



HIRSCHMANN

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Technical Bulletin

TB1001HE

Precision Time Protocol

The Precision Time Protocol (PTP) according to IEEE Standard 1588 makes extremely precise clock synchronization possible in the sub-microsecond area over Ethernet networks and thereby opens up completely new potential applications in industrial networks.



Fully synchronized using PTP solutions from Hirschmann™

Time synchronization with the Precision Time Protocol

Precise time information is especially important for decentralized systems. Using the Precision Time Protocol (PTP) specified in IEEE 1588, it is possible for the first time to synchronize clocks that are distributed over Ethernet networks within an accuracy of less than one microsecond.

PTP is always in demand in automation technology when procedures require precise synchronization. The field of Motion Control is an important area of application.

PTP helps to synchronize drives inside a robot, for example, or a printing press, a packaging or paper processing machine. Cooperating robots are linked to each other through extremely precise clocks, or entire parts for machines or installations are closely connected over PTP so that the on-going processes are coordinated exactly with each other chronologically. Clocks running synchronously in each component make it possible to create decentralized structures and decouple completion of the processes from the communication and processing of control commands.

Many companies outside the field of automation technology are also working on the evaluation and implementation of PTP. In all cases where readings have to be collected and correlated, PTP is a much sought-after solution. Hirschman is one of the pioneers in the field of clock synchronization over Ethernet. With the world's first IEEE 1588 compliant Boundary Clock Switch, Hirschmann™ has been a part of many projects since 2004. Products that comply with the new and expanded IEEE Standard 1588-2008, which include support for the PTP Transparent Clock Function for Fast Ethernet and Gigabit Ethernet are also available immediately.

You can learn more about reliable PTP solutions from Hirschmann™ at

www.hirschmann.com.



Perfectly synchronized: MICE media modules with PTP ensure that the time in the end devices is precise

The PTP technology integrated into the MICE modules provides maximum chronological accuracy, optimum synchronization and greater efficiency.

The MICE product family

The MICE Switches, designed for installation on DIN rails, support both Fast and Gigabit Ethernet as well as various routing, redundancy and security functionality. This makes them particularly suitable for use in industrial networks with complex applications, such as combined transmission of video, audio and data information.

- Very high operating reliability
- Very high network availability
- Fast installation
- User-friendly startup
- Universal remote diagnosis
- Convenient management
- Connections configured to meet requirements

MICE PTP media modules

Starting with firmware release 5.0, the new MM23 and MM33 MICE media modules from Hirschmann™ support the new, improved PTPv2 Standard which will become increasingly prevalent over the next few years. In addition, the MICE Switches currently offer the most comprehensive PTIP functionalities on the market. By the end of 2009, PTP technology will also be available in Hirschmann's MACH1000 devices.

Key Features

- Operation as PTP Boundary Clock (BC) or Transparent Clock (TC)
- Fully compliant with IEEE Standard 1588-2002 (PTPv1) as well as with IEEE Standard 1588-2008 (PTPv2)
- Time stamping at the Ethernet or IP level (IPv4)
- One-step and two-step operating modes
- TC operation optionally in End-to-End (E2E) or Peer-to-Peer (P2P) mode
- Best Master Clock algorithm
- Supports IEEE 1588 management function
- Synchronization accuracy within the sub-microsecond range (typically 30-50ns!)
- Asymmetry correction
- Extensive configuration options
- Interoperability with SNTP
- Extremely short synchronization time following start of operation



