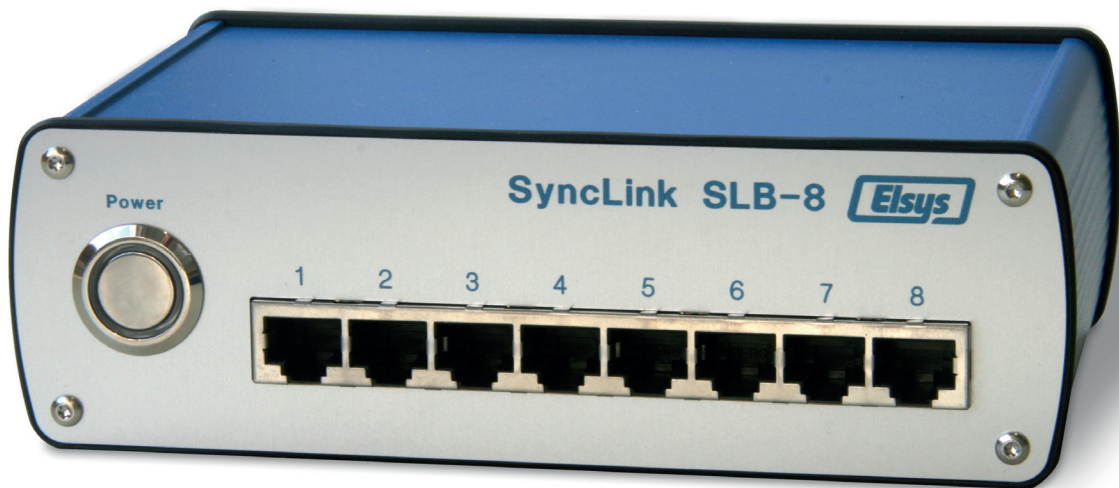


Data Acquisition Synchronization

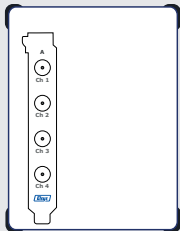
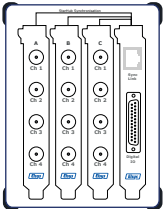
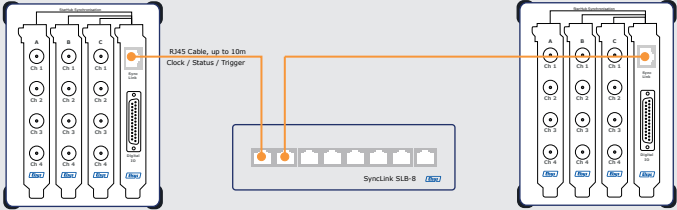
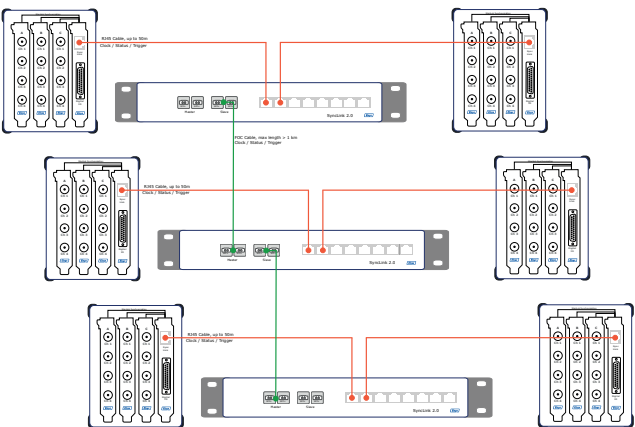


One of the strength of Elsys Data Acquisition Solution is its **Scalability**. A simple device may start with a 4-channel data acquisition card and may be expanded up to a multi-location, high channel count setup with more than 1000 inputs.

Regardless of the size of the system, the Elsys synchronization technology provides sample precision time information and trigger distribution.

Overview

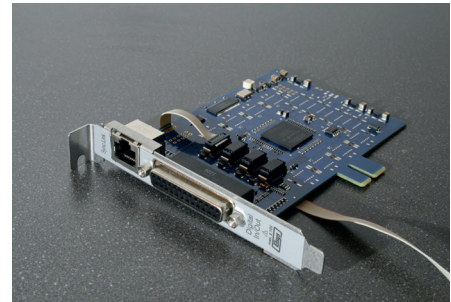
The following table shows the different level of synchronization which are possible with all Elsys data acquisition products.

