Industriefunkuhren

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Elektronik GmbH

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Technical Manual

GPS - NTP Time Server with
2x 10/100/1000 MBit LAN Interface

Model 8030HEPTA/GPS

ENGLISH

Version: 06.01 - 06.02.2020

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	SET	IMAGE (8030)	FIRMWARE (8024)
Valid for	Version: **06.xx**	Version: **06.xx**	Version: **03.xx**

Version number (Firmware / Manual)

THE FIRST TWO DIGITS OF THE VERSION NUMBER OF THE TECHNICAL MANUAL AND THE FIRST TWO DIGITS OF THE FIRMWARE VERSION MUST **COMPLY WITH EACH OTHER**. THEY INDICATE THE FUNCTIONAL CORRELATION BETWEEN DEVICE AND TECHNICAL MANUAL.

THE DIGITS AFTER THE POINT IN THE VERSION NUMBER INDICATE CORRECTIONS IN THE FIRMWARE / MANUAL THAT ARE OF NO SIGNIFICANCE FOR THE FUNCTION.

Downloading Technical Manuals

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Homepage: http://www.hopf.com

E-mail: info@hopf.com

Symbols and Characters

Operational Reliability
Disregard may cause damages to persons or material.

Functionality
Disregard may impact function of system/device.

Information
Notes and Information.

Safety regulations

The safety regulations and observance of the technical data serve to ensure trouble-free operation of the device and protection of persons and material. It is therefore of utmost importance to observe and compliance with these regulations.

If these are not complied with, then no claims may be made under the terms of the warranty. No liability will be assumed for any ensuing damage.

Safety of the device

This device has been manufactured in accordance with the latest technological standards and approved safety regulations

The device should only be put into operation by trained and qualified staff. Care must be taken that all cable connections are laid and fixed in position correctly. The device should only be operated with the voltage supply indicated on the identification label.

The device should only be operated by qualified staff or employees who have received specific instruction.

If a device must be opened for repair, this should only be carried out by employees with appropriate qualifications or by *hopf* Elektronik GmbH.

Before a device is opened or a fuse is changed all power supplies must be disconnected.

If there are reasons to believe that the operational safety can no longer be guaranteed the device must be taken out of service and labelled accordingly.

The safety may be impaired when the device does not operate properly or if it is obviously damaged.

CE-Conformity

This device fulfils the requirements of the EU directive 2014/30/EU "Electromagnetic Compatibility" and 2014/35/EU "Low Voltage Equipment".

Therefore the device bears the CE identification marking
(CE = Communautés Européennes = European communities)

The CE indicates to the controlling bodies that the product complies with the requirements of the EU directive - especially with regard to protection of health and safety for the operator and the user - and may be released for sale within the common markets.

Contents   Page

1   GPS - NTP Time Server 8030HEPTA/GPS

By GPS time synchronization and the worldwide used time protocol **NTP (Network Time Protocol)** the Time Server 8030HEPTA/GPS turns into a highly accurate **NTP Stratum 1** Time Server. It is used for the synchronization of computers and industrial networks.

The Time Server supports the following synchronization protocols:

- NTP (incl. SNTP)
- Daytime
- Time
- SINEC H1 time datagram (**Activation Key necessary**)
- IEEE 1588 Precision Time Protocol (PTP) (**Activation Key necessary**)

Front Side
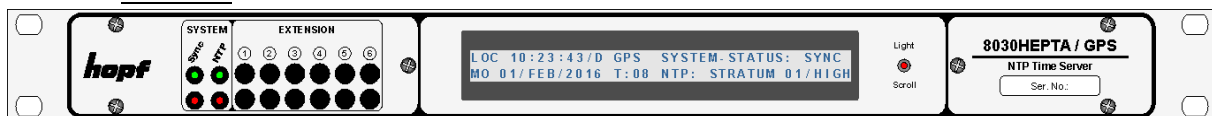
Rear Side
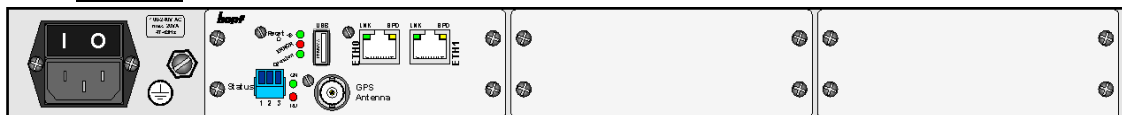
The Time Server 8030HEPTA/GPS is integrated into a 1U/84HP 19" rack and characterized by its easy and simple operation. Some of these practice-oriented functionalities are e.g.:

- **Complete parameterisation via protected WebGUI access**
  All required settings for operation can be executed via a password protected WebGUI also giving an overview of the status of the Time Server 8030HEPTA/GPS.

- **LCD-Display and Status-LEDs in the front panel**
  The LCD-Display and the Status-LEDs make rapidly and easily substantial information for commissioning, on the operating status and for support matters available if a problem occurs, even without WebGUI access.

- **Monitoring of GPS antenna circuit**
  An error message is generated when there is a short circuit in the GPS antenna circuit or an open antenna input.

- **Automatic switch-over of summer/winter time** (initial setting required)
  After initial commissioning there is no user intervention for a correct summer/winter time changeover for the following years required.

- **Automatic handling of the leap second**
  Should a leap second be inserted in the UTC time, it is recognized by the Time Server 8030HEPTA/GPS via the GPS signal and the leap second is automatically inserted in the time information.

- **Customized extensions possible**
  The new designed housing concept allows customized system extensions for additional signal outputs (processed ex-works) easily and fast.

A superior security is guaranteed via available coding procedures such as symmetric keys, autokey and access restrictions and deactivation of non-used protocols.

Different **Management and Monitoring Functions** are available **as options** (e.g. SNMP, SNMP-Traps, E-mail notification, Syslog-messages including MIB II and private Enterprise MIB).

The Time Server 8030HEPTA/GPS currently has unlockable features that are described in *Chapter 4.5 Activation of Functions (Activation Key)*:

- SINEC H1 time datagram
- Static Routing Table
- Alarming and management features
- Network Interface Bonding/Teaming
- IEC 62439-3 Parallel Redundancy Protocol (PRP)
- IEEE 802.1Q Tagged VLAN
- IEEE 1588 Precision Time Protocol (PTP)

A few other basic functions of the Time Server 8030HEPTA/GPS:

- The Time Server 8030HEPTA/GPS operates as **NTP Server with Stratum 1**
- Easy operation via **WebGUI**
- **LCD-Display (2x40) and Status LEDs on the front panel**
- **Sync status output** via optical coupler
- **High freewheel accuracy** provided by GPS-supported regulation of the internal quartz basis
- Completely **maintenance-free** system
- **SyncOFF Timer** (reception failure bypassing) for operation free of fault messages even based on difficult reception conditions
- Redundant **multiple validation** of the synchronization signal for an error-free and leap free signal evaluation
- Maintenance-free, buffered **backup clock** for at least three days

Software supplied:

- **hmc** (**hopf** Management Console) Software

Overview of the functions of the network Time Server 8030HEPTA/GPS:

Two Ethernet Interfaces
- Auto negotiate
- 10 Mbps half-/full duplex
- 100 Mbps half-/full duplex
- 1 Gbps full duplex

Time Protocols
- RFC-5905 NTPv4 Server
    - NTP Broadcast Mode
    - NTP Multicast Mode
    - NTP Client for additional NTP Servers (redundancy)
    - SNTP Server
    - NTP Symmetric Key Encryption
    - NTP Autokey Encryption
    - NTP Access Restrictions
- SINEC H1 time datagram **(Activation Key necessary)**
- RFC-867 DAYTIME Server
- RFC-868 TIME Server
- Precision Time Protocol (PTP) according to IEEE Std 1588™-2008 **(Activation Key necessary)**
    - IEEE Standard Profile for Use of IEEE 1588™ Precision Time Protocol in Power System Applications (Power Profile) according to IEEE Std C37.238™-2011

Network Configuration (Activation Key necessary)
- Routing
- Bonding (NIC Teaming) Link aggregation according to IEEE 802.1ad
- VLAN support according to IEEE 802.1q
- PRP (Parallel Redundancy Protocol) according to IEC62439-3

System Management (Activation Key necessary)
- E-mail notification
- Syslog messages to external syslog server
- SNMPv2c/v3, SNMP Traps (MIB II, Private Enterprise MIB)

Configuration Channel
- HTTP/HTTPS WebGUI (browser-based)
- Telnet
- SSH
- External LAN configuration tool (*hmc* – **Network-Configuration-Assistant**)

Additional Features
- Firmware Update via TCP/IP
- Fail-safe
- Watchdog circuit
- Customizable security banner
- NTP local time support

2 System Structure

The system 8030HEPTA/GPS consists of the following:

- 1/1 19" module rack 1U/84HP (Slim Line)
- System front panel with LCD-Display (2x40), pushbutton and status LEDs

System front view:

- Wide-ranging power supply unit from 100-240V AC / 20VA (Standard) or 40VA (47-63Hz). Other input voltages available
- Voltage feed with power switch with connections in accordance with IEC/EN60320/C14 including EMI line filter
- Connection for protection earth (PE) cables up to 16mm²
- Module 8030HEPTA
- Module 8024GPS
- Space for up to 8 additional output modules depending on system structure

System rear side:
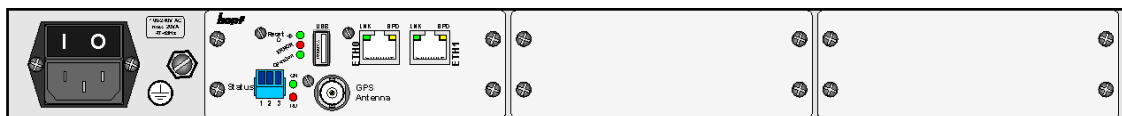
The new designed housing concept allows customized system extensions for additional signal outputs (processed ex-works) easily and fast.

2.1 19 inch Rack 1U/84HP (Slim Line)
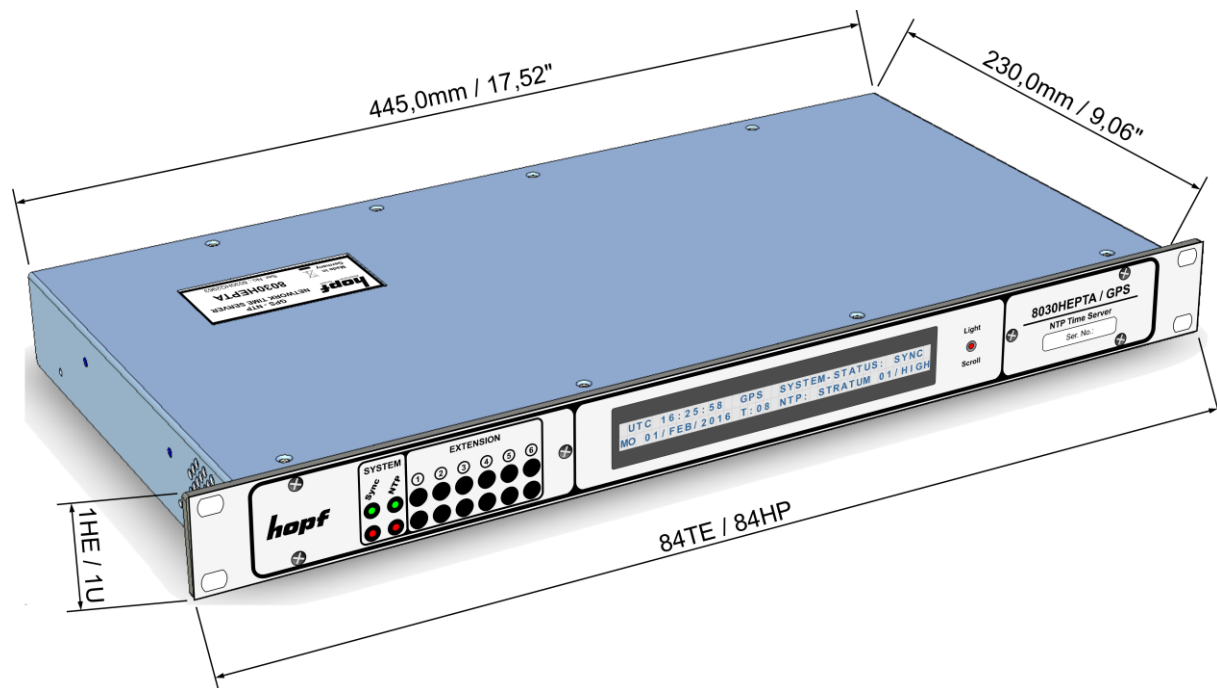
2.2 Functional Overview of the Front Panel Elements

This chapter describes the individual function elements of the front and rear panel.

2.2.1 LCD-Display with Pushbutton
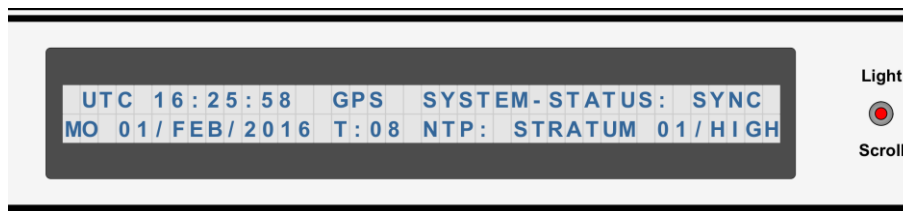
The background illumination of the LCD-Display is activated or rather controlled by the pushbutton Light/Scroll.

The 2x40 LCD-Display enables reading out the time and further essential information for the commissioning, the operation status, and for support even without WebGUI access.

The operation and function of the pushbutton and the display are described in *Chapter 7 LCD-Display with Pushbutton – Function*.

2.2.2 Status-LEDs – System (& Extension)

The Status LEDs on the front panel indicate the current synchronization and operation status of the System 8030HEPTA/GPS. Meanings of the LEDs are the following:

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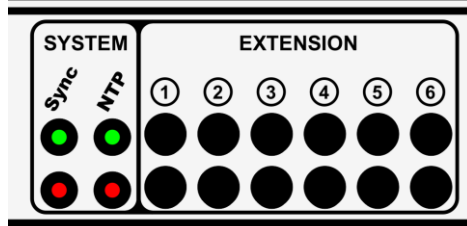
i During the boot process, all LEDs are flashing in a test sequence.

System - Sync			
Status LEDs			
Green	**Red**	**Sync-Status**	**Status Code**
ON	Off	**Sync** (radio-synchronous) with quartz regulation	**SYNC**
Flashes	Off	**Sync** (radio-synchronous) - SyncOFF timer running	**SYOF**
ON	Flashes	**Sync** (radio-synchronous) - simulation mode	**SYSI**
Flashes	Flashes	**Quarz** - SyncON timer running	**QUON**
ON	ON	**Quarz** - time was set via synchronization source	**QUEX**
Flashes	ON	**Quarz** - time set manually or after reset	**QUSE**
Off	ON	**No valid time**	**INVA**
Off	Off	No operating voltage / faulty	---

System - NTP				
Status LEDs		**NTP-Status**		
Green	**Red**	**NTP Service**	**STRATUM**	**ACCURACY**
Off	On	Not Active	---	Low
Flashes 1Hz 50%	On	Active	16	Low
Flashes 1Hz 10%	Flashes 1Hz 50%	Active	2-15	Low
Flashes 1Hz 50%	Flashes 1Hz 50%	Active	2-15	Medium
On	Flashes 1Hz 50%	Active	2-15	High
Flashes 1Hz 10%	Off	Active	1	Low
Flashes 1Hz 50%	Off	Active	1	Medium
On	Off	Active	1	High

2.2.3 Reset-(Default) Button

The Reset-(Default) Button is accessible with a thin object through the small drilling in the front panel next to the "Reset" inscription" (see **Chapter 4.3 Reset-(Default) Button**).

2.2.4 Status LEDs (TS/Error/Operation)

TS-LED (Green)	Time service of the Time Server 8030HEPTA/GPS
On	**Standard**, running
Off	Not or partially not running
ERROR-LED (Red)	**Description**
Off	**Standard case**, system 8030HEPTA/GPS is working.
3Hz flashing	Fail-safe basic parameterization is not available (emergency operation mode)
On	Primary CPU of system 8030HEPTA/GPS does not show any activity.
Operation-LED (Green)	**Description**
On	**Standard case**, system 8030HEPTA/GPS is working
1Hz flashing	System 8030HEPTA/GPS is booting the operating system.
3Hz flashing	A firmware update (image) of system 8030HEPTA/GPS is being executed.
Off	System 8030HEPTA/GPS is **not** ready for operation.

2.2.5 USB-Port (Host)
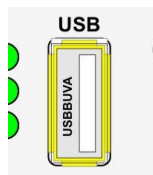
On specific problems the USB connection can be used for a system recovery after consulting the **hopf** Support.

2.2.6 LAN Interface ETH0/ETH1

LNK LED (Green)	Description
Off	10 MBit Ethernet detected
On	100 MBit / 1 GBit Ethernet detected

SPD LED (Yellow)	Description
Off	No LAN connection to a network
On	LAN connection available
Flashes	Network activity at ETH0 (transmission / reception)

Pin No.	Assignment
1	TX_DA+
2	TX_DA-
3	RX_DB+
4	BI_DC+
5	BI_DC-
6	RX_DB-
7	BI_DD+
8	BI_DD-

2.2.6.1 MAC-Address for ETH0/ETH1

Each LAN interface is clearly identifiable on the Ethernet via a unique MAC Address (hardware address).

The MAC addresses given for the LAN interfaces can be read in WebGUI of the appropriate board or be evaluated via the **hmc Network Configuration Assistant.**

The MAC address for ETH1 is incremented hexadecimal by 1 to the MAC address of ETH0.

Example:

- MAC address ETH0 = 00:03:C7:12:34:59
- MAC address ETH1 = 00:03:C7:12:34:5A

The MAC address is uniquely assigned for each LAN interface by the company **hopf** El-ektronik GmbH.

i	**hopf** Elektronik GmbH MAC addresses begin with **00:03:C7**:xx:xx:xx.

2.2.7 Sync Status Optical Coupler
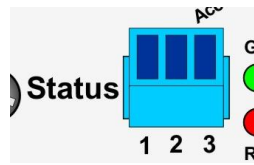
Sync Status Optical Coupler	
3-pole pluggable Connector	
Pin	**Signal**
1	Collector
2	n.c.
3	Emitter

2.2.8 Sync Status LEDs
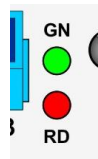
Sync Status LEDs	
LED	**Meaning**
RD	Status LED red
GN	Status LED green

The Status LEDs on the front panel signal the current (synchronization) status of the Sync Source (here Module 8024GPS). The meanings of the LEDs are as follows:

LED RD Red	LED GN Green	Status	STATUS Code
Off	ON	**Sync** (radio-synchronous) with quartz regulation	**SYNC**
Off	Flashes	**Sync** (radio-synchronous) - SyncOFF timer running	**SYOF**
Flashes	ON	**Sync** (radio-synchronous) - simulation mode	**SYSI**
Flashes	Flashes	**Quarz** - SyncON timer running	**QUON**
ON	ON	**Quarz** - time was set via synchronization source	**QUEX**
ON	Flashes	**Quarz** - time set manually or after reset	**QUSE**
ON	**Off**	**No valid time**	**INVA**
Off	**Off**	No operating voltage / faulty	---
3Hz	**Off**	**General Module Error (PCID)**	**INVA**
3Hz	**Invert 3Hz**	**User settings missing (Difference time / ST-WT Changeover)**	**INVA**

2.2.9 GPS Antenna Input

GPS Antenna	
BNC connector	
GPS	Antenna input

ℹ️ The antenna input provides an internal monitoring for "short-circuit" and "open input".

2.2.10 Extension Modules 1 – 6 (Option)

All installed system extensions deviating from the standard system 8030HEPTA/GPS including the pertinent Status LEDs are documented and described in a device-specific supplementary instruction.

3 Function Principle

This chapter describes the function principle of the Time Server 8030HEPTA/GPS and the internal relations between the different functional groups.

3.1 Block Diagram
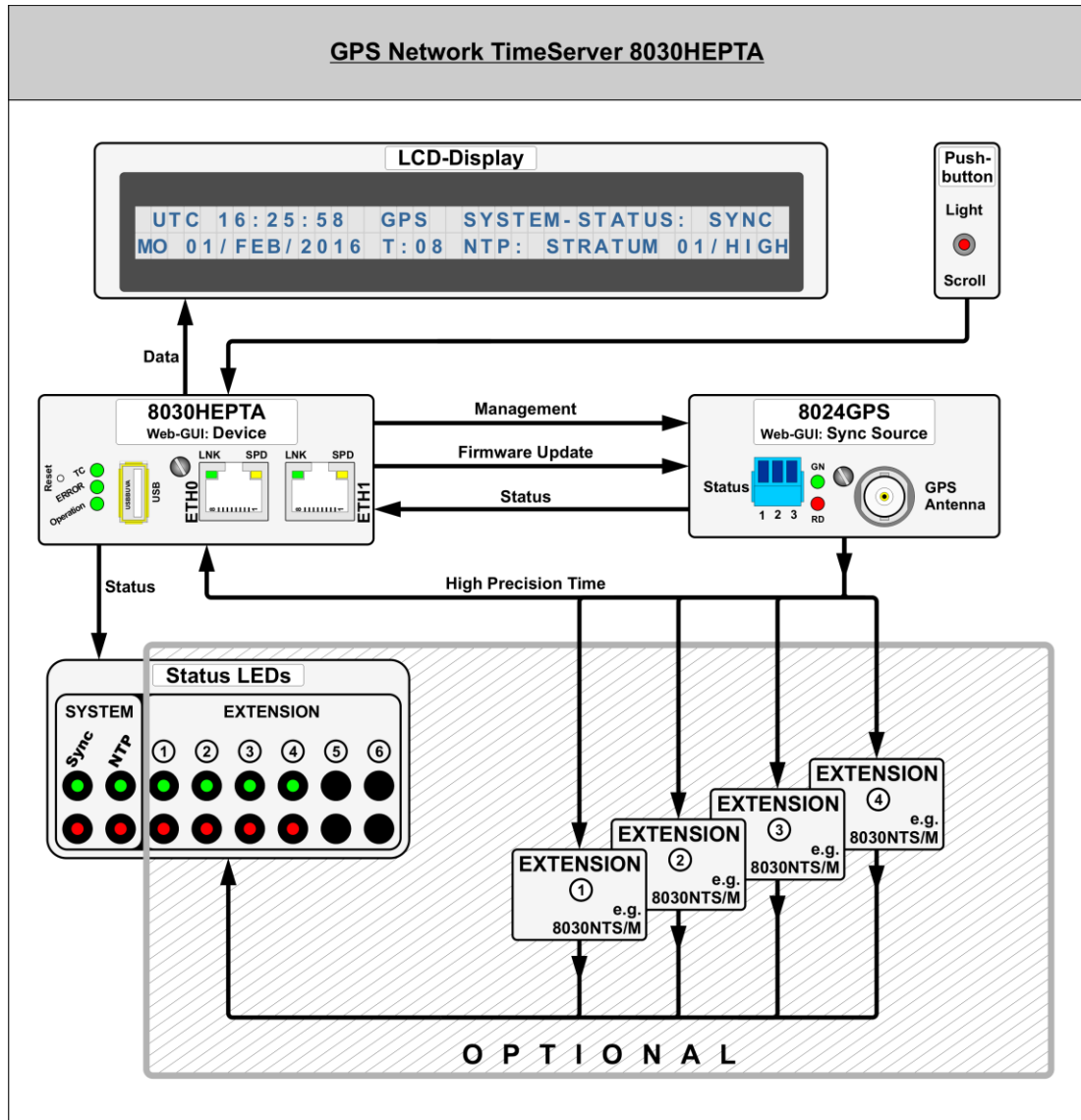
- **Firmware Update**

  A H8 firmware update of the Sync Source (here Module 8024GPS) is completely controlled by Module 8030HEPTA.

  The update file for Module 8024GPS is loaded into Module 8030HEPTA via LAN through the WebGUI. Then Module 8030HEPTA performs the update of the Sync Source (here Module 8024GPS) independently.

- **Management**

  The entire control of the Sync Source (here Module 8024GPS) is done by Module 8030HEPTA. All data of the Sync Source, indicated via WebGUI, are demanded cyclically by Module 8030HEPTA from the Sync Source or if necessary. These data are then prepared for the display in WebGUI. After activation settings for the Sync Source are transferred to the Sync Source immediately.

- **High Precision Time**

  The Sync Source provides a high-precision time information and the according synchronization status to Module 8030HEPTA. This time and status information is used for synchronization of the time sync services and if applicable other signal generations running on 8030HEPTA.

3.2 Function 8030HEPTA (WebGUI: Device)

The Module 8030HEPTA is the "heart" of the Time Server 8030HEPTA/GPS. A complete LINUX operating system is running on this Module providing all functions such as NTP, WebGUI etc. The Module also controls the connected Sync Source (here Module 8024GPS). Using the high-precise time information of Module 8024GPS the NTP service and all further time sync services running on Module 8030HEPTA is also adjusted with high-precision. Thus the Module 8030HEPTA is a very precise **NTP STRATUM 1 - Time Server**.

3.3 Function 8024GPS (WebGUI: Sync Source)

The Module 8024GPS is in principle an independent Module with GPS receiver and its own µProcessor. In synchronous status it provides a high-precise time information to the Module 8030HEPTA. The control of Module 8024GPS in this system is completely done via Module 8030HEPTA. Parameters required by Module 8024GPS or provided are entered into WebGUI of Module 8030HEPTA or rather be output.

The Module 8024GPS has an own failsafe memory in which all required data for operation after generation via WebGUI are stored.

As the data of the Sync Source for the WebGUI indication need to be received by the Module 8030HEPTA at first, it is **no real-time indication** in **WebGUI**.

3.4 LCD-Display with Pushbutton

System settings cannot be changed via the pushbutton nor the display. The display allows the readout of important system and operation parameters directly at the device, even without WebGUI access.

Update of the data in both the display and the WebGUI is subject to specific refreshing cycles. The display indicates if the refreshing cycle is not completed yet.

3.5 System EXTENSION 1 - 8 (Option)

System 8030HEPTA/GPS can be expanded with additional modules ex works. Therefore four extension slots are available.

Each extension slot can either be equipped with one NTP time server module 8030NTS/M (each with two GigaBit LAN interfaces) or max. two output modules.

Additionally implemented NTP time server modules 8030NTS/M are mutually independent and are going to be parameterized via their WebGUI. The operating status of each module 8030NTS/M will be displayed via 2 status LEDs on the front panel which are assigned to the particular module 8030NTS/M via the related EXTENSION number. If the application is exclusively equipped with modules 8030NTS/M, max. 4 mutually independent modules 8030NTS/M can be implemented.

Output modules issue signals of the internal signal generators of module 8030HEPTA via various electrical levels or via fiber optic. Parameterization of the particular signal generator can be done via WebGUI of module 8030HEPTA. Status of the output modules will not be monitored via status LEDs on the front panel. If the clock system is exclusively equipped with output modules, max. 8 output modules can be implemented.

System front view:

System rear side / plug-in side:


All installed system extensions deviating from the standard system 8030HEPTA/GPS including the pertinent Status LEDs are documented and described in a device-specific supplementary instruction.

4 System Behaviour

This chapter describes the behaviour of the system in special operational phases and conditions.

4.1 Boot Phase

The boot process of the Time Server 8030HEPTA/GPS starts after turning on the system or a reset.

This phase can be recognized by the LCD-Display and activated LED test of the Status LEDs in the front panel.

During the boot process the Module 8030HEPTA boots its LINUX operation system and is therefore not available via LAN.

The end of the boot process is reached when the LCD-Display changes to the standard picture and the LED test of the Status-LEDs in the front panel has been finished.

> **i** Boot phase takes approx. 35 seconds by using static IP-addresses for ETH0 and ETH1. Boot phase can be extended, depending on the network configuration in use (e.g. DHCP).

4.2 NTP Adjustment Process (NTP/Stratum/Accuracy)

NTP is a regulation process. After start of the NTP services, automatically processed during booting, the Time Server 8030HEPTA/GPS requires approximately 5-10 minutes after synchronization of the Sync Source (Status "SYNC") until NTP is set to the high accuracy of the Sync Source (here Module 8024GPS) and reaches the optimized operation condition of **<u>STRATUM = 1</u>** and **<u>ACCURACY = High</u>**.

The decisive factors here are accuracy of the synchronization source and the appropriate synchronization condition of the Sync Source.

4.3 Reset-(Default) Button

The Time Server 8030HEPTA/GPS can be reset by the Reset-(Default) Button behind the front panel of the board. The Reset-(Default) Button is accessible with a thin object through the small drilling in the front panel.

The button triggers different functions depending on how long it is pressed:

Duration	Function
< 1 sec.	No action
1 - 9 sec.	After releasing a system wide **hardware reset** is triggered
>= 10 sec.	After releasing a **FACTORY DEFAULT** followed by a **REBOOT** is triggered after approx. 10 seconds

4.4   Firmware Update

The Time Server 8030HEPTA/GPS is a multi-processor system. For this reason a firmware update always consists of a so called Software SET including three (3) program releases defined by the SET version needed to be loaded into the board.

Module 8030HEPTA (WebGUI: Device):

1x Image Update	upgrade_8030gen_rel_vXXXX.img
1x H8 Update	H8_8030HEPTA_vXXXX_128.mot

Module 8024GPS (WebGUI: Sync Source):

1x H8 Update	8024A_vXXXX_128.mot

An update is a critical process.
The device must not be turned off during the update and the network connection to the device not be interrupted.

All programs of a SET needed to be uploaded to ensure a defined operation condition.

The program releases assigned to a SET version may be taken from the release notes of the software SETs of the Time Sever 8030HEPTA/GPS.

4.4.1   Firmware Update 8030HEPTA (WebGUI: Device)

The general process of a software update of Module 8030HEPTA is described below:

For selection of the correct update set the identifier **8030HEPTA** has to be observed obligatory.

8030HEPTA can be recognized:
- By the label on the housing cover "**8030HEPTA**"
- In WebGUI at the Web-banner "**8030HEPTA**"

The firmware update 8030HEPTA has to be performed as a SET.

The software package contained in the file package hopf8030HEPTA_GPS_SET_vXXXX.zip has to be unpacked. The following steps have to be executed in the following sequence:

1. **Image Update 8030HEPTA**

2. **H8 Firmware Update 8030HEPTA**

3. **H8 Firmware Update 8024GPS**

Image Update 8030HEPTA

1. Log in as Master in WebGUI of the board.

2. Select in **Device** tab the menu item **Image Update**.

3. Select the file with the file **.img** via the selection window
   (Exapmle: **upgrade_8030gen_rel_vXXXX.img**).

4. The selected file is shown in the selection window.

5. The update process is started with the button **Upload now**.

6. In WebGUI the successful file transfer and writing to the Module is indicated.

7. In WebGUI the successful update is indicated after 2-3 minutes with the request to release a reboot of the board.

8. After activation and successful reboot of the board the image update process is finished.

H8 Firmware Update 8030HEPTA

1. Log in as Master in WebGUI of the board.

2. Select in the **Device** tab the menu item **H8 Firmware Update**.

3. Select the file with the file extension **.mot for Module 8030** via the selection window (Example: **H8_8030HEPTA_vXXXX_128.mot**).

4. The selected file is shown in the selection window.

5. The update process is started with the button **Upload now**.

6. In WebGUI the successful file transfer to the Module is indicated.

7. Now the update of the board automatically starts after a few seconds.

8. After successful update the board automatically reboots.

9. After approx. 2 minutes the H8 update process is finished and the board is again accessible via WebGUI.

4.4.2   Firmware Update 8024GPS (WebGUI: Sync Source)

H8 Firmware Update 8024GPS

1. Log in as Master in WebGUI of the board.

2. Select in the **GPS SYNC SOURCE** tab the menu item **H8 Firmware Update**.

3. Select the file with the file extension **.mot for Module 8024** via the selection window (Example: **8024A_vXXXX_128.mot**).

4. The selected file is shown in the selection window.

5. The update process is started with the button **Upload now**.

6. In WebGUI the successful file transfer to the Module is indicated.

7. Now the update of the board automatically starts after a few seconds.

8. After successful update the board automatically reboots.

9. After approx. 2 minutes the H8 update process is finished and the board is again accessible via WebGUI.

4.5 Activation of Functions (Activation Key)

The Time Server 8030HEPTA/GPS offers several functions that require an "Activation Key".

These functions are only available after entering a valid activation key (depending on the serial number of the particular module 8030HEPTA respectively 8030NTS/M, not depending on the serial number of the entire clock system). The serial number can be found in the WebGUI via Device / Serial Number: 8030xxxxxx.

The required function(s) can be activated at time of delivery as well as subsequently on site by the user.

Please find an overview of the above mentioned functions here:

- **Network Interface Bonding/Teaming**
  By activating this function the LAN interfaces ETH0 and ETH1 can be bundled to one logical network interface. This feature plays a key role in redundantly structured networks to increase fail-safety of the NTP time service.

- **IEEE 802.1Q Tagged VLAN**
  By activating this function network interfaces can be configured with additional VLANs (Virtual Bridged Local Area Networks) according to IEEE 802.1q.

- **Static Routing Table**
  This function is suitable for configuring static routes based on special network configuration requirements.

- **IEC 62439-3 Parallel Redundancy Protocol**
  The PRP functionality enables to bundle the physical network interfaces ETH0 and ETH1 to one logical network interface using the Parallel Redundancy Protocol (PRP).

- **IEEE 1588 Precision Time Protocol**
  By activating this function Precision Time Protocol (PTP) according to IEEE Std 1588™-2008 can be configured.

- **Alarming and management features**
  This function enables to use **SNMP (SNMPv2c, SNMPv3), Syslog and Email notification** to monitor the system status. Together with the assets provided in the MIB II by default, the *hopf* Private Enterprise MIB is also made available. By using the *hopf* Private Enterprise MIB numerous product-specific assets for realizing extended management and control functions are available.

- **SINEC H1 time datagram**
  By activating this function SINEC H1 time datagram can be parameterized and issued via the LAN interface.

> The settings for activation keys (e.g. an entered activation key) are neither modified nor influenced by the function FACTORY DEFAULTS.

5   Installation

The installation of the Time Server 8030HEPTA/GPS is described below.

5.1   System 8030HEPTA/GPS in 1U Slim Line Housing

5.1.1   Installation of the 19 Inch Rack

The System is assembled in a 1U/84HP 19" housing for control cabinet installation (measurement see *Chapter 2.1 19 inch Rack 1U/84HP (Slim Line)*).

The following steps are to be carried out:

- Place the rack in the control panel and fix to the mounting brackets on the front side of the rack using 4 screws.

> The side ventilation apertures on the right and left hand sides must not be covered. Otherwise ventilation will not be effective and lack of convection and / or thermal coupling with surrounding equipment may give rise to an excessive equipment operating temperature.

- Ensure that there is sufficient space between the back of the rack and the control panel to allow connection and data lines with the system

5.1.2   Earthing

The Time Server 8030HEPTA/GPS is usually earthed via the PE cable of the power supply.

An additional earth cable for surge protection purposes can be connected by means of the earth screw located on the rear side of the System housing.

5.1.3   AC Power Supply

The Systems' standard AC power supply unit is described here. However, the connection data on the nameplate of the respective unit is always applicable.

Attention should be paid to the following when connecting the power supply:

- Correct voltage type (AC or DC)
- Voltage level

The power feed is via an input connector with EMI filter compliant with IEC/EN 60320-1/C14

- Check that the mains power switch is in position " **0** " (= off).
- Plug the input connector into the System's mains power inlet.
- Connect the input connector to the mains power supply and switch the line circuit breaker on.

> The Time Server 8030HEPTA/GPS can be damaged if incorrect voltage is connected.

5.1.3.1 Safety and Warning Instructions

Please read these instructions fully in order to guarantee safe operation of the equipment and to be able to use all the functions.

> **Caution:** Never work on an open unit when voltage is applied! Danger to life!

The Time Server 8030HEPTA/GPS is an installation device. Installation and commissioning may only be carried out by suitably qualified specialist personnel. In doing so the respective country-specific specifications must be observed (e.g. VDE, DIN).

Before commissioning ensure that:

- The power supply has been connected correctly and electrical shock protection is in place
- The earth wire is connected
- All supply cables are correctly sized and fused
- All output cables are suitably sized or specially fused for the max. output current of the equipment
- Sufficient convection is guaranteed

The equipment contains life-threatening components and a high level of stored energy.

5.1.3.2 Power Supply Unit Specifications

All AC power supply specifications are described in ***Chapter 12 Technical Data***.

5.1.3.3 Fusing

Pay attention to the correct fusing of the power supply when connecting the Time Server 8030HEPTA/GPS.

The corresponding performance data can be taken from the equipment nameplate. The Time Server 8030HEPTA/GPS is currently fitted with a power supply unit with a power consumption of max. 20VA (Standard) or 40VA (47-63Hz).

> If the internal fuse (device protection) trips it is highly probable that the equipment is faulty. In this case the device should be checked in the factory.

5.1.4 DC Power Supply

5.1.4.1 DC Power Supply Option 1

Ensure that the external power supply is switched off. When connecting the supply cable make sure that the polarity is correct and the equipment is earthed.
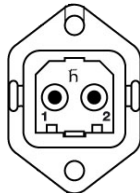
- The cable of the power supply is connected using a 2-pole plug connector with additional earth connection and inter-locked with the Time Server 8030HEPTA/GPS:

  $+V_{in}$:   Positive pole (contact 1)
  $-V_{in}$:   Negative pole (contact 2)
  PE: Earth

The Time Server 8030HEPTA/GPS can be damaged if incorrect voltage is connected.

Earthing:
By default the minus pole (-Vin) and earthing (PE) are connected system-sided.

5.1.4.2 DC Power Supply Option 2

Ensure that the external power supply is switched off. When connecting the supply cable make sure that the polarity is correct and the equipment is earthed.
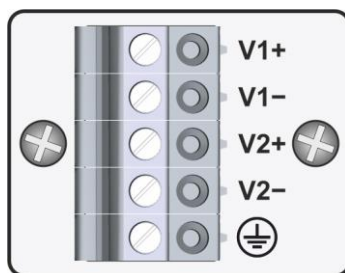
- This variant supports redundant power supply. The power supply is connected to the Time Server 8030HEPTA/GPS via 5 screw terminals:

  $+V1_{in}$:   Positive pole Input 1
  $-V1_{in}$:   Negative pole Input 1
  $+V2_{in}$:   Positive pole Input 2
  $-V2_{in}$:   Negative pole Input 2
  PE: Erdung

The Time Server 8030HEPTA/GPS can be damaged if incorrect voltage is connected.

Earthing:
By default the minus pole (-Vin) and earthing (PE) are connected system-sided.

5.1.4.3 Power Supply Unit Specifications

All DC power supply specifications are described in ***Chapter 12 Technical Data***. The specifications for DC Power Supply Option 1 and DC Power Supply Option 2 are identical.

5.1.4.4 Fusing

Pay attention to the correct fusing of the power supply when connecting the Time Server 8030HEPTA/GPS.

The corresponding performance data can be taken from the equipment nameplate. The Time Server 8030HEPTA/GPS is currently fitted with a power supply unit with a power consumption of max. 20VA (Standard) or 40VA (47-63Hz).

> If the internal fuse (device protection) trips it is highly probable that the equipment is faulty. In this case the device should be checked in the factory.

5.1.4.5 Reverse Voltage Protection

The version of Time Server 8030HEPTA/GPS with DC supply has reverse voltage protection. This protection prevents damage to the equipment due to an incorrectly connected DC power supply.

Protection is effected by means of a self-resetting fuse. In the case of reverse polarity, it is necessary to switch the equipment off for approx. 20 seconds after this fuse has tripped. The power supply can then be connected with the correct polarity.

5.2 Connection GPS Antenna System

The coaxial line of the GPS antenna system is placed on the BNC female connector with the **"GPS Antenna"** inscription on the rear side of the Time Server 8030HEPTA/GPS. More detailed descriptions referring to the installation of the antenna system, for example, cable lengths and cable types, are described in the document "Antenna System GPS".

GPS Antenna	
BNC connector	
GPS	Antenna input

There is an antenna input monitoring for "open" and "short-circuit" on the system side.

5.3 Connection LAN Interface ETH0/ETH1

LNK LED (Green)	Description
Off	10 MBit Ethernet detected
On	100 MBit / 1 GBit Ethernet detected

SPD LED (Yellow)	Description
Off	No LAN connection to a network
On	LAN connection available
Flashes	Network activity at ETH0 (transmission / reception)

Pin No.	Assignment
1	TX_DA+
2	TX_DA-
3	RX_DB+
4	BI_DC+
5	BI_DC-
6	RX_DB-
7	BI_DD+
8	BI_DD-

5.4 Connection Sync Status Optical Coupler

The Sync Status Optical Coupler connection is a 3-pole pluggable screw terminal.
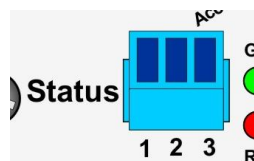
Sync Status Optical Coupler	
3-pole pluggable Connector	
Pin	**Signal**
1	Collector
2	n.c.
3	Emitter

6 Commissioning

This chapter describes commissioning of the Time Server 8030HEPTA/GPS.

