Industriefunkuhren

hopf

Elektronik GmbH

Technical Manual

Network Time Client with 2 LAN Interfaces

Model 7279(RC)

ENGLISH

Version: 04.00 - 20.03.2018

	SET	IMAGE (8030)	FIRMWARE (8030)
Valid for	Version: **04.xx**	Version: **04.xx**	Version: **02.xx**

Version Numbers (Firmware / Description)

The term **SET** defines the fixed connection between the image version and the related H8 firmware version.

The first two Digits of the technical description version number, the **SET** version and the image version **Must Be The Same**! They describe the shared functional identity between device, software and technical description.

The version number of the image and the H8 Software can be found in the WebGUI of this device (see ***chapter 5.3.7.1 Device Information and chapter 5.3.7.2 Hardware Information)***.

The two version number's digits after the dot describe corrections regarding the firmware and/or description which have no effect on functionality.

Downloading Technical Manuals

All current manuals of our products are available free of charge via our homepage on the Internet.

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.
ℹ	**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 comply with these regulations.

If not complied with, then no claims may be made under the terms of the warranty. No liability will be assumed for any consequential damages.

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.

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1 Description of the Board

The Board 7279(RC) is a **Network Time Client** (*abbreviation* NTC) for the integration into the modular ***hopf*** Clock Systems 7001RC, 7001, 6844, 6844RC and 6855.

The board is equipped with two Ethernet interfaces (ETH0/ETH1) 10/100/1000 Base-T (auto-sensing).

The Board 7279(RC) is synchronized with the **UTC time** by the worldwide used time **NTP (Network Time Protocol)** via one or more NTP Time Servers. The board can either be synchronized by a **NTP Timer Server** but also by a **SNTP Time Server,** if needed. However, this usually results in a considerably limited accuracy of the time information.

For high-precision network synchronization, the Board 7279(RC) can synchronize with the **PTP time protocol according to IEEE Std 1588 ™ -2008**. For this, however, the corresponding network topology must be guaranteed.

The time basis of the board synchronized via network is converted into a format that allows the synchronization of further ***hopf*** devices and components.

The **status** of the board is indicated via three LEDs in the front panel. This allows an easy identification of the current operation status or any fault.

The Board 7279(RC) offers a **broad range of functions**. Some of the practice-oriented functionalities are for example:

- **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 Board 7279(RC).

- **Automatic handling of the leap second**
  Should a leap second in the UTC time be announced by the Time Server, this is recognized by the Board 7279(RC) and the leap second will automatically be inserted into the time information.

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

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

A few other basic functions of the Board 7279(RC):

- Easy operation via **WebGUI**
- **Status LEDs** on the front panel
- Completely **maintenance-free** system

Software supplied:

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

Overview of the functions of the Board 7279(RC):

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
- Precision Time Protocol (PTP) according to IEEE Std 1588™-2008 **(Activation Key necessary)**
    - IEEE standard profile for using 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 WebGUI (browser-based)
- Telnet
- SSH
- External LAN configuration tool (***hmc*** **- Network-Configuration-Assistant**)

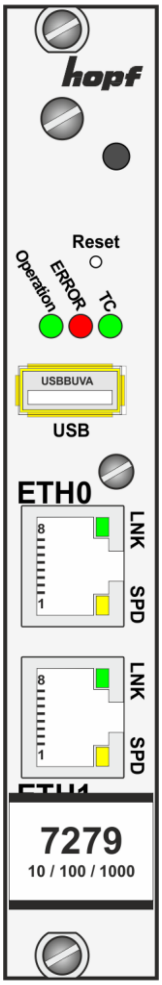
Additional Features

- Firmware Update via TCP/IP
- Failsafe
- Watchdog circuit
- Customizable security banner
- NTP local time support

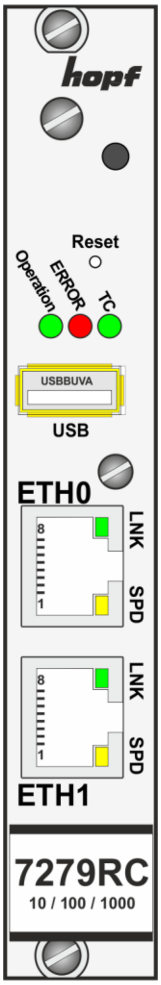
1.1 Front Panel

1.1.1 Board 7279 and 7279RC for 3U / 19" Racks

Board 7279 - 3U/4HP

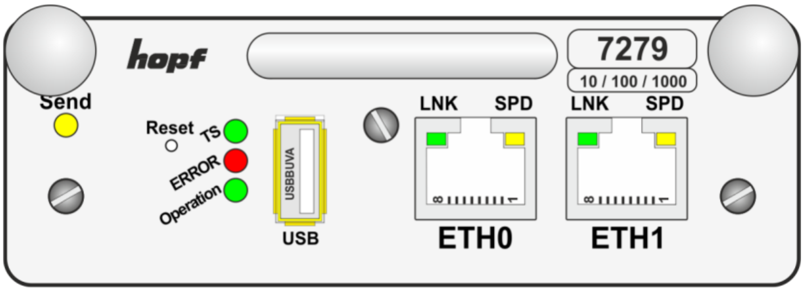


Board 7279RC - 3U/4HP



1.1.2 Front Panel of Board 7279 for 1U / 19" Racks (Slim Line)

Board 7274/1U - 1U (Slim Line)



1.2 Installation and Removal of the Board 7279(RC)

The board is supplied with power via an internal plug-in connection that also provides the output of the time information based on NTP and the system reset if any.

For service and repair purposes the module can be removed from the device.

Board 7279 (without RC) does not support HOT-PLUG

In case an installation or removal of the board should be necessary the device in which the module is integrated must be disconnected from power.

1.3 Functional Overview of the Front Panel Elements

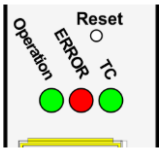
This chapter describes the individual front panel elements and their functions.

1.3.1 Reset Button

Reset
Operation
ERROR
TC

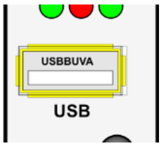
The Reset Button is accessible with a thin object through the small drilling in the front panel next to the "Reset" inscription" (see ***Chapter 3.3 Reset Button***).

1.3.2 Status LEDs (TC / ERROR /Operation)



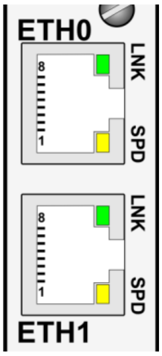
TC-LED (Green)	**Time service of the Board 7279(RC)**
On	**Standard**, running
Off	Not or partially not running
ERROR-LED (Red)	**Description**
Off	**Standard case**, Board 7279(RC) is working.
3Hz flashing	Fail-safe basic parameterization is not available (emergency operation mode)
On	Primary CPU of Board 7279(RC) does not show any activity.
Operation-LED (Green)	**Description**
On	**Standard case**, Board 7279(RC) is working
1Hz flashing	Board 7279(RC) is booting the operating system.
3Hz flashing	A firmware update (image) of Board 7279(RC) is being implemented.
Off	Board 7279(RC) is not ready for operation.

1.3.3 USB-Port (Host)



In case of specific problems the USB connection can be used for a system recovery after consulting the ***hopf*** Support.

1.3.4 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 (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-

1.3.4.1 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 the WebGUI of the appropriate board or can be evaluated via the ***hmc*** **Network Configuration Assistant.**

The MAC address for ETH1 is set hexadecimally plus 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*** Elektronik GmbH.

> ℹ The factory set MAC address for the Board 7279(RC) is stated on a sticker directly placed on the board.

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

2 Function Principle

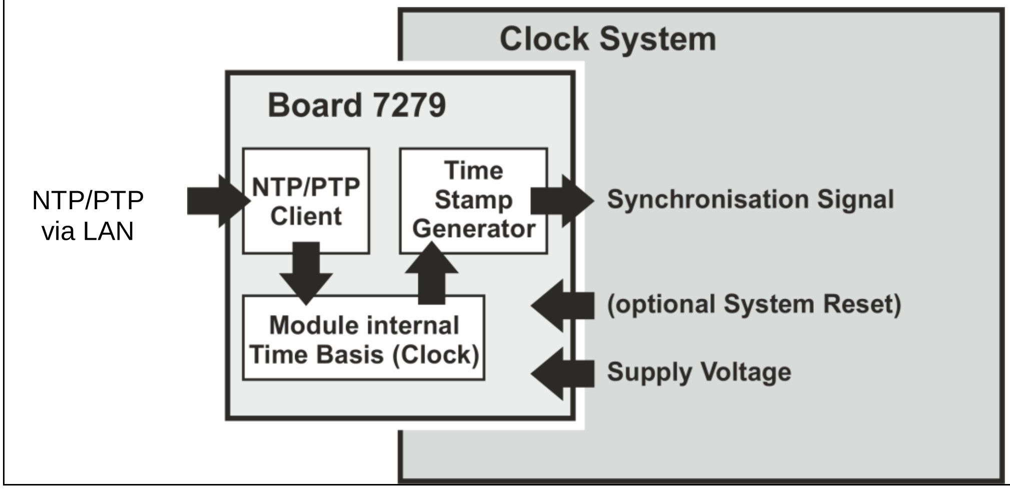
This chapter describes the functional principle of the Board 7279(RC) and the internal relations between the individual function groups.

The Board 7279(RC) is a multi-processor system.

The structure allows the following mode of operation:

The NTP/PTP service on the board is synchronized by a NTP/PTP Server via the network. With this time information the internal time basis of the board is synchronized with high precision. The time is then transformed into outputs with time information allowing further processing in the respective clock system.

Function Principle Board 7279(RC)



3 Board Behaviour

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

3.1 Boot Phase

The boot process of the Board 7279(RC) starts after switching on the system or a reset.

During the boot process the Board 7279(RC) boots its operation system and is therefore not available via LAN.

The end of the boot process is reached when 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).

3.2 Regulating Phase

After the boot phase, the NTP or PTP service is started automatically depending on the configuration of the board.

After starting the NTP/PTP service, the board will take about 5-10 minutes, depending on the accuracy and availability of the time servers configured in the card, to regulate the internal clock.

3.2.1 NTP Adjustment Phase (NTP/Stratum/Accuracy)

NTP is a regulation process. When the NTP service is activated, it automatically starts in the boot phase. After starting, the board will take about 5-10 minutes, depending on the accuracy and accessibility of the configured NTP server in the board.

After a successful adoption of time by the NTP Server the module usually takes on a Stratum value one plus than the respective NTP Server (e.g. Server = Stratum 1 ⇨ Stratum of the Board 7279(RC) = 2).

For an output of time via the module the NTP service needs to be regulated to an accuracy value = HIGH. The duration of the regulation process depends on factors such as accessibility and accuracy of the respective NTP Server (System Peer).

3.2.2 PTP Adjustment Phase

When the PTP service is activated it automatically starts in the boot phase. After starting the board will take about 5-10 minutes, depending on the accuracy and accessibility of the PTP-Grandmasters.

For an output of time via the board the PTP service needs to be regulated to an accuracy value = HIGH. The duration of the regulation process depends on factors such as accessibility and accuracy of the respective PTP Grandmaster.

3.3 Reset Button

The Board 7279(RC) 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.

After a FACTORY DEFAULT, the settings of Board 7279 (RC) must be checked (see ***chapter 5.3.7.3 Restoring Factory-Settings (Factory Defaults)***.)

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

Duration	Function
< 1 sec.	No action
1 - 9 sec.	After releasing a **hardware reset** on the board will be initiated
>= 10 sec.	After releasing a **FACTORY DEFAULT** followed by a **REBOOT** will be initiated after approx. 10 seconds

3.4 Firmware Update

The Board 7279(RC) is a multi-processor system. For this reason a firmware update always consists of a so called Software SET. This software set includes two (2) program releases, defined by the SET version.

Board 7279(RC):

1x Image Update	upgrade_8030gen_rel_vXXXX.img
1x H8 Update	H8_8030NTC_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 may not be interrupted.

All programs of a SET need to be uploaded to ensure a defined operating status.

The information about program releases assigned to a SET version can be found in the release notes of the software SETs of the Board 7279(RC).

The general process of a software update of Board 7279(RC) is described below:

For selection of the correct update set please ensure the correct identification code **7279(RC)**.

7279(RC) can be found:

- on the label on the housing cover "**7279(RC)**"
- in WebGUI at the web-banner "**7279(RC)**"

The firmware update 7279(RC) has to be carried out as a SET.

The software package contained in the file package hopf7279 _GPS_SET_vXXXX.zip has to be unpacked. The following steps have to be executed in the following sequence:

1. **Image Update**
2. **H8 Firmware Update**

Image Update

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 (Example: **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 board 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

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 extension **.mot** via the selection window (Example: **H8_7279_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 board 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.

3.5 Activation of Functions by Activation Keys

Currently the Board 7279(RC) offers some functions that require an "Activation Key".

These functions are only available after entering a valid activation key related to the serial number of the Board 7279(RC) (not the serial number of the overall system). The serial number can be found in the WebGUI via Device / Serial Number: 8030xxxxxx.

The activation of such function(s) can be done by default and also later on-site by the user if required.

Activation keys can be entered and displayed in the tab "Device" under the menu item "Product Activation".

Please find an overview of the above mentioned functions here:

- **IEEE 1588 Precision Time Protocol (PTP)**
  By activating this function, the PTP time datagram can be parameterized and enabled via the LAN interface for synchronization.

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

- **IEEE 802.1QTagged 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 Tables**
  This function is suitable for configuring static routes based on special network configuration requirements in the Board 7279(RC).

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

- **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.

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

4 Commissioning

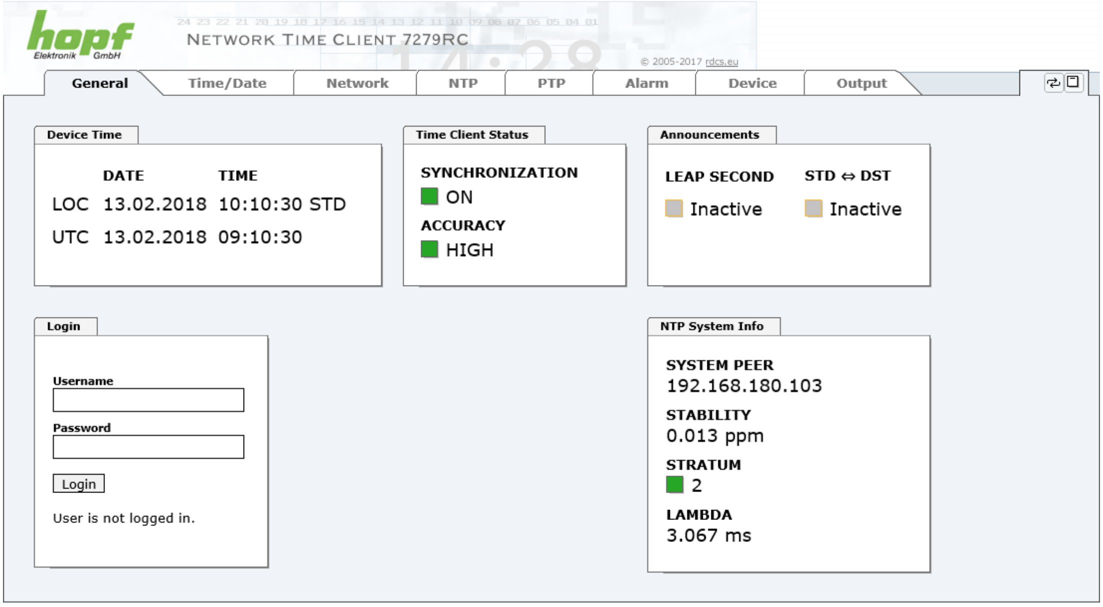
This chapter describes commissioning of the Board 7279(RC).

4.1 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 3.1 Boot Phase***)
- Use the SEARCH function of the ***hmc*** Software (Network Configuration Assistant) in order to access the Board 7279(RC) and set the basis LAN parameters (e.g. DHCP). Afterwards connect to the WebGUI of the Board 7279(RC) via Web browser

  OR
  connect directly with the factory default IP-address (ETH0 = 192.168.0.1 or ETH1 = DHCP) to the WebGUI via a 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 (e.g. entry of the NTP Time Server used for synchronization)
- Parameterize optional functions e.g. SNMP if necessary
- If all base settings are carried out correctly and the NTP Time Server supplies the time information with the appropriate accuracy, the **GENERAL** tab should look like this after approx. 30 min. (usually considerably faster):



Device Time

	DATE	TIME
LOC	13.02.2018	10:10:30 STD
UTC	13.02.2018	09:10:30

Time Client Status

SYNCHRONIZATION
🟩 ON
ACCURACY
🟩 HIGH

Announcements

LEAP SECOND	STD ⇔ DST
▨ Inactive	▨ Inactive

Login

Username
Password
Login
User is not logged in.

NTP System Info

SYSTEM PEER
192.168.180.103
STABILITY
0.013 ppm
STRATUM
🟩 2
LAMBDA
3.067 ms

4.2 Switching on the Operating Voltage

The Board 7279(RC) has no own switch for the power supply. The board is activated by switching on the device in which it is integrated.

4.3 Establish the Network Connection via Web Browser

Ensure that the network parameters of the Board 7279(RC) are configured in accordance with the local network before connecting the device to the network.

Connecting a network to an incorrectly configured Board 7279(RC) (e.g. duplicate IP address) may cause interference on the network.

The Board 7279(RC) is supplied with:

ETH0 with static IP-address

IP-address:	192.168.0.1
Network mask:	255.255.255.0
Gateway:	not set

ETH1 with DHCP

In case you do not know if Board 7279(RC) with its Factory Default setting causes problems in the network, the basis network parameterization should be executed via a "Peer to Peer" network connection.

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

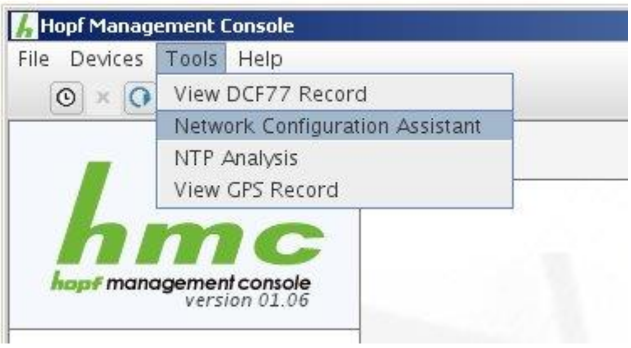
The network connection is made via a LAN cable and RJ45 plug (recommended cable type: CAT5 or better).

4.4 Network Configuration for ETH0 via LAN through ***hmc***

After connecting the system to the power supply and creating the physical network connection with the LAN interface of Board 7279(RC), the device can be searched on the network via the ***hmc*** (***hopf*** **Management Console**). Consequently the basic LAN parameters (IP address, netmask and gateway or DHCP) may be adjusted in order to allow accessibility of the Board 7279(RC) for other systems on the network.

For locating and identifying Board 7279(RC) via the SEARCH Function of the ***hmc*** - **Network Configuration Assistant** **it is required** that both the ***hmc***-computer and Board 7279(RC) are **in the same SUB Net**.

The basic LAN parameters can be set via the ***hmc*** integrated **Network Configuration Assistant**.

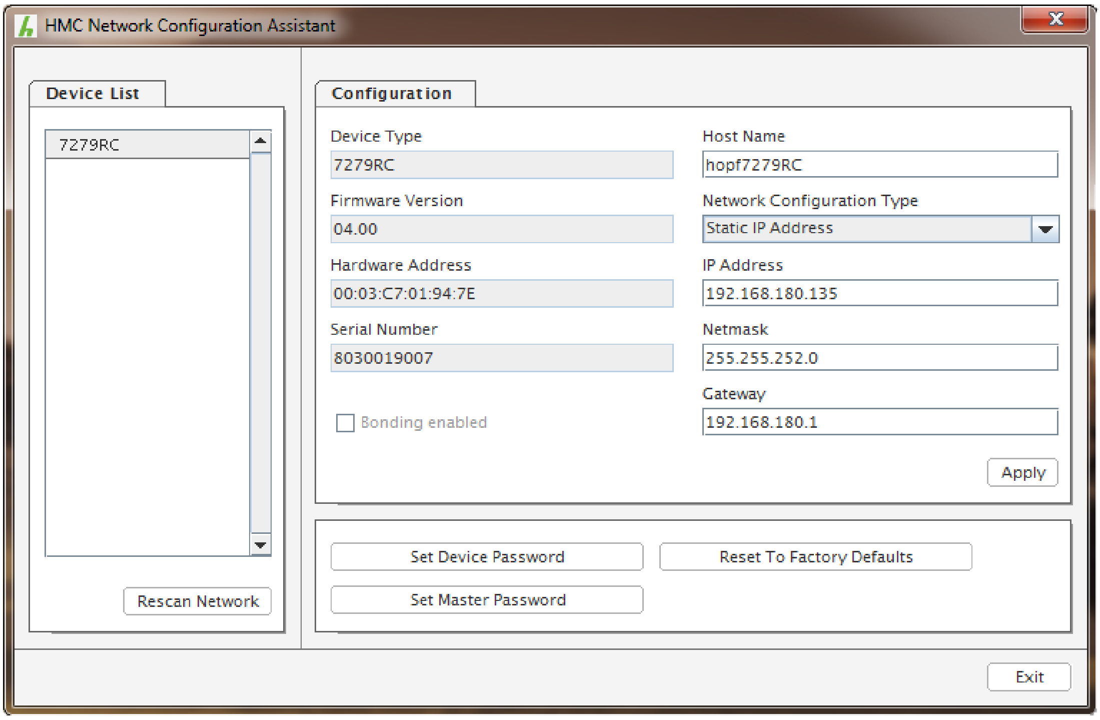


After a successful start of the ***hmc*** **Network Configuration Assistant** and completed search of the ***hopf*** LAN devices, the configuration of the basic LAN parameters can be done.

The Board 7279(RC) is stated as **7279(RC)** in the Device List.

Several Boards 7279(RC) (or other product variants) can be distinguished by their **Hardware Address** (MAC Address).

> The factory set MAC address for the Board 7279(RC) is stated on a sticker laterally positioned on the device.



Device Type: 7279RC
Firmware Version: 04.00
Hardware Address: 00:03:C7:01:94:7E
Serial Number: 8030019007
□ Bonding enabled
Host Name: hopf7279RC
Network Configuration Type: Static IP Address
IP Address: 192.168.180.135
Netmask: 255.255.252.0
Gateway: 192.168.180.1

For extended configuration of Board 7279(RC) through a browser via WebGUI the following basic LAN-parameters are required:

- **Host Name** ⇨ e.g. hopf7279
- **Network Configuration Type** ⇨ e.g. Static IP Address or DHCP
- **IP Address** ⇨ e.g. 192.168.0.4
- **Netmask** ⇨ e.g. 255.255.255.0
- **Gateway** ⇨ e.g. 0.0.0.0

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

- The hostname may only contain the characters 'A'-'Z', '0'-'9', '-' and '.' . No distinction is made between capital letters 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.

