The Synchronization Experts.

SETUP GUIDE

IMS-PSX210

Hot-Plug Module

Meinberg Funkuhren GmbH & Co. KG

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1 Imprint and Legal Information

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Document Publication Information

Manual Version:	1.2
Revision Date:	March 6, 2025
PDF Export Date:	April 29, 2025

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3 Change Log

Version	Date	Revision Notes
1.0	2023-11-08	Initial version
1.1	2024-06-24	- German translation - NTP hardware responder support - Added copyright notice - Added information on presentation conventions - Various other corrections
1.2	2025-03-06	- New imprint & legal information (→ Chapter 1) - Updated introduction (→ Chapter 7) - Added information on differences between new and legacy versions of IMS-PSX210 (→ Chapter 8) - Complete overhaul of information on module connectors and indicators (→ Chapter 8) - Updated references to IEEE 1588g-2022 to reflect its adoption since previous manual revision () - Updated status LED chapter (→ Chapter 8.1) - Updated SMA output chapter (→ Chapter 8.2) - Adopt standardized system for internal and external document links - New "NTP" tab chapter (→ Chapter 11.4) - New screenshots (→ Chapter 11)

4 Presentation Conventions in this Manual

4.1 Conventions for the Presentation of Critical Safety Warnings

Warnings are indicated with the following warning boxes, using the following signal words, colors, and symbols:

Caution!

This signal word indicates a hazard with a **low risk level**. Such a notice refers to a procedure or other action that may result in **minor injury** if not observed or if improperly performed.

Warning!

This signal word indicates a hazard with a **medium risk level**. Such a notice refers to a procedure or other action that may result in **serious injury** or even **death** if not observed or if improperly performed.

Danger!

This signal word indicates a hazard with a **high risk level**. Such a notice refers to a procedure or other action that will very likely result in **serious injury** or even **death** if not observed or if improperly performed.

4.2 Secondary Symbols Used in Safety Warnings

Some warning boxes may feature a secondary symbol that emphasizes the defining nature of a hazard or risk.

The presence of an “electrical hazard” symbol is indicative of a risk of electric shock or lightning strike.

The presence of a “fall hazard” symbol is indicative of a risk of falling when performing work at height.

This “laser hazard” symbol is indicative of a risk relating to laser radiation.

4.3 Conventions for the Presentation of Other Important Information

Beyond the above safety-related warning boxes, the following warning and information boxes are also used to indicate risks of product damage, data loss, and information security breaches, and also to provide general information for the sake of clarity, convenience, and optimum operation:

Important!

Warnings of risks of product damage, data loss, and also information security risks are indicated with this type of warning box.

Information:

Additional information that may be relevant for improving efficiency or avoiding confusion or misunderstandings is provided in this form.

4.4 Generally Applicable Symbols

The following symbols and pictograms are also used in a broader context in this manual and on the product.

The presence of the “ESD” symbol is indicative of a risk of product damage caused by electrostatic discharge.

Direct Current (DC) *(symbol definition IEC 60417-5031)*

Alternating Current (AC) *(symbol definition IEC 60417-5032)*

Grounding Terminal *(symbol definition IEC 60417-5017)*

Protective Earth Connection *(symbol definition IEC 60417-5019)*

Disconnect All Power Connectors *(symbol definition IEC 60417-6172)*

5 Important Safety Information

The safety information provided in this chapter as well as specific safety warnings provided at relevant points in this manual must be observed during every installation and operation procedure of the device, as well as its removal from service.

Any safety information affixed to the product itself must also be observed.

Any failure to observe this safety information, these safety warnings, and other safety-critical operating instructions in the product documentation, or any other improper usage of the product may result in unpredictable behavior from the product, and may result in injury or death.

Depending on your specific device configuration and installed options, some safety information may not be applicable to your device.

Meinberg accepts no responsibility for injury or death arising from a failure to observe the safety information, warnings, and safety-critical instructions provided in the product documentation.

It is the responsibility of the operator to ensure that the product is safely and properly used.

Should you require additional assistance or advice on safety-related matters for your product, Meinberg's Technical Support team will be happy to assist you at any time. Simply send a mail to techsupport@meinberg.de.

5.1 Appropriate Usage

The device must only be used appropriately in accordance with the specifications of the product documentation! Appropriate usage is defined exclusively by this manual as well as any other relevant documentation provided directly by Meinberg.

Appropriate usage includes in particular compliance with specified limits! The device's operating parameters must never exceed or fall below these limits!

5.2 Product Documentation

The information in this manual is intended for readers with an appropriate degree of safety awareness.

The following are deemed to possess such an appropriate degree of safety awareness:

- **skilled personnel** with a familiarity with relevant national safety standards and regulations,
- **instructed personnel** having received suitable instruction from skilled personnel on relevant national safety standards and regulations.

Read the product manual carefully and completely before you set the product up for use.

If any of the safety information in the product documentation is unclear for you, do **not** continue with the set-up or operation of the device!

Safety standards and regulations change on a regular basis and Meinberg updates the corresponding safety information and warnings to reflect these changes. It is therefore recommended to regularly visit the Meinberg website at https://www.meinbergglobal.com or the Meinberg Customer Portal at https://meinberg.support to download up-to-date manuals.

Please keep all product documentation, including this manual, in a safe place in a digital or printed format to ensure that it is always easily accessible.

Meinberg's Technical Support team is also always available at techsupport@meinberg.de if you require additional assistance or advice on safety aspects of your Meinberg product.

5.3 Safety during Installation

This rack-mounted device has been designed and tested in accordance with the requirements of the standard IEC 62368-1 (*Audio/Video, Information and Communication Technology Equipment—Part 1: Safety Requirements*). Where the rack-mounted device is to be installed in a larger unit (such as an electrical enclosure), additional requirements in the IEC 62368-1 standard may apply that must be observed and complied with. General requirements regarding the safety of electrical equipment (such as IEC, VDE, DIN, ANSI) and applicable national standards must be observed in particular.

The device has been developed for use in industrial or commercial environments and may only be used in such environments. In environments at risk of high environmental conductivity ("high pollution degree" according to IEC 60664-1), additional measures such as installation of the device in an air-conditioned electrical enclosure may be necessary.

If the appliance has been brought into the usage area from a cold environment, condensation may develop; in this case, wait until the appliance has adjusted to the temperature and is completely dry before setting it up.

When unpacking & setting up the equipment, and before operating it, be sure to read the information on installing the hardware and the specifications of the device. These include in particular dimensions, electrical characteristics, and necessary environmental conditions.

Fire safety standards must be upheld with the device in its installed state—never block or obstruct ventilation openings and/or the intakes or openings of active cooling solutions.

The device with the highest mass should be installed at the lowest position in the rack in order to position the center of gravity of the rack as a whole as low as possible and minimize the risk of the rack tipping over. Further devices should be installed from the bottom, working your way up.

The device must be protected against mechanical & physical stresses such as vibration or shock.

Never drill holes into the device to mount it! If you are experiencing difficulties with rack installation, contact Meinberg's Technical Support team for assistance!

Inspect the device housing before installation. The device housing must be free of any damage when it is installed.

5.4 Electrical Safety

This Meinberg product is operated at a hazardous voltage.

This system may only be set up and connected by skilled personnel, or by instructed personnel who have received appropriate technical & safety training from skilled personnel.

Custom cables may only be assembled by a qualified electrician.

This Meinberg product uses hot-pluggable power supply modules that can be replaced while the system is in operation. When removing a hot-pluggable power supply module, the power cable plug must **always** be disconnected beforehand!

Never work on cables carrying a live current!

