

Industriefunkuhren



---

## **Technical Manual**

Generator Module for Serial String Output

**Model 7639**

ENGLISH

Version: 03.00 – 10.09.2018

---



## **Version number (Firmware / Manual)**

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

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

## **Downloading Technical Manuals**

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](mailto:info@hopf.com)

## **Symbols and Characters**



### **Operational Reliability**

Disregard may cause damages to persons or material.



### **Functionality**

Disregard may impact function of system/device.



### **Information**

Notes and Information.



### Safety regulations

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

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



### Safety of the device

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

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

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

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

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

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

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

### CE-Conformity



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

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

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

| <b>Contents</b>                                                                        | <b>Page</b> |
|----------------------------------------------------------------------------------------|-------------|
| <b>1 General .....</b>                                                                 | <b>7</b>    |
| <b>2 Connection Elements of the Module 7639.....</b>                                   | <b>8</b>    |
| 2.1 Example of Front panels .....                                                      | 8           |
| 2.2 Components Overview of Module 7639 .....                                           | 9           |
| 2.3 Description of the Front Panel Elements .....                                      | 10          |
| 2.4 Function of Front Panel LEDs .....                                                 | 11          |
| 2.4.1 Module Front Panel with 2 LEDs .....                                             | 11          |
| 2.4.2 Module Front Panel with 3 LEDs .....                                             | 11          |
| 2.4.3 System Front Panel in case of using the Module in 1U Time Server 80xxHEPTA ..... | 12          |
| <b>3 Commissioning.....</b>                                                            | <b>13</b>   |
| <b>4 Configuration of the Module .....</b>                                             | <b>13</b>   |
| 4.1 Access to the Module .....                                                         | 14          |
| 4.2 DIP switch DS1-DS4 .....                                                           | 15          |
| 4.2.1 DIP switch DS1 - interface parameter.....                                        | 15          |
| 4.2.1.1 Setup baud rate .....                                                          | 15          |
| 4.2.1.2 Setup word length .....                                                        | 15          |
| 4.2.1.3 Setup parity mode .....                                                        | 15          |
| 4.2.1.4 Setup stop bits .....                                                          | 15          |
| 4.2.2 DIP switch DS2 - Setup data string.....                                          | 16          |
| 4.2.2.1 Output local time, standard time or UTC .....                                  | 16          |
| 4.2.2.2 Data String Transmission Points of Time .....                                  | 17          |
| 4.2.2.3 Transmission cycle (every second / minute / hour / on request) .....           | 18          |
| 4.2.3 DIP switch DS3 - data string configuration .....                                 | 18          |
| 4.2.4 DIP switch DS4 - configuration module 7639 .....                                 | 19          |
| 4.2.4.1 Parameterization via DIP switch or via external remote control .....           | 19          |
| 4.2.4.2 Service mode reserved for <b>hopf</b> Elektronik GmbH .....                    | 19          |
| 4.2.4.3 Additional Configuration of special data string outputs .....                  | 19          |
| 4.2.5 Parameterization of the Synchronization Source.....                              | 20          |
| <b>5 Data Strings.....</b>                                                             | <b>21</b>   |
| 5.1 General Information about Data Output .....                                        | 21          |
| 5.2 <b>hopf</b> Standard String (6021) .....                                           | 22          |
| 5.2.1 Specified Settings .....                                                         | 22          |
| 5.2.2 Structure.....                                                                   | 22          |
| 5.2.3 Status .....                                                                     | 22          |
| 5.2.4 Example .....                                                                    | 23          |
| 5.2.5 Serial Requests with ASCII Characters .....                                      | 24          |
| 5.3 <b>hopf</b> String 6021 CR/LF .....                                                | 24          |
| 5.3.1 Structure.....                                                                   | 24          |
| 5.4 SINEC H1 Extended .....                                                            | 25          |
| 5.4.1 Specified Settings .....                                                         | 25          |
| 5.4.2 Structure.....                                                                   | 25          |
| 5.4.3 Status .....                                                                     | 26          |
| 5.4.4 Example .....                                                                    | 26          |
| 5.4.5 Serial Requests with ASCII Characters .....                                      | 26          |

|          |                                                       |           |
|----------|-------------------------------------------------------|-----------|
| 5.5      | SAT 1703 Time String .....                            | 27        |
| 5.5.1    | Specified Settings .....                              | 27        |
| 5.5.2    | Structure .....                                       | 27        |
| 5.5.3    | Status .....                                          | 28        |
| 5.5.4    | Example .....                                         | 28        |
| 5.5.5    | Serial Requests with ASCII Characters .....           | 28        |
| 5.6      | <b>hopf</b> Master/Slave-String .....                 | 29        |
| 5.6.1    | Specified Settings .....                              | 29        |
| 5.6.2    | Structure .....                                       | 30        |
| 5.6.3    | Status .....                                          | 31        |
| 5.7      | IEC-103 (ASDU Type 6) .....                           | 32        |
| 5.7.1    | Specified Settings .....                              | 32        |
| 5.7.2    | Structure .....                                       | 33        |
| 5.7.3    | Example .....                                         | 33        |
| 5.7.4    | Initialization String for IEC-103 (ASDU Type 6) ..... | 34        |
| 5.8      | Data String 5050 H&B (PCZ 77) .....                   | 35        |
| 5.8.1    | Specified Settings .....                              | 35        |
| 5.8.2    | Structure .....                                       | 35        |
| 5.8.3    | Status and Day of the Week Nibble .....               | 36        |
| 5.8.4    | Example .....                                         | 36        |
| 5.9      | Data String ION 7550 .....                            | 37        |
| 5.9.1    | Specified Settings .....                              | 37        |
| 5.9.2    | Data String Structure .....                           | 37        |
| 5.9.3    | Status .....                                          | 38        |
| 5.9.4    | Data String Example .....                             | 38        |
| 5.10     | Trimble Time String (TSIP) .....                      | 39        |
| 5.10.1   | Specified Settings .....                              | 39        |
| 5.10.2   | Data String Structure .....                           | 39        |
| 5.10.3   | Day of the Week Seconds .....                         | 40        |
| <b>6</b> | <b>Technical Data .....</b>                           | <b>41</b> |

# 1 General

The **hopf** Module 7639 is a compact generator module for serial string output for the integration into Clock Systems and signal converters. This module converts a system/module internally fed time information into a highly-precise serial data string output. Via 9-pole SUB-D male plug the chosen time string in the interface standards below is available by default:

- RS232
- RS422

Potential separation of the signal output is optionally available ex works.

The required serial data string can be chosen from pre-programmed data strings. Operation of module 7639 is made via **DIP switch** and can be controlled via **remote connection** by using appropriate applications (remote functionality currently not implemented).

A variety of parameters is available for individual adjustment of interface parameters and data string parameters:

- Baud rate: 300 - 115200 Baud
- Data bits: 7 / 8
- Stop bits: 1 / 2
- Parity bit: No / Odd / Even
- Data string to be issued
- Transmission time: second / minute / hour / on request
- Time base: local time (e.g. CET / CEST), standard time (e.g. CET) and UTC time

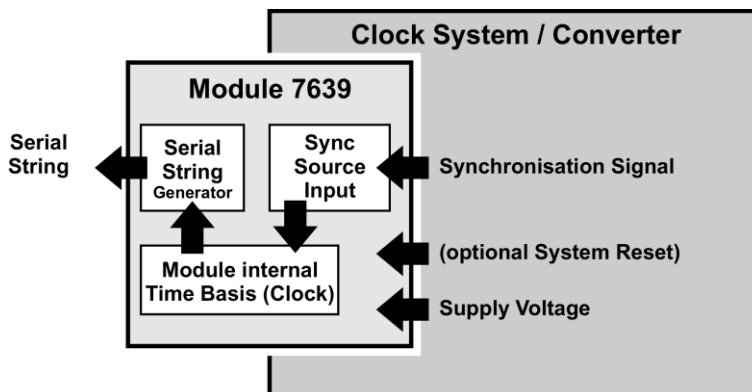


Module 7639 has only *one* logical interface issued in various physical formats via SUB-D plug.

Thus, only one output data string can be selected in module 7639.

The particular status of module 7639 will be displayed via 2 respectively 3 LEDs (depending on module version) at the front panel. The LEDs enable to recognize visually a successful / interfered synchronization as well as the activity of the 2 signal outputs.

