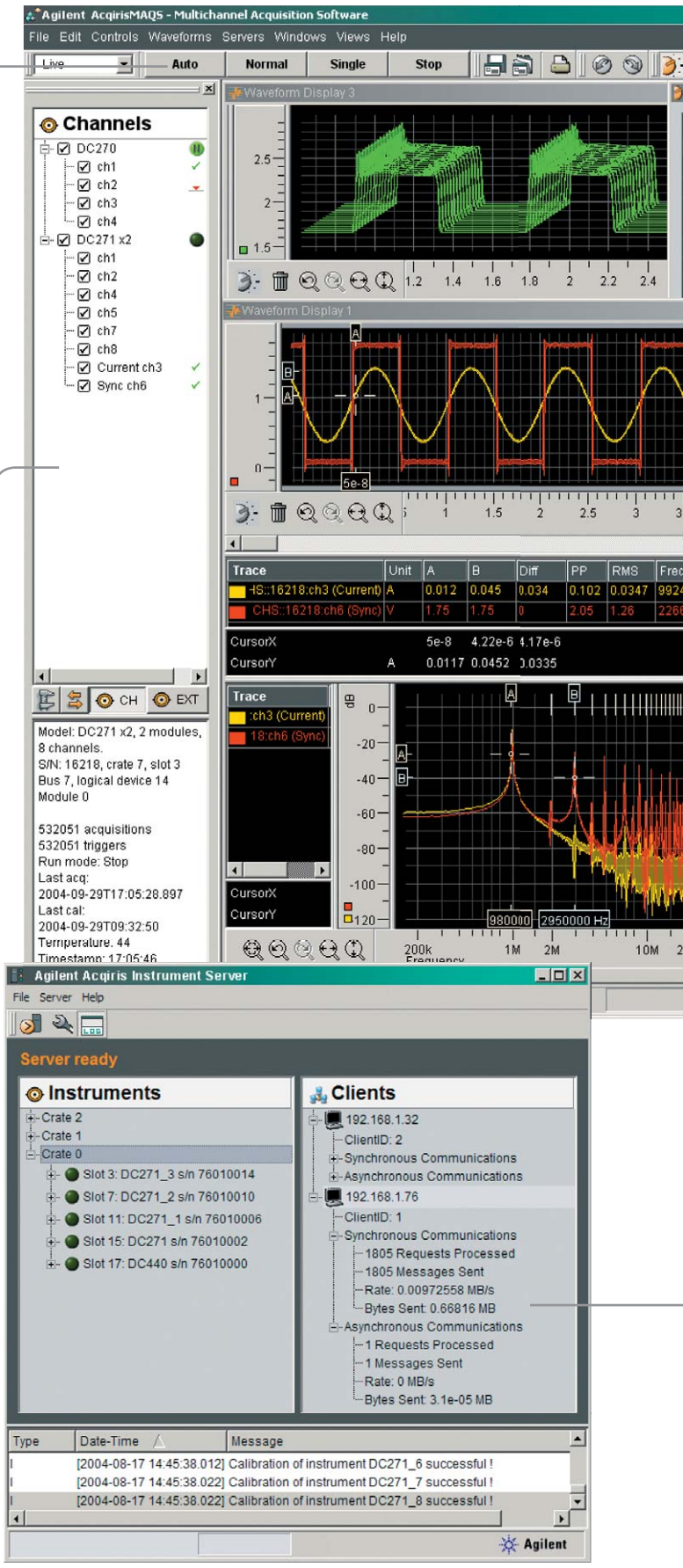
Table 8. System accessories

Software

Agilent's high-speed Acqiris data converter systems are supplied with a demo application, software drivers for Windows, Linux, LabVIEW RT and VxWorks, and application code examples for MATLAB, C/C++, VisualBasic, LabVIEW, and LabWindows/CVI.

These code examples provide digitizer setup and basic acquisition functionality, and are easily modified, so that the card can be quickly integrated into a measurement system. The flexibility of the driver means that, with minimum software adjustments, any Acqiris digitizer can be swapped out, replaced, or upgraded with the latest high-speed Acqiris digitizer.

Alternatively a system containing digitizer or TDC cards can be driven using the turnkey multichannel acquisition software AcqirisMAQS. This powerful software was designed and developed specifically for control and monitoring of advanced data acquisition systems. It allows remote Ethernet operation of multiple systems at various networked locations. The user-friendly interface provides drag & drop functions and a familiar multiple-window workspace, for multiple waveform display, and cursors for simple and rapid measurement. AcqirisMAQS does not support the U1051A nor the full functionality of U1080A products.



