



The Synchronization Experts.



## MANUAL

### IMS-HPS-100 Setup Guide

#### Hot-Plug Module

November 3, 2023

Meinberg Funkuhren GmbH & Co. KG



# Table of Contents

<b>1</b>	<b>Imprint</b>	<b>1</b>
<b>2</b>	<b>Copyright and Liability Exclusion</b>	<b>2</b>
<b>3</b>	<b>Important Safety Information</b>	<b>3</b>
3.1	Appropriate Usage . . . . .	3
3.2	Product Documentation . . . . .	4
3.3	Electrical Safety . . . . .	4
<b>4</b>	<b>Important Product Information</b>	<b>5</b>
4.1	CE Marking . . . . .	5
4.2	Ensuring the Optimum Operation of Your Device . . . . .	5
4.3	Maintenance and Modifications . . . . .	5
4.4	Prevention of ESD Damage . . . . .	6
4.5	Disposal . . . . .	7
<b>5</b>	<b>Replacement or Installation of a Hot-pluggable IMS Module</b>	<b>8</b>
5.1	Important Information Regarding Hot-Pluggable IMS Modules . . . . .	9
<b>6</b>	<b>HPS-100: PTP / SyncE / Hardware NTP Interface</b>	<b>10</b>
6.1	HPS100 - Global Configuration . . . . .	12
6.2	Option: Output Configuration . . . . .	13
6.3	Firmware Update via Web Interface . . . . .	14
6.4	SFP Transceiver . . . . .	15
<b>7</b>	<b>RoHS Conformity</b>	<b>16</b>

# 1 Imprint

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## 3 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 warnings 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](mailto:techsupport@meinberg.de).

### 3.1 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!

## 3.2 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 persons** with a familiarity with relevant national safety standards and regulations,
- **instructed persons** having received suitable instruction from a skilled person 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](mailto:techsupport@meinberg.de) if you require additional assistance or advice on safety aspects of your system.

## 3.3 Electrical Safety

The IMS LANTIME system in which the module is installed is operated at a hazardous voltage. Please refer to the specific safety information contained within the manual of your IMS system for more information.

When removing a hot-pluggable power supply module, the power supply cable must first be disconnected from the module before the module itself is removed.

Never open a power supply module—hazardous voltages may still reside within the module even after it is disconnected from the power source. If a power supply module is defective, it can be sent to Meinberg for repair.

The installation, set-up, and operation of an IMS system must be performed by suitably qualified personnel.

Failure to observe these safety instructions can result in severe injury.



## 4 Important Product Information

### 4.1 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.

### 4.2 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.

### 4.3 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).



## 4.4 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 devices usually bear this symbol.

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 modules.
- 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. ESD-proof bags that are crumpled or have holes cannot provide effective protection against electrostatic discharges. ESD-proof 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.

## 4.5 Disposal

### Disposal of Packaging Materials



The packaging materials that we use are fully recyclable:

Material	Used for	Disposal
Polystyrene	Packaging frame/filling material (e.g., polystyrene peanuts)	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 or batteries via the household waste. Inquire with your local waste disposal company or authority on how to best dispose of the product or battery 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.

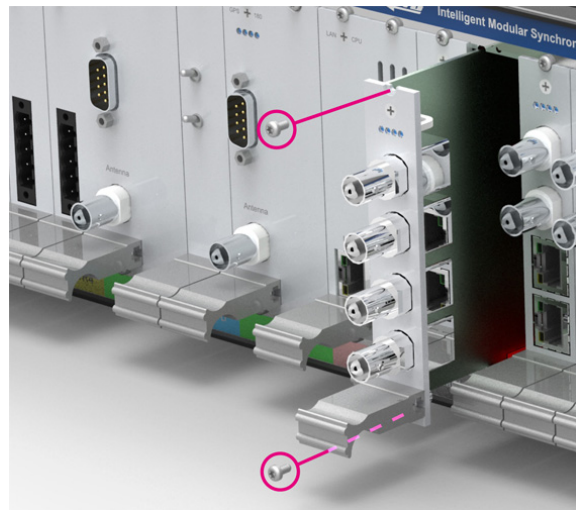
It can be returned to Meinberg for disposal. In this case, the shipping costs are to be borne by the customer, while Meinberg will cover the costs for disposal. If you wish for Meinberg to handle disposal for you, please get in touch with us. Otherwise, please use the return and collection systems provided within your country to ensure that your device is disposed of in a compliant fashion to protect the environment and conserve valuable resources.