## Functional Principle:



## 2 Connection Elements of the Module 7639

In this chapter you can find the description of connecting elements and LED elements of module 7639.

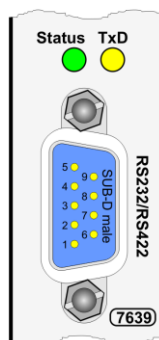


Connection of power supply and the supply of the synchronization signal are done system-internally.

### 2.1 Example of Front panels

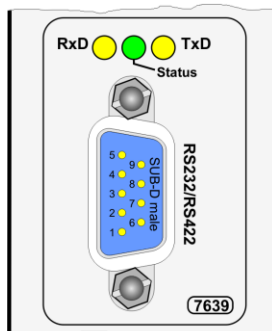
#### Example 1: module cover with 2 LEDs – TxD/Status

Extract 3U cover with module version 2 LEDs



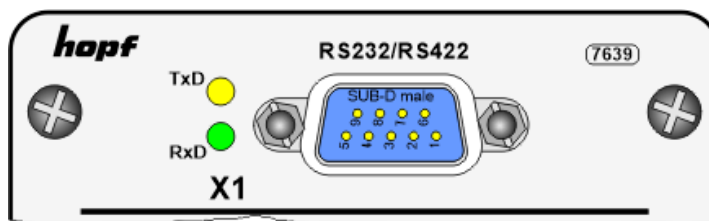
#### Example 2: module cover with 3 LEDs – RxD/Status/TxD

Extract DIN rail cover with module version 3 LEDs



#### Example 3: module cover with 2 LEDs – TxD/Status:

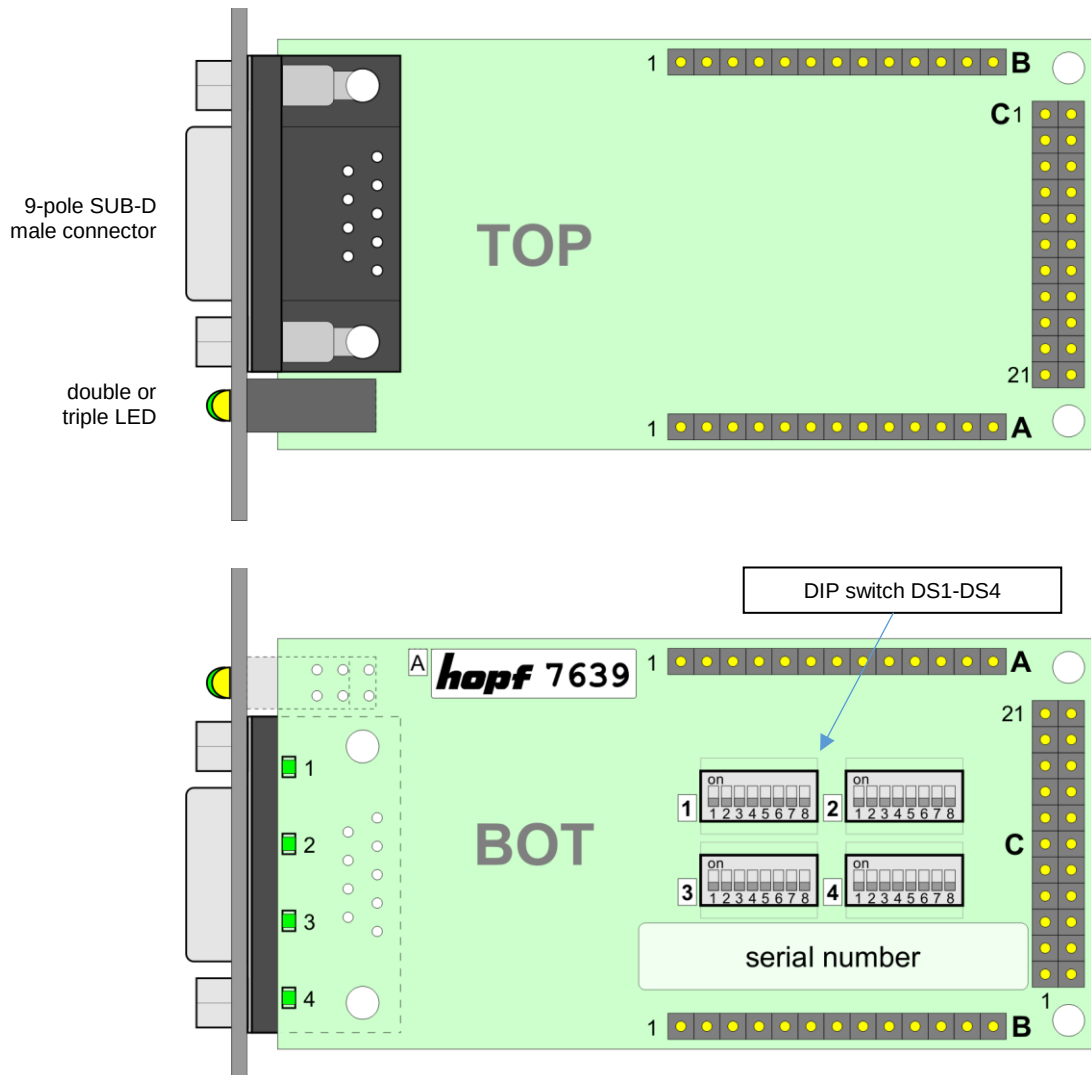
Extract 80xxHEPTA cover with module version 2 LEDs





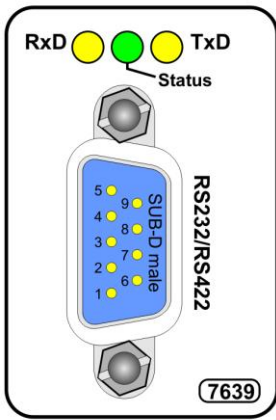
## 2.2 Components Overview of Module 7639

This chapter describes the arrangement of the module components.



## 2.3 Description of the Front Panel Elements

Assignment of the 9-pole SUB-D male connector.



| Serial-Remote          |                                          |
|------------------------|------------------------------------------|
| LED                    | double / triple LED                      |
| RxD                    | LED gn/ye - reception of serial data     |
| Status                 | LED green - Sync.-Status                 |
| TxD                    | LED yellow - transmission of serial data |
| 9-pole SUB-D connector |                                          |
| Pin                    | Signal                                   |
| 1                      | n.c.                                     |
| 2                      | RS232c RXD (receive data)                |
| 3                      | RS232c TXD (transmit data)               |
| 4                      | Switching service interface              |
| 5                      | GND                                      |
| 6                      | RS422 +TxD (high avtive)                 |
| 7                      | RS422 -TxD (low avtive)                  |
| 8                      | RS422 +RxD (high active)                 |
| 9                      | RS422 -RxD (low active)                  |

n.c. = not connected



Pin 4 of the SUB-D plug is currently not in use and **must** remain free!

## 2.4 Function of Front Panel LEDs

Depending on the application, the 7639 module is available in different versions (with 2 LEDs or optionally with 3 LEDs).

### 2.4.1 Module Front Panel with 2 LEDs

| <b>TxD - LED yellow</b> | <b>TxD - meaning</b>     |
|-------------------------|--------------------------|
| ON                      | Transmission serial data |
| OFF                     | No activity              |
| <b>RxD - LED green</b>  | <b>RxD - meaning</b>     |
| ON                      | Receiving serial data    |
| OFF                     | No activity              |