Never use cables or connectors that are visibly damaged or known to be defective! Faulty, defective, or improperly connected shielding, connectors, or cables present a risk of injury or death due to electric shock and may also constitute a fire hazard!

Before operating the device, check that all cables are in good order. Ensure in particular that the cables are undamaged (for example, kinks), that they are not wound too tightly around corners, and that no objects are placed on the cables.

Cables must be laid in such a way that they do not present a tripping hazard.

The power supply should be connected using a short, low-inductance cable. Avoid the use of power strips or extension cables if possible. If the use of such a device is unavoidable, ensure that it is expressly rated for the rated currents of all connected devices.

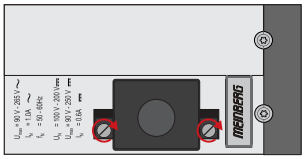
Never connect or disconnect power, data, or signal cables during a thunderstorm! Doing so presents a risk of injury or death, as cables and connectors may conduct very high voltages in the event of a lightning strike!

Device cables must be connected or disconnected in the order specified in the user documentation for the device. Connect all cables only while the device is de-energized before you connect the power supply.

Always pull cable connectors out at **both** ends before performing work on connectors! Improperly connecting or disconnecting this Meinberg system may result in electric shock, possibly resulting in injury or death!

When pulling out a connector, **never** pull on the cable itself! Pulling on the cable may cause the plug to become detached from the connector or cause damage to the connector itself. This presents a risk of direct contact with energized components.

5-Pin MSTB Connector



3-Pin MSTB Connector

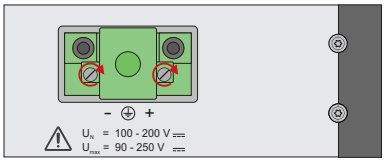


Illustration: Lock screws on an MSTB plug connector; in this case on a LANTIME M320

Ensure that all plug connections are secure. In particular, when using plug connectors with lock screws, ensure that the lock screws are securely tightened. This is especially important for power supply connectors where 3-pin or 5-pin MSTB connectors with lock screws are used (see illustration).

Before the device is connected to the power supply, the device housing must be grounded by connecting a grounding cable to the grounding terminal of the device.

When installing the device in an electrical enclosure, it must be ensured that adequate clearance is provided, minimum creepage distances to adjacent conductors are maintained, and that there is no risk of short circuits.

Protect the device from the ingress of objects or liquids!

If the device malfunctions or requires servicing (for example, due to damage to the housing, power supply cable, or the ingress of liquids or objects), the power supply may be cut off. In this case, the device must be isolated immediately and physically from all power supplies! The following procedure must be followed in order to correctly and reliably isolate the device:

- Pull the power supply plug from the power source.
- Loosen the locking screws of the MSTB power supply plug on the device and pull it out of the device.
- Contact the person responsible for your electrical infrastructure.
- If your device is connected to one or more uninterruptible power supplies (UPS), the direct power supply connection between the device and the UPS solution must be first be disconnected.

5.4.1 Special Information for Devices with DC Power Supply

In accordance with IEC 62368-1, it must be possible to disconnect the appliance from the supply voltage from a point other than the appliance itself (e.g., from the primary circuit breaker).

The power supply plug may only be fitted or dismantled while the appliance is isolated from the power supply (e.g., disconnected via the primary circuit breaker).

Power supply cables must have adequate fuse protection and have an adequate wire gauge size (1 mm^2 – 2.5 mm^2 / 17 AWG – 13 AWG)

The power supply of the device must have a suitable on-demand disconnection mechanism (i.e., a switch). This disconnection mechanism must be readily accessible in the vicinity of the appliance and marked accordingly as a disconnection mechanism for the appliance.

5.5 Safety when Handling SFP Modules

The fiber-optic SFP modules recommended by Meinberg are equipped with a Class 1 laser.

- Only use fiber-optic SFP modules that are compliant with the definition of a Class 1 laser in accordance with IEC standard 60825-1. Fiber-optic products that are not compliant with this standard may emit radiation capable of causing eye injuries.
- Never look into an unconnected connector of a fiber-optic cable or an unconnected SFP port.
- Unused fiber-optic connectors should always be fitted with a suitable protective cap.
- The safety information and manufacturer specifications relating to the SFP modules used must be heeded.
- The SFP module used must be capable of providing protection against voltage spikes in accordance with IEC 62368-1.
- The SFP module used must be tested and certified in accordance with applicable standards.

6 Important Product Information

6.1 CE Marking

This product bears the CE mark as is required to introduce the product into the EU Single Market.

The use of this mark is a declaration that the product is compliant with all requirements of the EU directives effective and applicable as at the time of manufacture of the product.

6.2 UKCA Marking

This product bears the British UKCA mark as is required to introduce the product into the United Kingdom (excluding Northern Ireland, where the CE marking remains valid).

The use of this mark is a declaration that the product is in conformity with all requirements of the UK statutory instruments applicable and effective as at the time of manufacture of the product.

6.3 Ensuring the Optimum Operation of Your Device

- Ensure that ventilation slots are not obscured or blocked by dust, or else heat may build up inside the device. While the system is designed to shut down safely and automatically in the event of temperature limits being exceeded, the risk of malfunctions and product damage following overheating cannot be entirely eliminated.
- The device is only deemed to be appropriately used and EMC limits (electromagnetic compatibility) are only deemed to be complied with while the device housing is fully assembled in order to ensure that requirements pertaining to cooling, fire safety, electrical shielding and (electro)magnetic shielding are upheld.

6.4 Maintenance and Modifications

Important!

Before performing any maintenance work on or authorized modification to your Meinberg system, we recommend making a backup of any stored configuration data (e.g., to a USB flash drive from the Web Interface).

6.5 Prevention of ESD Damage

An **ESDS device** (electrostatic discharge-sensitive device) is any device at risk of damage or malfunction due to electrostatic discharge (**ESD**) and thus requires special measures to prevent such damage or malfunction. Systems and modules with ESDS components usually bear this symbol.

Important!

Due to its complexity, the IMS-PSX210 is especially sensitive to electrostatic discharges and requires special care when handling. Please consider wearing special industrial-grade ESD-proof clothing and shoes when handling the product.

Precautionary measures should be taken to protect ESDS components from damage and malfunction.

- Before removing or installing a module, ground your body first (for example, by touching a grounded object) before touching ESDS components.
- Ensure that you wear a grounding strap on your wrist when handling such ESDS components. This strap must in turn be attached to an uncoated, non-conductive metal part of the system.
- Use only tools and equipment that are free of static electricity.
- Ensure that your clothing is suitable for the handling of ESDS components. In particular, do not wear garments that are susceptible to electrostatic discharges (wool, polyester). Ensure that your shoes enable a low-resistance path for electrostatic charges to dissipate to the ground.
- Only touch or hold ESDS components by the edges. Never touch any pins or conductors on the ESDS components.
- When removing or installing ESDS components, avoid coming into contact with persons who are not grounded. Such contact may compromise your connection with the grounding conductor and thus also compromise the ESDS component's protection from any static charges you may be carrying.
- Always store ESDS components in ESD-proof 'antistatic' bags. These bags must not be damaged in any way. Antistatic bags that are crumpled or have holes cannot provide effective protection against electrostatic discharges. Antistatic bags must have a sufficient electrical resistance and must not be made of conductive metals if the ESDS component has a lithium battery fitted on it.

6.6 Disposal

Disposal of Packaging Materials

The packaging materials that we use are fully recyclable:

Material	Use for	Disposal
Polystyrene	Packaging frame/filling material	Recycling Depot
PE-LD (Low-density polyethylene)	Accessories packaging, bubble wrap	Recycling Depot
Cardboard	Shipping packaging, accessories packaging	Paper Recycling

For information on the proper disposal of packaging materials in your specific country, please inquire with your local waste disposal company or authority.