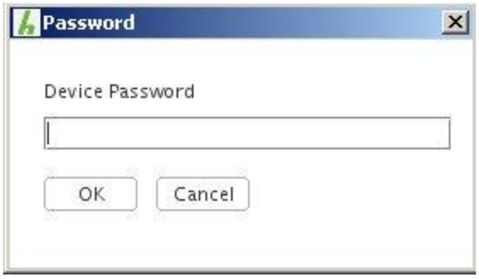
Class E Networks

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.

After entering the above mentioned LAN parameters, they need to be transferred to the Board 7279(RC) via the **Apply** button. Afterwards the entry of the **Device Password** is requested:



The Board 7279(RC) 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 Board 7279(RC) and are immediately active.

5 HTTP WebGUI – Web Browser Configuration Interface

For correct displaying and the correct function of the WebGUI, JavaScript and Cookies must be activated in the browser.

5.1 Quick Configuration

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

5.1.1 Requirements

- Board 7279(RC) must be ready for operation
- PC with installed web browser (e.g. Internet Explorer) in the sub-network of Board 7279(RC)

5.1.2 Configuration Steps

- Create the connection to the Time Client with a web browser
- Login as a **'master'** user (default password <**master**> is set by delivery)
- Switch to "Network" tab if available and 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 Client via "Reboot Device"
- NTP Service is now available with the standard settings
- NTP specified settings can be done in the "NTP" tab (e.g. entry of the NTP Time Server used for synchronization).
- Alarm messages via Syslog/SNMP/Email can be configured in "Alarm" tab – only if this function is enabled by an activation key

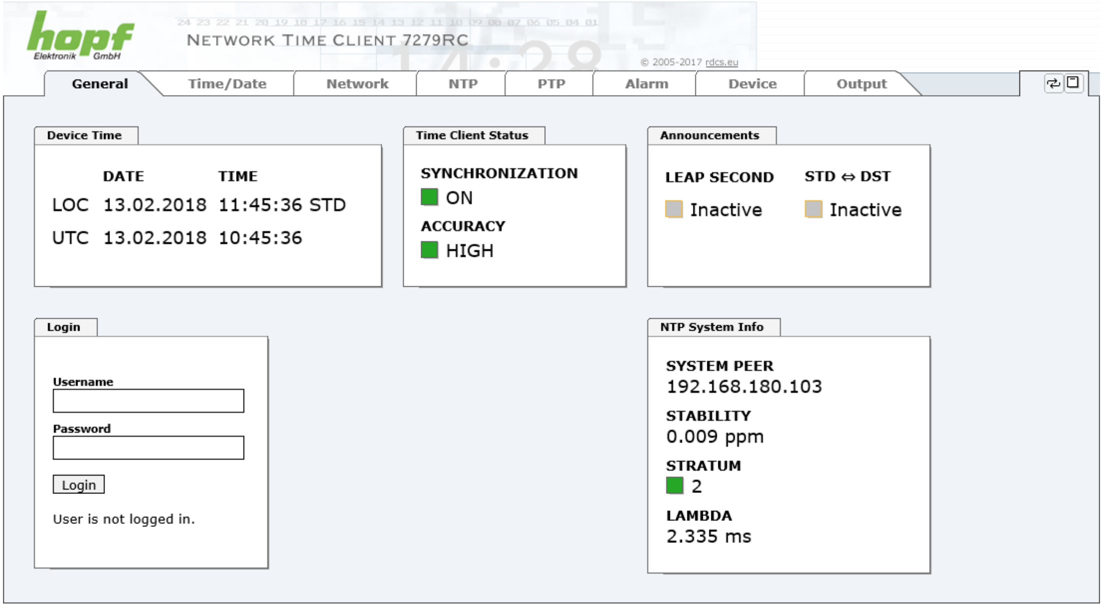
The following detailed explanatory information should be read if anything is unclear while executing the configuration steps.

5.2 General – Introduction

The Board 7279(RC) should be accessible to a web browser if it has been set up correctly. Enter the IP address - as set up in the Board 7279(RC) earlier - or the DNS name on the address line <http://xxx.xxx.xxx.xxx> and the following screen should appear.

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

The complete configuration can only be completed via the board's WebGUI!



Device Time

	DATE	TIME
LOC	13.02.2018	11:45:36 STD
UTC	13.02.2018	10:45:36

Time Client Status

SYNCHRONIZATION
🟩 ON
ACCURACY
🟩 HIGH

Announcements

LEAP SECOND	STD ⇔ DST
▨ Inactive	▨ Inactive

Login

Username

Password

Login

User is not logged in.

NTP System Info

SYSTEM PEER
192.168.180.103
STABILITY
0.009 ppm
STRATUM
🟩 2
LAMBDA
2.335 ms

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.

5.2.1 LOGIN and LOGOUT as User

All of the board's 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:

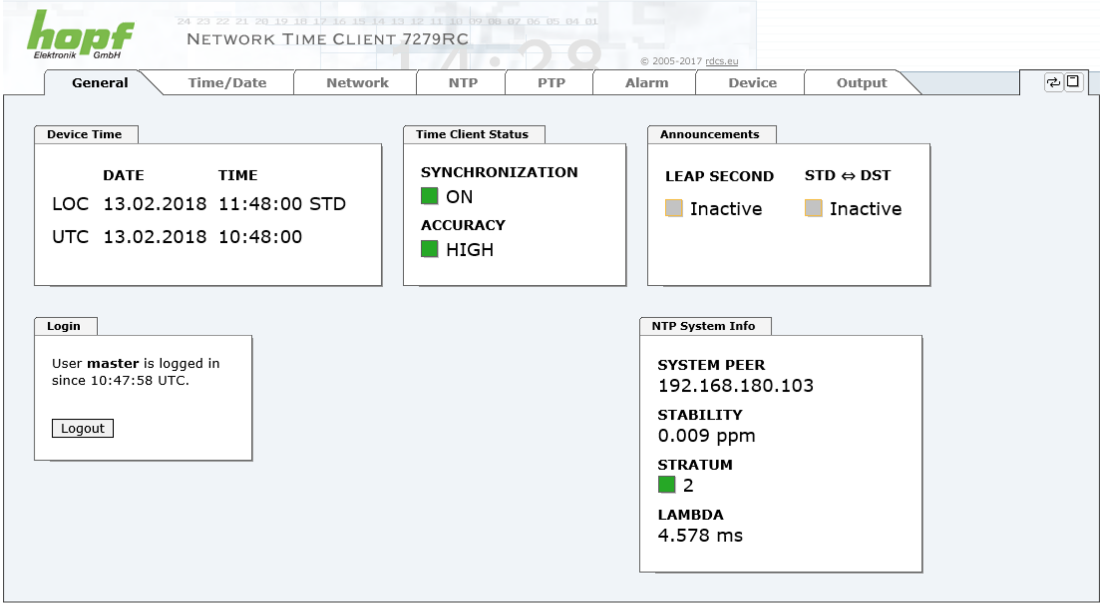
- "**master**" user (default password on delivery: <**master**>)
- "**device**" user (default password on delivery: <**device**>)

Due to security reasons the password should be changed after the first login.

The password must be between 6 and 20 characters long, contain at least one uppercase letter, one lowercase letter and one digit!

Differentiation is made between **capital letters and lower-case** characters in the password. Alphanumeric characters and the following symbols can be used: **[ ] ( ) * - _ ! $ % & / = ?**

The following screen should be visible after logging in as a "master" user:



Device Time

	DATE	TIME
LOC	13.02.2018	11:48:00 STD
UTC	13.02.2018	10:48:00

Time Client Status

SYNCHRONIZATION
🟩 ON
ACCURACY
🟩 HIGH

Announcements

LEAP SECOND
□ Inactive
STD ⇔ DST
□ Inactive

Login

User **master** is logged in since 10:47:58 UTC.

Logout

NTP System Info

SYSTEM PEER
192.168.180.103
STABILITY
0.009 ppm
STRATUM
🟩 2
LAMBDA
4.578 ms

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.

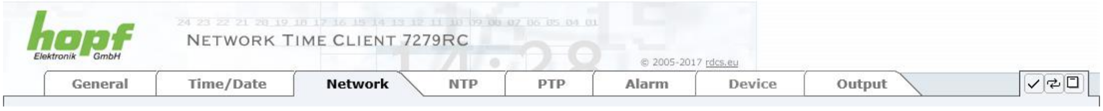
Users logged in as **"master"** have all access rights to the Board 7279(RC).

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

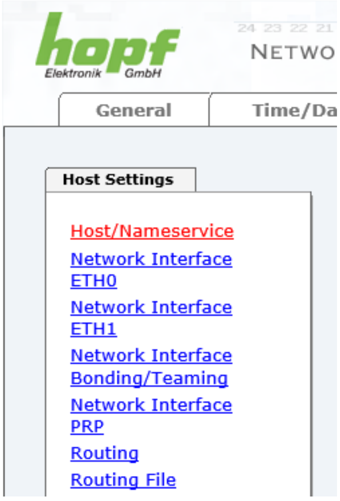
5.2.2 Navigation via the Web Interface

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.



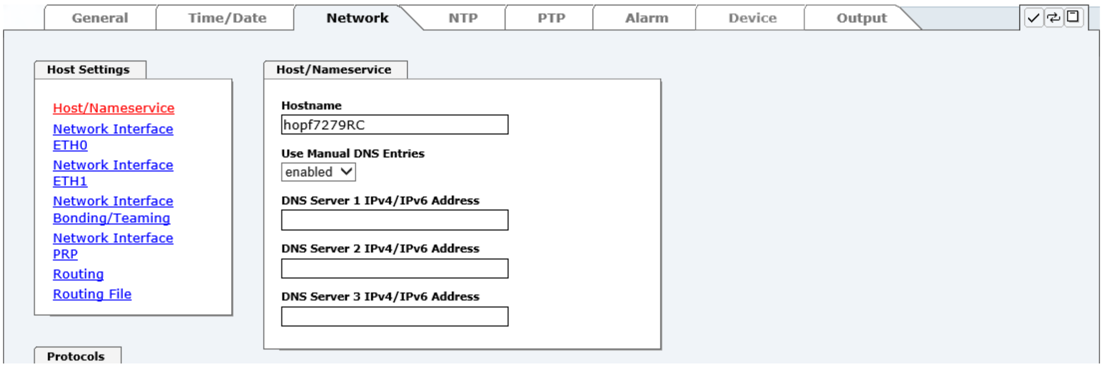
All the links within the tabs on the left hand side lead to corresponding detailed display or setting options.

5.2.3 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.

All changeable data is saved in Board 7279(RC). For these data transfer of values is divided into two steps.

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



Host/Nameservice

Hostname: hopf7279RC

Use Manual DNS Entries: enabled

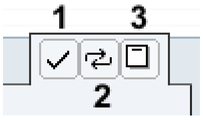
DNS Server 1 IPv4/IPv6 Address:

DNS Server 2 IPv4/IPv6 Address:

DNS Server 3 IPv4/IPv6 Address:

After an entry made with **Apply**, 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 permanently with **Save**.

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

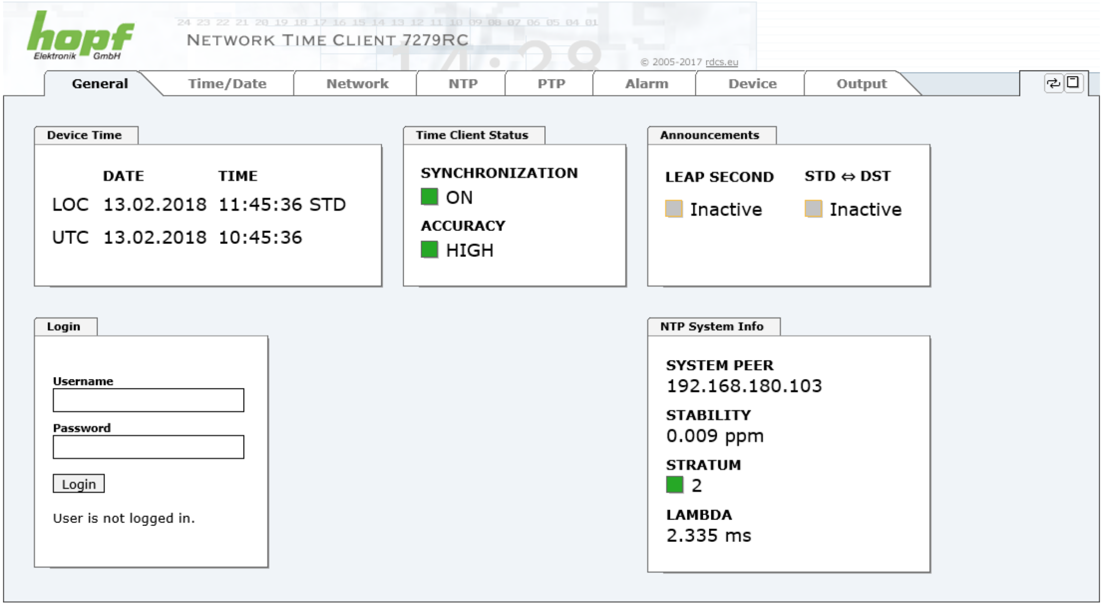
5.3 Description of the Tabs

The WebGUI is divided into the following tabs:

- General
- Time/Date
- Network
- NTP
- PTP
- Alarm
- Device

5.3.1 GENERAL Tab

This is the first tab which is displayed when using the web interface. This shows the current time and the synchronization status of Board 7279(RC). Furthermore logging in via this tab is possible (enter username and password), which is necessary to configure the Board 7279(RC) via WebGUI.



Device Time

	DATE	TIME
LOC	13.02.2018	11:45:36 STD
UTC	13.02.2018	10:45:36

Time Client Status

SYNCHRONIZATION
🟩 ON
ACCURACY
🟩 HIGH

Announcements

LEAP SECOND	STD ⇔ DST
⬜ Inactive	⬜ Inactive

Login

Username
Password
Login
User is not logged in.

NTP System Info

SYSTEM PEER
192.168.180.103
STABILITY
0.009 ppm
STRATUM
🟩 2
LAMBDA
2.335 ms

Login

The **Login** box is used in accordance with ***Chapter 5.2.1 LOGIN and LOGOUT as User***

Device Time

This sector displays the current time and date of Board 7279(RC), used for the output of time information. This time corresponds with the UTC time (UTC) received by NTP and the resulting local time (LOC). The local time is created by the parameters configured under the tab Time/Date (see ***Chapter 5.3.2 Time/Date Tab***). In addition to the local time the daylight saving time (DST) / and standard time (STD) is indicated.

Time Client Status

SYNCHRONIZATION

Indicates the synchronization status of the internal time output. This value describes whether connected components/devices can use the time information of Board 7279(RC) for their own synchronization.

ON: The time information put out by board 7279(RC) can be used by connected components/devices for their own synchronization.

OFF: The time information put out by board 7279(RC) **cannot** be used by connected components/devices for their own synchronization.

ACCURACY

The indication **ACCURACY** (accuracy of NTP/PTP) can include the possible values LOW - MEDIUM - HIGH. The meaning of those values is explained in ***Chapter 9.5 Accuracy & NTP/PTP Basic*** Principles.

> ℹ By default, the accuracy must be at least HIGH so that the module supplies time information for synchronization.
> This value can be set by the user if required.

Announcements

LEAP SECOND

announcement for inserting a leap second

Inactive: No announcement exists

Active: There is an announcement. A leap second is inserted on the next hour.

STD ⇔ DST

Announcement for adjustment for daylight saving time / standard time

Inactive: No announcement exists

Active: There is an announcement. An adjustment for daylight saving time / standard time is made with the upcoming hour change.

NTP System Info (with activated NTP)

SYSTEM PEER

Indicates the currently used NTP Time Server for the synchronisation.

STABILITY

Indicates the current NTP stability value of Board 7279(RC) in ppm.

STRATUM

Indicates the current NTP stratum value of Board 7279(RC) in the value range of 1-16.

> ℹ By default, the stratum value of the Board 7279(RC) is always one lower than the stratum of the SYSTEM PEER.
> The Board 7279(RC) can only be synchronized on a SYSTEM PEER that it is at least **STRATUM 14 or better.**

LAMBDA

Indicates the current calculated NTP-LAMBDA value of Board 7279(RC) in milliseconds.

PTP System Info (with activated PTP)

PTP Grandmaster Identity
Displays the PTP Grandmaster currently used for synchronization.

PTP State
Indicates the synchronization state of the PTP service.

Master Offset
Displays the offset detected by board 7279(RC) to the PTP Grandmaster.

5.3.2 Time/Date Tab

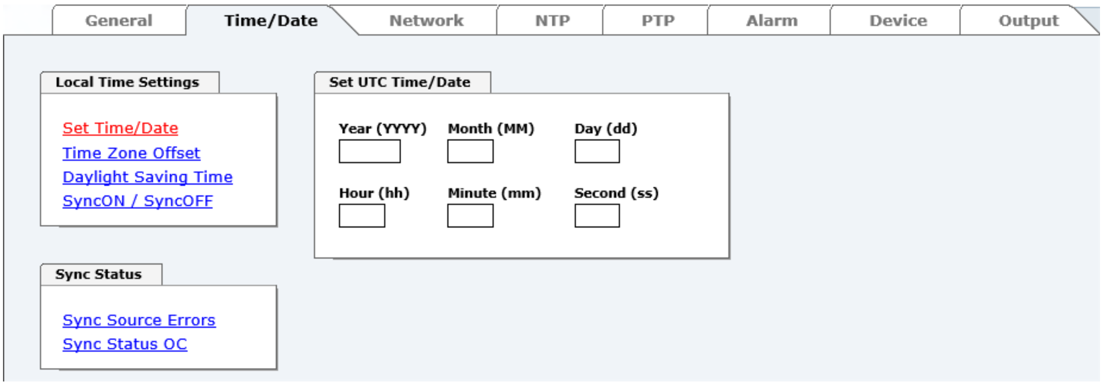
Board 7279 (RC) basically works with the time base UTC. The configuration of difference time (**Time Zone Offset to UTC**) is required for calculating the local standard time (winter time).

5.3.2.1 Set Time/Date

Set the UTC time with date. Setting time and date with this function is not required if Board 7279 (RC) is already connected to a Network Time Server (NTP or PTP). This function can be used if no Network Time Server is available when commissioning the board 7279 (RC).

After input, these values are checked directly for plausibility by pressing the **Apply** button. Then time and date are set.

> The UTC time must always be set. The local time is internally calculated from the difference time (Time Zone Offset) and the data of the summer / winter time changeover.



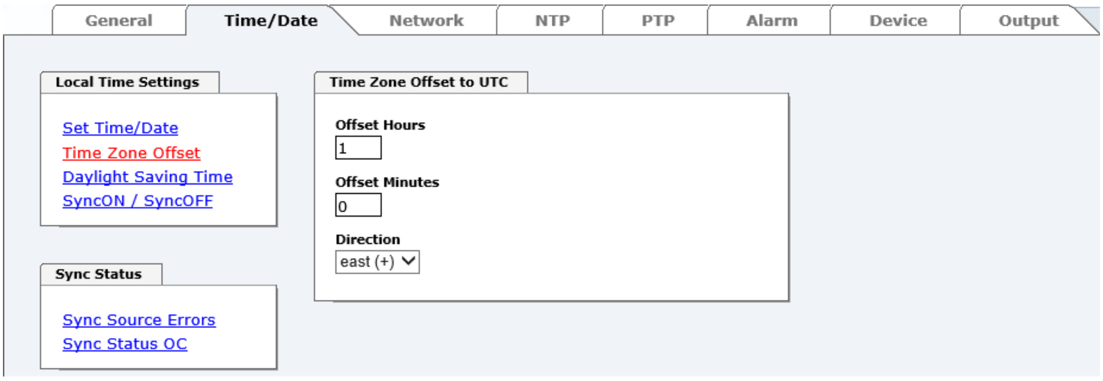
Year	Enter the current UTC year (2000-2099)
Month	Enter the current UTC month (01-12)
Day	Enter the current UTC day (01-31)
Hour	Enter the current UTC hour (00-23)
Minute	Enter the current UTC minute (00-59)
Second	Enter the current UTC second (00-59)

> The input must be complete and in the specified format.

5.3.2.2 Time Zone Offset

Setting of the difference time (Time Zone Offset) from UTC to the local standard time (winter time).

> 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: 1
Offset Minutes: 0
Direction: east (+)

- **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:

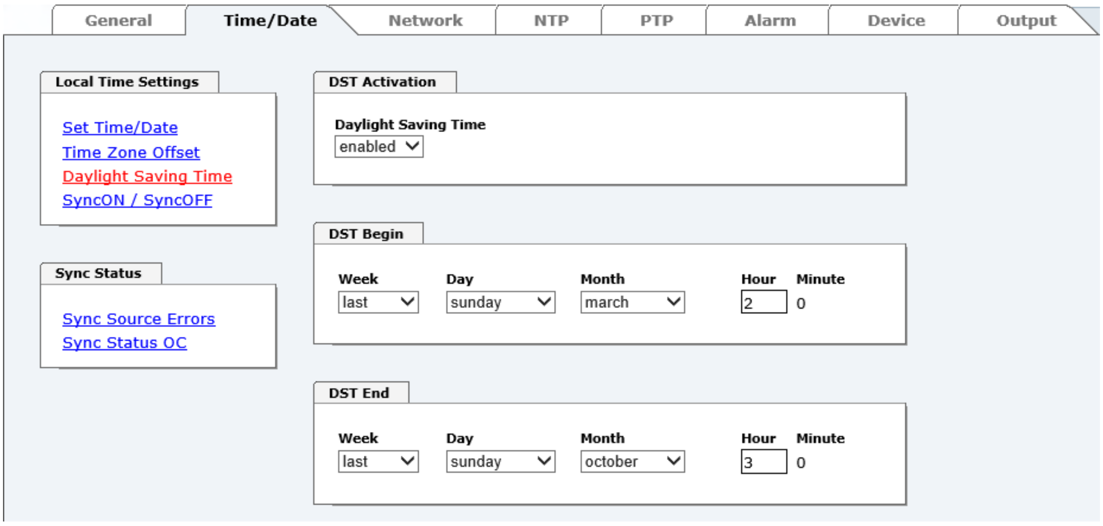
'East'	corresponds to east,
'West'	corresponds to west of the Prime-Meridian (Greenwich)

5.3.2.3 Configuration of Summer Time (Daylight Saving Time)

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 current year.