Respectively

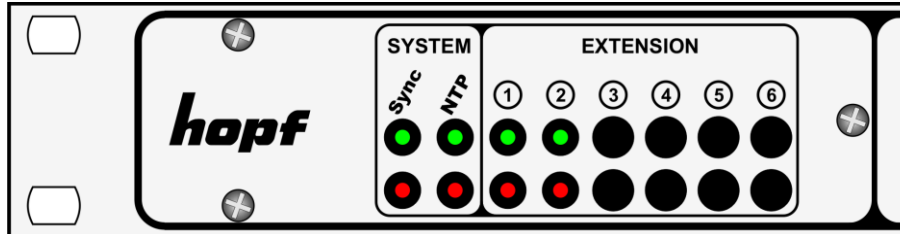
| <b>TxD - LED yellow</b>   | <b>TxD - meaning</b>                                    |                      |
|---------------------------|---------------------------------------------------------|----------------------|
| ON                        | Transmission serial data                                |                      |
| OFF                       | No activity                                             |                      |
| <b>Status - LED green</b> | <b>Status - meaning</b>                                 | <b>Status-symbol</b> |
| ON                        | <b>Sync</b> (radio-synchronous) with quartz regulation  | <b>SYNC</b>          |
| Flashes 900ms             | <b>Sync</b> (radio-synchronous) - SyncOFF timer running | <b>SYOF</b>          |
| Flashes 500ms             | <b>Sync</b> (radio-synchronous) - simulation mode       | <b>SYSI</b>          |
| Flashes 500ms             | <b>Quartz</b> - SyncON timer running                    | <b>QUON</b>          |
| Flashes 500ms             | <b>Quartz</b> - time was set via synchronization source | <b>QUEX</b>          |
| Flashes 500ms             | <b>Quartz</b> - time set manually or after reset        | <b>QUSE</b>          |
| Flashes 100ms             | <b>No valid time</b>                                    | <b>INVA</b>          |
| OFF                       | No operating voltage / faulty                           | ---                  |

### 2.4.2 Module Front Panel with 3 LEDs

| <b>TxD - LED yellow</b>   | <b>TxD - meaning</b>                                    |                      |
|---------------------------|---------------------------------------------------------|----------------------|
| ON                        | Transmission serial data                                |                      |
| OFF                       | No activity                                             |                      |
| <b>Status - LED green</b> | <b>Status - meaning</b>                                 | <b>Status-symbol</b> |
| ON                        | <b>Sync</b> (radio-synchronous) with quartz regulation  | <b>SYNC</b>          |
| Flashes 900ms             | <b>Sync</b> (radio-synchronous) - SyncOFF timer running | <b>SYOF</b>          |
| Flashes 500ms             | <b>Sync</b> (radio-synchronous) – simulation mode       | <b>SYSI</b>          |
| Flashes 500ms             | <b>Quartz</b> - SyncON timer running                    | <b>QUON</b>          |
| Flashes 500ms             | <b>Quartz</b> - time was set via synchronization source | <b>QUEX</b>          |
| Flashes 500ms             | <b>Quartz</b> - time set manually or after reset        | <b>QUSE</b>          |
| Flashes 100ms             | <b>No valid time</b>                                    | <b>INVA</b>          |
| OFF                       | No operating voltage / faulty                           | ---                  |
| <b>RxD - LED yellow</b>   | <b>RxD - meaning</b>                                    |                      |
| ON                        | Receiving serial Data                                   |                      |
| OFF                       | No activity                                             |                      |

### 2.4.3 System Front Panel in case of using the Module in 1U Time Server 80xxHEPTA

In 1U Time Server 80xxHEPTA module 7639 additionally indicates its current synchronization status via a pair of extension status LEDs 1-6 on the HEPTA front panel.



The meanings of the LEDs are as follows:

| LED RD<br>- Red | LED GN<br>- Green | Status                                                  |
|-----------------|-------------------|---------------------------------------------------------|
| OFF             | ON                | <b>Sync</b> (radio-synchronous) with quartz regulation  |
| OFF             | Flashes           | <b>Sync</b> (radio-synchronous) - SyncOFF timer running |
| Flashes         | ON                | <b>Sync</b> (radio-synchronous) - simulation mode       |
| Flashes         | Flashes           | <b>Quarz</b> - SyncON timer running                     |
| ON              | ON                | <b>Quarz</b> - time was set via synchronization source  |
| ON              | Flashes           | <b>Quarz</b> - time set manually or after reset         |
| ON              | OFF               | <b>No valid time</b>                                    |
| 3Hz             | OFF               | <b>General Module Error (PCID)</b>                      |
| OFF             | OFF               | <b>No operating voltage / faulty</b>                    |

### 3 Commissioning

After the parameterization of the module (via DIP switch) has been completed commissioning is carried out by switching-on the basis system or rather the converter.

### 4 Configuration of the Module

The used synchronization signal and the signal output at the connecting elements need to be configured according to the appropriate application.



**Attention:** Never work on the open unit when voltage is applied! Danger to life!



**ESD** The system contains ESD-sensitive components, briefly when touching these elements ESD safety measures needs to be observed.



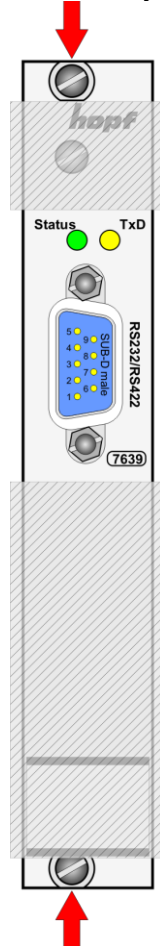
Using the module in **hopf** basis systems the relevant settings are usually carried out at the factory.

## 4.1 Access to the Module

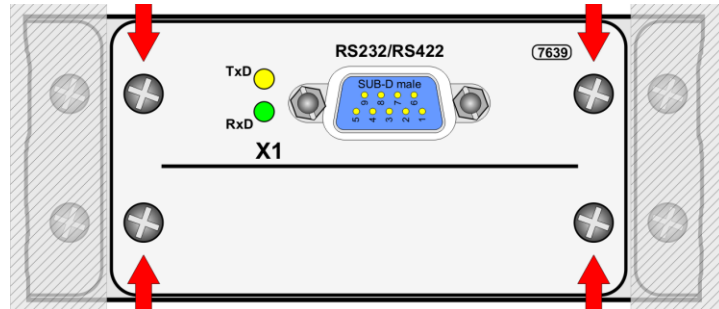
For the configuration of the module it needs to be pulled out of the appropriate **hopf** basis system / converter and the following steps are to be accomplished:

1. Switch-OFF and disconnect the device
2. Loosen the fixing screws of the appropriate module front panel

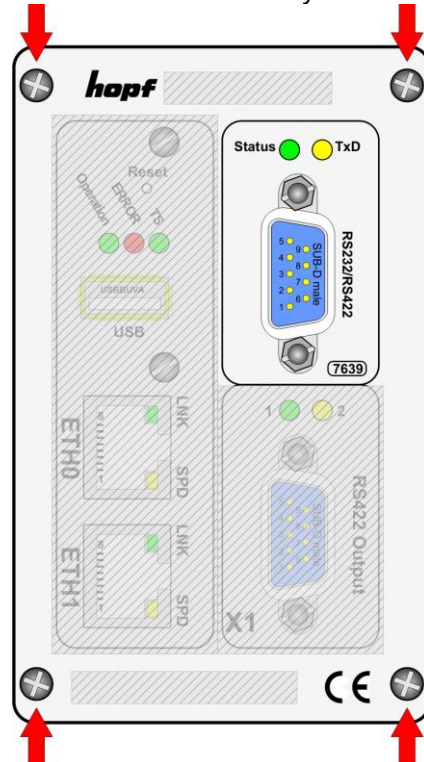
Module in 3U System



Module in 1U Time Server



Module in DIN rail system



3. Pull the panel with the Module carefully out of the housing. Ensure that no internal connecting cables are severed or get damaged.
4. Configure the component via DIP switch
5. Afterwards insert the component carefully into the housing by considering the connecting cable.
6. Fix the front panel with the screws.

## 4.2 DIP switch DS1-DS4

The module configuration can be setup via DIP switch DS1-DS4.



The DIP Switch should only be adjusted carefully with an appropriate tool in order to avoid damage to the switch.

### 4.2.1 DIP switch DS1 - interface parameter

The standard interface parameters are set via the DIP switch DS1.

