Industriefunkuhren

hopf Elektronik GmbH

# Technical Manual

# Model 6855 DCF77
# Slim Line (1U)

**ENGLISH**

**Version: 09.02 – 04.09.2006**

Valid for Devices 6855 DCF77 with FIRMWARE Version: **09.xx**

hopf Elektronik GmbH
Nottebohmstr. 41 • D-58511 Lüdenscheid • Tel.: +49 (0)2351 9386-86 • Fax: +49 (0)2351 9386-93 • Internet: http://www.hopf.com • E-Mail: info@hopf.com

## 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.

SEE:

- ***4.4 Display after System Start/Reset (Firmware)***

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

## 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.



hopf Elektronik GmbH
Nottebohmstr. 41 • D-58511 Lüdenscheid • Tel.: +49 (0)2351 9386-86 • Fax: +49 (0)2351 9386-93 • Internet: http://www.hopf.com • E-Mail: info@hopf.com

## 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

CE

This device fulfils the requirements of the EU directive 89/336/EWG "Electromagnetic compatibility" and 73/23/EWG "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.



***hopf*** Elektronik GmbH
Nottebohmstr. 41 • D-58511 Lüdenscheid • Tel.: +49 (0)2351 9386-86 • Fax: +49 (0)2351 9386-93 • Internet: http://www.hopf.com • E-Mail: info@hopf.com

## Contents Page





*hopf* Elektronik GmbH
Nottebohmstr. 41 • D-58511 Lüdenscheid • Tel.: +49 (0)2351 9386-86 • Fax: +49 (0)2351 9386-93 • Internet: http://www.hopf.com • E-Mail: info@hopf.com

hopf Elektronik GmbH
Nottebohmstr. 41 • D-58511 Lüdenscheid • Tel.: +49 (0)2351 9386-86 • Fax: +49 (0)2351 9386-93 • Internet: http://www.hopf.com • E-Mail: info@hopf.com

***hopf*** Elektronik GmbH
Nottebohmstr. 41 • D-58511 Lüdenscheid • Tel.: +49 (0)2351 9386-86 • Fax: +49 (0)2351 9386-93 • Internet: http://www.hopf.com • E-Mail: info@hopf.com

***hopf*** Elektronik GmbH
Nottebohmstr. 41 • D-58511 Lüdenscheid • Tel.: +49 (0)2351 9386-86 • Fax: +49 (0)2351 9386-93 • Internet: http://www.hopf.com • E-Mail: info@hopf.com

***hopf*** Elektronik GmbH
Nottebohmstr. 41 • D-58511 Lüdenscheid • Tel.: +49 (0)2351 9386-86 • Fax: +49 (0)2351 9386-93 • Internet: http://www.hopf.com • E-Mail: info@hopf.com

hopf Elektronik GmbH
Nottebohmstr. 41 • D-58511 Lüdenscheid • Tel.: +49 (0)2351 9386-86 • Fax: +49 (0)2351 9386-93 • Internet: http://www.hopf.com • E-Mail: info@hopf.com

# 1 System Description: 6855 DCF77 Slim Line (1U)

The proven and tested ***hopf*** System 6855 DCF77 has been integrated into an 1U/84HP housing (**U = height unit**) in the Slim Line version, which is geared to meet today's computer and network technology requirements. In this way, the wide functionality range of the 3U housing designs is maintained in spite of the reduction in size. In addition, status LEDs to the front and rear and status (error) relays provide information about the equipment's operating condition.

The full modularity of the System 6855 DCF77 is available in the 1U design. This allows tailor-made solutions to be realized with the System 6855 DCF77. The System can be extended using Function Boards which can be added by the customer. In this way, functionality can be easily upgraded on site at low cost. Function Boards can also be exchanged directly on site.

A high degree of flexibility and availability is achieved combined with complete freedom from maintenance and high reliability.

A variety of Function Boards is available to cover almost every requirement, from the simple pulse output to the NTP time server.

The Slim Line version of the ***hopf*** System 6855 DCF77 will further complement the innovative product range of ***hopf*** Elektronik GmbH.



***hopf*** Elektronik GmbH
Nottebohmstr. 41 • D-58511 Lüdenscheid • Tel.: +49 (0)2351 9386-86 • Fax: +49 (0)2351 9386-93 • Internet: http://www.hopf.com • E-Mail: info@hopf.com

Some of the System's base functions:

- **Synchronization** by **DCF77 transmitter** in Frankfurt a.M. / Germany
- Operating possible as **Slave-System** and respectively as **Sub-Master Clock** - Synchronisation by superior ***hopf*** Clock System
- 1U **sheet steel housing with** robust aluminium front panel
- Simple operation via **keypad** and **LCD-display** on the front panel
- All **cable connections** on the rear side
- **Status LEDs** on both front and rear sides
- **Status output** via two relays (dry contacts) for power and synchronization
- **Wide voltage input range** 100-240V AC - for worldwide application
- Housing with additional **earth screw** for cables up to 16mm²
- **Active cooling** by two temperature-controlled fans
- Power input with **mains switch** compliant with IEC/EN 60320-1/C14 and EMI **network noise filter**
- Prepared for **retrofitting** of Function Boards by the customer
- Up to two independent **NTP time servers** can be implemented on one System
- Two independent **serial interfaces** (each in RS232 and RS422 format)
- **DCF77 antenna simulation** (77.5kHz) for the synchronization of an additional DCF77 clock system
- **Potential isolation** of the DCF77 antenna circuit
- Completely **maintenance-free** System
- **SyncOFF timer** (reception failure bypassing) for error message-free operation even in difficult reception conditions
- Redundant **multiple synchronization signal verification** for error-free and leap-free signal evaluation
- Maintenance-free buffered **back-up clock** for three days

Extension options

- Customer-specific system adaptations for "tailor-made" project solutions.



*hopf* Elektronik GmbH
Nottebohmstr. 41 • D-58511 Lüdenscheid • Tel.: +49 (0)2351 9386-86 • Fax: +49 (0)2351 9386-93 • Internet: http://www.hopf.com • E-Mail: info@hopf.com

## 1.1 System 6855 DCF77 Slim Line (1U) Design

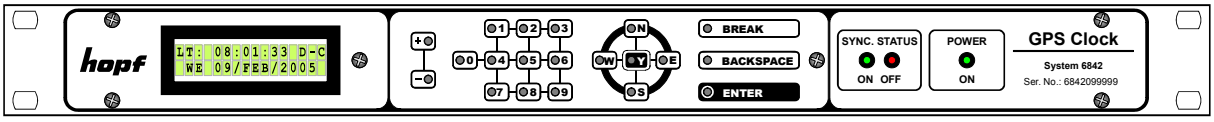
The system can be individually configured for various applications due to its partly modular design and can be easily upgraded or converted to suit changes in the application conditions.

### 1.1.1 19" Module Rack (1U)

The base system consists of the following:

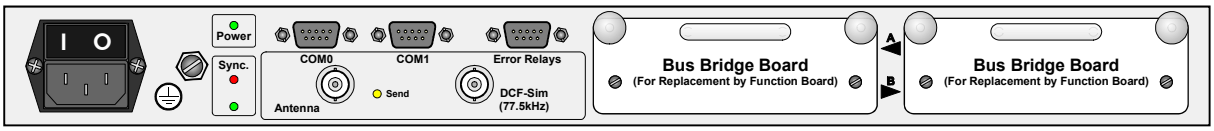
- 1/1 19" module rack 1U/84HP (Slim Line)
- Wide-ranging power supply unit from 100-240V AC / 20VA (47-63Hz)
  Other input voltages available
- Voltage input with mains switch and line filter
- Connection for protection earth (PE) cables up to 16mm²
- System front panel with LCD-Display (2x16), keypad (20 keys) and status LEDs

System front panel:




- Control Board 6855 for:
  - Synchronization signal reception and evaluation
  - Keypad control
  - Display control
  - System bus control
  - Time distribution in the system
- Two independent serial interfaces
- DCF77 antenna simulation (77.5kHz) via BNC socket
- System bus with two expansion slots

System rear side / connection side:






hopf Elektronik GmbH
Nottebohmstr. 41 • D-58511 Lüdenscheid • Tel.: +49 (0)2351 9386-86 • Fax: +49 (0)2351 9386-93 • Internet: http://www.hopf.com • E-Mail: info@hopf.com

## 1.1.2 Display

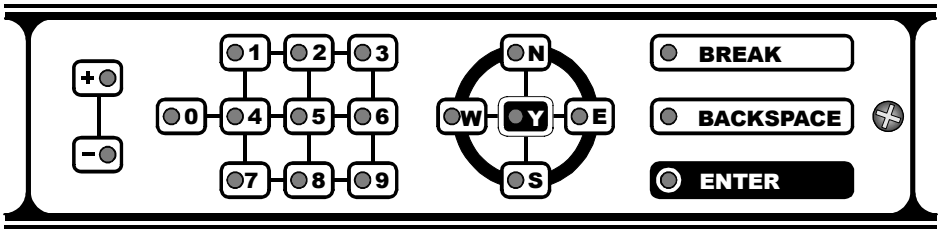
The display consists of a two-line LCD-Display (Liquid Crystal Display) with 2x16 characters and back-lighting.

