Agilent U1062A
Acqiris High-Speed PXI Digitizers
DC152: 10-bit, 2 ch, up to 2 GHz, 2-4 GS/s
DC122: 10-bit, 1 ch, 2 GHz, 4 GS/s
Main Features

- Dual- and single-channel 10-bit digitizers with up to 4 GS/s sampling rate
- Choice of fully-featured mezzanine front end, with internal calibration and input protection, offering 50Ω or 1 MΩ input impedance, with up to 2 GHz analog bandwidth
- Large 512 kSample acquisition memories expandable to 64 or 512 MSample (optional)
- Multi-module synchronization with auto-synchronous bus system for distribution of trigger and clock signal
- Device drivers for Windows®, VxWorks, LabViewRT, and Linux, with application code examples for MATLAB®, C/C++, Visual Basic, LabVIEW, and LabWindows/CVI

Acqiris High-Speed Digitizers

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 the signal conditioning, amplification, and interleaving functions essential to achieving high-speed data acquisition at 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 with 8-, 10-, and 12-bit resolution, wide bandwidths, and large acquisition memory. These products, in PCI, PXI, cPCI, and VME formats, are used in research, and in ATE and OEM applications in industries such as biotechnology, semiconductors, aerospace, physics, and astronomy.
High-Resolution High Sample Rate Signal Acquisition

Agilent Acqiris high-speed PXI digitizers (U1062A) significantly increase data acquisition and testing rates, achieving an impressive single-channel sampling rate of up to 4 GS/s. The sampling rate of these digitizers, in combination with an input bandwidth of up to 2 GHz, make them ideal for high-speed applications such as telecommunications, ATE, and semiconductor testing, where test time should be limited only by the speed limits of the device under test (DUT). These high-precision, high-speed digitizers become the optimized data conversion component in synthetic instrumentation systems, for the replacement of standard digital multimeters, oscilloscopes, power meters, and frequency counters in RF and microwave test systems.

The DC152, with up to 2 GHz of bandwidth, provides synchronous sampling of 2 GS/s on both input channels – in single-channel applications this doubles to 4 GS/s. The single-channel DC122 offers sampling rates of up to 4 GS/s. These digitizers are compliant with both the PXI and CompactPCI standards, and combine ultra-fast sampling and wide analog bandwidths with standard 512 ksample acquisition memories and optional 512 Msample acquisition memories.

Multiple Front-End Options

As with other Acqiris products, the entire front-end is mounted on a removable mezzanine card. In the event of accidental damage, or as relays fatigue over time, replacement is fast and efficient. The U1062A single- or dual-channel front-end mezzanines feature internal calibration and a choice of BNC or SMA connectors.

The 50 Ω input stage is fully protected against overvoltage signals. The programmable front-end electronics are used to provide a complete set of input voltage ranges, from 50 mV to 5 V full scale (in a 1, 2, 5 sequence) with variable voltage offset. With a bandwidth of 2 GHz, the digitizers provide optimized amplifier response. Flatness, overshoot, and accuracy are optimized to ensure precise high-frequency measurements.

The dual-channel switchable 50 Ω/1 MΩ input stage (for U1062A-002 only) offers the same input protection and programmable front-end electronics. With it features input voltage ranges, from 50 mV to 50 V full scale (in a 1, 2, 5 sequence) with variable voltage offset, and a bandwidth of 1.4 GHz into 50 Ω and > 300 MHz (typ.) into 1 MΩ.

<table>
<thead>
<tr>
<th>Front-end option</th>
<th>Impedance</th>
<th>Bandwidth</th>
<th>Full scale range</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>50 Ω (U1062A-F50 and U1062A-2F5)</strong></td>
<td>50 Ω</td>
<td>2 GHz</td>
<td>50 mV, 100 mV, 200 mV, 500 mV, 1 V, 2 V, and 5 V</td>
</tr>
<tr>
<td><strong>50 Ω / 1 MΩ</strong> (U1062-2FZ)</td>
<td>50 Ω</td>
<td>1.4 GHz</td>
<td>50 mV, 100 mV, 200 mV, 500 mV, 1 V, 2 V, and 5 V</td>
</tr>
<tr>
<td></td>
<td>1 MΩ</td>
<td>&gt;300 MHz (typ.)</td>
<td>50 mV, 100 mV, 200 mV, 500 mV, 1 V, 2 V, 5 V, 10 V, 20 V, and 50 V</td>
</tr>
</tbody>
</table>

2) Shared between input channels of the DC152.
Extended Functionality

Multi GHz bandwidth front-end
The front-end mezzanines include a proprietary front-end amplifier chip. This integrated circuit includes a programmable gain amplifier (PGA) with on-chip filtering and trigger circuitry. It provides pre-ADC signal conditioning and amplification, essential for high performance high-speed data conversion systems. The filter section, which is useful for signal noise reduction, allows 2-pole Bessel bandwidth limiting at 700 MHz and 200 MHz.