6.1 General Procedure

Overview of the general commissioning procedure:

- Finish the installation process completely
- Switch on the device
- Wait until the booting phase is finished (see **Chapter 4.1 Boot Phase**)
- Using the SEARCH Function of the separate **hmc** Software (Network Configuration Assistant) in order to access the Time Server 8030HEPTA/GPS and set the basis LAN parameters (e.g. DHCP). Afterwards connect to the WebGUI of the Time Server 8030HEPTA/GPS via Web browser

  OR

  Connect directly with the factory default IPv4-address (ETH0: 192.168.0.1 or ETH1 in DHCP) to the WebGUI of the Time Server 8030HEPTA/GPS via Web browser
- Log in as **"master"**
- Change default passwords for **"master"** and **"device"** In the **DEVICE tab**
- Set all required LAN parameters (e.g. entry of DNS server) in **NETWORK tab** if necessary
- Check current settings in **NTP tab** and modify according to individual needs as necessary
- Parameterize following values of the Sync Source (here Module 8024GPS) in **GPS SYNC SOURCE** tab:
  - o Set current UTC time
  - o Set the local difference time to UTC
  - o Set or deactivate the changeover times for summer/winter time
  - o Check values for reception mode, SyncON/SyncOFF Timer and status OC

  Trigger a **Module Reset** after the above mentioned entries
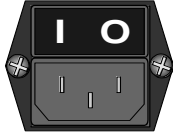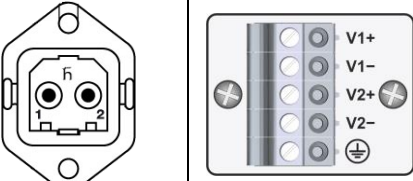
> ⚠ In order to obtain correct time outputs in local time or standard time, the time difference at UTC and the summer / winter time changeover must be parametrised during the first startup and after every factory default.

- Check for **Module Error** in register **GPS SYNC SOURCE**
- Parameterize optional functions e.g. SNMP or SINEC H1 time datagram

- If all base settings are carried out correctly and there is GPS reception, the **GENERAL** tab should look like this after approx. 5 min. (30 min. at initial start-up):
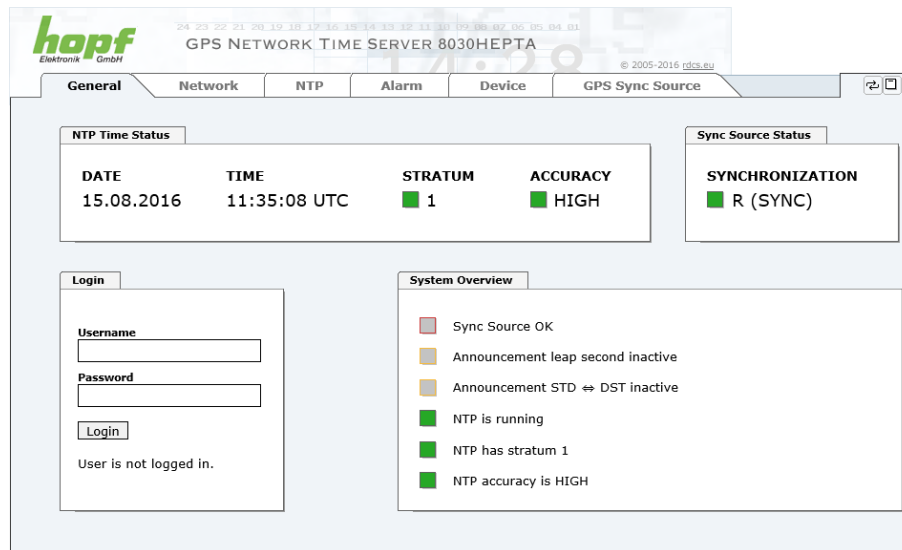
6.2 Switching the Operating Voltage on

AC power supply:	
	Put the mains power switch into position " **I** " (on). The Time Server 8030HEPTA/GPS starts running with the boot process indicated in the display (see *Chapter 6.3 LCD-Display after Switch On / Reset (Boot Phase)).*

DC power supply (Option 1 or Option 2):		
		Switch on external power supply source. The Time Server 8030HEPTA/GPS starts running with the boot process indicated in the display (see *Chapter 6.3 LCD-Display after Switch On / Reset (Boot Phase)).*

6.3 LCD-Display after Switch On / Reset (Boot Phase)

In the 2x40digit LCD-Display the following start-up picture appears for the boot phase after switching on or a reset:

```
    hopf 8030HEPTA/GPS : Booting...
    Status-LEDs (Front): LED-Test active
```

6.4 Establish the Network Connection via Web Browser

!	Ensure that the network parameters of the Time Server 8030HEPTA/GPS are configured in accordance with the local network before connecting the device to the network.

!	Connecting a network to an incorrectly configured Time Server 8030HEPTA/GPS (e.g. duplicate IP address) may cause interference on the network.

!	The Time Server 8030HEPTA/GPS is supplied with: **ETH0 with static IPv4-address** IPv4 address: 192.168.0.1 IPv4 Network mask: 255.255.255.0 Gateway: not set **ETH1 with DHCP**

!	In case it is not known whether the Time Server 8030HEPTA/GPS with a Factory Default setting causes problems in the network, the basis network parameterization should be executed via a "Peer to Peer" network connection.

i	Request the required network parameters from your network administrator if those are unknown.

The network connection is made via a LAN cable and RJ45 plug (recommended cable type: CAT5e or better).

6.5 Network Configuration for ETH0 via LAN through *hmc* software

After connecting the system to the power supply and creating the physical network connection to LAN interface of the Time Server 8030HEPTA/GPS, the device can be searched for on the network via the *hmc* Software. Then the base LAN parameters (IPv4 address, IPv4 netmask and gateway or DHCP) may be adjusted in order to allow accessibility of the Time Server 8030HEPTA/GPS for other systems on the network.

!	The SEARCH Function of the *hmc* Software (Network Configuration Assistant) **requires** for location and recognition of the wished Time Server 8030HEPTA/GPS that the *hmc*-computer and the Time Server 8030HEPTA/GPS are **in the same LAN**.

The base LAN parameters can be set via the *hmc* integrated **Network Configuration Assistant**.
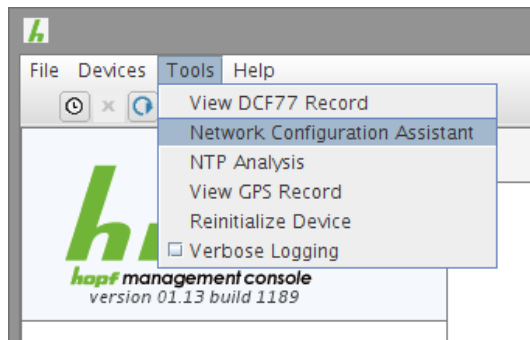
After a successful start of the *hmc* **Network Configuration Assistant** and completed search of the *hopf* LAN devices, the configuration of the base LAN parameters can be done.

The Time Server 8030HEPTA/GPS is stated as **8030HEPTA in the Device List.**

The determination of different Time Server 8030HEPTA/GPS (or other products variants) is made via **Hardware Address** (MAC Address).

> ℹ️ The factory set MAC address for the Time Server 8030HEPTA/GPS can also be read out via the LCD-Display.
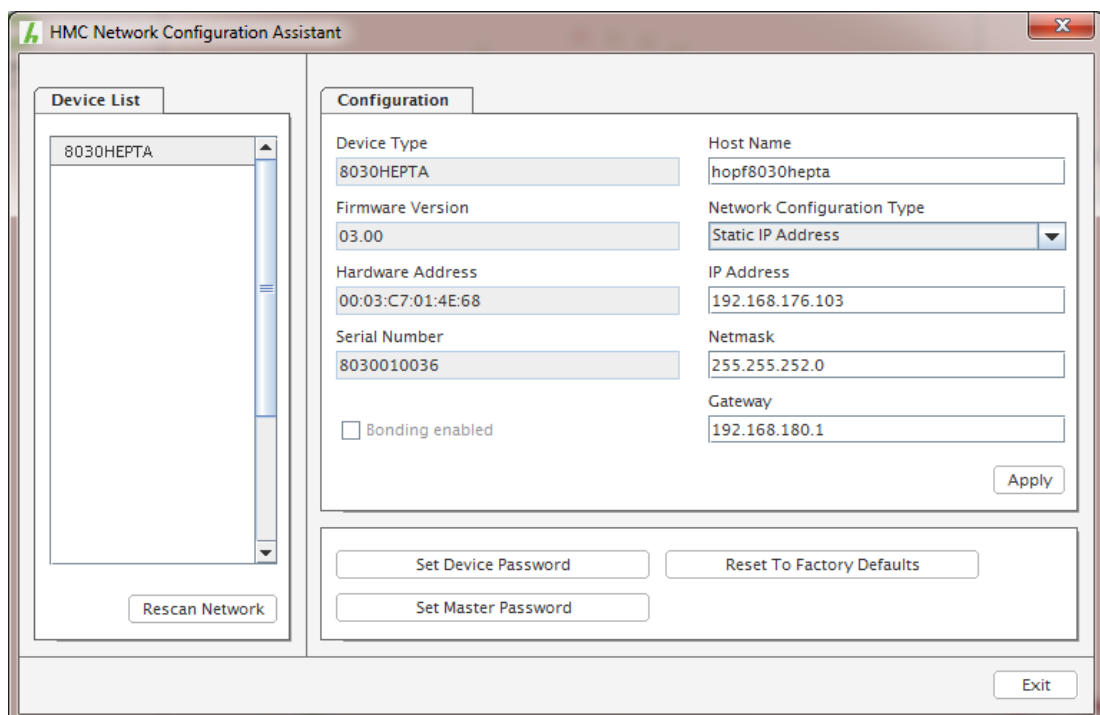
For an extended configuration of the Time Server 8030HEPTA/GPS through a browser via WebGUI the following base parameters are required:

- **Host Name** ⇨ e.g. hopf8030hepta
- **Network Configuration Type** ⇨ e.g. Static IP Address or DHCP
- **IP Address** ⇨ e.g. 192.168.0.20
- **Netmask** ⇨ e.g. 255.255.224.0
- **Gateway** ⇨ e.g. 192.168.224.1

The **hostname must** meet the following conditions:

- The hostname may only contain the characters 'A'-'Z', '0'-'9', '-' and '.' . There should be no distinction between upper-and lower-case letters.
- The character '.' may only appear as a separator between labels in domain names.
- The sign '-' must not appear as first or last character of a label.

The network parameters being assigned should be pre-determined with the network administrator in order to avoid problems on the network (e.g. duplicate IP address).

IP Address (IPv4)

An IP address is a 32 bit value divided into four 8 bit numbers. The standard presentation is 4 decimal numbers (in the range 0...255) separated from each other by dots (dotted quad notation).

Example: 192.002.001.123

The IP address consists of a leading network ID followed by the host ID. Four common network classes were defined in order to cover different requirements. Depending on the network class, the last one, two or three bytes define the host while the rest define the network (network ID) in each case.

In the following text the "x" stands for the host part of the IP address.

Class A Networks

IP addresses 001.xxx.xxx.xxx to 127.xxx.xxx.xxx

There is a maximum of 127 different networks in this class. This allows the possibility to connect a very high number of devices (max. 16.777.216)

Example: 100.000.000.001, (Network 100, Host 000.000.001)

Class B Networks

IP addresses 128.000.xxx.xxx to 191.255.xxx.xxx

Each of these networks can consist of up to 65534 devices.

Example: 172.001.003.002 (Network 172.001, Host 003.002)

Class C Networks

IP addresses 192.000.000.xx to 223.255.255.xxx

These network addresses are the most commonly used. Up to 254 devices can be connected.

Class D Networks

The addresses from 224.xxx.xxx.xxx - 239.xxx.xxx.xxx are used as multicast addresses.

Class E Networks

The addresses from 240.xxx.xxx.xxx - 254.xxx.xxx.xxx are designated as "Class E" and are reserved.

Gateway Address

The gateway or router address is required in order to be able to communicate with other network segments. The standard gateway must be set to the router address which connects these segments. This address must be within the local network of ETH0/ETH1.

After entering the above mentioned LAN parameters, they needed to be transferred to the Time Server 8030HEPTA/GPS via the `Apply` button. Afterwards the entry of the **Device Password** is requested:

The Time Server 8030HEPTA/GPS is supplied with the default device password <**device**> on delivery. After entry click on the `OK` button to confirm.

The LAN parameters thus set are directly adopted (without reboot) by the Time Server 8030HEPTA/GPS and are immediately active.

7   LCD-Display with Pushbutton – Function

System settings cannot be changed via the pushbutton nor the display. The display allows the readout of important system and operation parameters directly at the device, even without WebGUI access.

The data indicated in the display are applicable to updating-cycles such as the WebGUI. An on-going process is indicated via the display.

When the display has been activated by pressing a key, the backlight turns off after approx. 4 minutes without pressing any further key and the display switches to the standard image.

Switching on the System

In the 2x40digit LCD-Display the following start-up picture appears for the boot phase after switching on or a reset:

```
hopf 8030HEPTA/GPS : Booting...
Status-LEDs (Front): LED-Test active
```

7.1   Pushbutton Function (Light / Scroll)

The pushbutton has 3 functions right now:

1. Activation of the backlight (if not already been activated).

2. Switching to the next displayed image

3. If the pushbutton is pressed longer than 5 seconds, it is switched between UTC and local in the standard display image when the key is released. This switching over is failsafe stored.

7.2   Standard Display Image

This chapter describes the different elements and functions of the standard display image.

7.2.1   Standard Display Image without valid Time

The following picture (with incrementing second) is displayed after the start screen:

```
 UTC 00:00:38   GPS   SYSTEM-STATUS: INVA
MO 01/JAN/0000 T:00 NTP: STRATUM --/LOW
```

i	If the Sync Source ERROR "RTC error" is enabled after switching on without valid time, this can be corrected by releasing a Reset of the Sync Source.

7.2.2 Standard Display Image with valid Time

Example image for the standard display after a system start with valid backup information or after manual input of the time information via the WebGUI:

```
U T C   1 6 : 2 5 : 5 8     G P S     S Y S T E M - S T A T U S :   S Y N C
T U   1 2 / J A N / 2 0 1 6   T : 0 7   N T P :   S T R A T U M   0 1 / H I G H
```

Time Information:

LOC 10:25:19 /D	Display with the setting: **local time**. • D for summertime (Daylight-Saving Time) • S for standard time (wintertime)
UTC 08:25:19	Display with the setting: **UTC time**.
MO - TU - WE - TH - FR - SA - SU	Display with the **Weekday** in abbreviations: complies with **MONDAY – SUNDAY**
12/JAN/2016	Display of date: **Day / Abbr. of Month / Year**

> **i** It can be switched between UTC and local time as time basis for the display by using the button.
> Therefore the pushbutton must be pressed for 5 seconds.

GPS Information:

The number of the currently and actually received satellites is shown here. If the value drops under "04" the value starts flashing.

> **i** In the GPS reception mode "3D" at least 4 satellites for the synchronization need to be received.

System-Status:

SYNC	Time synchronized + Quartz regulation started/running
SYOF	Time synchronized + SyncOFF running
SYSI	Time synchronized as simulation mode (without actual GPS reception)
QUON	Quartz/Crystal time + SyncON running
QUEX	Quartz/Crystal time (in freewheel after synchronization failure ⇨ Board was already synchronized)
QUSE	Quartz/Crystal time after reset or manual setting
INVA	Invalid time

NTP-Status:

The current Stratum and accuracy value of the NTP service is shown here.

7.2.3 Standard Display with Additional Information

In the standard display further systemically significant information/conditions are displayed as soon as they occur.

```
UTC 16:25:58   GPS   SYSTEM-STATUS:
TU 12/JAN/2016 T:00 Sync Source-ERROR
```

Active additional information automatically leads to the activation of the backlight.

Supplementary information is indicated alternating to the standard content of the display. Such additional information include following details/conditions:

1. Announcement active (see **Chapter 7.10 Announcements (Summertime / Leap Second)**)

2. Sync Source ERROR active (see **Chapter 7.9 Sync Source ERROR**)

3. An Image-Update of Module 8030HEPTA is active

4. A H8-Update of the Sync Source is active

7.3 GENERAL ERROR

Should a failure occur within the system not ensuring a defined and safe operation of the Time Server 8030HEPTA/GPS anymore this is indicated via the LCD-Display.

If there is an active GENERAL ERROR, the backlight is activated.

If such an error occurs it is recommended to disconnect the system from power for 30 seconds and then turn it on and put it into operation again. If the failure occurs again after this process, the system needs to be sent for repair or rather contact the **hopf** Support with the appropriate failure report (see **Chapter 10.2 Support by Company hopf**).

Example:

```
GENERAL-ERROR: NO DATA FROM SYNC-SOURCE
Turn OFF/ON power may solve the problem
```

7.4   LAN Parameter

The 3 display pictures of the LAN parameter indicate essential information on the LAN inter-face ETH0 / ETH1 and in PRP- resp. Bonding-Mode.

For more detailed information see *Chapter 8.3.2 NETWORK Tab*.

In the display picture the currently valid values of the IPv4 address, netmask and gateway are shown and whether the values are statically assigned via the WebGUI or via DHCP.

Example for ETH0:

```
ETH0: STATIC   IP: 192.168.000.001/NM: 24
Link: Up       GW: 000.000.000.000
```

Example for ETH1:

```
ETH1:   DHCP   IP: 000.000.000.000/NM: 00
Link:   Down   GW: 000.000.000.000
```

Example for PRP / Bonding:

```
PRP : STATIC   IP: 192.168.000.001/NM: 24
Link: Up       GW: 000.000.000.000
```

For the non-active interface mode the following pictures are displayed:

Example for ETH0:

```
ETH0: Bonding or PRP is active
Link: Up
```

Example for ETH1:

```
ETH1: Bonding or PRP is active
Link: Down
```

Example for PRP / Bonding:

```
 Bonding and PRP is not active
```

7.5 Local Time Parameter

Provided a local time via the input of difference time to UTC and/or switching points for the summertime is parameterized, these values can be read in the display.

Example:

```
Time-Zone       S->D  02:00 SU 27/03/2016
Offset:+01:00   D->S  03:00 SU 30/10/2016
```

The difference time to UTC was set to +1h in the above example. Based on the general parameters for the summer-/wintertime changeover set in the WebGUI, the following switching points are calculated for the current year (2016) by the system:

- Start of summertime (S ☐ D) on Sunday, 27 March 2016 at 2.00 o'clock
- End of summertime (D ☐ S) on Sunday, 30 October 2016 at 3.00 o'clock

Without valid time (System-Status INVA) the real values for the ST/WT changeover cannot be calculated.

```
Missing  Data
Missing  Data
```

Should the ST/WT changeover be disabled, it is shown in the display as follows:

```
Time-Zone       S->D changeover disabled
Offset:+01:00   D->S changeover disabled
```

Should the difference time and/or ST/WT changeover not be initially set by the user (in this case at least one Sync Source ERROR is active), the following picture is displayed:

```
Time-Zone Offset and/or DST Changeover
         not initially set by USER
```

7.6   GPS Satellite Display

V:xx - Satellites in View

Number of available satellites detected by the GPS receiver.

T:xx - Satellites Tracked

Effective number of received satellites used for synchronization.

yy:zzz - Satellites Number : S/N Ratio

Overview of actually received GPS satellites with their number (yy) and reception quality (zzz).

≥ 48	Good reception quality
31-47	Sufficient reception quality
0-30	Poor reception quality

Example:

```
GPS  V:12    11:099 12:098 13:097 14:096
SAT  T:09    15:095 16:094 17:093 18:092
```

> **i** Maximum 8 satellites are shown in the display regardless from the actually received number.

7.7   Position

In this picture the position determined by the GPS receiver is displayed.

Example:

```
GPS    Latitude :    51°12,6861'  North
POS    Longitude:   007°39,8195'  East
```

The above example shows the indication of the position data of the company *hopf*.

7.8   Receiver Status

This image displays the reception status information determined by the GPS receiver.

Examples:

```
Receiver   PDOP: 2.46 Noise-Level: 133
Status     AGC: 18.7% JAM:13.9%->Critical
```

```
Receiver   PDOP: 9.99 Noise-Level: 112
Status     AGC: 18.7% JAM: 3.9%->   OK
```

```
Receiver   PDOP: 9.99 Noise-Level:  98
Status     AGC:  7.7% JAM: 9.9%->Warning
```

7.9 Sync Source ERROR

In the display the same Sync Source Errors messages are stated as in WebGUI (see **Chapter 8.3.7.13 Sync Source Errors**).

If there is more than one error, the different error messages are continuously indicated once a second.

| **i** | Should a Sync Source ERROR occur, this is signalized in the standard image. |

```
SYNC-SOURCE ERROR:    No error


```

Example for a Sync Source ERROR:

```
SYNC-SOURCE ERROR:  01 ERROR ACTIVE
HW -> Antenna circuit open
```

In the above picture no antenna has been connected to the system or rather the cable to the antenna is interrupted.

7.10 Announcements (Summertime / Leap Second)

In this picture the availability of an announcement for a summer-/wintertime changeover (DST-Announcement) or for inserting a leap second (Leap Second Announcement) is indicated.

| **i** | Should an announcement be available, this is signalized in the standard image. |

Example:

```
        DST-Announcement:   ACTIVE
Leapsecond-Announcement: Not active
```

In the above picture a summer-/wintertime changeover is processed on the next hour change.

7.11   System-Info

In the pictures with the system info, the uptime of the system, program versions and the serial numbers of the components are indicated.

In the display picture SYS-Info 01 the uptime and the image version of the Module 8030HEPTA are stated.

Example:

```
SYS-Info:  Uptime:0001-Day/02-Hour/53-Min
   01/04    Image:02.00P   Date:27.09.2016
```

In the display image SYS-Info 02 the serial number and the H8 processor version of the Module 8030HEPTA are shown in the first line, whereas in the second line the serial number of the Sync Source and its H8 processor version are stated.

Example:

```
SYS-Info:  8030-010133  P01.00  -02.08.2016
   02/04    8024-010310  P01.00  -16.02.2016
```

The display images SYS-Info 03 and 04 indicate device information exclusively required by the *hopf* Support.

Example:

```
SYS-Info:  011511B40018999999999A00010806
   03/04    1300000001383F00080210130002
```

```
SYS-Info:  010403B00001999999999A04012709
   04/04    12000000100003040127091200011
```

8 HTTP/HTTPS WebGUI – Web Browser Configuration Interface

> ⚠ For the correct display and function of the WebGUI, JavaScript and Cookies must be enabled in the browser.

8.1 Quick Configuration

This chapter gives a brief description of the basic operation of the WebGUI installed on the system.

8.1.1 Requirements

- Ready-for-operation **hopf** NTP Time Server 8030HEPTA/GPS

- PC with installed web browser (e.g. Internet Explorer) in the sub-network of Time Server 8030HEPTA/GPS

8.1.2 Configuration Steps

- Create the connection to the Time Server with a web browser

- Login as a **'master'** user (default password <master> is set by delivery)

- Switch to "Network" tab and if available enter the DNS Server (required for NTP and the alarm messages depending of network)

- Save the configuration

- Switch to "Device" tab and restart Network Time Server via "Reboot Device"

- NTP Service is now available with the standard settings

- NTP specified settings can be done in the "NTP" tab

- Alarm messages via Syslog/SNMP/Email can be configured in "Alarm" tab – only if this function is enabled by an activation key

> ⚠ The following detailed explanatory information should be read if anything is unclear while executing the configuration steps.

8.2   General – Introduction
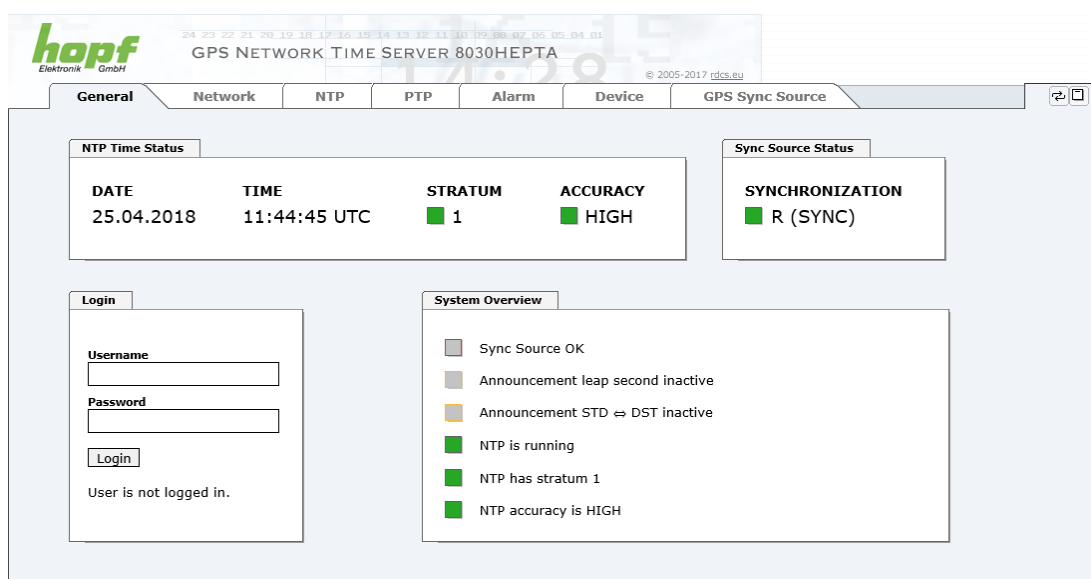
The Time Server 8030HEPTA/GPS should be accessible to a web browser if it has been set up correctly. Enter the IPv4 address <http://xxx.xxx.xxx.xxx> - as set up in the Time Server 8030HEPTA/GPS earlier - or the DNS name on the address line and the following screen should appear.

When using IPv6, it is mandatory to enclose the IPv6 address with [ ]
e.g..: `http://[2001:0db8:85a3:08d3::0370:7344]/`

> **!** The complete configuration can only be completed via the modules WebGUI!

> **!** The WebGUI was developed for multi-user read access but not for multi-user write access. It is the responsibility of the user to pay attention to this issue.

8.2.1 LOGIN and LOGOUT as User

All of the modules data can be read without being logged on as a special user. However, the configuration and modification of settings and data can only be carried out by an authorised user! Two types of user are defined:

- "**master**" user (default password on delivery: <**master**>)

- "**device**" user (default password on delivery: <**device**>)

i	Differentiation is made between **upper and lower case** characters in the password. Alphanumeric characters and the following symbols can be used: **[ ] ( ) * - _ ! $ % & / = ?**
i	The password must be between 6 and 20 characters long and contain at least one uppercase letter, one lowercase letter and one digit!
i	The password should be changed after the first login for security reasons.
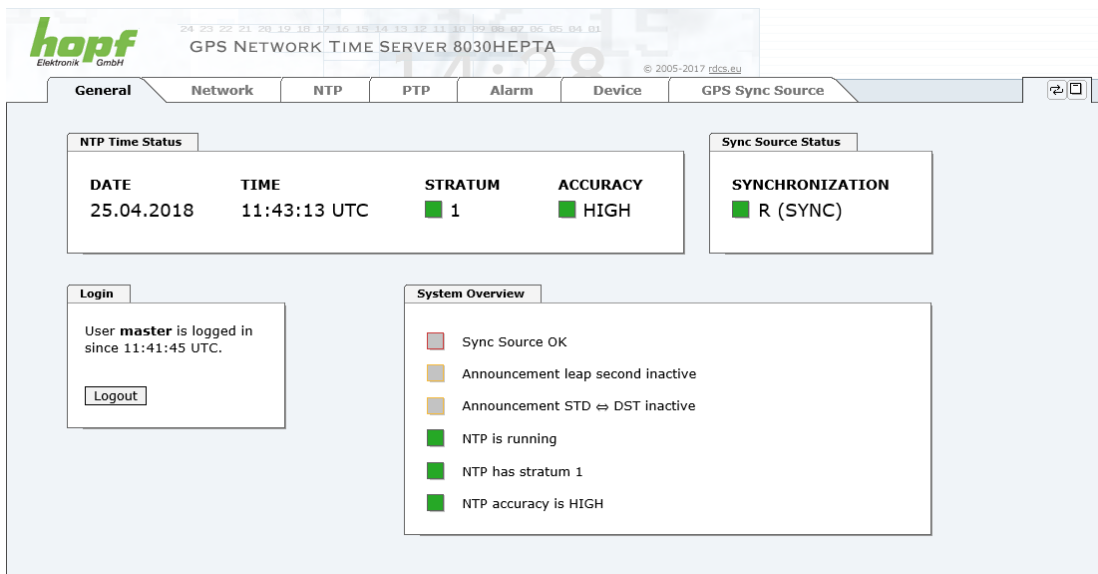
The following screen should be visible after logging in as a "master" user:

Click on the ⎡**Logout**⎦ button to log out.

The WebGUI is equipped with a session management. If the user does not conduct a logout, the logout is automatically made after 10 minutes of inactivity (idle time).

After successful login, depending on the access level (device or master user), changes can be made to the configuration and saved.

Users logged in as "**master**" have all access rights to the Time Server 8030HEPTA/GPS.

Users logged in as "**device"** do **not** have access to:

- Trigger reboot

- Trigger factory defaults

- Carry out image update

- Carry out H8 firmware update

- Upload certificate

- Change master password

- Diagnostics

- Download configuration files

8.2.2 Navigation via the Web Interface

The WebGUI is divided into functional tabs. Click on one of these tabs to navigate through the board. The selected tab is identified by a darker background colour, see the following image (General in this case).

User login is not required in order to navigate through the board configuration options.

JavaScript and Cookies should be enabled in the browser in order to guarantee the correct operation of the web interface.
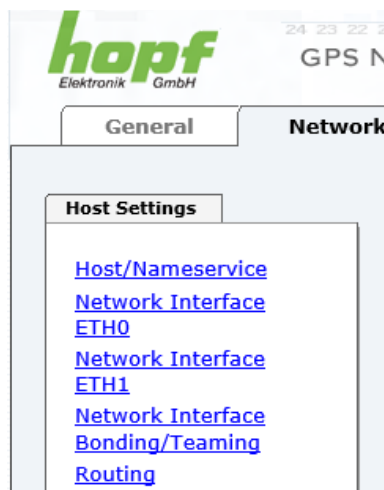
All the links within the tabs on the left hand side lead to corresponding detailed display or setting options.
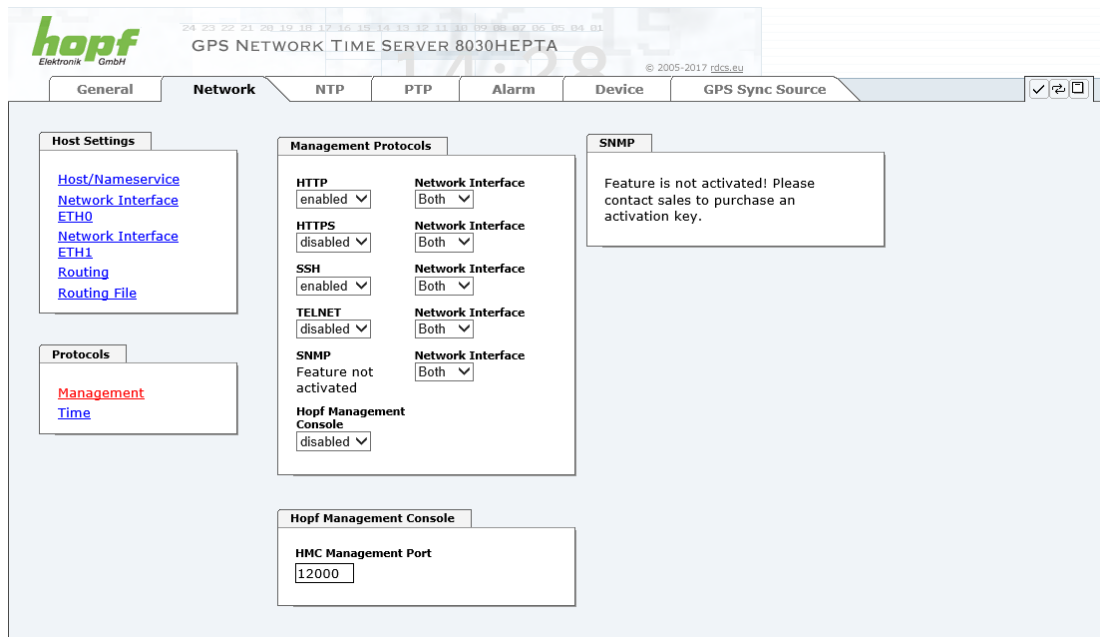
8.2.3 Enter or Changing Data

It is necessary to be logged on as one of the users described above in order to enter or change data.

8.2.3.1 Changing of Data in 8030HEPTA (WebGUI: Device)

All changeable data, except those in GPS SYNC SOURCE tab, are saved in Module 8030HEPTA. For these data the value saving is divided into two steps.

For a permanent saving the modified value **must** first be accepted with **Apply** from the module and then be stored with **Save**. Otherwise the modifications get lost after a reboot of the module or switching the system off.

After an entry with **Apply** is made, the configured field is marked with a star ' * '. This means that a value has been entered or changed but not yet been stored in the flash memory.

Meaning of the symbols from left to right:

No.	Symbol	Description
1	**Apply**	Acceptance of changes and entered data
2	**Reload**	Restoring the saved data
3	**Save**	Fail-save storage of the data in the flash configuration

If the data should only be tested it is sufficient to accept the changes with **Apply**.

!	**Changing Network Parameters** Modifications of the network parameters (e.g. IP address) are immediately effective clicking on **Apply** to confirm. However, the modifications are not permanently saved yet. This requires to access the WebGUI with the new network parameters again and to save the data with **Save** permanently.

!	For adopting changes and entering values only the respective buttons in the WebGUI can be used.

8.2.3.2 Changing of Data in 8024GPS (WebGUI: GPS Sync Source)

The modified data in the GPS SYNC SOURCE tab are directly transferred to the Module 8024GPS by pushing the button 1 and stored failsafe in Module 8024GPS. Tabs with settings and values modified in this manner can also be recognized by the modified display of the **Apply** button. The buttons 2 and 3 in GPS SYNC SOURCE tab are disabled and are not required.
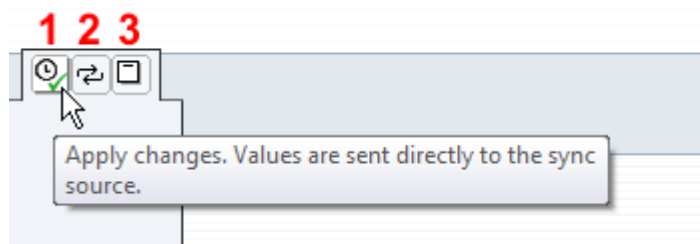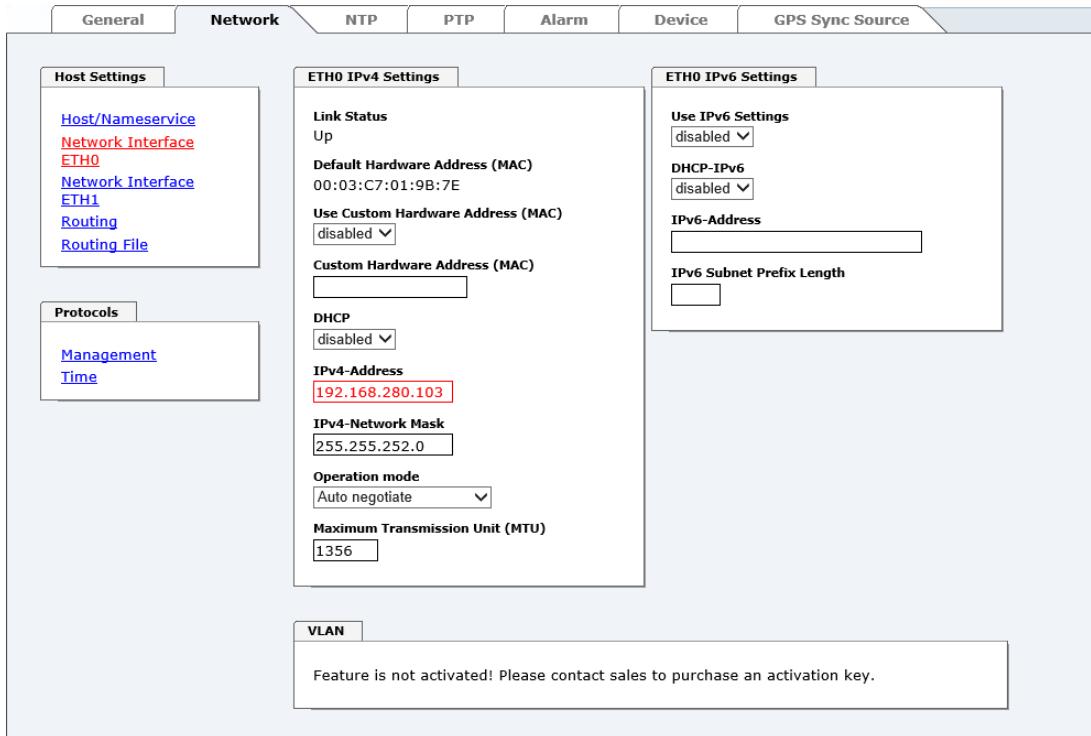
!	The new reading of the modified data from Module 8030HEPTA for the WebGUI indication can take up to 30 seconds after data transfer to Module 8024GPS. However, this has no effect on the function of the appropriate setting/value.

8.2.4   Plausibility Check during Input

A plausibility check is generally carried out during input.

As illustrated in the above image, an invalid value (e.g. text where a number should be entered, IP address not within the range etc.) is identified by a red border when an attempt is made to accept these settings. It should be noted here that this is only a semantic check and not to test whether an entered IP address can be used on the own network or in the configuration! As long as an error message is displayed it is not possible to save the configuration in the flash memory.

> ⚠ The error check only verifies semantics and the validity of ranges. It is **NOT a logic or network check** for entered data.

8.3   Description of the Tabs

The WebGUI is divided into the following tabs:

- General
- Network
- NTP
- PTP
- Alarm
- Device
- GPS Sync Source

8.3.1   GENERAL Tab

This is the first tab displayed when using the web interface.
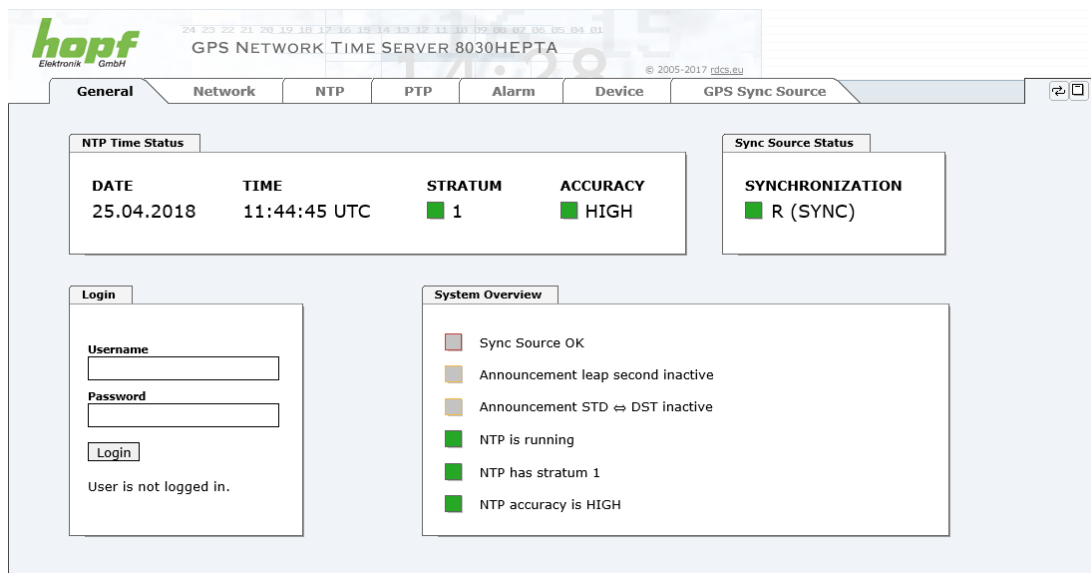
NTP Time Status

This area shows basic information about the current time and date of the Time Server 8030HEPTA/GPS. The time **always** corresponds to UTC. The reason for this is that NTP always works with UTC and not with local time.

Stratum displays the actual NTP stratum value of the Time Server 8030HEPTA/GPS with the value range from 1-16.