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



DST Activation

Daylight Saving Time: enabled

DST Begin

Week: last · Day: sunday · Month: march · Hour: 2 · Minute: 0

DST End

Week: last · Day: sunday · Month: october · Hour: 3 · Minute: 0

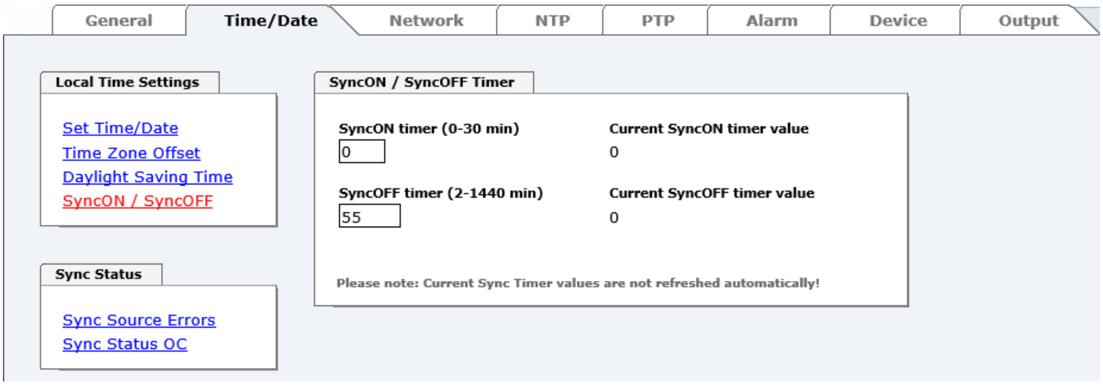
- **DST Activation (enabled/disabled) – Changeover times for summer/winter time**
- **DST Begin – Changeover time for standard time to Daylight Saving Time**
- **DST End – Changeover time for Daylight Saving Time to standard time**

The individual items mean the following:

Week	How often the changeover should be processed per day of the week in the month	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

These data are entered on the basis of the local time.

5.3.2.4 SyncON / SyncOFF Timer



SyncON timer (0-30 min): 0

Current SyncON timer value: 0

SyncOFF timer (2-1440 min): 55

Current SyncOFF timer value: 0

Please note: Current Sync Timer values are not refreshed automatically!

SyncON Timer

The SyncON Timer is used to delay the sync status "SYNC" by the configured time, despite synchronization with a Network Time Server.

This function will be activated when adjustment processes should be terminated as defined before reaching the sync status "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 PTP Grandmaster), 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.

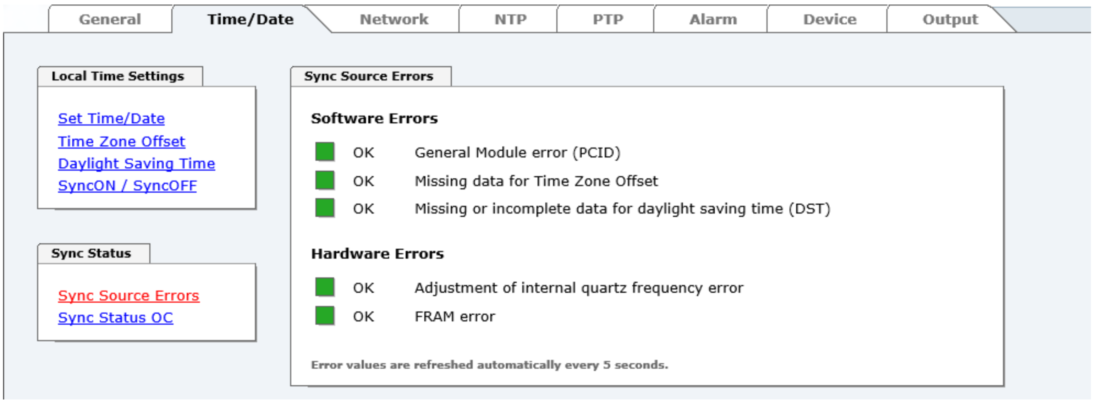
The Timer can be set from 2min. to 1440min.

Current Timer values

In case of an active Timer the appropriate value of the timer is displayed here.

5.3.2.5 Sync Source Errors

This tab displays the current failure status.



Sync Source Errors

Software Errors

🟩 OK General Module error (PCID)
🟩 OK Missing data for Time Zone Offset
🟩 OK Missing or incomplete data for daylight saving time (DST)

Hardware Errors

🟩 OK Adjustment of internal quartz frequency error
🟩 OK FRAM error

Error values are refreshed automatically every 5 seconds.

> This page is updated automatically every 5 seconds.

<u>Overview Software Errors</u>

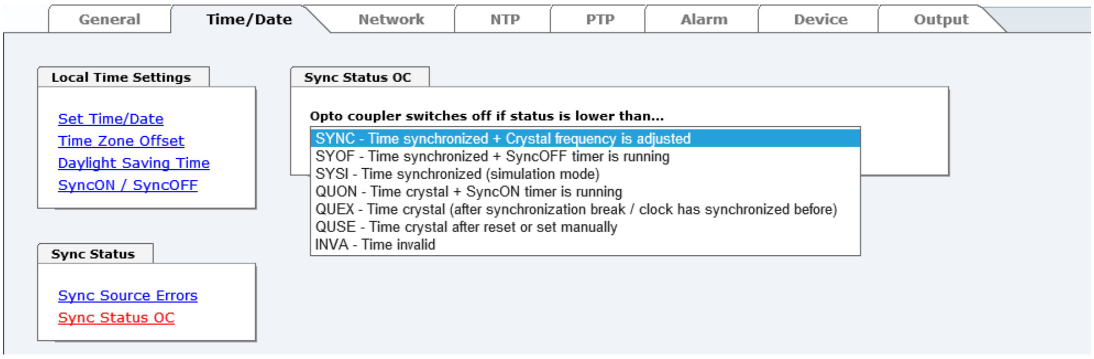
- **General Module error (PCID)**
  If this error occurs even after a power reset, the device is damaged.
- **Missing data for Time Zone Offset**
  Difference time (Time Zone Offset) must initially be entered by the user.
  Otherwise no synchronization will take place.
- **Missing or incomplete data for daylight saving time (DST)**
  The switchover times for summer/winter time must be initially set / disabled by the user. Otherwise no synchronization will take place.

<u>Übersicht Hardware Errors</u>

- **Adjustment of internal quartz frequency error**
  Problems with the internal quartz regulation have occurred. So the specified accuracy of the Sync Source cannot be guaranteed anymore.
- **FRAM error**

  If this error occurs even after a voltage reset, the support team of company ***hopf*** needs to be contacted for further steps.

5.3.2.6 Sync Status OC



Opto coupler switches off if status is lower than...

- SYNC - Time synchronized + Crystal frequency is adjusted
- SYOF - Time synchronized + SyncOFF timer is running
- SYSI - Time synchronized (simulation mode)
- QUON - Time crystal + SyncON timer is running
- QUEX - Time crystal (after synchronization break / clock has synchronized before)
- QUSE - Time crystal after reset or set manually
- INVA - Time invalid

The output of the status optical coupler can be configured by using 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:

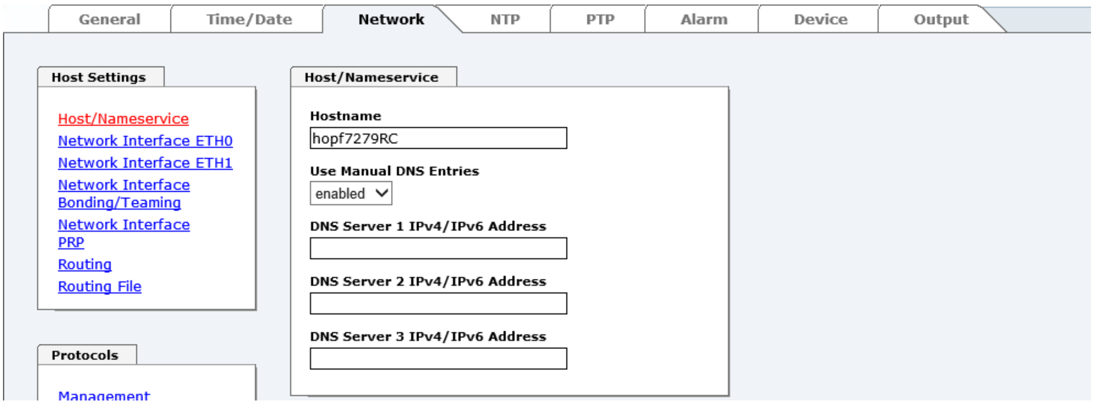
- Selected status achieved or better – Optical coupler switched through
- Selected status not achieved – Optical coupler blocked

Value range

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

5.3.3 NETWORK Tab

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



Hostname: hopf7279RC

Use Manual DNS Entries: enabled

DNS Server 1 IPv4/IPv6 Address:

DNS Server 2 IPv4/IPv6 Address:

DNS Server 3 IPv4/IPv6 Address:

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 permanently by pressing **Save**.

5.3.3.1 Host / Name Service

Setting for the unique network identification.

5.3.3.1.1 Hostname

Depending on the system the hostname default is either "**hopf7279**" or "**hopf7279RC**". This name should also be adapted in the respective network infrastructure.

In case of doubt, you might not change the standard value or you might 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 capital letters 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.

5.3.3.1.2 Use Manual DNS Entries

With this setting you can select if the manually entered DNS servers of Board 7279(RC) (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, you should set Manual DNS Entries disabled at Use.

5.3.3.1.3 DNS Server 1 to 3

The IP address (IPv4 or IPv6) of the DNS server should be entered if you wish to use complete Hostnames (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.

5.3.3.1.4 Use Manual Gateway Entries

With this setting, you can select if the manually entered gateways of Board 7279(RC) (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, you should set Manual Gateway Entries disabled at Use.

5.3.3.1.5 Default Gateway IPv4

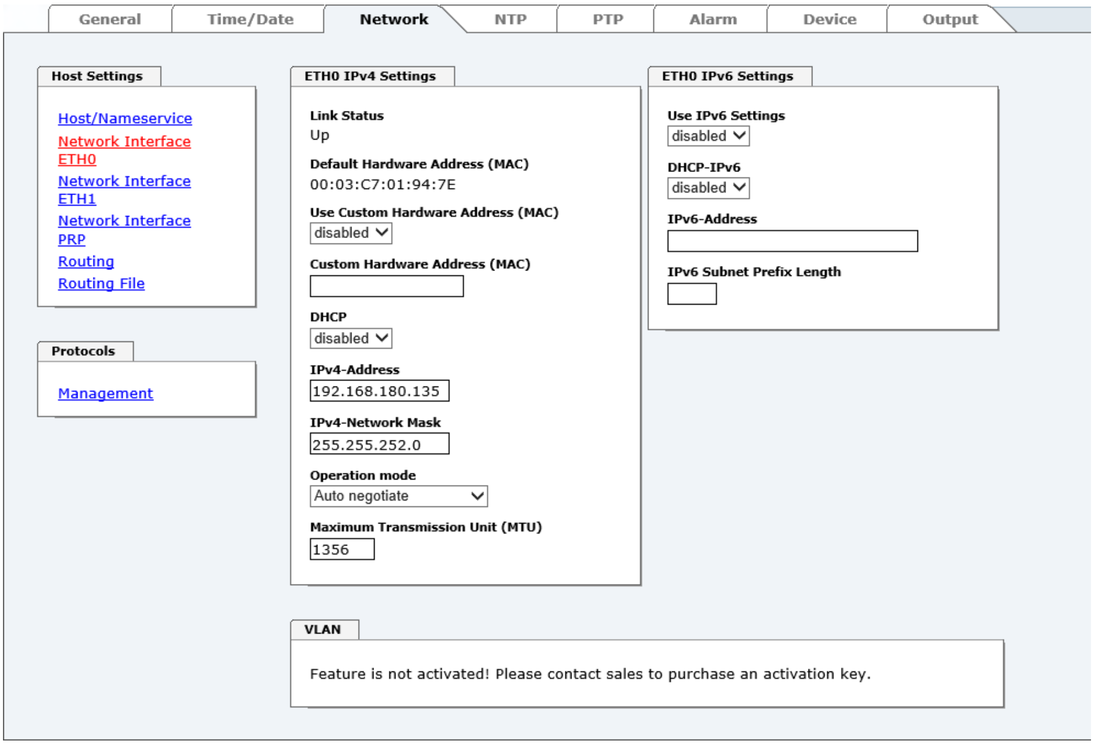
If the IPv4 default gateway is not known, it must be requested from the network administrator. If no standard gateway is available (special case), enter 0.0.0.0 in the input field or leave the field blank.

5.3.3.1.6 Default Gateway IPv6

If the IPv6 default gateway is not known, it must be requested from the network administrator. If no standard gateway is available (special case), enter :: in the input field or leave the field blank.

5.3.3.2 Network Interface ETH0/ETH1

Configuration of the Ethernet interface ETH0/ETH1 of Board 7279(RC)



Host Settings

- Host/Nameservice
- Network Interface ETH0
- Network Interface ETH1
- Network Interface PRP
- Routing
- Routing File

Protocols

- Management

ETH0 IPv4 Settings

Link Status: Up

Default Hardware Address (MAC): 00:03:C7:01:94:7E

Use Custom Hardware Address (MAC): disabled

Custom Hardware Address (MAC):

DHCP: disabled

IPv4-Address: 192.168.180.135

IPv4-Network Mask: 255.255.252.0

Operation mode: Auto negotiate

Maximum Transmission Unit (MTU): 1356

ETH0 IPv6 Settings

Use IPv6 Settings: disabled

DHCP-IPv6: disabled

IPv6-Address:

IPv6 Subnet Prefix Length:

VLAN

Feature is not activated! Please contact sales to purchase an activation key.

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

5.3.3.2.1 Default Hardware Address (MAC)

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

For further information about the MAC address refer to ***Chapter 1.3.4.1 MAC-Address for ETH0/ETH1*** for Board 7279(RC).

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

5.3.3.2.2 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**

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 Board 7279(RC) has to be restarted via "Device - Reboot Device" (see ***Chapter 5.3.7.4 Reboot Device***.

5.3.3.2.3 DHCP

If DHCP should be used, activate this function with **enabled**.

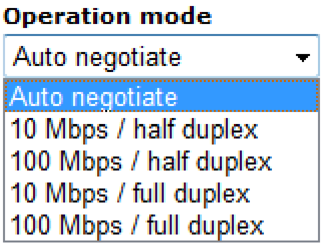
5.3.3.2.4 IPv4 Address

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

5.3.3.2.5 IPv4 Network Mask

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

5.3.3.2.6 Operation Mode



Operation mode: Auto negotiate

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.

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 Board 7279(RC) **and** the connected network components manually to the same value.

5.3.3.2.7 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.

Board 7279(RC) is going to be delivered with default setting 1356.

5.3.3.2.8 IPv6

The Board 7279(RC) 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 zeroes 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**

5.3.3.2.9 DHCP-IPv6

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

5.3.3.2.10 IPv6 Address

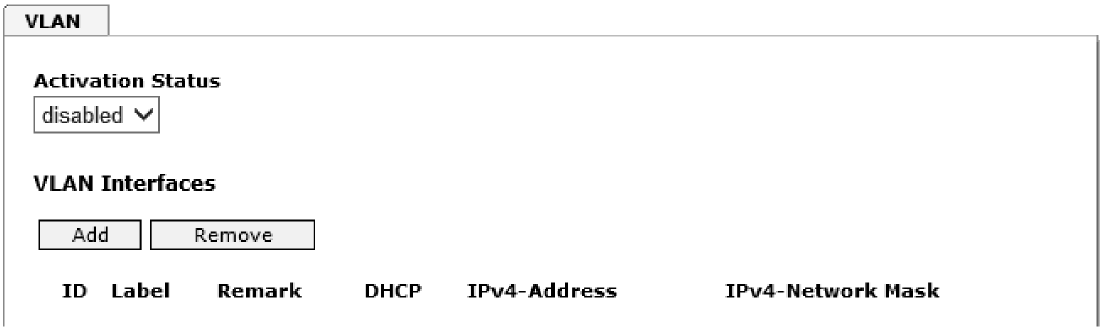
If DHCP is not used, enter the IPv6 address here. If the IPv6 address to be used is unknown, it must be requested by the network administrator.

5.3.3.2.11 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.

5.3.3.2.12 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 Board 7279(RC), 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

ID	Label	Remark	DHCP	IPv4-Address	IPv4-Network Mask

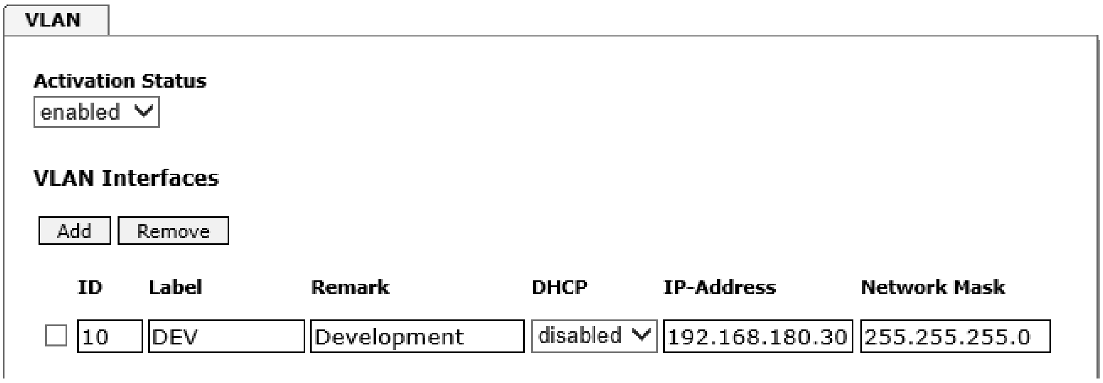
WebGUI with activated VLAN

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 IP-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

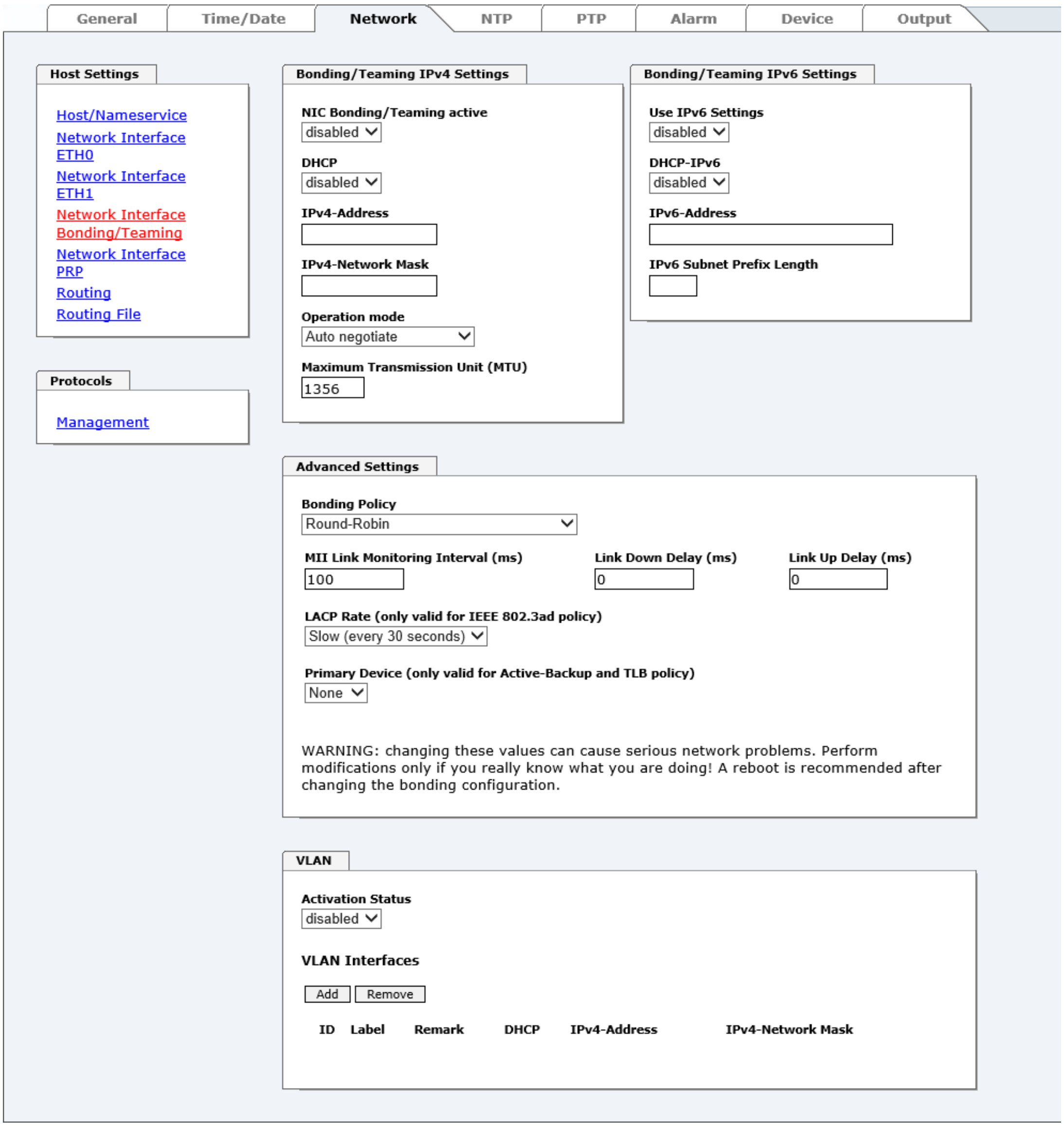
	ID	Label	Remark	DHCP	IP-Address	Network Mask
☐	10	DEV	Development	disabled	192.168.180.30	255.255.255.0

To ensure the correct function the network appliance must be connected with Board 7279(RC) 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!

5.3.3.3 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.



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

Bonding/Teaming IPv6 Settings

Use IPv6 Settings: disabled

DHCP-IPv6: disabled

IPv6-Address:

IPv6 Subnet Prefix Length:

Advanced Settings

Bonding Policy: Round-Robin

MII Link Monitoring Interval (ms): 100

Link Down Delay (ms): 0

Link Up Delay (ms): 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.

VLAN

Activation Status: disabled

VLAN Interfaces

ID	Label	Remark	DHCP	IPv4-Address	IPv4-Network Mask

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!

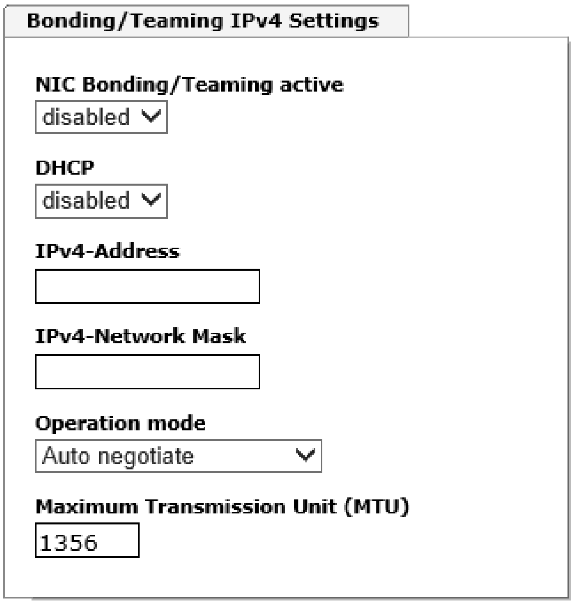
An incorrect configuration can lead to a loss of the network connection so that the Ethernet access to Board 7279(RC) is going to be refused.

In this case settings must be set back to default!

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.

5.3.3.3.1 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.

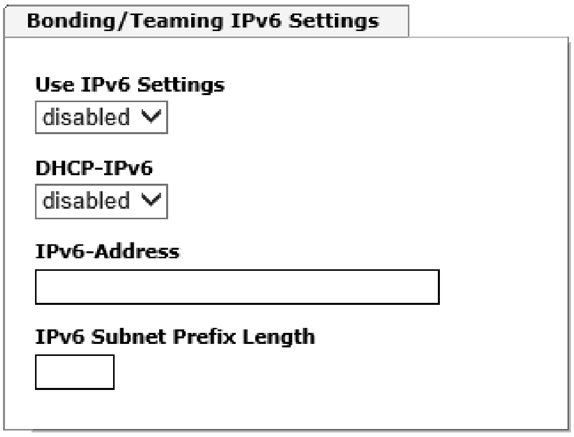
IPv4 Network Mask

Input of the IPv4 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.

