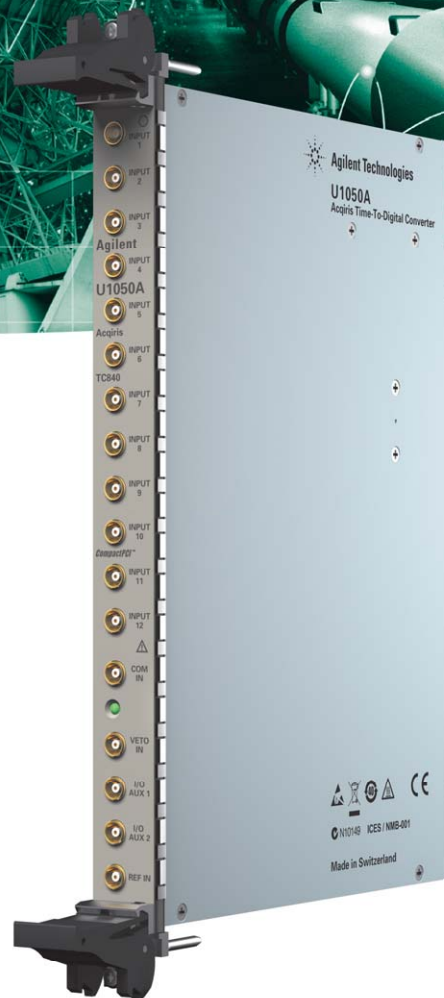




Agilent U1050A

Acqiris TC840 Time-to-Digital Converter

12 ch, 50 ps resolution





Main Features

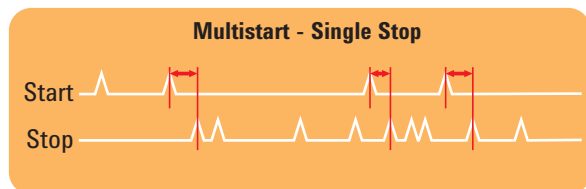
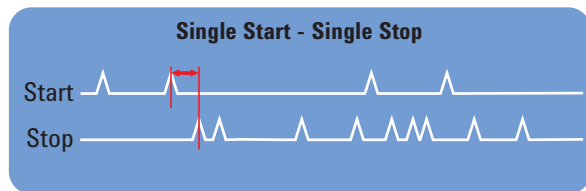
- 12 channel, single stop, time-to-digital converter (TDC) with single start and multistart acquisition modes
- 50 ps timing resolution
- Ideal for measurements in large scale experiments including particle accelerator timing, nuclear fusion studies and sub-critical/explosive testing
- Wide range with up to 20 s between first and last events
- Internal memory buffer, with up to 512 events per channel
- Low jitter (< 3 ps rms) high stability (± 2 ppm) internal clock source
- External 10 MHz reference input
- FPGA based data processing
- Fast DMA readout for increased data throughput
- Overvoltage-protected inputs, with 50 Ω K-lock connectors
- Built-in self calibration
- Low power consumption (< 25 W)

Multichannel High-Resolution Time Measurement

The Agilent Acqiris U1050A (TC840) time-to-digital converter (TDC) is designed specifically for use in large scale experiments including particle accelerator timing, nuclear fusion studies, and explosive testing. It is also well suited for use in commercial instrumentation including time-of-flight measurement in mass spectrometry and 3D geological mapping.

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 consists of a low phase noise PLL with very low jitter (< 3 ps rms) and 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 U1050A is a single- or multistart, single stop TDC. It has thirteen identical hardware channels, one common start channel and twelve independent stop channels. The timing information on the twelve independent channels is measured relative to the one common start channel.



On-Board Timing Calculation with Fast Data Readout

The timing information of the start and stop events on all channel inputs is obtained by combining a coarse-grain (5 ns), wide-range (32 bits) real-time count with a finer grain interpolated result coming from the analysis of a ramp signal started by the event.