The **ACCURACY** field (accuracy of NTP) can contain the values LOW - MEDIUM - HIGH. The meaning of these values is explained in *Chapter 14.5 Accuracy & NTP Basic Principles.*

.

Sync Source Status

Display of the actual status of synchronization of the Sync Source (here Module 8024GPS) with these possible values:

SYNC	Time synchronized + Quartz regulation started/running
SYOF	Time synchronized + SyncOFF running
SYSI	Time synchronized as simulation mode (without actual GPS reception)
QUON	Quartz/Crystal time + SyncON running
QUEX	Quartz/Crystal time (in freewheel after synchronization failure ⇨ Board was already synchronized)
QUSE	Quartz/Crystal time after reset or manual setting
INVA	Invalid time

Login

The login box is described in ***Chapter 8.2.1 LOGIN and LOGOUT as User***

System Overview

This table gives a direct overview of the Time Server's 8030HEPTA/GPS current operating states.
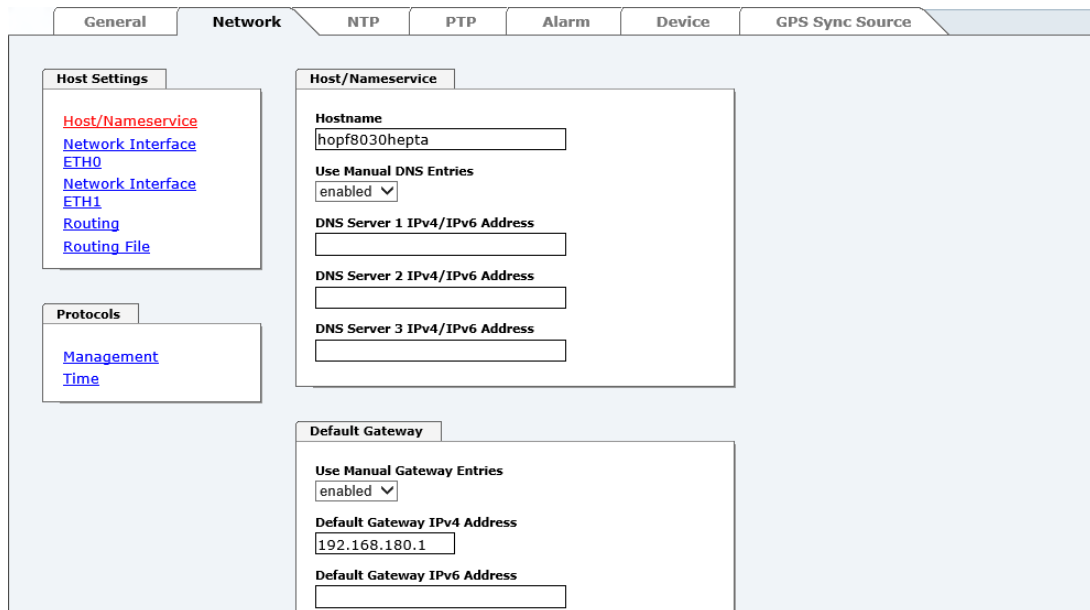
WebGUI	Description
Sync Source OK	When active (RED) there is a Sync Source failure. For details please go to **GPS SYNC SOURCE tab - Module Errors**.
Announcement leap second inactive	When active (ORANGE) there is an announcement for a leap-second.
Announcement STD ⇔ DST inactive	When active (ORANGE) there is an announcement for a summer / winter time change-over.
NTP is running	The NTP process on Module 8030HEPTA is running
NTP has stratum 1	Shows the appropriate stratum the NTP process works with.
NTP Accuracy is High	Shows the appropriate accuracy the NTP process works with.

Announcements

The display fields LEAP SECOND and STD ⇔ DST announce a corresponding event to the next hour (insertion of a leap-second or rather switchover of summer/winter time).

8.3.2 NETWORK Tab

All the links within the tab on the left hand side lead to corresponding detailed setting options.

| !	**Changing Network Parameters**
	Modifications of the network parameters (e.g. IP address) are immediately effective clicking on **Apply** to confirm. However, the modifications are not permanently saved yet. This requires to access the WebGUI with the new network parameters again and to save the data with **Save** permanently.

8.3.2.1 Host/Name Service

Setting for the explicit network detection.

8.3.2.1.1 Hostname

The standard setting for the Hostname is "**hopf8030HEPTA**". This name should also be adapted to the respective network infrastructure.

If in doubt, simply leave the standard value in place or ask your network administrator.

!	The **hostname must** meet the following conditions: • The hostname may only contain the characters 'A'-'Z', '0'-'9', '-' and '.' . There should be no distinction between upper-and lower-case letters. • The character '.' may only appear as a separator between labels in domain names. • The sign '-' must not appear as first or last character of a label.

!	For a correct operation a hostname is required. The field for the hostname **must not** be left blank.

8.3.2.1.2 Use Manual DNS Entries

With this setting you can select whether the manually entered DNS servers (DNS servers 1 to 3) should be used.

If "enabled" is selected here, the entries in DNS Server 1 to 3 are used.

If "disabled" is selected, the entries in DNS Server 1 to 3 are ignored.

> If a DHCP server is used to distribute the network configuration and if this also distributes the DNS servers used in the network, then **Use Manual DNS Entries** should be set to disabled.

8.3.2.1.3 DNS Server 1 to 3

The IP address (IPv4 or IPv6) of the DNS server should be entered if you wish to use the Fully-Qualified Host Name (hostname.domainname) or work with reverse lookup

Contact your network administrator for details of the DNS server if not known.

If no DNS server is available (special case), enter 0.0.0.0 in the input field or leave the field blank.

8.3.2.1.4 Use Manual Gateway Entries

With this setting, you can select whether the manually entered gateways (Default Gateway IPv4 and Default Gateway IPv6) should be used.

If "enabled" is selected here, the entries in Default Gateway IPv4 and Default Gateway IPv6 are used.

If "disabled" is selected, the entries in Default Gateway IPv4 and Default Gateway IPv6 are ignored.

> If a DHCP server is used to distribute the network configuration and if this also distributes the address of the default gateway used in the network, then Use Manual Gateway Entries should be set to disabled.

8.3.2.1.5 Default Gateway IPv4

If the IPv4 default gateway is not known, it must be requested by the network administrator. If no standard gateway is available (special case), enter 0.0.0.0 in the input field or leave the field blank.

8.3.2.1.6 Default Gateway IPv6

If the Ipv6 default gateway is not known, it must be requested by the network administrator. If no standard gateway is available (special case), enter :: in the input field or leave the field blank.

8.3.2.2 Network Interface ETH0/ETH1

Configuration of the Ethernet interface ETH0/ETH1 of the Time Server 8030HEPTA/GPS.

ETH1 must not be located in the same sub net as ETH0!

8.3.2.2.1 Default Hardware Address (MAC)

The factory default MAC address can only be read and cannot be changed by the user. It is assigned once only by *hopf* Elektronik GmbH for each Ethernet interface.

For further information about the MAC address refer to *Chapter 2.2.6.1 MAC-Address for ETH0/ETH1* for the Time Server 8030HEPTA/GPS.

> **i** *hopf* Elektronik GmbH MAC addresses begin with **00:03:C7**:xx:xx:xx.

8.3.2.2.2 Customer Hardware Address (MAC)

The MAC address assigned from *hopf* can be changed to any user-defined MAC address. The board identifies itself with the user-defined MAC address to the network. The default hardware address shown in WebGUI remains unchanged.

> **!** Double assignment of MAC addresses on the Ethernet referring to customers MAC addresses should be avoided.
> If the MAC address is not known, please contact your network administrator.

The use of customers MAC address needs to be activated by the function **Use Custom Hardware Address (MAC)** with **enable** and subsequently save it with **Apply** and **Save**.

Afterwards the customers MAC address has to be entered in hexadecimal form with a colon to separate as described in the below example, e.g. **00:03:c7:55:55:02**

> **i** The MAC address assigned by *hopf* can be activated at any time by disabling this function.

> **!** There are no MAC multicast addresses allowed!

Finally, the Module 8030HEPTA has to be restarted via "Device" / "Reboot Device" (see *Chapter 8.3.6.4 Restarting the Module (Reboot Device / Hardware Reset)*.

8.3.2.2.3 DHCP

If DHCP is to be used, activate this with **enabled**.

8.3.2.2.4 IPv4 Address

If DHCP is not used, the IPv4 address needed to be entered here. Contact your network administrator for details of the used IPv4 address if not known.

8.3.2.2.5 IPv4 Network Mask

If DHCP is not used, the network mask needed to be entered here. Contact your network administrator for details of the used network mask if not known.

8.3.2.2.6 Operation Mode
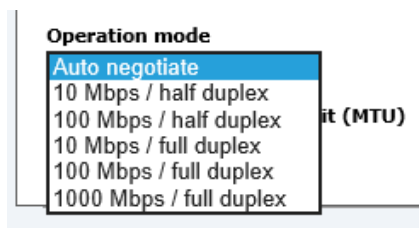
The network device usually adjusts the data stream and duplex mode to the device to which it is connected (e.g. HUB, SWITCH) automatically. If the network device requires a certain speed or duplex mode, this can be configured via the web interface. The value should only be changed in special cases. The automatic setting is normally used.

i	In individual cases an enabled "Auto negotiate" might lead to problems between the network components and the adjustment process fails.
	In such cases it is recommended to set the network speed of the Time Server 8030HEPTA/GPS **and** the connected network components manually to the same value.

8.3.2.2.7 Maximum Transmission Unit (MTU)

The Maximum Transmission Unit describes the maximum size of a data packet of a protocol of the network layer (layer 3 of OSI model), measured in octets which can be transferred into the frame of a net of the security layer (layer 2 of OSI model) without fragmentation.

Time Server 8030HEPTA/GPS is going to be delivered with default setting 1356.

8.3.2.2.1 IPv6

The Time Server 8030HEPTA/GPS can also be operated in an IPv6 network.

To enable IPv6, **Use IPv6 Settings** must be set to **enable**.

IPv6 addresses are 128 bits long and they are recorded in eight 4-character hexadecimal blocks. For example: **2001:0db8:0000:08d3:1319:8a2e:0370:7344**

Leading zeroes in a 4-character hexadecimal block can be omitted. For the above example, this results in the notation: **2001:db8:0:8d3:1319:8a2e:370:7344**

In addition, **once** per IPv6 address a consecutive sequence of blocks containing all zeros may be omitted. But this must be recorded with two consecutive colons. For the above example, this gives the notation: **2001:db8::8d3:1319:8a2e:370:7344**

Another example: **2001:0:0:0:1319:8a2e:0:7344** may be represented

> as **2001::1319:8a2e:0:7344**
>
> or **2001:0:0:0:1319:8a2e::7344**

8.3.2.2.2 DHCP-IPv6

If DHCP is to be used, this function is activated with **enabled**.

8.3.2.2.3 IPv6 Address

If DHCP is not used, enter the IPv6 address here. If the IPv6 address to be used is unknown, it must be requested by the network administrator.

8.3.2.2.4 IPv6 Subnet Prefix Lengh

If no DHCP is used, the length of the network address must be entered here. If the length of the network address is not known, it must be requested by the network administrator.

8.3.2.2.5 VLAN (Activation Key necessary)

A VLAN (Virtual Local Area Network) is a logical sub-network within a network switch or a whole physical network. VLANs are used to separate the logical network infrastructure from the physical wiring, thus to virtualize the Local Area Network. The technology of VLAN is standardized by IEEE Standard 802.1q. Network applications like Time Server 8030HEPTA/GPS, implementing the standard IEEE 802.1q, are able to allocate individual network interfaces to specific VLANs. To transfer data packets of several VLANs via a single network interface the data packets are marked with a related VLAN ID. This method is called VLAN-Tagging. The network application at the other end of the line (e.g. network switch, router etc.) can allocate the data packet to the correct VLAN by checking the marking / tag.

VLAN

Activation Status
disabled ∨

VLAN Interfaces

Add   Remove

ID   Label   Remark   DHCP   IPv4-Address   IPv4-Network Mask

WebGUI with activated VLAN

To be able to configure VLANs the activation status must be set to "enabled" first. Afterwards up to 32 different VLANs per network interface can be configured by clicking the button "Add".

An explicit VLAN ID must be configured for each VLAN interface.

The boxes "Label" and "Remark" can be filled out with a designation or a comment to easily keep the configured VLANs apart.

Determination of the IPv4-address for the configured VLAN interface can either be done automatically via DHCP or by filling out the boxes "IP-Address" and "Network Mask".

```
VLAN

Activation Status
enabled ∨

VLAN Interfaces
[ Add ]  [ Remove ]

   ID    Label    Remark        DHCP       IPv4-Address      IPv4-Network
                                                            Mask
☐  10    DEV      Development   disabled ∨ 192.168.180.30   255.255.255.0
```
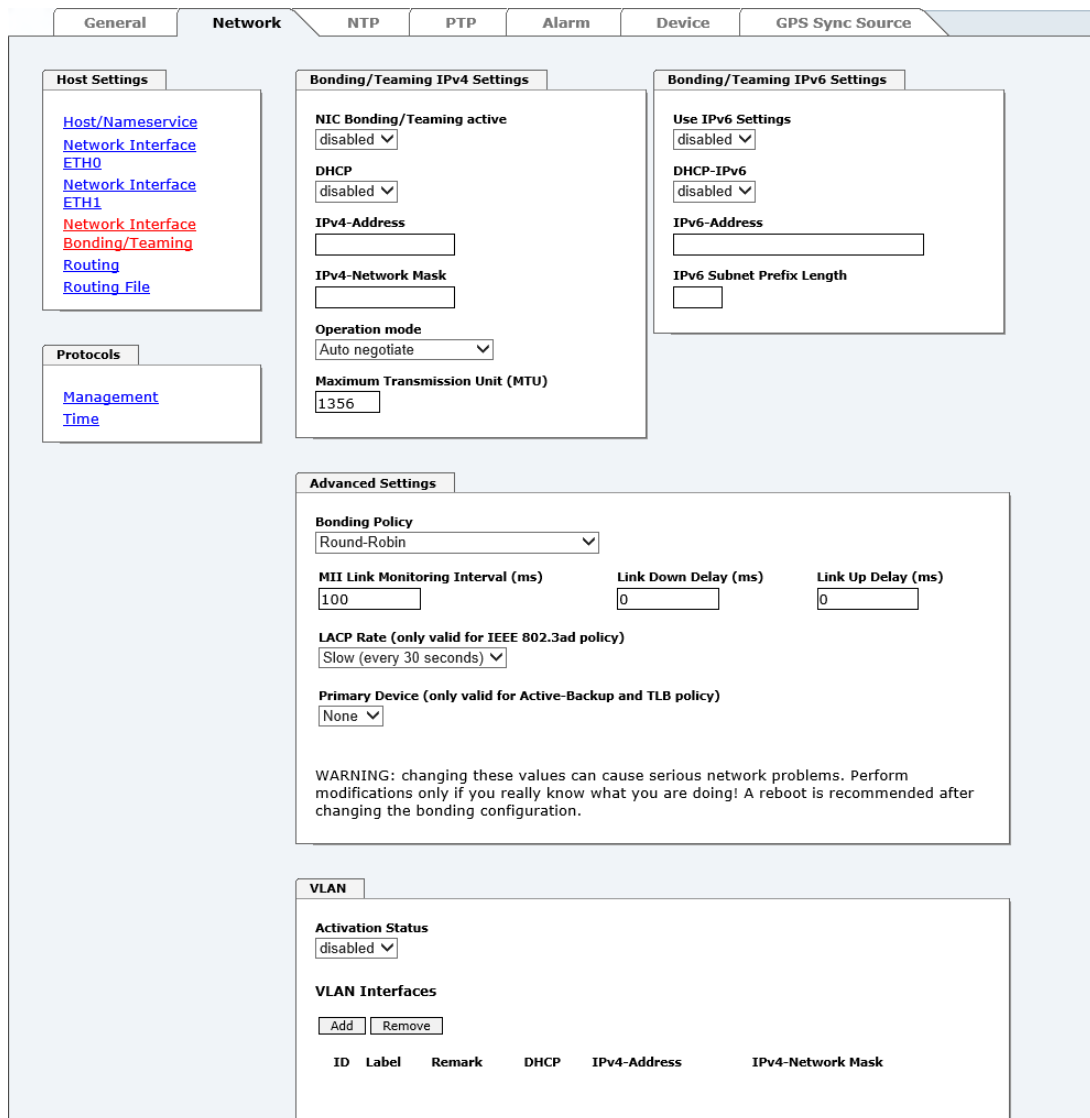
ℹ	To ensure the correct function the network appliance must be connected with Time Server 8030HEPTA/GPS via the network interface. Furthermore it must be ensured that the network appliance is accurately configured with the same VLANs.

⚠	VLAN ID one (1) and two (2) are reserved and are therefore not permitted!

8.3.2.3 Network Interface Bonding/Teaming (Activation Key necessary)

The function Network Interface Bonding/Teaming (also known as NIC Bonding, NIC Teaming, Link Bundling, EtherChannel) enables to bundle the physical network interfaces ETH0 and ETH1 to one logical network interface.

This function is used for the distribution of load as well as to increase fail-safety in computer networks.

> ⚠ Making settings without profound knowledge of Bonding/Teaming can lead to serious network problems!
>
> An incorrect configuration can lead to a loss of the network connection so that the Ethernet access to Time Server 8030HEPTA/GPS is going to be refused.
>
> In this case settings of Time Server 8030HEPTA/GPS must be set back to default settings!

> ℹ If function Bonding has been activated, parameters for ETH0 and ETH1 cannot be changed any more. The parameters are not displayed in the host setting menu as long as Bonding will be deactivated.

8.3.2.3.1 Basic Configuration

Determination of the basic network configuration with activated function Bonding/Teaming.

```
┌─────────────────────────────────────┐
│ Bonding/Teaming IPv4 Settings        │
│                                      │
│ NIC Bonding/Teaming active           │
│ [disabled ▼]                         │
│                                      │
│ DHCP                                 │
│ [disabled ▼]                         │
│                                      │
│ IPv4-Address                         │
│ [                    ]               │
│                                      │
│ IPv4-Network Mask                    │
│ [                    ]               │
│                                      │
│ Operation mode                       │
│ [Auto negotiate        ▼]            │
│                                      │
│ Maximum Transmission Unit (MTU)      │
│ [1356    ]                           │
│                                      │
└─────────────────────────────────────┘
```

NIC Bonding/Teaming active

Activation of function NIC Bonding/Teaming

DHCP

Activation of DHCP of the "Bonding interface".

> ⚠ A change of the IPv4-address or activating of DHCP do have an immediate effect after confirming the settings – the connection to the web interface must be adapted and renewed.

IPv4 Address

Input of IPv4 address of the "Bonding interface".

If you do not know the IPv4 address, please contact your network administrator.

> ⚠ A change of the IPv4 address or activating of DHCP do have an immediate effect after confirming the settings – the connection to the web interface must be adapted and renewed.

IPv4 Network Mask

Input of the network mask of the "Bonding interface".

> ⚠ A change of the IPv4 address or activating of DHCP do have an immediate effect after confirming the settings – the connection to the web interface must be adapted and renewed.

8.3.2.3.2 IPv6 Network Configuration

Defining the IPv6 network configuration with the Bonding/Teaming function activated.

Bonding/Teaming IPv6 Settings

Use IPv6 Settings
disabled

DHCP-IPv6
disabled

IPv6-Address

IPv6 Subnet Prefix Length

Use IPv6 Settings
Activation of IPv6 function

DHCP IPv6
Activation of IPv6 DHCP for the "Bonding interface"

IPv6 address
Input of the IPv6 address for the " Bonding interface".
If the IPv6 address is not known, it must be requested by the network administrator.

IPv6 Subnet Prefix Length
Input of the IPv6 network length for the " Bonding interface".

8.3.2.3.3 Advanced Settings

```
┌─────────────────────────────────────────────────────────────────┐
│ ╔═════════════════╗                                              │
│ ║ Advanced Settings ║                                            │
│ ╚═════════════════╝                                              │
│                                                                  │
│ Bonding Policy                                                   │
│ ┌───────────────────────────────────────┐                       │
│ │ Round-Robin                        ∨  │                       │
│ └───────────────────────────────────────┘                       │
│                                                                  │
│ MII Link Monitoring Interval (ms)   Link Down Delay (ms)   Link Up Delay (ms) │
│ ┌─────────────────┐                 ┌─────────────┐       ┌─────────────┐ │
│ │ 100             │                 │ 0           │       │ 0           │ │
│ └─────────────────┘                 └─────────────┘       └─────────────┘ │
│                                                                  │
│ LACP Rate (only valid for IEEE 802.3ad policy)                  │
│ ┌──────────────────────────┐                                    │
│ │ Slow (every 30 seconds) ∨ │                                   │
│ └──────────────────────────┘                                    │
│                                                                  │
│ Primary Device (only valid for Active-Backup and TLB policy)    │
│ ┌─────────┐                                                      │
│ │ None  ∨ │                                                      │
│ └─────────┘                                                      │
│                                                                  │
│                                                                  │
│ WARNING: changing these values can cause serious network problems. Perform │
│ modifications only if you really know what you are doing! A reboot is recommended after │
│ changing the bonding configuration.                             │
└─────────────────────────────────────────────────────────────────┘
```

Bonding Policy

- **Round-Robin:**
  In this case the network interfaces, starting with ETH0, are transmitting sequentially whereby a distribution of load and a higher tolerance for errors are achieved. In that mode the network interfaces must be connected to the same network switch.

- **Active Backup:**
  Only one of two network interfaces is sending and receiving. If an error occurs, the other network interface assumes responsibility for the process. The network interfaces do not have to be connected to the same network switch. From the outside the MAC address of the association is only visible on one network interface to avoid a mix-up. This mode supports tolerance for errors.

- **Balance XOR:**
  Source and target are permanently assigned with one another via the MAC address of the network interfaces ETH0 and ETH1. The network interfaces must be connected to the same network switch. This mode supports distribution of load and tolerance for errors.

- **Broadcast:**
  In this mode the computer sends its data via all available network interfaces which enables the use of several network switches. This fact leads to a high tolerance for errors, but this mode does not enable distribution of load.

- **IEEE 802.3ad Dynamic Link Aggregation:**
  The network interfaces ETH0 and ETH1 are going to be bundled (Trunking) in this mode. It is mandatory that the network interfaces are configured with the same transmission rate and duplex setting. Bundling is made dynamically via the Link Aggregation Control Protocol (LACP). This mode supports distribution of load as well as tolerance for errors.

> ⚠ The network switch on which the network interfaces ETH0 and ETH1 of Time Server 8030HEPTA/GPS are connected also needs to be configured correctly! A wrong configuration can lead to a loss of availability of Time Server 8030HEPTA/GPS!

- **Adaptive Transmit Load Balancing (TLB):**
  Outbound data traffic is split on both network interfaces ETH0 and ETH1 in accordance with the current load, depending on the interface speed adjusted.
  The network interfaces do not have to be connected on the same network switch.
  This mode supports distribution of load and tolerance for errors.

MII link monitoring interval (ms)

Indicates the interval in milliseconds for observing the MII-connection. A value of zero deactivates monitoring. The default value is 100ms.

link down delay (ms)

Determines the delay time in milliseconds to deactivate a connection after a link error is detected. This value needs to be a multiple of the MII link monitoring interval.

link up delay (ms)

Determines the delay time in milliseconds to enable a conjunction after a connection is detected. This value needs to be a multiple of the MII link monitoring interval.

LACP rate (only available for IEEE 802.3ad directive)

Indicates the link partner's request frequency to transfer LACP packets in IEEE 802.3ad mode.

Primary Device (only valid for active backup and TLB directive)

If this asset is configured and the network interface is active, the adjusted network interface is going to be used. Only if the network interface is inactive, mode is changed to the second network interface.

8.3.2.4 Network Interface PRP (Activation Key necessary)
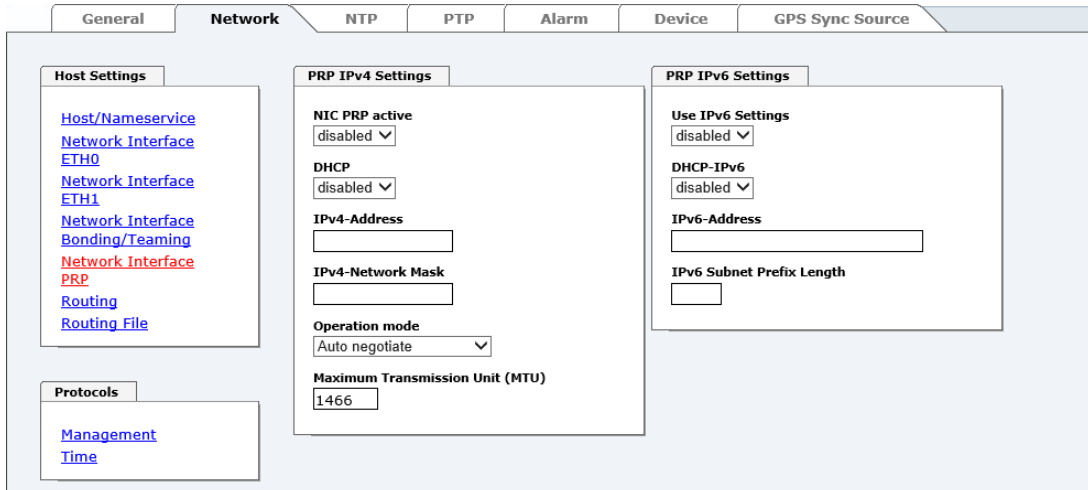
The PRP (Parallel Redundancy Protocol) functionality is specified in standard IEC 62439-3:2011 and enables to bundle the physical network interfaces ETH0 and ETH1 to one logical network interface. Each network interface is connected to an independent LAN (Local Area Network). If one of the two LANs has got a failure, usage of PRP ensures that the network connection between the PRP terminal devices is going to be maintained via the second, independent LAN. PRP standard was developed for very high demanding and critical applications in the field of automation of substations.

The following illustration shows an example of a PRP network:
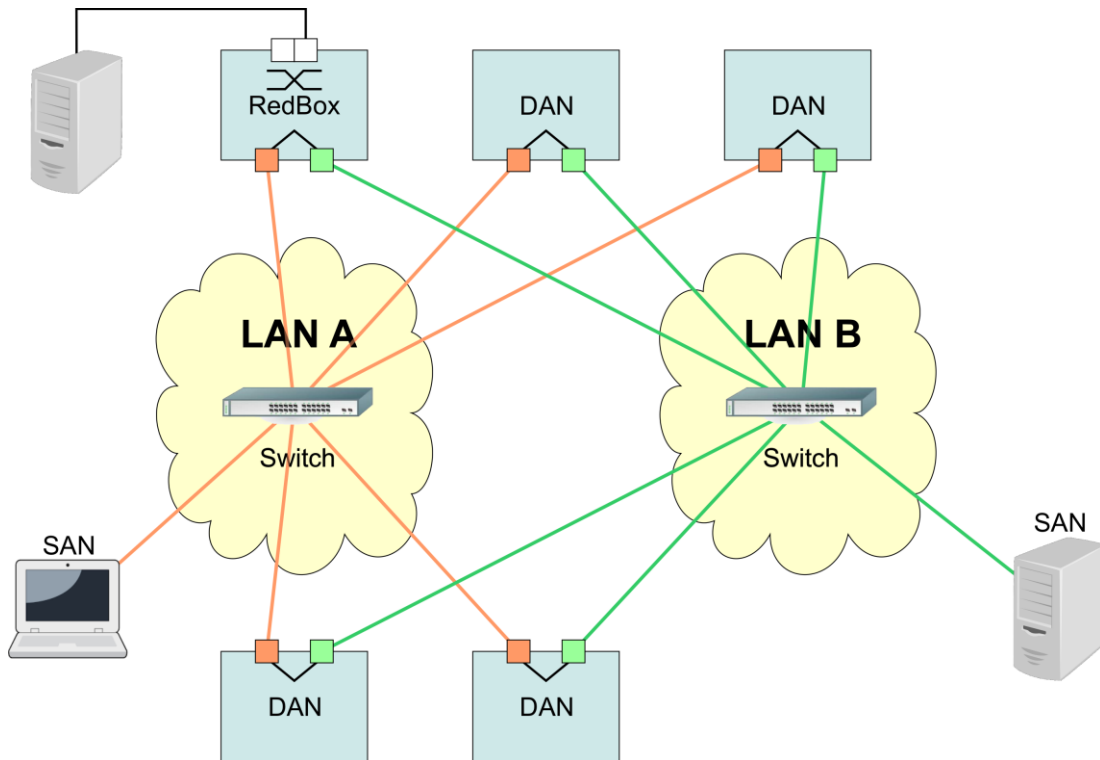
PRP-suitable applications are known as DAN (Dual Attached Node) and are going to be connected to the independent networks "LAN A" and "LAN B". The advantage of PRP is that cost-efficient and common network switches can be used which do not have to support the PRP standard. Applications which do not need to be redundantly available and which do not have to support PRP can be connected without problems in one of the two LANs - they are then called SAN (Single Attached Node). If it is necessary to redundantly connect non-PRP-supporting applications to the PRP network, a so-called RedBox (Redundancy Box) can be used.

Time Server 8030HEPTA/GPS supports PRP as DAN and can therefore directly be integrated into a PRP network without using a RedBox.

To use PRP the following settings must be carried out:

NIC PRP active

Activation of the PRP functionality

DHCP

Activation of DHCP for the "PRP interface".

> ⚠ A change of the IPv4 address or activation of DHCP will have an immediate effect after applying the settings - the connection to the web interface must be adapted and renewed.

IPv4 address

Input of the IPv4 address for the "PRP interface". If unknown the IPv4 address needs to be obtained by the network administrator.

> ⚠ A change of the IPv4 address or activation of DHCP will have an immediate effect after applying the settings - the connection to the web interface must be adapted and renewed.

IPv4 Network Mask

Input of the network mask for the "PRP interface".

> ⚠ A change of the IPv4 address or activation of DHCP will have an immediate effect after applying the settings - the connection to the web interface must be adapted and renewed.

Maximum Transmission Unit (MTU)

Input of the MTU to be used for the „PRP interface".

> ⚠ The MTU default setting with value 1466 should not be necessary by default.
>
> An incorrect configuration can lead to a loss of the network connection which refuses the Ethernet access to Time Server 8030HEPTA/GPS.
>
> In that case the settings of Time Server 8030HEPTA/GPS need to be set to "factory default"!

The network interface ETH0 of Time Server 8030HEPTA/GPS need to be connected to PRP network "LAN A", network interface ETH1 need to be connected to PRP network "LAN B"!

> ⚠ If settings are done without profound knowledge of PRP, severe network problems can occur.
>
> An incorrect configuration can lead to a loss of the network connection which refuses the Ethernet access to Time Server 8030HEPTA/GPS.
>
> In that case the settings of Time Server 8030HEPTA/GPS need to be set to "factory default"!

> ℹ If the functionality PRP was activated, parameters for ETH0 and ETH1 can no longer be adapted. The parameters will not be displayed in the host settings menu as long as PRP is going to be deactivated.

8.3.2.4.1 IPv6 Network Configuration

Defining the IPv6 network configuration for the PRP interface.

Use IPv6 Settings
Activation of IPv6 function

DHCP IPv6
Activation of IPv6 DHCP for the "PRP interface"

IPv6 address
Input of the IPv6 address for the " PRP interface".
If the IPv6 address is not known, it must be requested by the network administrator.
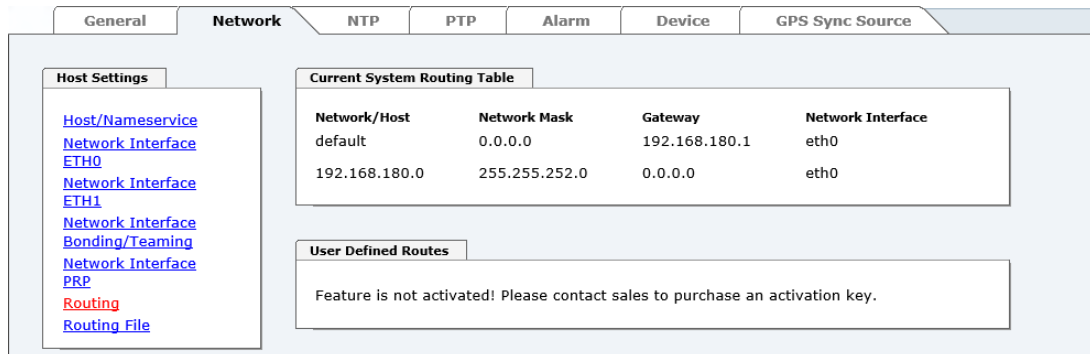
IPv6 Subnet Prefix Length
Input of the IPv6 network length for the " PRP interface".

8.3.2.5 Routing (Activation Key necessary)

Additional static routes can be configured if the module is not only used in the local sub net and if connection cannot be established via the configured standard gateway.

The gateway / gateway host need to be in the local sub-network range of the module in order to use the static routes.

> The parameterization of this feature is a critical process as an incorrect configuration may lead to considerable problems on the network!

WebGUI with Routing activated

The image above shows every configured route of the base system routing table as well as the user's defined static routes.

> The module cannot be used as a router!

Select **Use Route File** to set whether the routing configuration set under **User Defined Routes** should be used, or routing configuration using a routing file.

> If IPv6 routes are required, the routes must be made using the settings in *Chapter 8.3.2.6 Routing File*.

8.3.2.6 Routing File

In order to activate this function, **Use Route File** must be set to **enabled** on the Routing Page.

The routing file also makes it possible to configure IPv6 routes.

| General | **Network** | NTP | PTP | Alarm | Device | GPS Sync Source |

Host Settings

- Host/Nameservice
- Network Interface ETH0
- Network Interface ETH1
- Network Interface Bonding/Teaming
- Network Interface PRP
- Routing
- **Routing File**

Protocols

- Management
- Time

Routing File

Update file:

[   ] [Durchsuchen...]

[**Upload now**]

Download Routing File
📄 Click here to download

Current System Routing Table

Network/Host	Network Mask	Gateway	Network Interface
default	0.0.0.0	192.168.180.1	eth0
192.168.180.0	255.255.252.0	0.0.0.0	eth0
00000000000000000000000000000001	80	00000000000000000000000000000000	lo
fe800000000000000203c7fffe019b7e	80	00000000000000000000000000000000	lo
fe800000000000000000000000000000	40	00000000000000000000000000000000	eth0
ff000000000000000000000000000000	08	00000000000000000000000000000000	eth0
00000000000000000000000000000000	00	00000000000000000000000000000000	lo

Via the selection window under Update file and the button Upload now a new routing file can be uploaded. When uploading the file is checked whether the file is error-free and only then it is used.

If a routing file has already been uploaded, the uploaded routing file can be downloaded under **Download Routing File**.

Routing File Syntax

Each line of the routing file must be either a valid routing line or a comment line. A comment line starts with a hash sign (#) and can contain any text behind it.

A routing line has the format [destination address] [tab] [length of the destination mask in bits] [tab] [gateway address for the specified destination].

If the host 192.168.20.11 is to be reached using the gateway 192.168.0.2, then the routing file must look like this:

```
192.168.20.11    32    192.168.0.2
```

Example of a Routing File:

```
# Host 192.168.20.11 via Gateway 192.168.0.2
192.168.20.11    32    192.168.0.2
#Net 192.168.180.0 Netmask 255.255.255.0 via Gateway 192.168.0.2
192.168.180.0    24    192.168.0.2
#Net 2001:0db8:0:f102:: Subnet Prefix Length 64 via Gateway 2001:0db8:0:f101::1
2001:0db8:0:f102::    64       2000::1
```

Current **System Routing Table**

This table shows all active IPv4 and IPv6 routes.

For IPv6 routes, the colons of the destination and gateway addresses are not displayed, and the **Network Mask** column displays the length in hexadecimal

8.3.2.7 Management (Management-Protocols – HTTP, SNMP, SNMP-Traps, etc.)

Protocols that are not required should be disabled for security reasons. A correctly configured module is always accessible via the web interface.

Changes to the availability of a protocol (enable/disable) take effect immediately.

The **HMC NCA** field deactivates or activates the interface to the HMC network configuration wizard.
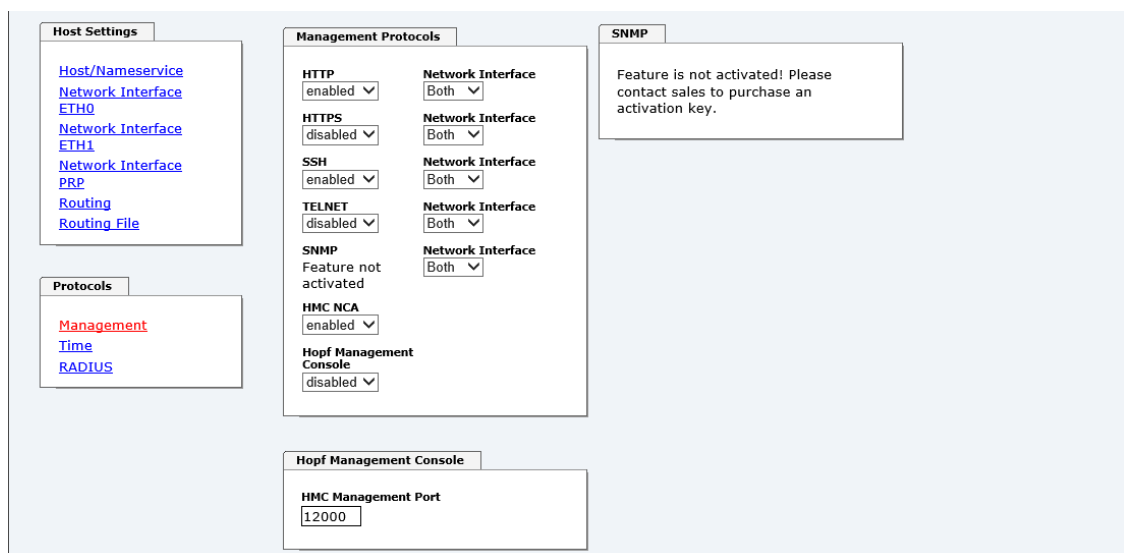
For SNMP functionality an activation key is necessary.

If by mistake all protocol channels become "disabled", the SSH channel is automatically "enabled" after the attempt to save.

After a Factory Default the HTTP and SSH channels are "enabled".

These service settings are valid globally! "Disabled" Services are not externally accessible and are not made externally available by the module!

WebGUI with Alarming activated

Using SNMP and SNMP- traps the protocol SNMP should be enabled. All fields must be filled in for a correct operation of SNMP. Contact your network administrator for details of data not known.

8.3.2.7.1 SNMPv2c / SNMPv3 (Activation Key required)

Both protocols SNMPv2c and SNMPv3 are supported and can be configured and enabled independently from each other.

System Location and System Contact are global settings and are valid for both protocols (SNMPv2c / SNMPv3).

In order to disable SNMPv2c both fields **SNMP Read Only Community** and **SNMP Read Write Community** must remain empty.

SNMPv2c	SNMPv2c enabled	SNMPv2c disabled
Read Only Community:	set (e.g. public)	empty
Read/Write Community:	set (e.g. secret)	empty

In order to enable SNMPv3 the following fields must be set:

SNMPv3	Description
Security Name:	SNMPv3 is enabled (identical to the username)
Access Rights:	Equivalent to the Read/Write Communities in SNMPv2c
Authentication Protocol:	Authentication (MD5 or SHA Hash)
Privacy Protocol:	Encryption (DES or AES Algorithm)

There are three security levels in SNMPv3 that can be adjusted by the removal of the passphrases:
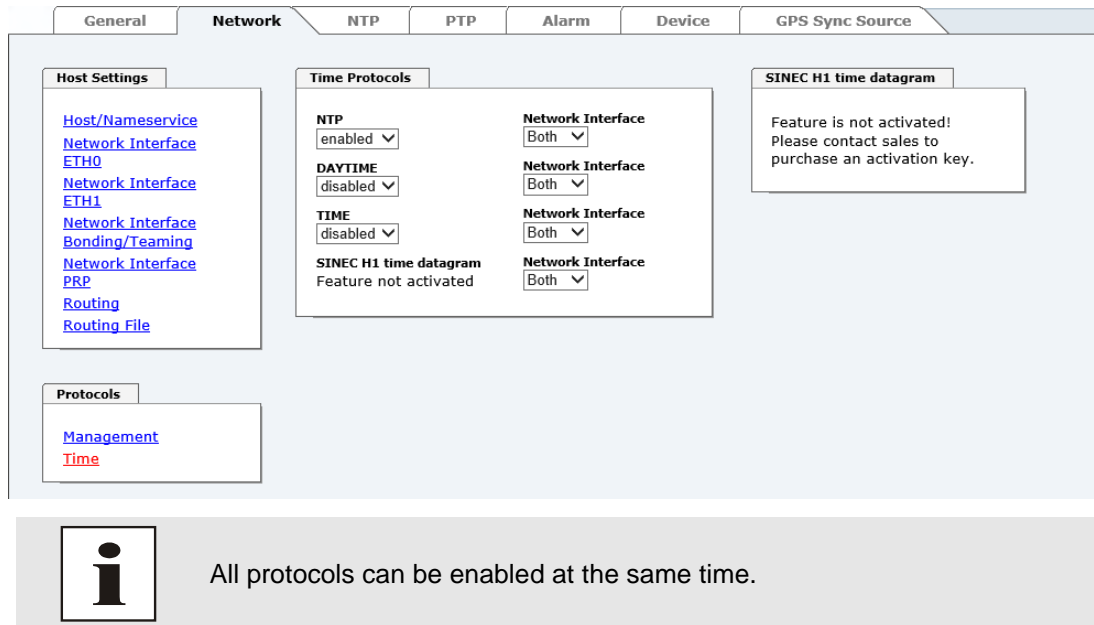
SNMPv3	noAuthNoPriv	authNoPriv	authPriv
Authentication Passphrase:	empty	set	set
Privacy Passphrase:	empty	empty	set

Right now only one user is supported.