Trigger mezzanine with Ctrl I/O
The trigger mezzanine also includes the proprietary front-end amplifier chip. The trigger processing circuit embedded in the package includes
• Dual comparators for window triggering mode
• On-chip DACs for threshold adjustment
• Additional filters for LF and HF reject trigger coupling
• A prescaler to allow an HF divide-by-four mode

The trigger mezzanine has a standard 50 Ω terminated BNC or SMA connector and the Ctrl I/O connectors. These four front-panel MMCX connectors provide access for an external clock or 10 MHz reference signal, a trigger output, and two additional I/O digital control lines (I/O A and B) for monitoring or modifying the digitizer’s status and configuration or extracting a 10 MHz clock signal.

Auto-synchronous bus system
If more than two synchronous data acquisition channels are required, several digitizers can be combined using the second generation high-bandwidth auto-synchronous bus system (AS bus 2). The system provides superior synchronization to the standard 10-MHz PXI reference clock. AS bus 2 connects up to three U1062A modules.

PXI Compliance for Modular Instrumentation
The U1062A digitizer is PXI compliant. Designed to benefit from fast data interfaces, the products can be integrated with other test and automation modules in both PXI and CompactPCI chassis.

The PXI format offers high performance in a small, rugged package. It is an ideal deployment platform for many automated test systems. A wide array of complementary PXI products are currently available, including multimeters, waveform generators, and switch multiplexers.
Easy Software Integration
Agilent’s high-speed Acqiris digitizers are supplied with 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 set up 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.

Fast data throughput with large memory
The memory and acquisition controller component is a digital CMOS integrated circuit. A high-speed data demultiplexer with on-board memory it is designed for the capture of 10-bit digital data at speeds up to 2 GS/s. It includes large internal static RAM, high clock frequencies, and is able to accept and generate LVDS levels 3 for fast I/O signals. The two IC’s on the digitizer each allow storage of the input data stream to a self-addressed, 10-bit, 256 ksample internal memory. The digitizer has provision for a 512 Msample external memory expansion. This acquisition memory is divided between the active input channels.

Precise channel interleaving
The cross point switch chip is a matrix of analog multiplexers. It includes a calibration input, essential for the accurate timing calibration of several interleaved ADCs, and allows offset matching with four dedicated on-chip, 8-bit DACs. The interleaving of multiple ADCs is essential for high-speed data conversion systems. The process increases the effective sample rate in high-speed digitizer systems by acquiring the same signal on two or more ADCs in parallel and out of phase. These acquired signals are then reordered and recombined, by the memory and acquisition controller, to reconstruct the signal waveform.

Reference clock and synchronization
The integrated circuit that handles the ADC clock distribution circuit also includes trigger functions that facilitate high-performance triggering. The chip is used with the memory and acquisition controller for interleaving 2 high-speed ADCs to achieve unmatched high-speed data acquisition.

3) Low-voltage differential signal, with a range of 100 mV to 600 mV.
**Acqiris High-Speed PXI Digitizers**