5.3.3.3.2 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".

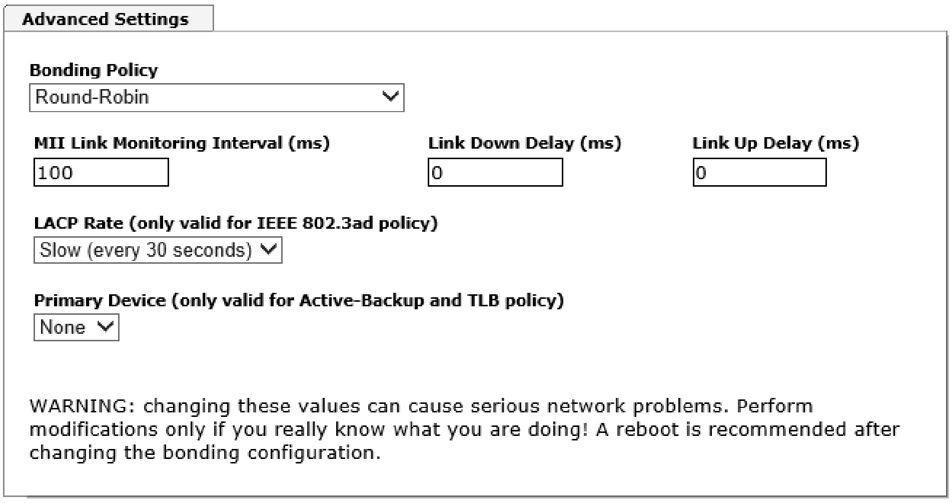
IPv6 address

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

IPv6 Subnet Prefix Length

Input of the IPv6 network length for the "bonding interface".

5.3.3.3.3 Advanced Settings



Advanced Settings

Bonding Policy
Round-Robin

MII Link Monitoring Interval (ms): 100

Link Down Delay (ms): 0

Link Up Delay (ms): 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 Board 7279(RC) are connected also needs to be configured correctly! A wrong configuration can lead to a loss of availability of Board!

- **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.

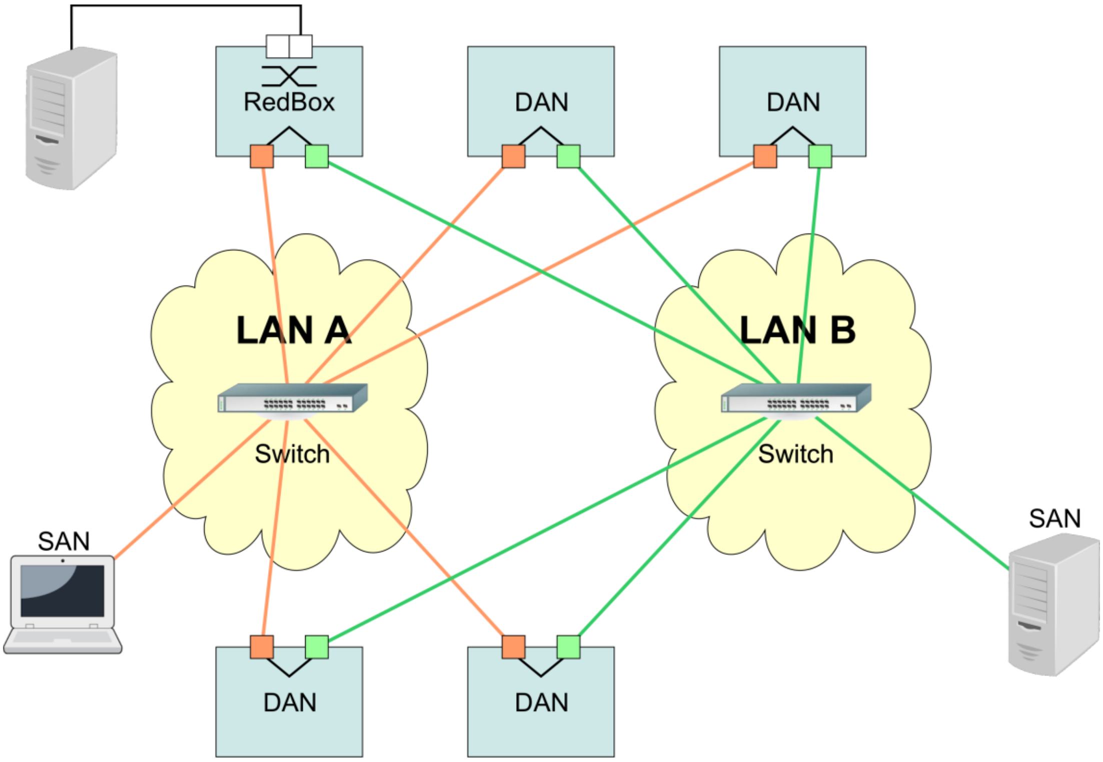
Primary Device (only valid for active backup and TLB directive)

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.

5.3.3.4 Network Interface PRP (Activation Key necessary)

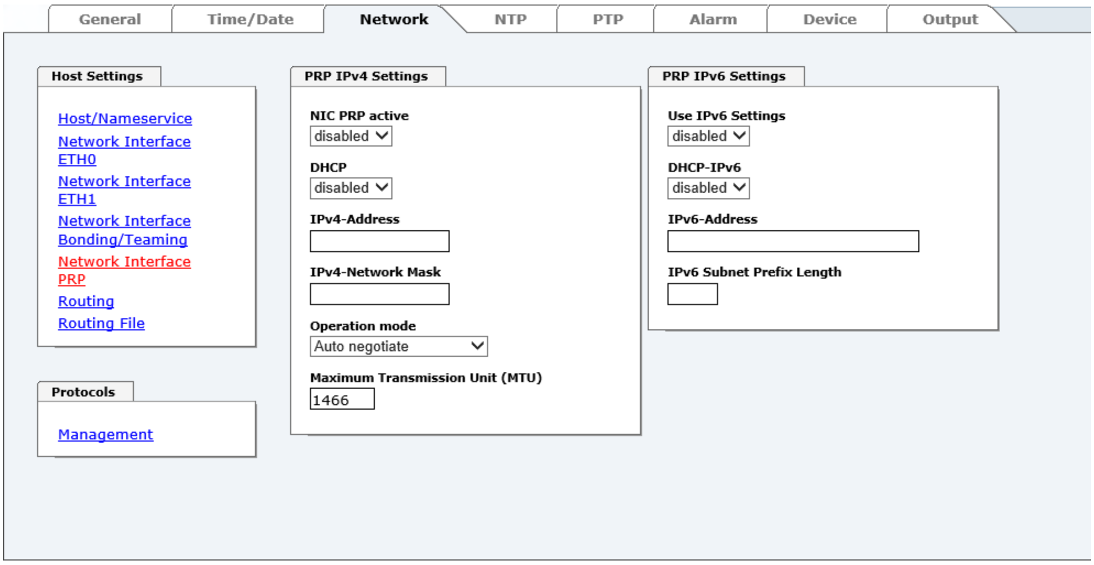
The PRP (Parallel Redundancy Protocol) functionality is specified in standard IEC 62439-3:2011 and enables to bundle the physical network interfaces ETH0 and ETH1 to one logical network interface. Each network interface is connected to an independent LAN (Local Area Network). If one of the two LANs has 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.

Board 7279(RC) supports PRP as DAN and can therefore directly be integrated into a PRP network without using a RedBox.



Host Settings

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

Protocols

Management

PRP IPv4 Settings

NIC PRP active: disabled
DHCP: disabled
IPv4-Address:
IPv4-Network Mask:
Operation mode: Auto negotiate
Maximum Transmission Unit (MTU): 1466

PRP IPv6 Settings

Use IPv6 Settings: disabled
DHCP-IPv6: disabled
IPv6-Address:
IPv6 Subnet Prefix Length:

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 IPv4 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 network interface ETH0 of Board 7279(RC) needs to be connected to PRP network "LAN A", network interface ETH1 needs to be connected to PRP network "LAN B"!

Changing of the MTU default setting with value 1466 should not be necessary by default.

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 Board 7279(RC).

In that case the settings of Board 7279(RC) need to be set to "factory default"!

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.

5.3.3.4.1 IPv6-Netzwerkkonfiguration

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 from the network administrator.

IPv6 Subnet Prefix Length

Input of the IPv6 network length for the "PRP interface".

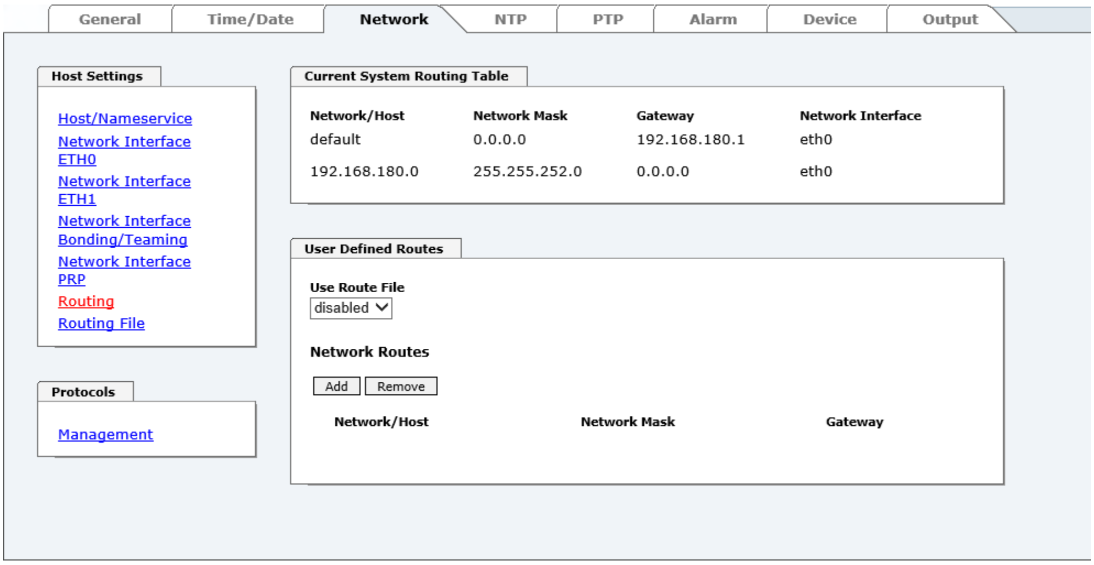
5.3.3.5 Routing (Activation Key necessary)

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

The gateway / gateway host needs to be in the local sub-network range of the board 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



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

User Defined Routes

Use Route File: disabled

Network Routes

Network/Host	Network Mask	Gateway

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

> The board cannot be used as a router!

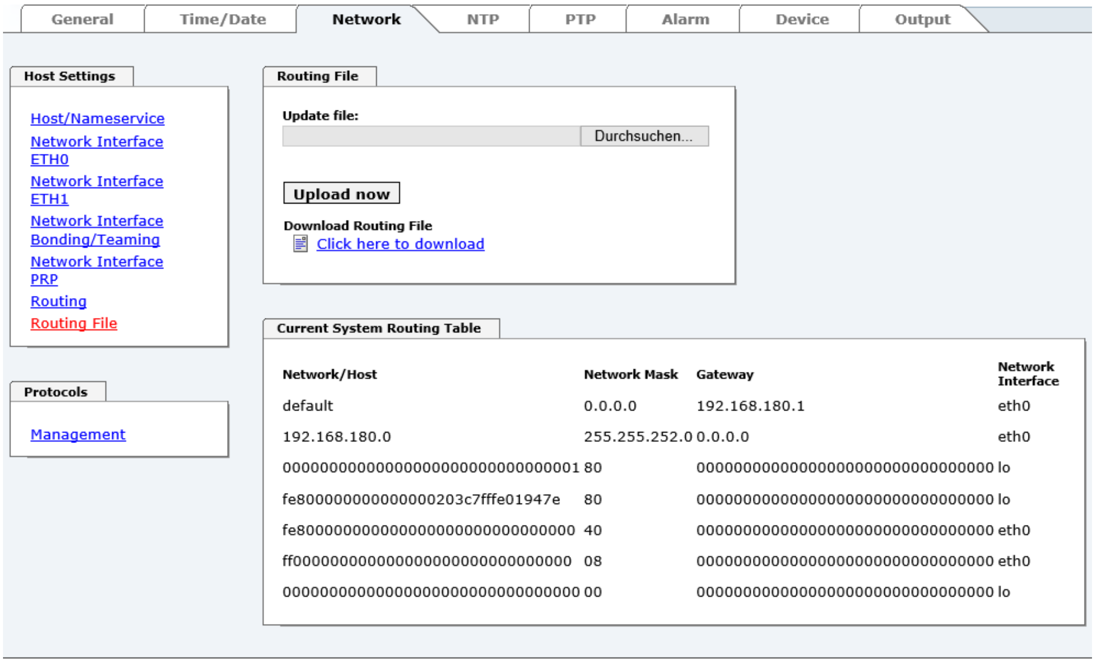
By selecting **Use Route File** you can set up whether the under **User Defined Routes** set routing configuration should be used, or if routing configuration should take place by using a routing file.

> If IPv6 routes are required, the routes must be made using the settings in ***Chapter 5.3.3.5 Routing (Activation Key necessary)***

5.3.3.6 Routing File

In order to activate this function, **Use Route File** must be set to **enabled** on the Routing Page (see ***Chapter 5.3.3.5 Routing (Activation Key necessary)***).

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



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
fe800000000000000203c7fffe01947e	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. While uploading the file is checked whether it is error-free; 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].

Should the host 192.168.20.11 be reached by 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 that are active in the Board 7279(RC).

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

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

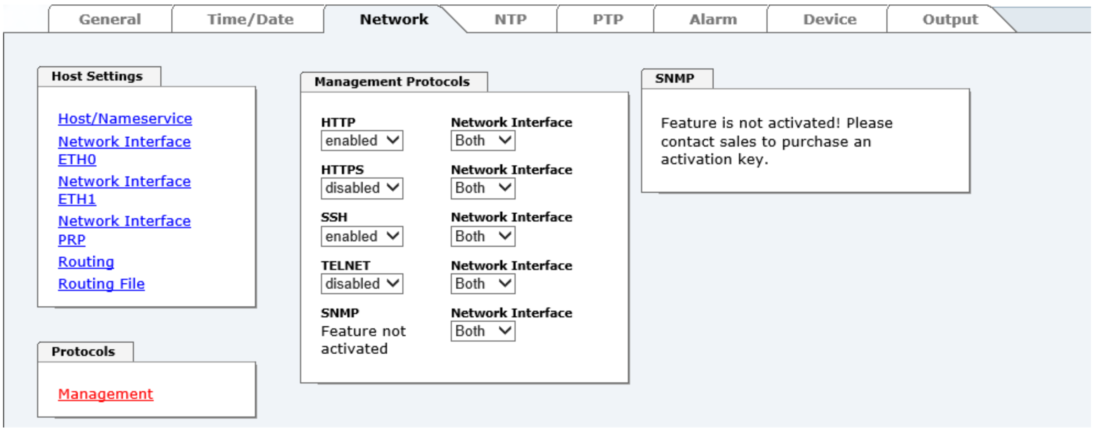
Protocols that are not required should be disabled for security reasons. A correctly configured board is always accessible via the web interface.

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

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".



Management Protocols

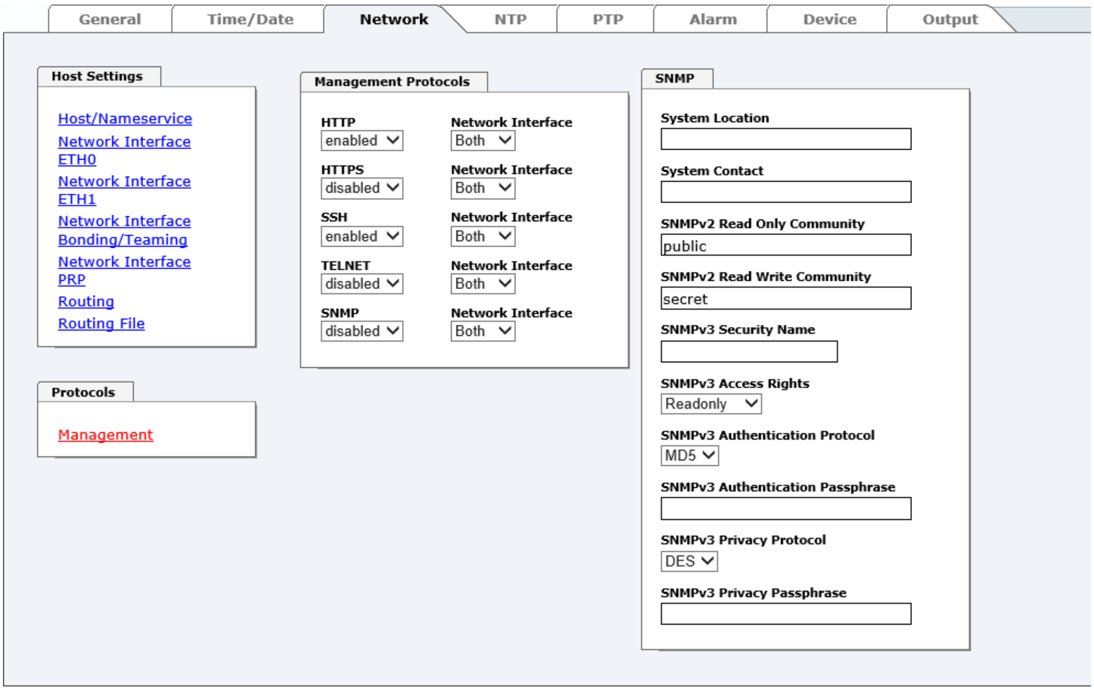
HTTP enabled	Network Interface Both
HTTPS disabled	Network Interface Both
SSH enabled	Network Interface Both
TELNET disabled	Network Interface Both
SNMP Feature not activated	Network Interface Both

SNMP

Feature is not activated! Please contact sales to purchase an activation key.

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

WebGUI with Alarming activated



Management Protocols

HTTP: enabled	Network Interface: Both
HTTPS: disabled	Network Interface: Both
SSH: enabled	Network Interface: Both
TELNET: disabled	Network Interface: Both
SNMP: disabled	Network Interface: Both

SNMP

System Location:

System Contact:

SNMPv2 Read Only Community: public

SNMPv2 Read Write Community: secret

SNMPv3 Security Name:

SNMPv3 Access Rights: Readonly

SNMPv3 Authentication Protocol: MD5

SNMPv3 Authentication Passphrase:

SNMPv3 Privacy Protocol: DES

SNMPv3 Privacy Passphrase:

Using SNMP and SNMP- traps the protocol SNMP should be enabled.

5.3.3.7.1 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.

5.3.4 NTP Tab

This tab shows information and adjustment possibilities of the NTP services of the Board 7279(RC).

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/.

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.

> After all changes relating to NTP a restart of the NTP service must be performed (see ***Chapter 5.3.4.6 Restart NTP***).

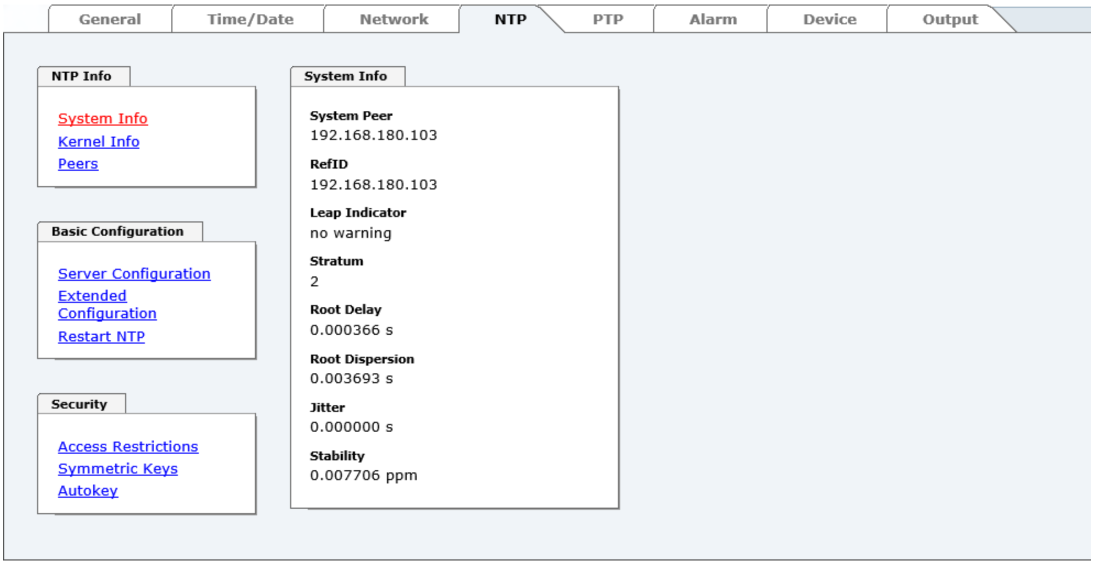
> Via the NTP protocol SNTP Clients can also be synchronized. In contrast to NTP in SNTP Clients delay times are not evaluated on the network. For this reason the accuracy reached in SNTP Clients is lower than in NTP Clients.

5.3.4.1 System Info

In the window "System Info" the current NTP values of the NTP service running on the Board 7279(RC) are indicated. In addition to the NTP calculated values for root delay, root dispersion, jitter, and stability the stratum value of the Board 7279(RC), the status to the leap second, and the current system peer are also found here.

The NTP version used adjusts the leap second correctly.

In case the used NTP Server (System PEER) works with Stratum 1 the NTP Client reaches max. Stratum 2.



System Info

System Peer
192.168.180.103

RefID
192.168.180.103

Leap Indicator
no warning

Stratum
2

Root Delay
0.000366 s

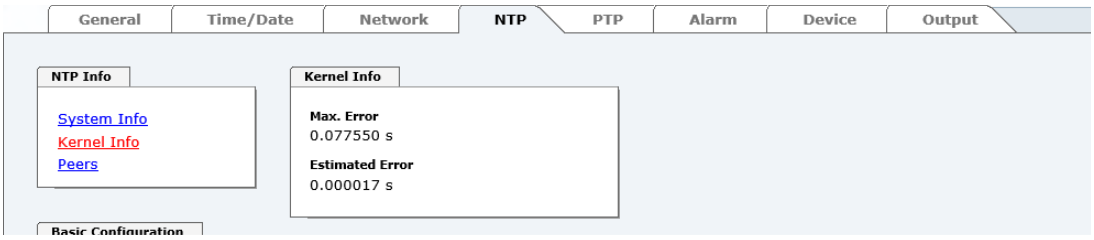
Root Dispersion
0.003693 s

Jitter
0.000000 s

Stability
0.007706 ppm

5.3.4.2 Kernel Info

The “Kernel Info” overview shows the current error values. Both values are internally updated every second.