The lighting is activated by pressing a key and switches off automatically after approx. 4 minutes when the keypad is not pressed.

For a description of the display functions please see ***Chapter 5 System Parameterization and Operation***.

## 1.1.3 Keypad

The alphanumeric keypad with 20 keys provides menu-driven operation of the clock system.

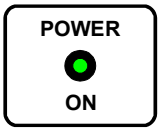
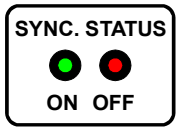
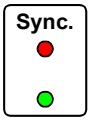



For keypad operation please see ***Chapter 4.5 Keypad Functions***.

## 1.1.4 Status LEDs

The System has status LEDs on both the front and rear sides. These allow the System status to be recognized in the installed condition in the control panel, whilst operating via the front panel as well as whilst checking the cabling on the rear side of the System.

The LEDs indicate the following System conditions:

| | | | | |
|---|---|---|---|---|
|  |  | **Power** (green) | ON | The System is in operation |
| | | | OFF | The System is out of operation (for example, it is switched off, defective or the power supply has failed) |
| Front side | Rear side | | | |
|  |  | **Sync.** (red) | ON | The system is **not** currently synchronized by DCF77 |
| | | **Sync.** (green) | ON | The system is currently synchronized by DCF77 or the status delay is active |



hopf Elektronik GmbH
Nottebohmstr. 41 • D-58511 Lüdenscheid • Tel.: +49 (0)2351 9386-86 • Fax: +49 (0)2351 9386-93 • Internet: http://www.hopf.com • E-Mail: info@hopf.com

### 1.1.5 System Bus 6000

The System Bus, consisting of the Bus Board with VG ledges, via which the Control Board 6855 and the Function Boards are connected, can be found in the System 6855.

The System Bus serves to provide:

- Distribution of the time information
- Communication between Control Board 6855 and the Function Boards
- Transmission of the regulated second pulse (PPS). This serves to synchronize the data output of the implemented Function Boards
- Distribution of the regulated DCF77 pulse (generated by the Control Board 6855)
- Circular auto-reset circuit for ongoing verification of the System Bus Function Boards to be found in the System
- Power supply for the installed boards

Each active Function Board (transmit and receive) which is linked to the System Bus has a **SEND** LED. This LED signals which of the Function Boards is active on the System Bus.

Function Boards which only receive data from the System Bus do not have a **SEND** LED.

### 1.1.6 Function Board Slots

Up to two Function Boards can be implemented in the System 6855 DCF77 Slim Line (1U).

As a basic principle, the slot can be freely selected for each 'Function Board' / 'System Bus Function Board'.

Exceptions of the slot selection can be found in ***Chapter 7 Function Boards***

Only boards that have been adapted for the 1U Slim Line System can be used in these slots.

Slots that have been prepared for special functions are identified with the letters **"A"** and **"B"**.

### 1.1.7 Temperature-controlled Forced Ventilation

The clock system has two temperature-controlled fans to prevent the operating temperature rising above the allowed limit as a result of thermal coupling with equipment mounted in the control panel.

These fans are mounted on the side ventilation apertures and switch in when the temperature in the equipment reaches approx. 45°C.

The ventilation apertures on the left and right hand sides must not be covered. Otherwise, active ventilation is ineffective and inadequate convection and/or thermal coupling with surrounding equipment may cause the temperature to rise above the equipment's maximum permissible operating temperature.



hopf Elektronik GmbH
Nottebohmstr. 41 • D-58511 Lüdenscheid • Tel.: +49 (0)2351 9386-86 • Fax: +49 (0)2351 9386-93 • Internet: http://www.hopf.com • E-Mail: info@hopf.com

## 1.2 Quick Install - with DCF77 Antenna

- Earth system / connect power supply
- Connect DCF77 antenna
- Switch on power supply
- Set system status byte to synchronization with DCF77 antenna signal
- Check correct setting of system status byte using **SHOW** function
- Align antenna (see ***Chapter 5.1.4.3 Antenna Alignment*** and DCF77 Antenna Equipment Description)
- Activate Master Reset

The equipment should be synchronous within less than 30 minutes.

Verifiable by:

- LCD display
- Status LED's
- Error Relays



hopf Elektronik GmbH
Nottebohmstr. 41 • D-58511 Lüdenscheid • Tel.: +49 (0)2351 9386-86 • Fax: +49 (0)2351 9386-93 • Internet: http://www.hopf.com • E-Mail: info@hopf.com

# 2 System 6855 DCF77 Synchronization

This Chapter describes the various options for synchronizing System 6855 and the settings to be observed in doing so for the correct output of local time and UTC time.

## 2.1 System 6855 DCF77 Synchronization Principle

System 6855 is a DCF77-based clock system. This means that the system, in principle, is synchronized with local time (standard time with ST/WT changeover, if required). Certain points must be noted in order for the system to transmit both local time and UTC time correctly.

In System 6855 DCF77, UTC time is a calculated time which is determined on the basis of the time offset and changeover points of time for summer time and winter time.

The DCF77 Transmitter (location: Mainflingen, Frankfurt am Main / Germany) always transmits time information as local time (CET/CEST). This means that **UTC time is calculated** for DCF77 systems. Two variables are now required in order to convert from local time to UTC time:

- ***The time offset between UTC and the valid standard time (winter time) in the respective time zone***
- ***The changeover points of time between winter time and summer time – provided that such changeover takes place in the respective time zone***

The signal received via the DCF77 antenna contains this required information for the CET time zones (UTC+1h).

As a result, when configuring, it is necessary to differentiate between system operation in the CET time zone and system operation as a slave or sub-master system for worldwide application.

### 2.1.1 Operation in the CET Time Zone (Europe)

If the system is configured for operation in the CET time zone, settings for time offset and changeover points of time are not required or are ignored, since the time offset is fixed and the ST/WT changeover is controlled by information contained in the synchronization signal.

Fixed **time offset**: Standard time (winter time) ⇨ UTC + 1h
Summer time ⇨ UTC + 2h

**Changeover point of time + current time status** (summer or winter time) are taken from the synchronization signal



hopf Elektronik GmbH
Nottebohmstr. 41 • D-58511 Lüdenscheid • Tel.: +49 (0)2351 9386-86 • Fax: +49 (0)2351 9386-93 • Internet: http://www.hopf.com • E-Mail: info@hopf.com

### 2.1.2 Operation in a different Time Zone (Worldwide)

If the system is configured for worldwide application, in order for UTC time output to be correct, the time offset must be parameterized for the respective time zone. Settings for the changeover points of time are not required, or are ignored, since the ST/WT changeover is controlled by the information contained in the synchronization signal.

**Time offset**: Standard time (winter time) ⇨ Set time offset
Summer time ⇨ Set time offset +1h

**Changeover point of time + current time status** (summer or winter time) are taken from the synchronization signal

### 2.1.3 Quartz Clock Operation (CET / Worldwide)

If the system is configured and operated as a quartz clock with no synchronization, the valid time offset for the respective time zone at the installation location must **always** be set as well as the changeover points of time for summer time and winter time, if applicable.