**Model DC152**
Dual-channel, 10-bit, 2 GHz, 2-4 GS/s

**Model DC122**
Single-channel, 10-bit, up to 2 GHz, 4 GS/s

<table>
<thead>
<tr>
<th>Signal input 50 Ω (-2F5 and -F50 Front-end option)</th>
<th>High-impedance input: 50 Ω/1 MΩ (-2FZ front-end option)</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Channels</strong></td>
<td><strong>Channels</strong></td>
</tr>
<tr>
<td>U1062A-001: Single at 4 GS/s</td>
<td>U1062A-001: not supported</td>
</tr>
<tr>
<td>U1062A-002: Dual at 2 GS/s, Single at 4 GS/s</td>
<td>U1062A-002: Dual at 2 GS/s, Single at 4 GS/s</td>
</tr>
<tr>
<td><strong>Bandwidth (-3 dB)</strong></td>
<td><strong>Bandwidth (-3 dB)</strong></td>
</tr>
<tr>
<td>DC to 2 GHz</td>
<td>50 Ω: DC to 1400 MHz</td>
</tr>
<tr>
<td><strong>Full scale (FS)</strong></td>
<td>1 MΩ: DC to &gt;300 MHz (typ.)</td>
</tr>
<tr>
<td>50 mV to 5 V</td>
<td>50 Ω: 50 mV to 5 V</td>
</tr>
<tr>
<td><strong>Offset range</strong></td>
<td>1 MΩ: 50 mV to 50 V</td>
</tr>
<tr>
<td>± 2 V for 50 to 500 mV FS</td>
<td>50 Ω: ± 2 V for 50 to 500 mV FS</td>
</tr>
<tr>
<td>± 5 V for 1 to 5 V FS</td>
<td>1 MΩ: ± 2 V for 50 to 500 mV FS</td>
</tr>
<tr>
<td><strong>Bandwidth limit filters</strong></td>
<td>1 MΩ: ± 2 V for 1 to 5 V FS</td>
</tr>
<tr>
<td>700 MHz, 200 MHz and 20 MHz</td>
<td>1 MΩ: ± 20 V for 1 to 5 V FS</td>
</tr>
<tr>
<td><strong>Maximum input voltage</strong></td>
<td>1 MΩ: ± 200 V for 10 to 50 V FS</td>
</tr>
<tr>
<td>± 5 V DC</td>
<td></td>
</tr>
<tr>
<td><strong>Coupling</strong></td>
<td></td>
</tr>
<tr>
<td>DC, AC (32 Hz LF limit, 50 Ω)</td>
<td></td>
</tr>
<tr>
<td><strong>Impedance</strong></td>
<td></td>
</tr>
<tr>
<td>50 Ω ± 1% at DC</td>
<td></td>
</tr>
<tr>
<td><strong>Connectors</strong></td>
<td></td>
</tr>
<tr>
<td>BNC or SMA, gold plated</td>
<td></td>
</tr>
<tr>
<td><strong>SFDR (typ.)</strong></td>
<td></td>
</tr>
<tr>
<td>60 dB at 10.5 MHz</td>
<td></td>
</tr>
<tr>
<td>36 dB at 951 MHz</td>
<td></td>
</tr>
<tr>
<td><strong>SNR (Full BW, 2 GS/s)</strong></td>
<td></td>
</tr>
<tr>
<td>&gt; 32 dB at 50 mV FS</td>
<td></td>
</tr>
<tr>
<td>&gt; 36 dB at 100 mV FS</td>
<td></td>
</tr>
<tr>
<td>&gt; 38 dB at 1 V FS</td>
<td></td>
</tr>
<tr>
<td>&gt; 39 dB at 200 mV, 2 V, 5 V FS</td>
<td></td>
</tr>
<tr>
<td><strong>DC accuracy</strong></td>
<td></td>
</tr>
<tr>
<td>± 2.5% FS at 50 mV FS</td>
<td></td>
</tr>
<tr>
<td>± 2% FS at ≥ 100 mV FS</td>
<td></td>
</tr>
<tr>
<td><strong>Effective bits (at 2 GS/s)</strong></td>
<td></td>
</tr>
<tr>
<td>&gt; 6.8 at 10.7 MHz</td>
<td></td>
</tr>
<tr>
<td>&gt; 6.5 at 99.5 MHz</td>
<td></td>
</tr>
<tr>
<td>&gt; 6.3 at 407 MHz</td>
<td></td>
</tr>
<tr>
<td>&gt; 4.8 at 910 MHz, full BW (all sampling rates)</td>
<td></td>
</tr>
</tbody>
</table>

| Digital conversion                                  |                                                        |
| **Sample rate**                                     |                                                        |
| 10 MS/s to 2 GS/s in 1, 2, 2.5, 5 sequence and 4 GS/s |                                                        |
| **Resolution**                                      |                                                        |
| 10 bits (1:1024)                                    |                                                        |
| **Integral nonlinearity (typ.)**                    |                                                        |
| < ± 0.3% FS (typ.) at 1.8 MHz                       |                                                        |
| **Differential nonlinearity (typ.)**                |                                                        |
| < 2 LSB (typ.)                                     |                                                        |
| **Acquisition memory**                             |                                                        |
| DC152: 256 kSample/channel                          |                                                        |
| DC122: 512 kSample                                  |                                                        |
| **Maximum optional memory**                        |                                                        |
| DC152: 256 MSample/channel                          |                                                        |
| DC122: 512 MSample                                  |                                                        |