#### 4.2.1.1 Setup baud rate

| DS1 switch 8 | DS1 switch 3 | DS1 switch 2 | DS1 switch 1 | baud rate                |
|--------------|--------------|--------------|--------------|--------------------------|
| OFF          | OFF          | OFF          | OFF          | 9600 baud                |
| OFF          | OFF          | OFF          | ON           | 1200 baud                |
| OFF          | OFF          | ON           | OFF          | 4800 baud                |
| OFF          | OFF          | ON           | ON           | 9600 baud                |
| OFF          | ON           | OFF          | OFF          | 19200 baud               |
| OFF          | ON           | OFF          | ON           | 38400 baud               |
| OFF          | ON           | ON           | OFF          | 57600 baud               |
| OFF          | ON           | ON           | ON           | 115200 baud              |
| ON           | OFF          | OFF          | OFF          | 300 baud                 |
| ON           | OFF          | OFF          | ON           | 600 baud                 |
| ON           | OFF          | ON           | OFF          | 2400 baud                |
| ON           | OFF          | ON           | ON           | Free currently 9600 baud |
| ON           | ON           | OFF          | OFF          | Free currently 9600 baud |
| ON           | ON           | OFF          | ON           | Free currently 9600 baud |
| ON           | ON           | ON           | OFF          | Free currently 9600 baud |
| ON           | ON           | ON           | ON           | Free currently 9600 baud |

#### 4.2.1.2 Setup word length

| DS1 switch 7 | meaning    |          |
|--------------|------------|----------|
| OFF          | 8 data bit | standard |
| ON           | 7 data bit |          |

#### 4.2.1.3 Setup parity mode

| DS1 switch 6 | DS1 switch 5 | meaning     |          |
|--------------|--------------|-------------|----------|
| OFF          | OFF          | no parity   | standard |
| OFF          | ON           | no parity   |          |
| ON           | OFF          | parity even |          |
| ON           | ON           | parity odd  |          |

#### 4.2.1.4 Setup stop bits

| SW1 switch 4 | meaning     |          |
|--------------|-------------|----------|
| OFF          | 1 stop bit  | Standard |
| ON           | 2 stop bits |          |

## 4.2.2 DIP switch DS2 - Setup data string

### 4.2.2.1 Output local time, standard time or UTC

Usually, the local time is set as time base for output. This time is going to be adjusted by one hour in case of switching from summer time to winter time and vice versa. In case of standard or UTC time base no time adjustments will take place by activating summer time.

| DS2 switch 8 | DS2 switch 7 | meaning       |          |
|--------------|--------------|---------------|----------|
| OFF          | OFF          | Local time    | Standard |
| OFF          | ON           | Standard time |          |
| ON           | OFF          | UTC           |          |
| ON           | ON           | Local time    |          |

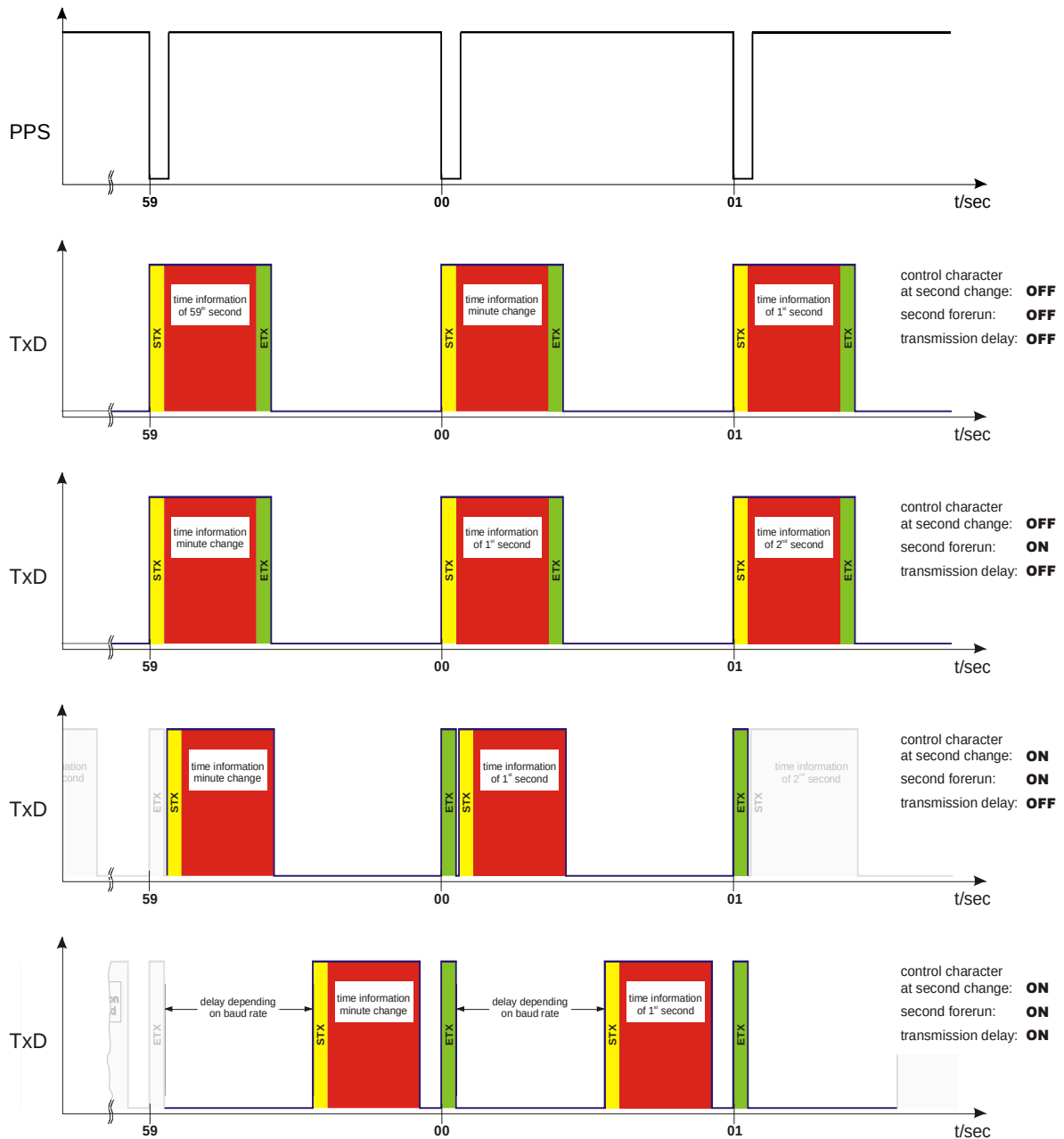


standard time (= winter time) ⇒ UTC + difference time from sync-signal  
 local time (summer time not active) ⇒ UTC + difference time from sync-signal  
 local time (summer time active) ⇒ UTC + difference time from sync-signal +1h



#### 4.2.2.2 Data String Transmission Points of Time

| DS2 switch 4 | DS2 switch 3 | forerun | ETX              | Transmission delay |          |
|--------------|--------------|---------|------------------|--------------------|----------|
| OFF          | OFF          | Off     | immediately      | Off                | Standard |
| OFF          | ON           | On      | immediately      | Off                |          |
| ON           | OFF          | On      | at second change | Off                |          |
| ON           | ON           | On      | at second change | On                 |          |



#### 4.2.2.3 Transmission cycle (every second / minute / hour / on request)

| DS2 switch 2 | DS2 switch 1 | Transmission point            |          |
|--------------|--------------|-------------------------------|----------|
| OFF          | OFF          | Every second                  | Standard |
| OFF          | ON           | Transmission at minute change |          |
| ON           | OFF          | Transmission at hour change   |          |
| ON           | ON           | Transmission on request       |          |