8.3.2.8 Time (Time Protocols – NTP, DAYTIME etc.)

Activation and configuration of different synchronization protocols

  All protocols can be enabled at the same time.

8.3.2.8.1 Synchronization Protocols (Time Protocols – NTP, SNTP etc.)

Needed time protocols can be enabled here.

- NTP (incl. SNTP)
- DAYTIME
- TIME
- SINEC H1 time datagram (Activation Key necessary)

8.3.2.8.2 SINEC H1 time datagram (Activation Key necessary)

Configuration of the SINEC H1 time datagram

SINEC H1 time datagram
Send Interval 1 second ▾
Timebase UTC ▾
Destination MAC Address 09:00:06:03:FF:EF ▾
Minimum Accuracy Low ▾

Broadcast transmission intervals of the SINEC H1 time datagram (Send Interval)

- every second
- every 10 second
- every 60 second

Time base see also *Chapter 14.2.1 Time-Specific Expressions*

- Local time
- UTC
- Standard time
- Standard time with daylight / standard time status

Destination MAC Address

- 09:00:06:03:FF:EF
- 09:00:06:01:FF:EF
- FF:FF:FF:FF:FF:FF

Synchronization Status based on Starting Transmission (Minimum Accuracy)

This setting defines at which internal accuracy status the SINEC H1 time datagram should be transmitted (see *Chapter 14.5 Accuracy & NTP Basic Principles* and *Chapter 12 Technical Data*):

- LOW
- MEDIUM
- HIGH

⚠️ The setting Minimum Accuracy = LOW may lead to the output of non-synchronised (thus possibly wrong) time information.

8.3.2.9 RADIUS

This page allows the configuration of the RADIUS service (Remote Authentication Dial-In User Service).

In order to use this service, a correspondingly configured RADIUS server must exist.

8.3.2.9.1 RADIUS Server Configuration under Windows Server 2016

Prepare Active Directory Users and Computers

The RADIUS server must support two user groups.

Under 'Active Directory Users and Computers' create two groups of authorized users to authenticate with RADIUS - e.g. RADIUS-master and RADIUS-device.

Then you have to add authorized users to these groups.

Master users have full access to the system, device users have limited access to the system.

Installation of the function Network Policy and Access Service

In menu item 'Server-Manager' / 'Dashboard' / 'Manage' / 'Add Roles and Features' add server role 'Network Policy and Access Services' and restart server if required.

Configuration of RADIUS service

Open the Network Policy Server via 'Server Manager' / 'Dashboard' / 'Tools' / 'Network Policy Server'.

Register your RADIUS server on ActiveDirectory so that it can make queries to the users and groups database.

With the right mouse button click on the NPS (Local) button of the Network Policy Server and 'Register server in ActiveDirectory'.

Create RADIUS Clients

After configuring the RADIUS server service, the **hopf** device must be entered as RADIUS client.

The required menu can be found on the Network Policy Server 'NPS (Local)' / 'RADIUS Clients and Server' / 'RADIUS Clients'. With the right mouse button click on 'New'.

Type in 'Friendly name' (e.g. HOPF Device), Client-'Address' (e.g. 192.168.1.123) and a 'Shared secret' key (***).

The address typed in must match the address of the **hopf** device.

The shared secret key can be chosen freely. It must be repeated in the confirm field. The chosen key will be required as a secret key during configuration at the **hopf** device.

Create a Connection Request Policy

Open the menu item 'NPS (Local)' / 'Policies' / 'Connection Request Policy' in the Network Policy Server – then click on 'New' with the right mouse button.

Type in a 'Policy name' (e.g. TEST) => 'NEXT'

In the menu item 'Condition description' click on 'Add ...'

Select 'Client Friendly Name' and type in => 'Add ...'

Type in a name (e.g. TEST) => 'OK'

Click on 'NEXT' => 'NEXT' => 'NEXT'

In 'Configure Settings' select Attribute 'User-Name' and click 'NEXT' => 'FINISH'

Create a Network Policy

Subsequently the two network policies for the MASTER and DEVICE access to the *hopf* device must be created.

With the right mouse button click on menu item 'New' of the Network Policy Server menu 'NPS (Local)' / Policies / Network Policies

Type in a 'Policy name' (e.g. HOPF-master) => NEXT

In the menu item 'Condition description' click on 'Add ...'

Select the menu item 'User Groups' and click 'Add ...'

Click 'Add Groups ...' and select the previous created group e.g. RADIUS-master => 'OK' => 'Next'

In 'Specify Access permission' select **'Access granted'** => 'NEXT'

In 'Configure Authentication Methods' select **'Unencrypted authentication (PAP, SPAP)'** => NEXT

Click on 'Next' to open a note that needs to be confirmed with **'No'** to proceed with the next screen.

Click on 'Next' for the 'Configure settings' window.

In this window the attribute 'Tunnel password' must be set under 'RADIUS attributes' / 'Standard' with the button 'Add'. All other attributes must be cleared using the Remove button.

When adding the tunnel password attribute, make sure that Hexadecimal is selected for "Enter attribute value as". Now you have to select a password that must be entered into the tunnel password input field in the following way:

1. Six zeros must be entered at the beginning of the password.

2. As a two-digit hexadecimal number, the length of the selected password must be added. If as password, e.g. master is selected, then 06 must be added since master is six characters long.

3. Now, the ASCII value of each character of the selected password must be added as a two-digit hexadecimal number. For the password **master**, **6D6173746572** would have to be specified.

4. Finally, the tunnel password must be confirmed with OK.

Here are some password examples and the tunnel passwords to be given:

Password Example	Tunnel Password Input
Test123	0000000754657374313233
MySecret	000000084D79536563726574
ABCDEFGHIJKLMNOPQRST	0000001441424344454647484940a4b4c4d4e4f5051525354

After confirming the chosen password continue by clicking on 'Next'.

Use the 'Finish' button to complete the configuration of the new network policy.

Two network policies must be set up. One of the network policies regulates access to the *hopf* device with the MASTER user rights, the other regulates the access with DEVICE user rights. The tunnel passwords of the two network policies must be different.

If both network policies have been created, the Network Policy page must contain at least the two newly created policies.

8.3.2.9.2 RADIUS Configuration on the *hopf* Device

On the RADIUS page, the data required for the RADIUS configuration can be entered by the MASTER user or, if the RADIUS service is already activated, by a user who is in the MASTER group of the RADIUS server.

All other users see the following message:

Use the **Enable** field to enable and disable the RADIUS service. If the RADIUS service is disabled, the MASTER and the DEVICE users are used for logging into the web interface. If the RADIUS service is activated, the RADIUS service is used to log in to the web interface.

The **Server Address** field must specify the network address of the RADIUS server.

The **Secret Key** field must display the 'shared secret key' specified on the RADIUS server for this *hopf* device.

In the field **Master User Secret** the 'Tunnel password' must be entered, which has been specified in the *hopf* Master network policy.

In the field **Device User Secret** the 'Tunnel password' must be entered, which has been specified in the *hopf* Device network policy.

The following picture shows the RADIUS configuration on the *hopf* device, for a RADIUS server with the address 192.168.1.124 and the shared secret key **MySecret**.

8.3.2.9.3 Notes

The RADIUS service is only used for the web interface.

> ⚠ If other protocols than http and https are activated in the management section of *Chapter 8.3.2.7 Management (Management-Protocols – HTTP, SNMP, SNMP-Traps, etc.)*, they continue to use the master and the device user, therefore the other protocols should be deactivated when using the RADIUS service.

If the RADIUS service is activated after logging in with a user of the master group on the general page, you will be logged in as **master** user.

Users who are in the device group will see that they are logged in as **device** users.

8.3.3 NTP Tab

This tab shows information and adjustment possibilities of the NTP services of the Time Server 8030HEPTA/GPS. The NTP service is the significant main service of the Time Server 8030HEPTA/GPS.

If you are not familiar with the subject of NTP you can find a short description in the Glossary. More details are also available at http://www.ntp.org/.

NTP functionality is provided by an NTP-Demon running on the embedded Linux of the Time Server 8030HEPTA/GPS.

Depending on the receiving conditions and under unfavourable circumstances it may take several hours until long-term accuracy is obtained (normally 5-10 minutes). During this time the NTP algorithm adjusts the internal accuracy parameters.

> The NTP time protocol must be enabled in order to use NTP
> (see **Chapter 8.3.2.8 Time**)

> After all changes relating to NTP a restart of the NTP service must be performed (see **Chapter 8.3.3.6 Restart NTP**).
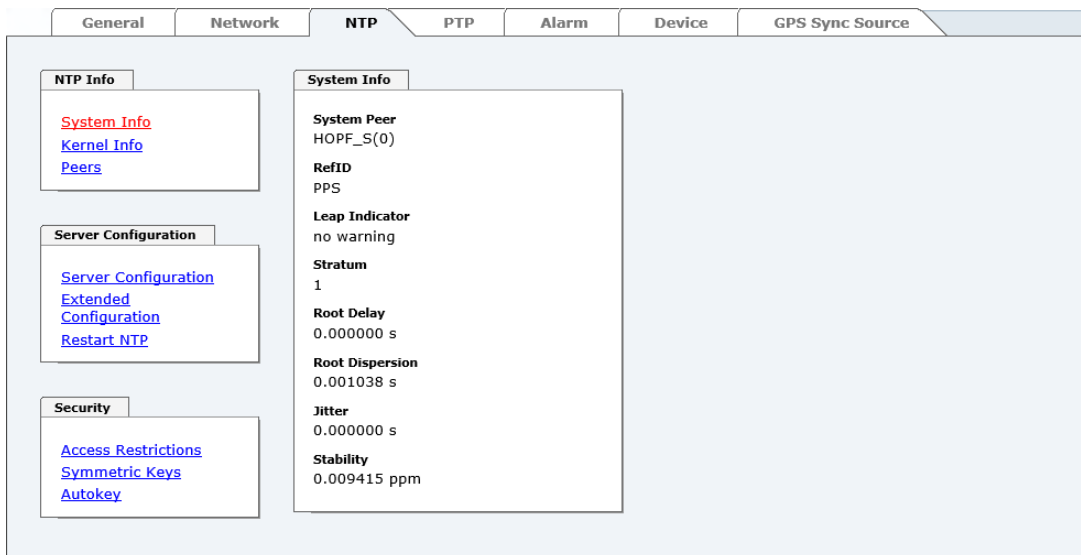
> Via the NTP protocol SNTP Clients can also be synchronized. In contrast to NTP in SNTP Clients delay times are not evaluated on the network. For this reason the accuracy reached in SNTP Clients is lower than in NTP Clients.

8.3.3.1 System Info

In the window "System Info" the current NTP values of the NTP service running on the embedded Linux of the Time Server 8030HEPTA/GPS are indicated. In addition to the NTP calculated values for root delay, root dispersion, jitter, and stability the stratum value of the Time Server 8030HEPTA/GPS, the status to the leap second, and the current system peer are also found here.

The NTP version used adjusts the leap second correctly.

The Time Server 8030HEPTA/GPS works as NTP Server with stratum 1 and belongs to the best available class of NTP server, as it has a reference clock with direct access.

8.3.3.2 Kernel Info

The "Kernel Info" overview shows the current error values of the internal embedded Linux clock. Both values are internally updated every second.

This screenshot shows a maximum kernel clock error of 1.500 msec (milliseconds). The estimated error value is 1 µs (microseconds).

The values indicated here are based on the calculation of the NTP service and have no significance for the accuracy of the Sync Source (here Module 8024GPS).
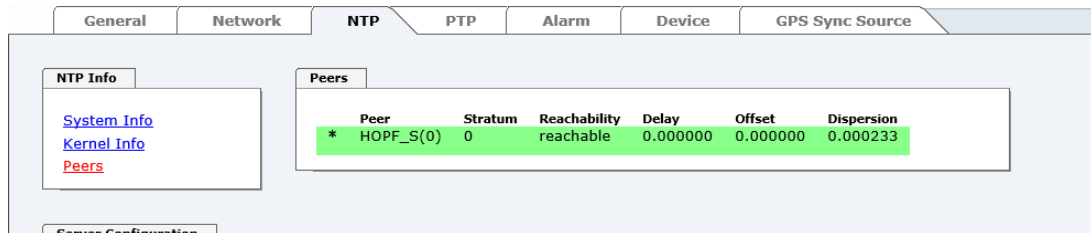
8.3.3.3 Peers

The "Peers summary" is used to track the performance of the configured NTP server/driver and the NTP algorithm itself.

The information displayed is identical with the information available via NTPQ or NTPDC programs.

Each NTP server/driver that has been set up in the NTP server configuration is displayed in the peer information.

The connection status is displayed in the reachability column (not reachable, bad, medium, and reachable).
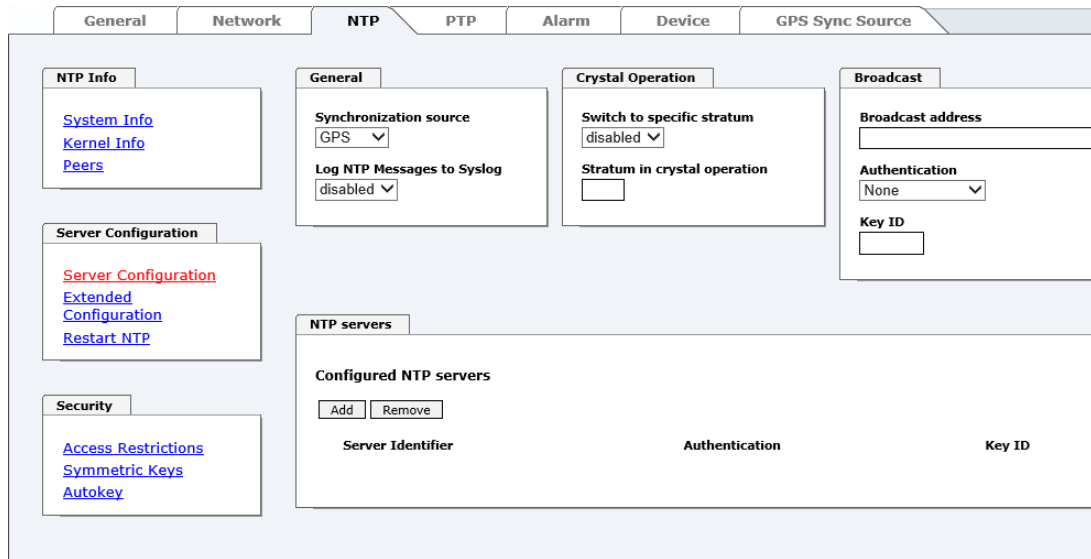
The first line displays the **_hopf_ - refclock ntp driver** that gets the time information directly from the Sync Source.

A short explanation and definition of the displayed values can be found in *Chapter 14.5 Accuracy & NTP Basic Principles*.

The character in the first column on the left presents the current status of the NTP association in the NTP selection algorithm. A list and description of possible characters can be found in the Glossary (see *Chapter 14.2 Tally Codes (NTP-specific)*).

8.3.3.4 Server Configuration

The basic settings for NTP base functionality are displayed selecting the "Server Configuration" link.

The **hopf** - **refclock ntp driver** is already configured as standard (127.127.38.0 in the "Peers Summary") and is not explicitly displayed here.

8.3.3.4.1 Synchronization Source (General / Synchronization source)

As *"Synchronization source"* either GPS or DCF77, depending on the appropriate Sync Source, has to be selected. This is required in order to align the NTP algorithm for the calculation of the accuracy with the synchronization source.

> ⚠ Based on the selection of GPS, even though GPS is not the source of the Sync Source (different product option) the value **HIGH** for **Accuracy** may never be reached.

8.3.3.4.2 NTP Syslog Messages (General / Log NTP Messages to Syslog)

This option enables or disables Syslog messages which are generated from the NTP service.

This value has no effect if Syslog is not configured in the ALARM tab (see **Chapter 8.3.5.1 Syslog Configuration**).

8.3.3.4.3 Crystal Operation

Crystal Operation / Switch to Specific Stratum

If the Sync Source (here Module 8024GPS) runs in crystal operation (status "crystal") the NTP service of the Time Server 8030HEPTA/GPS usually behaves in the way that the receipt of time information is stopped from the Sync Source and the stratum value reset to 16 (defined as invalid in NTP).

> ⚠ NTP Clients do not accept time information from a NTP Time Server with stratum 16 (invalid). Briefly, as long as the Time Server 8030HEPTA/GPS indicates the stratum value 16, NTP Clients are not synchronized.

This behaviour of NTP during crystal operation of the Sync Source can be changed. Therefore the function "*Switch to specific stratum*" should be enabled by setting the value to "*enabled*" and the so-called downgrading stratum (= stratum value of the Time Server 8030HEPTA/GPS during crystal operation of the Sync Source).

For the synchronization of NTP Clients during crystal operation of the Sync Source or for testing the system without connected synchronization source, in the setting "*enabled*" any stratum value between 1 and 15 can be set.

Crystal Operation / Stratum in Crystal Operation

The value defined here (range 1-15) designates the transmitted fall back NTP stratum level of the module in "*Quartz*" synchronization status. Stratum 1 should be configured if downgrading is not desired in status "Quartz".

> ⚠ The NTP service MUST also be restarted (see **Chapter 8.3.3.6 Restart NTP**).

> ⚠ Using the option "*Switch to specific stratum*" the NTP Clients are synchronized with time information indicated in the general menu of the WebGUI of the Sync Source (here Module 8024GPS) during crystal operating. Whether this time information (e.g. through drift) is imprecise or the time is manually set (wrong) cannot be detected by the NTP Client!

> ⚠ In case the value 1 is used for *"Stratum in crystal operation"*, the NTP Client cannot not verify whether the Time Server 8030HEPTA/GPS is synchronised or runs in crystal operation. Should a differentiation be wished between synchronized and crystal operation the downgrading stratum needs to be set to a value between 2 and 15.

The value is only adjustable if the "*Switch to specific stratum*" function is enabled.

8.3.3.4.4 Broadcast / Broadcast Address

This section is used to configure the Time Server 8030HEPTA/GPS as a broadcast or multicast server.

The broadcast mode in NTPv3 and NTPv4 is limited to clients on the same sub-network and Ethernets which support broadcast technology.

This technology does not generally extend beyond the first hop (network node - such as router or gateway).

The broadcast mode is provided for configurations which are designed to facilitate one or more servers and as many clients as possible in a sub-network. The server continuously generates broadcast messages at defined intervals, corresponding to 16 seconds (minpoll 4) for Time Server 8030HEPTA/GPS. Care should be taken to ensure that the correct broadcast address is used for the sub-network, usually xxx.xxx.xxx.255 (e.g. 192.168.1.255). If the broadcast address is not known, this can be requested from the network administrator.

This section can also be used to configure the Time Server 8030HEPTA/GPS as a multicast server. The configuration of a multicast server is similar to that of a broadcast server. However, a multicast group address (class D) is used instead of the broadcast address.

An explanation of multicast technology goes beyond the scope of this document.

In principle, a host or router sends a message to an IPv4 multicast group address and expects all hosts and routers to receive this message. In doing so, there is no limit to the number of senders and receivers and a sender may also be a receiver and vice-versa. The IANA has assigned the multicast group address IPv4 224.0.1.1 to the NTP, however this should only be used if the multicast range can be safely limited in order to protect neighbouring networks. As a basic principle, administratively manageable IPv4 group addresses should be used as described in RFC-2365 or GLOP group addresses as described in RFC-2770.

8.3.3.4.5 Broadcast / Authentication / Key ID

Broadcast packets can be protected by authentication for security reasons.

If a security method is selected here, this must be configured **additionally** in the security settings of the NTP tab. A key must be defined if the Symmetric Key is selected.

8.3.3.4.6 Additional NTP SERVERS

Adding further NTP servers provides the opportunity to implement a security system for the time service. However, this affects the accuracy and stability of the Time Server 8030HEPTA/GPS.

Detailed information on this subject can be found in the NTP documentation (http://www.ntp.org/).

8.3.3.5 Extended NTP Configuration

NTP is a standard for synchronising clocks in computer systems via packet-based communication networks. For special applications a NON standard setting can be configured.

For activation of this special NTP setting, the customer's approval shown in the WebGUI needed to be declared by checking the field "I agree".

8.3.3.5.1 Suppression of unspecified NTP Outputs (Block Output when Stratum Unspecified)

Unspecified NTP outputs that e.g. are generated by NTP at a restart are suppressed when this function is enabled.

8.3.3.5.2 NTP Timebase

For custom applications this function enables adjustment of the time base of the NTP output.

Entering this function the transmitted time protocol of the Time Server is not conform to the NTP standard anymore.
According to the NTP standard NTP uses only the UTC time base. The NTP time protocol does not allow any leaps in time.

This function is only allowed for the Output of NTP
In case of activated function the output of the Time Server for
SINEC H1 TIME DATAGRAM / TIME / DAYTIME is released with a wrong time basis. Therefore this datagram should be deactivated for security reasons.

> **Following configuration steps for the activation of the NTP time basis are required:**
>
> - Select the desired NTP time base.
>
> - Transfer the setting with **Apply Changes** to the Time Server.
>
> - Fail-save storage of the configuration by pressing **Save to Flash within 10 seconds**.
>   Depending on the activated time base leap a board reset might be released after transfer with Apply Changes eliminating non saved configurations.

UTC - NTP with Time Basis UTC

According to the RFC standard NTP uses only the UTC time base.

NTP with the Time Base Standard Time

Using the NTP time protocol with the standard time base the released time information correspond with UTC plus the time difference, adjusted in the base system **without** considering the daylight saving time changeover.

NTP with the Time Base Local Time

Output of the NTP time protocol with the local time base the released time information correspond with UTC plus the time difference and the additional offset for the possible summer time, adjusted in the base system.

NTP does not allow any leaps in time. Using the NTP time protocol with the local time base the internal NTP process of a board is restarted based on a summer-/winter time adjustment.

> Using the NTP time protocol with the local time base the summer-/winter time adjustment is released one to two minutes belated.
>
> Afterwards the local time is correctly available in the NTP time protocol. Therefore, within this transition period a requested NTP time protocol is replied by the former time base.

> Changing the time base for the output of the protocol for NTP is only designed for customized applications and does not correspond with the standard of NTP. The synchronisation of a standard NTP-Client with a time basis deviating from UTC results in a wrong time information in the standard NTP-Client and might cause time leaps!

8.3.3.6 Restart NTP

The following screen appears after clicking on the Restart NTP option:
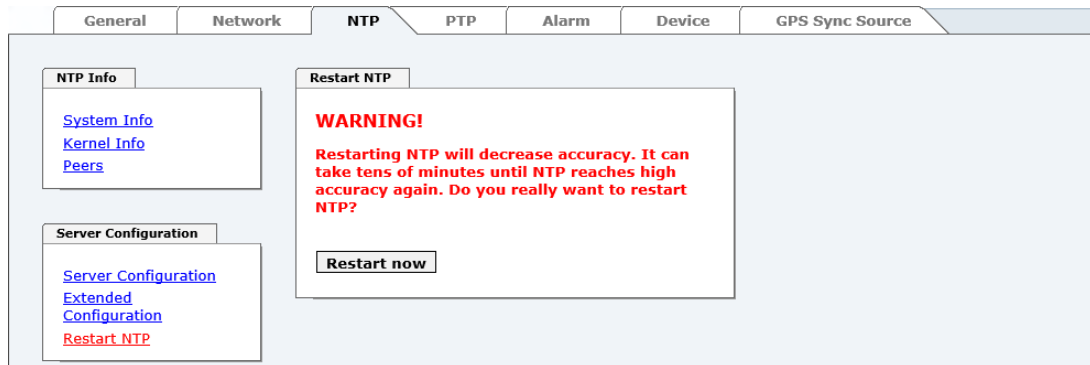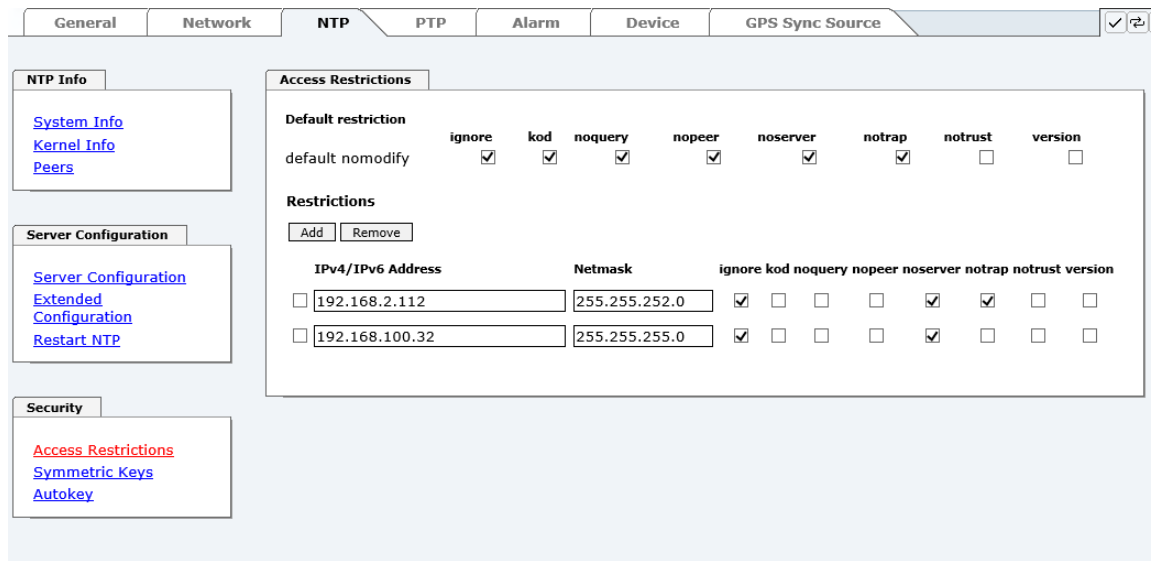
Restarting NTP services is the only possibility of making NTP changes effective without having to restart the entire Time Server 8030HEPTA/GPS. As can be seen from the warning message, the currently reachable stability and accuracy get lost caused by this restart.

> After a restart of the NTP service it takes up to 10 minutes until the NTP service on the Time Server 8030HEPTA/GPS is completely adjusted.

8.3.3.7 Configuring the NTP Access Restrictions

One of the extended configuration options for NTP is the "Access Restrictions" (NTP access restrictions).

Restrictions are used in order to control access to the System's NTP service and these are regrettably the most misunderstood options of the NTP configuration.

If you are not familiar with these options, a detailed explanation can be found at http://www.ntp.org/.

> ⚠ IP addresses should be used when configuring the restrictions – no Host-names!

The following steps show how restrictions can be configured - should these not be required it is sufficient to retain the standard settings.

The standard restrictions tell the NTP service how to handle packets of hosts (including remote time servers) and sub-network which otherwise have no special restrictions.

The NTP configuration can simplify the selection of the correct standard restrictions while making the required security available.

Before beginning the configuration the points **8.3.3.7.1** to **8.3.3.7.4** must be checked by the user:

8.3.3.7.1 NAT or Firewall

Are incoming connections to the NTP Service blocked by NAT or a Stateful Inspection Firewall?	
No	Proceed to *Chapter 8.3.3.7.2 Blocking Unauthorised Access*
Yes	No restrictions are required in this case. Proceed further to *Chapter 8.3.3.7.4 Internal Client Protection / Local Network Threat Level*

8.3.3.7.2 Blocking Unauthorised Access

Is it really necessary to block all connections from unauthorised hosts if the NTP Service is openly accessible?	
No	Proceed to *Chapter 8.3.3.7.3 Allowing Client Requests*
Yes	In this case the following restrictions are to be used: **ignore in the default restrictions** ☑ If a standard restriction is selected in this area, exceptions can be declared in separate lines for each authorised server, client or sub-network. See *Chapter 8.3.3.7.5 Addition of Exceptions to Standard Restrictions*

8.3.3.7.3 Allowing Client Requests

Are clients to be allowed to see the server status information when they receive the time information from the NTP service (even if this is information about the module, operating system and NTPD version)?	
No	In this case select from the following standard restrictions: See *Chapter 8.3.3.7.6 Access Control Options* **kod** ☑ **notrap** ☑ **nopeer** ☑ **noquery**. ☑
Yes	In this case select from the following standard restrictions: See *Chapter 8.3.3.7.6 Access Control Options* **kod** ☑ **notrap** ☑ **nopeer** ☑ If a standard restriction is selected in this area, exceptions can be declared in separate lines for each authorised server, client or sub-network. See *Chapter 8.3.3.7.5 Addition of Exceptions to Standard Restrictions*

8.3.3.7.4 Internal Client Protection / Local Network Threat Level

How much protection from internal network clients is required?	
Yes	The following restrictions can be enabled if greater security settings than the installed authentication are required in order to protect the NTP service from the clients see *Chapter 8.3.3.7.6 Access Control Options* **kod** ☑ **notrap** ☑ **nopeer** ☑

8.3.3.7.5 Addition of Exceptions to Standard Restrictions

After the standard restrictions have been set once, certain exceptions may be necessary for special hosts/sub-networks in order to allow remote time servers and client hosts/sub-networks to contact the NTP service.

These standard restrictions are to be added in the form of restriction lines.

Access Restrictions

Default restriction

	ignore	kod	noquery	nopeer	noserver	notrap	notrust	version
default nomodify	☑	☑	☑	☑	☑	☑	☐	☐

Restrictions

Add   Remove

	IP-Address	Netmask	ignore	kod	noquery	nopeer	noserver	notrap	notrust	version
☐	192.168.2.112	255.255.0.0	☑	☐	☐	☐	☑	☑	☐	☐
☐	192.168.100.32	255.255.255.0	☑	☐	☐	☐	☑	☐	☐	☐

ℹ️ An unrestricted access of the Time Server 8030HEPTA/GPS to its own NTP service is always allowed, irrespective of whether standard restrictions are ignored or not. This is necessary in order to be able to display NTP data on the web interface.

Add restriction exception: (for each remote time server)

Restrictions: Press ADD

Enter the IP address of the remote time server.

Enable restrictions: e.g.

notrap / nopeer / **noquery** ☑

Allow **unrestricted access** to a special host (e.g. System administrator's workstation):

Restrictions: Press ADD

IP address 192.168.1.101

Do not enable any restrictions

Allow a **sub-network** to receive time server and query server statistics:

Restrictions: Press ADD

IP address 192.168.1.0

Network mask   255.255.255.0

notrap / nopeer   ☑

The entry of exceptions also works for IPv6 addresses. For this, the IPv6 address must be entered in the column IPv4/IPv6 Address and the length of the IPv6 net mask must be entered in the Netmask column.

8.3.3.7.6 Access Control Options

The official documentation concerning the current implementation of the restriction instructions can be found on the "Access Control Options" page at http://www.ntp.org/.

Numerous access control options are used. The most important of these are described in detail here.

nomodify – "Do not allow this host/sub-network to modify the NTPD settings unless it has the correct key."

> **Default Settings**:
> Always active. Can't be modified by the user.

As standard, NTP requires authentication with a symmetric key in order to carry out modifications with NTPDC. If a symmetric key is not configured for the NTP service, or if this is kept in a safe place, it is not necessary to use the nomodify option unless the authentication procedure appears to be unsafe.

noserver – "Do not transmit time to this host/sub-network."
This option is used if a host/sub-network is only allowed access to the NTP service in order to monitor or remotely configure the service.

notrust – "Ignore all NTP packets which are not encrypted."
This option tells the NTP service that all NTP packets which are not encrypted should be ignored (it should be noted that this is a change from ntp-4.1.x). The notrust option MUST NOT be used unless NTP Crypto (e.g. symmetric key or Autokey) has been correctly configured on both sides of the NTP connection (e.g. NTP service and remote time server, NTP service and client).

noquery – "Do not allow this host/sub-network to request the NTP service status."
The ntpd status request function, provided by ntpd/ntpdc, declassifies certain information over the running ntpd Base System (e.g. operating system version, ntpd version) which under certain circumstances ought not to be made known to others. It must be decided whether it is more important to hide this information or to give clients the possibility of seeing synchronization information over ntpd.

ignore – "In this case ALL packets are refused, including ntpq and ntpdc requests".

kod – "A kiss-o'-death (KoD) packet is transmitted if this option is enabled in the case of an access error." KoD packets are limited. They cannot be transmitted more frequently than once per second. Any KoD packet which occurs within one second from the last packet is removed.

notrap – "Denies support for the mode 6 control message trap service in order to equalize hosts." The trap service is a sub-system of the ntpq control message protocols. This service logs remote events in programmes.

version – "Denies packets which do not correspond to the current NTP version."

> Changes in data do not take effect immediately after clicking on the "Apply" symbol. The NTP service MUST also be restarted (see **Chapter 8.3.3.6 Restart NTP**).

8.3.3.8 Symmetric Key

8.3.3.8.1 Why Authentication?

Most NTP users do not require authentication as the protocol contains several filters (for bad time).

Despite this, however, the use of authentication is common. There are certain reasons for this:

- Time should only be used from safe sources
- An attacker broadcasts false time signals
- An attacker poses as another time server

8.3.3.8.2 How is Authentication used in the NTP Service?

Client and server can execute an authentication whereby a code word is used on the client side and a restriction on the server side.

NTP uses keys to implement the authentication. These keys are used when data are exchanged between two machines.

In principle both sides must know this key. The key can generally be found in the "*.*/etc/ntp.keys" directory. It is unencrypted and hidden from public view. This means that the key has to be distributed on a safe route to all communication partners. The key can be downloaded for distribution under "Downloads / Configuration Files" on the DEVICE tab. It is necessary to be logged in as "Master" in order to access this.

The keyword key of a client's ntp.conf determines the key that is used to communicate with the designated server (e.g. the Time Server 8030HEPTA/GPS). The key must be reliable if time is to be synchronised. Authentication causes a delay. This delay is automatically taken into account and adjusted in the current versions.

8.3.3.8.3 How is a key created?

A key is a sequence of up to 31 ASCII characters. Some characters with special significance cannot be used (alphanumeric characters and the following symbols can be used:**[ ] ( ) * - _ ! $ % & / = ?**).

A new line can be inserted by pressing the `ADD` key. The key which is stored in the key file is entered on this line. The key ID is used to identify the key and is in the range from 1 – 65534. This means that 65534 different keys can be defined.

Duplicate key ID's are not allowed. Having now explained the principles of keys, it should be possible to use a key in practically the same way as a password.

The value of the request key field is used as the password for the ntpdc tool while the value of the control key field is used as the password for the ntpq tool.

More information is available at http://www.ntp.org/.

8.3.3.8.4 How does authentication work?
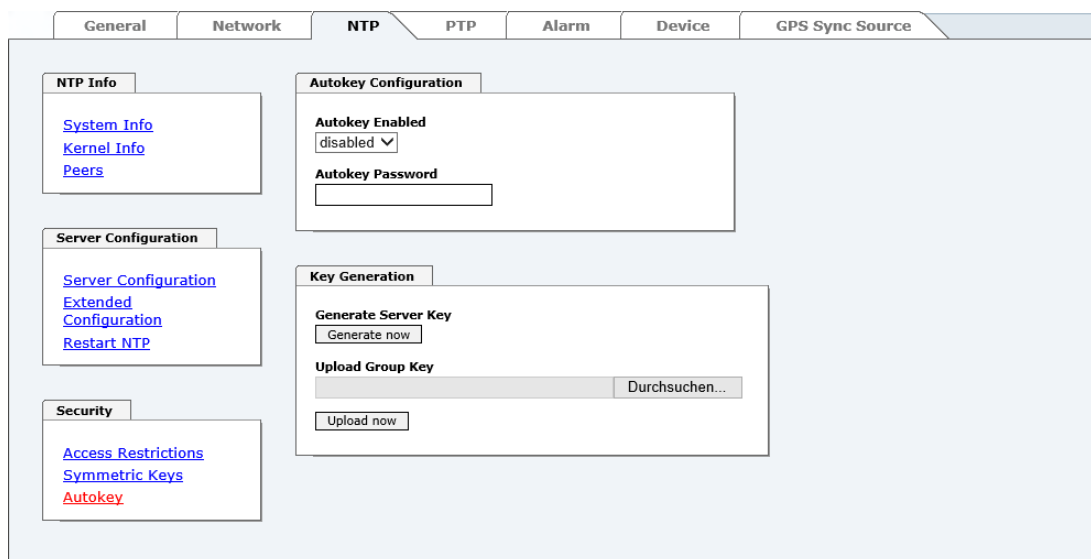
The basic authentication is a digital signature and no data encryption (if there are any differences between the two). The data packet and the key are used to create a non-reversible number which is attached to the packet.

The receiver (which has the same key) carries out the same calculation and compares the results. Authentication has been successful if the results agree.

8.3.3.9 Autokey

NTPv4 offers a new Autokey scheme based on **public key cryptography**.

As a basic principle, **public key cryptography** is safer than **symmetric key cryptography** as protection is based on a private value which is generated by each host and is never visible.

In order to enable Autokey v2 authentication, the "Autokey Enabled" option must be set to "enabled" and a password specified (may not be blank).

A new server key and certificate can be generated by pressing the "Generate now" button.

> ⚠️ **Generate now**
> This should be carried out regularly as these keys are only valid for one year.

If the Time Server 8030HEPTA/GPS is to form part of an NTP trust group, a group key can be defined and uploaded with the "Upload now" button.

Detailed information about the NTP Autokey scheme can be found in the NTP documentation (http://www.ntp.org/).

> ⚠️ Changes in data do not take effect immediately after clicking on the "Apply" symbol. The NTP service MUST also be restarted (see ***Chapter 8.3.3.6 Restart NTP***).

8.3.4   PTP Tab

This Tab shows information and adjustment possibilities of the PTP service of the Time Server 8030HEPTA/GPS.
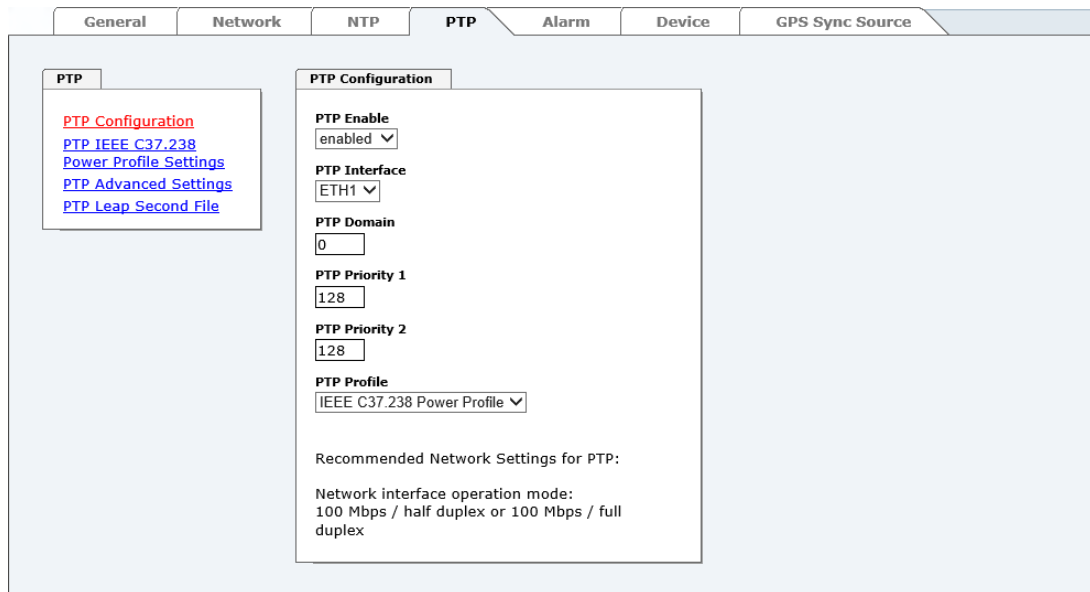
PTP functionality is provided by a PTP-Demon running on the embedded Linux of the Time Server 8030HEPTA/GPS.

Depending on the receiving conditions and under unfavourable circumstances it may take several hours until long-term accuracy is obtained (normally 5-10 minutes).