Max. Error
0.077550 s

Estimated Error
0.000017 s

This screenshot shows a maximum kernel clock error of 77,550 msec (milliseconds). The estimated error value is 17 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.

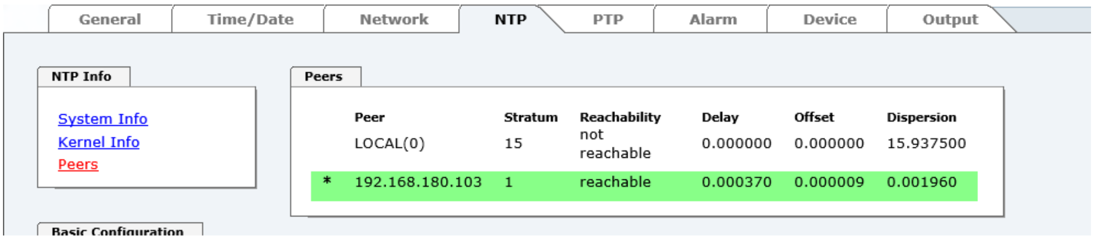
5.3.4.3 Peers

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).



	Peer	Stratum	Reachability	Delay	Offset	Dispersion
	LOCAL(0)	15	not reachable	0.000000	0.000000	15.937500
*	192.168.180.103	1	reachable	0.000370	0.000009	0.001960

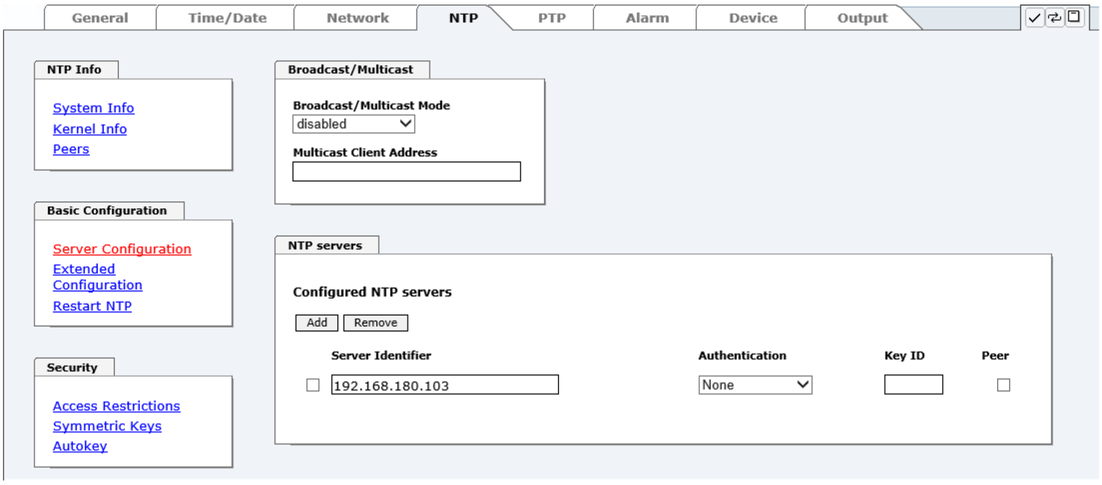
In the upper picture, the second line shows the external NTP server used for synchronization.

A short explanation and definition of the displayed values can be found in ***Chapter 9.5 Accuracy & NTP/PTP 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 9.2 Tally Codes (NTP-specific)***).

5.3.4.4 Server Configuration

The basic settings for NTP base functionality are displayed when the "Server Configuration" link is selected.



Broadcast/Multicast Mode: disabled

Multicast Client Address:

Configured NTP servers

	Server Identifier	Authentication	Key ID	Peer
□	192.168.180.103	None		□

5.3.4.4.1 Broadcast / Multicast

This section is used to configure the Board 7279(RC) 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 Board 7279(RC). 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 Board 7279(RC) 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.

5.3.4.4.2 NTP SERVERS for Synchronisation

Server Name

In this field the NTP Server, used for the synchronisation of Board 7279(RC), should be registered. Adding further NTP servers provides the option to implement a safety system for the time service. However, this influences the accuracy and stability of the board.

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

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.

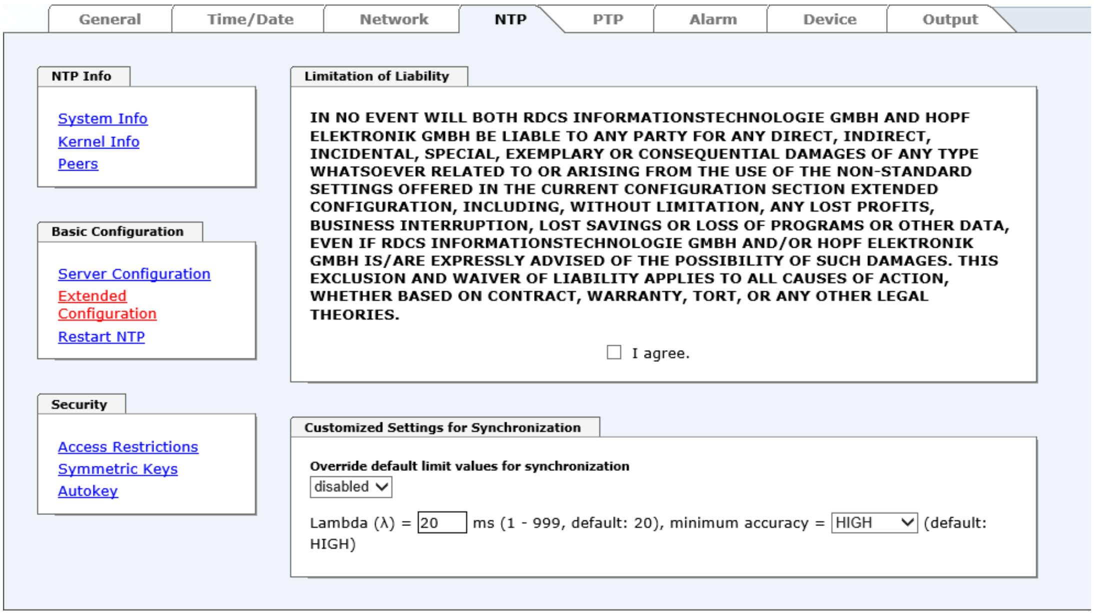
5.3.4.5 Extended Configuration

The synchronisation behaviour of Board 7279(RC) can be adjusted following the link " **Extended Configuration**". This function allows by reference to the associated system properties Board 7279(RC) to use NTP Server for synchronization and thus for the output of time information for the synchronization of connected devices and components with inaccurate NTP server. Reasons for inaccurate NTP server could be e.g. poor network performance, poor own accuracy or bad availability resulting in an insufficiently accurate synchronization of the module with the standard settings.

This function should be disabled by default.

When using this function the specified accuracy of Board 7279(RC) and thus the accuracy of devices and components synchronized by the module may be worsened.

When using this function the specified data of NTP accuracy stated in the technical data of Board 7279(RC) are not valid anymore.



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☐ I agree.

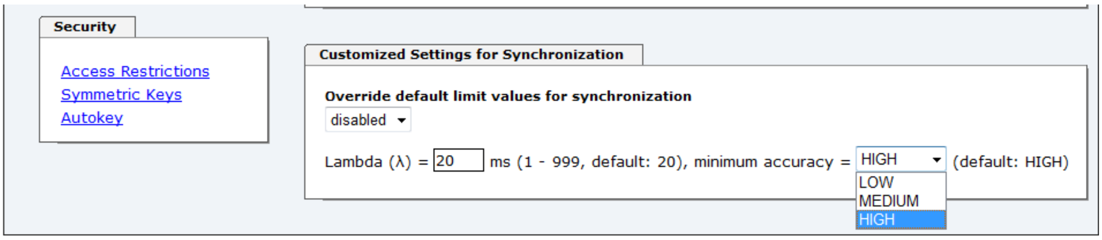
Customized Settings for Synchronization

Override default limit values for synchronization
disabled

Lambda (λ) = 20 ms (1 - 999, default: 20), minimum accuracy = HIGH (default: HIGH)

These functions are only unlocked with the declaration of consent "**I agree**" of the disclaimer "**Limitation of Liability**".

Safety Guidelines
These functions should only be used by qualified users.
hopf is not liable for any damage caused by these.



Customized Settings for Synchronization

Override default limit values for synchronization
disabled

Lambda (λ) = 20 ms (1 - 999, default: 20), minimum accuracy = HIGH (default: HIGH)

Override default limit values for synchronization

For standard operation this function is disabled and should only be used by qualified users.

Lambda (λ)

For observance of specified accuracy of Board 7279(RC), it uses only accurate NTP server for synchronisation which have an accuracy value for lambda better 20ms.

In case it is required that Board 7279(RC) should be synchronized on a more inaccurate NTP server the threshold accuracy value for lambda can be adjusted by this function.

The actually calculated lambda value is shown in the General tab.

Therefore, the function "**Override default limit values for synchronisation**" needs to be activated and to configure the required accuracy value for lambda (1-999ms).

> When using this function the specified accuracy of Board 7279(RC) and thus the accuracy of devices and components synchronized by the module may be worsened.

Minimum Accuracy

Only with the accuracy status **accuracy = high** Board 7279(RC) synchronizes.

This function can be used for NTP server not being able to synchronize Board 7279(RC) with the required accuracy. It allows the adjustment of the accuracy value (**accuracy = high** / **medium** / **low**) and the accuracy of the connected devices and components for the synchronization.

> Modification of values does not cause an immediate effect when clicking on the apply symbol. In addition the NTP service **must** be restarted (see ***Chapter 5.3.4.6 Restart NTP***).

5.3.4.5.1 Definition Accuracy (Low / Medium / High)

Calculation

LAMBDA	**=**	**((root delay / 2) + Rootdispersion) * 1000**

LOW =

LAMBDA **>** Accuracy-value
or
No system peer available
or
Stratum = 16
or
Internal NTP clock = not sync
or
Clock hardware fault **=** ERROR

MEDIUM =

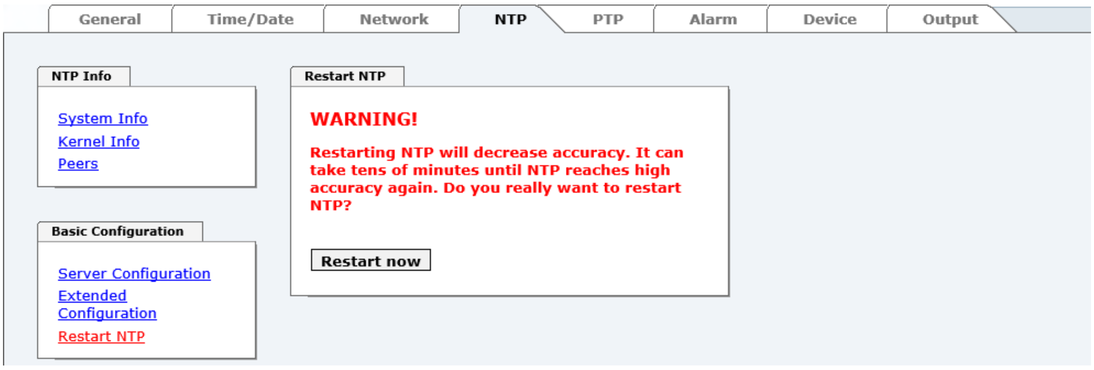
LAMBDA **<** Accuracy-value **and** System_Peer_Offset **>=** 0,001s
or
LAMBDA **<** Accuracy-value **and** Stability **>** 2,0

HIGH =

LAMBDA **<** **Accuracy**-value **and** Stability **<** 0,2
or
LAMBDA **<** Accuracy-value **and** Stability **<=** 2,0 **and** System_Peer_Offset **<** 0,001s

5.3.4.6 Restart NTP

The following screen appears after clicking on the Restart NTP function:



WARNING!

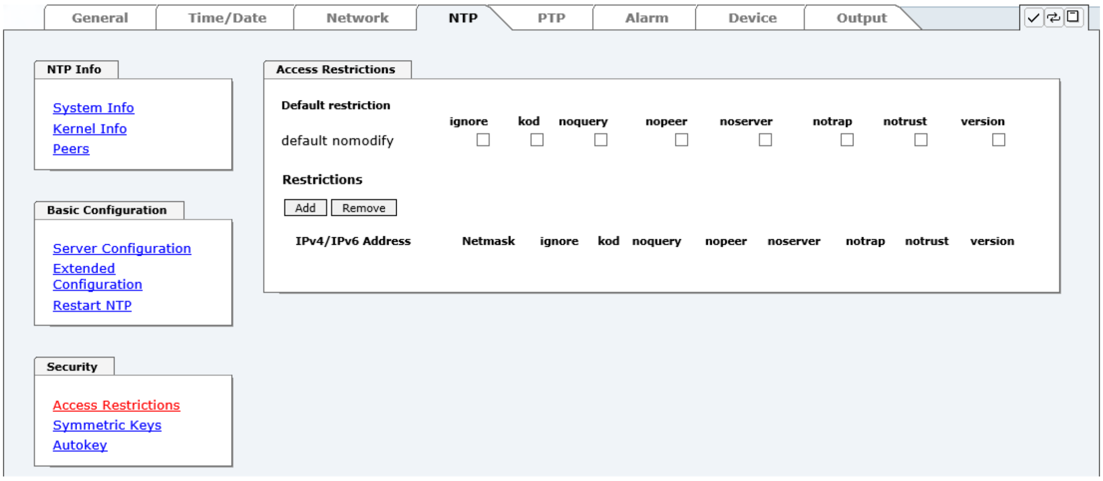
Restarting NTP will decrease accuracy. It can take tens of minutes until NTP reaches high accuracy again. Do you really want to restart NTP?

Restarting NTP Services is the only possibility of making NTP changes effective without having to restart the entire Board 7279(RC). As can be seen from the warning message, the currently reachable stability and accuracy are lost due to this restart.

After a restart of the NTP service it takes a few minutes until the NTP service on Board 7279(RC) is adjusted on an available NTP Server again.

5.3.4.7 Access Restrictions / Configuring the NTP Service Restrictions

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



Default restriction

	ignore	kod	noquery	nopeer	noserver	notrap	notrust	version
default nomodify	□	□	□	□	□	□	□	□

Restrictions

IPv4/IPv6 Address	Netmask	ignore	kod	noquery	nopeer	noserver	notrap	notrust	version

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 ***5.3.4.7.1*** to ***5.3.4.7.4*** must be checked by the user:

5.3.4.7.1 NAT or Firewall

Are incoming connections to the NTP Service blocked by NAT or a Stateful Inspection Firewall?	
No	Proceed to ***Chapter 5.3.4.7.2 Blocking Unauthorised Access***
Yes	No restrictions are required in this case. Proceed further to ***Chapter 5.3.4.7.4 Internal Client Protection / Local Network Threat Level***

5.3.4.7.2 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 5.3.4.7.3 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 5.3.4.7.5 Addition of Exceptions to Standard***

5.3.4.7.3 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 5.3.4.7.6 Access Control Options*** **kod** ☑ **notrap** ☑ **nopeer** ☑ **noquery**. ☑
Yes	In this case select from the following standard restrictions: See ***Chapter 5.3.4.7.6 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 5.3.4.7.5 Addition of Exceptions to Standard .***

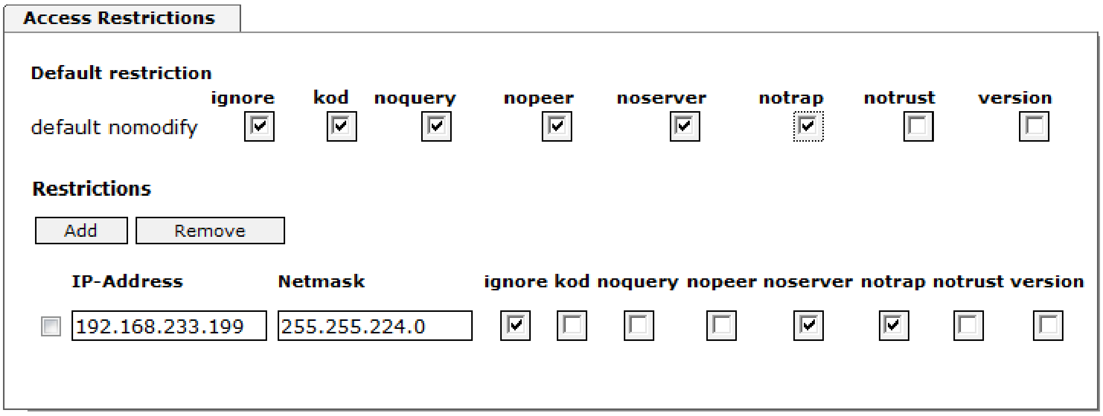
5.3.4.7.4 Internal Client Protection / Local Network Threat Level

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 5.3.4.7.6 Access Control Options.*** **kod** ☑ **notrap** ☑ **nopeer** ☑

5.3.4.7.5 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
☐	192.168.233.199	255.255.224.0	☑	☐	☐	☐	☑	☑	☐	☐

An unrestricted access of the Board 7279(RC) 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 occurrence of exceptions also works for IPv6 addresses. To do this, the IPv6 address must be added in the **IPv4/IPv6 address**, and the **Netmask** column must be set to the length of the IPv6 netmask.

5.3.4.7.6 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".

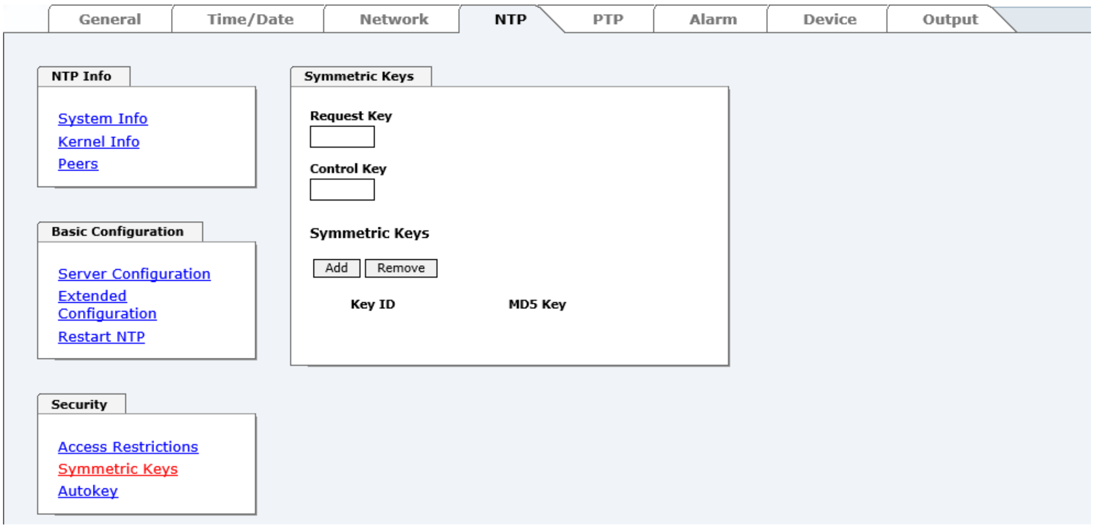
kod – "A kiss-o'-death (KoD) packet is transmitted if this option is enabled in the case of an access error."
KoD packets are limited. They cannot be transmitted more frequently than once per second. Any KoD packet which occurs within one second from the last packet is removed.

notrap – "Denies support for the mode 6 control message trap service in order to synchronise 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 5.3.4.6 Restart NTP***).

5.3.4.8 Symmetric Key



5.3.4.8.1 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

5.3.4.8.2 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 ***hopf*** NTP Time Server 8030NTS/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.

5.3.4.8.3 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/.

5.3.4.8.4 How does authentication work?

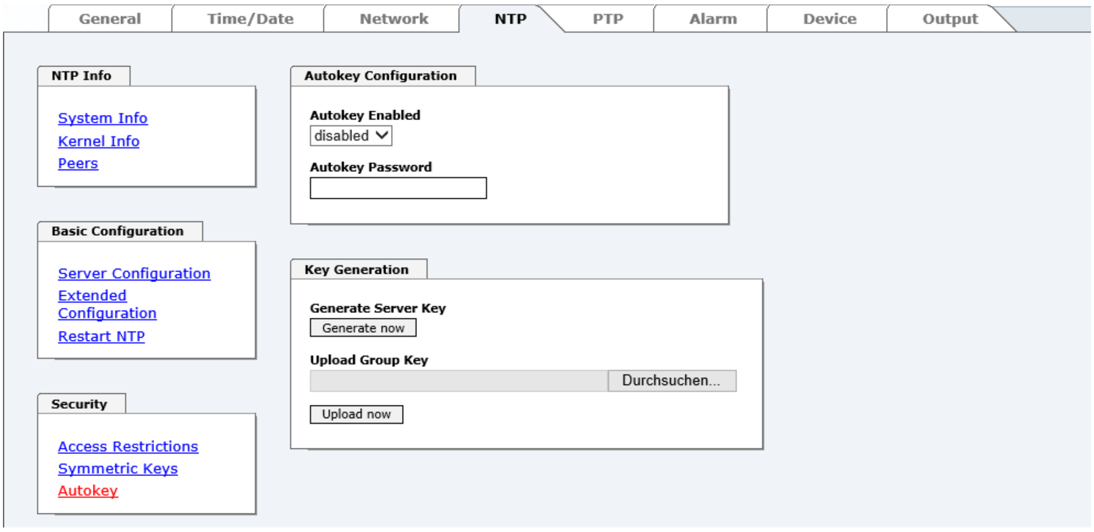
The basic authentication is a digital signature and no data encryption (if there are any differences between the two). The data packet and the key are used to create a non-reversible number which is attached to the packet.

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

5.3.4.9 Autokey / Public Key Cryptography

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.



Autokey Configuration

Autokey Enabled: disabled

Autokey Password:

Generate Server Key

Upload Group Key

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 Board 7279(RC) 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 5.3.4.6 Restart NTP***).

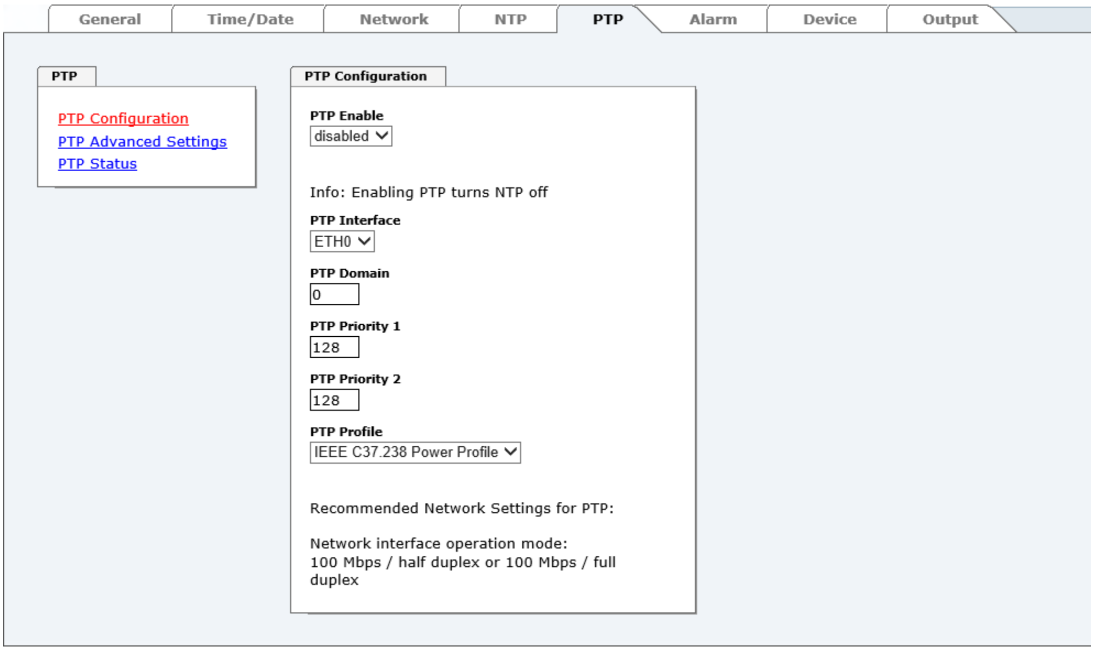
5.3.5 PTP Tab

This Tab shows information and adjustment possibilities of the PTP service of the Board 7279(RC).