| Time base                                           |                                                        |
| **Clock accuracy**                                  |                                                        |
| Better than ± 2 ppm                                 |                                                        |
| **Sampling jitter**                                 |                                                        |
| 1.2 ps RMS (typ.) for 10 μs with internal clock and reference | |

| Acquisition modes                                   |                                                        |
| Single shot, Start-on-trigger, Sequence mode (1 to 1000 segments with standard memory, dead time 350 ns at 2 GS/s, 16,000 segments with memory -M64 option, 1.8 μs dead time at 2 GS/s, 125,000 segments with -512 memory option, 1.8 μs dead time at 2 GS/s) | |
| **Trigger time interpolator**                       |                                                        |
| 15 ps resolution                                   |                                                        |
**Internal and external trigger**

**Internal trigger input**

**Trigger frequency range**
DC to 1 GHz for positive, negative, window or pattern trigger,
DC to 2 GHz in HF mode
Threshold adjust range: FS of channel
Amplitude range: > 15% FS

**External trigger input**

**Impedance:** 50 Ω ± 1%
**Trigger frequency range:**
DC to 1 GHz for positive, negative, window or pattern trigger,
DC to 2 GHz in HF mode
**Full Scale:** 0.5, 1, 2, 5 V
**Threshold Adjust Range:** ± FS/2
**Maximum input voltage:** ± 5 V DC
**Amplitude range:** >15% FS

**Coupling**
DC, AC LF reject (50 Hz), HF reject (50 kHz)

**Modes**
Edge, positive and negative
HF: divide by 4
Spike Stretcher
Window In/Out
Pattern

**Pre-trigger**
Adjustable to 100% of horizontal full scale

**Post-trigger**
Adjustable up to 2^25 - 1 sample

**Control I/O**

**I/O A & B signals**
TTL and CMOS compatible (3.3 V)

**Ctrl I/O A & B input**
Trigger enable

**Ctrl I/O A & B output**
10 MHz reference clock
Acquisition skipping to next segment
Acquisition active
Trigger ready

**CLK IN input**
200 MHz to 2 GHz
> 500 mV pk-pk into 50 Ω
± 5 DC max voltage

**CLK IN ext. clock/ref threshold**
Variable between -3 V and +3 V

**CLK IN ext. reference frequency**
10 MHz ± 0.3 %

**TRG OUT output level**
Adjustable in range ± 2.5 V (no load)
Amplitude ±0.8 V (no load), ± 15 mA max

**TRG OUT rise/fall time**
2.5 ns into 50 Ω

**General**

**Host computer and operating system**
PC running Microsoft Windows 7,
Windows Vista, Windows XP,
Wind River VxWorks,
National Instruments LabVIEW RT,
or Linux.
The following 64 bits operating systems are also supported: XP64, Vista64, 7 64, Linux.
PowerPC systems running Wind River VxWorks.
For more information on which specific processors and operating system versions are supported, please contact us.

**Transfer speed**
High-speed PCI bus transfers data at sustained rates to host computer:
Up to 100 Mbytes/s for 32-bit/33 MHz operation

**Power consumption**
< 35 W without memory option
< 44 W with memory option

**Current requirements (max.)**
Without memory option:
+12 V  0.12 A
+5 V 4.0 A
+3.3 V  3.9 A
-12 V  0.015 A

With memory option:
+12 V  0.12 A
+5 V 4.0 A
+3.3 V  6.8 A
-12 V  0.015 A

Front-Panel LEDs indicate digitizer status
Green: ready for trigger
Yellow: module identification
Red: trigger