The PTP-Demon is implemented according to standard IEEE 1588-2008. More detailed description of the adjustable value in the PTP tab and their effects on the PTP-Demon can be found in this standard.

8.3.4.1   PTP Configuration

The "PTP Configuration" window provides basic settings of the PTP service.

PTP Enable

This option activates or deactivates the PTP service.

Remark: Changes in the "Network Interface …" settings in the "NETWORK" tab, can lead to the deactivation of "PTP Enable".

PTP Interface

This option sets the network interface that is used by the PTP service.

The content of the drop down depends on the settings in the "NETWORK" tab.

If "NIC Bonding / Teaming active" is active, only "BOND0" can be chosen.

If "NIC PRP active" is active, only "PRP0" can be chosen.

If "NIC Bonding / Teaming active" and "NIC PRP active" are inactive, "ETH0" or "ETH1" can be chosen.

PTP Domain

This option controls the PTP domain.

- Value-range: 0 to 255

PTP Priority 1

This option controls the PTP priority 1.

- Value-range: 0 to 255

PTP Priority 2

This option controls the PTP priority 2.

- Value-range: 0 to 255

PTP Profile
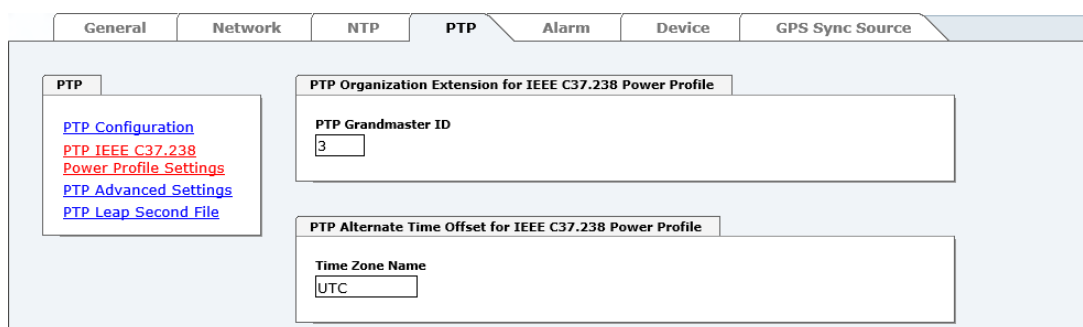
This option supports the selection of predefined profiles. Either "None" or "IEEE C37.238 Power Profile" can be selected.

If "IEEE C37.238 Power Profile" is selected, all settings in the "PTP Advanced Settings" window are set according to the standard IEEE C37.238 and all the settings in that window cannot be modified. The options in the "PTP IEEE C37.238 Power Profile Settings" window are only used by the PTP service when this profile is selected.

If "None" is selected, the settings in the "PTP Advanced Settings" window can be modified and the settings in the "PTP IEEE C37.238 Power Profile Settings" window are not used by the PTP service.

8.3.4.2 PTP IEEE C37.238 Power Profile Settings

The "PTP IEEE C37.238 Power Profile Settings" window supplies settings for the IEEE C37.238 standard. They only affect the PTP service if the "IEEE C37.238 Power Profile" profile is selected in the "PTP Configuration" window.

PTP Grandmaster ID

This option controls the PTP Grandmaster ID.

- Value-range: 3 to 254

Time Zone Name
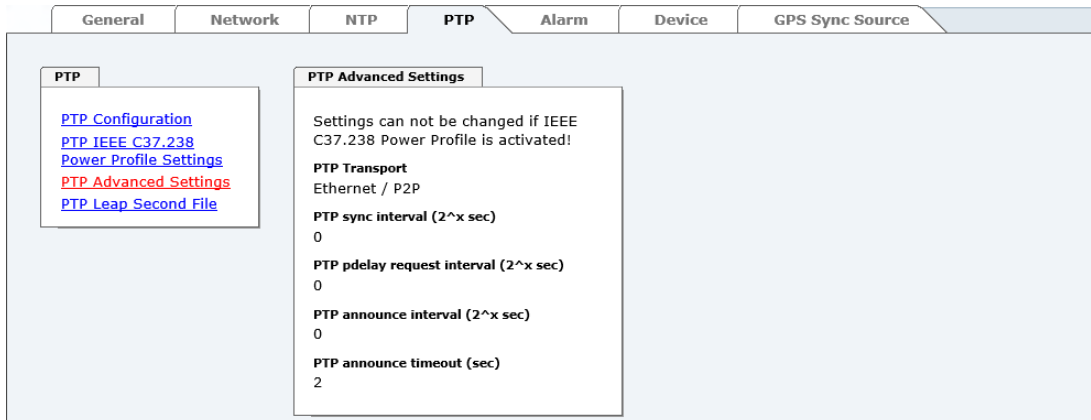
This option controls the time zone name.

- String length: 10 characters

This setting is used as "display name" in the "ALTERNATE_TIME_OFFSET_INDICATOR TLV". The other parameters that are needed by this TLV are taken from the system settings.

8.3.4.3 PTP Advanced Settings

The "PTP Advanced Settings" window supplies settings for the communication of the PTP service. These settings can be only changed, if the "PTP Profile" is set to "None" in the "PTP Configuration" window.

PTP Transport

This setting determines the network protocol that is used by the PTP service.

Possible choices: "Ethernet / P2P", "Ethernet / E2E" und "IPv4 / E2E"

PTP sync interval (2^x sec)

This setting determines the sending interval of SYNC messages of the PTP service.

The sending interval is calculated in the following way:

- x … selected value in the WebGUI
- Sending interval = 2^x
- Value-range: -7 to 6

The sending interval can be chosen between 0.0078125 seconds up to 64 seconds.

PTP pdelay request interval (2^x sec)

This setting determines the sending interval of Path Delay or Delay messages of the PTP service.

The sending interval is calculated in the following way:

- x … selected value in the WebGUI
- Sending interval = 2^x
- Value-range: -7 to 6

The sending interval can be chosen between 0.0078125 seconds up to 64 seconds.

PTP announce interval (2^x sec)

This setting determines the sending interval of Announce messages of the PTP service.

The sending interval is calculated in the following way:

- x … selected value in the WebGUI
- Sending interval = 2^x
- Value-range: -4 to 6

The sending interval can be chosen between 0. 0625 seconds up to 64 seconds.

PTP announce timeout

This setting determines how many seconds the PTP service stays in the LISTENING state.
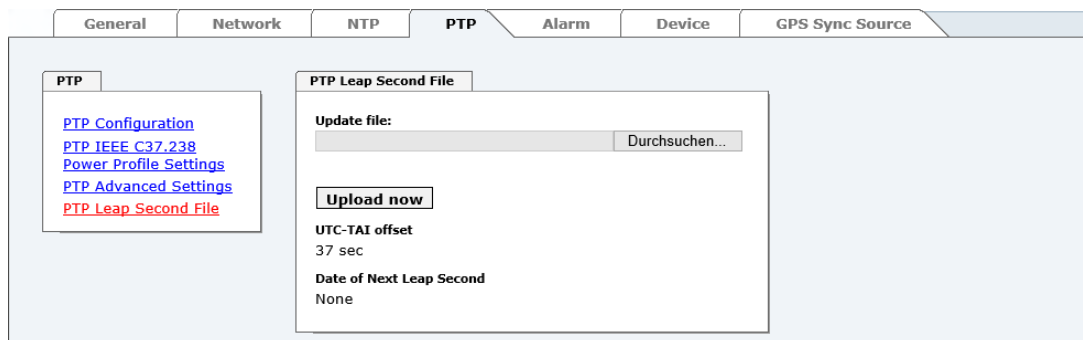
- Value-range: 2 to 255

The value entered corresponds to the seconds that the PTP service spends in the LISTENING state.

8.3.4.4 PTP Leap Second File

The "PTP Leap Second File" window supplies a functionality to upload a Leap-Second-File to the Time Server 8030HEPTA/GPS.

This file informs the PTP service, how many seconds UTC and TAI time differs.

In case of announcing a leap second by the synchronization source the leap second file will automatically be updated.

If time server 8030HEPTA/GPS is not in operation during the whole announcing time, it is not possible for the application to update its leap second file. The leap second file needs to be updated next time when time server is put in operation.

> **i** On the following website
> https://www.ietf.org/timezones/data/leap-seconds.list
> a current version of the leap second file can be downloaded.

UTC-TAI offset

This field shows the actual value, that the PTP service uses, for the difference of UTC and TAI time.

Date of Next Leap Second

This box shows if and if yes when the next leap second is going to be inserted.

8.3.5 ALARM Tab (Activation Key necessary)

All the links within the tab on the left hand side lead to corresponding detailed setting options.
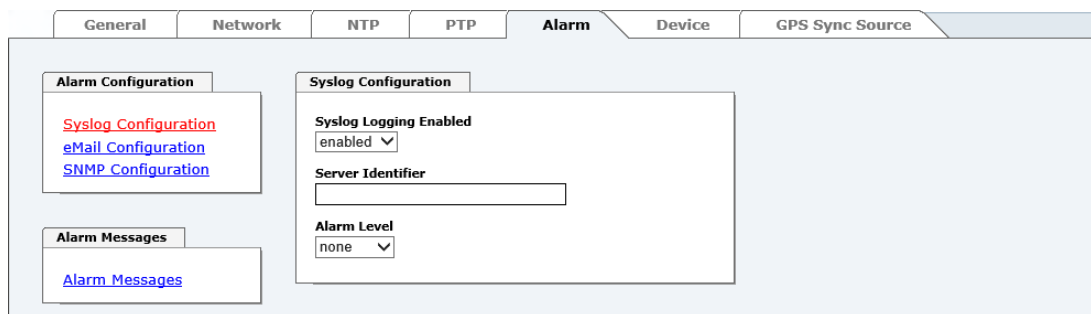
8.3.5.1 Syslog Configuration

It is necessary to enter the name or IPv4 or IPv6 address of a Syslog server in order to store every configured alarm situation which occurs on the module in a Linux/Unix Syslog. If everything is configured correctly and enabled (depending on the Syslog level), every message is transmitted to the Syslog server and stored in the Syslog file there.

Syslog uses Port 514.

Co-logging in the system itself is not possible as therefore the internal memory is not of sufficient size.

It should be noted that the standard Linux/Unix Syslog mechanism is used for this functionality. This is not the same as the Windows System Event mechanism!
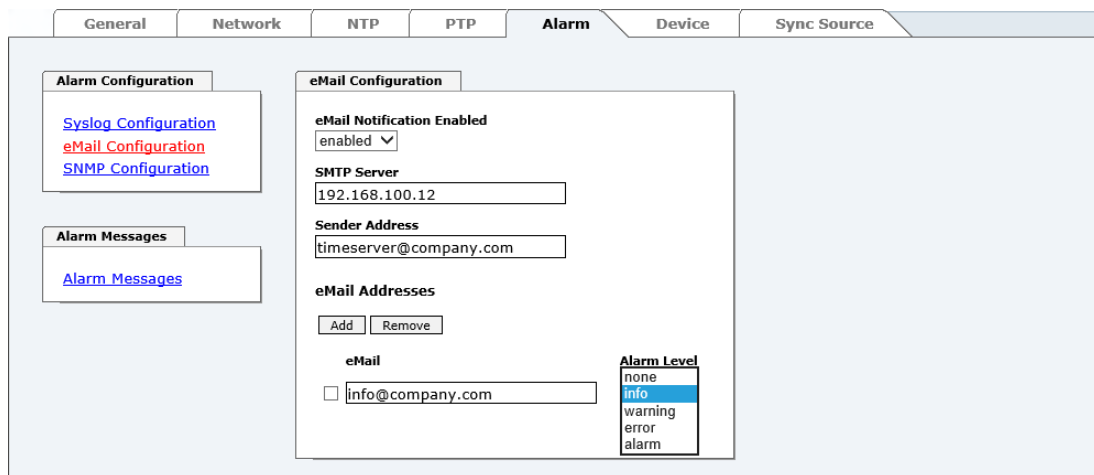
The alarm level designates the priority level of the messages to be transmitted and the level from which transmission should take place (see *Chapter 8.3.5.4 Alarm Messages*).

Alarm Level	Transmitted Messages
none	no messages
info	info / warning / error / alarm
warning	warning / error / alarm
error	error / alarm
alarm	alarm

The NTP service implemented in the system can transmit its own Syslog messages (see *Chapter 8.3.3.4.2 NTP Syslog Messages (General / Log NTP Messages to Syslog)*).

8.3.5.2 E-mail Configuration

E-mail notification is one of the important features of this device which offers technical personnel the opportunity to monitor and/or control the IT environment.

It is possible to configure various, independing E-mail addresses which each have different alarm levels.

Dependending on the configured level, an E-mail is sent after an error has occurred on the respective receiver.

A valid E-mail server (SMTP server) must be entered for the purpose of correct configuration.
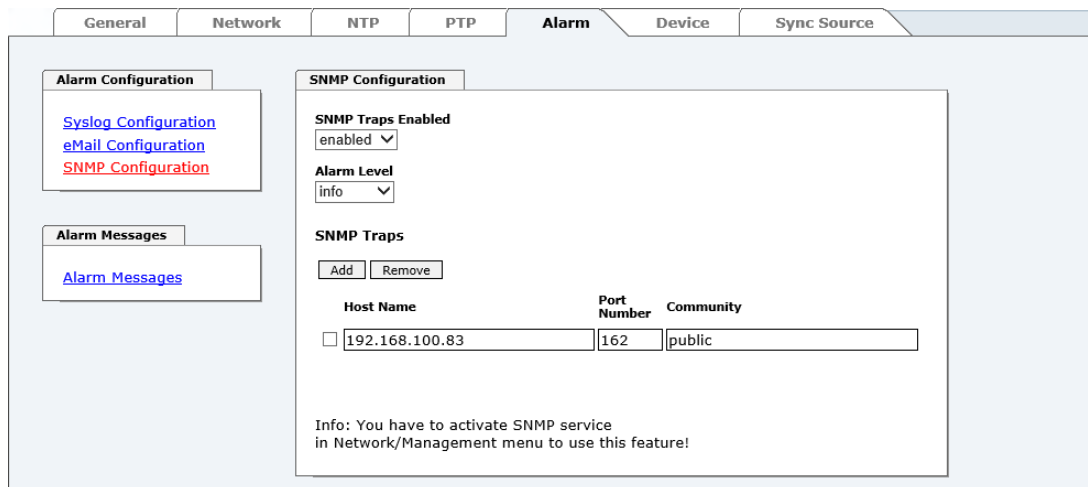
Some E-mail servers only accept messages if the sender address entered is valid (spam protection). This can be inserted in the "Sender Address" field.

The Alarm Level designates the priority level of the messages to be sent and determines from which level the message should be sent (see **Chapter 8.3.5.4 Alarm Messages**).

Alarm Level	Transmitted Messages
none	no messages
info	info / warning / error / alarm
warning	warning / error / alarm
error	error / alarm
alarm	alarm

8.3.5.3 SNMP Configuration / TRAP Configuration

It is possible to use an SNMP agent (with MIB) or to configure SNMP traps in order to monitor the module over SNMP.

SNMP traps are sent to the configured hosts over the network. It should be noted that these are based on UDP and therefore it is not certain that they will reach the configured host!

Several hosts can be configured. However, all have the same alarm level.

The private *hopf* enterprise MIB is also available over the web (see *Chapter 8.3.6.11 Downloading Configuration Files / SNMP MIB*).

The Alarm Level designates the priority level of the messages to be sent and determines from which level the message should be sent (see *Chapter 8.3.5.4 Alarm Messages*).
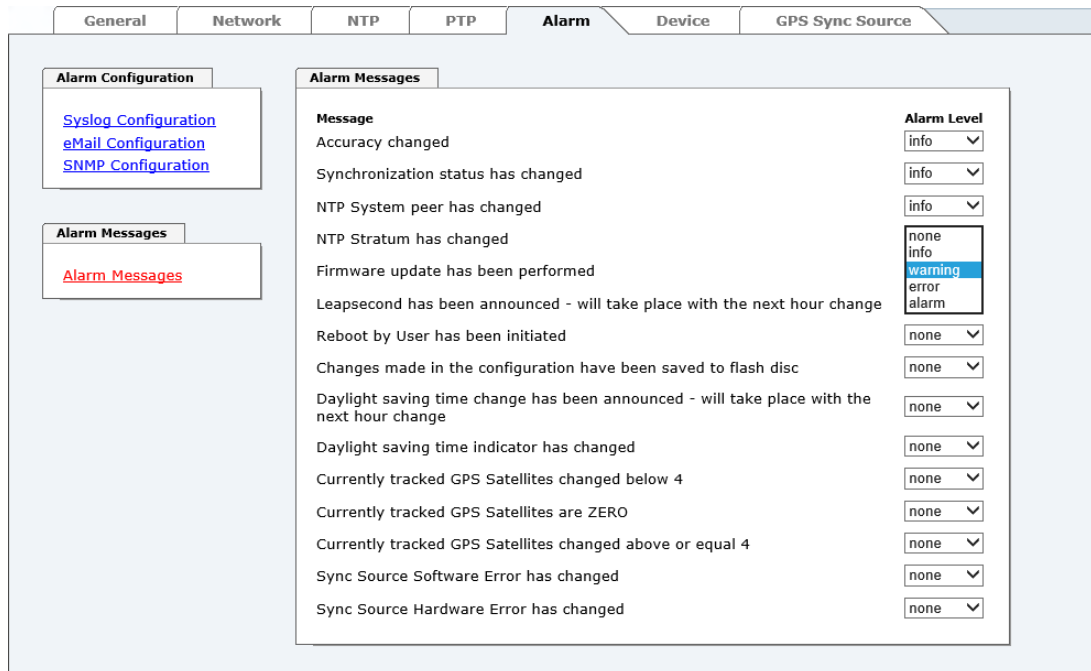
Alarm Level	Transmitted Messages
none	no messages
info	info / warning / error / alarm
warning	warning / error / alarm
error	error / alarm
alarm	alarm

> ⚠ The SNMP protocol must be enabled in order to use SNMP (see *Chapter 8.3.2.7 Management (Management-Protocols – HTTP, SNMP)*).

8.3.5.4 Alarm Messages

Every message shown in the image can be configured with the displayed alarm levels. Selection of the level NONE means that this message is completely ignored.

| General | Network | NTP | PTP | **Alarm** | Device | GPS Sync Source |

Alarm Configuration

Syslog Configuration
eMail Configuration
SNMP Configuration

Alarm Messages

Alarm Messages

Alarm Messages

Message	Alarm Level
Accuracy changed	info
Synchronization status has changed	info
NTP System peer has changed	info
NTP Stratum has changed	none / info / warning / error / alarm
Firmware update has been performed	
Leapsecond has been announced - will take place with the next hour change	
Reboot by User has been initiated	none
Changes made in the configuration have been saved to flash disc	none
Daylight saving time change has been announced - will take place with the next hour change	none
Daylight saving time indicator has changed	none
Currently tracked GPS Satellites changed below 4	none
Currently tracked GPS Satellites are ZERO	none
Currently tracked GPS Satellites changed above or equal 4	none
Sync Source Software Error has changed	none
Sync Source Hardware Error has changed	none

Depending on the messages, their configured levels and notifications levels of the E-mails, a corresponding action is carried out if an event occurs.

⚠ Modified settings are failsafe stored after **Apply** and **Save** only.

8.3.6 DEVICE Tab

All the links within the tab on the left hand side lead to corresponding detailed setting options.
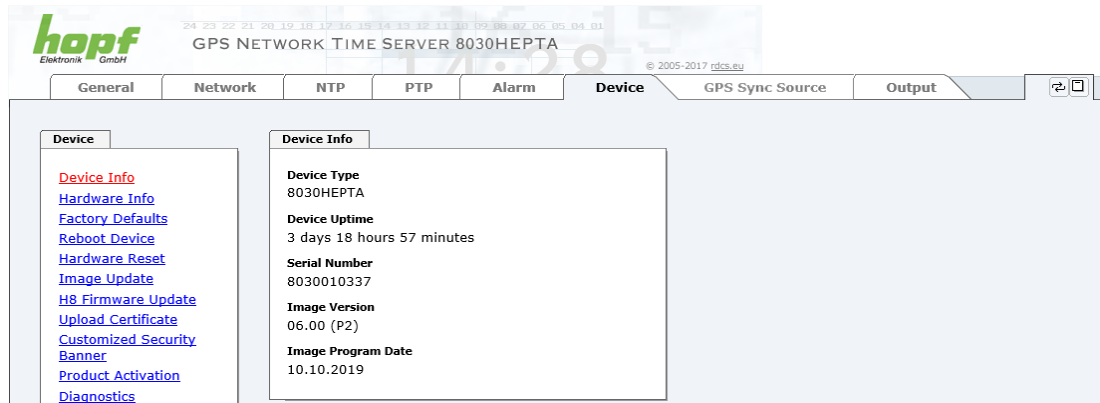
This tab provides the basic information about the hardware of Module 8030HEPTA as well as software/firmware. Password administration and the update services for the module are also made accessible via this website. The complete download zone is also a component of this site.

8.3.6.1 Device Information

All information is available exclusively in write-protected and read-only form. Details on the board type, serial number and current software versions are provided to the user for service and enquiry purposes.

8.3.6.2 Hardware Information

Read-only access is provided here in the same way as for device information.

The user requires this information in the case of service requests, e.g. MACH version, hardware status etc.
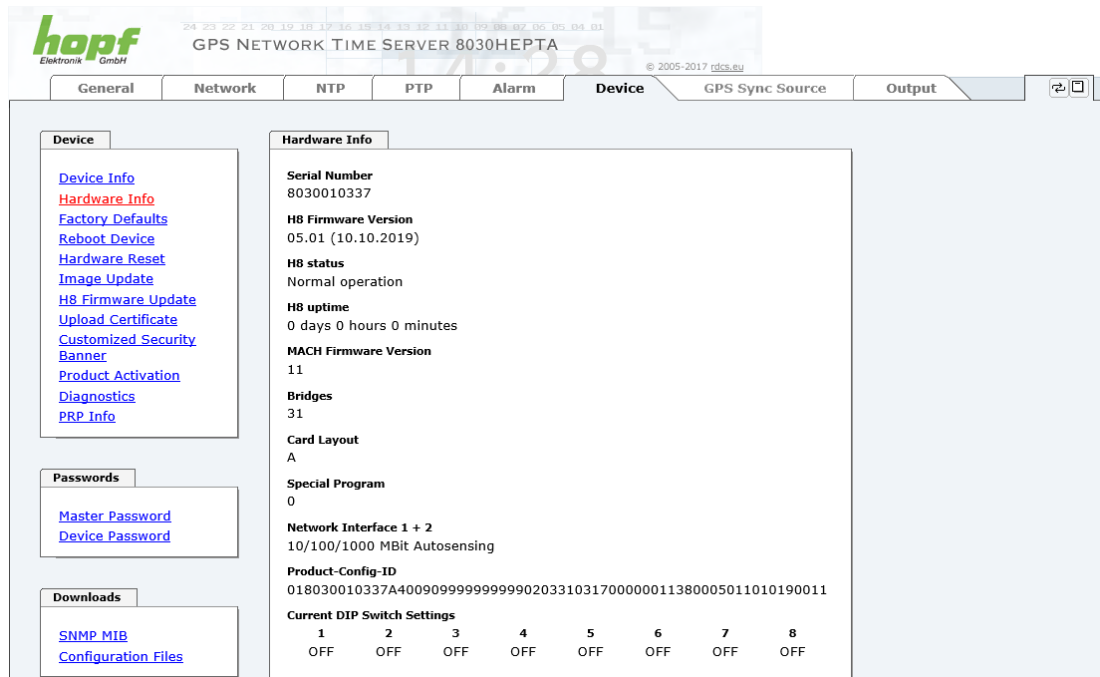
The display "Current DIP Switch Settings" is not applicable for this device.

8.3.6.3 Restoring the Factory Defaults Settings

In some cases it may be necessary or wished to reset all settings of Module 8030HEPTA to factory settings (factory defaults).

| General | Network | NTP | PTP | Alarm | **Device** | Sync Source |

Device

Device Info
Hardware Info
Factory Defaults
Reboot Device
Image Update
H8 Firmware Update
Upload Certificate
Customized Security Banner
Product Activation
Diagnostics

Factory Defaults

WARNING!

RESET to factory defaults is a critical action, all values will be set to default - the device will be rebootet immediately. Are you sure you want to reset to factory defaults now?

[Reset now]

This function serves to reset all values in the flash memory to their factory default values.

This also includes passwords (see **Chapter 13.1 Factory Default Values of Module 8030HEPTA (Device)**).

Please log in as a "Master" user in accordance with the description in **Chapter 8.2.1 LOGIN and LOGOUT as User**

Pressing the "**Reset now**" button releases setting of the factory default values.

Once this procedure has been triggered there is NO possibility of restoring the deleted configuration.

> ℹ️ A **Factory Default** requires a complete check and optionally a new configuration of the Module 8030HEPTA. In particularly the default MASTER and DEVICE passwords should be reset.

8.3.6.4 Restarting the Module (Reboot Device / Hardware Reset)

> ⚠ The restart concerns the Module 8030HEPTA and the Sync Source (here Module 8024GPS).

Reboot Device: Restart of the internal Operating System

Hardware Reset: Board Reset including all Hardware components

> ⚠ All settings **not** saved with "**Save**" are lost on Reboot / Hardware Reset (see *Chapter 8.2.3 Enter or Changing Data*).

Moreover the **NTP service** implemented in the system is restarted. This leads to a renewed alignment phase with the loss of the stability and accuracy reached up to this point.

Log in is carried out as "Master" user in accordance with the description in *Chapter 8.2.1 LOGIN and LOGOUT as User*.

Press the "**Reboot now**" button and wait until the restart has been performed.

8.3.6.5 Image Update & H8 Firmware Update

Patches and error recovery are provided for the individual Boards by means of updates.

Both the embedded image and the H8 firmware can only be downloaded to the Board via the web interface (login as "Master" user required). See also **Chapter 4.4 Firmware Update**.

⚠	**The following points should be noted regarding updates:** • Only experienced users or trained technical personnel should carry out an update after checking all necessary preconditions. • Important: **Faulty updates** or **update attempts** may under certain circumstances require the Board to be returned to the factory for rectification at the owner's expense. • Check that the update on hand is suitable for your Board. If in doubt please consult the support of the **hopf** company. • In order to guarantee a correct update, the "**New version of saved site**" function must be set to "**On each access to the site**" in the Internet browser used. • During the update procedure, the device **must not be switched off** and **settings must not be saved to the flash memory**! • Updates are always executed as software set. I.e. H8 firmware update + image update. Unless specifically defined otherwise in the SET, it is absolutely essential to complete the H8 firmware update first, followed by the image update. • For the Update please pay attention to the points in **Chapter 4.4 Firmware Update**.

In order to carry out an update, enter the name and the folder in which the update / firmware image is located in the text field or open the file selection dialogue by pressing the "Browse" button.

Correct firmware and image designations are (e.g.):

H8_8030_v0114_128.**mot** for the **H8 firmware**
         (update takes approx. 1-1.5 minutes)

upgrade_8030gen_v0120.**img** for the **embedded image**
         (update takes approx. 2-3 minutes)

The update process is started by pressing the "**Update now**" button. The update is installed if the transfer and checksum test are successful. A success page is displayed and shows the number of bytes that have been transferred and installed.
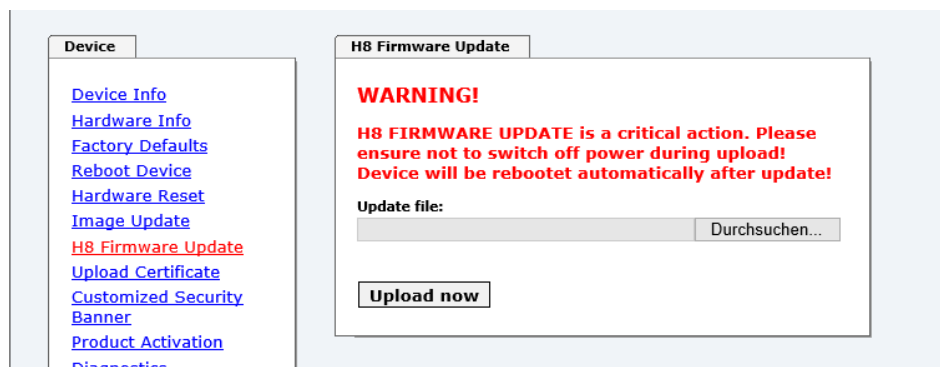
A restart of the device with the new Firmware is done automatically after the H8-Firmware update.
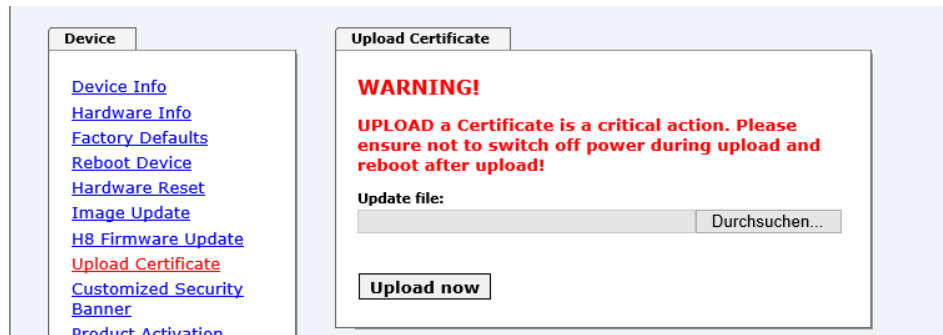
The procedure for the **Image update** differs only in how the device is restarted.
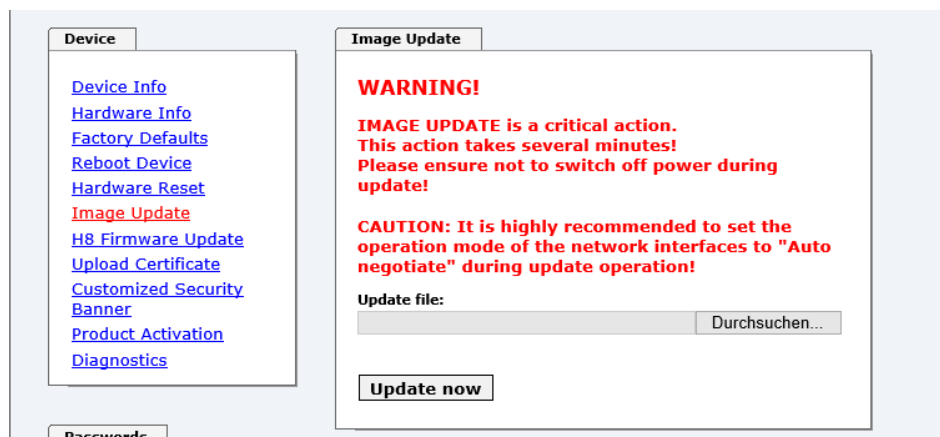
After the image-update the WebGUI displays a window to confirm the restart (reboot) of the device.
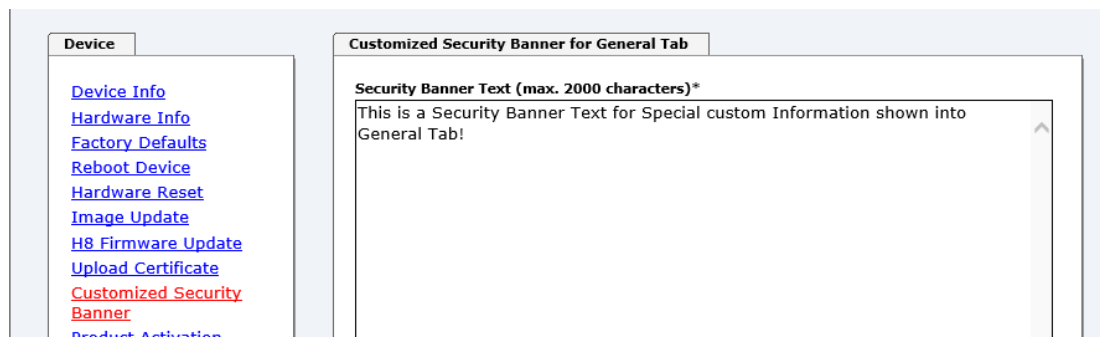
8.3.6.6 Upload SSL-Server-Certificate

This offers the possibility to encrypt the https connections to the device with a user-provided SSL server certificate.

8.3.6.7 Customized Security Banner
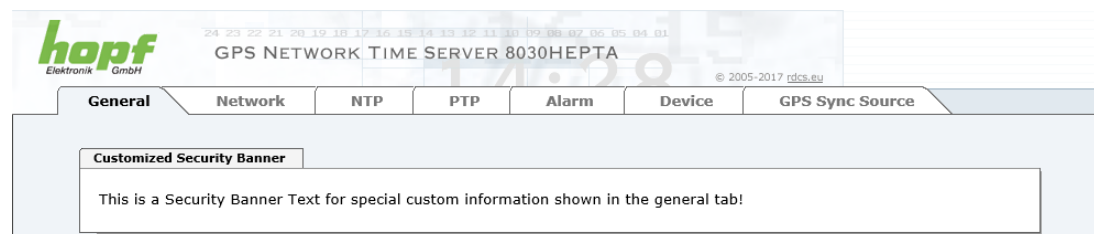
Special security information displayed in the General tab can be entered here by the user.

The security information can be written as 'unformatted' text. There are 2000 characters available to write failsafe into the device.

When saving the text, only the following characters are accepted (all other characters are discarded and therefore not displayed on the General page!):

- Capital letters (A…Z)

- Lowercase letters (a…z)

- Numbers (0…9)

- The following special characters: space (" "), exclamation mark ("**!**"), Comma ("**,**"), dot ("**.**"), Colon ("**:**"), question mark ("**?**")

After a successful storage the "Customized Security Banner" with the saved security information is displayed in the General-Tab.

To delete the "Customized Security Banner" the inserted text must be deleted and saved again.

8.3.6.8 Product Activation

For the activation of optional functions, e.g " Network Interface Bonding" or "SINEC H1 time datagram", a special activation key is required for which an order with the **hopf** Elektronik GmbH can be placed. Each activation key is related to a special board with an appropriate serial number and cannot be used for several boards.

> ⚠ For a subsequent order of an activation key the serial number of the Module 8030HEPTA (device) needs to be provided. The serial number can be found under the tab DEVICE – Device info (serial number 8030…).

> ⚠ The settings for activation keys (e.g. an entered activation key) are neither deleted nor restored via the function FACTORY DEFAULTS.

| General | Network | NTP | PTP | Alarm | **Device** | Sync Source |

Device

- Device Info
- Hardware Info
- Factory Defaults
- Reboot Device
- Image Update
- H8 Firmware Update
- Upload Certificate
- Customized Security Banner
- Product Activation
- Diagnostics

Overview

Feature	Status	Activation Key
SINEC H1 time datagram	Inactive	N/A
Static Routing Table	Inactive	N/A
Alarming and management features	Inactive	N/A
Network Interface Bonding/Teaming	Inactive	N/A
IEC 62439-3 Parallel Redundancy Protocol (PRP)	Inactive	N/A
IEEE 802.1Q Tagged VLAN	Inactive	N/A
IEEE 1588 Precision Time Protocol (PTP)	Inactive	N/A

Passwords

- Master Password
- Device Password

Activate Feature

Insert Activation Key

Downloads

- SNMP MIB
- Configuration Files

Key Reset

WARNING!

The activated features won't be available anymore after reset. If you want to reactivate this features you will have to enter the activation keys again.

[Perform Key Reset now]

Overview

Full listening of all optional functions with the current activation status and stored activation key

Activate Feature

Input field to enter a new activation key. After entering the feature is activated by pressing the ☑ Apply button.

If the activation was successful the new feature is listed in the overview with status "Active" and can be used immediately.

Key Reset

Clears all activation keys and sets all optional features to status "Inactive". All other non-optional features are still available after performing the key reset. If an optional feature is enabled again, the last stored configuration for this feature is restored.

8.3.6.9 Diagnostics Function

It "status messages" is enabled the output is processed as SYSLOG message. This function should only be used/enabled in case a problem arises and after consulting the **hopf** support.
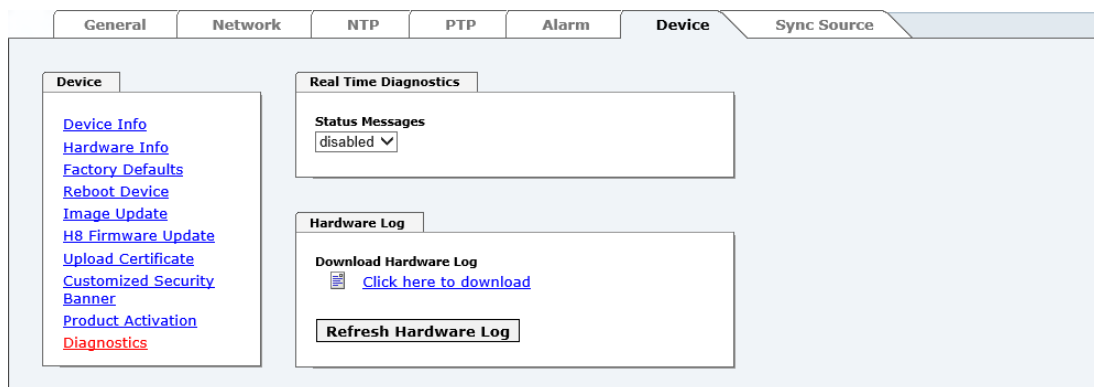
8.3.6.10 Passwords (Master/Device)

Differentiation is made between upper and lower case characters in passwords. In principle, all alphanumeric characters and the following symbols are allowed in passwords:

[ ] ( ) * - _ ! $ % & / = ?

(See also **Chapter 8.2.1 LOGIN and LOGOUT as User**)

> ⚠ A new password must contain at least one capital letter and lowercase letter, a number, and six characters.

8.3.6.11 Downloading Configuration Files / SNMP MIB

In order to be able to download certain configuration files via the web interface, it is necessary to be logged on as a **"master"** user.
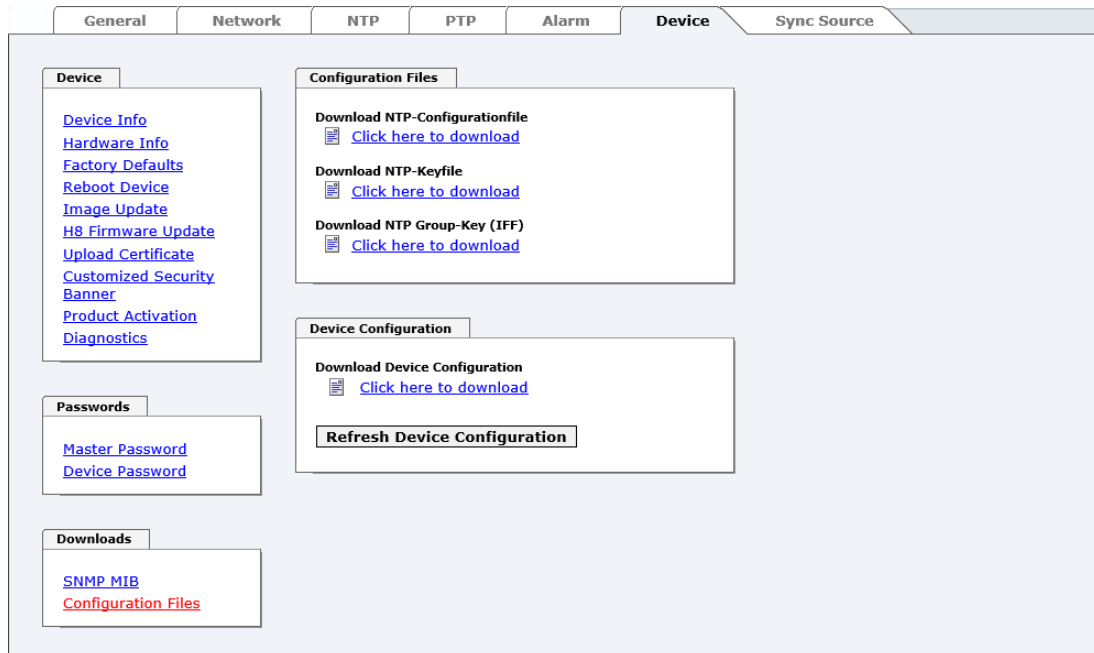
| | The loaded file **System Configuration** from the module is only used for support purposes and cannot be reloaded for adjusting the settings in the Time Server 8030HEPTA/GPS. |

| | For the download of the file **System Configuration** the following process is mandatory:
1. Pressing the button **SAVE**
2. Pressing the button `Refresh System Configuration`
3. After approximately 30 seconds, the files are available for the download
4. Press on the link Configuration Files to update the web site
5. Perform the download of the file |

The "private **hopf** enterprise MIB" is also available via the WebGUI in this area.