Disposal of the Device

This product falls under the labeling obligations of the Waste Electrical and Electronic Equipment Directive 2012/19/EU ("*WEEE Directive*") and thus bears this WEEE symbol. The presence of this symbol indicates that this electronic product may only be disposed of in accordance with the following provisions.

Important!

Do not dispose of the product via the household waste. Inquire with your local waste disposal company or authority on how to best dispose of the product if necessary.

This product is considered to be a "**B2B**" product for the purposes of the WEEE Directive and is also classified as "**IT and Telecommunications Equipment**" in accordance with Annex I of the Directive.

It can be returned to Meinberg for disposal. Any transportation expenses for returning this product (at end-of-life) must be covered by the end user, while Meinberg will bear the costs for the waste disposal itself. If you wish for Meinberg to handle disposal for you, please get in touch with us. Otherwise, please use the return and collection systems provided within your country to ensure that your device is disposed of in a compliant fashion to protect the environment and conserve valuable resources.

7 Introduction

This Setup Guide is systematically structured to assist you with the set-up of your Meinberg product.

With full support for PTPv2 networks and strict compliance with the IEEE 1588 standards, the IMS-PSX210 allows your IMS system to operate as a PTP master or slave clock via two discrete high-performance 10 Gigabit Ethernet interfaces to provide maximum PTP network performance.

A comprehensive range of PTPv2 profiles used in various industries are supported to ensure that PTP performance is optimized for the application at hand and compliant with industry standards.

How It Works

Although it is integrated into a Meinberg IMS system, the IMS-PSX210 operates as a semi-independent, self-contained single-board computer (SBC) with a dedicated dual-core processor, RAM, and network controller. The IMS-PSX210 is configured and monitored entirely via the IMS system's Web Interface, but the time services themselves (PTP, software NTP daemon, hardware-level NTP responder, SyncE) run entirely on the module.

This 'hardware firewall' between the IMS LANTIME system and IMS-PSX210 is a highly effective security mechanism that strictly controls the flow of data between the IMS system and IMS-PSX210 and allows the time services of the IMS-PSX210 to be isolated not only from the base IMS system itself but also from each other—multiple IMS-PSX210 modules in a single IMS LANTIME system can serve physically discrete networks.

The host reference clock of the IMS system provides the time references needed to synchronize the IMS-PSX210, or conversely, the host reference clock of the IMS system can be synchronized to an external PTP master clock by a IMS-PSX210 running in slave mode.

Compatibility

The IMS-PSX210 is an IMS module that is compatible with all of the current systems in the IMS family:

IMS System	M500	M1000	M1000S	M2000S	M3000	M3000S	M4000
Compatible	✓*	✓*	✓*	✓	✓	✓	✓

* Please note when installing in a LANTIME M500, LANTIME M1000, or LANTIME M1000S system, the IMS-PSX210 can only be installed in the (lower) MRI slot due to the physical dimensions of the module.

The module can be installed in any IO, MRI, or ESI slot of your IMS system with a free slot to the right of it (M500, M3000, M3000S, M4000) or above it (M1000, M1000S, M2000S):

IMS Slot	PWR	CLK	CPU	MRI	ESI	I/O
Compatible	✗	✗	✗	✓	✓	✓

To eliminate any risk of compatibility problems, your IMS system should have at least **LTOS Version 7.08.021** installed. LTOS updates can be downloaded from the Meinberg firmware download page at http://mbg.link/firmware-en.

Manual Revisions

Meinberg products are subject to ongoing development even after their market release, with new features and enhancements added on a regular basis via firmware and software updates. Meinberg also revises its product manuals to account for these feature updates.

This version of the manual has been prepared based on the following LANTIME configuration:

- LANTIME M3000
- IMS-PSX210 with Kernel Version v4.9.307
- LTOS v7.08.021

When using a different LANTIME system, a different LTOS version, or a different module firmware version, there may be noticeable differences, for example in the presentation and availability of options in the Web Interface as shown in → Chapter 11, "Configuration and Setup via Web Interface".

Further Reading

This brief Setup Guide only provides the information required to quickly set up your module in your IMS system without any problems. We recommend also carefully studying the following manuals alongside this Setup Guide for the use of your IMS-PSX210:

Meinberg IMS System Manuals	http://www.mbg.link/doc-en
LTOS Configuration & Management Manual	http://www.mbg.link/doce-fw-ltos

The **LTOS Configuration & Management Manual** in particular provides a detailed description of all configuration and status monitoring options available for your Meinberg product.

7.1 Note Regarding PTP Terminology

The user interfaces of this product, and by extension this product documentation, utilize the original IEEE 1588-2002 terminology "Master/Slave" to refer to the hierarchy employed by PTP networks. Various other alternative designations have been suggested and adopted by various devices in the time between the adoption of the original standard and the time of writing of this manual.

Most recently, the IEEE 1588 Working Group has agreed new alternative terminology in the standard IEEE 1588g-2022, specifically the use of "*timeTransmitter*" in place of "*Master*" and "*timeReceiver*" in place of "*Slave*", along with all appropriate changes to any terminology derived from this nomenclature.

Prior to the adoption of this standard, the terms "*Leader*" and "*Follower*" were informally selected by the IEEE 1588 Working Group and published as such. While other reservations were expressed against this terminology, resulting in it ultimately not being adopted by the IEEE 1588 Working Group, some associations (notably the SMPTE), as well as some manufacturers of end devices and software solutions, chose to adopt the since-rejected terminology nonetheless.

As a result, different PTP devices may use different terminology to refer to the same hierarchical structure:

Original IEEE 1588-2002 Terminology	SMPTE Terminology	IEEE 1588g-2022 Terminology
Master	Leader	timeTransmitter
Slave	Follower	timeReceiver
Best Master Clock Algorithm	Best Leader Clock Algorithm	Best timeTransmitter Clock Algorithm

Regardless of the terminology used, it is compliance with the IEEE 1588-2002 and IEEE 1588-2008 standards (for PTPv1 and PTPv2 respectively) that dictates compatibility with other PTP devices. Therefore, a PTP device that uses Leader/Follower terminology will be able to interoperate with a PTP device that uses Master/Slave terminology.

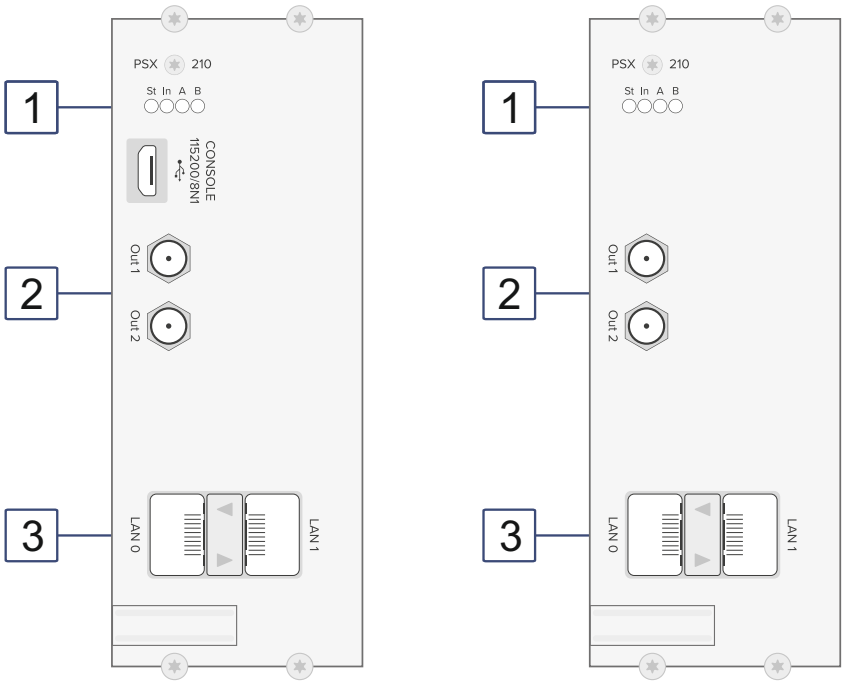
8 IMS-PSX210 Module Connectors and Indicators

Information:

There are two revisions of the IMS-PSX210, both of which are covered by this manual.