## 2.2 Summary / Synchronization Source Settings

System synchronization options and their required settings:

| | MENU 1: SET (see Chapter 5.1.1 ) | DCF77 Antenna Signal | | DCF77 Pulse (Option) | | Serial Data String | | Quartz Clock |
|---|---|---|---|---|---|---|---|---|
| | | CET | World-wide | CET | World-wide | CET | World-wide | CET / World-wide |
| 1.01 | TIME | o | o | o | o | o | o | + |
| 1.02 | TIME OFFSET | - | + | - | + | - | + | + |
| 1.03 | CHANGEOVER TIME W ⇨ S (Standard- ⇨ Summer time) | - | - | - | - | - | - | (+) |
| 1.04 | CHANGEOVER TIME S ⇨ W (Summer- ⇨ Standard time) | - | - | - | - | - | - | (+) |
| **1.20** | **SYSTEM STATUS (Bit2 - Bit0)** | **001** | **100** | **010** | **101** | **011** | **110** | **000** |

\+ Always required

(+) Only when necessary

o Not required – but possible

\- Input not possible or no function



hopf Elektronik GmbH
Nottebohmstr. 41 • D-58511 Lüdenscheid • Tel.: +49 (0)2351 9386-86 • Fax: +49 (0)2351 9386-93 • Internet: http://www.hopf.com • E-Mail: info@hopf.com

### 2.2.1 Synchronization with DCF77 Antenna - CET Time Zone only

DCF77 antenna equipment which receives or distributes the original DCFF time character signal is required for this purpose.

It is not necessary to set the time offset or changeover points of time. All information for the calculation of UTC time is transferred with the synchronization signal.

Only possible within the reception range of the DCF77 signal (CET time zone).

For further information about the signals see ***Chapter 12 Appendix***.

### 2.2.2 Synchronization with DCF77 Antenna Simulation (77.5kHz) - CET / WORLDWIDE

In this instance, the clock system generates an analogue, amplitude-modulated carrier signal which a connected, standard DCF77 radio-controlled clock is unable to differentiate from an "original" DCF77 signal received via an antenna. However, it is possible here to use other than just CET/CEST time bases for the signal to be simulated (e.g. installation location: Asia and DCF77 antenna simulation output via ***hopf*** GPS system). For this reason, the **Worldwide** setting for standard time to UTC time offset is freely selectable in this case.

Changeover between summer time and winter time also takes place via the synchronization signal in this instance.

For further information about the signals see ***Chapter 12 Appendix***.

### 2.2.3 Synchronization with DCF77 Pulse (Option) - CET / WORLDWIDE

DCF77 time information is transmitted in digital form with the DCF77 pulse. As in the case of DCF77 antenna simulation (77.5kHz), this signal can be generated by ***hopf*** GPS equipment and therefore can also be used for synchronization worldwide. In the case of the DCF77 pulse (1Hz), the parameters which require to be set by the customer are defined by the selected installation location.

DCF77 pulse input feed is **not** available on the standard version of this equipment type.
If such an input is required then this must be installed by ***hopf*** prior to delivery.
Retrofitting by the customer is **not** possible.

For further information about the signals see ***Chapter 12 Appendix***.

### 2.2.4 Synchronization via Serial Interface - CET / WORLDWIDE

On this setting, the ***hopf*** DCF-Slave data string is transmitted to the clock via the COM1 serial interface. This setting blocks the interface for other types of data communication (e.g. cyclical time telegram output).

Depending on the setting, the UTC time offset is either fixed at 1 hour or can be set as desired.

Changeover between summer time and winter time also takes place via the synchronization signal in this case.



*hopf* Elektronik GmbH
Nottebohmstr. 41 • D-58511 Lüdenscheid • Tel.: +49 (0)2351 9386-86 • Fax: +49 (0)2351 9386-93 • Internet: http://www.hopf.com • E-Mail: info@hopf.com

**Functional Description for Synchronization via Serial Data String**

A number of ***hopf*** radio-controlled clocks or systems can output the serial ***hopf*** DCF-Slave data string. This string serves for the synchronization of sub-master systems. It contains all the necessary data from the transmitting clock system, such as hour, minute, second, day, month, year and status information.

This string is transmitted every minute with the control characters STX (start of text) and ETX (end of text). The baud rate is 9600 baud, that is approx. 1 character per millisecond. With the exception of ETX, all time information is transmitted in the 59$^{th}$ second (the data for the next full minute is transmitted). ETX is transmitted exactly on the minute changeover.

Control Board 6855 evaluates the data received and, following checks for plausibility and upwards compatibility, prepares the data for synchronization.

The highly precise setting of the internal time takes place with the start edge of the ETX, transmitted exactly on the minute changeover, and the internal quartz base is also readjusted after several data strings have been received.

Synchronization with the DCF-Slave data string is only possible on COM1. When DCF-Slave synchronization is set then the serial parameters for COM1 are set automatically (see also **System Status** and **Serial Parameters**).

## 2.2.5 Quartz Clock Operation - CET / WORLDWIDE

Connected synchronization sources are not evaluated in this mode. The clock runs with the accuracy of the quartz base only.

All data such as time, date, time offset, and changeover points of time must be entered manually for the respective installation location.



*hopf* Elektronik GmbH
Nottebohmstr. 41 • D-58511 Lüdenscheid • Tel.: +49 (0)2351 9386-86 • Fax: +49 (0)2351 9386-93 • Internet: http://www.hopf.com • E-Mail: info@hopf.com

# 3 Installation

The following describes the installation of the System hardware.

## 3.1 Installation of the 19" Rack

The following steps are to be carried out:

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

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

- Ensure that there is sufficient space between the connection side of the rack and the control panel to allow for the connection of the cable to the System.

## 3.2 Earthing

The System 6855 DCF77 Slim Line (1U) is usually earthed via the PE cable of the power supply.

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

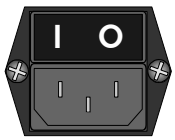
## 3.3 AC Power Supply

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

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

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

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




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

The System 6855 can be damaged if incorrect voltage is connected.



hopf Elektronik GmbH
Nottebohmstr. 41 • D-58511 Lüdenscheid • Tel.: +49 (0)2351 9386-86 • Fax: +49 (0)2351 9386-93 • Internet: http://www.hopf.com • E-Mail: info@hopf.com

### 3.3.1 Safety and Warning Instructions

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

**Caution:** Never work on an open unit with live power supply! Danger to life!

The System 6855 DCF77 Slim Line is an installation device. Installation and commissioning may only be carried out by suitably qualified specialist personnel. In doing so the respective country-specific specifications must be observed (e.g. VDE, DIN).

Before commissioning ensure that:

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

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

### 3.3.2 Power Supply Unit Specifications

All AC power supply specifications are contained in ***Chapter 10 Technical Data System 6855 DCF77 Slim Line (1U)***.

### 3.3.3 Fusing

Pay attention to the correct fusing of the power supply when connecting the System 6855 DCF77 Slim Line (1U)

The corresponding performance data can be taken from the equipment nameplate. The System 6855 DCF77 Slim Line (1U) is currently fitted with a power supply unit with a power consumption of max. 20VA.

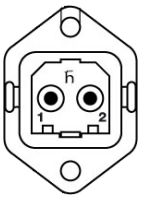
If the internal fuse (device protection) trips it is highly probable that the equipment is faulty. In this case the device should be checked in the factory.



hopf Elektronik GmbH
Nottebohmstr. 41 • D-58511 Lüdenscheid • Tel.: +49 (0)2351 9386-86 • Fax: +49 (0)2351 9386-93 • Internet: http://www.hopf.com • E-Mail: info@hopf.com

## 3.4 DC Power Supply (Option)

Ensure that the external power supply is switched off. When connecting the supply cable make sure that the polarity is correct and the equipment is earthed.



- The cable of the power supply is connected using a 2-pole plug connector with additional earth connection and interlocked with the System 6855 DCF77 Slim Line (1U):

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

The System 6855 can be damaged if incorrect voltage is connected.

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

### 3.4.1 Power Supply Unit Specifications

All DC power supply specifications are contained in ***Chapter 10 Technical Data System 6855 DCF77 Slim Line (1U)***.

### 3.4.2 Fusing

Pay attention to the correct fusing of the power supply when connecting the System 6855 DCF77 Slim Line (1U).

The corresponding performance data can be taken from the equipment nameplate. The System 6855 DCF77 Slim Line (1U) is currently fitted with a power supply unit with a power consumption of max. 20VA.

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

### 3.4.3 Reverse Voltage Protection

The version of System 6855 DCF77 Slim Line (1U) with DC supply has reverse voltage protection. This protection prevents damage to the equipment due to an incorrectly connected DC power supply.

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



hopf Elektronik GmbH
Nottebohmstr. 41 • D-58511 Lüdenscheid • Tel.: +49 (0)2351 9386-86 • Fax: +49 (0)2351 9386-93 • Internet: http://www.hopf.com • E-Mail: info@hopf.com

## 3.5 Synchronization Source Connection

A number of synchronization signals can be connected to System 6855 DCF77.