PTP functionality is provided by a PTP-Demon running on the embedded Linux of the Board 7279(RC).

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.



PTP Enable
disabled

Info: Enabling PTP turns NTP off

PTP Interface
ETH0

PTP Domain
0

PTP Priority 1
128

PTP Priority 2
128

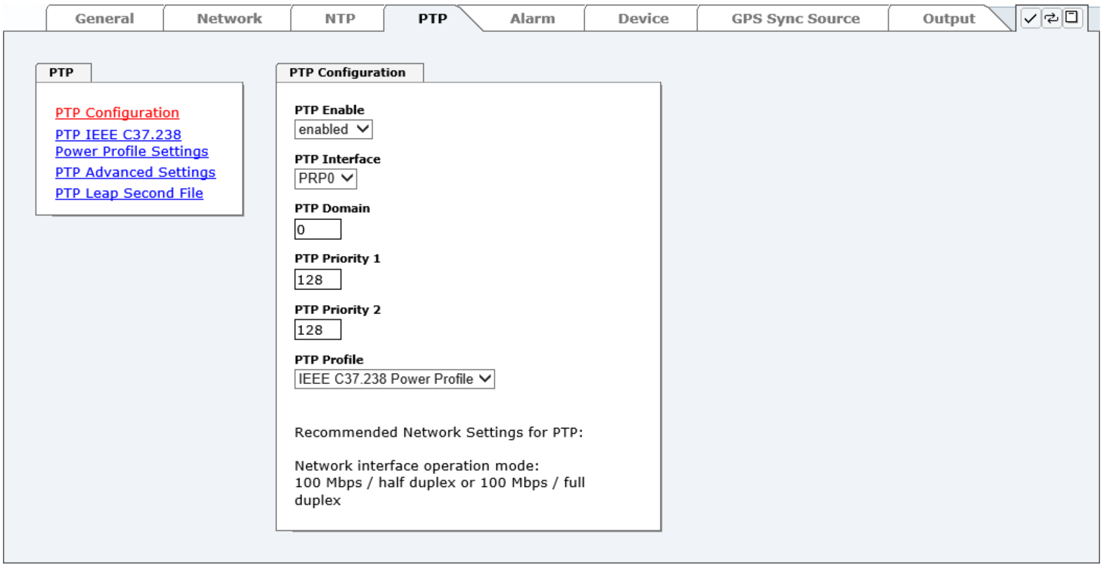
PTP Profile
IEEE C37.238 Power Profile

Recommended Network Settings for PTP:

Network interface operation mode:
100 Mbps / half duplex or 100 Mbps / full duplex

5.3.5.1 PTP Configuration

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



PTP Configuration

PTP Enable
enabled

PTP Interface
PRP0

PTP Domain
0

PTP Priority 1
128

PTP Priority 2
128

PTP Profile
IEEE C37.238 Power Profile

Recommended Network Settings for PTP:

Network interface operation mode:
100 Mbps / half duplex or 100 Mbps / full duplex

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".

Note: Enabling PTP automatically disables NTP. Then NTP only can be reactivated by disabling PTP.

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

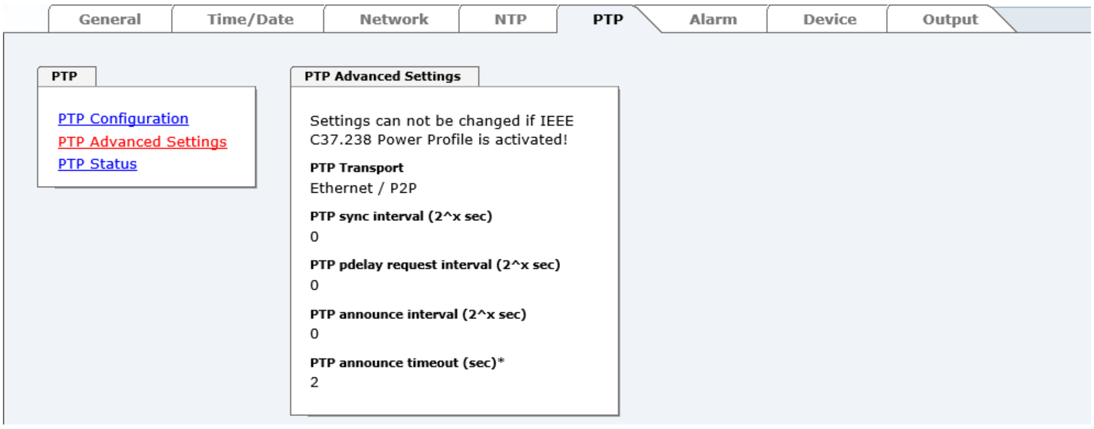
This option supports the selection of predefined profiles. Either "None" or "IEEE C37.238 Power Profile" can be selected.

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.

If "None" is selected, the settings in the "PTP Advanced Settings" window can be modified.

5.3.5.2 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.



Settings can not be changed if IEEE C37.238 Power Profile is activated!

PTP Transport
Ethernet / P2P

PTP sync interval (2^x sec)
0

PTP pdelay request interval (2^x sec)
0

PTP announce interval (2^x sec)
0

PTP announce timeout (sec)*
2

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^ 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

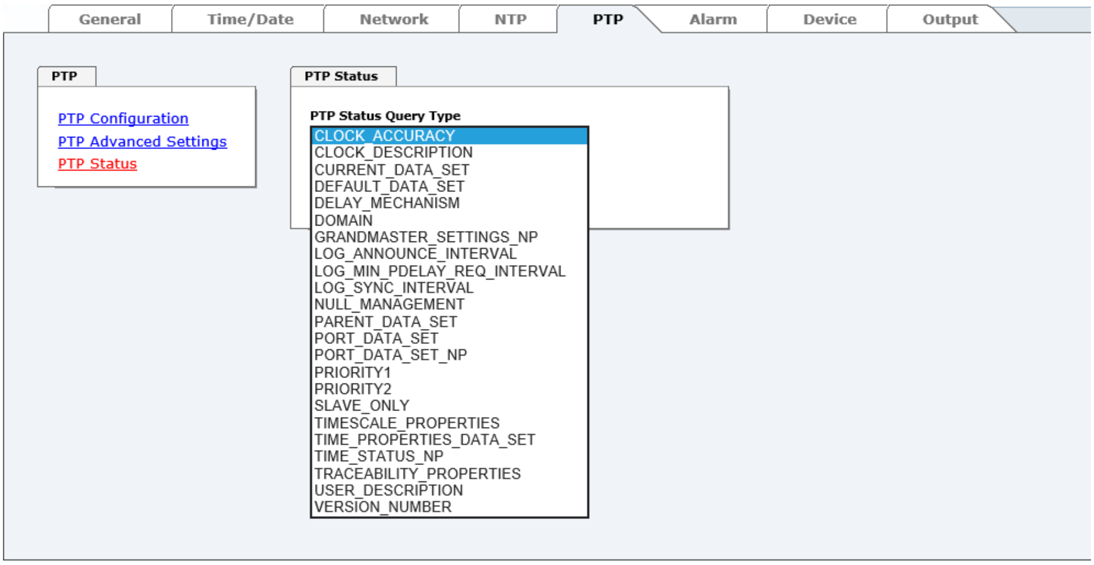
The value entered corresponds to the seconds that the PTP service spends in the LISTENING state.

5.3.5.3 PTP Status

The status of the PTP service can be queried in this window.

To query status information, select the appropriate value from the **PTP Status Query Type** drop-down box and then press the **Get PTP Status** button.

The displayed information is identical to the retrievable information by means of the PTP program PMC.

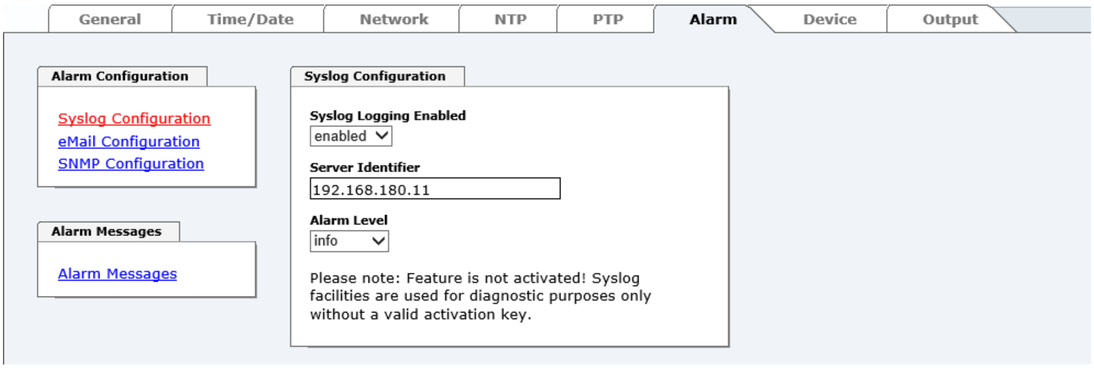


PTP Status Query Type

CLOCK_ACCURACY
CLOCK_DESCRIPTION
CURRENT_DATA_SET
DEFAULT_DATA_SET
DELAY_MECHANISM
DOMAIN
GRANDMASTER_SETTINGS_NP
LOG_ANNOUNCE_INTERVAL
LOG_MIN_PDELAY_REQ_INTERVAL
LOG_SYNC_INTERVAL
NULL_MANAGEMENT
PARENT_DATA_SET
PORT_DATA_SET
PORT_DATA_SET_NP
PRIORITY1
PRIORITY2
SLAVE_ONLY
TIMESCALE_PROPERTIES
TIME_PROPERTIES_DATA_SET
TIME_STATUS_NP
TRACEABILITY_PROPERTIES
USER_DESCRIPTION
VERSION_NUMBER

5.3.6 ALARM Tab

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



Alarm Configuration

Syslog Configuration
eMail Configuration
SNMP Configuration

Alarm Messages

Alarm Messages

Syslog Configuration

Syslog Logging Enabled
enabled

Server Identifier
192.168.180.11

Alarm Level
info

Please note: Feature is not activated! Syslog facilities are used for diagnostic purposes only without a valid activation key.

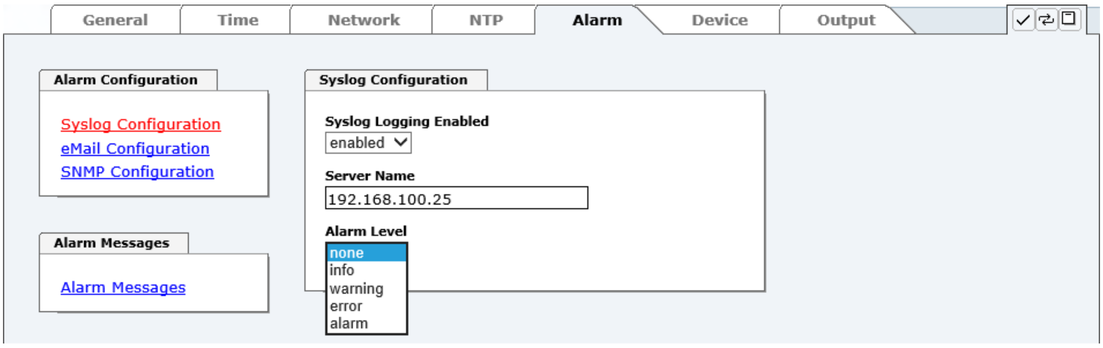
5.3.6.1 Syslog Configuration (Activation Key necessary)

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 Board in a Syslog. If everything is configured correctly and enabled (dependent 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 on the Board itself is not possible as the flash memory is not of sufficient size.

It should be noted that the standard Syslog mechanism is used for this functionality. This is not the same as the Windows System Event mechanism!



Alarm Configuration

Syslog Configuration
eMail Configuration
SNMP Configuration

Alarm Messages

Alarm Messages

Syslog Configuration

Syslog Logging Enabled
enabled

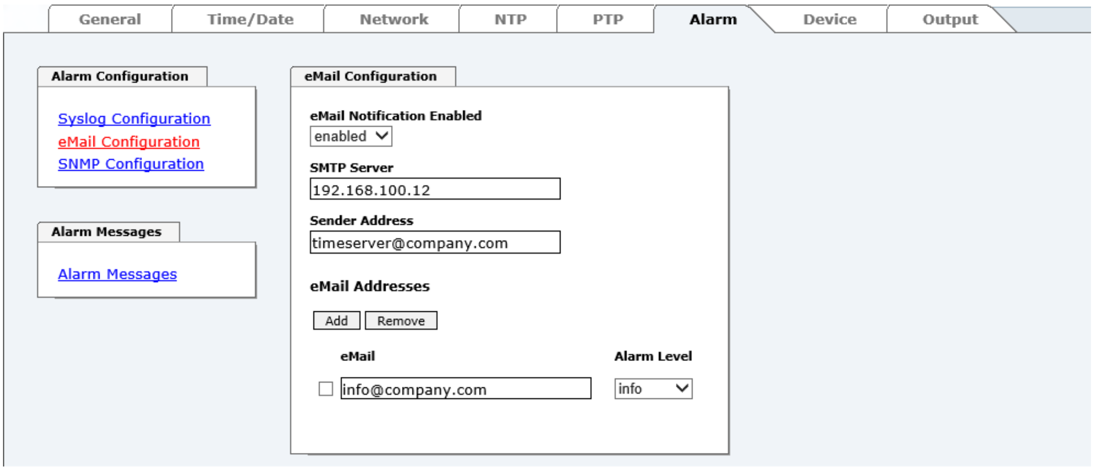
Server Name
192.168.100.25

Alarm Level
none
info
warning
error
alarm

The alarm level designates the priority level of the messages to be transmitted and the level from which transmission has to take place (see ***Chapter 5.3.6.4 Alarm Messages (Activation Key necessary)***).

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

5.3.6.2 E-mail Configuration (Activation Key necessary)



eMail Configuration

eMail Notification Enabled: enabled

SMTP Server: 192.168.100.12

Sender Address: timeserver@company.com

eMail Addresses

	eMail	Alarm Level
□	info@company.com	info

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, independent E-mail addresses which each have different alarm levels.

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

A valid E-mail server (SMTP server) must be entered for the purpose of correct configuration.

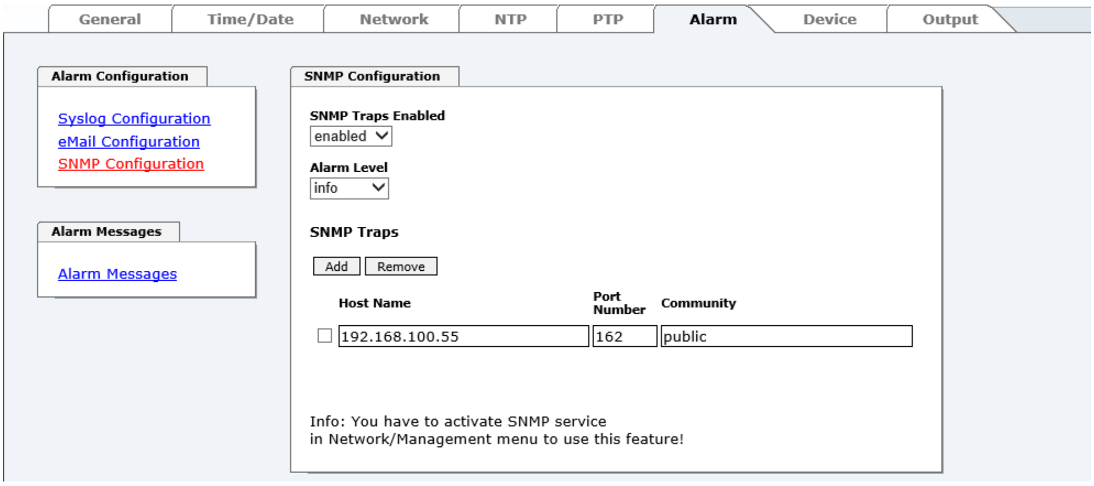
Some E-mail servers only accept messages if the sender address entered is valid (spam protection). This can be inserted in the "Sender Address" field.

The Alarm Level designates the priority level of the messages to be sent and the level from which they are to be sent (see ***Chapter 5.3.6.4 Alarm Messages (Activation Key necessary)***).

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

5.3.6.3 SNMP Configuration / TRAP Configuration (Activation Key necessary)

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



SNMP Traps Enabled: enabled

Alarm Level: info

SNMP Traps

	Host Name	Port Number	Community
□	192.168.100.55	162	public

Info: You have to activate SNMP service
in Network/Management menu to use this feature!

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 5.3.7.11 Downloading SNMP MIB / Configuration Files***).

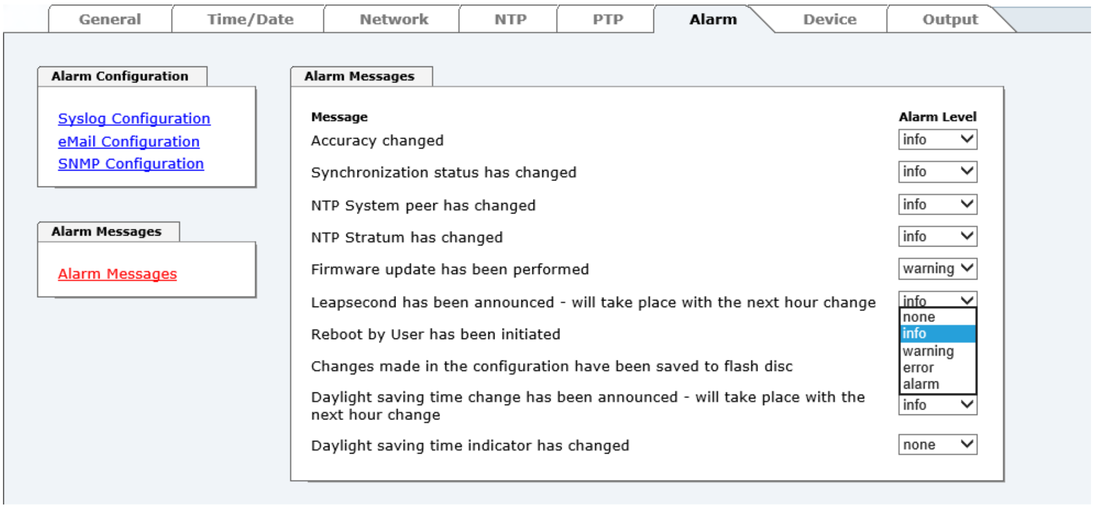
The "Alarm Level" designates the priority level of the messages to be sent and the level from which they are to be sent (see ***Chapter 5.3.6.4 Alarm Messages (Activation Key necessary)***).

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

SNMP protocol must be enabled in order to use SNMP (see ***Chapter 5.3.3.7 Management (Management-Protocols – HTTP, SNMP, SNMP-Traps, etc.)***).

5.3.6.4 Alarm Messages (Activation Key necessary)

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



Message	Alarm Level
Accuracy changed	info
Synchronization status has changed	info
NTP System peer has changed	info
NTP Stratum has changed	info
Firmware update has been performed	warning
Leapsecond has been announced - will take place with the next hour change	info
Reboot by User has been initiated	
Changes made in the configuration have been saved to flash disc	
Daylight saving time change has been announced - will take place with the next hour change	info
Daylight saving time indicator has changed	none

A corresponding action is carried out if an event occurs, depending on the messages, their configured levels and the configured notification levels of the E-mails.

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

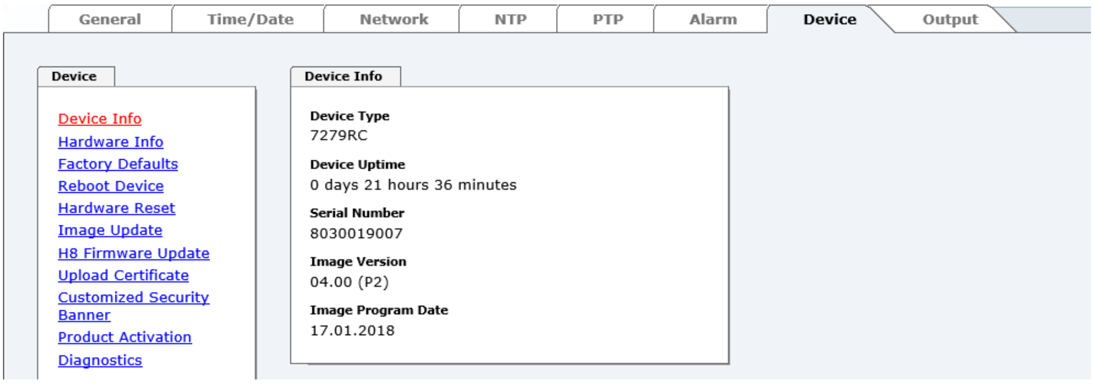
5.3.7 DEVICE Tab

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

This tab provides the basic information about the module hardware and software/firmware. Password administration and the update services for the device are also made accessible via this website. The complete download zone is also a component of this site.