8.3.7 GPS SYNC SOURCE Tab

The complete display and parameterization of the Sync Source (here Module 8024GPS) takes place in this tab.

The modified values in the tab GPS SYNC SOURCE are directly transferred to the Module 8024GPS (Sync Source) by pressing the button 1 and failsafe stored in Module 8024GPS. This behaviour is indicated on the modified display of the Apply button. The buttons 2 and 3 are without function in the tab GPS SYNC SOURCE and are not required.
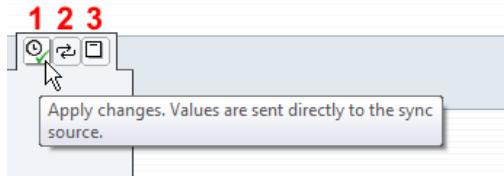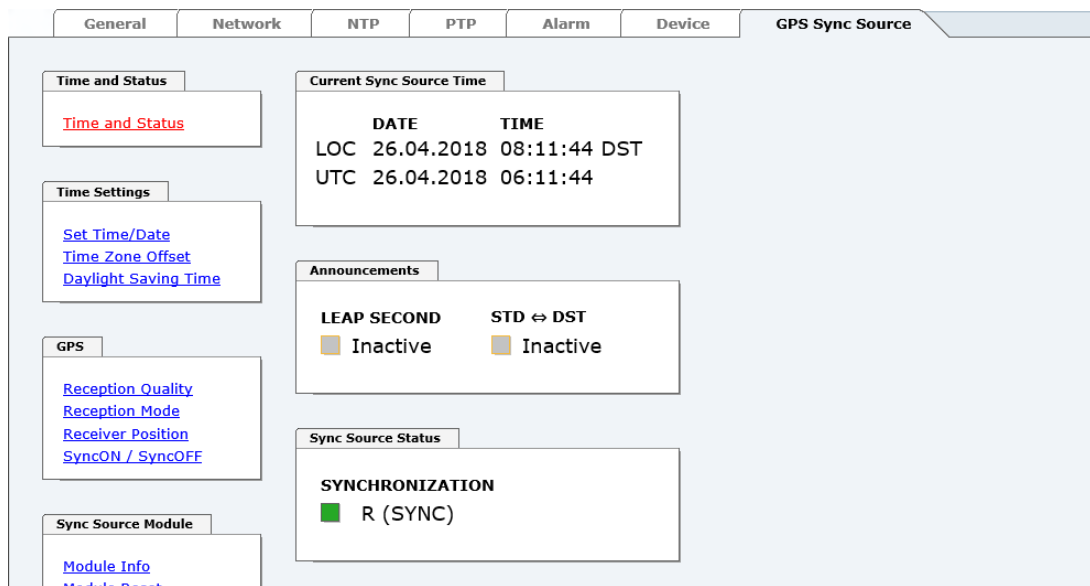
> ⚠ After the data transfer to 8024GPS it can take up to 30 seconds until the modified data are re-read from 8030HEPTA for the WebGUI indication.
>
> This delayed indication has no effect on the functionality.

> ⚠ Generally it is recommended to perform a restart of the the Sync Source (here Module 8024GPS) with a **Module Reset** after performing all modifications. This ensures that the Module 8024GPS will be operated with the new and failsafe stored data.

8.3.7.1 Time and Status

Current Sync Source Time

This area indicates the current time and date of the Sync Source. Both the local and UTC time are displayed.

> ⚠ In theory, depending on the synchronization status of the Sync Source, the time displayed here can differ from the NTP time since two independent time systems are involved.

Announcements

The display fields LEAP SECOND and STD ⇔ DST announce a corresponding event to the next hour (insertion of a leap-second or rather switch-over of summer/winter time).

Sync Source Status

Display of the actual status of synchronization of the Sync Source with these possible values:

SYNC	Time synchronized + Quartz regulation started/running
SYOF	Time synchronized + SyncOFF running
SYSI	Time synchronized as simulation mode (without actual GPS reception)
QUON	Quartz/Crystal time + SyncON running
QUEX	Quartz/Crystal time (in freewheel after synchronization failure ⇨ Board was already synchronized)
QUSE	Quartz/Crystal time after reset or manual setting
INVA	Invalid time
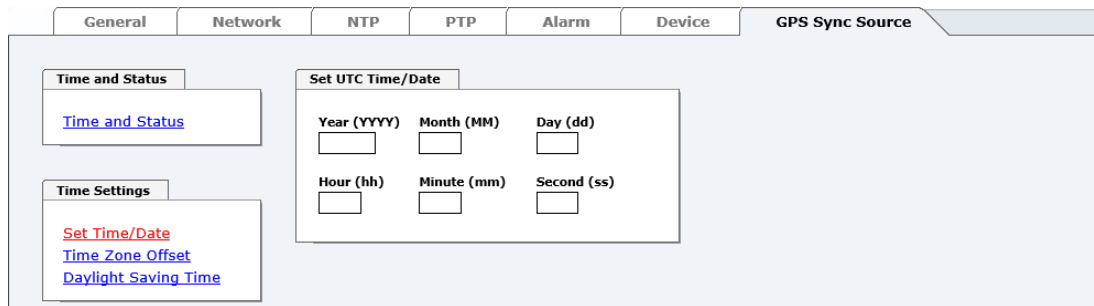
8.3.7.2 Set Sync Source Time

Adjustment of UTC including the date in the Sync Source (here Module 8024GPS)

After entering the plausibility of these values are directly checked by clicking on the **Apply** button and then sent to the Sync Source (here Module 8024GPS).

> ⚠ Always the UTC time must be set. The local time is internally calculated from the difference time (Time Zone Offset) and the summer / winter time changeover (Daylight Saving Time).

| General | Network | NTP | PTP | Alarm | Device | **GPS Sync Source** |

Time and Status

Time and Status

Set UTC Time/Date

Year (YYYY)   Month (MM)   Day (dd)

Hour (hh)   Minute (mm)   Second (ss)

Time Settings

Set Time/Date
Time Zone Offset
Daylight Saving Time

- **Year**   Input of the current UTC year (2000-2099)
- **Month**   Input of the current UTC month (01-12)
- **Day**   Input of the current UTC day (01-31)
- **Hour**   Input of the current UTC hour (00-23)
- **Minute**   Input of the current UTC minute (00-59)
- **Second**   Input of the current UTC second (00-59)
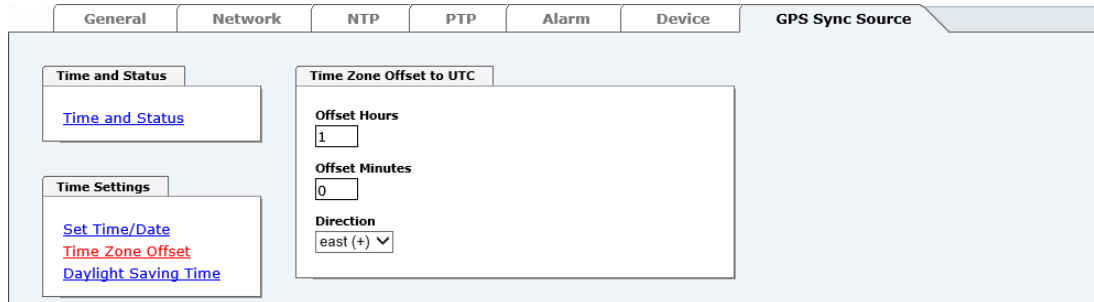
> ⚠ The input must be complete and according to the stated format.

8.3.7.3 Time Zone Offset

Setting of the difference time (Time Zone Offset) from UTC to the local standard time (winter time) in the Sync Source (here Module 8024GPS)

> ⚠ The difference time to be entered **always** relates to **the local standard time (winter time)** even though the commissioning or rather the input of the difference time takes place during daylight saving time.

- **Offset Hours**   Time Zone Offset input of the full hour (0-13)
- **Offset Minutes**   Time Zone Offset input of minutes (0-59)

Example:

Time Offset for Germany	⇨ East, 1 hour and 0 minutes (+ 01:00)
Time Offset for Peru	⇨ West, 5 hours and 0 minutes (- 05:00)

Direction relating to Prime Meridian – Direction of the Difference Time

Entering the direction the local time deviates from world time:

'East'	corresponds to east,
'West'	corresponds to west of the Prime-Meridian (Greenwich)

8.3.7.4 Daylight Saving Time (DST)
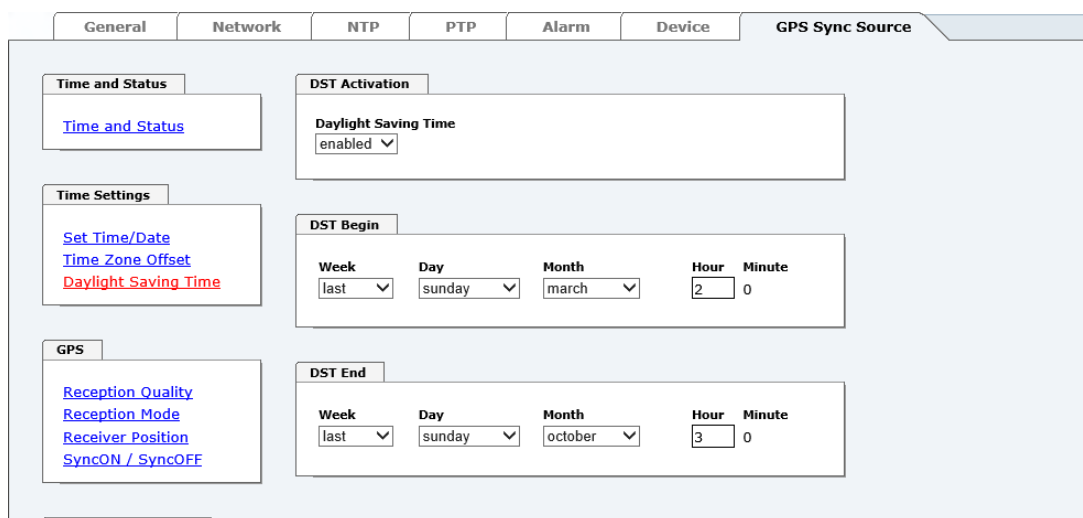
Setting of the changeover times for summer/winter time in the Sync Source (here Module 8024GPS).

This input is used to define the point of time at which the changeover to Daylight Saving Time or winter time occurs during the course of the year. The hour, day of the week, week of the month and month at which the Daylight Saving Time begins and ends are determined.

So the exact times are automatically calculated for the running year.

> **i** After the turn of the year the changeover times for summer/winter time are **automatically** recalculated, without any user intervention.

- **DST Activation (enabled/disabled) – Changeover times for summer/winter time**
- **DST Begin – Changeover time for standard time to Daylight Saving Time**
- **DST End – Changeover time for Daylight Saving Time to standard time**

The individual items have the following meanings:

Week	At which occurrence of that particular weekday in that month the changeover is going to take place.	First - 1st week Second - 2nd week Third - 3th week Fourth - 4th week Last - last week
Day	The day of the week when the changeover should be processed	Sunday, Monday … Saturday
Month	the month when the changeover should be processed	January, February ... December
Hour Minute	The time in hour and minute when the changeover should be processed	00h ... 23h 00min ... 59min

> **!** The data are entered on the basis of the local time.

8.3.7.5 Reception Quality

In this tab following information is indicated with read-only access:

Satellites in View

Number of available satellites detected by the GPS receiver.

Satellites Tracked

Effective number of received satellites used for synchronization.

Satellites Number – S/N Ratio

Overview of actually received GPS satellites with their number and reception quality and the pertinent interpretation.

Green	≥ 48	Good reception quality
Yellow	31-47	Sufficient reception quality
Red	0-30	Poor reception quality

Receiver Status
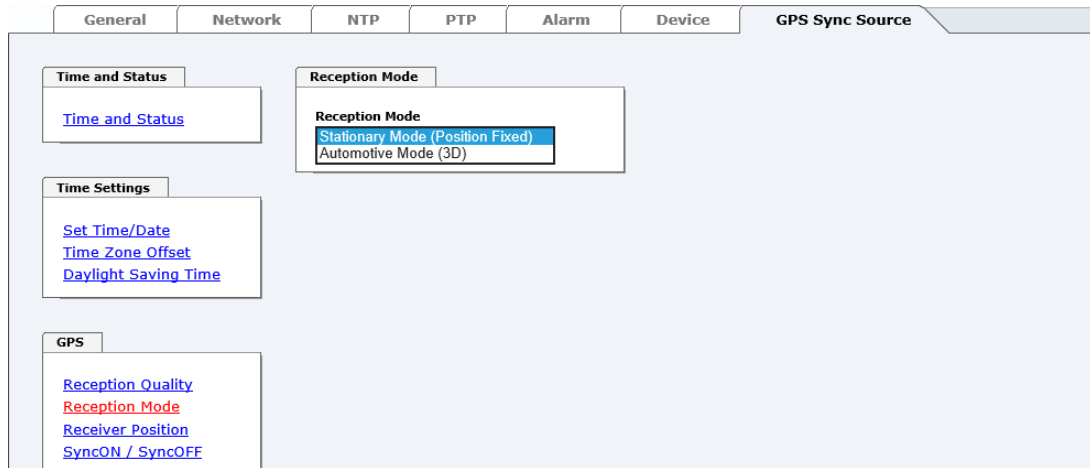
Display of the actual GPS receiver values. For analysing the GPS receiver in case of support.
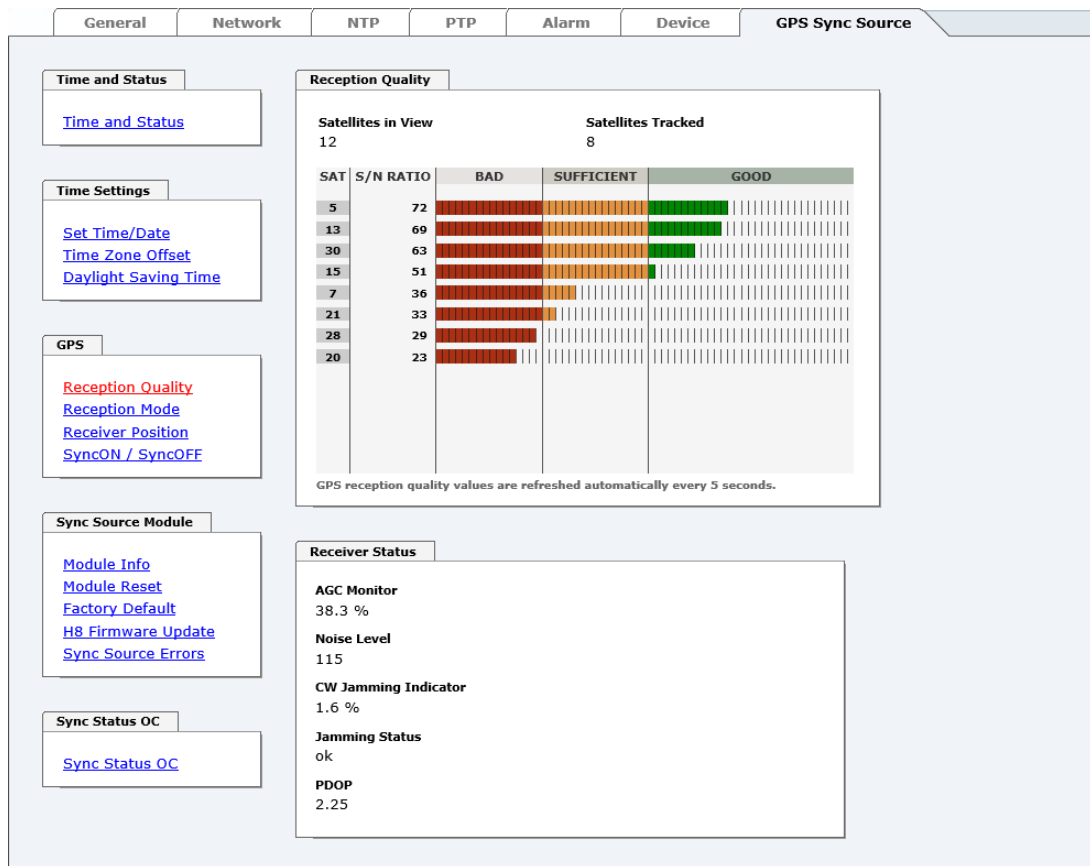
This page is updated automatically every 5 seconds.

8.3.7.6 Reception Mode

In this tab the GPS reception mode is adjusted and displayed. The accuracy of the time evaluation is defined by the exact position calculation of the installation site. For this calculation (3D evaluation) it is necessary to receive information from at least four (4) satellites. The signal runtime to several satellites is determined from the calculated position and the precise second mark is generated from their mean value.

Stationary Mode (Position Fixed) – Standard operation

In Stationary Mode (Fixed position), the GPS receiver calculates its accuracy based on a fixed position. If four or more satellites are received in this mode, the exact location is updated automatically.

In this mode, a synchronization with a changing position is not possible.

Automotive (3D)

The automotive (3D) mode allows the use of system 8030HEPTA at mobile locations (except aircraft).

8.3.7.7 Receiver Position
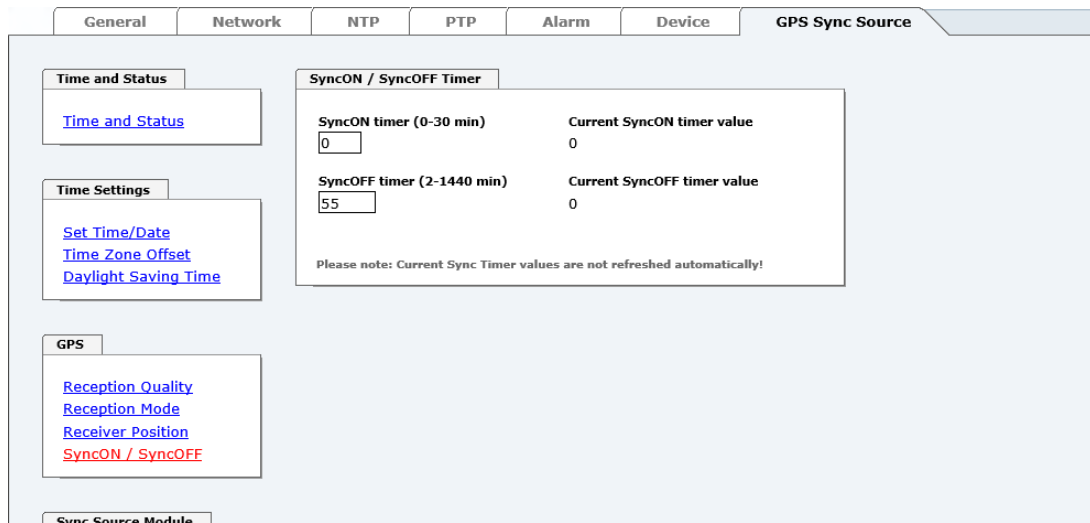
In this tab the current position is displayed.

| General | Network | NTP | PTP | Alarm | Device | **GPS Sync Source** |

Time and Status

Time and Status

Longitude

Degrees	Minutes	Milliseconds	Direction
7	39	47260	east

Time Settings

Set Time/Date
Time Zone Offset
Daylight Saving Time

Latitude

Degrees	Minutes	Milliseconds	Direction
51	12	42123	north

GPS

Reception Quality
Reception Mode
Receiver Position
SyncON / SyncOFF

Sync Source Module

Longitude / Latitude – Current Position with Longitude and Latitude

Display of the actual position calculated by the GPS receiver.

8.3.7.8 SyncON / SyncOFF Timer

SyncON Timer

The SyncON timer is used to delay the sync-status "SYNC" by the set time although the GPS receiver is synchronous.

This function is enabled when adjustment processes should be terminated as defined before the sync status is "SYNC".

This function is not required for this device and should always be set to 0.

SyncOFF Timer

This value is used to provide reception failure bypassing for an error-message free operation even under poor reception conditions.

In the event of a reception failure of the Sync Source (here Module 8024GPS), the decrease of the Sync Source to **quartz** status is delayed by the set value. The system continues to run in synchronization status on the internally regulated, highly accurate quartz base during this period with sync status **'SYOF'**.

This timer is of special significance when certain system outputs are linked to a specific system status.

The Timer can be set from 2min. to 1440min.

Current Timer values

In case of an active Timer the appropriate value of the timer is displayed here.

8.3.7.9 Module Info

This tab indicates information about the hardware and software of the Module 8024GPS (Sync Source) implemented in the Time Server 8030HEPTA/GPS.

> ℹ These details might be provided for service and support purposes.

8.3.7.10 Module Reset

This function triggers a hardware reset of (just) the Sync Source (here Module 8024GPS).

> ℹ This function has no effect on the failsafe stored data.

8.3.7.11 Factory Default

```
 Time and Status
   Time and Status

 Time Settings
   Set Time/Date
   Time Zone Offset
   Daylight Saving Time

 GPS
   Reception Quality
   Reception Mode
   Receiver Position
   SyncON / SyncOFF

 Sync Source Module
   Module Info
   Module Reset
   Factory Default
   H8 Firmware Update
```

 Factory Default

 WARNING!

 RESET to factory defaults is a critical action, all synchronization settings will be lost. Are you sure you want to reset the system to factory defaults now?

 [Perform Reset now]

After setting the Sync Source to factory default values the GPS receiver needs up to 13 minutes of satellite reception in order to generate the correct information on the leap second from the GPS data. Only then the Sync Source (here Module 8024GPS) can be synchronized.

During this time (however only when the GPS receiver really receives satellites) the following message is displayed in the tab **Module Errors**:

GPS Receiver in raw data mode - no synchronisation

8.3.7.12 H8 Firmware Update (Sync Source)

Patches and Bug Fixes are provided for the Time Server 8030HEPTA/GPS by means of updates.

The H8 update of the Sync Source is loaded only via the web interface in the Time Server 8030HEPTA/GPS (log in as "master" user required). See also **Chapter 4.4 Firmware Update**.

The following points should be considered regarding updates:

- Only experienced users or trained technical personnel should carry out a board update after checking all necessary preconditions.

- Important: **Faulty updates** or **update attempts** may, under certain circumstances, require the module to be returned to the factory for repair at customer's expense.

- Is the update on hand suitable for the module? If there are any doubts please consult the support of the **hopf** company.

- In order to guarantee a correct update, the "**New version of saved site**" function must be set to "**On each access to the site**" on the Internet browser used.

- During the update procedure, the device **must not be switched off** not **settings be saved to the flash memory**!

- Updates are **always** carried out as Software SETs. That means that all programmes included in the SET must be downloaded to the system.

- For the update pay attention to point described in **Chapter 4.4 Firmware Update**

In order to carry out an update, enter the name and the folder in which the update / firmware image is located in the text field or open the file selection dialogue by pressing the "Browse" button.

A correct image designation is (e.g.):

8024_128_v0400.**mot**   for **H8 Firmware**
                                           (Update takes approx. 1-1.5 minutes)
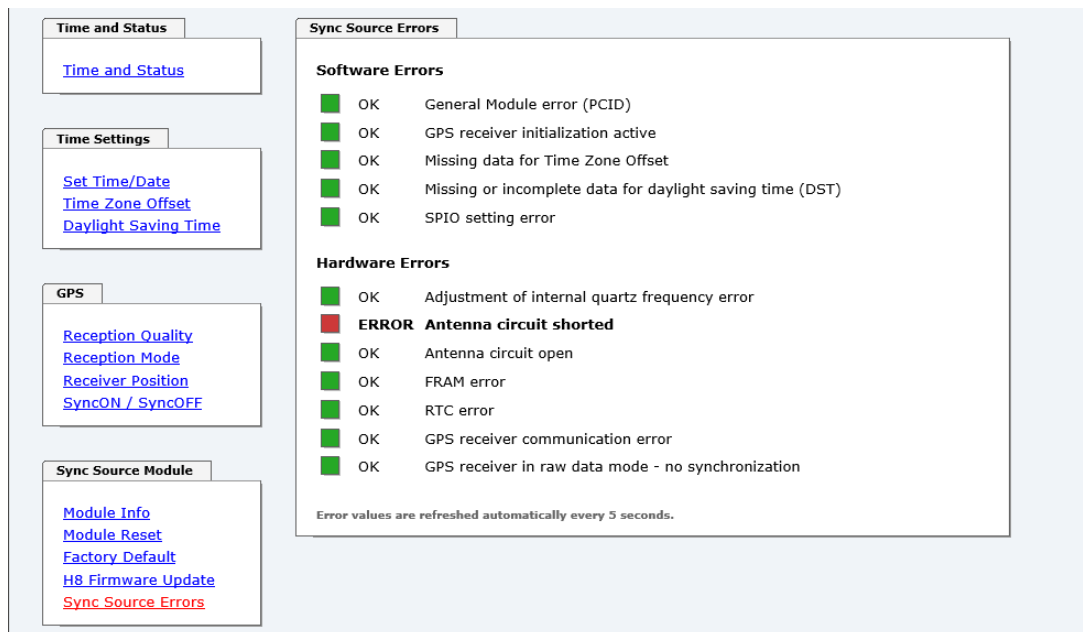
Time and Status	H8 Firmware Update
Time and Status	**WARNING!**
	H8 FIRMWARE UPDATE is a critical action. Please ensure not to switch off power during upload! Device will be rebootet automatically after update!
Time Settings	**Update file:**
Set Time/Date	[_____] [Durchsuchen...]
Time Zone Offset	
Daylight Saving Time	[Upload now]
GPS	
Reception Quality	
Reception Mode	
Receiver Position	
SyncON / SyncOFF	
Sync Source Module	
Module Info	
Module Reset	
Factory Default	
H8 Firmware Update	
Sync Source Errors	

8.3.7.13 Sync Source Errors

This tab displays the current failure status of the Sync Source (here Module 8024GPS):

If a collected error message is displayed in the GENERAL tab, there is at least one error (Sync Source Error).

This page is updated automatically every 5 seconds.

Overview Software Errors
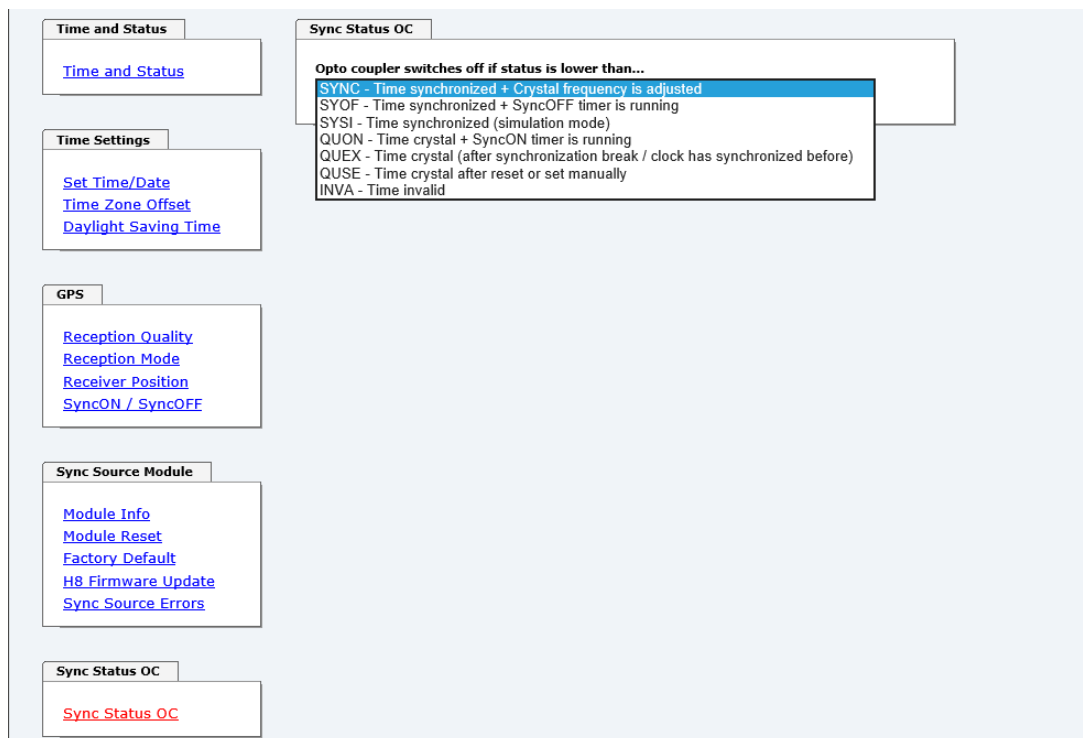
- **General Module error (PCID)**

  If this error occurs even after a Power down, the device is damaged.

- **GPS receiver initialization active**

  This condition might last for max. 1 minute after particular actions.

- **Missing data for Time Zone Offset**

  Difference time (Time Zone Offset) must be an initial entry by the user.

- **Missing or incomplete data for daylight saving time (DST)**

  The switchover times for summer/winter time must be initially set / disabled by the user.

- **SPIO setting error**

  If this error occurs even after a voltage reset, the support team of company *hopf* needs to be contacted for further actions.

Overview Hardware Errors

- **Adjustment of internal quartz frequency error**

  Problems with the internal quartz regulation of the Sync Source (here Module 8024GPS) have occurred. So the specified accuracy of the Sync Source cannot be guaranteed anymore.

- **Antenna circuit shorted**

  The Sync Source (here Module 8024GPS) has detected a short circuit in the antenna system. The antenna system should be checked.

- **Antenna circuit open**

  The Sync Source (here Module 8024GPS) has detected an open antenna input. The antenna system should be checked.

- **FRAM error**

  If this error occurs even after a voltage reset, the support team of company *hopf* needs to be contacted for further actions.

- **RTC error**

  If this error with set or synchronized time (not sync.-status INVA) and a successive reset of the sync. source still maintains the internal backup clock may be defective.

- **GPS receiver communication error**

  If this error occurs even after a Power-Reset, the support team of company *hopf* needs to be contacted for further actions.

- **GPS receiver in raw data mode – no synchronization**

  If this condition is indicated, the GPS receiver requires special data from the GPS signal for which it needs up to 13 minutes signal reception of satellites. Only then the Sync Source (here Module 8024GPS) can be synchronized.

  This happens e.g. after resetting the Sync Source parameters to factory default values.

8.3.7.14 Sync Status OC

The output of the status optical coupler (on the rear panel of the Time Server 8030HEPTA/GPS) can be configured by the use of this function.

The Sync states are listed in this selection window in rising quality from the bottom to the top (**SYNC** = optimal condition).

Behaviour of Optical Coupler:

- Selected status achieved or better   – Optical coupler switched through
- Selected status not achieved   – Optical coupler blocked

<u>Value range</u>

Optical Coupler Status	**SYNC**	Time synchronized + Quartz regulation started/running
	SYOF	Time synchronized + SyncOFF running
	SYSI	Time synchronized as simulation mode (without actual GPS reception)
	QUON	Quartz/Crystal time + SyncON running
	QUEX	Quartz/Crystal time (in freewheel after synchronization failure ⇨ Board was already synchronized)
	QUSE	Quartz/Crystal time after reset or manual setting
	INVA	Invalid time

8.3.8 OUTPUT Tab

This chapter describes the additional functions of the Time Server 8030HEPTA/GPS.

The WebGUI identifies the actual available device specific signal generators and only displays the corresponding tabs like (PPS / DCF77 / IRIG-B / …).

The delivery status of the customer specific device can be found in the accompanying configuration documentation.
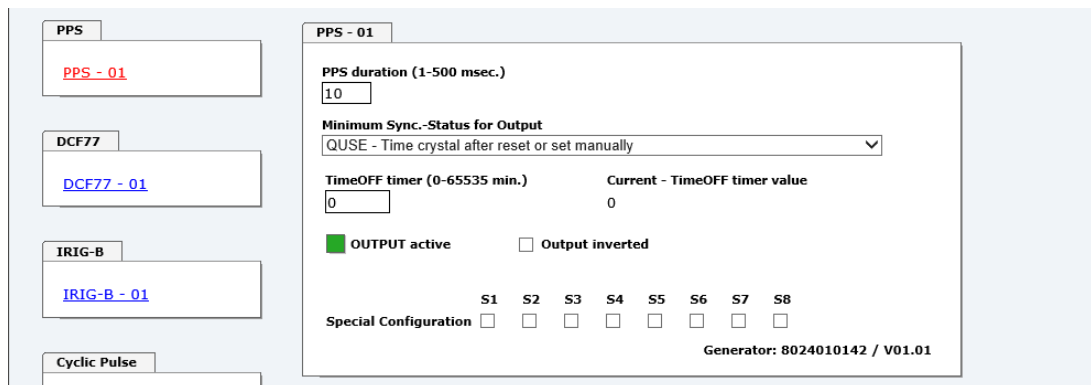
> **i** Subsequent activation of the Output functionality is **_not_** possible on site.

8.3.8.1 PPS (Optional Hardware necessary)

The signal generation for the output of a PPS pulse (1Hz) may be configured in this panel.

> **i** For the output of this signal additional hardware (at system level) is required (see system manual if applicable).

8.3.8.1.1 PPS duration

This section serves to select the pulse width to be transmitted. Basically it is possible to specify the pulse width in milliseconds.

Possible <u>values</u> for the **pulse duration**:

- Minimum: 1 msec
- Maximum: 500 msec

8.3.8.1.2 Minimum Sync.-Status for Output

Signal output can be configured only to be generated when the Time Server 8030HEPTA/GPS has reached a minimum synchronization status. As soon as this minimum synchronization status drops below this value during operation, the signal output stops unless the TimeOFF Timer has been set greater than 0. In this case the output is done for the duration of the TimeOFF Timer despite the minimum synchronization status for the output falls below the configured value.

Range of Sync.-Status

The synchronization status is represented from the bottom of the following table (INVA) up with increasing quality.

Synchronisation Status	SYNC	Time synchronized + quartz control started/running
	SYOF	Time synchronized + SyncOFF running
	SYSI	Time synchronized as simulation mode (with no actual GPS reception)
	QUON	Quartz/crystal time + SyncON running
	QUEX	Quartz/crystal time (in freewheel after synchronization failure ⇨ Board was already synchronized)
	QUSE	Quartz/crystal time after reset or manually set
	INVA	Invalid time

Value range TimeOFF timer = 0 to 65635min.

8.3.8.1.3 Status of the Signal Output

The status of the output is stated via a display element with the following color and text indications:

GREEN	OUTPUT active	There is a signal output
YELLOW	OUTPUT + TimeOFF active	There is a signal output for the duration of the TimeOFF Timer
RED	OUTPUT blocked	There is **no** signal output

8.3.8.1.4 Output inverted

All outputs stated in the system manuals of the according devices are related to the DEFAULT setting: Output not inverted.

If nevertheless the inverting of the output signal has to be configured the "Output inverted" checkbox has to be enabled.

8.3.8.1.5 Special Configuration

If used, the correct settings are described in the additional system manual of the customer-specific device.
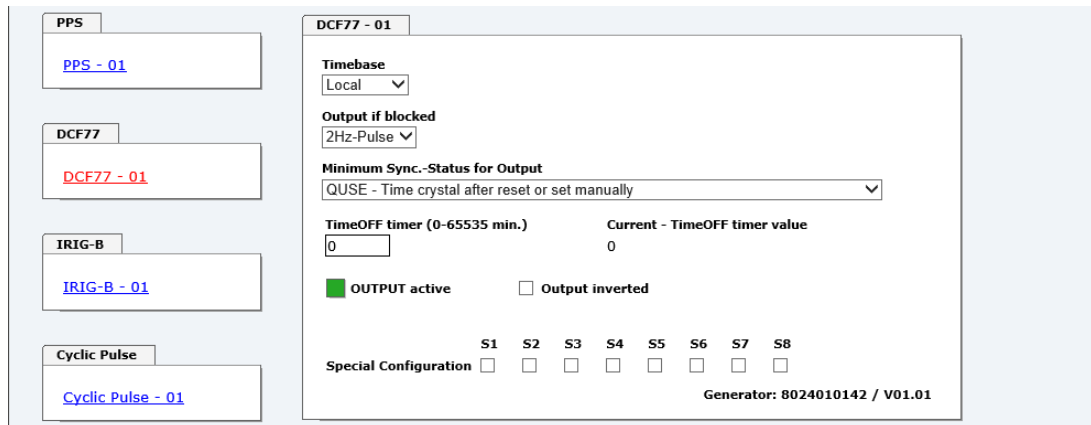
Otherwise for S1-S8 the DEFAULT-setting (all checkboxes disabled) should not be changed due to compatibility reasons.

8.3.8.2 DCF77 (Optional Hardware necessary)

The signal generation for the output of a DCF77 pulse (1Hz) may be configured in this panel.

> **i** For the output of this signal additional hardware (at system level) is required (see system manual if applicable).

```
┌─ PPS ──────────┐      ┌─ DCF77 - 01 ─────────────────────────────────────┐
│                │      │                                                   │
│  PPS - 01      │      │  Timebase                                         │
│                │      │  Local      ▼                                     │
└────────────────┘      │                                                   │
                        │  Output if blocked                                │
┌─ DCF77 ────────┐      │  2Hz-Pulse ▼                                      │
│                │      │                                                   │
│  DCF77 - 01    │      │  Minimum Sync.-Status for Output                  │
│                │      │  QUSE - Time crystal after reset or set manually ▼│
└────────────────┘      │                                                   │
                        │  TimeOFF timer (0-65535 min.)   Current - TimeOFF timer value │
┌─ IRIG-B ───────┐      │  0                              0                 │
│                │      │                                                   │
│  IRIG-B - 01   │      │  ■ OUTPUT active        □ Output inverted         │
│                │      │                                                   │
└────────────────┘      │                         S1  S2  S3  S4  S5  S6  S7  S8 │
                        │  Special Configuration  □   □   □   □   □   □   □   □  │
┌─ Cyclic Pulse ─┐      │                                                   │
│                │      │                         Generator: 8024010142 / V01.01 │
│  Cyclic Pulse - 01│   │                                                   │
│                │      └───────────────────────────────────────────────────┘
└────────────────┘
```

8.3.8.2.1 Timebase

Timebase	Local Time
	Standard Time
	UTC Time

In general the local time is set as the base. This time leaps forward/back 1 hour every daylight saving time changeover. The standard or UTC time must be selected as the base if automatic daylight saving time changeover shall be suppressed.

When setting standard time (winter time), the time offset to local summer time is minus 1 hour. Standard time runs continuously (without time leap) throughout the whole year.

When setting UTC, the world time (formerly GMT) is used as the time base. This time base also runs continuously (without time leap) throughout the whole year.

8.3.8.2.2 Output if blocked

Using this menu item the interference reaction of the DCF77 pulse can be controlled unless the system status is lower than the reference value.

Fault signal	**2 Hz Pulse:** If the system status is lower than the reference value, a 2Hz pulse instead of the DCF77 pulse is provided.
	No Signal If the system status is lower than the reference value there is <u>no</u> signal output.

> **i** Transmission of a 2Hz pulse in the event of a fault allows the connected devices to monitor for line breakage.

8.3.8.2.3   Minimum Sync.-Status for Output

The signal output can be adjusted only to be generated when the Sync Module has reached a minimum synchronization status. As soon as this minimum synchronization status drops below this value during operation, the signal output stops unless the TimeOFF Timer has been set greater than 0. In this case the output is done for the duration of the TimeOFF Timer despite the minimum synchronization status for the output falls below the set value.

Range of Sync.-Status

The synchronization status is represented from the bottom of the following table (INVA) up with increasing quality.

Synchronisation Status	SYNC	Time synchronized + quartz control started/running
	SYOF	Time synchronized + SyncOFF running
	SYSI	Time synchronized as simulation mode (with no actual GPS reception)
	QUON	Quartz/crystal time + SyncON running
	QUEX	Quartz/crystal time (in freewheel after synchronization failure ⇨ Board was already synchronized)
	QUSE	Quartz/crystal time after reset or manually set
	INVA	Invalid time

Value range TimeOFF timer = 0 to 65635min.

8.3.8.2.4   Status of the Signal Output

The status of the output is stated via a display element with the following color and text indications:

GREEN	OUTPUT active	There is a signal output
YELLOW	OUTPUT + TimeOFF active	There is a signal output for the duration of the TimeOFF Timer
RED	OUTPUT blocked	There is **no** signal output

8.3.8.2.5   Output inverted

All outputs stated in the system manuals of the according devices are related to the DEFAULT setting: Output not inverted.

If nevertheless the inverting of the output signal has to be configured the "Output inverted" checkbox has to be enabled.

8.3.8.2.6   Special Configuration

If used, the correct settings are described in the additional system manual of the customer-specific device.

Otherwise for S1-S8 the DEFAULT-setting (all checkboxes disabled) should not be changed due to compatibility reasons.

8.3.8.3 IRIG-B (Optional Hardware necessary)

The signal generation for the output of an IRIG-B signal may be configured in this panel.

> **i** For the output of this signal additional hardware (at system level) is required (see system manual if applicable).