### 3.5.1 DCF77 Antenna

The coaxial cable of the DCF77 antenna equipment is connected to the BNC socket marked **"Antenna"** on the rear of the System. More detailed descriptions concerning the installation of the antenna equipment, such as cable lengths or cable types, for example, can be found in the document named "DCF77 Antenna Equipment".

### 3.5.2 DCF77 Antenna Simulation (77.5kHz)

The coaxial cable for DCF77 antenna simulation (77.5kHz) is connected to the BNC socket marked **"Antenna"** on the rear of the System.

Type RG59 coaxial cable is recommended as standard for connections between ***hopf*** Systems.

### 3.5.3 DCF77 Pulse (Option)

Additional hardware is required for the injection of a DCF77 pulse. This is in accordance with the signal level which is to be used for synchronization.

If this option was installed in the factory then connection details and signal level are to be taken from the system drawing provided.

### 3.5.4 Serial String

The synchronization string is always connected to the COM1 interface. In doing so attention is to be paid to the correct signal level.

See ***Chapter 3.6 COM0 / COM1 Serial Interfaces Connection***

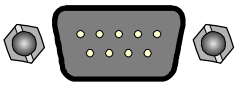


***hopf*** Elektronik GmbH
Nottebohmstr. 41 • D-58511 Lüdenscheid • Tel.: +49 (0)2351 9386-86 • Fax: +49 (0)2351 9386-93 • Internet: http://www.hopf.com • E-Mail: info@hopf.com

## 3.6 COM0 / COM1 Serial Interfaces Connection

The serial interfaces are assigned as follows:

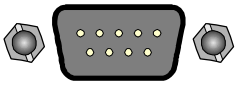
SUB-D connector
9 pin



**COM0**

| Pin | Assignment |
|---|---|
| 1 | |
| 2 | RxD RS232 |
| 3 | TxD RS232 |
| 4 | |
| 5 | GND |
| 6 | +TxD RS422 (high active) |
| 7 | -TxD RS422 (low active) |
| 8 | +RxD RS422 (high active) |
| 9 | -RxD RS422 (low active) |

SUB-D connector
9 pin

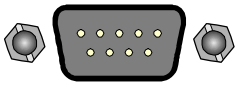


**COM1**

| Pin | Assignment |
|---|---|
| 1 | |
| 2 | RxD RS232 |
| 3 | TxD RS232 |
| 4 | |
| 5 | GND |
| 6 | +TxD RS422 (high active) |
| 7 | -TxD RS422 (low active) |
| 8 | +RxD RS422 (high active) |
| 9 | -RxD RS422 (low active) |

## 3.7 Error Relays Connection

SUB-D connector
9 pin



**Error Relays**

| Pin | Assignment |
|---|---|
| 1 | |
| 2 | PWR - REL2 Surge contact (c) |
| 3 | PWR - REL2 Normally open contact (no) |
| 4 | |
| 5 | GND |
| 6 | PWR - REL2 Normally closed contact(nc) |
| 7 | SYNC - REL1 Normally closed contact (nc) |
| 8 | SYNC - REL1 Surge contact (c) |
| 9 | SYNC - REL1 Normally open contact (no) |

**PWR** = Power / Operation – **SYNC** = Synchronous

## 3.8 DCF77 Antenna Simulation Connection (77.5kHz)

The antenna cable of the DCF77 System to be synchronized is connected to the System's BNC socket marked **"DCF-Sim"**. A type RG59 coaxial cable is recommended as standard for the connection between ***hopf*** Systems.

## 3.9 Function Boards Connection

The necessary steps to connect the Function Boards should be consulted in the respective technical specifications of the Function Boards present in the system.



*hopf* Elektronik GmbH
Nottebohmstr. 41 • D-58511 Lüdenscheid • Tel.: +49 (0)2351 9386-86 • Fax: +49 (0)2351 9386-93 • Internet: http://www.hopf.com • E-Mail: info@hopf.com

# 4 Commissioning

This chapter describes the commissioning of the system 6855.

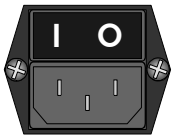
## 4.1 General Procedure

The commissioning procedure is as follows:

- Check the cabling:
  - Earth
  - Power supply
  - DCF77 antenna equipment
  - COM0 / COM1 serial interfaces
  - DCF77 antenna simulation (77.5kHz)
  - Error relays
  - Function Boards
- Isolate all plug connections to the output interfaces and Function Boards (recommended)
- DCF77 antenna equipment connection to remain in place
- Switch on System 6855
- Power LEDs light up on front and rear sides
- The start frame appears on the display (for approx. 3 seconds)
- Execute all parameter settings via the **SET menu** and also via the **INI** and **S.CLOCK menus** when necessary
- Check for successful synchronization of the System 6855
- Commission the Function Boards (where present):
  - Set the Function Board(s) parameters
  - Re-establish the plug connections
  - Check that the connected equipment is receiving the time correctly

## 4.2 Switching on the Operating Power Supply

**AC power supply:**




Put the mains power switch into position " **I** " (on).

The System 6855 DCF77 Slim Line (1U) runs and the firmware version and programming date are shown on the display (see ***Chapter 4.4 Display after System Start/Reset (Firmware)***).

**DC power supply:**

Switch on external power supply source.

The System 6855 DCF77 Slim Line (1U) runs and the firmware version and programming date are shown on the display (see ***Chapter 4.4 Display after System Start/Reset (Firmware)***).

The Power Status LED and the red Sync LED light up on the front and rear sides for both types of power supply.



hopf Elektronik GmbH
Nottebohmstr. 41 • D-58511 Lüdenscheid • Tel.: +49 (0)2351 9386-86 • Fax: +49 (0)2351 9386-93 • Internet: http://www.hopf.com • E-Mail: info@hopf.com

## 4.3 Selection of Display Language

System 6855 has both English and German language display menus.

The English display menus are described in the English Description and the German display menus are described in the German Description.

Setting takes place via the status byte (see ***Chapter 5.1.1.7 System Status Byte***).

## 4.4 Display after System Start/Reset (Firmware)

The following start frame appears on the 2x16 digit LCD-Display for approx. 3 seconds after switch-on or reset:

```
VERSION 09.03
 24.OCT.2003
```

⇨ Control Board 6855 firmware

⇨ Firmware programming date

### 4.4.1 Standard Display without Valid Time

The following frame (with incremental seconds) appears on the display on **first commissioning** or after a minimum of 3 days of **no voltage condition**:

```
LT:  00.00.01  ---
 --  00/---/2000
```

After a voltage failure of less than 3 days the display starts up with the internal back-up clock information, provided that time information was previously available.

### 4.4.2 Standard Display with Valid Time

Sample frame for the standard display after system start with valid back-up clock information or following manual input of the time information:

```
LT:  14:56:27  S-C
 MO  24/JAN/2006
```

The meaning of the individual items is as follows:

| | |
|---|---|
| **LT : 14:56:27** | On adjustment: show **local time** on the display. |
| **UT : 13:56:27** | On adjustment: show **UTC time** on the display. |
| **MO - TU - WE - TH - FR - SA - SU** | Display of the **weekday** in abbreviated form: corresponds to **MONDAY – SUNDAY** |
| **24/JAN/2006** | Display of the date: **Day / Month abbreviation / Year** |



hopf Elektronik GmbH
Nottebohmstr. 41 • D-58511 Lüdenscheid • Tel.: +49 (0)2351 9386-86 • Fax: +49 (0)2351 9386-93 • Internet: http://www.hopf.com • E-Mail: info@hopf.com

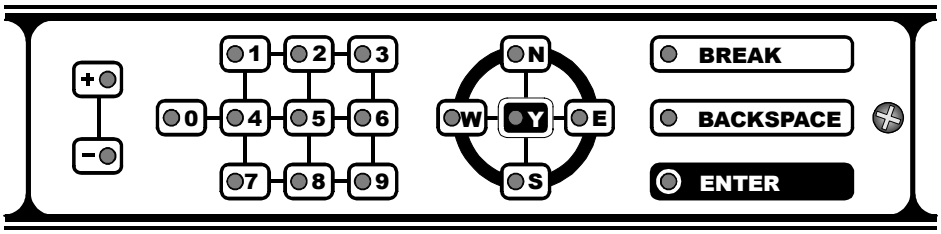
**Status display:**

| | | |
|---|---|---|
| Position 1: X-- | **"D"**<br>**"S"** | For summer time (Daylight-saving time)<br>For winter time (Standard time) |
| Position 2: -X- | **"A"**<br>**"_"** | Announcement of ST/WT changeover (summer time/ winter time changeover) to another time zone. This announcement takes place approx. 1 hour before the time zone change **or**<br>Announcement of a leap second. This information takes place approx. 1 hour before the insertion of the leap second. |
| Position 3: --X | **"C"**<br>**"r"**<br>**"R"** | Display of the internal status of the clock system:<br>**"C"** = Clock system is running in quartz operation (C=Crystal)<br>**"r"** = Clock system is synchronized with DCF77 **without** internal quartz base control<br>**"R"** = Clock system is synchronized with DCF77 **with** internal quartz base control (R=Radio) |

## 4.5 Keypad Functions

The following describes the keypad design and operation.