Each channel consists of:

- A programmable comparator
- An XOR gate used to select the active slope
- A stable signal generator
- An analog-to-digital converter (ADC).

Once digitized, the data is fed to a Xilinx Virtex-2 Pro FPGA-based data processing unit for storage and readout. Data readout is achieved with fast direct memory access (DMA) at up to 100 MB/s.

Each channel is processed to determine the real time of each detected event, start and stop. The final relative time value is obtained by subtracting the start time from each stop time. The internal memory buffer on the card allows recording of up to 512 events per channel. An additional auxiliary input for a common veto signal can be used to enable/disable all start and stop detection, as desired.

Self Calibration

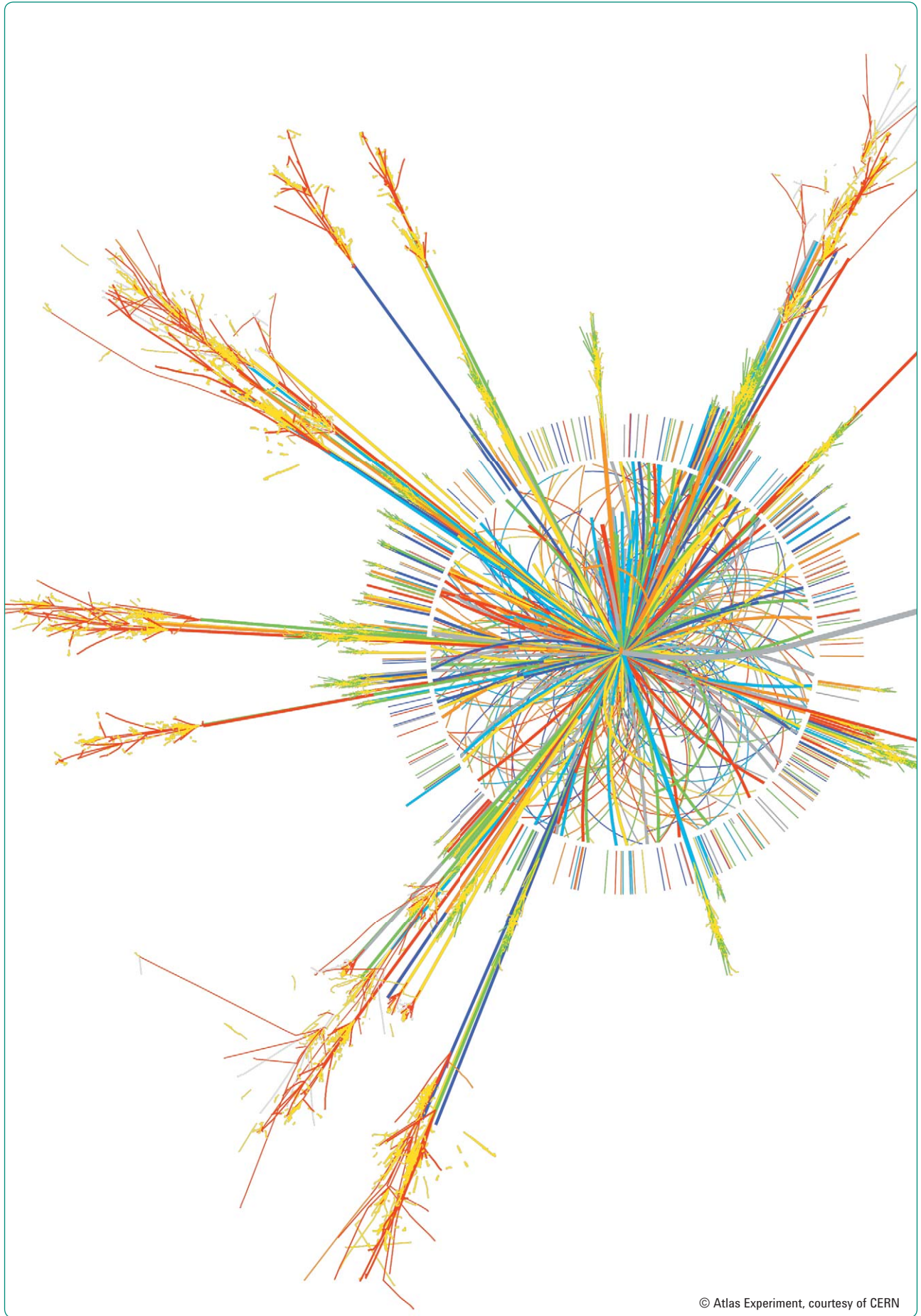
To achieve the desired precision on all the input channels, the U1050A time-to-digital converter has a powerful self calibration routine. This self calibration is done simply through a software command available in the driver, so no extra programming is needed.

