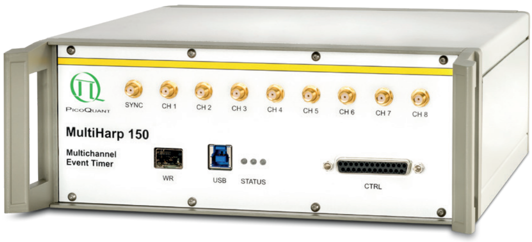
MultiHarp 150

High-Throughput Multichannel Event Timer & TCSPC Unit

- 4, 8, or 16 independent input channels
- one common sync channel (up to 1.2 GHz)
- High sustained data throughput (80 Mcps in time tagging mode, 180 Mcps in histogramming mode)
- 5 ps (P) or 80 ps (N) temporal resolution
- Ultra short dead time (650 ps) per channel, no dead time across channels
- Ref In / Ref Out / PPS In / White Rabbit interface for multi-device synchronization
- Marker inputs for external synchronization signals or other events
- USB 3.0 interface
- NEW Multifunctional on-board event filters for “P” versions

Applications

- Time-resolved fluorescence and luminescence spectroscopy
- Coincidence correlation, antibunching
- Quantum optics
- FLIM, FRET, FCS
- Multicolor lifetime imaging
- Time-of-Flight (ToF) measurements, LIDAR
- Single Molecule Spectroscopy (SMS)



The MultiHarp 150 is an easy-to-use, plug-and-play multi-channel event timer and Time-Correlated Single Photon Counting (TCSPC) device. Its outstanding features are an extremely fast signal processing along with an extraordinarily high sustained data throughput via USB 3.0 interface. The MultiHarp 150 is a compact, robust and reliable device whose high quality is reflected by our unique 5-year limited warranty.

Multiple input channels, outstanding flexibility

The MultiHarp 150 is available with either 4, 8, or 16 identical detection channels, which are synchronized but independent, and either 5 ps (“P”) or 80 ps (“N”) base resolution. Each model features also one common synchronization input. All channels including the sync input can be used as detector inputs, e.g. for coincidence correlation or coincidence counting. The MultiHarp 150 is also ideally suited for performing TCSPC with multiple detectors using forward start-stop operation. Here the common sync channel allows for synchronization with the excitation source.

Ultrashort dead time for high data throughput

The smartly designed timing electronics allows to fully exploit the count rate limits of time-correlated single photon counting, without having to compromise on the time resolution for many modern single photon detectors. The ultra short dead time of 650 ps allows detecting multiple photons per excitation cycle even at the highest repetition rates achievable by modern picosecond pulsed lasers (requires a detector from the PMA Hybrid Series).

Adjustable timing offsets for each input channel

Each input channel has internal adjustable timing offsets with ±100 ns range at 5 ps (P) or 80 ps (N). This simplifies the cabling requirements for experimental set-ups, as selecting cable lengths to compensate for signal delays is no longer needed.

Time-Tagged Time-Resolved modes

The Time-Tagged Time-Resolved (TTTR) modes supported by the MultiHarp 150 record all relevant time and channel routing information of each detected individual photon event. By storing this full data set, it becomes possible to carry out the most comprehensive and sophisticated analysis of photon dynamics after a measurement. A real time data correlator is included to monitor FCS experiments at count rates of up to 1000000 counts/sec. Furthermore, the MultiHarp 150 can be synchronized with other hardware such as scanners when operated in TTTR mode.

White Rabbit ready

White Rabbit is a fully deterministic, Ethernet-based timing network which provides sub-nanosecond accuracy and precise synchronization of devices over large distances. Thanks to its White Rabbit interface, the MultiHarp 150 is prepared to be used in networks that are based on this emerging technology.

Easy to use software included, custom programming supported

The MultiHarp 150 comes with a Windows software package that providing all important functions such as setting measurement parameters, displaying results, loading / saving of measurement parameters and measurement curves. Important measurement data, including count rate, count maximum, position and peak width are continuously displayed. A comprehensive online help system eases the user into fully employing the capabilities of the MultiHarp 150. A library for custom programming, e.g., with LabVIEW is also included. PicoQuant is committed to the support and development of this software and upgrades with extended functionality will be made available.