## 5 Replacement or Installation of a Hot-pluggable IMS Module

If the system is supplied with an antenna and antenna cable, it is advisable to first mount the antenna in a suitable location (see chapter Antenna Mounting) and lay the antenna cable.

Please use a Torx screwdriver (T8 x 60) for removal and installation of the module.

1. Follow the safety instructions at the beginning of this manual!
2. Remove the two marked Torx screws from the module holder plate or the cover plate of the empty slot.
3. **Note when removing!**  
Pull the module carefully out of the guide rail. Note that the module is firmly anchored in the connector block of the housing. You need a certain amount of force to release the module from this link. Once the connection to the connector block of the system's backplane is loosened, the module can be easily pulled out.
4. **Note during installation!**  
Please ensure that the module is correctly inserted into the two guide rails of the system housing as otherwise damage to the module and the housing could be caused. Make sure that the module is securely locked into the connector block before you fasten the two screws.
5. Now you can put the installed module into operation.



*Attachment points of an 1U IMS system*

## 5.1 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:

<b>PWR Slot:</b>	"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.
<b>I/O, ESI, and MRI Slots:</b>	"Hot-Pluggable"	
<b>CLK1, CLK2 Slots:</b>	"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.
<b>RSC/SPT Slots:</b>	"Hot-Pluggable"	It will not be possible for your IMS system to switch between signal generators while the RSC/SPT is not installed.
<b>CPU Slot:</b>	" <u>Not</u> Hot-Pluggable"	Before the CPU is removed, the IMS system must be powered down.  Please note that after powering on and rebooting the LANTIME Operating System, the configuration of some IMS modules may be reset to factory defaults!



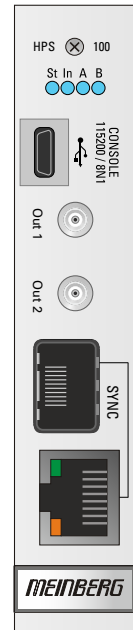
### Information:

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.

# 6 HPS-100: PTP / SyncE / Hardware NTP Interface

IEEE 1588 v2 compatible

Profiles:	<p>Custom Profile</p> <p><u>Default:</u>          Default E2E IEEE1588-2008          Default P2P IEEE1588-2008</p> <p><u>Power:</u>          Utility IEC 61850-9-3 Power Profile          IEEE C.37.238-2011 Power Profile          IEEE C.37.238-2017 Power Profile</p> <p><u>Telecom:</u>          ITU-T G.8265.1 Telecom Frequency Profile          ITU-T G.8275.1 Telecom Phase / Time Profile (full timing support)          ITU-T G.8275.2 Telecom Phase / Time Profile (partial timing support)</p> <p><u>Broadcast:</u>          SMPTE ST 2059-2 Broadcast Profile          AES67 Media Profile          IEEE 802.1AS TSN/AVB Profile          DOCSIS 3.1</p>
Operating Mode:	<p>PTP V2          PTP V1 (Performance Level C, D and E)          Monitor (Performance Level D and E)          NTP</p>
PTP Modes:	<p>Multicast/Unicast Layer 2 (IEEE 802.3)          Multicast/Unicast Layer 3 (UDP IPv4/IPv6)          Hybrid Mode          E2E / P2P Delay Mechanism          Up to 128 messages/second per client</p>
NTP Mode:	<p>NTP Server mode (8 ns time stamp accuracy)          NTPD Software Service (15,000 req./s)</p>
1588 Clock Mode:	<p>1-Step, 2-Step for both Master and Slave operation</p>
Synchronous Ethernet:	<p>Master and Slave Capability          Compliant to ITU-T G.8261, G.8262 and G.8264          Ethernet Synchronization Messaging Channel (ESMC)</p>
Network Protocols:	<p>IPv4, IPv6          DHCP, DHCPv6          DSCP          IEEE 802.1q VLAN filtering/tagging          IEEE 802.1p QOS</p>