**Warranty**
1 year

**Environmental and physical**

**Operating temperature**
0° to 40°C

**Required airflow**
> 2 m/s in situ

**Relative humidity**
5 to 95% (non-condensing)

**Safety**
Complies with EN61010-1

**EMC immunity**
Complies with EN61326-1 Industrial Environment

**EMC emissions**
Complies with EN61326-1 Class A for radiated emissions

**Dimensions**
3U PXI/CompactPCI standard
100 mm x 160 mm x 20 mm

Front panel complies with IEEE1101.10 Certification and Compliance

4) U1062A all ADCs sampling at 2 GS/s.
## Model Descriptions

<table>
<thead>
<tr>
<th>Model</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>U1062A</td>
<td>Acqiris DC152 and DC122 high-speed 10-bit PXI digitizer</td>
</tr>
<tr>
<td>U1062A-001</td>
<td>Single-channel, 4 GS/s, 512 kSample, DC122</td>
</tr>
<tr>
<td>U1062A-002</td>
<td>Dual-channel, 2-4 GS/s, 256-512 kSample, DC152</td>
</tr>
<tr>
<td>U1062A-F50</td>
<td>Single channel 50 ohm, 2 GHz front-end</td>
</tr>
<tr>
<td>U1062A-2F5</td>
<td>Dual channel 50 ohm, 2 GHz front-end</td>
</tr>
<tr>
<td>U1062A-2FZ</td>
<td>Dual channel 50 ohm/1 Mohm, 1 GHz/300 MHz front-end</td>
</tr>
<tr>
<td>U1062A-512</td>
<td>512 MSample acquisition memory</td>
</tr>
<tr>
<td>U1062A-M64</td>
<td>64 MSample acquisition memory</td>
</tr>
</tbody>
</table>

## Accessories

<table>
<thead>
<tr>
<th>Model</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>U1093A-AS5</td>
<td>AS bus 2 connector</td>
</tr>
<tr>
<td>U1062A-UK6</td>
<td>Calibration Certificate and Cal Data</td>
</tr>
</tbody>
</table>

## Ordering Information

**Model**

- **U1062A**
  - Acqiris DC152 and DC122 high-speed 10-bit PXI digitizer
- **U1062A-001**
  - Single-channel, 4 GS/s, 512 kSample, DC122
- **U1062A-002**
  - Dual-channel, 2-4 GS/s, 256-512 kSample, DC152
- **U1062A-F50**
  - Single channel 50 ohm, 2 GHz front-end
- **U1062A-2F5**
  - Dual channel 50 ohm, 2 GHz front-end
- **U1062A-2FZ**
  - Dual channel 50 ohm/1 Mohm, 1 GHz/300 MHz front-end
- **U1062A-512**
  - 512 MSample acquisition memory
- **U1062A-M64**
  - 64 MSample acquisition memory

**Accessories**

- **U1093A-AS5**
  - AS bus 2 connector
- **U1062A-UK6**
  - Calibration Certificate and Cal Data

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**www.agilent.com**

For more information on Acqiris product line, sales or services, see our website at:

- [www.agilent.com/find/acqiris](http://www.agilent.com/find/acqiris)
- [www.agilent.com/find/u1062a](http://www.agilent.com/find/u1062a)

Product specifications and descriptions in this document subject to change without notice.

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**Contacts**

### Agilent Acqiris Product Information

**USA**

- (800) 829-4444

**Asia-Pacific**

- 61 3 9210 2890

**Europe**

- 41 (22) 884 32 90

### Additional Agilent Contact Information

#### Americas

- Canada: (877) 894-4414
- Latin America: 305 269 7500
- United States: (800) 829-4444

#### Asia Pacific

- Australia: 1 800 629 485
- China: 800 810 0189
- Hong Kong: 800 938 693
- India: 1 800 112 929
- Japan: 0120 (421) 345
- Korea: 080 769 0800
- Malaysia: 1 800 888 848
- Singapore: 1 800 375 8100
- Taiwan: 0800 047 866
- Thailand: 1 800 226 008

#### Europe and Middle East

- Austria: 43 (0) 1 380 277 1571
- Belgium: 32 (0) 2 404 93 40
- Denmark: 45 70 13 15 15
- Finland: 358 (0) 10 855 2100
- France: 0825 010 700*
  - *0.125 €/minute
- Germany: 49 (0) 7031 464 6333
- Ireland: 1890 924 204
- Israel: 972 3 9288-504/544
- Italy: 39 02 92 60 8484
- Netherlands: 31 (0) 20 547 2111
- Spain: 34 (91) 831 3300
- Sweden: 0200-88 22 55
- Switzerland: 0800 80 53 53
- United Kingdom: 44 (0) 118 9276201

**Other European Countries:**

www.agilent.com/find/contactus

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