Run control and toolbar buttons

Acquisition modes are changed using the Run Control buttons: From automatic, normal (triggered) to single acquisition on an individual device or group basis, as selected in the Channel View tree.

Save and recall configurations, layout, and display windows. Search and connect to networked acquisition systems, in a few mouse clicks.

Channel view

The Channel View tree provides a simple way to visualize and organize all the connected digitizer channels. It presents a tree of all the connected devices, showing a live display of their operational states, along with a device description including serial number and location in the acquisition system. From the presented collection of devices, individual channels to whole groups of digitizers can be chosen for use. The user can then perform specific operations on the chosen channels, change digitizer acquisition states using Run Control, or individual channel parameters and settings using the Instrument Settings panel.

1) An instrument server is a PC or processor that is linked directly to one or more Acqiris digitizer modules. This server can then communicate to one or more client PC or processors, and vice-versa.

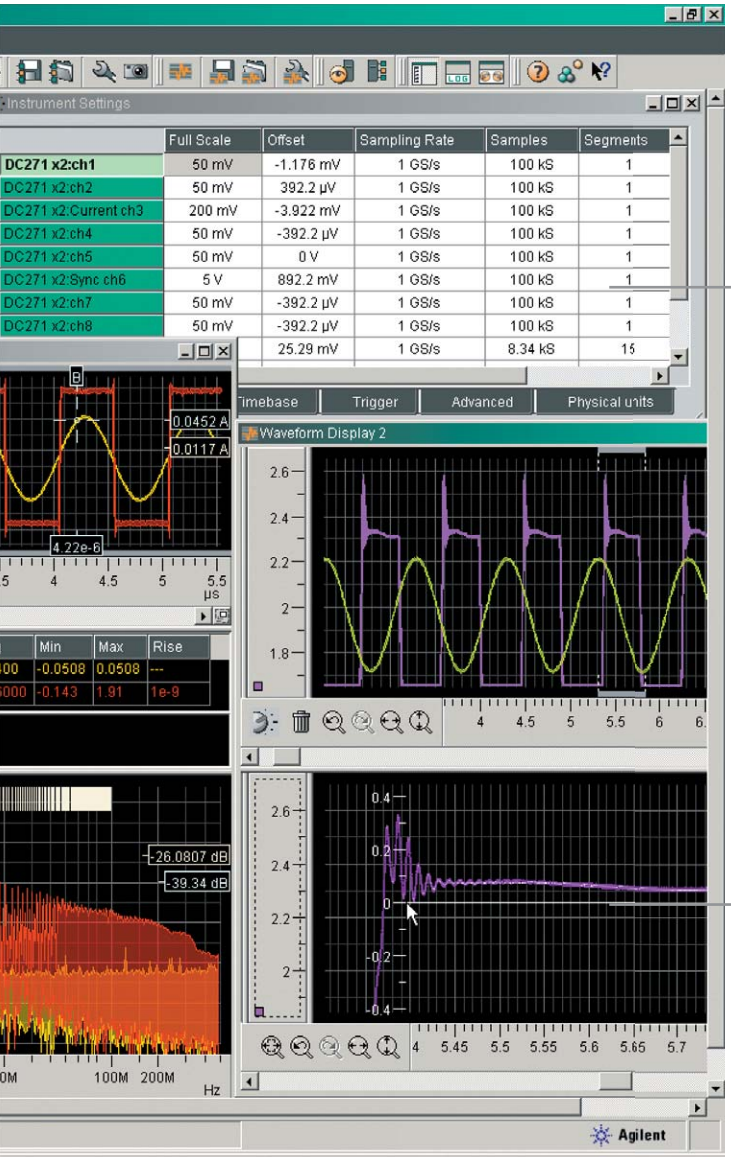


Figure 2. AcqirisMAQS software

Instrument settings
The easy-to-use table structure of the Instrument Settings window is designed specifically for the organization of the acquisition parameters of a large number of channels in a data acquisition system.

Split into several tabulated pages, each concerned with specific groups of attributes of the acquisition system, the channels are shown as rows with individual parameters as columns on each page. The tables are fully customizable, the visible columns chosen from a selection presented as tear-off menus, the channels chosen from the Channel View tree.

Settings can be changed on an individual or group basis. Valid parameter values, corresponding to the selected channels are indicated in the appropriate cell.

Waveform display
These scalable windows show the acquired data from selected channels as a function of time. Both time- and Y-axis (scalable to the physical units of the acquisition) are easily defined and resized, and gridlines can be added and removed. Offsets and magnification of particular areas of interest can be achieved with simple mouse movements.