Ethernet Interface:	Combo Port: 1 x 100/1000BASE-T RJ45, 1 x GBIT SFP - Slot
USB Interface:	USB 1.1 / USB 2.0 full-speed, Micro USB female connector
Signal Outputs:	2x SMA, TTL (50 Ohm) connectors configurable signals: 1PPS, 10 MHz, 2048 kHz
CPU:	825 MHz Cortex A9 Dual Core on SOC
Time Stamp Accuracy:	8 ns

**LED Indicators**

LED St:	Init	lights blue during initialisation, off in normal operation mode
LED In:	red	Error - TSU does not work correctly, PTP services stopped
	yellow	No link, but initialized
	green	link up
	red	stopped

LED A - LED B: Shows the current State of the TSU

yellow - yellow	Listening
green - off	Master Mode
off - green	Slave Mode
yellow - off	Passiv Mode
off - yellow	uncalibrated
red - red	stopped

**Performance Level Options:**

Option	Unicast Clients	Delay Req./s	NTP Req./s	PTPv1	PTP Monitoring
PL-A	8	1024	1600	NO	NO
PL-B	256	32768	51200	NO	NO
PL-C	512	65536	102400	YES	NO
PL-D	1024	131072	204800	YES	YES
PL-E	2048	262144	409600	YES	YES

## 6.1 HPS100 - Global Configuration

**PTP V2 Configuration**

---

**Interface 01 (Slot: MRI2)**    Network    Global    SyncE    Misc    Outputs    NTP

---

**PTP Instances**    Instance 1    Instance 2

---

**Operating Mode**  
 Disabled     PTP V2     PTP V1     NTP     Monitor

**Select Profile**  
 Custom

---

**PTP Mode**  
 Unicast Master     Hybrid-Mode

**Unicast Master Address 1**    **Unicast Master Address 2**  
 192.168.100.11    0.0.0.0

**Delay Mechanism**    **Domain Number**    **Network Protocol**  
 E2E    0    UDP/IPv4 (L3)

**Timescale**    **Priority1**    **Priority2**  
 PTP Standard (TAI)    128    128

---

**Announce Interval**    **Sync Interval**    **Delay Request Interval**  
 1 announce message every 2 seconds    1 sync message per second    1 request message every 2 seconds

---

**Interval Duration [s]**    **Announce Receipt Timeout**    **Alternate Time Offset Indicator**  
 60    3    No

**Fixed Offset [ns]**  
 0 ns

---

**Profile Specific Configuration**

Power IEEE C37.238-2011	<b>Use Profile Extensions</b> No	<b>Grandmaster ID</b> 3
Telecom ITU-T G.8265.1	<b>Network Inaccuracy</b> 0 ns	
Telecom ITU-T G.8275.1		
SMPTE ST 2059-2		
IEEE 802.1AS		
Utility IEC 61850-9-3		
Power IEEE C37.238-2017		

### Operating Mode

If supported, there is an option to run a NTP service in Server mode with hardware timestamp support. Select between PTP and NTP mode at this step. It is not possible to run both modes at the same time on one TSU card.

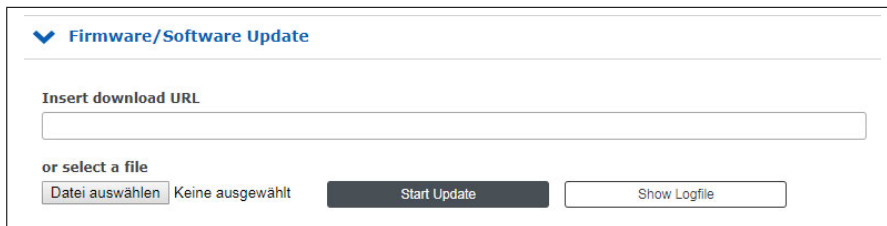
### Select Profile

User can choose among preselected sets of PTP parameters defined in profiles usually used in different industries. If the default setting “Custom” is selected, the user can select any parameter combination available in the global configuration section as long as the PTP standard allows it. Depending on the selected profile, there might be profile specific parameters available which can be found in the “Profile Specific Parameters” section below the standard PTP parameters sections.