Level	Setup	Description
0		<p>Single card configuration (TPCX or TPCE)</p> <ul style="list-style-type: none"> • 4 or 8 channels
1		<p>Multi-Card setup in a single device with StarHub synchronisation board.</p> <ul style="list-style-type: none"> • up to 64 channels • sync. precision < 1 ns • Interface to SynLink
2		<p>Multi-Device setup with SynLink SLB-8 synchronization device.</p> <ul style="list-style-type: none"> • up to 1024 channels • sync. precision: 12.5 ns • cable length up to 10 m • RJ45 Cat. 6 Cable • star topology
3		<p>Multi-Device setup with SynLink 2.0 synchronisation device</p> <ul style="list-style-type: none"> • up to 1024 channels • sync. precision: 12.5 ns • cable length between DAQ and SynLink: 50 m • FOC cable connection between multiple SynLink devices • daisy chain topology

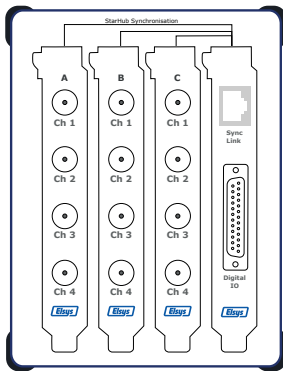
Inter-Device Synchronization

All data acquisition cards from the TPCX and TPCE family can be synchronized by using a StarHub synchronization board. The StarHub acts as master clock reference and trigger distributor. Even when the device is build up from several boards, it behaves like one multichannel system. The synchronization precision is lower than 1 ns. This allows to make precise time measurements over different board inputs even at the fastest sampling rate of 240 MS/s.

Trigger on all Channels: All trigger events from any channel in the system gets synchronized through the StarHub and allows that all channels in the device can be the trigger source and this without additional delays or uncertainties.



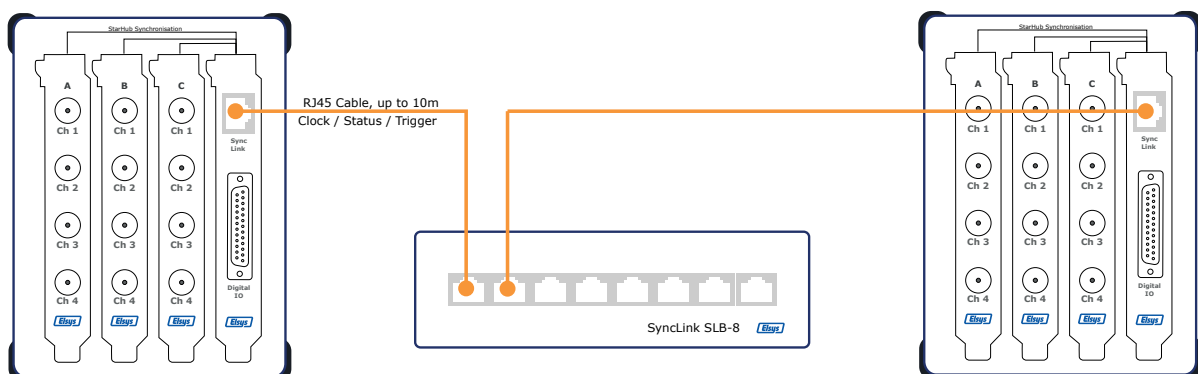
StarHub Synchronization Board



Multi-Device Synchronization

The SyncLink SLB-8 allows to expand the measurement setup up to 8 (optional up to 16) devices. The maximum cable length is limited to 10 meters between the DAQ device and the SyncLink which is sufficient in most indoor and lab applications.