The earlier legacy revision of the IMS-PSX210 (sold from 2023 to early 2025, shown on left in illustration below) features a micro-USB terminal interface that is not intended for end-user operation and provides no useful end-user functionality. The newer revision of the IMS-PSX210 (sold from early 2025, shown on right in illustration below) lacks this terminal interface.

The numbering in the drawings below relate to the relevant subsection in this chapter.



Legacy IMS-PSX210 Model

Current IMS-PSX210 Model

(1)	Status LEDs	→ Chapter 8.1
(2)	Signal Outputs	→ Chapter 8.2
(3)	Network Interfaces	→ Chapter 8.3

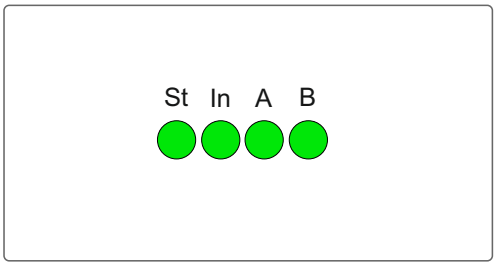
8.1 Status LEDs

"*St*" LED: Initialization status of IMS-PSX210

"*In*" LED: Network link status & fault state of IMS-PSX210

"*A*" LED: Port status of PTP instance on port *LAN0*

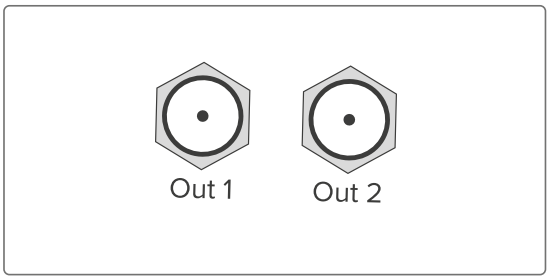
"*B*" LED: Port status of PTP instance on port *LAN1*



LED	Colors	Description
St	Blue	The internal firmware is initializing and a connection is being established with the IMS system.
	Off	The initialization of the internal firmware is complete and a connection has been established with the IMS system, but the oscillator is not yet locked to its phase reference.
	Green	The initialization of the clock's firmware is completed, the connection with the IMS system has been established, and the oscillator is locked to the phase reference.
In	Off	A fault has been detected in the internal timestamper unit of the IMS-PSX210 and the PTP service has been suspended.
	Yellow	The IMS-PSX210 cannot detect a network link, but the module is otherwise initialized and functional.
	Green	The IMS-PSX210 is initialized, functional, and a network link is detected.
A/*B*	Off	The PTP stack for the corresponding network interface is still initializing or has been disabled for the corresponding port.
	Red	The PTP stack for the corresponding network interface has been unable to initialize, an error has occurred during initialization, or the port is in Pre-Master state.
	Yellow	The PTP stack for the corresponding network interface is listening for other reachable clocks.
	Yellow, flashing	The PTP stack for the corresponding network interface is operating in Passive mode.
	Green	The PTP stack for the corresponding network interface is operating in Master or Slave mode.
	Green, flashing	The PTP stack for the corresponding network interface is (still) uncalibrated.

8.2 Signal Outputs

These SMA connectors are reserved for future use.



8.3 Network Interfaces

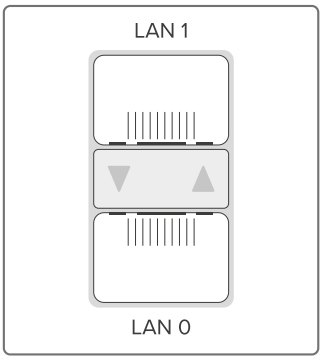
Warning!

Prevention of Eye Injuries

- Fiber-optic SFP+ modules that are not compliant with the definition of a Class 1 laser in accordance with IEC standard 60825-1 may emit radiation capable of causing eye injuries.
- Never look into an unconnected connector of a fiber-optic cable or an unconnected SFP+ port, and ensure that unused fiber-optic connectors are always fitted with a suitable protective cap.

The two SFP+ network interface ports LAN0 and LAN1 provide the PTP connectivity. Each port is a discrete physical interface, individually and independently operable in Master or Slave mode.

These ports are exclusively used for PTP and NTP communication. Management access is provided by any network port on your IMS system's CPU module or any installed LNE network expansion module. Access to the Web Interface is not possible via the network ports on the IMS-PSX210.



Information:

When selecting a transceiver to use with your IMS-PSX210 module, please be aware that the SFP+ ports only support SFP+ modules with 10 Gigabit Ethernet support. The IMS-PSX210 module does not support standard SFP modules with lower transmission rates.

A list of transceivers tested and known by Meinberg to be fully compatible with the IMS-PSX210 is provided in → Chapter 10.4, "Tested SFP+ Transceivers".

9 Before You Start

9.1 Contents of Delivery

Unpack the IMS-PSX210 and all accessories carefully and check the contents of the delivery against the enclosed packing list to ensure that no parts are missing. If any of the listed items are missing, please contact our Sales Department at ✉ sales@meinberg.de.

Check that the product has not been damaged in transit. If the product is damaged or fails to operate upon installation, please contact Meinberg immediately. Only the recipient (the person or company receiving the system) may file claims or complaints against the forwarder for damage caused in transit.

Meinberg recommends that you keep the original packaging materials in case the product needs to be shipped or transported again at a later date.

10 System Installation

10.1 Important Information Regarding Hot-Pluggable IMS Modules

The following information should be strictly observed when replacing IMS modules during operation. Not all IMS modules are fully hot-pluggable. For example, it is naturally not possible to replace a power supply unit in a system without PSU redundancy without first having installed a second power supply unit while the system is in operation.

The following rules apply for the individual IMS slots:

PWR Slot:	"Hot-Swappable"	If you operate your system with only one power supply unit, a second power supply unit must be installed before removing or replacing it in order to keep your system operational.
I/O, ESI, and MRI Slots:	"Hot-Pluggable"	
CLK1, CLK2 Slots:	"Hot-Pluggable"	When a clock module is replaced or installed, it is important to rescan the reference clocks ("**Rescan Refclocks**") in the "**System**" menu of the Web Interface.
RSC/SPT Slots:	"Hot-Pluggable"	It will not be possible for your IMS system to switch between signal generators while the RSC/SPT is not installed.
CPU Slot:	"Not Hot-Pluggable"	Before the CPU is removed, the IMS system must be powered down. Please note that after powering on and rebooting LTOS, the configuration of some IMS modules may be reset to factory defaults!

Information:

The NTP service and access to the Web Interface will be unavailable while the CPU is not installed. Management and monitoring functions will also be disabled.