### 4.5.1 Keypad Layout




### 4.5.2 Key Assignment

| Key | Function |
|---|---|
| **+ / -** | Input of the operational signs for numerical values |
| **0 ... 9** | Input of the digits |
| **N, E, S, W** | Input keys |
| **Y** | Call up menu group selection frame |
| | |
| **BREAK** | Aborts all key controls. Quits the input menu at any time and in any position. All inputs following the most recent activation of the **ENTER** key are discarded. |
| **BACKSPACE** | Deletes the last character entered |
| **ENTER** | Calls up the main menu from the standard display.<br>Completes and accepts the input at the end of an input frame. When no input is made, pressing **ENTER** switches through to the next frame. |



hopf Elektronik GmbH
Nottebohmstr. 41 • D-58511 Lüdenscheid • Tel.: +49 (0)2351 9386-86 • Fax: +49 (0)2351 9386-93 • Internet: http://www.hopf.com • E-Mail: info@hopf.com

### 4.5.3 Keypad Inputs / Main Menu Activation

The main menu is activated by pressing the **ENTER** key.

The display changes from the standard frame to the main menu:

**Standard frame:**

```
LT:  14:56:27  S-C
  MO  24/JAN/2006
```

**Main menu:**

```
   SET=1  SHOW=2
S.CLOCK=3  INI=4
```

- The requested menu item is executed by entering the corresponding number.
- The cursor on the frame shows the point at which the next entry can take place.
- An incorrect input number is either directly refused or checked for plausibility after the **ENTER** key is pressed. An **"INPUT ERROR"** message follows. The display then returns to the standard frame.
- All of the selection functions are not always required or used. The System functions for which they are effective are indicated in the specification, at the beginning of each sub-function. If such a function is called up by mistake this can be exited by pressing the **BREAK** key.

## 4.6 Initialization

The base initialization of the equipment is carried out first. This enables the equipment to synchronize with DCF77.

To initialize the System 6855 DCF77 the menu items presented below are to be parameterized accordingly (see ***Chapter 5.1.1 SET Menu – Basic Settings System 6855***). In doing so attention should be paid to System and location specific requirements such as time base, synchronization source and synchronization parameters.

Menu items required for the base parameterization:

**MENU 1: #SET**

```
1.20   SYSTEM STATUS
```

The display language for menu navigation, the synchronization source and the time base for the time display (**LT** or **UT**) are set here. All further settings are to be carried out in accordance with the needs and use of the equipment.



hopf Elektronik GmbH
Nottebohmstr. 41 • D-58511 Lüdenscheid • Tel.: +49 (0)2351 9386-86 • Fax: +49 (0)2351 9386-93 • Internet: http://www.hopf.com • E-Mail: info@hopf.com

# 5 System Parameterization and Operation

The following explains the menu structure and the individual menus.

## 5.1 Menu Structure

The main menu is called up by pressing the **ENTER** key. This is divided into four different menu items. These are called up by entering the respective number (1-4). Following this entry the respective sub-menus are then called up.

The menu structure is constructed as follows:

**MENU 1: #SET**

```
1.01   TIME
1.02   DIF.-TIME
1.03   CHANGEOVER DATE (Changeover Standard time ⇨ Summer time)
1.04   CHANGEOVER DATE (Changeover Summer time ⇨ Standard time)
1.05   DAY OFFSET
1.06   COM0 - SERIALPARAMETER
1.07   COM0 - MODE 1
1.08   COM0 - MODE 2
1.09   COM1 - SERIALPARAMETER
1.10   COM1 - MODE 1
1.11   COM1 - MODE 2
1.12   LAN1 - ADR              (No Board 7270 in the System ⇨ no function)
1.13   LAN1 - GATEWAY          ( ------------------- " ------------------ )
1.14   LAN1 - NET-MASK         ( ------------------- " ------------------ )
1.15   LAN1 - CONTROL-BYTE     ( ------------------- " ------------------ )
1.16   LAN2 - ADR              (No 2nd Board 7270 in the System ⇨ no function)
1.17   LAN2 - GATEWAY          ( ------------------- " -------------------- )
1.18   LAN2 - NET-MASK         ( ------------------- " -------------------- )
1.19   LAN2 - CONTROL-BYTE     ( ------------------- " -------------------- )
1.20   SYSTEM STATUS
1.21   SPECIAL BYTE
1.22   STATUS OR PULSE OUTPUT
```



hopf Elektronik GmbH
Nottebohmstr. 41 • D-58511 Lüdenscheid • Tel.: +49 (0)2351 9386-86 • Fax: +49 (0)2351 9386-93 • Internet: http://www.hopf.com • E-Mail: info@hopf.com

### MENU 2: #SHOW

| | | |
|---|---|---|
| 2.01 | DIF.-TIME | |
| 2.02 | CHANGEOVER DATE (Changeover point of time Summer ⇨ Standard) | |
| 2.03 | CHANGEOVER DATE (Changeover point of time Standard ⇨ Summer) | |
| 2.04 | DAY OFFSET | |
| 2.05 | COM0 - SERIALPARAMETER | |
| 2.06 | COM0 - MODE 1 | |
| 2.07 | COM0 - MODE 2 | |
| 2.08 | COM1 - SERIALPARAMETER | |
| 2.09 | COM1 - MODE 1 | |
| 2.10 | COM1 - MODE 2 | |
| 2.11 | LAN1 - ADR | (No Board 7270 in the System ⇨ no function) |
| 2.12 | LAN1 - GATEWAY | ( ---------- " ---------- ) |
| 2.13 | LAN1 - NET-MASK | ( ---------- " ---------- ) |
| 2.14 | LAN1 - CONTROL-BYTE | ( ---------- " ---------- ) |
| 2.15 | LAN2 - ADR | (No 2nd Board 7270 in the System ⇨ no function) |
| 2.16 | LAN2 - GATEWAY | ( ---------- " ---------- ) |
| 2.17 | LAN2 - NET-MASK | ( ---------- " ---------- ) |
| 2.18 | LAN2 - CONTROL-BYTE | ( ---------- " ---------- ) |
| 2.19 | SYSTEM STATUS | |
| 2.20 | SPECIAL BYTE | |
| 2.21 | STATUS OR PULSE OUTPUT | |

### MENU 3: #S.CLOCK

| | |
|---|---|
| 3.01 | SLAVE CLOCK NO. 1-4; see Board 7406 manual<br>(if no Board 7406 in the System ⇨ no function) |

### MENU 4: #INI

| | |
|---|---|
| 4.01 | TIME-OUT FOR STATUS CHANGE |
| 4.02 | TIME-OUT FOR DCF77 SIMULATION |
| 4.03 | ANTENNA ALIGNMENT |
| 4.04 | DCF77 RESERVE |
| 4.05 | PROGRAMM RESET |
| 4.06 | MASTER RESET |



hopf Elektronik GmbH
Nottebohmstr. 41 • D-58511 Lüdenscheid • Tel.: +49 (0)2351 9386-86 • Fax: +49 (0)2351 9386-93 • Internet: http://www.hopf.com • E-Mail: info@hopf.com

## 5.1.1 SET Menu – Basic Settings System 6855

Input of basic setting functions such as time/date, time offset etc.

Grey script on the display corresponds to possible customer input.

Selection screens are confirmed with **'Y'** (yes) or rejected with **'N'** (no) or any key other than **'Y'** and **'BR'**. After entering **'N'** the next sub-function is displayed.

### 5.1.1.1 Input Time / Date

The local time is set with this input function. The entry is made on two lines and must be complete. For this purpose it is also necessary to input the leading zeros.