#### 4.2.3 DIP switch DS3 - data string configuration

| Data string-Block A<br>(DIP switch DS3 SW 6-8 = OFF) |     |     |     |     |                                                        |
|------------------------------------------------------|-----|-----|-----|-----|--------------------------------------------------------|
| DIP-Switch DS3                                       |     |     |     |     | Data string                                            |
| SW5                                                  | SW4 | SW3 | SW2 | SW1 |                                                        |
| OFF                                                  | OFF | OFF | OFF | OFF | <b>hopf</b> Standard string 6021                       |
| OFF                                                  | OFF | OFF | OFF | ON  | <b>hopf</b> String 6021 CR/LF                          |
| OFF                                                  | OFF | OFF | ON  | OFF | SINEC H1 Extended                                      |
| OFF                                                  | OFF | OFF | ON  | ON  | SAT1703 Time String                                    |
| OFF                                                  | OFF | ON  | OFF | OFF | <b>hopf</b> Master/Slave-String                        |
| OFF                                                  | OFF | ON  | OFF | ON  | IEC-103 (ASDU Type 6)                                  |
| OFF                                                  | OFF | ON  | ON  | OFF | 5050 H&B (PCZ 77)                                      |
| OFF                                                  | OFF | ON  | ON  | ON  | ION 7550                                               |
| OFF                                                  | ON  | OFF | OFF | OFF | Trimble Time String (TSIP)                             |
| OFF                                                  | ON  | OFF | OFF | ON  | <b>Free</b> currently <b>hopf</b> Standard string 6021 |
| OFF                                                  | ON  | OFF | ON  | OFF | <b>Free</b> currently <b>hopf</b> Standard string 6021 |
| OFF                                                  | ON  | OFF | ON  | ON  | <b>Free</b> currently <b>hopf</b> Standard string 6021 |
| OFF                                                  | ON  | ON  | OFF | OFF | <b>Free</b> currently <b>hopf</b> Standard string 6021 |
| OFF                                                  | ON  | ON  | OFF | ON  | <b>Free</b> currently <b>hopf</b> Standard string 6021 |
| OFF                                                  | ON  | ON  | ON  | OFF | <b>Free</b> currently <b>hopf</b> Standard string 6021 |
| OFF                                                  | ON  | ON  | ON  | ON  | <b>Free</b> currently <b>hopf</b> Standard string 6021 |
| ON                                                   | OFF | OFF | OFF | OFF | <b>Free</b> currently <b>hopf</b> Standard string 6021 |
| ON                                                   | OFF | OFF | OFF | ON  | <b>Free</b> currently <b>hopf</b> Standard string 6021 |
| ON                                                   | OFF | OFF | ON  | OFF | <b>Free</b> currently <b>hopf</b> Standard string 6021 |
| ON                                                   | OFF | OFF | ON  | ON  | <b>Free</b> currently <b>hopf</b> Standard string 6021 |
| ...                                                  | ... | ... | ... | ... | ...                                                    |
| ON                                                   | ON  | ON  | ON  | ON  | <b>Free</b> currently <b>hopf</b> Standard string 6021 |



If a data string is selected which is not used in the system, the **hopf** **Standard string 6021** is always output

## 4.2.4 DIP switch DS4 - configuration module 7639

### 4.2.4.1 Parameterization via DIP switch or via external remote control

| DS4 switch 8 | meaning                                                                                                                    |          |
|--------------|----------------------------------------------------------------------------------------------------------------------------|----------|
| OFF          | Parameterization via DIP switch                                                                                            | Standard |
| ON           | Parameterization via external remote control - only in combination with additional application (currently not implemented) |          |

### 4.2.4.2 Service mode reserved for **hopf** Elektronik GmbH

| DS4 switch 7 | Service mode                                                                                           |
|--------------|--------------------------------------------------------------------------------------------------------|
| OFF          | Reserved for <b>hopf</b> Elektronik GmbH, this setting cannot be changed and must always be <b>OFF</b> |

### 4.2.4.3 Additional Configuration of special data string outputs

As required string-specific functions of these DIP switches will be described in the chapter of the related data string.

| DS4 switch 6 | DS4 switch 5 | Point of transmission                                              |          |
|--------------|--------------|--------------------------------------------------------------------|----------|
| OFF          | OFF          | Switch for additional configuration of special data string outputs | Standard |
| OFF          | ON           | Switch for additional configuration of special data string outputs |          |
| ON           | OFF          | Switch for additional configuration of special data string outputs |          |
| ON           | ON           | Switch for additional configuration of special data string outputs |          |

## 4.2.5 Parameterization of the Synchronization Source

### Adjustment via: DS4 / SW1-SW4 - Default: No Default-Setting

The Module 7639 can be synchronized by different time information. Using these modules in **hopf** basis systems respectively in converters the necessary settings are performed by default (ex works).

Using the module in converter units the settings may be required by the customer.

This selection determines what kind of time information should be evaluated by the module.

| DS4 |     |     |     | Selection of Sync Source                                                   |
|-----|-----|-----|-----|----------------------------------------------------------------------------|
| SW4 | SW3 | SW2 | SW1 |                                                                            |
| OFF | OFF | OFF | OFF | 01: <b>hopf</b> Binary string with PPS (NTP configuration)                 |
| OFF | OFF | OFF | ON  | 02: <b>hopf</b> System-BUS 6000 with PPS                                   |
| OFF | OFF | ON  | OFF | 03: <b>hopf</b> System-BUS 7001 with PPS                                   |
| OFF | OFF | ON  | ON  | 04: <b>hopf</b> Master/Slave-String – transmission cycle: every minute     |
| OFF | ON  | OFF | OFF | 05: <b>hopf</b> Master/Slave-String - transmission cycle: every second     |
| OFF | ON  | OFF | ON  | 06: <b>hopf</b> Master/Slave-String with PPS – transm. cycle: every minute |
| OFF | ON  | ON  | OFF | 07: <b>hopf</b> Master/Slave-String with PPS – transm. cycle: every second |
| OFF | ON  | ON  | ON  | 08: DCF77 pulse (1Hz) – local time                                         |
| ON  | OFF | OFF | OFF | Free currently <b>hopf</b> Binary string with PPS                          |
| ON  | OFF | OFF | ON  | Free currently <b>hopf</b> Binary string with PPS                          |
| ON  | OFF | ON  | OFF | Free currently <b>hopf</b> Binary string with PPS                          |
| ON  | OFF | ON  | ON  | Free currently <b>hopf</b> Binary string with PPS                          |
| ON  | ON  | OFF | OFF | Free currently <b>hopf</b> Binary string with PPS                          |
| ON  | ON  | OFF | ON  | Free currently <b>hopf</b> Binary string with PPS                          |
| ON  | ON  | ON  | OFF | Free currently <b>hopf</b> Binary string with PPS                          |
| ON  | ON  | ON  | ON  | Free currently <b>hopf</b> Binary string with PPS                          |



There is no synchronization of the Module and also no generation of the signal for the output in case of an incorrect setting.

## 5 Data Strings

This Chapter describes the data strings supported by this module.

### 5.1 General Information about Data Output

When "last control character at second change" is set there is a transmission gap of up to 970msec., depending on the baud rate. This should be taken into consideration when programming the time-out on the reception side.



Received data on the serial interface that are not specified in the pertinent data string might disturb and interrupt the cyclic string output.

Possible string-specific settings are specified for all data strings.

|                           |                                                                                          |
|---------------------------|------------------------------------------------------------------------------------------|
| <b>required:</b>          | Required string settings must be set by the customer after selection of a data string.   |
| <b>pre-set:</b>           | After the first selection of the string via Remote, the parameters are set as indicated. |
| <b>freely adjustable:</b> | These parameters can be set as desired.                                                  |
| <b>fixed:</b>             | These parameters are set as and as long as the string is selected.                       |

## 5.2 **hopf** Standard String (6021)

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

### 5.2.1 Specified Settings

|                           |            |
|---------------------------|------------|
| <b>Required:</b>          | <b>No</b>  |
| <b>Freely adjustable:</b> | <b>All</b> |
| <b>Pre-set:</b>           | <b>No</b>  |

### 5.2.2 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)<br>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             |

### 5.2.3 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                         |
|----------------|----|----|----|----|---------------------------------|
| <b>Status:</b> | 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  | time / date invalid             |
|                | 0  | 1  | x  | x  | crystal operation               |
|                | 1  | 0  | x  | x  | radio operation                 |
|                | 1  | 1  | x  | x  | radio operation (high accuracy) |

|                         |   |   |   |   |  |            |
|-------------------------|---|---|---|---|--|------------|
| <b>Day of the Week:</b> | 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 | time invalid   | winter | no announcement       |
| 1 = 0001 | time invalid   | winter | announcement          |
| 2 = 0010 | time invalid   | summer | no announcement       |
| 3 = 0011 | time invalid   | summer | announcement          |
| 4 = 0100 | quartz         | winter | no announcement       |
| 5 = 0101 | quartz         | winter | announcement          |
| 6 = 0110 | quartz         | summer | no announcement       |
| 7 = 0111 | quartz         | summer | announcement          |
| 8 = 1000 | radio          | winter | no announcement       |
| 9 = 1001 | radio          | winter | announcement          |
| A = 1010 | radio          | summer | no announcement       |
| B = 1011 | radio          | summer | announcement          |
| C = 1100 | radio          | winter | no announcement       |
| D = 1101 | radio          | winter | announcement          |
| E = 1110 | radio          | summer | no announcement       |
| F = 1111 | radio          | summer | announcement          |

## 5.2.4 Example

(STX)E4123456180517(LF)(CR)(ETX)

- It is Thursday 18.05.2017 - 12:34:56 o'clock.
- radio operation (high accuracy)
- daylight saving time
- no announcement of a changeover
- ( ) - ASCII-control characters e.g. (STX)

### 5.2.5 Serial Requests with ASCII Characters

The transmission of a data string can also be triggered by the user on enquiry by means of an ASCII character. The following characters trigger the transmission of the standard string:

- ASCII "**D**" - for Time / Date (Local Time)
- ASCII "**G**" - for Time / Date (UTC Time)

The System answers within 1msec. with the corresponding data string.