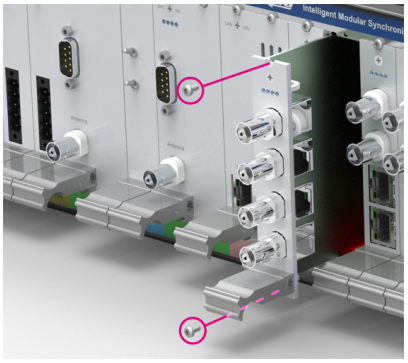
10.2 Installation and Removal of Hot-Pluggable IMS Modules

A Torx screwdriver is required (T8 x 60) to remove and install IMS modules.

Important!

Take note of the safety information provided in → Chapter 5, "Important Safety Information"!

Removing a Module



Locations of fixture screws in a 3U IMS system

Locations of fixture screws in a 1U IMS system

1. Remove the two marked Torx screws from the module faceplate.

2. Pull the module **carefully** out of the guide rail. Note that the module will be securely seated in the connector block inside the chassis—a certain amount of force must be applied to release the module. Once the module has been detached from the connector block on the system backplane, the module can be easily pulled out.

3. If the removed module is not to be replaced with another module, a suitable one-slot or two-slot 'placeholder' faceplate should be fitted using the two Torx screws in order to cover this space.

Installing a Module

1. To replace a module, remove the installed module in accordance with the guide "**Removing a Module**" on the previous page. Otherwise, remove the two Torx screws from the cover plate of the unused slot. We recommend keeping the cover plate in a safe place for later use.

2. Insert the module correctly into the two guide rails of the system chassis. If it cannot be inserted with reasonably minimal effort, it is possible that the module is not properly seated in the guide rails. In this case, you should pull the module out and try again. **Do not use excessive force when pushing the module in!** Failure to heed this instruction may result in damage to the module and/or chassis.

3. Once the module has reached the connector block of the system backplane, a little more effort will be required to insert the module into the connector block. Ensure that the module is locked securely into place and that the faceplate of the module is flush with that of the adjacent modules or cover plates.

4. Insert and tighten the two Torx screws with a **max. torque of 0.6 Nm**.

The installed module is now ready to be set up for use.

10.3 Data and Signal Cables

Clock Communication

Communication between the IMS-PSX210 module and other clocks in the PTP/NTP infrastructure is achieved via the two SFP+ ports on the module. These require the use of an SFP+ transceiver module with 10 Gigabit Ethernet support to match the corresponding signal transport requirements. The specific cables required therefore depend accordingly on the SFP transceiver module used.

If a fiber-optic transceiver module is used, then generally a suitable duplex fiber patch cable will be required. The transceiver modules supported by Meinberg all require an LC duplex type connector. The maximum lengths and specifications of the patch cables will depend on the transceiver module in use.

If a copper transceiver module is used (see note below), then generally a standard Ethernet patch cable will be used for communication between the IMS-PSX210 module and the next clock or network node. Because the IMS-PSX210 module is only operable in a **10 Gigabit** Ethernet link mode, cable of at least Cat 7 standard must be employed.

Important!

Please note that the IMS-PSX210 module is primarily designed for use in fiber-optic networks and operability with copper cabling has not been tested. While SFP+ copper transceivers and suitable cable may theoretically work, Meinberg cannot guarantee any performance levels when using copper cable.

10.4 Tested SFP+ Transceivers

The following SFP+ transceivers have been successfully tested by Meinberg for use with the IMS-PSX210:

Type	Mode	Connector Type	Max. Connection Length
Finisar FTLX8574D3BCL	Multi-Mode	Duplex LC	400 m / 1312 ft (OM4) 300 m / 984 ft (OM3) 82 m / 269 ft (OM2)
Arista 10G SRL	Multi-Mode	Duplex LC	100 m / 328 ft (OM3)
Cisco SFP 10G SR	Multi-Mode	Duplex LC	400 m / 1312 ft (OM4)
Cisco SFP 10G LR	Single-Mode	Duplex LC	10000 m / 32808 ft
Smartoptics SO-SFP-L12	Single-Mode	Duplex LC	10000 m / 32808 ft

11 Configuration and Setup via Web Interface

This chapter describes the initial setup of a IMS-PSX210 using the Web Interface.

The IMS-PSX210 is configured by selecting the menu "**PTP**" → "**PTP V2 Configuration**" in the Web Interface.

The configuration options addressed in this chapter represent a IMS-PSX210 with Kernel Version **v4.9.307** running under **LTOS v7.08.021**.

11.1 Network

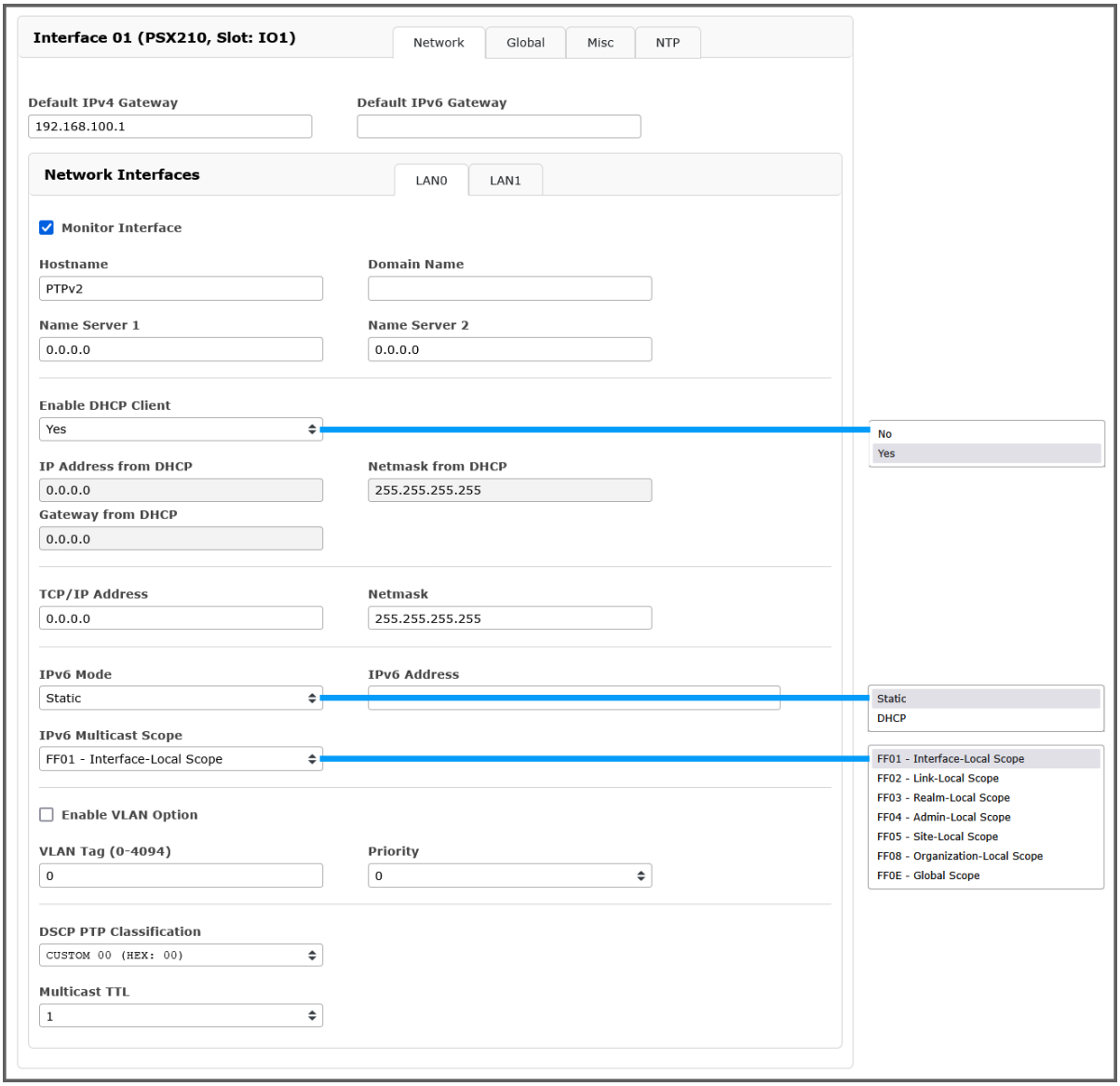


Figure 11.1: Network Tab

The **Network** tab is used to perform the IP network configuration for your IMS-PSX210 module. This configuration is not necessary if you intend to only use Layer 2 Ethernet (IEEE 802.3) as the communication protocol for both ports.