8.3.8.3.1 IRIG-B - Format

Following IRIG-B output formats are available:

Selection of Output Format IRIG-B / IEEE C37.118 / AFNOR
IRIG-B / B007+B127 (time, year, second of the day)
IRIG-B / B003+B123(time, second of the day)
IRIG-B / B006+B126 (time, year)
IRIG-B / B002+B122 (time)
IEEE C37.118 (previously IEEE 1344)
AFNOR NF S87-500

8.3.8.3.2 Timebase

Timebase	Local Time
	Standard Time
	UTC Time

In general the local time is set as the base. This time leaps forward/back 1 hour every daylight saving time changeover. The standard or UTC time must be selected as the base if automatic daylight saving time changeover shall be suppressed.

When setting standard time (winter time), the time offset to local summer time is minus 1 hour. Standard time runs continuously (without time leap) throughout the whole year.

When setting UTC, the world time (formerly GMT) is used as the time base. This time base also runs continuously (without time leap) throughout the whole year.

8.3.8.3.3 Minimum Sync.-Status for Output

The signal output can be adjusted only to be generated when the Sync Module has reached a minimum synchronization status. As soon as this minimum synchronization status drops below this value during operation, the signal output stops unless the TimeOFF Timer has been

set greater than 0. In this case the output is done for the duration of the TimeOFF Timer despite the minimum synchronization status for the output falls below the set value.

Range of Sync.-Status

The synchronization status is represented from the bottom of the following table (INVA) up with increasing quality.

Synchronisation Status	SYNC	Time synchronized + quartz control started/running
	SYOF	Time synchronized + SyncOFF running
	SYSI	Time synchronized as simulation mode (with no actual GPS reception)
	QUON	Quartz/crystal time + SyncON running
	QUEX	Quartz/crystal time (in freewheel after synchronization failure ⇨ Board was already synchronized)
	QUSE	Quartz/crystal time after reset or manually set
	INVA	Invalid time

Value range TimeOFF timer = 0 to 65635min.

8.3.8.3.4 Status of the Signal Output

The status of the output is stated via a display element with the following color and text indications:

GREEN	OUTPUT active	There is a signal output
YELLOW	OUTPUT + TimeOFF active	There is a signal output for the duration of the TimeOFF Timer
RED	OUTPUT blocked	There is **no** signal output

8.3.8.3.5 Output inverted

All outputs stated in the system manuals of the according devices are related to the DEFAULT setting: Output not inverted.

If nevertheless the inverting of the output signal has to be configured the "Output inverted" checkbox has to be enabled.

8.3.8.3.6 Special Configuration

If used, the correct settings are described in the additional system manual of the customer-specific device.
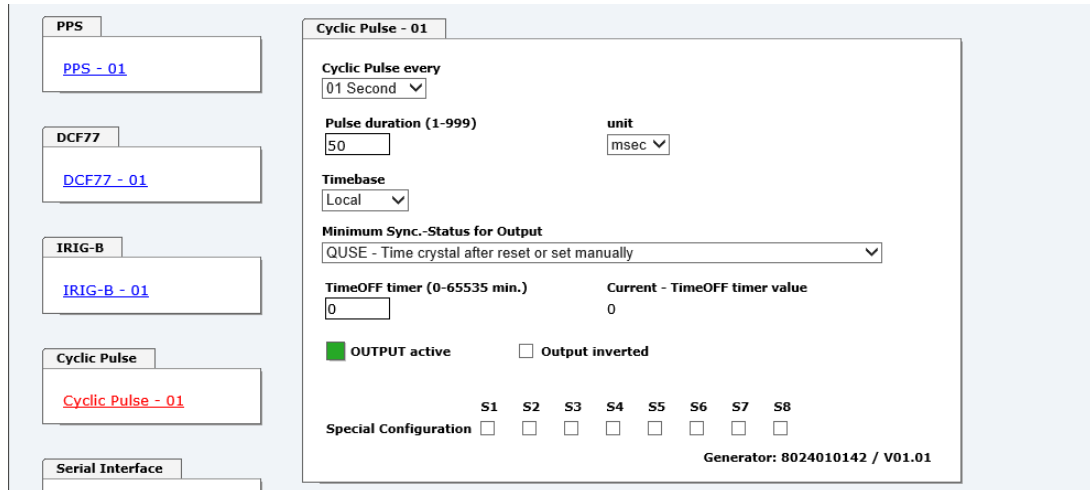
Otherwise for S1-S8 the DEFAULT-setting (all checkboxes disabled) should not be changed due to compatibility reasons.

8.3.8.4 Cyclic Pulse (Optional Hardware necessary)

The signal generation for the output of cyclic pulses may be configured in this panel.

i	For the output of this signal additional hardware (at system level) is required (see system manual if applicable).

8.3.8.4.1 Cyclic Pulse every

This section is used to select the pulse to be transmitted. Possible pulses are:

- Pulses every second: every 1, 2, 3, 4, 5, 6, 10, 12, 15, 20 or 30 seconds
- Pulses every minute: every 1, 2, 3, 4, 5, 6, 10, 12, 15, 20 or 30 minutes
- Pulses every hour: every 1, 2, 3, 4, 6, 8, 12 or 24 hours

8.3.8.4.2 Pulse duration (1-999)

This section is used to select the pulse width to be transmitted. Basically it is possible to specify the pulse width in milliseconds or seconds.

Possible <u>values</u> for the **pulse duration**:

- Minimum: 1
- Maximum: 999

Possible values for the **pulse duration unit**:

- Second (sec)
- Millisecond (msec)

i	Certain inputs are automatically corrected: • Value > 999 are automatically corrected to 999. • The pulse lengths <u>must</u> be at least 20msec shorter than the pulse interval.

8.3.8.4.3 Timebase

Timebase	Local Time
	Standard Time
	UTC Time

In general the local time is set as the base. This time leaps forward/back 1 hour every daylight saving time changeover. The standard or UTC time must be selected as the base if automatic daylight saving time changeover shall be suppressed.

When setting standard time (winter time), the time offset to local summer time is minus 1 hour. Standard time runs continuously (without time leap) throughout the whole year.

When setting UTC, the world time (formerly GMT) is used as the time base. This time base also runs continuously (without time leap) throughout the whole year.

8.3.8.4.4 Minimum Sync.-Status for Output

The signal output can be adjusted only to be generated when the Sync Module has reached a minimum synchronization status. As soon as this minimum synchronization status drops below this value during operation, the signal output stops unless the TimeOFF Timer has been set greater than 0. In this case the output is done for the duration of the TimeOFF Timer despite the minimum synchronization status for the output falls below the set value.

Range of Sync.-Status

The synchronization status is represented from the bottom of the following table (INVA) up with increasing quality.

Synchronisation Status	SYNC	Time synchronized + quartz control started/running
	SYOF	Time synchronized + SyncOFF running
	SYSI	Time synchronized as simulation mode (with no actual GPS reception)
	QUON	Quartz/crystal time + SyncON running
	QUEX	Quartz/crystal time (in freewheel after synchronization failure ⇨ Board was already synchronized)
	QUSE	Quartz/crystal time after reset or manually set
	INVA	Invalid time

Value range TimeOFF timer = 0 to 65635min.

8.3.8.4.5 Status of the Signal Output

The status of the output is stated via a display element with the following color and text indications:

GREEN	OUTPUT active	There is a signal output
YELLOW	OUTPUT + TimeOFF active	There is a signal output for the duration of the TimeOFF Timer
RED	OUTPUT blocked	There is **no** signal output

8.3.8.4.6 Output inverted

All outputs stated in the system manuals of the according devices are related to the DEFAULT setting: Output not inverted.

If nevertheless the inverting of the output signal has to be configured the "Output inverted" checkbox has to be enabled.

8.3.8.4.7 Special Configuration

If used, the correct settings are described in the additional system manual of the customer-specific device.
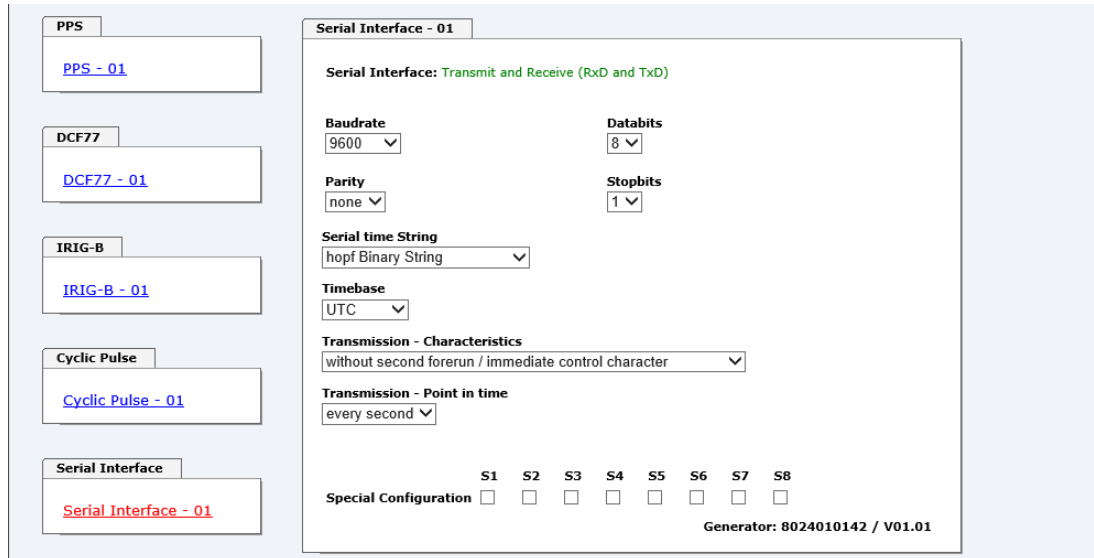
Otherwise for S1-S8 the DEFAULT-setting (all checkboxes disabled) should not be changed due to compatibility reasons.

8.3.8.5 Serial Interface (Optional Hardware necessary)

The serial data string generation may be configured in this panel.

> **i** For the output of serial data string additional hardware (at system level) is required (see system manual if applicable).

8.3.8.5.1 Serial Interface

> **!** Data strings are available by selection to change automatically the serial parameter.

Baud Rate

- 9600 baud
- 1200 baud
- 4800 baud
- 9600 baud
- 19200 baud
- 38400 baud
- 57600 baud
- 115000 baud

Databits

Possible settings are:

- 8 for 8 databits
- 7 for 7 databits

Parity

Possible settings are:

- No Parity
- Even Parity
- Odd Parity

Stopbits

Possible settings are:

- 1 for 1 stopbit
- 2 for 2 stopbits

8.3.8.5.2 Timebase

Timebase	Local Time
	Standard Time
	UTC Time

In general the local time is set as the base. This time leaps forward/back 1 hour every daylight saving time changeover. The standard or UTC time must be selected as the base if automatic daylight saving time changeover shall be suppressed.

When setting standard time (winter time), the time offset to local summer time is minus 1 hour. Standard time runs continuously (without time leap) throughout the whole year.

When setting UTC, the world time (formerly GMT) is used as the time base. This time base also runs continuously (without time leap) throughout the whole year.

8.3.8.5.3 Output scheme

The output scheme for the transmission must be selected here:

- Without second forerun / immediate control character
- With second forerun / immediate control character
- With second forerun / control character every second
- With second forerun / control character delayed every second

8.3.8.5.4 Transmission Time

- Every Second
- EveryMinute
- Every Hour
- Remote

8.3.8.5.5 Special Configuration

If used, the correct settings are described in the additional system manual of the customer-specific device.

Otherwise for S1-S8 the DEFAULT-setting (all checkboxes disabled) should not be changed due to compatibility reasons.

8.3.8.5.6 Serial time String

The string output for the transmission must be selected here:

- *hopf* Binäry String

- *hopf* time Universal

- *hopf* Master/Slave-String

- *hopf* Standard String (6021)

- Trimble Time String (TSIP)

- SINEC H1 Extended

- SAT 1703 Time String

- ABB Melody (CR/LF)

- ABB Melody (LF/CR)

8.3.8.5.6.1 *hopf* Binary String

The *hopf* Binary String can be used to synchronize slave systems with the time data of the master system.

Required:	• Transmission Time every second
	• With second forerun / control character every second
	• UTC time
	• 9600 baud, 8 bit, 1 stop bit, no parity

Example:

(STX):TIME:80;0233D88F08;07E0;003C;F4108014*6B(CR)(LF)   (ETX)

8.3.8.5.6.2 *hopf* time Universal

The *hopf* time Universal String can be used to synchronize slave systems with the time data of the master system.

Required:	• Transmision Time every second
	• With second forerun / control character every second
	• 9600 baud, 8 bit, 1 stop bit, no parity

Example:

(STX)731144501904201602+0000FFFF*23(CR)(LF)   (ETX)

8.3.8.5.6.3 *hopf* Master/Slave-String

The *hopf* Master/Slave-String can be used to synchronize slave systems with the time data of the master system.

The *hopf* Master/Slave-String transmits:

- the full time information (hour, minute, second)
- the date (day, month, year [2 digits])
- the difference time local to UTC (hour, minute)
- the day of the week
- status information (announcement of DST changeover, announcement of a leap second and the status of reception of the *hopf* Master/Slave-String source)

8.3.8.5.6.3.1 Specified Settings

Required:	The following settings are required for the synchronization of the *hopf* slave-systems:
	• output second forerun
	• ETX on the second change; selectable: data string at the beginning or at the end of the 59. second.
	• local time
	• 9600 baud, 8 bit, 1 stop bit, no parity

> Received data on the serial interface that are not specified in the pertinent data string might disturb and interrupt the cyclic string output.
> The receiving synchronization interface should be set to "transmitting on request" for Sub-Master (Slave) Systems.

8.3.8.5.6.3.2 Structure

Character No.	Meaning	Hex-Value
1	STX (start of text)	$02
2	status	$30-39, $41-46
3	day of the week	$31-37
4	tens hour	$30-32
5	unit hour	$30-39
6	tens minute	$30-35
7	unit minute	$30-39
8	tens second	$30-36
9	unit second	$30-39
10	tens day	$30-33
11	unit day	$30-39
12	tens month	$30-31
13	unit month	$30-39
14	tens year	$30-39
15	unit year	$30-39
16	difference time tens hour / operational sign	$30-31, $38-39
17	difference time unit hour	$30-39
18	difference time tens minutes	$30-35
19	difference time unit minutes	$30-39
20	LF (line feed)	$0A
21	CR (carriage Return)	$0D
22	ETX (end of text)	$03

The difference time (time zone offset) is transmitted in hours and minutes following the year. The transmission is done in BCD. The difference time may be up to ± 14.00h.

The operational sign is shown as the highest bit in the hours.

    logic **1** = local time before UTC

    logic **0** = local time after UTC

Example:

Data String	Tens Difference Time Nibble	Difference Time
(STX)831234560301960300(LF)(CR)(ETX)	**0000**	- 03:00h
(STX)831234560301961100(LF)(CR)(ETX)	**0001**	- 11:00h
(STX)831234560301968230(LF)(CR)(ETX)	**1000**	+ 02:30h
(STX)831234560301969100(LF)(CR)(ETX)	**1001**	+ 11:00h

8.3.8.5.6.3.3 Status

	b3	b2	b1	b0		Meaning
Status:	x	x	x	0		no announcement hour
	x	x	x	1		announcement (DST changeover)
	x	x	0	x		standard time
	x	x	1	x		daylight saving time (DST)
	x	0	x	x		no announcement leap second
	x	1	x	x		announcement leap second
	0	x	x	x		synchronization status code: INVA / QUSE / QUEX / QUON
	1	x	x	x		synchronization status code: SYOF / SYNC
Day of the Week:	0	0	0	1		Monday
	0	0	1	0		Tuesday
	0	0	1	1		Wednesday
	0	1	0	0		Thursday
	0	1	0	1		Friday
	0	1	1	0		Saturday
	0	1	1	1		Sunday

Status	Operating Mode	Time	DST changeover	Leap Second
0 = 0000	INVA / QUSE / QUEX / QUON	standard time	no announcement	no announcement
1 = 0001	INVA / QUSE / QUEX / QUON	standard time	announcement	no announcement
2 = 0010	INVA / QUSE / QUEX / QUON	DST	no announcement	no announcement
3 = 0011	INVA / QUSE / QUEX / QUON	DST	announcement	no announcement
4 = 0100	INVA / QUSE / QUEX / QUON	standard time	no announcement	announcement
5 = 0101	INVA / QUSE / QUEX / QUON	standard time	announcement	announcement
6 = 0110	INVA / QUSE / QUEX / QUON	DST	no announcement	announcement
7 = 0111	INVA / QUSE / QUEX / QUON	DST	announcement	announcement
8 = 1000	SYOF / SYNC	standard time	no announcement	no announcement
9 = 1001	SYOF / SYNC	standard time	announcement	no announcement
A = 1010	SYOF / SYNC	DST	no announcement	no announcement
B = 1011	SYOF / SYNC	DST	announcement	no announcement
C = 1100	SYOF / SYNC	standard time	no announcement	announcement
D = 1101	SYOF / SYNC	standard time	announcement	announcement
E = 1110	SYOF / SYNC	DST	no announcement	announcement
F = 1111	SYOF / SYNC	DST	announcement	announcement

DST = daylight saving time

8.3.8.5.6.3.4 Example

(STX)841234561807028230(LF)(CR)(ETX)

- It is Thursday 18.07.2002 - 12:34:56 o'clock
- synchronization status code: SYNC
- no announcement of a changeover
- The difference time to UTC is +2.30 h

8.3.8.5.6.4 *hopf* Standard String (6021)

Below the *hopf* Standard String is described.

8.3.8.5.6.4.1 Specified Settings

Required:	no

8.3.8.5.6.4.2 Structure

Character No.	Meaning	Hex-Value
1	STX (start of text)	$02
2	status (internal clock status)	$30-39, $41-46
3	day of the week (1=Monday ... 7=Sunday) for UTC time bit 3 is set to 1 in the day of the week	$31-37
4	tens hour	$30-32
5	unit hour	$30-39
6	tens minute	$30-35
7	unit minute	$30-39
8	tens second	$30-36
9	unit second	$30-39
10	tens day	$30-33
11	unit day	$30-39
12	tens month	$30-31
13	unit month	$30-39
14	tens year	$30-39
15	unit year	$30-39
16	LF (line feed)	$0A
17	CR (carriage return)	$0D
18	ETX (end of text)	$03

8.3.8.5.6.4.3 Status

The second and the third ASCII-character contain the status and the day of the week. The status is decoded binary.

	b3	b2	b1	b0	Meaning
Status:	x	x	x	0	no announcement hour
	x	x	x	1	announcement (DST changeover)
	x	x	0	x	standard time
	x	x	1	x	daylight saving time (DST)
	0	0	x	x	synchronization status code: INVA
	0	1	x	x	synchronization status code: QUSE / QUEX / QUON
	1	0	x	x	synchronization status code: SYOF
	1	1	x	x	synchronization status code: SYNC
Day of the Week:	0	x	x	x	CEST / CET
	1	x	x	x	UTC - time
	x	0	0	1	Monday
	x	0	1	0	Tuesday
	x	0	1	1	Wednesday
	x	1	0	0	Thursday
	x	1	0	1	Friday
	x	1	1	0	Saturday
	x	1	1	1	Sunday

Status	operation mode	time	announcement SZ-WZ-SZ
0 = 0000	INVA	winter	no announcement
1 = 0001	INVA	winter	announcement
2 = 0010	INVA	summer	no announcement
3 = 0011	INVA	summer	announcement
4 = 0100	QUSE / QUEX / QUON	winter	no announcement
5 = 0101	QUSE / QUEX / QUON	winter	announcement
6 = 0110	QUSE / QUEX / QUON	summer	no announcement
7 = 0111	QUSE / QUEX / QUON	summer	announcement
8 = 1000	SYOF	winter	no announcement
9 = 1001	SYOF	winter	announcement
A = 1010	SYOF	summer	no announcement
B = 1011	SYOF	summer	announcement
C = 1100	SYNC	winter	no announcement
D = 1101	SYNC	winter	announcement
E = 1110	SYNC	summer	no announcement
F = 1111	SYNC	summer	announcement

8.3.8.5.6.4.4 Example

(STX)E4123456180702(LF)(CR)(ETX)

- It is Thursday 18.07.2002 - 12:34:56 o'clock.
- synchronization status code: SYNC
- daylight saving time
- no announcement of a changeover
- ( ) - ASCII-control characters e.g. (STX)

8.3.8.5.6.5 Trimble Time String (TSIP)

The Trimble Time String (TSIP) can be used to synchronize slave systems with the time data of the master system.

Example in Hex description (not ASCII):

10 8F 0B 00 00 41 0A 49 00 00 00 00 00 13 04 07 E0 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 10 03

8.3.8.5.6.6 SINEC H1 Extended

Below the data string SINEC H1 Extended is described.

String request

The data string SINEC H1 Extended can also be sent by request. The time of output shall be configured to "send only by request" and the string will shall be requested with the ASCII character **"?"**.

8.3.8.5.6.6.1 Specified Settings

Required:	**no**

8.3.8.5.6.6.2 Structure

Character No.	Meaning	Hex-Value
1	STX (start of text)	$02
2	"D" ASCII D	$44
3	":" colon	$3A
4	tens day	$30-33
5	unit day	$30-39
6	"." point	$2E
7	tens month	$30-31
8	unit month	$30-39
9	"." point	$2E
10	tens year	$30-39
11	unit year	$30-39
12	";" semicolon	$3B
13	"T" ASCII T	$54
14	":" colon	$3A
15	day of the week	$31-37
16	";" semicolon	$3B
17	"U" ASCII U	$55
18	":" colon	$3A
19	tens hour	$30-32
20	unit hour	$30-39
21	"." point	$2E
22	tens minute	$30-35
23	unit minutes	$30-39
24	"." point	$2E
25	tens second	$30-36
26	unit second	$30-39
27	";" semicolon	$3B
28	"#" or " " (space)	$23 / $20
29	"*" or " " (space)	$2A / $20
30	"S", "U" or " " (space)	$53 / $55 / $20
31	"!", "A" or " " (space)	$21 / $41 / $20
32	ETX (end of text)	$03

8.3.8.5.6.6.3 Status

The characters 28-31 in the data string SINEC H1 Extended tell the synchronization status of the Sync Module 8024GPS.

The characters mean the following:

character no. 28 = "#"   no synchronisation after reset, time invalid
    "synchronization status code: INVA"

      " " (space)   synchronisation after reset, clock in crystal operation
    "synchronization status code:
    QUSE / QUEX / QUON / SYOF / SYNC"

character no. 29 = "*"   time from internal crystal in the clock
    "synch. status code: INVA / QUSE / QUEX / QUON"

      " " (space)   time by synchronisation
    "synchronization status code: SYOF / SYNC"

character no. 30 = "S"   daylight saving time
                 "U"   UTC
      " " (space)   standard time

character no. 31 = "!"   announcement of a DST or standard time changeover
                 "A"   announcement of a leap second
      " " (space)   no announcement

8.3.8.5.6.6.4 Example

(STX)D:18.07.02;T:4;U:12.34.56; _ _ _ _ (ETX)   (_) = Space

- It is Thursday 18.07.02 - 12:34:56 o'clock
- The clock is synchronous (synchronization status code: SYNC)
- standard time (winter time)
- no announcement of a changeover

8.3.8.5.6.7 SAT 1703 Time String

All modes can be transmitted with the SAT 1703 Time String (e.g. with forerun or end character at second change).

The SAT 1703 Time String can also be sent on request. The point of transmission shall be set to "transmission on request". The SAT 1703 Time String may be requested with ASCII-character **"?"**.

8.3.8.5.6.7.1 Specified Settings

Required:	**no**

8.3.8.5.6.7.2 Structure

Character No.	Meaning		Hex-Value
1	STX (start of text)		$02
2	tens day		$30-33
3	unit day		$30-39
4	"."		$2E
5	tens month		$30-31
6	unit month		$30-39
7	"."		$2E
8	tens year		$30-39
9	unit year		$30-39
10	"/"		$2F
11	unit day of the week		$31-37
12	"/"		$2F
13	tens hours		$30-32
14	unit hours		$30-39
15	":"		$3A
16	tens minutes		$30-35
17	unit minutes		$30-39
18	":"		$3A
19	tens seconds		$30-35
20	unit seconds		$30-39
21	"M" or "M" or "U"	(Standard time, Daylight saving time or UTC)	$4D, $4D, $55
22	"E" or "E" or "T"		$45, $45, $54
23	"Z" or "S" or "C"		$5A, $53, $43
24	" " or "Z" or " "		$20, $5A, $20
25	" " ($20 ⇨ synchronous) or "*" ($2A ⇨ not synchronous)		$20 $2A
26	" " ($20 ⇨ no announcement) or "!" ($21 ⇨ announcement of a DST or standard time changeover)		$20 $21
27	CR (carriage return)		$0D
28	LF (line feed)		$0A
29	ETX		$03

8.3.8.5.6.7.3 Status

The characters 21-26 in the SAT 1703 Time String indicate the synchronisation status of the clock.

The characters mean the following:

Character no. 21-24 =	"MESZ"	Central European Summertime (Daylight Saving Time)
	"MEZ "	Central European Time (standard time / winter time)
	"UTC "	Coordinated Universal Time

Character no. 25 =	"*"	time from internal crystal in the clock "synchronization status code: INVA / QUSE / QUEX / QUON"
	" " (space)	time by synchronisation "synchronization status code: SYOF / SYNC"

Character no. 26 =	"!"	announcement of a DST or standard time changeover
	" " (space)	no announcement

8.3.8.5.6.7.4 Example

(STX)18.07.02/4/02:34:45UTC_ _ _(CR)(LF)(ETX)

- It is Thursday 18.07.02 - 02:34:45 o'clock UTC
- The clock is synchronous (synchronization status code: SYNC)

8.3.8.5.6.8 ABB Melody (CR/LF)

Below the ABB Melody DataString is described.

8.3.8.5.6.8.1 Specified Settings

Required:	The following settings are required for the synchronization:
	• Output every minute • Output without second forerun • Output without ETX on the second change • UTC time • 9600 baud, 8 bit, 2 stop bit, parity even

8.3.8.5.6.8.2 Structure

Character No.	Meaning	Hex-Value
1	STX (start of text)	$02
2	status (internal clock status)	$30-39, $41-46
3	day of the week (1=Monday ... 7=Sunday) for UTC time bit 3 is set to 1 in the day of the week	$31-37
4	tens hour	$30-32
5	unit hour	$30-39
6	tens minute	$30-35
7	unit minute	$30-39
8	tens second	$30-36
9	unit second	$30-39
10	tens day	$30-33
11	unit day	$30-39
12	tens month	$30-31
13	unit month	$30-39
14	tens year	$30-39
15	unit year	$30-39
16	CR (carriage return)	$0D
17	LF (line feed)	$0A
18	ETX (end of text)	$03

8.3.8.5.6.8.3 Status

The second and the third ASCII-character contain the status and the day of the week.
The status is decoded binary.

	b3	b2	b1	b0	Meaning
Status:	x	x	x	0	no announcement hour
	x	x	x	1	announcement (DST changeover)
	x	x	0	x	standard time
	x	x	1	x	daylight saving time (DST)
	0	0	x	x	synchronization status code: INVA
	0	1	x	x	synchronization status code: QUSE / QUEX / QUON
	1	0	x	x	synchronization status code: SYOF
	1	1	x	x	synchronization status code: SYNC
Day of the Week:	0	x	x	x	CEST / CET
	1	x	x	x	UTC - time
	x	0	0	1	Monday
	x	0	1	0	Tuesday
	x	0	1	1	Wednesday
	x	1	0	0	Thursday
	x	1	0	1	Friday
	x	1	1	0	Saturday
	x	1	1	1	Sunday

Status	operation mode	time	announcement SZ-WZ-SZ
0 = 0000	INVA	winter	no announcement
1 = 0001	INVA	winter	announcement
2 = 0010	INVA	summer	no announcement
3 = 0011	INVA	summer	announcement
4 = 0100	QUSE / QUEX / QUON	winter	no announcement
5 = 0101	QUSE / QUEX / QUON	winter	announcement
6 = 0110	QUSE / QUEX / QUON	summer	no announcement
7 = 0111	QUSE / QUEX / QUON	summer	announcement
8 = 1000	SYOF	winter	no announcement
9 = 1001	SYOF	winter	announcement
A = 1010	SYOF	summer	no announcement
B = 1011	SYOF	summer	announcement
C = 1100	SYNC	winter	no announcement
D = 1101	SYNC	winter	announcement
E = 1110	SYNC	summer	no announcement
F = 1111	SYNC	summer	announcement

8.3.8.5.6.8.4 Example

(STX)CC123456210416(CR)(LF)(ETX)

- It is Thursday 21.04.2016 - 12:34:56 o'clock.
- synchronization status code: SYNC
- UTC
- no announcement of a changeover
- ( ) - ASCII-control characters e.g. (STX)

8.3.8.5.6.9 ABB Melody (LF/CR)

Below the ABB Melody DataString is described.

8.3.8.5.6.9.1 Specified Settings

Required:	The following settings are required for the synchronization:
	• Output every minute
	• Output without second forerun
	• Output without ETX on the second change
	• UTC time
	• 9600 baud, 8 bit, 2 stop bit, parity even

8.3.8.5.6.9.2 Structure

Character No.	Meaning	Hex-Value
1	STX (start of text)	$02
2	status (internal clock status)	$30-39, $41-46
3	day of the week (1=Monday ... 7=Sunday) for UTC time bit 3 is set to 1 in the day of the week	$31-37
4	tens hour	$30-32
5	unit hour	$30-39
6	tens minute	$30-35
7	unit minute	$30-39
8	tens second	$30-36
9	unit second	$30-39
10	tens day	$30-33
11	unit day	$30-39
12	tens month	$30-31
13	unit month	$30-39
14	tens year	$30-39
15	unit year	$30-39
16	LF (line feed)	$0A
17	CR (carriage return)	$0D
18	ETX (end of text)	$03

8.3.8.5.6.9.3 Status

The second and the third ASCII-character contain the status and the day of the week. The status is decoded binary.

	b3	b2	b1	b0	Meaning
Status:	x	x	x	0	no announcement hour
	x	x	x	1	announcement (DST changeover)
	x	x	0	x	standard time
	x	x	1	x	daylight saving time (DST)
	0	0	x	x	synchronization status code: INVA
	0	1	x	x	synchronization status code: QUSE / QUEX / QUON
	1	0	x	x	synchronization status code: SYOF
	1	1	x	x	synchronization status code: SYNC
Day of the Week:	0	x	x	x	CEST / CET
	1	x	x	x	UTC - time
	x	0	0	1	Monday
	x	0	1	0	Tuesday
	x	0	1	1	Wednesday
	x	1	0	0	Thursday
	x	1	0	1	Friday
	x	1	1	0	Saturday
	x	1	1	1	Sunday

Status	operation mode	time	announcement SZ-WZ-SZ
`0 = 0000`	INVA	winter	no announcement
`1 = 0001`	INVA	winter	announcement
`2 = 0010`	INVA	summer	no announcement
`3 = 0011`	INVA	summer	announcement
`4 = 0100`	QUSE / QUEX / QUON	winter	no announcement
`5 = 0101`	QUSE / QUEX / QUON	winter	announcement
`6 = 0110`	QUSE / QUEX / QUON	summer	no announcement
`7 = 0111`	QUSE / QUEX / QUON	summer	announcement
`8 = 1000`	SYOF	winter	no announcement
`9 = 1001`	SYOF	winter	announcement
`A = 1010`	SYOF	summer	no announcement
`B = 1011`	SYOF	summer	announcement
`C = 1100`	SYNC	winter	no announcement
`D = 1101`	SYNC	winter	announcement
`E = 1110`	SYNC	summer	no announcement
`F = 1111`	SYNC	summer	announcement

8.3.8.5.6.9.4 Example

(STX)CD123456220416(LF)(CR)(ETX)

- It is Friday 22.04.2016 - 12:34:56 o'clock.
- synchronization status code: SYNC
- UTC
- no announcement of a changeover
- ( ) - ASCII-control characters e.g. (STX)

9   SSH and Telnet Basic Configuration

> ⚠ Only basic configuration is possible via SSH or Telnet. The complete configuration of the Time Server 8030HEPTA/GPS takes place exclusively via the WebGUI.

It is just as easy to use SSH (Port 22) or Telnet (Port 23) as the WebGUI. Both protocols use the same user interface and menu structure.
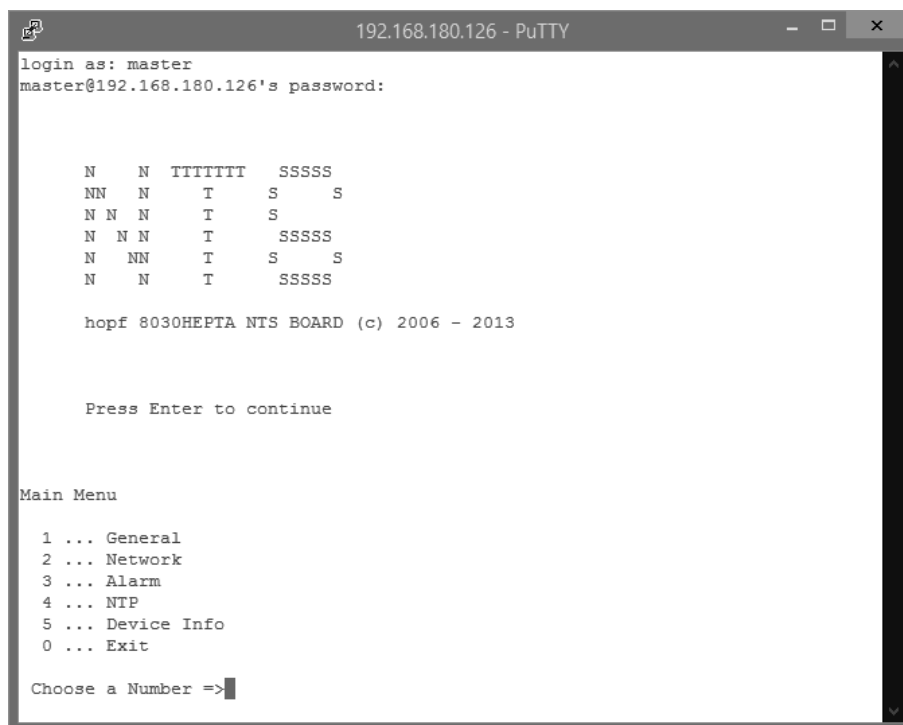
The user names and passwords are the same as on the WebGUI and are kept in alignment (see **Chapter 8.3.6.10 Passwords (Master/Device)**).

> ⚠ SSH does not allow blank passwords for safety reasons.

> ⚠ The corresponding protocols should be enabled for the use of Telnet or SSH (see **Chapter 8.3.2.7 Management (Management-Protocols – HTTP, SNMP)**).

```
                    192.168.180.126 - PuTTY              _ □  ×
login as: master
master@192.168.180.126's password:


     N    N  TTTTTTT   SSSSS
     NN   N     T     S     S
     N N  N     T     S
     N  N N     T      SSSSS
     N   NN     T     S     S
     N    N     T      SSSSS

     hopf 8030HEPTA NTS BOARD (c) 2006 - 2013



     Press Enter to continue


Main Menu

  1 ... General
  2 ... Network
  3 ... Alarm
  4 ... NTP
  5 ... Device Info
  0 ... Exit

  Choose a Number =>
```

The navigation through the menu takes place by entering the respective number associated with the menu option (as can be seen in the above image).

10 Fault Analysis / Troubleshooting

This chapter explains different error patterns and the process to contact the *hopf* support team.

10.1 Error Patterns

This chapter describes various error patterns which enable the customer to make a preliminary problem analysis. In addition they also provide assistance in describing the error when contacting the *hopf* support.

> **i** If possible, for each problem the entire status in the tabs **GENERAL** and **GPS SYNC SOURCE** page "**Module Errors**" via WebGUI should always be checked.

10.1.1 Complete Failure

Description

- The Status LEDs on the front panel are off

Cause / Problem Solution

- Device is switched off
- Voltage supply failure
- Power supply defective

10.1.2 No GPS Reception / No Synchronization

Description

- In WebGUI the status of the SYNC SOURCE is **not** displayed with **SYNC** or **SYOF**
- The Status LEDs of Module 8024GPS on the front panel do not indicate **SYNC** or **SYOF** status

Cause / Problem Solution

- System was not correctly/completely initialized

The following describes various effects and their possible causes on a non-synchronizing system:

Case 1:

Effect: After the first installation, no satellite appears on the display after several hours and **0** is displayed under **Satellites in View**.

Possible Errors:

- The antenna cable is too long
- An incorrect cable type was used for the length of the antenna equipment
- The antenna cable is faulty
- The antenna cable is not connected
- The antenna is defective
- The indirect lightning protection is defective

Case 2:

Effect: There are 7 satellites in the visibility range (**V=07**) but a maximum of 2 appear on the display frame. However, the value of these satellites is 30 or above.

Possible Errors:

- The visibility range of the antenna to the sky is limited.

Case 3:

Effect: There are 9 satellites in the visibility range (**V=09**) and 6 appear on the display frame. The signal/noise ratios are all below 30. The equipment is not synchronized.

Possible Errors:

- The cable is too long
- An incorrect cable type was used for the length of the antenna equipment
- The BNC connectors are poorly mounted
- The cable is bent or crimped
- Indirect lightning protection was irreversibly damaged by overvoltage
- The antenna is defective

Case 4:

Effect: The equipment was working perfectly but has not been receiving for several days. 7 satellites appear in the visibility range (**V=07**) but no satellite is displayed.

Possible Errors:

- The cable has been damaged
- There was excess voltage on the antenna equipment and the indirect lightning protector is defective
- The antenna is defective
- The GPS receiver of Module 8024GPS is defective
- A building change has had an effect on the antenna equipment (e.g. shading of the antenna caused by subsequent building installation, or the laying of cables with a high electrical alternating field in the immediate vicinity of the GPS antenna cable)
- Electronic equipment with an interference effect on the GPS signal has been put into operation in the vicinity of the GPS antenna equipment / GPS receiver (e.g. transmitter for pagers)

Further information on the subject of the GPS antenna system can be consulted in the manual "Antenna Equipment GPS".

10.1.3 No Daylight Saving Time / Summer Time Switchover

Description
- There is no "DST" for "daylight saving time" (summer time) displayed in the Sync Source time in WebGUI
- Summer time is not considered in outputs working with it and even in case of availability.

Cause / Problem Solution
- Changeover times are not set
- Parameterization failure

10.2 Support by Company *hopf*

Should the system show any other failures than listed in *Chapter 10.1 Error Patterns*, please contact the support of company *hopf* Elektronik GmbH by providing an exact failure description and the following information:

i	If possible, for each problem the **Configuration File** in the tab **DEVICE** should be downloaded from the device and be sent to the *hopf* support (see *Chapter 8.3.6.11 Downloading Configuration Files / SNMP MIB*).

- With the file **System Configuration** or if not possible with the serial number of the System
- When does the error occur: During commissioning or operation
- Exact error description
- In the case of GPS reception/synchronization problems ⇨ description of the antenna equipment used:
    - Components used (antenna, indirect lightning protection, etc.)
    - Cable type used
    - Total length of the antenna system
    - Sequence of components and cable lengths between the components
    - Antenna installation site (e.g. signal shading by building)

Please write to the following E-mail address with the above information:

support@hopf.com

!	Providing a detailed error description and above listed information avoid the need for additional clarification and leads to a faster processing by the support team.

11 Maintenance

The Time Server 8030HEPTA/GPS is generally maintenance-free. The following points should be observed if a cleaning of the system might be necessary.

11.1 General Guidelines for Cleaning

The following **must not** be used to clean the Time Server 8030HEPTA/GPS:

- Fluids

- Cleaning agents containing solvents

- Cleaning agents containing acids

- Abrasive media

The use of such cleaning agents or media could damage the Time Server 8030HEPTA/GPS.

Do not use a wet cloth to clean the Time Server 8030HEPTA/GPS.

There is the danger of an electric shock.

To clean the Time Server 8030HEPTA/GPS use a cloth that is:

- Antistatic

- Soft

- Non-fabric

- Damp

11.2 Cleaning the Housing

Make sure that connections or cables are not loosened while cleaning the housing of the Time Server 8030HEPTA/GPS. There is the danger of damage and functionality loss.

11.3 Cleaning the Display and Front Panel

Minimum pressure should be exerted when cleaning the display and push button. Excessive pressure may cause mechanical damage.

12 Technical Data

> The company *hopf* reserves the right to hardware and software alterations at any time.