Easy Integration

Agilent Acqiris time-to-digital converters are supplied with software drivers for Windows® and application code examples for MATLAB®, C/C++ and LabVIEW.

These code examples provide card set up and basic acquisition functionality, and are easily modified, so that the card can quickly be integrated into a measurement system.

The flexibility of the driver means that, with minimum software adjustments, any Agilent Acqiris TDC can be swapped out, replaced, and upgraded over time, with the latest Agilent Acqiris time-to-digital converter.



Wide Range, Single and Multistart, Time-to-Digital Converter

Model TC840, 12 channel, 50 ps resolution

Signal input

Connectors

50 Ω K-lock
Lemo 00.250
QLA 00
NIM/CAMAC Standard CD/N549

Impedance

50 Ω $\pm 1\%$

Threshold

Programmable from -1.5 V to +1.5 V, in 0.732 mV steps (12-bit)

Sensitivity

100 mV over threshold for 350 ps (minimum pulse to trigger)
Hysteresis 15 mV

Channels

One common start
Twelve inputs stop

Protection

Clamping diodes at ± 2.5 V,
0.5 W max into 50 Ω

Propagation delay skew

$\Delta t_{pd} = 15$ ps for 10 mV to 100 mV,
 $\Delta t_{pd} = 40$ ps for 100 mV to 2 V

VSWR (typical)

< 1.5 from DC to 1 GHz

VETO IN

50 Ω input with programmable threshold

REF IN

50 Ω input for external high-precision 10 MHz source
0 to 3 V pkpk
Threshold at 1.5 V

Time resolution and range

Time resolution

50 ps

Time range

Up to 20 s

Integral non-linearity

± 50 ps

Differential non-linearity

± 30 ps

Post-start dead time

10 ns

Clock accuracy

Better than ± 2 ppm

Clock jitter

< 3 ps rms

Internal reference frequency

10 MHz

Acquisition and readout

Acquisition modes

Single start – single stop
Multistart – single stop

Readout modes

DMA – 100 MB/s

General

Host computer and operating system

PC compatible (x86) systems running Microsoft Windows Vista, Windows XP, Windows 2003 Server, Windows 2000 or National Instruments LabVIEW RT.

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 (typical)

< 25 W

Current requirements (typical)

12 V	0.1 A
5 V	4.1 A
3.3 V	0.8 A
-12 V	0.05 A

Warranty

1 year

Front-panel LEDs indicate module status

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

6U CompactPCI standard (PXI compliant)
233 mm x 160 mm x 20 mm

Front panel complies with IEEE1101.10

CE Certification and Compliance



Contacts

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Sweden	0200-88 22 55
Switzerland	0800 80 53 53
United Kingdom	44 (0) 118 9276201
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Ordering Information

Model	Description
U1050A-001	Acqiris TC840 12-channel, high-resolution multistart, single stop time-to-digital converter
U1050A-UK6	Calibration certificate

Accessories

U1092A-CB7	BNC to Lemo, 1m cable
U1092A-CB8	BNC to Lemo, 2m cable
U1092A-CB9	Lemo to BNC adapter

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

www.agilent.com/find/acqiris

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