Individual Waveform Display windows can also be divided into separate plot areas. This can include additional acquisition data traces, persistence traces, or display the frequency spectrum using a choice of FFT windowing routines.
Within the visualization, cursors allow simple and accurate measurement of signal amplitudes and timing. A selection of signal measurements, including rise time, duty cycle, amplitude, and overshoot can also be made, with the measurements displayed as a function of the displayed traces.

Distributed control and acquisition
AcqirisMAQS integrates a remote control module to allow client-server [1] control and monitoring of data acquisition systems from multiple locations simultaneously, and to access test systems located at dispersed sites (depending on licence option chosen).
With AcqirisMAQS, any PC or laptop can be set up as a client to control multiple digitizer channels connected to an instrument server, via an Ethernet connection, simple crossover cable, or in any networked environment over the Ethernet, on-site, or from a remote location. A single client can set up connections to one or more instrument servers. However only the master client, as defined by the system setup, has power to change parameters; other non-master clients have only monitoring rights.

	AcqirisMAQS Software
U1092A-S01	AcqirisMAQS single-station, master licence
U1092A-S02	AcqirisMAQS single-station, master and monitoring licence
U1092A-S03	AcqirisMAQS multi-station, single shot, master and monitoring licence

Table 9. Supported AcqirisMAQS license options

Example Configurations

Portable high-resolution system

1x U1091AC30 3-slot crate

1x U1091AK04 ExpressCard interface to laptop PC, with 3m copper cable

2x U1066A-001 Acqiris dual-channel, 400 MS/s DC440 high-speed digitizer

1x U1093A-AS4 AS bus, double termination, XB103

1x U1092A-C32 Handle and feet kit

This low power, 3-slot portable system provides 4 synchronized input channels with 12-bit resolution and a high-speed interface to a laptop PC with ExpressCard slot. Ideal for Telecom testing or Ultrasound systems.

High-speed data acquisition

1x U1091AC50 5-slot crate

1x U1091AK12 2.5 GHz Intel Core 2 Duo processor, embedded PC

4x U1065A-004 Acqiris quad-channel, 2-8 GS/s DC282 high-speed digitizer

3x U1093A-AS5 AS bus 2 connector

1x U1092A-S01 AcqirisMAQS single-station, master license

The 5-slot crate provides four vacant slots to be used by Agilent data converter modules. By including 4 U1065A modules, synchronized using the AS bus 2 connectors, this system offers 16 high-speed (2 GS/s) data acquisition channels that to the embedded high-performance host processor look to be one single instrument.

Ready for anything

1x U1091AC83 8-slot crate

1x U1091AK13 PCIe interface to desktop PC, with 5 m copper cable

1x U1066A-001 Acqiris dual-channel, 400 MS/s DC440 high-speed digitizer

2x U1065A-002 Acqiris single-channel, 8 GS/s DC222 high-speed digitizer

2x U1080A-001 Acqiris dual-channel, 1-2 GS/s AC240 high-speed digitizer with on-board signal processing

1x U1050A-001 Acqiris wide-range, single-stop, TC840 time-to-digital converter

1x U1093A-AS5 AS bus 2 connector

1x U1092A-C82 Handle and feet kit

1x U1092A-C02 Blanking panel

This system has everything, four synchronized channels each offering 10-bit sampling at 4 GS/s, two 12-bit channels sampling at 420 MS/s, two 8-bit 1 GS/s channels in the analyzer board, plus a 12 channel TDC for precise timing measurement. The system is interfaced through PCIe interface to a PC, and there is even a spare slot available for a future upgrade or to add an additional cPCI unit.

Rack mountable 80-channel system

1x U1091AC21 21-slot crate

1x U1091AK02 cPCI to PCI interface to desktop PC, with 5 m copper cable

20x U1064A-004 Acqiris quad-channel, 1-4 GS/s DC271A high-speed digitizer

1x U1092A-S01 AcqirisMAQS single-station, master license

Held in a 21-slot 9U crate, this example system with 80 acquisition channels each running with a real-time sampling rate of 1 GS/s, has a power consumption of less than 900W. The whole system can sit on a desk or be mounted into a 19" rack. The AcqirisMAQS software allows easy control of the system and visualization of the acquired data through a desktop PC interfaced through the PCI bus. With 80 input channels, large scale experiments as in radio astronomy or particle physics, can be integrated and controlled in a single desktop solution.