12.1 General – 8030HEPTA/GPS

General Data – System 8030HEPTA/GPS	
Housing design:	Sheet steel / Aluminium, closed
Housing dimensions:	See *Chapter 2.1 19 inch Rack 1U/84HP (Slim Line)*
Protection type of the housing:	IP20
Protection class:	I, with PE connection. Additional earth screw for cables up to 16mm^2
Cooling:	Passive, ventilation slots left / right
Weight:	Approx. 3kg

AC Power Supply (with wide input range)	Power supply capacity 20VA (Standard)	Power supply capacity 40VA
Nominal input voltage:	100-240V AC / 47-63Hz Connection via input connector compliant with IEC/EN 60320-1/C14 with EMI line filter and switch	
Input voltage range:	85-264V AC	
Frequency:	47-63Hz	
Current consumption (at nominal values):	about 0.37A (120V AC) 0.23A (230V AC)	about 0.80A (120V AC) 0.40A (230V AC)
Starting current:	Typ. 15A (I_O = 100%) 120V AC Typ. 30A (I_O = 100%) 230V AC	
Mains failure bridging at nominal load:	> 20msec. (> 100V AC)	
Turn-on time after application of mains voltage:	< 500msec.	
Transient overvoltage protection:	Overvoltage category II (EN 60664-1)	
Input fuse - internal:	2A (equipment protection)	
Recommended pre-fuse:	Line protection switch 6A, 10A characteristic B (EN 60898)	
PE leakage current:	< 0.75mA (60Hz, compliant with EN 60950)	
Insulation voltage input / PE:	2000V AC, 1 minute, residual current = 10mA, 500V DC, 50MΩ at least (at room temperature)	
Output Data (internal only)		
Internal nominal output voltage:	5V DC	
Nominal output current I_N 0°C .. +55°C:	3A (U_{OUT} = 5V DC)	6A (U_{OUT} = 5V DC)
Efficiency:	> 74% (at 230V AC and nominal values)	> 75% (at 230V AC and nominal values)

DC Power Supply (Option)	Power supply capacity 20VA (Standard) / 40VA - Option		
Nominal input voltage:	24V DC	48V DC	110/220V DC
Input voltage range:	18-36V DC	36-76V DC	100-250V DC
Current consumption (at nominal values):	**20VA power supply:** 0.69A	**20VA power supply:** 0.35A	**20VA power supply:** 0.40A
	40VA power supply: 1.36A	**40VA power supply:** 0.68A	**40VA power supply:** 0.40A
Turn-on time after application of mains voltage:	< 200msec.	< 200msec.	< 500msec.
Input fuse - internal (equipment protection):	**20VA power supply:** 2A fast-acting	**20VA power supply:** 1A fast-acting	**20VA power supply:** 2A
	40VA power supply: 4A fast-acting	**40VA power supply:** 2A fast-acting	**40VA power supply:** 2A
Insulation voltage input / output:	1.500V DC 1 minute, 500V DC 50MΩ at least (20°C ±15°C)	1.500V DC 1 minute, 500V DC 50MΩ at least (20°C ±15°C)	2000V AC, 1 Minute, residual current = 10mA, 500V DC, 50MΩ at least (at room temp.)
Output Data (internal only)			
Internal nominal output voltage:	5V DC	5V DC	5V DC
Nominal output current I_N 0°C ... +55°C	**20VA power supply:** 3A (U_{OUT} = 5V DC)	**20VA power supply:** 3A (U_{OUT} = 5V DC)	**20VA power supply:** 3A (U_{OUT} = 5V DC)
	40VA power supply: 6A (U_{OUT} = 5V DC)	**40VA power supply:** 6A (U_{OUT} = 5V DC)	**40VA power supply:** 6A (U_{OUT} = 5V DC)
Efficiency:	> 90%	> 90%	> 74%

Ambient Conditions		
Temperature range:	Operation:	0°C to +55°C
	Storage:	-20°C to +75°C
Humidity:		max. 95%, non condensing

CE Conformity
EMV Directive 2014/30/EU
EN 55022 : 2010 / AC : 2011
EN 61000-3-2 : 2006 / A2 : 2009, EN 61000-3-3 : 2013
EN 55024 : 2010
Low Voltage Directive 2014/35/EU
EN 60950-1 : 2006 / AC : 2011

MTBF	
MTBF	> 200,000h

Power Consumption - internal	
Normal operation	Typical: 900mA (max. 1200mA) at 5V DC
Boot phase	Typical: 900mA (max. 1200mA) at 5V DC

12.2 Module 8030HEPTA

LAN - ETH0/ETH1	
Network connection	Via a LAN cable with RJ45 connector, male (recommended cable type CAT5 or better)
Request per second	Max. 6,250 requests (during operation in GigaBit networks under optimum network conditions)
Number of connectable Clients	Theoretically unlimited
Network interface ETH0	10/100/1000 Base-T
Ethernet compatibility	Version 2.0 / IEEE 802.3
Isolation voltage (Network- to system side)	1500 Vrms
Boot time:	typ.: 35 seconds - When using static IP addresses for ETH0 and ETH1. Depending on the network configuration in use (e.g. DHCP) an extension of the boot phase can occur.

GPS-System - Accuracy		
Lambda < 15ms	Stability < 0.2ppm	HIGH
Lambda < 15ms	Stability >= 0.2ppm and <= 2ppm, Offset < 1ms	HIGH
Lambda < 15ms	Stability > 2ppm or Offset >= 1ms	MEDIUM
DCF77-System - Accuracy		
Lambda < 15ms	Stability < 0.6ppm	HIGH
Lambda < 15ms	Stability >= 0.6ppm and <= 2ppm, Offset < 2ms	HIGH
Lambda < 15ms	Stability > 2ppm or Offset >= 2ms	MEDIUM

Time Protocols

- NTPv4 Server
- NTP Broadcast Mode
- NTP Multicast Mode
- NTP Client for additional NTP Servers (Redundancy)
- SNTP Server
- NTP Symmetric Key Encryption
- NTP Autokey Encryption
- NTP Access Restrictions
- RFC-867 DAYTIME Server
- RFC-868 TIME Server
- SINEC H1 time datagram (Activation Key required)
- Precision Time Protocol (PTP) according to IEEE Std 1588™-2008 (Activation Key required)
  - o IEEE Standard Profile to use IEEE 1588™ Precision Time Protocol in Power System application (Power Profile) according to IEEE Std C37.238™-2011

TCP/IP Network Protocols

- HTTP/ HTTPS
- DHCP
- Telnet
- SSH
- SNMP (Activation Key required)
- SMTP (Activation Key required)
- SYSLOG (Activation Key required)

Configuration Channels

- HTTP/HTTPS WebGUI (browser-based)
- Telnet
- SSH
- External LAN configuration tool (**hmc** - **Network-Configuration-Assistant**)

12.3 Module 8024GPS

Accuracy			
Internal PPS pulse on GPS reception (after 5min. continuous GPS reception):	Standard Quartz:	< ±30ns	
	VCTCXO:	< ±15ns	
VCO control of the internal quartz base (after 5 min continuous GPS reception):	Standard Quartz:	< ±0.030ppm	
	VCTCXO:	< ±0.015ppm	
Freewheel accuracy:	Standard Quartz:	< ±0.1ppm	
	after at least 5min. GPS reception/ T = +20° C Drift for T = +20° C (constant): - after 1h: 0.36msec. - after 24h: 8.64msec.		
	VCTCXO:	<± 0.02ppm	
	after at least 5min. GPS reception/ T = +20° C Drift for T = +20° C (constant): - after 1h: 0.72msec. - after 24h: 1.73msec.		
Internal back-up clock (RTC):	±25ppm / for T = +10° C to +50° C		

GPS Data	
Receiver type:	22 channel phase tracking receiver, C/A code
Evaluation:	L1 frequency (1575.42MHz)
Sensitivity:	Tracking: -161dB Cold Start: -148dBm
Synchronization time TTF (Time to First Fix):	• Warm start: < 1min. • Cold start: < 5min • first installation < 12.5 min (without valid leap second information)
Antenna connection:	• Via BNC connector, female • For active antennas, U_b = 5V DC / max. 70mA • Antenna power feed via BNC connector, female of Module 8024GPS

Signal Outputs	
Status optical coupler:	Via 3-pole pluggable screw terminal Resistive circuit-breaking capacity: max. 50mA / 80V DC

Special production:

Modifications can be made to hardware and software in accordance with customer specifications.

The *hopf* Company reserves the right to modify hardware and software at any time.

---

13 Factory Defaults of Time Server 8030HEPTA/GPS

This chapter lists the factory default values of the individual components integrated in the Time Server 8030HEPTA/GPS.

13.1 Factory Default Values of Module 8030HEPTA (Device)

The default delivery status of the Time Server 8030HEPTA/GPS meets the factory default values when using GPS synchronization sources. In case of DCF77 synchronization (different product variant) the function **"NTP / General / Sync Source"** is factory-set to **"DCF77"** on delivery.

> ⚠ Using the board in DCF77 systems (different product variant) the setting for **"NTP / General / Sync Source"** needs to be re-configured to **"DCF77"** after a factory default.

NTP Server Configuration	Setting	WebGUI
Sync Source	GPS	GPS

13.1.1 Network

Host/Nameservice	Setting	WebGUI
Hostname	hopf8030hepta	hopf8030hepta
Use Manual DNS Entries	Enabled	Enabled
DNS Server 1 IPv4/IPv6 Address	Blank	---
DNS Server 2 IPv4/IPv6 Address	Blank	---
DNS Server 3 IPv4/IPv6 Address	Blank	---
Use Manual Gateway Entries	Enabled	Enabled
Default Gateway IPv4 Address	Blank	---
Default Gateway IPv6 Address	Blank	---
Network Interface ETH0	**Setting**	**WebGUI**
Use Custom Hardware Address (MAC)	Disabled	Disabled
Custom Hardware Address (MAC)	Blank	---
DHCP	Disabled	Disabled
IPv4	192.168.0.1	192.168.0.1
IPv4-Netmask	255.255.255.0	255.255.255.0
Operation mode	Auto negotiate	Auto negotiate
VLAN Interfaces	Disabled	Disabled
IPv6 Settings	Disabled	Disabled
Network Interface ETH1	**Setting**	**WebGUI**
Use Custom Hardware Address (MAC)	Disabled	Disabled
Custom Hardware Address (MAC)	Blank	---
DHCP	Enabled	Enabled
IPv4	Blank	---
IPv4-Netmask	Blank	---
Operation mode	Auto negotiate	Auto negotiate
VLAN Interfaces	Disabled	Disabled
IPv6 Settings	Disabled	Disabled
Bonding	**Setting**	**WebGUI**
Network Interface Bonding/Teaming	Disabled	Disabled

PRP	Setting	WebGUI
Network Interface PRP	Disabled	Disabled
Routing	**Setting**	**WebGUI**
Use Route File	Disabled	Disabled
User Defined Routes	Blank	---
Management	**Setting**	**WebGUI**
HTTP	Enabled	Enabled
HTTPS	Disabled	Disabled
SSH	Enabled	Enabled
TELNET	Disabled	Disabled
SNMP	Disabled	Disabled
HMC NCA	Enabled	Enabled
System Location	Blank	---
System Contact	Blank	---
Read Only Community	Public	Public
Read/Write Community	Secret	Secret
Security Name	Blank	---
Access Rights	Readonly	Readonly
Authentication Protocol	MD5	MD5
Authentication Passphrase	Blank	---
Privacy Protocol	DES	DES
Privacy Passphrase	Blank	---
Time	**Setting**	**WebGUI**
NTP	Enabled	Enabled
DAYTIME	Disabled	Disabled
TIME	Disabled	Disabled
SINEC H1 time datagram	**Setting**	**WebGUI**
Send Interval	sekündlich	1 second
Timebase	UTC	UTC
Destination MAC Address	09:00:06:03:FF:EF	09:00:06:03:FF:EF
Minimum Accuracy	LOW	LOW
RADIUS	**Setting**	**WebGUI**
Enable	Disabled	Disabled
Server Address	Blank	---
Secret Key	Blank	---
Master User Secret	Blank	---
Device User Secret	Blank	---

13.1.2 NTP

NTP Server Configuration	Setting	WebGUI
Sync Source	GPS	GPS
NTP to Syslog	Disabled	Disabled
Switch to specific stratum	Disabled	Disabled
Stratum in crystal operation	Blank	---
Broadcast address	Blank	---
Authentication	Disabled	None
Key ID	Blank	---
Additional NTP Servers	Blank	---

NTP Extended Configuration	Setting	WebGUI
Limitation of Liability	Blank	---
Block Output when Stratum Unspecified	Disabled	Disabled
Timebase	UTC	UTC
NTP Access Restrictions	**Setting**	**WebGUI**
Access Restrictions		Default no modify
Access Restrictions	Activ	activ
NTP Symmetric Keys	**Setting**	**WebGUI**
Request Key	Blank	---
Control Key	Blank	---
Symmetric Keys	Blank	---
NTP Autokey	**Setting**	**WebGUI**
Autokey	Disabled	Disabled
Password	Blank	---

13.1.3 PTP

PTP Configuration	Setting	WebGUI
PTP Enabled	disabled	disabled
PTP Interface	ETH0	ETH0
PTP Domain	0	0
PTP Priority 1	128	128
PTP Priority 2	128	128
PTP Profile	IEEE C37.238 Power Profile	IEEE C37.238 Power Profile
PTP IEEE C37.238 Power Profile Settings	**Setting**	**WebGUI**
PTP Grandmaster ID	3	3
Time Zone Name	UTC	UTC
PTP Advanced Settings	**Setting**	**WebGUI**
PTP Transport	Ethernet / P2P	Ethernet / P2P
PTP sync interval (2^x sec)	1 second	0
PTP pdelay request interval (2^x sec)	1 second	0
PTP announce interval (2^x sec)	1 second	0
PTP announce timeout (sec)	2 seconds	2

13.1.4 ALARM

Syslog Configuration	Setting	WebGUI
Syslog	Disabled	Disabled
Server Name	Blank	---
Alarm Level	Disabled	none
E-mail Configuration	**Setting**	**WebGUI**
E-mail Notifications	Disabled	Disabled
SMTP Server	Blank	---
Sender Address	Blank	---
E-mail Addresses	Blank	---

SNMP Traps Configuration	Setting	WebGUI
SNMP Traps	Disabled	Disabled
Alarm Level	Disabled	none
SNMP Trap Receivers	Blank	---
Alarm Messages	**Setting**	**WebGUI**
Alarms	all Disabled	all none

13.1.5 DEVICE

User Passwords	Settings	WebGUI
Master Password	master	master
Device Password	device	device
Diagnostic	**Settings**	**WebGUI**
Real Time Diagnostics	Disabled	Disabled
Product Activation	**Settings**	**WebGUI**
Activate Feature	No changes	No changes

13.2 Factory Default Values of Module 8024GPS (Sync Source)

After triggering a factory default of Module 8024GPS two steps are carried out.

1. **Deleting the current leap second information in the GPS receiver**

2. **Following parameters are set to default values:**

Difference time	**00h 00min east**
Changeover times:	**disabled**
Begin of Daylight Saving Time:	Week => first Day => Monday Month => January Hour => 0
End of Daylight Saving Time:	Week => first Day => Monday Month => January Hour => 0
SyncON / SyncOFF Timeout:	**0000 / 0055** (minutes)
GPS Position: Longitude: Latitude:	 **E 000° 00' 0000** **N 00° 00' 0000**
GPS reception mode:	**Position Fixed**
Sync Status OC:	**SYNC**

14 Glossary and Abbreviations

14.1 NTP-specific Terminology

Stability	The average frequency stability of the clock system.
Accuracy	Specifies the accuracy in comparison to other clocks.
Precision of a clock	Specifies how precisely the stability and accuracy of a clock system can be maintained.
Offset	This value represents the time difference between two clocks. It is the offset by which the local time would have to be adjusted in order to keep it congruent with the reference clock.
Clock skew	The frequency difference between two clocks (first derivative of offset over time).
Drift	Real clocks vary in frequency difference (second derivative of offset over time). This variation is known as drift.
Roundtrip delay	Roundtrip delay of an NTP message to the reference and back.
Dispersion	Represents the maximum error of the local clock relative to the reference clock.
Jitter	The estimated time error of the system clock measured as the average exponential value of the time offset.

14.2 Tally Codes (NTP-specific)

space	**reject**	Rejected peer – either the peer is not reachable or its synchronization distance is too great.
x	**falsetick**	The peer was picked out by the NTP intersection algorithm as a false time supplier.
.	**excess**	The peer was picked out by the NTP sort algorithm as a weak time supplier on the basis of synchronization distance (concerns the first 10 peers).
-	**outlyer**	The peer was picked out by the NTP clustering algorithm as an outlyer.
+	**candidate**	The peer was selected as a candidate for the NTP combining algorithm.
#	**selected**	The peer is of good quality but not among the first six peers selected by the sort algorithm on the basis of synchronization distance.
*	**sys.peer**	The peer was selected as a system peer. Its characteristics are transferred to the Base System.
o	**pps.peer**	The peer was selected as a system peer. Its characteristics are transferred to the Base System. The current synchronization is derived from a PPS (pulse-per-second) signal either indirectly via PPS reference clock driver or directly via kernel interface.

14.2.1 Time-Specific Expressions

UTC	**UTC Time** (**U**niversal **T**ime **C**oordinated) was depending on the Greenwich Mean Time (GMT) definition of the zero meridian. While GMT follows astrological calculations, UTC is based on the stability and accuracy of the Caesium standard. The leap second was defined in order to cover this deviation.
Time Zone	The globe was originally divided into 24 longitudinal segments or time zones. Today, however, there are a number of time zones which in part apply specifically to certain individual countries only. In relation to the time zones, consideration was given to the fact that local daylight and sunlight coincide at different times in the individual time zones. The zero meridian runs through the British city of Greenwich.
Time Offset	This is the difference between UTC and the valid standard time of the current time zone. The Time Offset will be commit from the local time zone.
Local Standard Time (winter time)	**Standard Time = UTC + Time Offset** The time offset is defined by the local time zone and the local political regulations.
Daylight Saving Time (summer time)	**Offset of Daylight Saving Time = + 1h** Daylight Saving Time was introduced to reduce the energy requirement in some countries. In this case one hour is added to the standard time during the summer months.
Local Time	Local Time = Standard Time if exists with summer / winter time changeover
Leap Second	A leap second is a second which is added to the official time (UTC) in order to synchronise this with Greenwich Mean Time when required. Leap seconds are defined internationally by the **International Earth Rotation and Reference Systems Service (IERS)**.

14.3 Abbreviations

D, DST	Daylight Saving Time
ETH0	Ethernet Interface 0
ETH1	Ethernet Interface 1
FW	Firmware
GPS	Global Positioning System
HW	Hardware
IF	Interface
IP	Internet Protocol
LAN	Local Area Network
LED	Light Emitting Diode
NTP	Network Time Protocol
NE	Network Element
OEM	Original Equipment Manufacturer
OS	Operating System
PTP	Precision Time Protocol
PRP	Parallel Redundancy Protocol
RFC	Request for Comments
SNMP	Simple Network Management Protocol (handled by more than 60 RFCs)
SNTP	Simple Network Time Protocol
S, STD	Standard Time
TCP	Transmission Control Protocol http://de.wikipedia.org/wiki/User_Datagram_Protocol
ToD	Time of Day
UDP	User Datagram Protocol http://de.wikipedia.org/wiki/User_Datagram_Protocol
UTC	Universal Time Coordinated
VLAN	Virtual Local Area Network
WAN	Wide Area Network
msec	millisecond (10^{-3} seconds)
µsec	microsecond (10^{-6} seconds)
ppm	parts per million (10^{-6})

14.4 Definitions

An explanation of the terms used in this document.

14.4.1 DHCP (Dynamic Host Configuration Protocol)

DHCP makes it possible to integrate a new computer into an existing network with no additional configuration. It is only necessary to set the automatic reference of the IP address on the client. Without DHCP, relatively complex settings need to be made. Beside the IP address, further parameters such as network mask, gateway and DNS server have to be entered. A DHCP server can assign these parameters automatically by DHCP when starting a new computer (DHCP client).

DHCP is an extension of the BOOTP protocol. A valid IP address is allocated automatically if a DHCP server is available on the network and DHCP is enabled.

> **i** See RFC 2131 Dynamic Host Configuration Protocol for further information.

14.4.2 NTP (Network Time Protocol)

Network Time Protocol (NTP) is a standard for the synchronization of clocks in computer systems via packet-based communication networks. Although it is processed mainly over UDP, it can also be transported by other layer 4 protocols such as TCP. It was specially developed to facilitate reliable timing via networks with variable packet runtime.

NTP uses the Marzullo algorithm (devised by Keith Marzullo of the San Diego University in his dissertation) with a UTC timescale and supports leap seconds from Version 4.0. NTP. It is one of the oldest TCP/IP protocols still in use. It was developed by David Mills of the University of Delaware and published in 1985. The protocol and UNIX implementation continue to be developed under his direction. Version 4 is the up to date version of the protocol. This uses UDP Port 123.

NTPv4 can maintain the local time of a system to an accuracy of some 10 milliseconds via the public Internet. Accuracies of 500 microseconds and better are possible under ideal conditions on local networks.

With a sufficiently stable, local clock generator (oven-stabilised quartz, rubidium oscillator, etc.) and using the kernel PLL (see above), the phase error between reference clock generator and local clock can be reduced to something of the order of a few hundred microseconds. NTP automatically compensates for the drift of the local clock.

NTP can be installed over firewalls and offers a range of security functions.

> **i** See RFC 5905 for further information.

14.4.3 SNMP (Simple Network Management Protocol)

Simple Network Management Protocol (SNMP) is a network protocol which was developed by the IETF in order to be able to monitor and control network elements from a central station. This protocol regulates the communication between the monitored devices and the monitoring station. SNMP describes the composition of the data packets which can be transmitted and the communication procedure. SNMP was designed in such a way that every network-compatible device can be integrated into the monitoring. Functions of the network management which can be provided by SNMP include:

- Monitoring of network components
- Remote control and configuration of network components
- Fault detection and notification

Due to its simplicity, SNMP has become the standard which is supported by most management programmes. SNMP Versions 1 and 2c hardly offer any safety mechanisms. The safety mechanisms have been significantly expanded in the current Version 3.

Using description files, so-called MIB's (Management Information Base), the management programmes are able to represent the hierarchical structure of the data of any SNMP agent and to request data from them. In addition to the MIB's defined in the RFC's, every software and hardware manufacturer can define his own so-called private MIB's which reflect the special characteristics of his product.

14.4.4 TCP/IP (Transmission Control Protocol / Internet Protocol)

TCP and IP are generally used concurrently and thus the term TCP/IP has become established as the standard for both protocols.

IP is based on network layer 3 (layer 3) in the OSI Layer Model whereas TCP is based on layer 4, the transport layer. In other words, the expression TCP/IP signifies network communication in which the TCP transport mechanism is used to distribute or deliver data over IP networks. As a simple example: Web browsers use TCP/IP to communicate with web servers.

14.4.5 PTP (Precision Time Protocol)

The Precision Time Protocol (PTP) is a standard for synchronising clocks in computer networks. Unlike NTP it focuses on a higher accuracy and local networks.

In a network with several PTP-devices, every PTP-device executes the Best Master Clock-algorithm, to determine which PTP-device has the highest accuracy. That PTP-device serves as reference clock and is called Grandmaster Clock.

The Grandmaster Clock sends SYNC messages periodically to distribute the actual time to the slaves. The slaves periodically send Delay Request- or Path Delay Request-messages to the Grandmaster Clock. The Grandmaster Clock replies to those messages with a Delay Respond or Path Delay Respond message. The PTP-devices take sending and reception timestamps of those messages and attach those timestamps to the messages. These timestamps allow the slave to calculate the network delay and the exact actual time. For calculating the network delay the slave assumes, that the network delay in both directions is the same.

The PTP-devices use either Ethernet or UDP for their network communication. UDP uses the Ports 319 and 320.

14.5 Accuracy & NTP Basic Principles

⚠ NTP is based on the Internet protocol. Transmission delays and errors as well as the loss of data packets can lead to unpredictable accuracy data and time synchronization effects.

ℹ NTP protocol neither defines nor guarantees the accuracy or correctness of the time server.

Thus the QoS (Quality of Service) used for direct synchronization with GPS or serial interface does not apply to synchronization via NTP.

In simplified terms, accuracies of between 1msec and 1sec can be expected, depending on the accuracies of the servers used.

The accuracy of IP-based time synchronization is depending on the following criteria:

- Characteristics and accuracy of the time server / time signal used

- Characteristics of the sub-network

- Characteristics and quality of the synchronization client

- The algorithm used

NTP has a variety of algorithms to equalise the possible characteristics of IP networks. Algorithms also exist to equalise the offset between reference time source and the local clock.

However, under some circumstances it is not possible to provide an algorithmic solution.

For example:

1. Time servers which do not deliver any correct time cannot be detected at all. The only option available to NTP is to mark these time servers as FALSETICKERS in comparison to other time servers and to disregard them. However, this means that if only 2 time servers are configured, NTP has no way of determining the correctness of the individual times and clearly identifying which time is incorrect.

2. Asymmetries in the transmission between NTP servers and NTP clients can neither be measured nor calculated by NTP. NTP works on the assumption that the transmission path to the NTP server is exactly as long as the return path. The NTP algorithm can only filter out changes on a statistical basis. The use of several servers makes it possible for the combining algorithm to pick up and filter out any such errors. However, there is no possibility of filtering if this asymmetry is present on all or most of the NTP servers (faulty routing etc).

3. It goes without saying that the accuracy of the synchronised time cannot be better than the accuracy resolution of the local clock on the NTP server and NTP client.

With reference to the above mentioned error circumstances, the delivered **time offset** of the NTP should be considered to be at best the most favourable case and in no way to be a value that takes account of all possible errors.

In order to resolve this problem, NTP delivers the maximum possible error in relation to the offset. This value is designated as the synchronization distance ("**LAMBDA**") and is the sum of the **Root Dispersion** and half of the **Root Delay** of all NTP servers used. This value describes the worst possible case and thus the maximum error that can be expected.

Finally, please note that the user of the Time Server is responsible for the network conditions between the Time Server and the NTP clients.

As an example, we mention the case where a network has a delay of 500msec and an accuracy shift (asynchronous) of 50msec occurs. The synchronised clients will therefore NEVER achieve accuracy values of one millisecond or even microseconds!

The accuracy value in the GENERAL tab of the WebGUI is designed to help the user to estimate the accuracy.

15   List of RFCs

- NTPv4 - Protocol and Algorithms Specification (RFC 5905)
- NTPv4 - Autokey Specification (RFC 5906)
- PPS API (RFC 2783)
- DHCP (RFC 2131)
- Time Protocol (RFC 868)
- Daytime Protocol (RFC 867)
- HTTP (RFC 2616)
- HTTPS (RFC 2818)
- SSH-2 (RFC 4250-4256, 4335, 4344, 4345, 4419, 4432, 4716, 5656)
- TELNET (RFC 854)
- SNMPv2c (RFC 1213, RFC1901-1908)
- SNMPv3 (RFC 3410)
- SYSLOG (RFC 5424)
- SMTP (RFC 5321)

16 List of Open Source Packages Used

Third Party Software

The *hopf* Time Server 8030HEPTA/GPS includes a numerous of software packages subject to other license conditions. In case the use of such a software package might violate the licence conditions immediately after written notice it is ensured that the underlying licence conditions are met again.

If the underlying licence conditions relating to a specific software package require availability of the source code the package is provided electronically (email, download etc.) on requested.

The following table includes all used software packages with the applicable underlying software license conditions:

Package name	Version	Licence	Licence details	Patches
boost	1.60.0		http://www.boost.org/LICENSE_1_0.txt	no
busybox	1.24.1	GPL	v2	no
bzip2	1.0.6	BSD		no
can-utils	f0abaaacb0a3f620f73dd6fd716d7daa3c36a8e3	GPL	v2	no
cifs-utils	6.4	GPL	v3	no
dhcpcd	6.10.1	BSD		no
dhcpdump	1.8		Copyright 2001, 2002 by Edwin Groothuis, edwin@mavetju.org All rights reserved. Redistribution and use in source and binary forms, with or without modification, are permitted provided that the following conditions are met: 1. Redistributions of source code must retain the above copyright notice, this list of conditions and the following disclaimer. 2. Redistributions in binary form must reproduce the above copyright notice, this list of conditions and the following disclaimer in the documentation and/or other materials provided with the distribution. THIS SOFTWARE IS PROVIDED BY THE AUTHOR AND CONTRIBUTORS ``AS IS'' AND ANY EXPRESS OR IMPLIED WARRANTIES, INCLUDING, BUT NOT LIMITED TO, THE IMPLIED WARRANTIES OF MERCHANTABILITY AND FITNESS FOR A PARTICULAR PURPOSE ARE DISCLAIMED. IN NO EVENT SHALL THE AUTHOR OR CONTRIBUTORS BE LIABLE FOR ANY DIRECT, INDIRECT, INCIDENTAL, SPECIAL, EXEMPLARY, OR CONSEQUENTIAL DAMAGES (INCLUDING, BUT NOT LIMITED TO, PROCUREMENT OF SUBSTITUTE GOODS OR SERVICES; LOSS OF USE, DATA, OR PROFITS; OR BUSINESS INTERRUPTION) HOWEVER CAUSED AND ON ANY THEORY OF LIABILITY, WHETHER IN CONTRACT, STRICT LIABILITY, OR TORT (INCLUDING NEGLIGENCE OR OTHERWISE) ARISING IN ANY WAY OUT OF THE USE OF THIS SOFTWARE, EVEN IF ADVISED OF THE POSSIBILITY OF SUCH DAMAGE.	no
dosfstools	3.0.28	GPL	v3	no
eeprog	0.7.6	GPL	v2+	no
ethtool	4.2	GPL	v2	no
exfat	1.2.3	GPL	v2+	no
exfat-utils	1.2.3	GPL	v2+	no

freeradius-client	1.1.7	BSD		yes
freetype	2.6.2	GPL	v2	No
gd	2.1.1	BSD		no
genext2fs	**1.4.1**	**-**		**no**
gzip	1.6	GPL	v2	no
host-auto-conf	**2.69**	**GPL**	**v3**	**no**
host-au-tomake	1.15	GPL	v2	no
host-bison	**3.0.4**	**GPL**	**v3**	**no**
host-dos2unix	7.3.1	BSD		no
host-e2fsprogs	1.42.13	GPL	v2	no
host-flex	2.5.37		Flex carries the copyright used for BSD software, slightly modified because it originated at the Lawrence Berkeley (not Livermore!) Laboratory, which operates under a contract with the Department of Energy: Copyright (c) 2001, 2002, 2003, 2004, 2005, 2006, 2007 The Flex Project. Copyright (c) 1990, 1997 The Regents of the University of California. All rights reserved. This code is derived from software contributed to Berkeley by Vern Paxson. The United States Government has rights in this work pursuant to contract no. DE-AC03-76SF00098 between the United States Department of Energy and the University of California. Redistribution and use in source and binary forms, with or without modification, are permitted provided that the following conditions are met: 1. Redistributions of source code must retain the above copyright notice, this list of conditions and the following disclaimer. 2. Redistributions in binary form must reproduce the above copyright notice, this list of conditions and the following disclaimer in the documentation and/or other materials provided with the distribution. Neither the name of the University nor the names of its contributors may be used to endorse or promote products derived from this software without specific prior written permission. THIS SOFTWARE IS PROVIDED ``AS IS'' AND WITHOUT ANY EXPRESS OR IMPLIED WARRANTIES, INCLUDING, WITHOUT LIMITATION, THE IMPLIED WARRANTIES OF MERCHANTABILITY AND FITNESS FOR A PARTICULAR PURPOSE. This basically says "do whatever you please with this software except remove this notice or take advantage of the University's (or the flex authors') name". Note that the "flex.skl" scanner skeleton carries no copyright notice. You are free to do whatever you please with scanners generated using flex; for them, you are not even bound by the above copyright.	no
host-gen-ext2fs	1.4.1	GPL	v2	no
host-gettext	0.19.7	GPL	v3	no
host-kmod	22	LGPL	v2.1	no
host-libffi	3.2.1		libffi - Copyright (c) 1996-2014 Anthony Green, Red Hat, Inc and others. See source files for details.	no

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host-lib-glib2	2.46.2	LGPL	v2	no
host-libtool	2.46	GPL	v2	no
host-libxml2	2.9.3		Copyright (C) 1998-2012 Daniel Veillard All Rights Reserved. Permission is hereby granted, free of charge, to any person obtaining a copy of this software and associated documentation files (the "Software"), to deal in the Software without restriction, including without limitation the rights to use, copy, modify, merge, publish, distribute, sublicense, and/or sell copies of the Software, and to permit persons to whom the Software is furnished to do so, subject to the following conditions: The above copyright notice and this permission notice shall be included in all copies or substantial portions of the Software. THE SOFTWARE IS PROVIDED "AS IS", WITHOUT WARRANTY OF ANY KIND, EXPRESS OR IMPLIED, INCLUDING BUT NOT LIMITED TO THE WARRANTIES OF MERCHANTABILITY, FITNESS FOR A PARTICULAR PURPOSE AND NONINFRINGEMENT. IN NO EVENT SHALL THE AUTHORS OR COPYRIGHT HOLDERS BE LIABLE FOR ANY CLAIM, DAMAGES OR OTHER LIABILITY, WHETHER IN AN ACTION OF CONTRACT, TORT OR OTHERWISE, ARISING FROM, OUT OF OR IN CONNECTION WITH THE SOFTWARE OR THE USE OR OTHER DEALINGS IN THE SOFTWARE.	no
host-lzo	2.09	GPL	v2	no
host-m4	1.4.17	GPL	v3	no
host-mtd	1.5.2	GPL	v2	no
host-ncurses	5.9		Copyright (c) 1998-2010,2011 Free Software Foundation, Inc. Permission is hereby granted, free of charge, to any person obtaining a copy of this software and associated documentation files (the "Software"), to deal in the Software without restriction, including without limitation the rights to use, copy, modify, merge, publish, distribute, distribute with modifications, sublicense, and/or sell copies of the Software, and to permit persons to whom the Software is furnished to do so, subject to the following conditions: The above copyright notice and this permission notice shall be included in all copies or substantial portions of the Software.	no

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host-omap-u-boot-utils	0.2.1	GPL	v2	no
host-pkgconf	0.9.12		Copyright (c) 2011, 2012, 2013, 2014, 2015 pkgconf authors (see AUTHORS). Permission to use, copy, modify, and/or distribute this software for any purpose with or without fee is hereby granted, provided that the above copyright notice and this permission notice appear in all copies. This software is provided 'as is' and without any warranty, express or implied. In no event shall the authors be liable for any damages arising from the use of this software.	no
host-uboot-tools	2016.01	GPL	v2+	no
host-zlib	1.2.8		Copyright (C) 1995-2017 Jean-loup Gailly and Mark Adler This software is provided 'as-is', without any express or implied warranty. In no event will the authors be held liable for any damages arising from the use of this software. Permission is granted to anyone to use this software for any purpose, including commercial applications, and to alter it and redistribute it freely, subject to the following restrictions: 1. The origin of this software must not be misrepresented; you must not claim that you wrote the original software. If you use this software in a product, an acknowledgment in the product documentation would be appreciated but is not required. 2. Altered source versions must be plainly marked as such, and must not be misrepresented as being the original software. 3. This notice may not be removed or altered from any source distribution.	no
hwdata	0.267	GPL	v2	no
i2c-tools	3.1.2	GPL	v2	no
igmpproxy	0.1	GPL	v2	no
ipkg	0.99.163	GPL	v2	no
iproute2	4.4.0	GPL	v2	no
iptables	1.6.0	GPL		no
iputils	2.4.10	GPL	v2	no
latencytop	0.5	GPL	v2	no
libarchive	3.1.2	BSD		no
libevent	2.0.22	3-clause BSD	http://libevent.org/LICENSE.txt	no
libffi	3.2.1	MIT License		no
libfuse	2.9.5	GPL		no
libglib2	2.46.2	LGPL	v2+	no
libnl	3.2.27	GPL		no
linux	4.1.13-g8dc6617	GPL	v2	yes
linuxptp	2.0	GPL	v2	yes

libpcap	1.7.4	2-clause BSD		no
libpng	1.6.21		http://www.libpng.org/pub/png/src/libpng-LICENSE.txt	no
libselinux	2.1.13			
libsepol	2.1.9	LGPL	v2.1	
libserial	0.6.0rc2	GPL	v3	no
libserial-port	0.1.1	GPL	v3	no
libsock-etcan	0.0.10	LGPL	v2.1	no
libsysfs	2.1.0	LGPL	v2.1	no
libusb	1.0.19	LGPL	v2	no
libxml2	2.9.3	MIT License		no
libzip	0.11.2	BSD		no
lighttpd	1.4.39	3-clause BSD		no
lm-sensors	3.4.0	LGPL	v2.1	no
lshw	B.02.17	GPL	v2	no
lua	5.3.2	MIT License		no
lzo	2.09	GPL	v2	no
lzop	1.03	GPL	v2	no
memstat	1.0	MIT License		no
mii-diag	2.11	GPL		no
minicom	2.7	GPL	v2	no
mmc-utils		GPL	v2	no
mtd	1.5.2	GPL	v2	no
nano	2.5.1	GPL		no
nanocom	1.0	GPL		no
ncftp	3.2.5		http://www.ncftp.com/ncftp/doc/LICENSE.txt	no
ncurses	5.9	Permissive free software licence	Copyright (c) 1998-2004,2006 Free Software Foundation, Inc. Permission is hereby granted, free of charge, to any person obtaining a copy of this software and associated documentation files (the "Software"), to deal in the Software without restriction, including without limitation the rights to use, copy, modify, merge, publish, distribute, distribute with modifications, sublicense, and/or sell copies of the Software, and to permit persons to whom the Software is furnished to do so, subject to the following conditions: The above copyright notice and this permission notice shall be included in all copies or substantial portions of the Software. THE SOFTWARE IS PROVIDED "AS IS", WITHOUT WARRANTY OF ANY KIND, EXPRESS OR IMPLIED, INCLUDING BUT NOT LIMITED TO THE WARRANTIES OF MERCHANTABILITY, FITNESS FOR A PARTICULAR PURPOSE AND NONINFRINGEMENT. IN NO EVENT SHALL THE ABOVE COPYRIGHT HOLDERS BE LIABLE FOR ANY CLAIM, DAMAGES OR OTHER LIABILITY, WHETHER IN AN ACTION OF CONTRACT, TORT OR OTHERWISE, ARISING FROM, OUT OF OR IN CONNECTION WITH THE SOFTWARE OR THE USE OR OTHER DEALINGS IN THE SOFTWARE. Except as contained in this notice, the name(s) of the above copyright holders shall not be used in advertising or otherwise to promote the sale, use or other dealings in this Software without prior written authorization.	no
netsnmp	5.7.3	BSD (mehrere)	http://net-snmp.sourceforge.net/about/license.html	no
netstat-nat	1.4.10	GPL		no
ntp	4.2.8p11	NTP	Copyright (c) University of Delaware 1992-2011 Permission to use, copy, modify, and distribute this software and its documentation for any purpose with or with-	yes (6)

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openssh	7.1p2	BSD		no
openssl	1.0.2g	Dual	http://www.openssl.org/source/license.html	no
opkg	0.3.1	GPL	v2	no
pcre	8.38	BSD		no
popt	1.16	GNU Free Documentation License	V1.3	no
pps-tools	0deb9c7e135e9380a6d09e9d2e938a146bb698c8	GPL	v2	no
prp	1.4	Permissive free software licence	Copyright (c) 2007, Institute of Embedded Systems at Zurich University of Applied Sciences (http://ines.zhaw.ch) Redistribution and use in source and binary forms, with or without modification, are permitted provided that the following conditions are met: - Redistributions of source code must retain the above copyright notice, this list of conditions and the following disclaimer. - Redistributions in binary form must reproduce the above copyright notice, this list of conditions and the following disclaimer in the documentation and/or other materials provided with the distribution. - Neither the name of the Zurich University of Applied Sciences nor the names of its contributors may be used to endorse or promote products derived from this software without specific prior written permission.	yes
rsync	3.1.2	GPL		no
setools	3.3.8	GPLv2, LGPLv2.1		no
setserial	2.17	GPL		no
spi-dev_test	V3.0	GPL	v2	no
sqlite	3100200	Public domain		no
sshpass	1.05	GPL		no
start-stop-daemon	1.18.4	GPL	v2	no
statserial	1.1	GPL		no
sudo	1.8.15	ISC-style	http://www.sudo.ws/sudo/license.html	no
sysstat	11.2.0	GPL	v2	no
ti-tools	06dbdb2727354b5f3ad7c723897f40051fddee49		Copyright(c) 1998 - 2010 Texas Instruments. All rights reserved. All rights reserved. Base on code from Copyright (c) 2007, 2008, Johannes Berg johannes@sipsolutions.net Copyright (c) 2007, Andy Lutomirski Copyright (c) 2007, Mike Kershaw Copyright (c) 2008-2009, Luis R. Rodriguez mcgrof@gmail.com	no

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uboot	2010.06	GPL	v2	no
uboot-tools	2016.01	GPL	v2	no
usb_mode switch	2.2.6	GPL	v2	no
usb_mode switch_data	20151101	GPL	v2	no
util-linux	2.27.1	GPL	v2	no
zlib	1.2.8	Permissive free software licence	http://www.gzip.org/zlib/zlib_license.html	no