Module variants

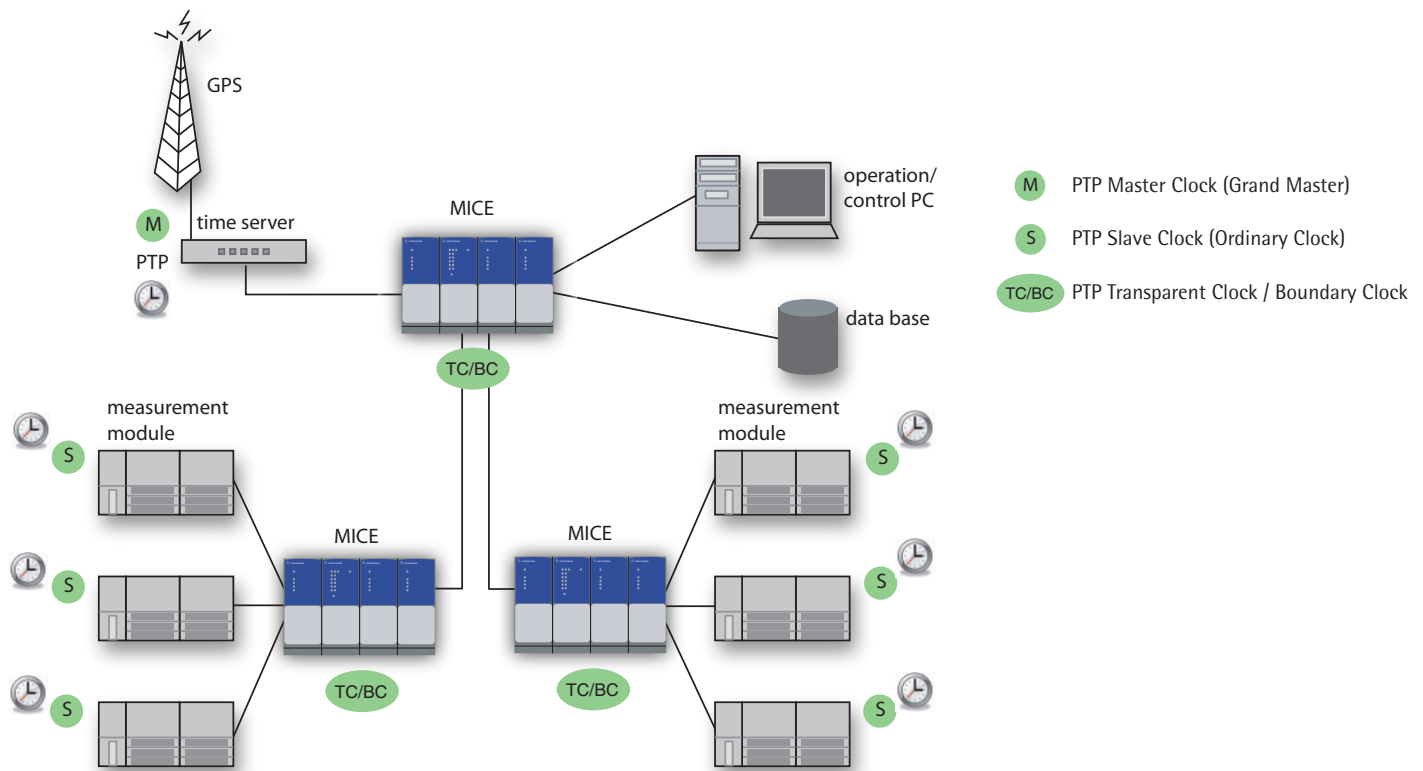
Fast Ethernet PTP Module	10/100BaseTX Ports	100BaseFX MMF Ports	100BaseFX SMF Ports	10BaseFL Ports
MM23-T1T1T1T1SAHH	4	-	-	-
MM23-M2M2T1T1SAHH	2	2	-	-
MM23-S2S2T1T1SAHH	2	-	2	-
MM23-F4F4T1T1SAHH	2	-	-	2

Gigabit Ethernet Module	Combo Ports
MM33-07079999SAHH	2

(A Combo Port supports either 10/100/1000BaseT TP or Gigabit Ethernet Fiber Optic Connection)



The applications of PTP at a glance:



Highly versatile potential PTP applications:

In energy distribution plants, parameters such as currents and voltages are measured with decentralized sensors, then linked and analyzed at a central location. Turbine controls use the PTP protocol in order to establish even more efficient installations. For process monitoring, decently recorded events are marked with precise time stamps and transmitted to the control center for logging and/or analysis.

In measurement engineering, PTP is used to correlate decently recorded physical variables, for example, in high-frequency measurement engineering. Geoscientists use PTP to synchronize seismic measuring devices over long distances in order to locate earthquake hypocenters exactly. In telecommunications, networks are synchronized over PTP, or cellular phone base stations are provided with precise clock pulses.

Furthermore, other important potential uses of PTP can be found in areas such as safety technology, automotive engineering or in military applications.

Further examples of applications:

- Industrial automation technology
- Motion Control
- Robotics
- Measurement and testing technology
- LXI (LAN eXtension for Instrumentation)
- Communications technology for the energy distribution networks
- Decentralized data acquisition
- Test benches
- Physical measurement engineering
- Wireless networks
- Telecom networks
- And many more...



PTP Technology support from Hirschmann™



Meinberg SyncBox/PTP



Meinberg LANTIME M600/GPS/PTP



ZHW/InES PCI Ethernet Card

Hirschmann™ has been working intensively with the Institute for Embedded Systems at the Zurich University of Applied Sciences (ZHAW) in Winterthur for several years. As part of this cooperation, ZHAW offers support in implementing PTP Ordinary Clocks to interested users. This includes software stacks and VHDL designs based on the technology developed by Hirschmann™, as well as additional services such as evaluation kits, training and design support. More detailed information can be found at <http://ines.zhaw.ch>.

In cooperation with Meinberg Funkuhren and ZHAW, Hirschmann™ has prepared a PTP Starter Kit that supports manufacturers who are getting started in the new world of high-precision synchronization over Ethernet networks. This Starter Kit contains everything that is needed for your tests and experiments to discover the potential uses of PTP for individual requirements.

It is available in different versions and consists of a GPS-synchronized Master Clock from Meinberg, a PCI card as PTP Slave from ZHAW, as well as the MICE PTP Switch from Hirschmann™. More detailed information can be found at www.hirschmann.de or www.meinberg.de.

The complete range of Belden solutions

Using this innovative technology, Hirschmann™ can satisfy extensive customer and market requirements and also underscore its role as a pioneer. Hirschmann™ thereby demonstrates its competence in providing solutions and rounds out the comprehensive Belden portfolio of products and solutions in the PTP field.

In conjunction with Belden Europe and Lumberg Automation, we are your leading source of complete solutions in these areas:

- Industrial Networking
- Industrial Connecting Solutions
- Wire and Cable Systems



We would be happy to provide you with information about our extensive offerings for your industry and about Belden® EMEA's world-wide service. You can obtain additional information and technical details at www.hirschmann.com. Or speak directly to our sales consultants at: +49 (0) 7127 /14-1809.