Selection frame:

```
 SET TIME Y/N _
```

Input frame:

```
TIME:HH:MM:SS
d.DD/MM/YYYY.Z_
```

The meaning of the individual items is as follows:

| Code | Meaning | Value Range |
|---|---|---|
| **HH** | Hour | 00 ... 23 |
| **MM** | Minute | 00 ... 59 |
| **SS** | Second | 00 ... 59 |
| **d** | Weekday | 1 = Monday ... 7 = Sunday |
| **DD** | Day | 01 ... 31 |
| **MM** | Month | 01 ... 12 |
| **YYYY** | Year | 1955 ... 2054 |
| **Z** | Time Zone | W = winter time; S = summer time |

The entry is accepted by pressing the **ENTER** key.

In case of an incorrect input the **"INPUT ERROR"** message appears for 3 seconds. The setting function is then exited and the standard frame reappears on the display.

If further entries are required, any key except **Y** and **BREAK** can be pressed to switch through the **SET** menu.

The setup program is exited by pressing the **BREAK** key. The standard frame reappears.



hopf Elektronik GmbH
Nottebohmstr. 41 • D-58511 Lüdenscheid • Tel.: +49 (0)2351 9386-86 • Fax: +49 (0)2351 9386-93 • Internet: http://www.hopf.com • E-Mail: info@hopf.com

#### 5.1.1.1.1 Set Time when setting Quartz Clock

**Effect when setting "Quartz Clock" without set changeover points of time:**

Input time / date: e.g. 12:34:56 1.12/06/2006.S

The display accepts the value entered, leaps from **S** to **W** after the next minute change and then remains in this time zone.

**Effect when setting "Quartz Clock" with set changeover points of time:**

Input time / date: e.g. 12:34:56 1.12/06/2006.S

If the entry is plausible (date and time zone correspond to the programmed changeover points of time) then this time is accepted into the System.

If the time zone entered (summer/winter time) differs from the system value existing prior to the entry then this is only transferred on the 2nd minute change following the entry. After the 1st minute change the system time leaps back, for 1 minute, to the value which existed prior to the entry. This occurrence is the result of a number of plausibility checks which the System executes internally.

### 5.1.1.2 Input Local Time to UTC Time Offset (Time Zone)

The time offset between the local standard time and the world time (UTC time) is entered with this function.

Selection frame:

```
SET DIF.- TIME
      Y/N _
```

Input frame:

```
DIF-TIME:+01:00_
```

The operational sign indicates the direction in which the local time differs from the world time:

- **'+'** Corresponds to East of the Null Meridian (Greenwich)
- **'-'** Corresponds to West of the Null Meridian (Greenwich)

Since most countries of the world count their time offset in whole hours, the input is also in one hour steps:

e.g. + 05:00 or - 11:00

However, some countries also use smaller time intervals. Therefore it is also possible to input the data in one minute steps:

e.g. + 05:30 or - 08:45

The time offset always relates to the **local standard time (winter time)**, even if commissioning or input of the time offset takes place during summer time.



hopf Elektronik GmbH
Nottebohmstr. 41 • D-58511 Lüdenscheid • Tel.: +49 (0)2351 9386-86 • Fax: +49 (0)2351 9386-93 • Internet: http://www.hopf.com • E-Mail: info@hopf.com

Example for Germany:

| UTC | Local Time | Time offset to be set: | Comment |
|---|---|---|---|
| 13:00:00 | 14:00:00 **(winter time)** | +01:00 | |
| 13:00:00 | 15:00:00 **(summer time)** | +01:00 | The time offset of two hours is made up of<br>+01:00h time offset and<br>+01:00h for the summer time offset (changeover points of time must be set for this purpose). |

### 5.1.1.3 Input ST/WT Changeover Points of Time

This input is used to define the points of time at which the changeover is made to summer time or to winter time throughout the course of the year. The hour, weekday, week and month in which the ST/WT changeover (summer time / winter time changeover) is to take place are given here. The exact points of time are then calculated automatically for the current year.

This input is only activated if the system is configured as quartz clock. In other modes the changeover is made automatically by the synchronisation signal.

The parameters are selected in such a way that the changeover can take place at any point of time. For control purposes, the exact date for the current year is indicated in the **Show** functions.

If the ST/WT changeover should **not** be activated another synchronisation mode has to be selected. After a minute change in this mode, the system has to be changed in the quartz mode. The ST/WT changeover is deactivated now.

Selection frame:

```
SET CHANGE_OVER
DATE  S->D  Y  N
```

For winter / summer time changeover (**S**tandard time ⇨ **D**aylight saving time)

Input frame:

```
S-->D  hh.d.w.MM
      >02.7.5.03<
```

Selection frame:

```
SET CHANGE_OVER
DATE  D->S  Y  N
```

For summer / winter time changeover (**D**aylight saving time ⇨ **S**tandard time)

Input frame:

```
D-->S  hh.d.w.MM
      >03.7.5.10
```

The meaning of the individual items is as follows:

| | | |
|---|---|---|
| **hh** | The hour<br>in which the changeover is to take place | 00 ... 23 hours |
| **d** | The weekday<br>on which the changeover is to take place | 1 = Mo ... 7 = Su |
| **w** | the appearance of weekday in the month<br>on which the changeover is to take place | 1 ... 4 ⇨ 1.-4. appearance<br>5 ⇨ last appearance in the month |
| **MM** | The month<br>in which the changeover is to take place | 1 = January … 12 = December |

The entry is completed by pressing the **ENTER** key.



hopf Elektronik GmbH
Nottebohmstr. 41 • D-58511 Lüdenscheid • Tel.: +49 (0)2351 9386-86 • Fax: +49 (0)2351 9386-93 • Internet: http://www.hopf.com • E-Mail: info@hopf.com

**Input example for Germany (CET/CEST):**

**WT (CET) ⇨ ST (CEST)** at the 2nd hour on the last Sunday in March. Input: 02.7.5.03

**Changeover WT (standard / winter time) ⇨ ST (summer time)**

| Local time | UTC | Offset UTC ⇨ local time |
|---|---|---|
| 01:59:58 | 00:59:58 | +1 hour |
| 01:59:59 | 00:59:59 | +1 hour |
| 03:00:00 | 01:00:00 | +2 hours |
| 03:00:01 | 01:00:01 | +2 hours |

**ST (CEST) ⇨ WT (CET)** at the 3rd hour on the last Sunday in October. Input: 03.7.5.10

**Changeover ST (summer time) ⇨ WT (standard / winter time)**

| Local time | UTC | Offset UTC ⇨ local time |
|---|---|---|
| 02:59:58 | 00:59:58 | +2 hours |
| 02:59:59 | 00:59:59 | +2 hours |
| 02:00:00 | 01:00:00 | +1 hour |
| 02:00:01 | 01:00:01 | +1 hour |

### 5.1.1.4 Enter Day Offset (Option)

With the aid of this function, an offset of ± 14999 days from the date of the synchronization signal can be set for the System date.

Selection screen:

```
SET DIF.- TIME
      Y  N  _
```

This is a special function and must be enabled by ***hopf*** . Values can be entered in the non-enabled condition, however they do not affect the System date.



*hopf* Elektronik GmbH
Nottebohmstr. 41 • D-58511 Lüdenscheid • Tel.: +49 (0)2351 9386-86 • Fax: +49 (0)2351 9386-93 • Internet: http://www.hopf.com • E-Mail: info@hopf.com

### 5.1.1.5 Serial Interface Parameters

The interface parameters and output mode can be entered separately for each of the two serial interfaces. The following selection screens appear (for parameterization see ***Chapter 6 COM0 / COM1***).

If synchronization is set via the serial data string then the COM1 parameters can be set; however they are automatically reset to the setting for reception of the DCF-Slave data string.

Synchronization with the DCF-Slave data string is only possible on **COM1**.