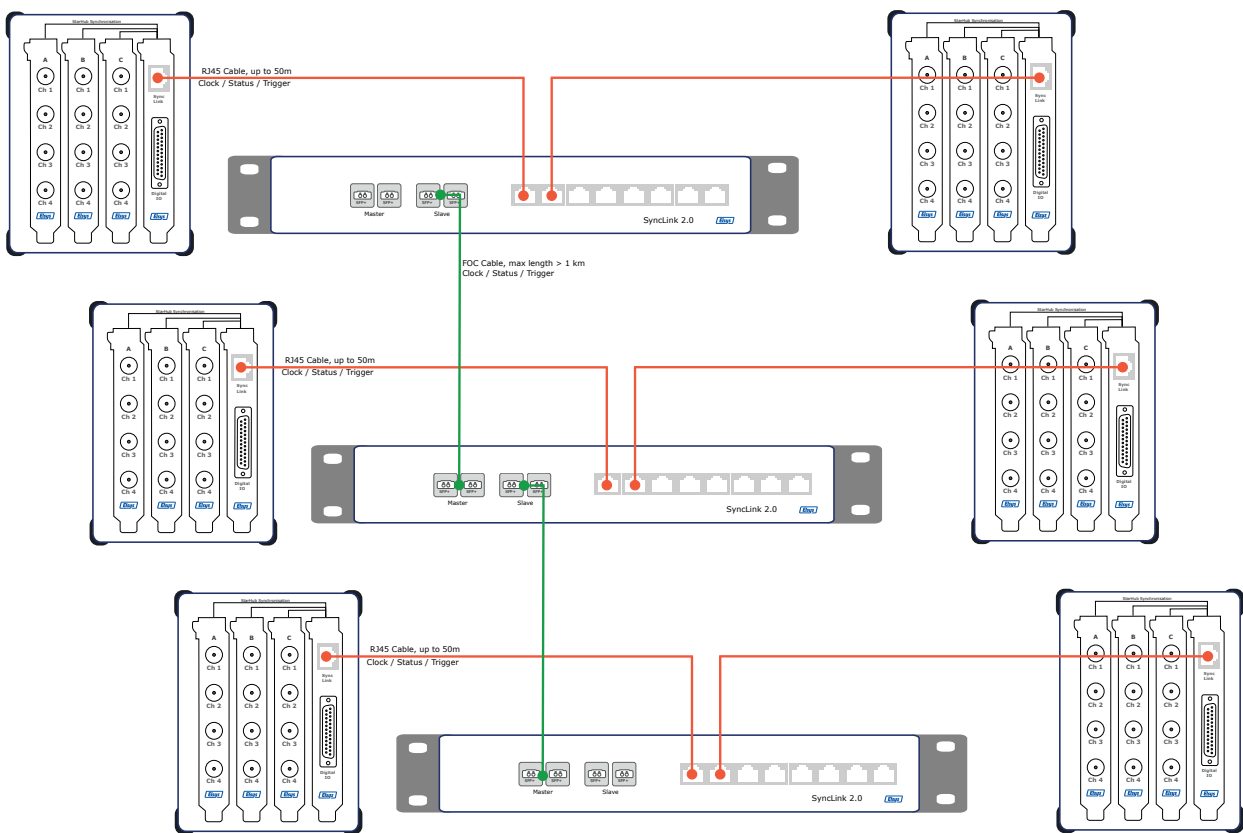
The synchronization precision is 12.5 ns and is much better than normally achieved with other synchronization methods like GPS or PTP.