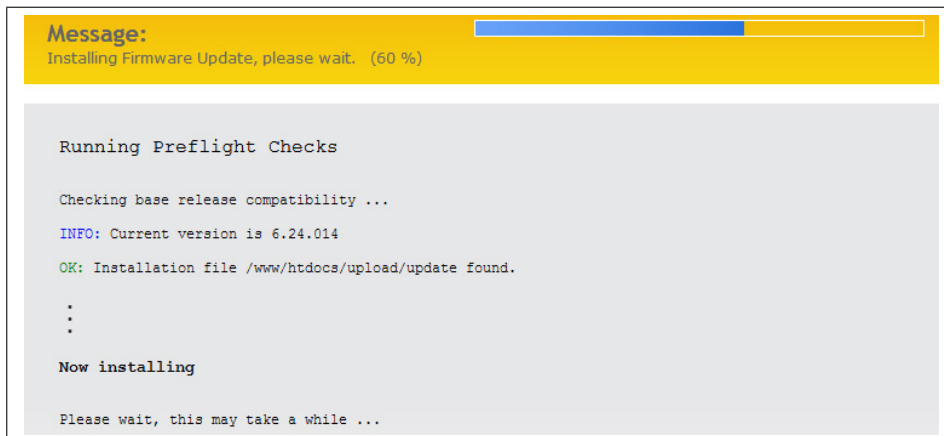
## 6.3 Firmware Update via Web Interface



The screenshot shows a web interface for firmware updates. At the top, there is a dropdown menu labeled "Firmware/Software Update". Below it, there is a text input field labeled "Insert download URL". Underneath the input field, there is a section titled "or select a file" with a button labeled "Datei auswählen" (File selection) and the text "Keine ausgewählt" (None selected). To the right of this section are two buttons: "Start Update" and "Show Logfile".

If you need to update the software of your HPS100 time stamp unit, you need a specific update file. You can download the latest HPS100 firmware version from our website: <https://www.meinbergglobal.com/english/sw/refclock-updates.htm>

The update file can be uploaded to the HPS100 by first choosing the file on your local computer with the "Browse" button and then press "Start Update". Afterwards you are prompted to confirm the start of the update process.



The screenshot shows a message box with a yellow header and a progress bar. The header text reads "Message: Installing Firmware Update, please wait. (60 %)". The main content area is a grey box containing the following text:

```
Running Preflight Checks

Checking base release compatibility ...
INFO: Current version is 6.24.014
OK: Installation file /www/htdocs/upload/update found.

:
:

Now installing

Please wait, this may take a while ...
```

## 6.4 SFP Transceiver



### Recommended and tested Transceivers from other Vendors

Mode	Vendor/Type	Distance
MULTI MODE:	AVAGO AFBR-5710PZ	550 m (1,805 ft)
	FINISAR FTLF8524P3BNL	500 m (1,640 ft)
	CISCO GLC-SX-MMD	220 m (722 ft)
SINGLE MODE:	AVAGO AFCT-5710PZ	10 km (32,808 ft)
	FINISAR FTLF1318P3BTL	10 km (32,808 ft)
	SMARTOPTICS SO-SFP-L120D-C63	80 km (262,467 ft)
RJ-45:	AVAGO ABCU-5740RZ	100 m (328 ft)
	FINISAR FCLF8521P2BTL	100 m (328 ft)

### Information:

#### Important Note for HPS100 Modules:

Since HPS firmware version  $\geq 1.4$ , an SFP Copper port is no longer supported. Therefore always use the native RJ45 port for your network copper lines.



Sending Synchronous Ethernet (SyncE) over Copper SFPs does not work!

The reason is because Copper SFPs have their own internal TCXO oscillators which are not adjustable so that the SyncE reference frequency that comes out of the system is not forwarded on the network. So the SyncE signal is free-running on a Copper SFP and therefore not useable for the next network node.

Please use a Fiber Optic SFP instead! The HPS100 module provides a native RJ45 port where SyncE via copper lines is possible.

### 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.

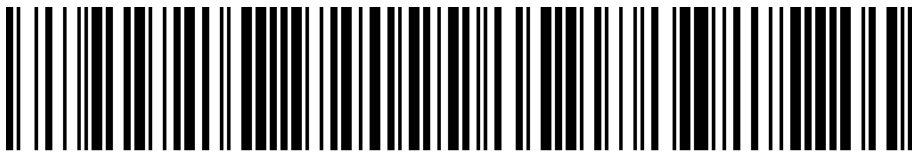
## 7 RoHS Conformity

### 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.





IMS-HPS-100\_QSG\_031123