5.3.7.1 Device Information

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



Device Type
7279RC

Device Uptime
0 days 21 hours 36 minutes

Serial Number
8030019007

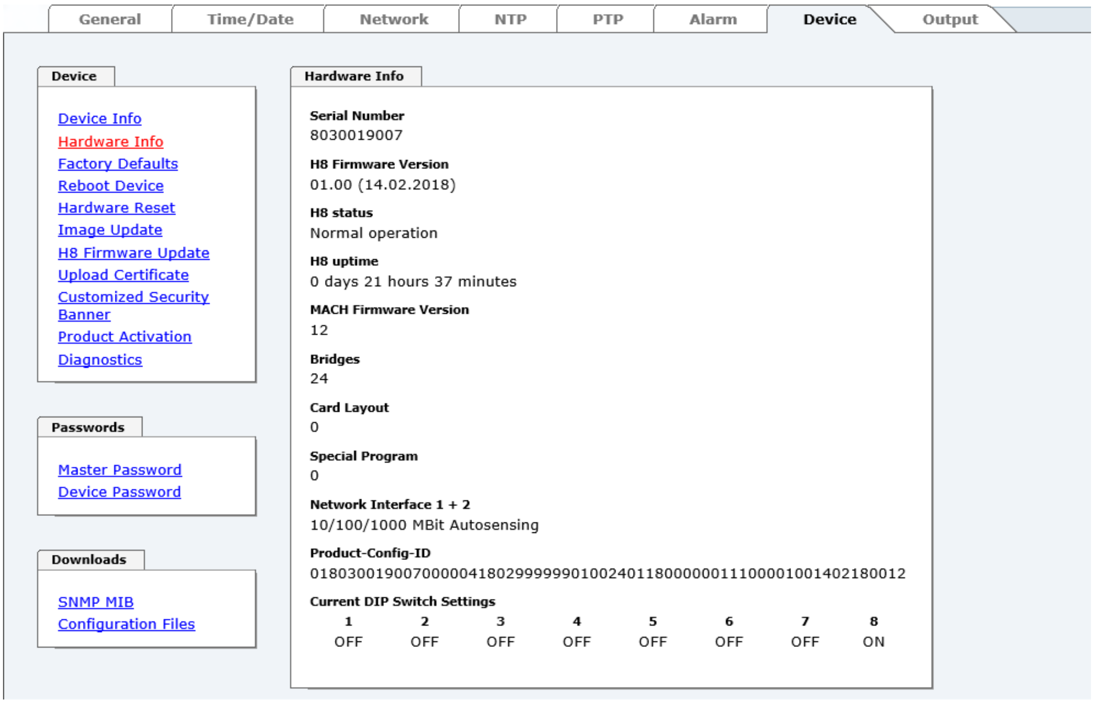
Image Version
04.00 (P2)

Image Program Date
17.01.2018

5.3.7.2 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.



Serial Number
8030019007

H8 Firmware Version
01.00 (14.02.2018)

H8 status
Normal operation

H8 uptime
0 days 21 hours 37 minutes

MACH Firmware Version
12

Bridges
24

Card Layout
0

Special Program
0

Network Interface 1 + 2
10/100/1000 MBit Autosensing

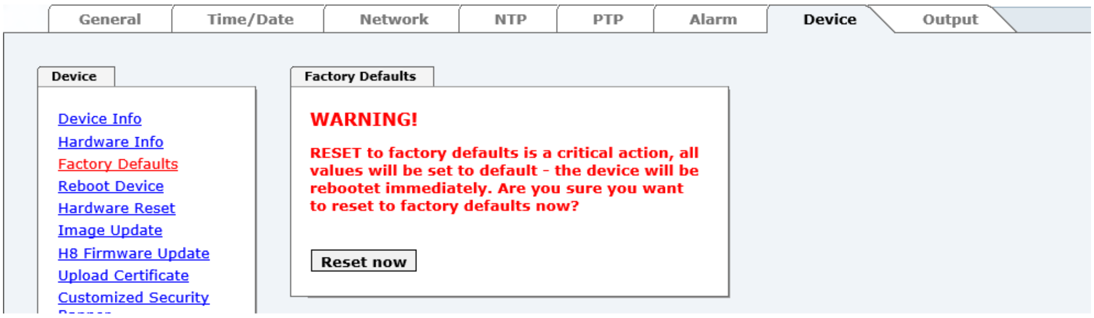
Product-Config-ID
0180300190070000041802999999010024011800000011100001001402180012

Current DIP Switch Settings

1	2	3	4	5	6	7	8
OFF	OFF	OFF	OFF	OFF	OFF	OFF	ON

5.3.7.3 Restoring Factory-Settings (Factory Defaults)

In some cases it might be wished to restore all settings of the Board 7279(RC) to their factory-settings (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?

This function enables the restoring of all settings from the flash memory to their factory default values. This also affects passwords (see ***Chapter 8 Factory Defaults***).

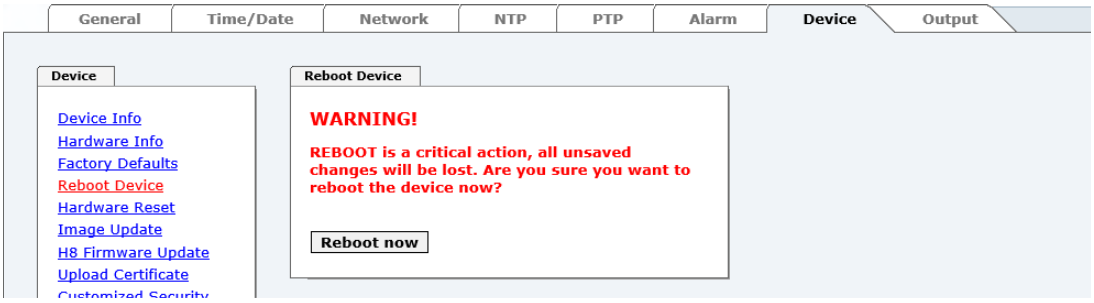
The registration is conducted as Master user according to the manual, ***Chapter 5.2.1 LOGIN and LOGOUT as User***.

By pressing "**Reset now**" factory default values are set.

There is NO chance to restore the deleted configuration once this process is triggered.

> After a **Factory Default** a complete verification and a possibly new configuration of the Board 7279(RC) are required. Especially the default MASTER and DEVICE passwords and the settings for system synchronization should be reset.

5.3.7.4 Reboot Device



WARNING!

REBOOT is a critical action, all unsaved changes will be lost. Are you sure you want to reboot the device now?

All settings not saved with "**Save**" are lost on reset (see ***Chapter 5.2.3 Enter or Changing Data***).

In broad terms, the **NTP service** implemented on the Board is restarted. This leads to a renewed alignment phase with the loss of the stability and accuracy reached up to this point.

Please log in as a "Master" user in accordance with the description in ***Chapter 5.2.1 LOGIN and LOGOUT as User***.

Press the "**Reset now**" button and wait until the restart has been completed.

This procedure can take up to one minute. The website is not automatically updated.

5.3.7.5 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 3.4 Firmware Update***.

The following points should be noted regarding updates:

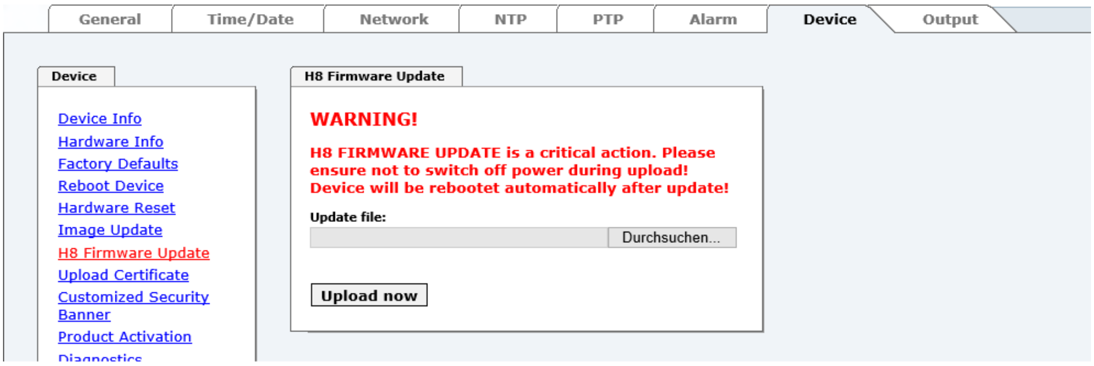
- Only experienced users or trained technical personnel should carry out an update after checking all necessary preconditions.
- Important: **Faulty updates** or **update attempts** may under certain circumstances require the Board to be returned to the factory for rectification at the owner’s expense.
- 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 3.4 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.):

H8-8030NTC_v0100_128.**mot**	for the **H8 firmware** (update takes approx. 1-1.5 minutes)
upgrade_8030_v0200_Release.**img**	for the **embedded image** (update takes approx. 7-8 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.



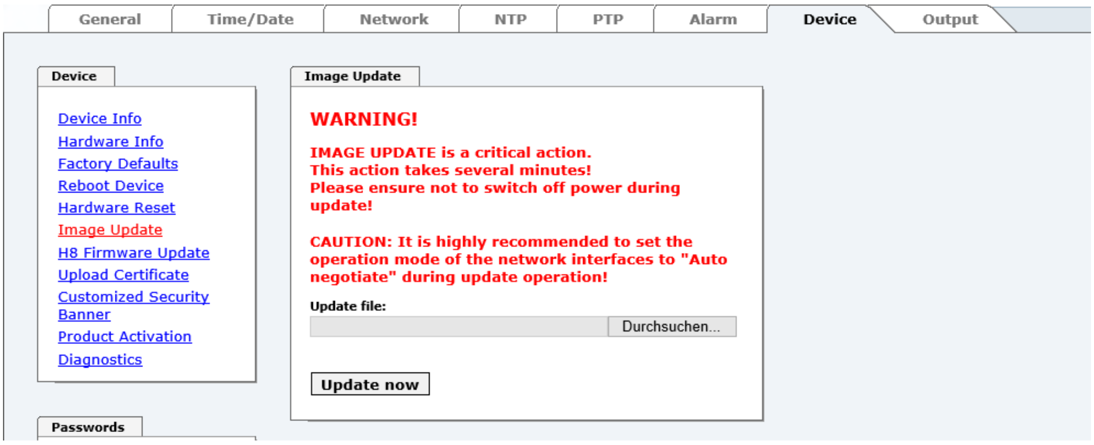
WARNING!

H8 FIRMWARE UPDATE is a critical action. Please ensure not to switch off power during upload! Device will be rebootet automatically after update!

Update file:

A restart of the Board with the new Firmware is done automatically after the H8-Firmware update.

The procedure for the **Image update** differs only in how the board is restarted.



WARNING!

**IMAGE UPDATE is a critical action.
This action takes several minutes!
Please ensure not to switch off power during update!**

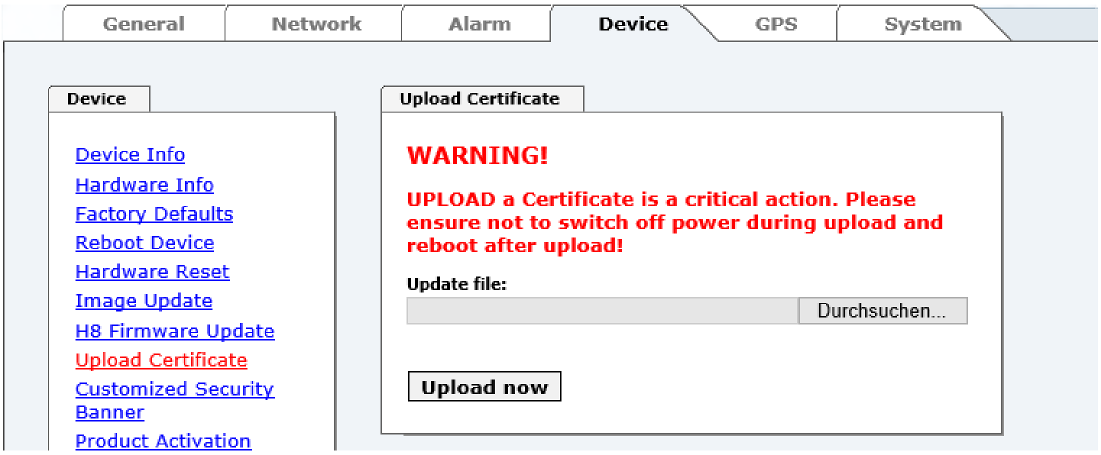
CAUTION: It is highly recommended to set the operation mode of the network interfaces to "Auto negotiate" during update operation!

Update file:

After the image-update the WebGUI displays a window to confirm the restart (reboot) of the board.

5.3.7.6 Upload Certificate (SSL-Server-Certificate)

It is possible to encrypt the https connections to the 7052RC card with a user-supplied SSL server certificate.



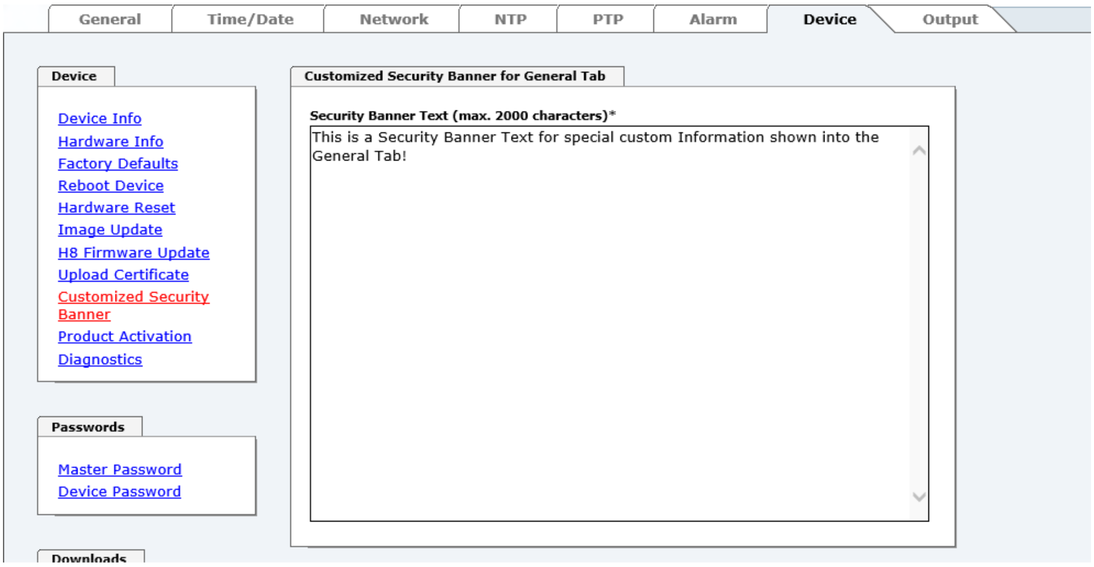
WARNING!

UPLOAD a Certificate is a critical action. Please ensure not to switch off power during upload and reboot after upload!

Update file:

5.3.7.7 Customized Security Banner

Special security information displayed in the General tab can be entered here by the user.



Customized Security Banner for General Tab

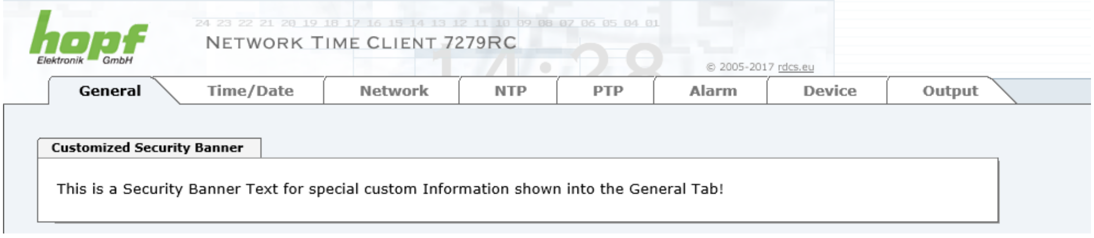
Security Banner Text (max. 2000 characters)*

This is a Security Banner Text for special custom Information shown into the General Tab!

The security information can be written as 'unformatted' text as well as in HTML format. 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 ("**?**")



Customized Security Banner

This is a Security Banner Text for special custom Information shown into the General Tab!

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

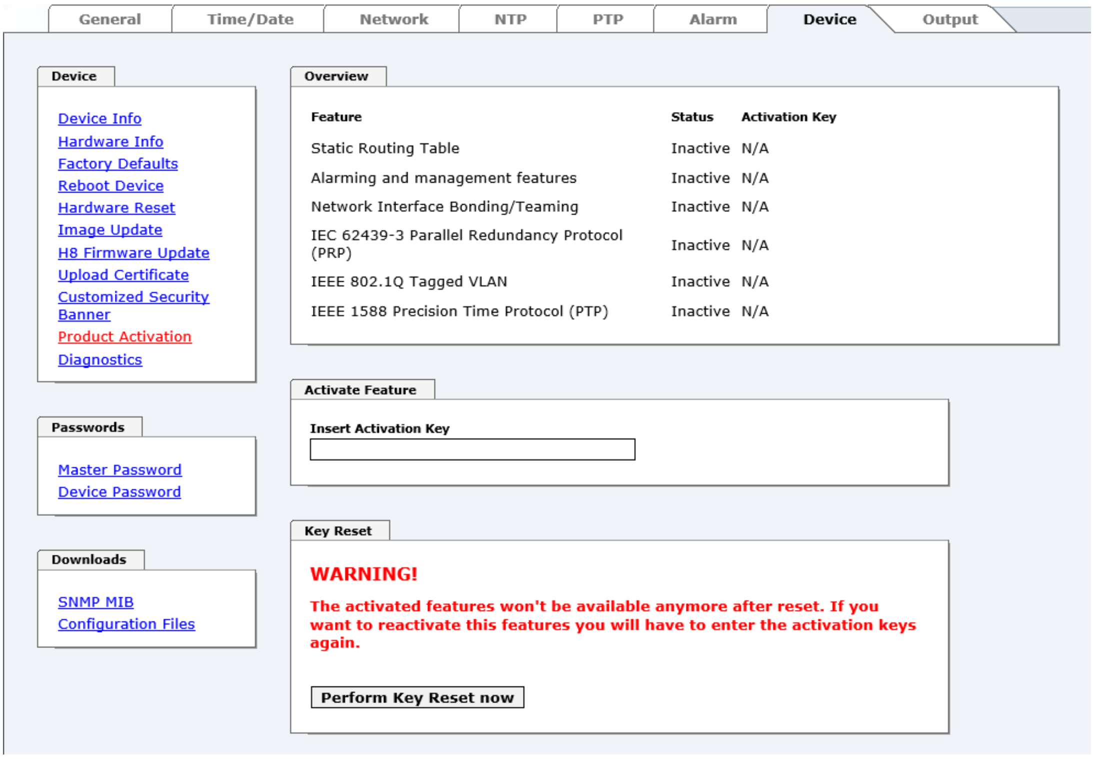
To delete the "Customized Security Banner" the inserted text must be deleted and saved again.

5.3.7.8 Product Activation

For the activation of optional functions, e.g "Network Interface Bonding/Teaming", 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 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.



Overview

Feature	Status	Activation Key
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

Activate Feature

Insert Activation Key

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 listing 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.

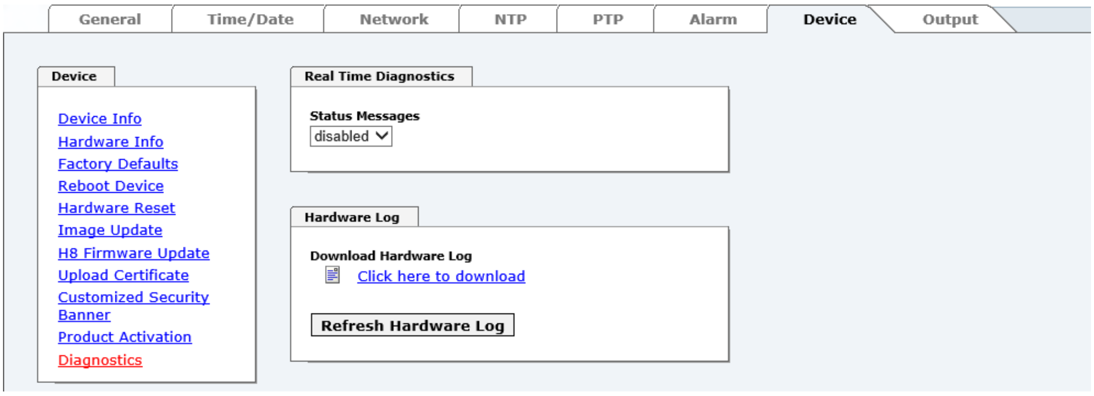
If the activation was successful the new feature is listed in the overview with status “Active” and can be used immediately.

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.

5.3.7.9 Diagnostics Function

If "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.



Status Messages: disabled

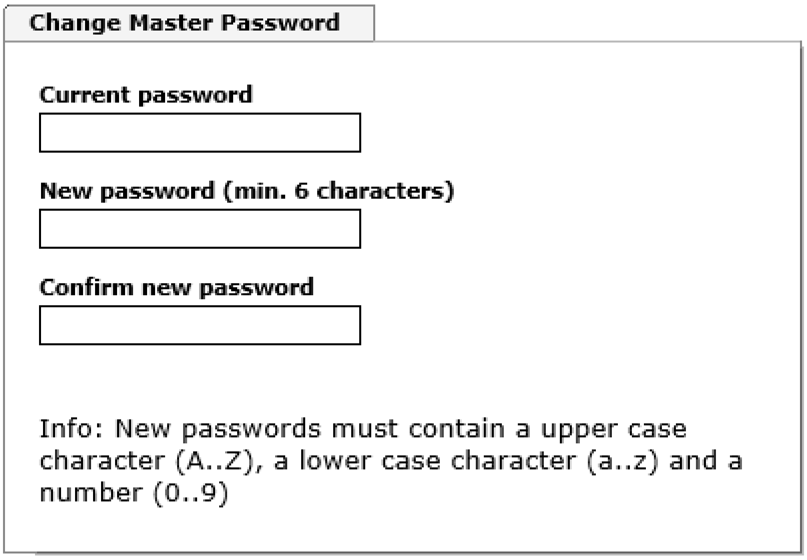
Download Hardware Log

5.3.7.10 Passwords Master / Device

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

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

(See also ***Chapter 5.2.1 LOGIN and LOGOUT as User***)

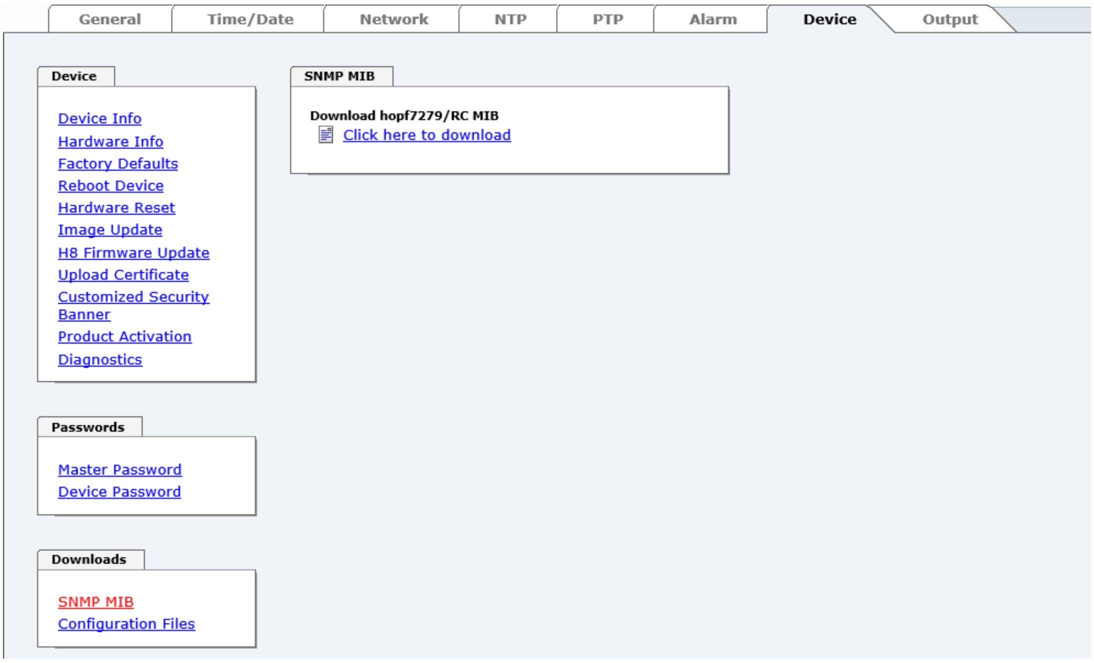


Info: New passwords must contain a upper case character (A..Z), a lower case character (a..z) and a number (0..9)

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

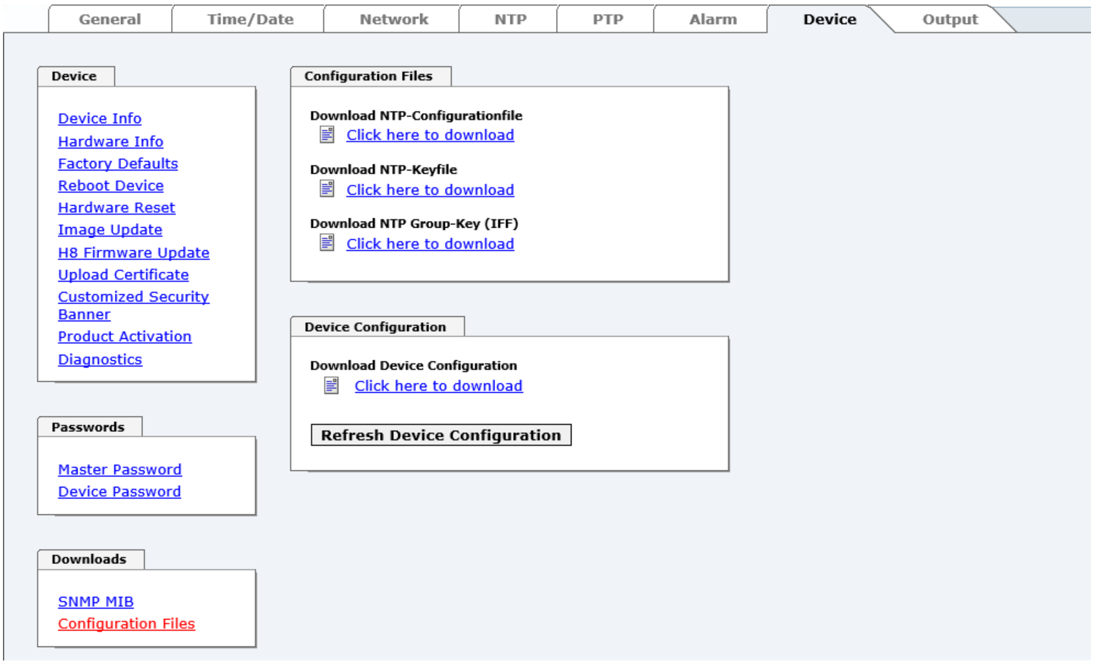
5.3.7.11 Downloading SNMP MIB / Configuration Files

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



Download hopf7279/RC MIB
Click here to download

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.