#### 5.1.1.5.1 Selection Frames for COM0 Serial Interface Parameters

**Setting the Serial Parameters**

Selection frame:

```
SET COM_0 SERIAL
PARAMETER  Y/N_
```

The parameters for **B**aud rate, **W**ord length, **P**arity bit, **S**top bit and **H**and**S**hake must be entered in sequence in the following input frame:

Input frame:

```
 B:09600   W:8
 P:N  S:1  HS:N_
```

**Setting Mode Byte 1**

Selection frame:

```
   SET COM_0
  MODE_1  Y  N  _
```

Input frame:

```
BIT 7654 3210
    1110 1100_
```

**Setting Mode Byte 2**

Selection frame:

```
   SET COM_0
  MODE_2  Y  N  _
```

Input frame:

```
BIT 7654 3210
    1110 1100_
```

#### 5.1.1.5.2 Selection Frames for COM1 Serial Interface Parameters

```
SET COM_1 SERIAL
PARAMETER  Y/N_
```

The parameters for the COM1 interface are entered in the same way as for COM0.



hopf Elektronik GmbH
Nottebohmstr. 41 • D-58511 Lüdenscheid • Tel.: +49 (0)2351 9386-86 • Fax: +49 (0)2351 9386-93 • Internet: http://www.hopf.com • E-Mail: info@hopf.com

### 5.1.1.6 LAN Board Parameters (Option)

If the System is extended with one or two LAN Boards, the base parameterization can be carried out via the keypad. In order to be able to parameterize the LAN Boards they must be coded as Board 1 and Board 2 (see the respective LAN Board description).

Further information and an explanation of the parameters are available in the respective LAN Board description.

#### 5.1.1.6.1 Selection Frames for LAN Board 1 Parameters

**Setting the IP address**

Selection frame:

```
   SET LAN 1
   ADR.  Y/N_
```

Input frame:

```
LAN 1 >192.168.
      001.010<
```

**Setting the Gateway address**

Selection frame:

```
   SET LAN 1
GATEWAY ADR. Y/N
```

Input frame:

```
G.W 1 >192.168.
      001.005<
```

**Setting the Network Mask**

Selection frame:

```
   SET LAN 1
NET-MASK. Y/N_
```

Input frame:

```
 NET-MASK LAN 1
      >24<  _
```

⇦ corresponds to 255.000.000.000

**Setting the Control Byte**

Selection frame:

```
   SET LAN 1
CNTRL.-BYTE Y/N
```

Input frame:

```
BIT 7654 3210
    1010 0001_
```

#### 5.1.1.6.2 Selection Frames for LAN Board 2 Parameters

Selection frame:

```
   SET LAN 2
   ADR.  Y/N_
```

The parameters for LAN Board 2 are entered in the same way as for LAN Board 1.



hopf Elektronik GmbH
Nottebohmstr. 41 • D-58511 Lüdenscheid • Tel.: +49 (0)2351 9386-86 • Fax: +49 (0)2351 9386-93 • Internet: http://www.hopf.com • E-Mail: info@hopf.com

### 5.1.1.7 System Status Byte

A number of basic settings, such as user menu language, synchronization modes etc., can be set with the individual bits in the system status byte.

The meaning of the individual bits is as follows:

| 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 | **Time Display** |
|---|---|---|---|---|---|---|---|---|
| 0 | | | | | | | | Time display is local time |
| 1 | | | | | | | | Time display is UTC |
| **7** | **6** | **5** | **4** | **3** | **2** | **1** | **0** | **Bit 6 - no function** |
| | x | | | | | | | Not assigned at present - should always be set to 0 for compatibility reasons |
| **7** | **6** | **5** | **4** | **3** | **2** | **1** | **0** | **Display Menu Language Selection** |
| | | 0 | | | | | | Display menu in German language |
| | | 1 | | | | | | Display menu in English language |
| **7** | **6** | **5** | **4** | **3** | **2** | **1** | **0** | **Time Base for DCF77 Antenna Simulation (77.5kHz)** |
| | | | 0 | 0 | | | | Local time (standard time with ST/WT changeover, if applicable) |
| | | | 0 | 1 | | | | Standard time only (winter time) |
| | | | 1 | 0 | | | | UTC |
| | | | 1 | 1 | | | | Free - currently local time (standard time with ST/WT changeover, if applicable) |
| **7** | **6** | **5** | **4** | **3** | **2** | **1** | **0** | **Synchronization Source - see Chapter 2.2 Summary / Synchronization Source Settings** |
| | | | | | 0 | 0 | 0 | Quartz clock |
| | | | | | 0 | 0 | 1 | DCF77 antenna **(CET)** |
| | | | | | 0 | 1 | 0 | DCF77 pulse input **(CET)** |
| | | | | | 0 | 1 | 1 | DCF-Slave via serial data string on COM1 **(CET)** |
| | | | | | 1 | 0 | 0 | DCF77 antenna **(Worldwide)** |
| | | | | | 1 | 0 | 1 | DCF77 pulse input **(Worldwide)** |
| | | | | | 1 | 1 | 0 | DCF-Slave via serial data string on COM1 **(Worldwide)** |
| | | | | | 1 | 1 | 1 | Not assigned at present |

The individual status bits can be set via the keypad using keys **'0'** and **'1'** and, after entering all bits with **'ENT'**, transferred fail-safe into the System.

Selection screen:

```
  SET SYSTEM
  STATUS Y/N_
```

Input screen:

```
BIT 7654 3210
    0000 0001_
```

Standard setting

### 5.1.1.8 Special Byte

The Special Byte is used to control customer programs and special programs. The individual bits are described in the corresponding special description. This byte is not active in the standard version and is without function.

Selection screen:

```
  SET SPECIAL
  BYTE Y N_
```

Input screen:

```
BIT 7654 3210
    0000 0000_
```

⇦ This bit combination should always be set for compatibility reasons



hopf Elektronik GmbH
Nottebohmstr. 41 • D-58511 Lüdenscheid • Tel.: +49 (0)2351 9386-86 • Fax: +49 (0)2351 9386-93 • Internet: http://www.hopf.com • E-Mail: info@hopf.com

### 5.1.1.9 Status and Pulse Output

This function is not available in this equipment version.

**The setting must not be changed;** otherwise the status output of the LEDs and error relays will be faulty.

Programming takes place by entering a byte. The input is selected with the following selection frame:

Selection frame:

```
SET STATUS- OR
PULS-OUTPUT Y/N
```

Input frame:

```
BIT 7654 3210
    0000 0001_
```

⇦ **Setpoint**

### 5.1.1.10 Fail-safe Storage of the Input Data

All input data entered via the keypad is checked for plausibility and stored fail-safe on an EEPROM after the next minute change. In order to check that the input has been successful a **P**rogram-**R**eset or **M**aster-**R**eset must be carried out. The values stored on the EEPROM can then be read back and checked with the **SHOW** function.



*hopf* Elektronik GmbH
Nottebohmstr. 41 • D-58511 Lüdenscheid • Tel.: +49 (0)2351 9386-86 • Fax: +49 (0)2351 9386-93 • Internet: http://www.hopf.com • E-Mail: info@hopf.com

## 5.1.2 SHOW Menu - Display of the System 6855 Base Settings

The **SHOW** function is called up to check the values. The values are only displayed here and cannot be changed.

After selecting the main menu by pressing **ENTER** the figure **2** is entered. The first **SHOW** selection frame appears.

The **SHOW** menu selection frames are output on the display. The menu is controlled as follows:

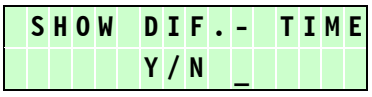
- The next selection frame is displayed by entering **ENTER** or **N**.
- The corresponding display frame is called up by entering **Y**.
- The display jumps to the next selection frame if **ENTER** or **N** are entered in the display frame.
- The **SHOW** menu can be exited at any time by pressing **BREAK**.

The individual functions of the System 6855 DCF77 are explained below.

### 5.1.2.1 Time Offset

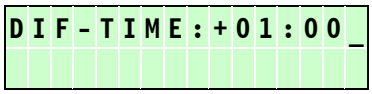
The current time offset between the local time and UTC time can be viewed with this display frame.

Selection frame:




After entering **Y** the following frame appears (example):

Display frame:




**Only** the set time offset to the local standard time (winter time) is always displayed.

### 5.1.2.2 ST/WT Changeover Points of Time

The ST/WT changeover points of time for the current year, calculated from the customer input, can be viewed with this display frame.

After a year change the clock system automatically recalculates the ST/WT changeover points of time.



hopf Elektronik GmbH
Nottebohmstr. 41 • D-58511 Lüdenscheid • Tel.: +49 (0)2351 9386-86 • Fax: +49 (0)2351 9386-93 • Internet: http://www.hopf.com • E-Mail: info@hopf.com

**Time Zone Changeover D ⇨ S**

This function shows the changeover point of time from
**D**aylight saving time (summer time) to **S**tandard time (winter time).

Selection frame:

```
SHOW CHANGE_OVER
 D -->  S  Y N _
```

After entering [Y] the following frame appears (example):

Display frame:

```
TIME:02:00:00
7.30/10/2005 D>S
```

The changeover takes (took) place on Sunday 30 October 2005 at 03.00 a.m.