Since this is often too fast for the requesting computer, it is also possible to realize a response delay in 10msec. steps on request via software. For the delayed transmission of the data string, the requesting computer transmits the lower case letters "**d**", "**g**" to the clock with a two position multiplication factor.

The clock interprets the multiplication factor as a hexadecimal value.

#### Example:

The computer transmits        **ASCII gFF**        (Hex 67, 46, 46)

The clock transmits the Time / Date (UTC Time) data string after approx. 2550 milliseconds.

## 5.3 **hopf** String 6021 CR/LF

The **hopf** data string 6021 CR/LF is described below. It corresponds to the **hopf** Standard string 6021 with the exception of the sequence of the control characters CR / LF.

|                           |            |
|---------------------------|------------|
| <b>Required:</b>          | <b>No</b>  |
| <b>Freely adjustable:</b> | <b>All</b> |
| <b>Pre-set:</b>           | <b>No</b>  |

### 5.3.1 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)<br>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             |



## 5.4 SINEC H1 Extended

Below the data string SINEC H1 Extended is described.

### 5.4.1 Specified Settings

|                           |            |
|---------------------------|------------|
| <b>Required:</b>          | <b>No</b>  |
| <b>Freely adjustable:</b> | <b>All</b> |
| <b>Pre-set:</b>           | <b>No</b>  |

### 5.4.2 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               |

### 5.4.3 Status

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

The characters mean the following:

|                    |             |                                                                        |
|--------------------|-------------|------------------------------------------------------------------------|
| Character no. 28 = | "#"         | no radio synchronisation after reset, time invalid                     |
|                    | " " (space) | radio synchronisation after reset, clock at least in crystal operation |
| Character no. 29 = | "*"         | time from internal crystal in the clock                                |
|                    | " " (space) | time by radio reception                                                |
| Character no. 30 = | "S"         | daylight saving time                                                   |
|                    | "U"         | UTC (Coordinated Universal Time)                                       |
|                    | " " (space) | standard time                                                          |
| Character no. 31 = | "!"         | announcement of a DST or standard time changeover                      |
|                    | "A"         | announcement of a leap second                                          |
|                    | " " (space) | no announcement                                                        |

### 5.4.4 Example

(STX)D:18.05.17;T:4;U:12.34.56; \_ \_ S \_ (ETX)      ( \_ ) = Space

- It is Thursday 18.05.17 - 12:34:56 o'clock
- radio operation
- summer time (daylight saving time)
- no announcement of a changeover

### 5.4.5 Serial Requests with ASCII Characters

The data string SINEC H1 Extended can also be sent by request.

The time of output will be set to "send only by request" and the string will be requested with the ASCII character "?".

## 5.5 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).

### 5.5.1 Specified Settings

|                           |            |
|---------------------------|------------|
| <b>Required:</b>          | <b>No</b>  |
| <b>Freely adjustable:</b> | <b>All</b> |
| <b>Pre-set:</b>           | <b>No</b>  |

### 5.5.2 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,<br>Daylight saving time<br>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<br>"*" (\$2A ⇒ not synchronous)                                          | \$20<br>\$2A                                       |                  |
| 26            | " " (\$20 ⇒ no announcement) or<br>"!" (\$21 ⇒ announcement of a DST or<br>standard time changeover) | \$20<br>\$21                                       |                  |
| 27            | CR (carriage return)                                                                                 | \$0D                                               |                  |
| 28            | LF (line feed)                                                                                       | \$0A                                               |                  |
| 29            | ETX                                                                                                  | \$03                                               |                  |

### 5.5.3 Status

The characters 21-26 in the SAT 1703 Time String indicate the synchronisation status of the clock as well as the output time.

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             |
|                       | " " (space) | time by radio reception                             |
| Character no. 26 =    | "!"         | announcement of a DST or standard time changeover   |
|                       | " " (space) | no announcement                                     |

### 5.5.4 Example

**(STX)18.05.17/4/02:34:45UTC\_ \_ \_ (CR)(LF)(ETX)**

- It is Thursday 18.05.2017 - 02:34:45 o'clock UTC
- The clock is synchronous

### 5.5.5 Serial Requests with ASCII Characters

The Data String can also be sent on request.

The point of transmission will be set to "transmission on request". The SAT 1703 Time String can be requested with ASCII-character "?".

## 5.6 **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)

### 5.6.1 Specified Settings

|                  |                                                                                                                                                                                                                                                                                                                                                                                                                                                               |
|------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Required:</b> | <p>The following settings are required for the synchronization of the <b>hopf</b> slave-systems:</p> <ul style="list-style-type: none"> <li>• Normally points of time every minute, depending on system also every second</li> <li>• output second forerun</li> <li>• ETX on the second change; selectable: data string at the beginning or at the end of the 59. second.</li> <li>• local time</li> <li>• 9600 baud, 8 bit, 1 stop bit, no parity</li> </ul> |
|------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|



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.

## 5.6.2 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  $\pm 14.00h$ .

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 <u>0</u> 300(LF)(CR)(ETX) | <u>0000</u>                 | - 03:00h        |
| (STX)83123456030196 <u>1</u> 100(LF)(CR)(ETX) | <u>0001</u>                 | - 11:00h        |
| (STX)83123456030196 <u>8</u> 230(LF)(CR)(ETX) | <u>1000</u>                 | + 02:30h        |
| (STX)83123456030196 <u>9</u> 100(LF)(CR)(ETX) | <u>1001</u>                 | + 11:00h        |

### 5.6.3 Status

|                         | b3 | b2 | b1 | b0 | Meaning                                                   |
|-------------------------|----|----|----|----|-----------------------------------------------------------|
| <b>Status:</b>          | 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:<br>INVA / QUSE / QUEX / QUON |
|                         | 1  | x  | x  | x  | synchronization status code:<br>SYOF / SYNC               |
| <b>Day of the Week:</b> | 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 /<br>QUEX / QUON | standard time | no announcement | no announcement |
| 1 = 0001 | INVA / QUSE /<br>QUEX / QUON | standard time | announcement    | no announcement |
| 2 = 0010 | INVA / QUSE /<br>QUEX / QUON | DST           | no announcement | no announcement |
| 3 = 0011 | INVA / QUSE /<br>QUEX / QUON | DST           | announcement    | no announcement |
| 4 = 0100 | INVA / QUSE /<br>QUEX / QUON | standard time | no announcement | announcement    |
| 5 = 0101 | INVA / QUSE /<br>QUEX / QUON | standard time | announcement    | announcement    |
| 6 = 0110 | INVA / QUSE /<br>QUEX / QUON | DST           | no announcement | announcement    |
| 7 = 0111 | INVA / QUSE /<br>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

#### 5.6.3.1.1.1.1 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

## 5.7 IEC-103 (ASDU Type 6)

Reference: IEC60870-5-103



This data string requires the configuration of **Mode Byte 3** (see **Chapter 5.7.4 Initialization String for IEC-103 (ASDU Type 6)**).