Download NTP-Configurationfile
Click here to download

Download NTP-Keyfile
Click here to download

Download NTP Group-Key (IFF)
Click here to download

Download Device Configuration
Click here to download

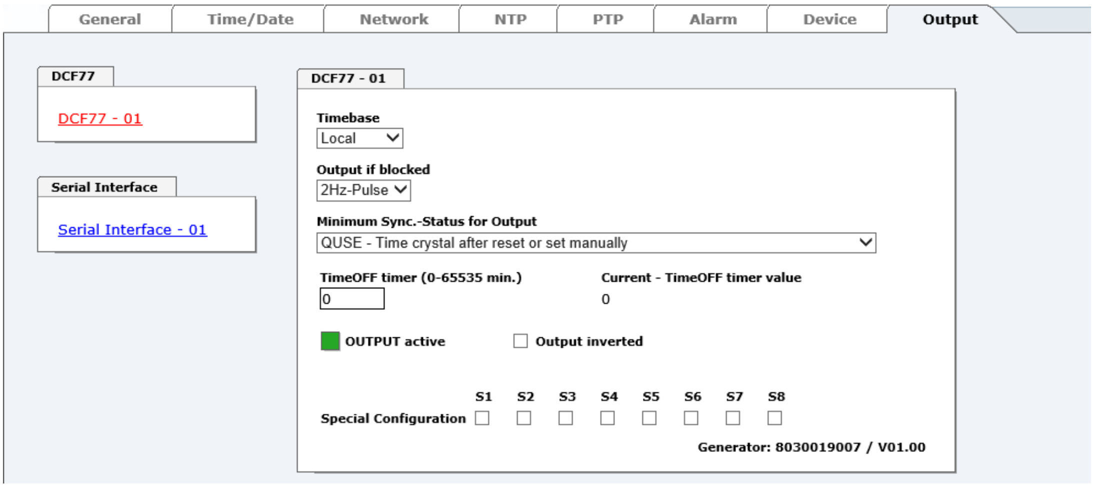
5.3.8 OUTPUT Tab

This Chapter describes the additional output functions of the Board 7279(RC).

Subsequent activation of the Output functionality is **not** possible on site.

5.3.8.1 DCF77

The signal generation for the output of a DCF77 pulse (1Hz) may be configured in this panel.



DCF77 - 01

Timebase: Local

Output if blocked: 2Hz-Pulse

Minimum Sync.-Status for Output: QUSE - Time crystal after reset or set manually

TimeOFF timer (0-65535 min.): 0

Current - TimeOFF timer value: 0

🟩 OUTPUT active

□ Output inverted

	S1	S2	S3	S4	S5	S6	S7	S8
Special Configuration	□	□	□	□	□	□	□	□

Generator: 8030019007 / V01.00

5.3.8.1.1 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.

5.3.8.1.2 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 no signal output.

Transmission of a 2Hz pulse in the event of a fault allows the connected devices to monitor for line breakage.

5.3.8.1.3 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 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.

5.3.8.1.4 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

5.3.8.1.5 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.

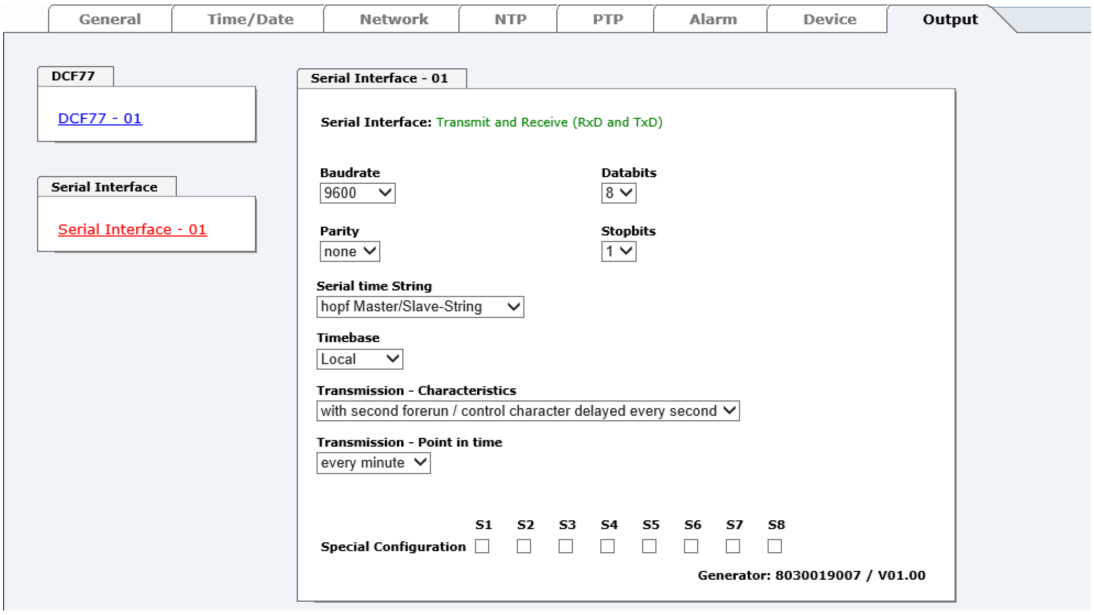
5.3.8.1.6 Special Configuration

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.

5.3.8.2 Serial Interface

The serial data string generation may be configured in this panel.



Serial Interface: Transmit and Receive (RxD and TxD)

Baudrate: 9600
Databits: 8
Parity: none
Stopbits: 1
Serial time String: hopf Master/Slave-String
Timebase: Local
Transmission - Characteristics: with second forerun / control character delayed every second
Transmission - Point in time: every minute

	S1	S2	S3	S4	S5	S6	S7	S8
Special Configuration	□	□	□	□	□	□	□	□

Generator: 8030019007 / V01.00

5.3.8.2.1 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

5.3.8.2.2 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.

5.3.8.2.3 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

5.3.8.2.4 Transmission Time

- Every Second
- Every Minute
- Every Hour
- Remote

5.3.8.2.5 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.

5.3.8.2.6 Serial time String

The string output for the transmission must be selected here:

- ***hopf*** Binary String
- ***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)
- ABB Freelance

5.3.8.2.6.1 ***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)
```

5.3.8.2.6.2 ***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)

5.3.8.2.6.2.1 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.

5.3.8.2.6.2.2 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)83123456030196**0**300(LF)(CR)(ETX)	**0000**	- 03:00h
(STX)83123456030196**1**100(LF)(CR)(ETX)	**0001**	- 11:00h
(STX)83123456030196**8**230(LF)(CR)(ETX)	**1000**	+ 02:30h
(STX)83123456030196**9**100(LF)(CR)(ETX)	**1001**	+ 11:00h

5.3.8.2.6.2.3 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

5.3.8.2.6.2.4 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

5.3.8.2.6.3 *hopf* Standard String (6021)

Below the ***hopf*** Standard String is described.

5.3.8.2.6.3.1 Specified Settings

Required:	**no**

5.3.8.2.6.3.2 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

5.3.8.2.6.3.3 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

5.3.8.2.6.3.4 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)

5.3.8.2.6.4 Trimble Time String (TSIP)

The Trimble Time String (TSIP) can be used to synchronize slave systems with the time data of the master system.

<u>Example in Hex description (not ASCII):</u>

```
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 10 03
```

5.3.8.2.6.5 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 be requested with the ASCII character **"?"**.

5.3.8.2.6.5.1 Specified Settings

Required:	**no**

5.3.8.2.6.5.2 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

5.3.8.2.6.5.3 Status

The characters 28-31 in the data string SINEC H1 Extended tell the synchronization status of the device.

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

5.3.8.2.6.5.4 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

5.3.8.2.6.6 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 String may be requested with ASCII-character **"?"**.

5.3.8.2.6.6.1 Specified Settings

Required:	**no**

5.3.8.2.6.6.2 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

5.3.8.2.6.6.3 Status

The characters 21-26 in the SAT 1703 Time String indicate the synchronisation status.

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

5.3.8.2.6.6.4 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)

5.3.8.2.6.7 ABB Melody (CR/LF)

Below the ABB Melody DataString is described.

5.3.8.2.6.7.1 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

5.3.8.2.6.7.2 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

5.3.8.2.6.7.3 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

5.3.8.2.6.7.4 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)

5.3.8.2.6.8 ABB Melody (LF/CR)

Below the ABB Melody DataString is described.

5.3.8.2.6.8.1 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

5.3.8.2.6.8.2 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	LF (line feed)	$0A
17	CR (carriage return)	$0D
18	ETX (end of text)	$03

5.3.8.2.6.8.3 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

5.3.8.2.6.8.4 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)

5.3.8.2.6.9 ABB Freelance

Below the ABB Freelance DataString is described.

5.3.8.2.6.9.1 Specified Settings

Pre-settings at string selection:	The following settings are required for the synchronization: • Output at minute change • Output with second forerun • Output with ETX on the second change • UTC time • 9600 baud, 8 bit, 1 stop bit, no parity

These settings are activated when the freelance string is selected newly, that is: beforehand, another string must have been activated!
While the Freelance string is active, the settings can be changed. The changed settings will be kept if a reset is released.

5.3.8.2.6.9.2 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	CR (carriage return)	$0D
17	LF (line feed)	$0A
18	ETX (end of text)	$03

5.3.8.2.6.9.3 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

5.3.8.2.6.9.4 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)

6 SSH and Telnet Basic Configuration

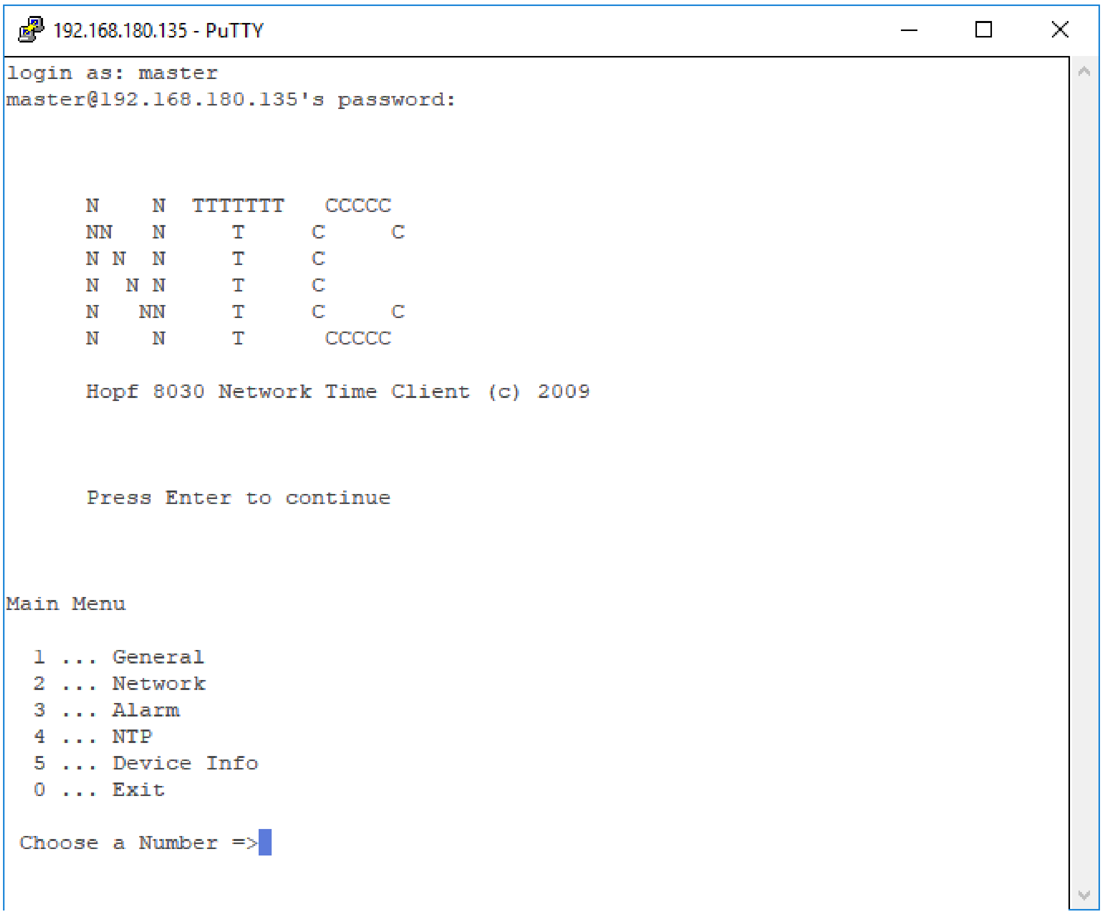
Only basic configuration is possible via SSH or Telnet. The complete configuration of the device takes place exclusively via the WebGUI.

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 5.3.7.10 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 5.3.3.7 Management (Management-Protocols – HTTP, SNMP, SNMP-Traps, etc.)***).



```
login as: master
master@192.168.180.135's password:



      N    N  TTTTTTT   CCCCC
      NN   N     T     C     C
      N N  N     T     C
      N  N N     T     C
      N   NN     T     C     C
      N    N     T      CCCCC

      Hopf 8030 Network Time Client (c) 2009



      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).

7 Technical Data

The company ***hopf*** reserves the right to hardware and software alterations at any time.

General	
Operation	via WebGUI
Installation Position	any position
Protection Type of Board	IP00
Dimensions of Module	Multi-layer board 80mm x 60mm
Power Supply	5V DC ± 5% (via internal plug-in connectors)
Power Consumption	Type 230mA / max. 300mA
MTBF	> 1,250,000h
Weight	Approx. 0.1kg

Temperature Range	
Operation	0° C to +50° C
Storage	-20° C to +75° C
Humidity	max. 90%, non condensing

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.

CE Conformity
EMV Directive 2004/108/EC
EN 55022 : 2006 + A1 : 2007
EN 61000-3-2 : 2006 + A2 : 2009, EN 61000-3-3 : 2008
EN 55024 : 1998+A1 : 2001+A2 : 2003
Low Voltage Directive 2006/95/EC
EN 60950-1 : 2006

NTP Accuracy	**Accuracy Value**
LOW	Lambda **> 20 msec**
MEDIUM	Lambda **< 20 msec**
HIGH	Lambda **< 20 msec AND** stability < 0.8 pp

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
- IEEE 1588 Precision Time Protocol (PTP)

TCP/IP Network Protocols

- HTTP
- FTP
- Telnet
- SSH
- SNMP
- NTP
- PTP

Configuration

- HTTP WebGUI (Browser Based)
- Telnet
- SSH
- ***hmc*** Network Configuration Assistent

Features

- HTTP (status, control)
- SNMPv2c, SNMPv3, SNMP Traps (MIB-II, Private Enterprise MIB)
- E-mail Notification
- Syslog Messages to External Syslog Server
- Update over TCP/IP
- Fail-safe
- Watchdog
- Power Management
- System Management
- IEEE 802.1Q Tagged VLAN
- IEC 62439-3 Parallel Redundancy Protocol (PRP)
- Network Interface Bonding/Teaming

8 Factory Defaults

Usually the delivery status of the Board 7279(RC) corresponds with the factory-defaults.

8.1 Network

Host/Name Service	**Setting**	**WebGUI Presentation**
Hostname	hopf8030ntc	hopf8030ntc
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-Adresse	Blank	---
Default Gateway IPv6-Adresse	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	Disabled	Disabled
Management	**Setting**	**WebGUI**
HTTP	Enabled	Enabled
HTTPS	Disabled	Disabled
SSH	Enabled	Enabled
TELNET	Disabled	Disabled
SNMP	Disabled	Disabled
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	---

8.2 NTP

NTP Server Configuration	**Setting**	**WebGUI**
Additional NTP Servers	Blank	---
Authentication	Disabled	None
Key ID	Blank	---
Peer	Blank	---
Broadcast/Multicast Mode	Disabled	Disabled
Multicast Client address	Blank	---
NTP Client Configuration	**Setting**	**WebGUI**
Lambda	20ms	20ms
Accuracy	HIGH	HIGH
NTP Access Restrictions	**Setting**	**WebGUI**
Access Restrictions		Default no modify
NTP Symmetric Keys	**Setting**	**WebGUI**
Request Key	Blank	---
Control Key	Blank	---
Symmetric Keys	Blank	---
NTP Autokey	**Setting**	**WebGUI**
Autokey	Disabled	Disabled
Password	Blank	---

8.3 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 delay request interval (2^x sec)	1 second	0
PTP announce interval (2^x sec)	1 second	0
PTP announce timeout (sec)	2 second	2

8.4 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

8.5 DEVICE

User Passwords	Setting	WebGUI
Master Password	master	---
Device Password	device	---

8.6 DCF77 - 01

Timebase	Local
Output if blocked	2Hz-Pulse
Minimum Sync.-Status for Output	QUSE – Time Crystal after reset or set manually
TimeOFF timer (0 - 65535 min.)	0

8.7 Serial Interface - 01

Baudrate	9600
Databits	8
Parity	None
Stopbits	1
Serial Time String	hopf Binary String
Timebase	UTC
Transmission - Characteristics	Without second forerun / immediate control character
Transmission - Point in time	Every second

9 Glossary and Abbreviations

9.1 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.

9.2 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.

9.2.1 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)**.

9.3 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
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
WAN	Wide Area Network
msec	millisecond (10^{-3} seconds)
µsec	microsecond (10^{-6} seconds)
ppm	parts per million (10^{-6})

9.4 Definitions

An explanation of the terms used in this document.

9.4.1 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.

9.4.2 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.

9.4.3 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 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.

9.4.4 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.

9.5 Accuracy & NTP/PTP Basic Principles

⚠ NTP and PTP are network protocols. Transmission delays and errors as well as the loss of data packets can lead to unpredictable accuracy data and time synchronization effects.

ℹ NTP and PTP protocols 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 and PTP.

In simplified terms, during synchronization with NTP accuracies of between 1msec and 1sec can be expected, depending on the accuracies of the servers used. PTP uses a better algorithm to compensate for network delays, so with PTP it is possible to achieve an accuracy of 0.5 µs. Problems in the network can also lead to greater inaccuracies with PTP.

The accuracy of network-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 and PTP 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 as well as between PTP Grandmaster and PTP slave can neither be measured nor calculated by NTP/PTP. NTP/PTP works on the assumption that the transmission path to the NTP server/PTP Grandmaster 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 resp. PTP Grandmaster and PTP Slave.

With reference to the above mentioned error circumstances, the delivered **time offset** of the NTP/PTP 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 resp. PTP Grandmaster and PTP Slave.

As an example, we mention the case where a network has a delay of 500msec and an accuracy shift (asynchronization) 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.

10 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)

11 List of Open Source Packages used

Third Party Software

The Board 7279(RC) 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	f0abaaacb0 a3f620f73dd 6fd716d7da a3c36a8e3	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

Package name	Version	Licence	Licence details	Patches
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-autoconf	**2.69**	**GPL**	**v3**	**no**
host-automake	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-genext2fs	1.4.1	GPL	v2	no
host-gettext	0.19.7	GPL	v3	no
host-kmod	22	LGPL	v2.1	no

Package name	Version	Licence	Licence details	Patches
host-libffi	3.2.1		libffi - Copyright (c) 1996-2014 Anthony Green, Red Hat, Inc and others. See source files for details. 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-libglib2	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	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

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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	1.8	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
libserialport	0.1.1	GPL	v3	no
libsocketcan	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:	no

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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 without fee is hereby granted, provided that the above copyright notice appears in all copies and that both the copyright notice and this permission notice appear in supporting documentation, and that the name University of Delaware not be used in advertising or Publicity pertaining to distribution of the software without specific, written prior permission. The University of Delaware makes no representations about the suitability this software for any purpose. It is provided "as is" without express or implied warranty.	yes (6)
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

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rsync	3.1.2	GPL		no
setools	3.3.8	GPLv2, LGPLv2.1		no
setserial	2.17	GPL		no
spidev_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	06dbdb2727 354b5f3ad7 c723897f40 051fddee49		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 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 Texas Instruments 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 BY THE COPYRIGHT HOLDERS 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 COPYRIGHT OWNER 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
uboot	2010.06	GPL	v2	no
uboot-tools	2016.01	GPL	v2	no

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usb_modeswitch	2.2.6	GPL	v2	no
usb_modeswitch_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