General Configuration

These settings affect both Ethernet ports.

Monitor Interface: If checked, this enables network link state monitoring for that network interface.

Default IPv4 Gateway: Specifies the IPv4 address of the default gateway to which any outbound traffic is sent when no routing information is available (i.e., addresses outside of the local subnet).

Default IPv6 Gateway: Specifies the IPv6 address of the default gateway to which any outbound traffic is sent when no routing information is available (i.e., addresses outside of the local scope).

Port-Specific Configuration

These settings affect only individual Ethernet ports on your IMS-PSX210 module. Ensure that the correct tab for the port in question is selected before modifying the settings.

Hostname: The hostname of the IMS-PSX210 module for communication via UDP/IPv4 or UDP/IPv6.

Domain Name: The optional domain name for the domain in which the IMS-PSX210 module resides.

Name Server 1: The IP address of the DNS server used to resolve domain names when communicating via UDP/IPv4 or UDP/IPv6.

Name Server 2: The IP address of an optional second DNS server used to resolve domain names when communicating via UDP/IPv4 or UDP/IPv6.

Enable DHCP Client: If IPv4 address allocation is handled by a DHCP server within the subnet, this should be enabled to automatically acquire an IP address for the subnet.

TCP/IP Address: If IPv4 address allocation is handled manually within the subnet, the address for the IMS-PSX210 module should be entered here. This field will be disabled if DHCP is enabled.

Netmask: If IPv4 address allocation is handled manually within the subnet, the netmask for the subnet is entered in this field. This field will be disabled if DHCP is enabled, as the netmask will be acquired from the DHCP server.

IPv6 Mode: Specifies how IPv6 address allocation is handled:

Static requires the IPv6 address of the IMS-PSX210 module to be set manually.

DHCP acquires the IPv6 address from a DHCPv6 server (stateful autoconfiguration).

Information:

Please note that stateless IPv6 autoconfiguration (SLAAC/Router Advertisement) is not yet supported by the IMS-PSX210 at time of writing.

IPv6 Address: If IPv6 address allocation is handled manually within the subnet, the address for the IMS-PSX210 module should be entered here. This field will be disabled if DHCP is enabled.

IPv6 Multicast Scope: Specifies the address scope for IPv6 multicasts.

Enable VLAN Option: Enables VLAN tagging. VLAN tags allow clocks and clients to be isolated from one another, despite being connected to the same physical network, without the need for multiple sets of cables and multiple devices.

VLAN Tag: Specifies the VLAN tag (0–4096) that will be embedded in the IMS-PSX210 module's outgoing packets.

Priority: A general priority level that relates to the IEEE 802.1p Class of Service (CoS) for prioritizing VLAN packets.

DSCP PTP Classification: The 6-bit differentiated services code point (DSCP) in the Differentiated Services field of the header of IP packets for packet classification purposes.

Multicast TTL: The TTL (time to live) value for IPv4 multicast packets, or the hop limit for IPv6 multicast packets.

11.2 Global

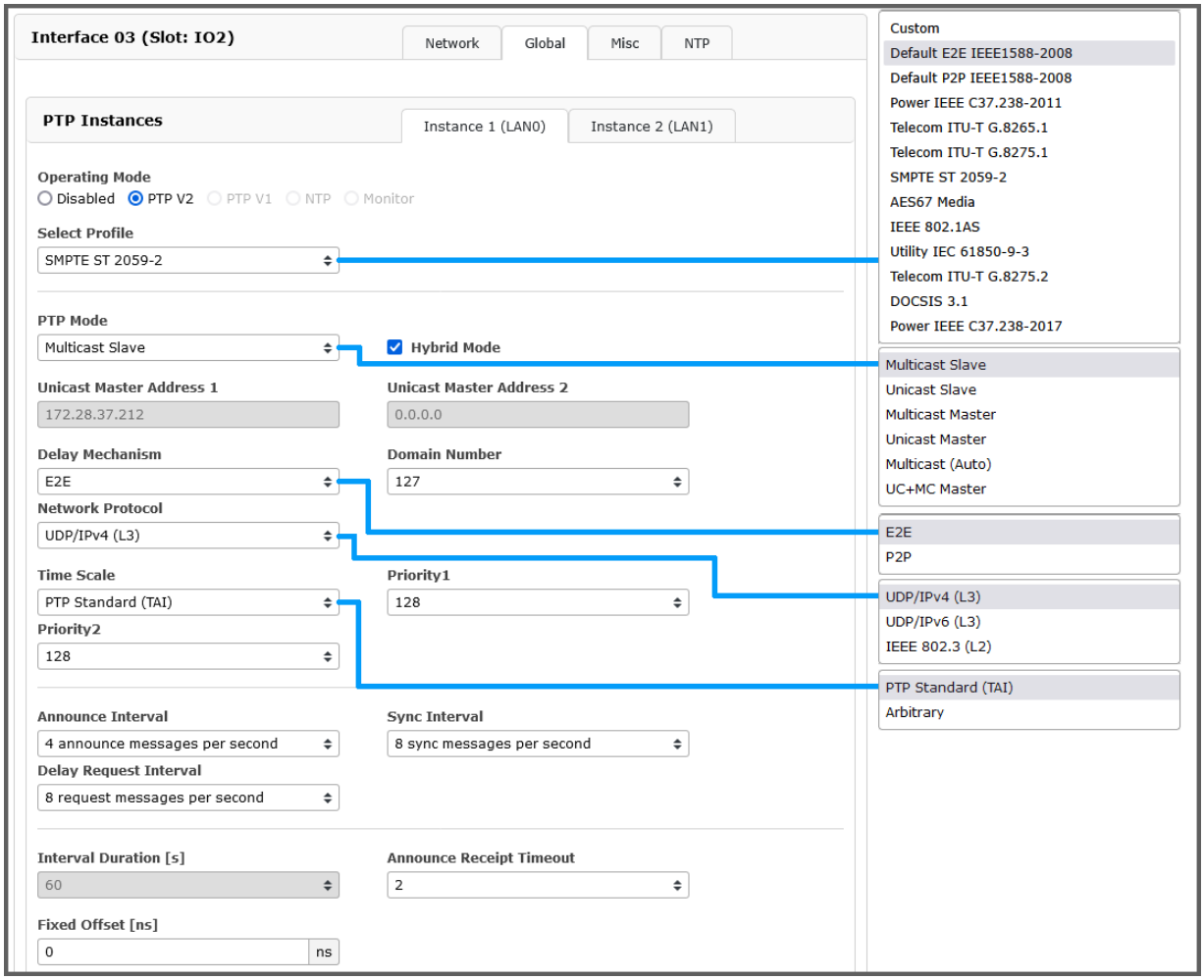


Figure 11.2: Global Tab

The PTP instances on each of the two ports are configured here. The corresponding port/instance is configured by selecting the relevant tab.