### 5.7.1 Specified Settings

|                                   |                                                                                                                                                                                                                                                                                                                                                                       |
|-----------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Required:</b>                  | <ul style="list-style-type: none"> <li>• baud rate: 9600 Baud</li> <li>• 8 data bit</li> <li>• 1 stop bit</li> <li>• parity: even</li> <li>• transmission point = every minute</li> <li>• control character at second change: off</li> <li>• second forerun: off</li> <li>• transmission delay: off</li> <li>• Mode byte 3 (address): 0 to 254 (\$00-\$FE)</li> </ul> |
| <b>Pre-set:<br/>(remote only)</b> | All <b>required</b> parameters & mode byte3 = 254 (\$FE)                                                                                                                                                                                                                                                                                                              |

For mode byte 3, the following 4 settings can be selected via the dip switch 4

| DS4<br>Switch 6 | DS4<br>Switch 5 | Initialization                           |       |
|-----------------|-----------------|------------------------------------------|-------|
| OFF             | OFF             | Modebyte3 = 254 (initialization address) | 1-254 |
| OFF             | ON              | Modebyte3 = 127 (initialization address) | 1-127 |
| ON              | OFF             | Modebyte3 = 63 (initialization address)  | 1-63  |
| ON              | ON              | Modebyte3 = 0 (initialization)           | aus   |



## 5.7.2 Structure

| Character No. | Meaning                                   | Hex-Value          |
|---------------|-------------------------------------------|--------------------|
| 1             | Start flag                                | \$68               |
| 2             | Length of Information                     | \$0F               |
| 3             | Repeated length of Information            | \$0F               |
| 4             | Start flag                                | \$68               |
| 5             | Control field                             | \$44               |
| 6             | Station address                           | \$FF               |
| 7             | Frame Type identification                 | \$06               |
| 8             | Variable structure identifier             | \$81               |
| 9             | Cause of transmission                     | \$08               |
| 10            | Common address of ASDU                    | \$FF               |
| 11            | Function type                             | \$FF               |
| 12            | Information number                        | \$00               |
| 13            | Milliseconds (Low octet)                  | \$0000-\$EA5F      |
| 14            | Milliseconds (High octet)                 |                    |
| 15            | Minutes (0..59) + MSB = Invalid Flag      | \$00-3B, \$80-\$BB |
| 16            | Hours (0..23) + MSB = SU Summer time Flag | \$00-17, \$80-\$97 |
| 17            | Days (1..31)                              | \$01-\$1B          |
| 18            | Months (1..12)                            | \$01-\$0C          |
| 19            | Years (00..99)                            | \$00-\$63          |
| 20            | Checksum (sum of fields 5 to 19 mod 256)  | \$00-\$FF          |
| 21            | End flag                                  | \$16               |

MSB of minute: 1 = clock is not synchronous (time invalid or quartz)  
0 = clock is synchronous

MSB of hour: 1 = daylight saving time  
0 = standard time

The seconds are displayed in the value of the milliseconds.

Thus the millisecond value runs from 0 .. 59999 decimal or from 0000 .. EA5F hexadecimal.  
(If output is set to the minute change this value is always 0)

The checksum is the sum of byte 5 to 19 Modulo 256.

## 5.7.3 Example

The length of the data string is fixed to 21 characters. All characters including special characters are allowed. Only binaurally values are transmitted.

The transmitted values are given out hexadecimal:

<68><0f><0f><68><44><ff><06><81><08><ff><ff><00><00><00><05><88><11><07><09><fe><16>

- Time is 08:05:00.000 at 17<sup>th</sup> July 2009
- daylight saving time
- The clock is synchronous.

### 5.7.4 Initialization String for IEC-103 (ASDU Type 6)

This initialization string is sent with ascending IEC address every second unless the minute change. The IEC address is continuously repeated from 1 to a selectable value of maximal 254 (\$01-\$FE). Setting up the IEC address is done in **Mode Byte 3**.



Disable the initialization string:

- Setting the IEC address to "0"
- or
- Transmission point: every minute

#### Mode Byte 3 for Initialization String IEC-103

| B7 | B6 | B5 | B4 | B3 | B2 | B1 | B0 | DEZ | HEX  | Note                         |
|----|----|----|----|----|----|----|----|-----|------|------------------------------|
| 0  | 0  | 0  | 0  | 0  | 0  | 0  | 0  | 0   | \$00 | Disabled DS4: SW5=1, SW4=1   |
| 0  | 0  | 0  | 0  | 0  | 0  | 0  | 1  | 1   | \$01 |                              |
| :  | :  | :  | :  | :  | :  | :  | :  | :   |      |                              |
| :  | :  | :  | :  | :  | :  | :  | :  | :   |      |                              |
| 0  | 0  | 0  | 0  | 1  | 1  | 1  | 1  | 15  | \$0F |                              |
| 0  | 0  | 0  | 1  | 0  | 0  | 0  | 0  | 16  | \$10 |                              |
| 0  | 0  | 0  | 1  | 0  | 0  | 0  | 1  | 17  | \$11 |                              |
| :  | :  | :  | :  | :  | :  | :  | :  | :   |      |                              |
| 0  | 0  | 1  | 1  | 1  | 1  | 0  | 1  | 63  | \$3F | DS4: SW5=1, SW4=0            |
| :  | :  | :  | :  | :  | :  | :  | :  | :   |      |                              |
| 0  | 1  | 1  | 1  | 1  | 1  | 1  | 1  | 127 | \$7F | DS4: SW5=0, SW4=1            |
| :  | :  | :  | :  | :  | :  | :  | :  | :   |      |                              |
| 1  | 1  | 1  | 1  | 1  | 1  | 0  | 0  | 252 | \$FC |                              |
| 1  | 1  | 1  | 1  | 1  | 1  | 0  | 1  | 253 | \$FD |                              |
| 1  | 1  | 1  | 1  | 1  | 1  | 1  | 0  | 254 | \$FE | Max. Value DS4: SW5=0, SW4=0 |

#### Structure IEC-103

| Character no. | Meaning                                | Hex Value |
|---------------|----------------------------------------|-----------|
| 1             | Start flag                             | 10        |
| 2             | Control field                          | 47        |
| 3             | IEC-Address                            | \$01-\$FE |
| 4             | Checksum (sum of fields 2 & 3 mod 256) | \$00-\$FF |
| 5             | End flag                               | 16        |

#### Example

The length of data string consists of 5 characters. Just binary values are sent.

The hexadecimal values of the transmitted characters are stated:

<10><47><01><48><<16> (String initializes unit with the address 01)

<10><47><02><49><<16>

:

<10><47><0F><56><<16>

<10><47><10><57><<16>

:

<10><47><FE><45><<16> (String with maximal valid address)

## 5.8 Data String 5050 H&B (PCZ 77)

This data string is compatible with the serial data string of the board 6830.

The "Hartmann and Braun" internal designation of the radio clock is PCZ 77.

### 5.8.1 Specified Settings

|                                                                     |                                                                                                                                                                                                                                                                                                              |
|---------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Required:</b><br><br><b>&amp;<br/>Pre-set:<br/>(remote only)</b> | <ul style="list-style-type: none"> <li>• baud rate: 1200 Baud</li> <li>• 7 data bit</li> <li>• 1 stop bit</li> <li>• parity: even</li> <li>• transmission point = every minute</li> <li>• control character at second change: on</li> <li>• second forerun: on</li> <li>• transmission delay: off</li> </ul> |
| <b>fixed</b>                                                        | ---                                                                                                                                                                                                                                                                                                          |

### 5.8.2 Structure

| Character No. | Meaning              | Hex-Value           |
|---------------|----------------------|---------------------|
| 1             | Hour Tens            | \$30-\$32           |
| 2             | Hour Unit            | \$30-\$39           |
| 3             | Space                | \$20                |
| 4             | Minute Tens          | \$30-\$35           |
| 5             | Minute Unit          | \$30-\$39           |
| 6             | Space                | \$20                |
| 7             | Second Tens          | \$30-\$35           |
| 8             | Second Unit          | \$30-\$39           |
| 9             | Space                | \$20                |
| 10            | Days Tens            | \$30-\$33           |
| 11            | Days Unit            | \$30-\$39           |
| 12            | Space                | \$20                |
| 13            | Month Tens           | \$30-\$31           |
| 14            | Month Unit           | \$30-\$39           |
| 15            | Space                | \$20                |
| 16            | Years Tens           | \$30-\$39           |
| 17            | Years Unit           | \$30-\$39           |
| 18            | Space                | \$20                |
| 19            | Status               | \$30-\$39,\$41-\$46 |
| 20            | Day of the week      | \$31-\$37           |
| 21            | CR (Carriage Return) | \$0D                |
| 22            | LF (Line Feed)       | \$0A                |

### 5.8.3 Status and Day of the Week Nibble

|                                | b3 | b2 | b1 | b0 | Meaning                               |
|--------------------------------|----|----|----|----|---------------------------------------|
| <b>Status nibble:</b>          | x  | x  | x  | 0  | Radio operation                       |
|                                | x  | x  | x  | 1  | Quartz operation                      |
|                                | x  | x  | 1  | x  | Announcement Winter/Summer/Wintertime |
|                                | x  | x  | 0  | x  | No announcement                       |
|                                | x  | 0  | x  | x  | CET (UTC + 1h)                        |
|                                | x  | 1  | x  | x  | CEST (UTC + 2h)                       |
|                                | 1  | 0  | 0  | x  | UTC                                   |
| <b>Day of the week nibble:</b> | 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                                |

