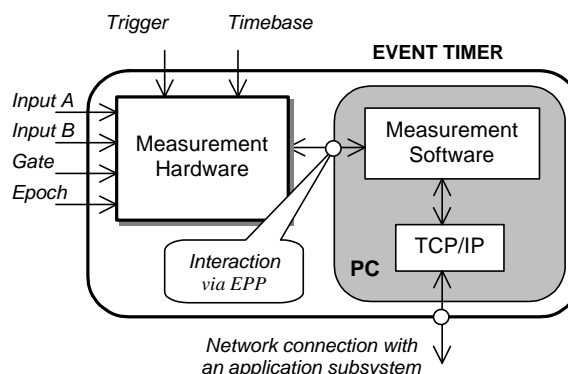


# Event Timer A031-ET

The Event Timer is a computer-based instrument that can be used for various applications (such as satellite laser ranging) where high-precise epoch time-tags or time interval measurements are especially needed.

The Event Timer presents a specific combination of hardware and software means that jointly provide a wide variety of timing measurements under external control from an application subsystem and transfers the current results of measurements to such subsystem for any particular application. Flexible and therewith simple control via standard network connection makes it possible to use the Event Timer with various (remote or local) application subsystems adapted to practical needs.



The Event Timer provides:

- Two inputs A and B for the events being measured
- Time-tag marking specifying the input (A or B) that provided the measured event
- Two modes of operation supporting either the event timing or time interval measurement:
  - *AT*-mode when the events can come at any input in arbitrary order;
  - *TI*-mode when a Start-event at the input A opens the input B over internal gate
- Arbitrary external gating
- Cyclical operation at KHz rates
- Measurement up to 6 550 events at rate up to 14.2 MHz in every operating cycle
- Separate input for *Epoch* supporting synchronization of the internal real-time clock
- Self-calibration and testing

The Event Timer offers high precision and flexibility of applications on the basis of a compact and inexpensive hardware that is available either as a single board or completed desktop device. As a result the Event Timer combined with user-made or custom-made application software can be used to create reasonably priced top-quality timing systems.

## Summary of Specifications

Inputs (50 Ω):	<i>Input A</i> <i>Input B</i> <i>Gate</i> <i>Epoch</i> <i>Trigger</i> <i>Ext. Timebase</i>	NIM pulse (falling edge) NIM pulse (falling edge) NIM pulse (high level) TTL pulse (rising edge, 1 pps) TTL pulse (rising edge) 10 MHz (>0.5 V p-p)
Single-shot RMS resolution (Jitter)	<15 ps (11-13 ps typical)	
Non-linearity error	<±1 ps	
Dead time	70 ns	
Buffer memory size	6 550 time-tags before reading by the local PC	
Triggering	external or internal after readiness to the next cycle	
Measurement rate	up to 1 KHz (with PC Pentium IV)	
Software	MS-Windows® based	
Interface	PC Ethernet port supporting TCP/IP protocol	
Hardware connection to PC	via PC parallel port supporting EPP mode	
Hardware dimension	220x233x25 mm (single board); 375x60x233 mm (desktop)	
Power supply	+5V/0.5A; +12V/0.6A; -12V/70 A (single board); 100-240 VAC (desktop)	

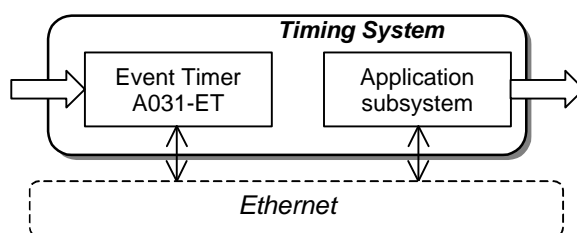
## Application notes

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### About A031-ET based Timing Systems

The Event Timer A031-ET combines high precision and small dead time, making it well applicable for single-channel timing systems where all events are being measured by the same means. This provides the best temporal and temperature stability of time interval measurement between any two events. Basically the Event Timer is designed to meet different special requirements of applications related to Satellite Laser Ranging (SLR).

Any required timing system is the Event Timer combined with a particular kind of software-based application subsystem. These two parts of the system can interact either locally (by using one stand-alone computer under MS-Windows®) or remotely (by using two computers) via Ethernet network on the basis of "Server-Client" scheme. In the case of remote interaction the application software can be



matched with any operating system (Unix, Linux, etc.) supporting the TCP/IP protocol.

While some examples of similar timing systems are available, basically the application software should be either user-made or custom-made to satisfy the required particular application. The Event Timer includes detailed protocol of interactions with an application subsystem to be made.

### A031-ET operation

The Event Timer measures the events cyclically, up to 6,550 events in every cycle. Cycle duration involves a preliminary specified time period of measurement and a time period of data transferring from the measurement hardware to the local PC. At the same time this PC can transfer the currently accumulated epoch time-tags to the application subsystem on its request at any instant.

The measurement can be performed in either of two operating modes, each being adapted to the most popular mode of SLR:

1. The *AT*-mode is well suitable to measure the overlapped time intervals between Start and Stop events that come continuously at the separate inputs (A and B) of the Event Timer. Since every time-tag contains the input mark, this makes it possible to measure time intervals that are much greater than the period of Start-event repetition and conform to the specified limits.

2. The *TI*-mode provides more traditional cyclical measurement of the time intervals between a single Start-event at the input A and multiple Stop-events at the input B over internal gate. Such measurement considerably surpasses the possibilities of the traditional time interval counters in functionality and precision.

### Additional note

Basically the Event Timer A031-ET is being delivered as a custom-made product and certain user-defined modifications of the timer's functions are possible.

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