Operating Mode: Specifies the operating mode of this IMS-PSX210 module. At time of writing only PTPv2 and NTP are supported; PTPv1 and Monitor mode are grayed out and will be enabled in a later firmware version.

Selecting *Disabled* will disable that port.

Select Profile: Specifies the PTPv2 profile to be applied for this clock instance. Selecting *Custom* allows any parameter to be adjusted within the constraints of the IEEE 1588-2008 PTPv2 standard.

As soon as a profile is selected, the available options for the instance parameters will be adjusted accordingly. Profiles which specify a fixed and unalterable value for a given parameter will be grayed out, while parameters with constraints will be limited to options within those constraints.

Information:

This list assumes the use of the Custom profile. Please note that some options will be unavailable with certain industry profiles due to the constraints imposed by those profile's standards.

PTP Mode:

Specifies the transmission mode for the PTP traffic. The possible options are:

- *"Multicast Slave"*
The clock operates in slave-only mode and listens for master clocks sending Announce messages on the appropriate multicast address.

- *"Unicast Slave"*
The clock operates in slave-only mode and listens for master clocks sending Announce messages from the specified unicast master addresses.

- *"Multicast Master"*
The clock operates in master or passive mode and sends Announce messages to the multicast address.

- *"Unicast Master"*
The clock operates in master or passive mode and sends Announce messages to any unicast slave clocks polling for Announce messages.

- *"Multicast Auto"*
The clock selects and/or modifies its mode intelligently based on the detected PTP topology and responds to changes in topology accordingly.

- *"UC+MC Master"*
The clock operates as both a unicast and multicast master, sending Announce messages to any unicast slave clocks polling it directly and also to the multicast address.

Hybrid Mode:

If enabled, Announce, Sync, and Follow-Up messages are transmitted to the multicast address, while Delay Request and Delay Response messages are transmitted via unicast directly to the respective clocks. This helps to optimize bandwidth usage as it reduces the volume of bandwidth-heavy multicast traffic while leveraging the flexibility of multicast transmission.

Unicast Master Address 1:

Specifies the address from which the instance should listen for Announce messages in unicast mode. If unicast mode is selected, at least one master clock address must be specified.

Unicast Master Address 2:

Specifies an optional second address from which the instance should listen for Announce messages in unicast mode. If two addresses are specified, the clock will apply the Best Master Clock Algorithm (BMCA) with the data contained in the Announce messages to ascertain which of the two clocks has the best quality.

Delay Mechanism: Specifies the mechanism by which the delay measurement process is performed:

- *P2P (peer-to-peer)*
The Delay Request/Delay Response exchange is performed with the most directly connected nodes (e.g., a transparent clock). This mechanism is recommended if it can be guaranteed that every clock—from grandmaster to slave—is PTP-aware (i.e., operates as a PTP clock in its own right). Some PTP profiles mandate the use of P2P delay measurement (and by extension, the consistent use of PTP-aware switches and routers).

- *E2E (end-to-end)*
The Delay Request/Delay Response exchange is performed directly between the master and slave clocks.

Domain Number: Specifies the PTP domain number, which is integrated into all PTPv2 traffic. This instance will ignore any PTPv2 traffic that does not match this domain number, and other clocks are expected to ignore traffic from this instance that if the clock does not have the same domain number.

Network Protocol: Specifies the network transmission protocol for PTP traffic.

- *UDP/IPv4 (L3)*
PTP traffic is transmitted via Layer 3 UDP/IP with IPv4 addressing. IPv4 must be configured accordingly.

- *UDP/IPv6 (L3)*
PTP traffic is transmitted via Layer 3 UDP/IP with IPv6 addressing. IPv6 must be configured accordingly.

- *IEEE 802.3 (L2)*
PTP traffic is transmitted via Layer 2 Ethernet with clock ID/MAC addressing.

Time Scale: Specifies whether the timescale for this PTP network is International Atomic Time (*TAI*) or *Arbitrary*. A timescale that is declared to be arbitrary is assumed to have no relation to a standard timebase such as UTC.

Priority 1: The value **Priority 1** can be a value from 0–255 and is part of the dataset included in Announce messages for use by slave clocks to prioritize certain master clocks over others. This field can be used to manually specify this value.

This can be useful, for example, if you wish to have a specific device serve as the primary grandmaster under any circumstances, regardless of clock quality, and have a second device serve as the backup in case the primary grandmaster fails.

A lower **Priority 1** value has greater priority over a higher one.

Priority 2:	The value **Priority 2** can be a value from 0–255 and is part of the dataset included in Announce messages for use by slave clocks to prioritize certain master clocks over others. This field can be used to manually specify this value. Unlike **Priority 1**, **Priority 2** takes into account clock quality first and will only act as a tiebreaker if two master clocks are of equal quality. A lower **Priority 2** value has greater priority over a higher one.
Announce Interval:	Specifies how frequently Announce messages should be sent.
Sync Interval:	Specifies how frequently Sync messages should be sent.
Delay Request Interval:	Specifies how frequently (Peer) Delay Request messages should be sent.
Interval Duration:	Specifies how long in seconds the instance will wait for a message until timeout.
Announce Receipt Timeout:	Specifies how many Announce intervals the instance will wait for until it stops listening for Announce messages.
Fixed Offset:	Allows a fixed offset in nanoseconds to be applied by the slave instance to the time received from its master. This can be used to correct a known and consistent offset that cannot be accounted for by network delay.

Profile-Specific Configuration

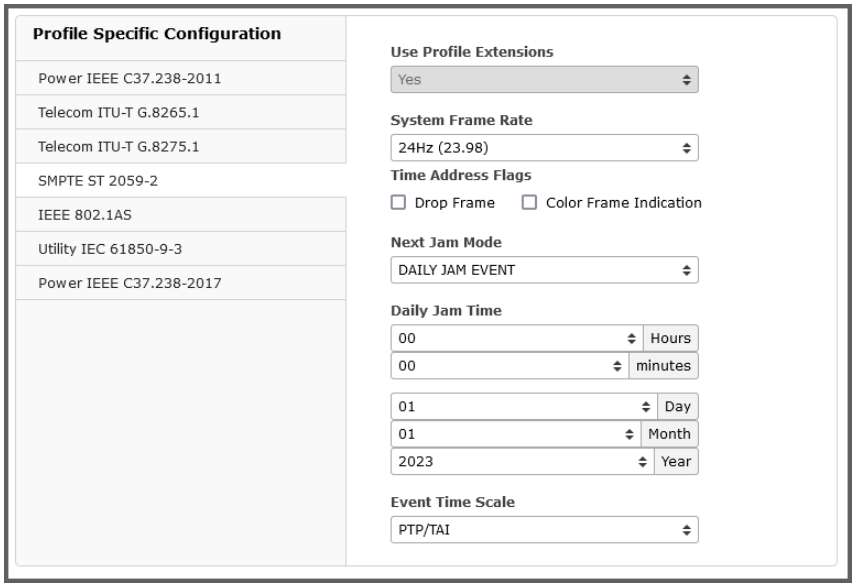


Figure 11.3: Profile-Specific Configuration

The lower part of the configuration panel provides profile-specific options and extensions.

11.3 Misc

Figure 11.4: Misc. Tab

The **Misc.** tab provides other general PTP options.

Activate PTP One-Step: Where two-step mode employs a Sync and Follow-Up message to account for processing latency in message generation, one-step operation uses the accurate timestamp generated in the Sync message and omits the Follow-Up message.

One-step mode is recommended if all other PTP devices in the network are capable of generating PTP messages efficiently in hardware, such that the delay between the timestamp and the message generation is negligible.