Distributed Multi-Device Synchronization

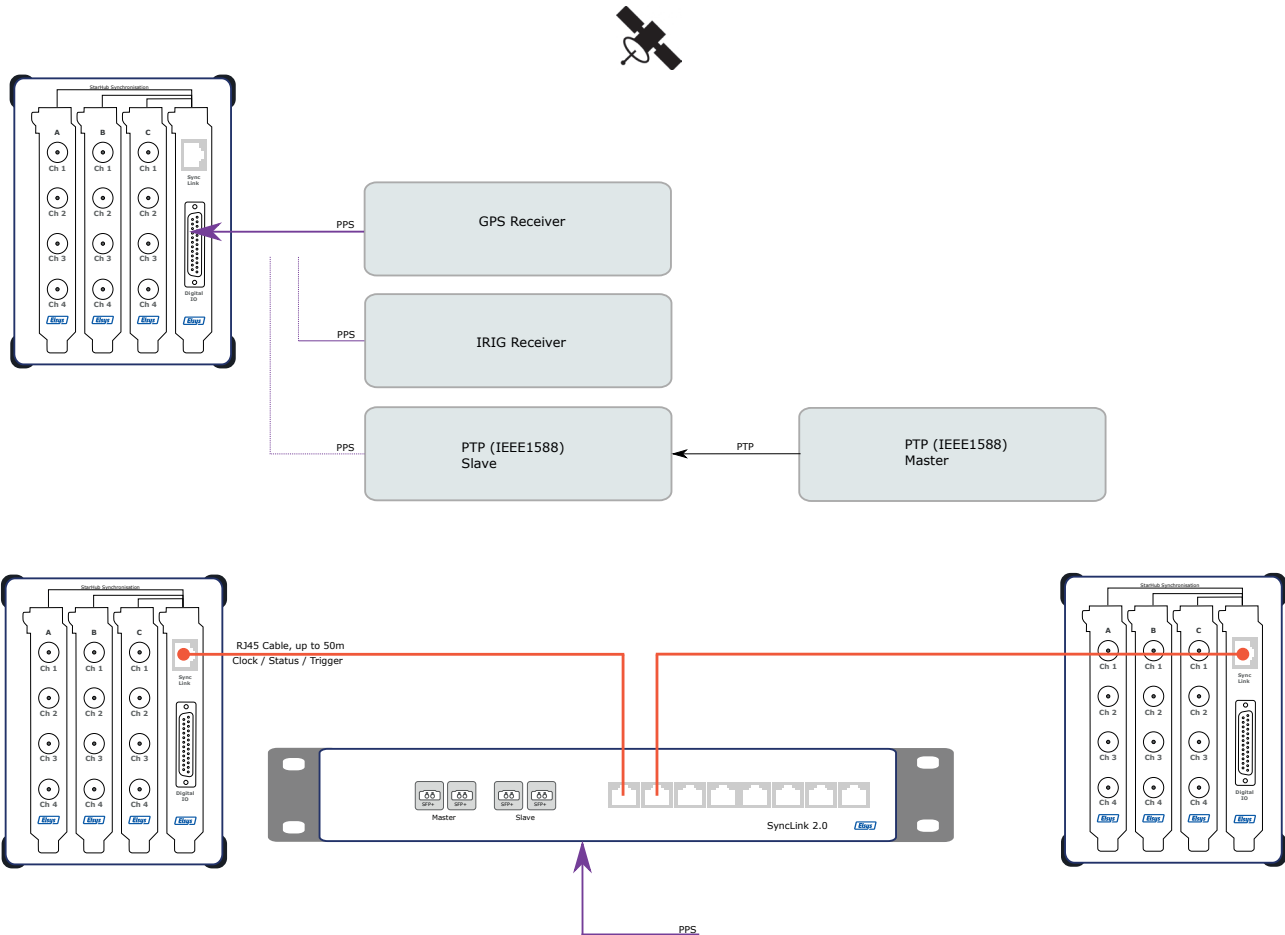
The SyncLink 2.0 is the highest level of synchronization and allows to daisy-chain several SyncLink units together. The connection between them is established over fiber optical cables (FOC) allowing much larger distances between the DAQs than possible with the SyncLink SLB-8. The connection between the DAQ and the SyncLink 2.0 is still based on RJ45 CAT. 6 cables but its maximum length is expanded to 50 m while it is only 10 m for the SLB-8.

A main advantage beside the high synchronization precision of 12.5 ns is the possibility to transmit also trigger message to all connected devices in sub-microsecond delays. This makes this solution most suitable for measurement where a trigger condition is not available on all location.



External Synchronization

Elsys provides several possibilities to synchronize to or from other 3rd part measurement systems. Basically any synchronization technology which is capable of delivering a synchronized Pulse per Second (pps) signal can be used as master clock. The PPS signal must either connected to the StarHub PPS input or to the SyncLink 2.0 PPS input.



Synchronization Precision Overview

Protocol	Synchronization Device	Precision
Elsys specific	StarHub	< 1 ns
Elsys specific	SyncLink SLB-8	12.5 ns
Elsys specific	SyncLink 2.0	12.5 ns
GPS	StarHub / SyncLink 2.0	± 1 us
IEEE 1588 (PTP) (Software) (Hardware)	StarHub / SyncLink 2.0	100 us – 100 ms ± 1 us

Elsys AG

Elsys AG
Mellingerstrasse 12
CH-5443 Niederrohrdorf
Switzerland

Telefon: +41 56 496 01 55
Email: info@elsys.ch
www.elsys-instruments.com