Configure your system

1. Choose the system size

U1091AC30	3-slot cPCI crate
U1091AC50	5-slot cPCI crate
U1091AC83	8-slot cPCI crate
U1091AC21	21-slot cPCI crate

2. Choose an interface or single board PC

U1091AK02	cPCI to PCI interface, with 5 m cable
U1091AK04	cPCI to ExpressCard interface, with 3 m cable
U1091AK12	Embedded cPCI processor, 2.5 GHz Intel Core 2 Duo processor, 320 GB HDD, up to 8 GB RAM
U1091AK13	cPCI to PCIe interface, with 5 m cable

3. Choose and configure the required data converters*

U1064A	8-bit cPCI digitizers, 1-4 ch, up to 4 GS/s, up to 1 GHz bandwidth
U1065A	10-bit cPCI digitizers, 1-4 ch, up to 8 GS/s, up to 3 GHz bandwidth
U1066A	12-bit cPCI digitizers, 2 ch, up to 400 MS/s, up to 300 MHz bandwidth
U1080A	8-bit cPCI analyzers, 2 ch, up to 2 GS/s, up to 1 GHz bandwidth with FPGA processing.
U1050A	Twelve-channel cPCI Time-to-Digital Converter
U1051A	Six-channel cPCI Time-to-Digital Converter

4. Choose optional software

U1092A-S01	AcqirisMAQS single-station, master licence
U1092A-S02	AcqirisMAQS single-station, master and monitoring licence
U1092A-S03	AcqirisMAQS multi-station, single-shot, master and monitoring licence

* Refer to individual data converter brochures for configuration details.

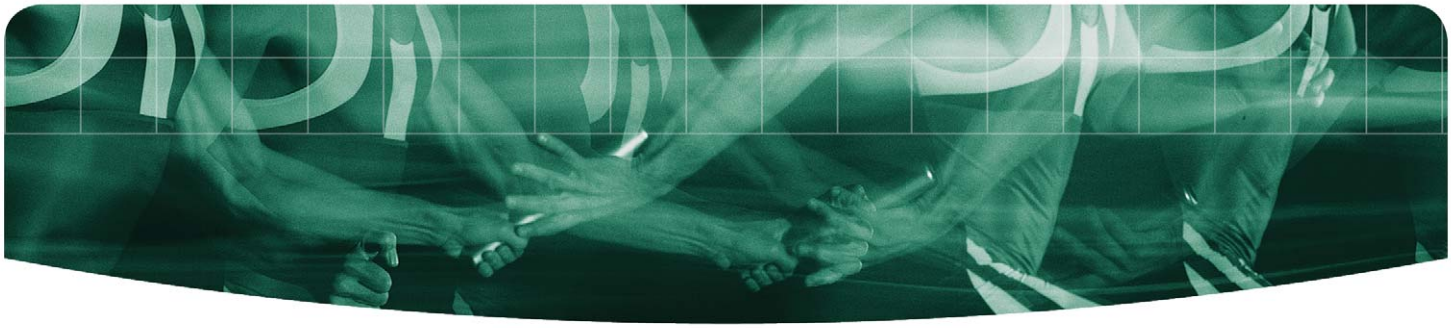
5. Choose optional synchronization connectors

U1093A-AS1	AS bus connector, simple bridge, XB100, for U1064A and U1066A
U1093A-AS2	AS bus connector, left termination, XB101, for U1064A and U1066A
U1093A-AS3	AS bus connector, right termination, XB102, for U1064A and U1066A
U1093A-AS4	AS bus connector, double termination, XB103, for U1064A and U1066A
U1093A-AS5	AS bus 2 connector, XB200, for U1065A

6. Choose optional accessories

U1092A-C31	Rack-mount kit for 3 slot crate
U1092A-C32	Handle and feet kit for 3 slot crate
U1092A-C33	Rack-mount kit with lateral handles for 3 slot crate
U1092A-C51	Rack-mount kit for 5 slot crate
U1092A-C52	Handle and feet kit for 5 slot crate
U1092A-C53	Rack-mount kit with lateral handles for 5 slot crate
U1092A-C81	Rack-mount kit for 8 slot crate
U1092A-C82	Handle and feet kit for 8 slot crate
U1092A-C83	Rack-mount kit with lateral handles for 8 slot crate
U1092A-C02	6U cPCI blanking panel
U1092A-HVB	High-voltage protection for data converter BNC connectors
U1092A-HVS	High-voltage protection for data converter SMA connectors

Warranty extensions: Standard 1 year warranty on Agilent high-speed data converter systems can be extended to 3 or 5 years for both data converter modules and the system crates.



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