The MultiHarp 150 can be used in different operation modes:

Integration mode, oscilloscope mode, Time-Tagged Time-Resolved mode (listing each event arrival time), on-line („real-time“) correlator for FCS

Specifications

	MultiHarp 150 P	**MultiHarp 150 N**
Input Channels and Sync	constant level trigger on all inputs, software adjustable	constant level trigger on all inputs, software adjustable
Number of detector channels	4 (MultiHarp 150 4P), 8 (MultiHarp 150 8P), or 16 (MultiHarp 150 16P)	4 (MultiHarp 150 4N) or 8 (MultiHarp 150 8N)
Input voltage operating range (pulse peak into 50 Ohms)	- 1200 mV to 1200 mV	- 1200 mV to 1200 mV
Input voltage max. range (damage level)	± 2500 mV	± 2500 mV
Trigger edge	falling or rising edge, software adjustable	falling or rising edge, software adjustable
Trigger pulse width	> 0.4 ns (rise time max. 20 ns)	> 0.4 ns (rise time max. 20 ns)
Time to Digital Converters		
Time bin width (adjustable)	5 ps, 10 ps, 20 ps, […], 41943040 ps	80 ps, 160 ps, 320 ps, […], 335544320 ps
Timing precision*	< 35 ps rms	< 85 ps rms
Timing precision / √2*	< 25 ps rms	< 60 ps rms

Dead time	< 650 ps (can be increased via software up to 160 ns in steps of 1 ns)	< 650 ps (can be increased via software up to 160 ns in steps of 1 ns)
Adjustable programmable time offset for each input channel	± 100 ns, resolution 5 ps	± 100 ns, resolution 80 ps
Differential non-linearity	< 10 % peak, < 1 % rms (over full measurement range)	< 10 % peak, < 1 % rms (over full measurement range)
Maximum sync rate (periodic pulse train)	1.2 GHz	1.2 GHz
Histogrammer		
Count depth	32 bit (4 294 967 295 counts)	32 bit (4 294 967 295 counts)
Full scale time range	327 ns to 2.74 s	5.24 µs to 21.99 s
Maximum number of time bins	65 536	65 536
Peak count rate per input channel	1.5×10^9 counts/sec for 2 048 events	1.5×10^9 counts/sec for 2 048 events
Total sustained count rate, sum over all input channels**	166×10^6 counts/sec (4P and 8P) 332×10^6 counts/sec (16P)	180×10^6 counts/sec
TTTR Engine		
T2 mode resolution	5 ps	80 ps
T3 mode resolution	5 ps, 10 ps, 20 ps, […], 41 943 040 ps	80 ps, 160 ps, 320 ps, […], 335 544 320 ps
FiFo buffer depth (records)	134 217 728 events	134 217 728 events
Peak count rate per input channel	1.5×10^9 counts/sec for 2048 events	1.5×10^9 counts/sec for 2048 events
Sustained count rate per input channel**	78×10^6 counts/sec	78×10^6 counts/sec
Total sustained count rate, sum over all input channels**	80×10^6 counts/sec	80×10^6 counts/sec
Operation		
PC interface	USB 3.0	USB 3.0
PC requirements	Dual core CPU or better, min. 2 GHz CPU clock, min. 4 GB memory	Dual core CPU or better, min. 2 GHz CPU clock, min. 4 GB memory
Operating system	Windows 10/11	Windows 10/11
Power consumption	<50 W	<50 W
Operation environment	Indoor use only	Indoor use only
Operation altitude	Max. 2000 m above sea level	Max. 2000 m above sea level
Dimensions		
versions with 4 or 8 detector channels	incl. feet and handles 305 × 240 × 95 mm	incl. feet and handles 305 × 240 × 95 mm
versions with 16 detector channels	incl. feet and handles 305 × 350 × 95 mm	(not available)

* In order to determine the timing precision it is necessary to repeatedly measure a time difference and to calculate the standard deviation (rms error) of these measurements. This is done by splitting an electrical signal from a pulse generator and feeding the two signals each to a separate input channel. The differences of the measured pulse arrival times are calculated along with the corresponding standard deviation. This latter value is the rms jitter which we use to specify the timing precision. However, calculating such a time difference requires two time measurements. Therefore, following from error propagation laws, the single channel rms error is obtained by dividing the previously calculated standard deviation by sqrt(2). We also specify this single channel rms error here for comparison with other products.

** Sustained throughput depends on configuration and performance of host PC.

PicoQuant

PicoQuant GmbH
Rudower Chaussee 29 (IGZ)
12489 Berlin
Germany

Phone +49-(0)30-1208820-0
Telefax +49-(0)30-1208820-90
Email info@picoquant.com
Web www.picoquant.com

All Information given here is reliable to our best knowledge. However, no responsibility is assumed for possible inaccuracies or omissions. Specifications and external appearances are subject to change without notice. Trademarks or corporate names are used for explanation and identification, to the owner's benefit and without intent to infringe.

© PicoQuant GmbH, Januar 2024