Enable PTP Management Messages: If this checkbox is enabled, PTP management messages will be sent to other PTP clocks. Management messages are requests sent to other clocks in the network to provide information about themselves.

11.4 NTP

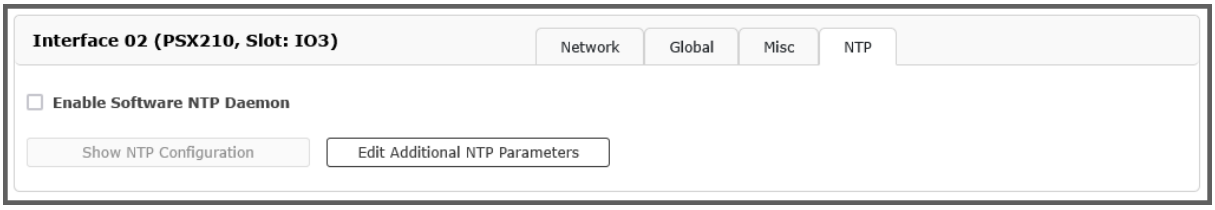


Figure 11.5: NTP Tab

The **NTP** tab features a button "**Edit Additional NTP Parameters**" that provides access to a text editor to modify additional configuration parameters of the software NTP daemon running on the IMS-PSX210.

At the time of publication of this manual, this daemon is permanently enabled, and the checkbox "**Enable Software NTP Daemon**" is therefore disabled and grayed out.

12 Troubleshooting

Our Technical Support team will be pleased to help you with any problems that you may be having with your Meinberg IMS-PSX210 module. However, before you contact our Technical Support team, it is advisable to read this chapter through first to see if your problem might be more quickly resolved with one of the solutions below.

Problem	Possible Causes	Possible Solutions
The module is not detected by the base IMS unit.	The module may not have been properly inserted into the slot.	Ensure that the module is properly aligned with the guide rails inside the IMS unit; the module must lock securely into the socket at the back. The metal plate of the module should be perfectly flush with the metal plates of the other slots and the screws should be straight.
The IMS module is not listed and not configurable in the Web Interface of the IMS system.	The firmware of your IMS system may not be up to date.	Check in the menu **System –> Configuration & Firmware Management** whether the latest version of LTOS is installed, and install the latest version if necessary.
The LEDs "**A**" and "**B**" have turned red during operation and PTP operation has ceased entirely. The PTP tab has disappeared from the Web Interface.	If the two LEDs do not change to another color than red after several seconds, it is possible that the internal PTP stack has crashed and the module must be restarted.	Remove the module from the IMS unit and reinsert it to restart the module. If the problem persists, download the Diagnostic File via the LTOS Web Interface and contact Meinberg Technical Support at ✉ techsupport@meinberg.de, attaching this file to the email.

13 Technical Appendix

13.1 Supported PTPv2 Profiles

This is a list of the PTPv2 profiles supported by your product and the corresponding settings.

PTP Profile	Operation Modes	OSI Layer/Network Protocol	PTP Domain (Default)	Delay Mechanism	Announce Receipt Timeout (Default)	Announce Interval (Default)	Sync Interval (Default)	(Peer) Delay Req. Interval (Default)	PTP Timescale Required?
Default E2E IEEE1588-2008	Any except Mixed Master	L2/L3	0–255 (0)	E2E	2–10 (2)	2000 ms	1000 ms	1000–128000 ms	Y
Default P2P IEEE1588-2008	Multicast	L2/L3	0–255 (0)	P2P	2–10 (2)	2000 ms	1000 ms	1000 ms	Y
Power IEEE C37.238-2011	Multicast	L2	0–255 (0)	P2P	2–3 (2)	1000 ms	1000 ms	1000 ms	Y
Power IEEE C37.238-2017	Multicast	L2	0–127, 254 (254)	P2P	3	1000 ms	1000 ms	1000 ms	Y
Utility IEC 61850-9-3	Multicast	L2	0–255 (0)	P2P	3	1000 ms	1000 ms	1000 ms	Y
Telecom ITU-T G.8265.1	Unicast	L3	4–23 (4)	E2E	2	62.5–16000 ms (125 ms)	7.8125–128000 ms (62.5 ms)	7.8125–128000 ms (62.5 ms)	N
Telecom ITU-T G.8275.1	Multicast	L2	24–43 (24)	E2E	3–10 (3)	128 ms	62.5 ms	62.5 ms	Y

PTP Profile	Operation Modes	OSI Layer/Network Protocol	PTP Domain (Default)	Delay Mechanism	Announce Receipt Timeout (Default)	Announce Interval (Default)	Sync Interval (Default)	(Peer) Delay Req. Interval (Default)	PTP Timescale Required?
Telecom ITU-T G.8275.2	Unicast	L3	44–63 (44)	E2E	2	125–1000 ms (125 ms)	7.8125–1000 ms (7.8125 ms)	7.8125–1000 ms (7.8125 ms)	Y
DOCSIS 3.1	Multicast	L2	24–43 (24)	E2E	3–10 (3)	128 ms	62.5 ms	62.5 ms	Y
SMPTE ST 2059-2	Any	L3	0–127 (127)	Any	2–10 (2)	125–2000 ms (250 ms)	7.8125–500 ms (125 ms)	7.8125–500 ms	N
AES67 Media	Multicast	UDP/IPv4 (L3)	0–255 (0)	Any	2–10 (2)	1000–16000 ms (2000 ms)	-62.5–2000ms (125 ms)	1000 ms-32000 ms (1000 ms)	N
IEEE 802.1AS	Multicast	L2	0	P2P	2–10 (2)	62.5–16000 ms (1000 ms)	7.8125–128000 ms (125 ms)	1000 ms	Y

14 Your Opinion Matters to Us

This user manual is intended to assist you in the preparation, use, and care of your Meinberg product, and provides important information for configuration and status monitoring.

Be a part of the ongoing improvement of the information contained in this manual. Please contact our Technical Support team if you have any suggestions for improvements or technical questions that are relevant to the manual.

Meinberg – Technical Support

Phone: +49 (0) 5281 – 9309- 888
Email: techsupport@meinberg.de

15 RoHS Conformity

Conformity with EU Directive 2011/65/EU (RoHS)

We hereby declare that this product is compliant with the European Union Directive 2011/65/EU and its delegated directive 2015/863/EU "Restrictions of Hazardous Substances in Electrical and Electronic Equipment" and that no impermissible substances are present in our products pursuant to these Directives.

We warrant that our electrical and electronic products sold in the EU do not contain lead, cadmium, mercury, hexavalent chromium, polybrominated biphenyls (PBBs), polybrominated diphenyl ethers (PBDEs), bis(2-ethylhexyl)phthalat (DEHP), benzyl butyl phthalate (BBP), dibutyl phthalate (DBP), or diisobutyl phthalate (DIBP) above the legal limits.

16 List of Abbreviations

CLK	Clock
CPU	Central Processing Unit
EMC	Electromagnetic Compatibility
ESD	Electrostatic Discharge
ESDS	Electrostatic Discharge Sensitivity/Sensitive
ESI	External Synchronization Input
GND	Ground
HP	Horizontal Pitch
IMS	Intelligent Modular Synchronization
I/O	Input/Output
LTOS	LANTIME Operating System
MRI	Multi-Reference Input
PWR	Power
RSC	Redundant Switch Control
RTC	Real-Time Clock
TCP	Transmission Control Protocol
UDP	User Datagram Protocol
USB	Universal Serial Bus
WEEE	Waste of Electrical and Electronic Equipment