### 5.8.4 Example

**12 34 56 03 01 96 03(CR) ... (LF)**

Radio operation, no announcement, wintertime (standard time)

It is Wednesday 03.01.96 - 12:34:56 o'clock

## 5.9 Data String ION 7550

### 5.9.1 Specified Settings

Table 1: Interface Parameter

|                         |                                                                                                                                                                                                                                                                                                                                                                                                                                        |
|-------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Pre-set:</b>         | <p>The following parameters are pre-set for the data string output (delivery status):</p> <ul style="list-style-type: none"> <li>• Baud rate: 9600 Baud</li> <li>• Data bits: 8</li> <li>• Stop bit(s): 1</li> <li>• Parity: no</li> <li>• Point of transmission: every second</li> <li>• Second forerun: no</li> <li>• Control character: yes</li> <li>• Control character at second change: off</li> <li>• CR/LF: CR ⇒ LF</li> </ul> |
| <b>Required:</b>        | -                                                                                                                                                                                                                                                                                                                                                                                                                                      |
| <b>Free adjustable:</b> | All parameter are free adjustable.                                                                                                                                                                                                                                                                                                                                                                                                     |



Warning: The accuracy specified in the data string is only achieved when the board is inserted into a GPS system with a time-out ( $\leq 2$  min).

### 5.9.2 Data String Structure

Table 2: Data String Structure

| Character No. | Meaning                          | Hex-Value              |
|---------------|----------------------------------|------------------------|
| 1             | SOH (start of header)            | \$01                   |
| 2             | Hundredth day of year            | \$30-\$33              |
| 3             | Tens day of the year             | \$30-\$39              |
| 4             | Units day of the year            | \$30-\$39              |
| 5             | ","                              | \$3A                   |
| 6             | Tens hours                       | \$30-\$32              |
| 7             | Units hours                      | \$30-\$39              |
| 8             | ","                              | \$3A                   |
| 9             | Tens minutes                     | \$30-\$35              |
| 10            | Units minutes                    | \$30-\$39              |
| 11            | ","                              | \$3A                   |
| 12            | Tens seconds                     | \$30-\$35              |
| 13            | Units seconds                    | \$30-\$39              |
| 14            | Indication of accuracy (table 3) | \$23, \$2A, \$2E, \$3F |
| 15            | CR (carriage return)             | \$0D                   |
| 16            | LF (line feed)                   | \$0A                   |

### 5.9.3 Status

Table 3: Indication of Accuracy

| Character |      | Description   | Meaning                  |
|-----------|------|---------------|--------------------------|
| ASCII     | HEX  |               |                          |
| ?         | \$3F | Question mark | Accuracy > 100 $\mu$ sec |
| #         | \$23 | Number sign   | Accuracy < 100 $\mu$ sec |
| *         | \$2A | Asterisk      | Accuracy < 10 $\mu$ sec  |
| .         | \$2E | Point         | Accuracy < 1 $\mu$ sec   |

Table 4: Duration of Accuracy Level by Loss of Synchronisation

| Accuracy level | Accuracy      | Max. Duration until next level | Accuracy Change |
|----------------|---------------|--------------------------------|-----------------|
| 0              | < 1 $\mu$ s   | Approx 1 minute                | . □ *           |
| 1              | < 10 $\mu$ s  | Approx 2 minutes               | * □ #           |
| 2              | < 100 $\mu$ s | Approx 27 minutes              | # □ ?           |
| 3              | > 100 $\mu$ s |                                | ?               |

Table 5: Duration of Accuracy Level in Case of Synchronisation

| Accuracy level | Accuracy    | Duration until next level                                |
|----------------|-------------|----------------------------------------------------------|
| 1 - 4          | > 1 ms      | Quartz operation until synchronisation                   |
| 0              | < 1 $\mu$ s | Radio, with quartz control until loss of synchronisation |

### 5.9.4 Data String Example

(SOH)303:12:34:56\*(CR)(LF)

- It is the 303<sup>rd</sup> day of year,
- 12:34:56 o'clock,
- the accuracy is better than 10  $\mu$ sec

## 5.10 Trimble Time String (TSIP)

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

### 5.10.1 Specified Settings

|                         |                                                                                                                                                                                                                                                                                                                |
|-------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Pre-set:</b>         | <ul style="list-style-type: none"> <li>• Point of transmission: every second</li> <li>• Output without second forerun</li> <li>• Output immediately</li> <li>• (no special character)</li> <li>• Last character immediately</li> <li>• UTC time</li> <li>• 9600 Baud, 8 Bit, 1 Stop bit, Parity Odd</li> </ul> |
| <b>Required:</b>        | -                                                                                                                                                                                                                                                                                                              |
| <b>Free adjustable:</b> | All parameter (not all have an effect)                                                                                                                                                                                                                                                                         |

### 5.10.2 Data String Structure

| Character No. | Meaning                                 | Hex-Value |
|---------------|-----------------------------------------|-----------|
| 1             | DLE                                     | \$10      |
| 2             | Packet ID                               | \$8F      |
| 3             | Sub packet ID                           | \$0B      |
| 4             | Event Count (0 for GPS)                 | \$00      |
| 5             | Event Count (0 for GPS)                 | \$00      |
|               | Weekly seconds:                         |           |
| 6             | Exponent 1. Byte                        | \$00-\$FF |
| 7             | Exponent 3. Nibble + 1. Nibble Mantissa | \$00-\$FF |
| 8             | Mantissa                                | \$00-\$FF |
| 9             | Mantissa                                | \$00-\$FF |
| 10            | Mantissa                                | \$00-\$FF |
| 11            | Mantissa                                | \$00-\$FF |
| 12            | Mantissa                                | \$00-\$FF |
| 13            | Mantissa LSB                            | \$00-\$FF |
|               | Date                                    |           |
| 14            | Day                                     | \$01-\$1F |
| 15            | Month                                   | \$01-\$0C |
| 16            | Year 1. Byte                            | \$00-\$FF |
| 17            | Year 2. Byte                            | \$00-\$FF |
|               |                                         |           |
| 18-76         | GPS Data (at present all = 0)           | \$00-\$FF |
| 77            | DLE                                     | \$10      |
| 78            | ETX                                     | \$03      |





## 6 Technical Data

### General

| General Data             |                                                                            |
|--------------------------|----------------------------------------------------------------------------|
| Operation                | via DIP switches                                                           |
| Installation Position    | any position                                                               |
| Protection Type of Board | IP00                                                                       |
| Dimensions of Module     | multi-layer board 80mm x 40mm                                              |
| Power Supply             | 5V DC $\pm$ 5% (system internal)                                           |
| Power Consumption        | 150mA to 300mA<br>(depending on the module variant and the interface used) |
| MTBF                     | > 950,000 hours                                                            |
| Weight                   | < 0.05kg                                                                   |

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

| CE Conformity                                        |  |
|------------------------------------------------------|--|
| EMV Directive 2014/30/EU                             |  |
| EN 55022 : 2010 / AC : 2011                          |  |
| EN 61000-3-2 : 2006 / A2 : 2009, EN 61000-3-3 : 2013 |  |
| EN 55024 : 2010                                      |  |
| Low Voltage Directive 2014/35/EU                     |  |
| EN 60950-1 : 2006 / AC : 2011                        |  |

| Potential Isolation (optional) |                                 |
|--------------------------------|---------------------------------|
| Insulation Voltage:            | at least 500V DC 1000M $\Omega$ |

| Module - Signal Outputs (standard configuration)        |                                                                                                                                             |
|---------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------|
| Full-duplex serial remote interface (without handshake) | Via 9-pole SUB-D (male) connector in the front panel - in level: <ul style="list-style-type: none"> <li>• RS232</li> <li>• RS422</li> </ul> |
| Pulse output (optional)                                 | Via 9-pole SUB-D (male) connector in the front panel - in level: <ul style="list-style-type: none"> <li>• RS232</li> <li>• RS422</li> </ul> |

### Special production:

Modifications can be made to hardware and software in accordance with customer specifications.



**hopf** Elektronik GmbH reserves the right to modify hardware and software at any time.