**Time Zone Changeover S ⇨ D**

This function shows the changeover point of time from
**S**tandard time (winter time) to **D**aylight saving time (summer time).

Selection frame:

```
SHOW CHANGE_OVER
 S -->  D Y/N _
```

After entering [Y] the following frame appears (example):

Display frame:

```
TIME:02:00:00
7.27/03/2005 S>D
```

The changeover takes (took) place on Sunday 27 March 2005 at 02.00 a.m.

If an invalid changeover time is set the following appears:

Display frame:

```
 NO CHANGE_OVER
    DATES
```

### 5.1.2.3 Day Offset

The current day offset can be viewed with this display screen.

Selection screen:

```
 SHOW DIF.-DAYS
      Y/N _
```

After entering [Y] the following image appears (example):

Selection screen:

```
D-TAGE:-00365_
```

(e.g. for -365 days)

This is a special function and must be enabled by ***hopf*** . Values can be displayed in the non-enabled condition, however they do not affect the System date.



***hopf*** Elektronik GmbH
Nottebohmstr. 41 • D-58511 Lüdenscheid • Tel.: +49 (0)2351 9386-86 • Fax: +49 (0)2351 9386-93 • Internet: http://www.hopf.com • E-Mail: info@hopf.com

### 5.1.2.4 Serial Interface Parameters

With this menu the serial interface parameters can be shown.

#### 5.1.2.4.1 Display Frames for the COM0 Serial Interface Parameters

The configuration of the COM0 interface is shown with these display frames. The significance of the configuration can be found in ***Chapter 6 COM0 / COM1 Serial Interfaces***.

**COM 0 Interface Parameter Displays**

Selection frame:

```
SHW COM_0 SERIAL
PARAMETER   Y/N
```

Display frame:

```
 B:09600   W:8
 P:N S:1  HS:N_
```

**Mode Byte 1 Displays**

Selection frame:

```
   SHOW COM_0
   MODE_1 Y/N_
```

Display frame:

```
BIT 7654 3210
    1111 0100_
```

**Mode Byte 2 Displays**

Selection frame:

```
   SHOW COM_0
   MODE_2 Y/N_
```

Display frame:

```
BIT 7654 3210
    0000 0000_
```

#### 5.1.2.4.2 Display Frames for the COM1 Serial Interface Parameters

The configuration of the COM1 interface is shown with these display frames. The display functions are analogue to the COM0 interface display.



hopf Elektronik GmbH
Nottebohmstr. 41 • D-58511 Lüdenscheid • Tel.: +49 (0)2351 9386-86 • Fax: +49 (0)2351 9386-93 • Internet: http://www.hopf.com • E-Mail: info@hopf.com

### 5.1.2.5 LAN Board Parameters (Option)

Further information and an explanation of the parameters can be found in the description of the LAN Board.

#### 5.1.2.5.1 Display Frames for LAN Board 1 Parameters

The configuration of the LAN Board coded as Board 1 (if present in the System) is displayed on this display frame.

**IP Address Displays**

Selection frame:

```
  SHOW LAN 1
  ADR. Y/N_
```

Display frame:

```
LAN 1 >192.168.
      001.010<
```

Always the last inputted IP address **by keypad** is displayed. If the IP address is changed by Telnet or via serial interface of the LAN board it will be displayed, too.

**Gateway Address Displays**

Selection frame:

```
  SHOW LAN 1
GATEWAY ADR. Y/N
```

Display frame:

```
G.W 1 >192.168.
      001.005<
```

**Network Mask Displays**

Selection frame:

```
  SHOW LAN 1
 NET-MASK Y/N_
```

Display frame:

```
 NET-MASK LAN 1
       >24<  _
```

**Control Byte Displays**

Selection frame:

```
  SHOW LAN 1
CNTRL.-BYTE Y/N
```

Display frame:

```
BIT 7654 3210
    1010 0001_
```

#### 5.1.2.5.2 Display Frames for LAN Board 2 Parameters

The configuration of the LAN Board coded as Board 2 (if present in the System) is displayed on this display frame.

The LAN Board 2 parameters are displayed in the same way as for LAN Board 1.



hopf Elektronik GmbH
Nottebohmstr. 41 • D-58511 Lüdenscheid • Tel.: +49 (0)2351 9386-86 • Fax: +49 (0)2351 9386-93 • Internet: http://www.hopf.com • E-Mail: info@hopf.com

### 5.1.2.6 System Status Byte

The System Status Byte is displayed with this display frame.

Selection frame:

```
  SHOW SYSTEM
  STATUS Y/N_
```

Display frame:

```
BIT 7654 3210
    0000 0000_
```

### 5.1.2.7 Special Byte

The Special Byte is displayed with this display frame (only at customer- or special programs)

Selection frame:

```
  SHOW SPECIAL
  BYTE Y/N_
```

Display frame:

```
BIT 7654 3210
    0000 0000_
```

No function is assigned to these bits at present.

### 5.1.2.8 Status and Pulse Output

The SETPOINT setting required for this equipment version can be checked with this display frame.

Selection frame:

```
SHOW STATUS- AND
 PULS-OUTPUT Y/N
```

Display frame:

```
BIT 7654 3210
    0000 0001_
```

⇦ Setpoint for this equipment version

## 5.1.3 S.CLOCK Menu - Back-up Clock Control with Function Board 7406

After selecting the main menu by pressing the **ENTER** key the figure **3** is entered. The following selection frame appears:

Selection frame:

```
SLAVE CLOCK NO.
 1 - 4 >_
```

Further information and an explanation of the parameters can be found in the description of the Function Board 7406.



hopf Elektronik GmbH
Nottebohmstr. 41 • D-58511 Lüdenscheid • Tel.: +49 (0)2351 9386-86 • Fax: +49 (0)2351 9386-93 • Internet: http://www.hopf.com • E-Mail: info@hopf.com

## 5.1.4 INI Menu - System 6855 Extended Settings/Functions

Different settings can be configured for special applications and problem solutions using the **INI** menu. These functions are pre-set to Standard in the factory.

After jumping to the main menu display by pressing the **ENTER** key the figure **4** is entered.

Pressing the **BREAK** key returns the user to the standard display.

### 5.1.4.1 Delayed Sync. Status Change

This value serves as a reception failure bridgeover for error message-free operation under difficult reception conditions.

In the event of synchronization source reception failure (in this case DCF77), the synchronization of the system to quartz status **'C'** is delayed by the set value. During this period the System continues to run on the internal, high precision controlled quartz base in Sync.-Status **'r'** mode.

The value can be set between 002 and 255 minutes. The setting depends primarily on the freewheel accuracy.

Freewheel Accuracy Calculation Example

In order to calculate the maximum value to be set for **'TIME-OUT FOR STATUS-CHANGE'**, the quartz freewheel accuracy value is calculated by the required minimum system accuracy.

For example, if the freewheel accuracy is ±2x10E-6 and the required minimum system accuracy is **10 msec.**, the following calculation results:

0.01s / (2 x 10E-6) = 5000s = **83 minutes 20 seconds**

⇨ The **maximum** value to be set for **'STATUS CHANGE AFTER'** is **83 minutes**.

Viewing and changing the time delay takes place on the same display frame and is called up as follows:

Selection frame:

```
DELAY STATUS-
CHANGE Y/N_
```

Display frame:

```
STATUS CHANGE
AFTER >002< MIN.
```

**STANDARD Value: 002**

The currently valid time delay is shown.

The time is increased with the **+** key and reduced with **-**.

On exiting the program via the **BREAK** key the last displayed value is stored in a failsafe manner.



hopf Elektronik GmbH
Nottebohmstr. 41 • D-58511 Lüdenscheid • Tel.: +49 (0)2351 9386-86 • Fax: +49 (0)2351 9386-93 • Internet: http://www.hopf.com • E-Mail: info@hopf.com

### 5.1.4.2 Delayed DCF77 Antenna Simulation and Pulse Switch-off

System 6855 simulates the DCF77 antenna signal (DCF77 Antenna Simulation) and the DCF77 pulse signal (on the System Bus) for the synchronization of other ***hopf*** systems or external systems.

These signals do not contain synchronization status information for the transmitting device (Master). For this reason, connected equipment is always radio-synchronous with this signal; even when the transmitting device is running on its own internal quartz base.
In order to identify a possible Master System synchronization problem in the Slave System, DCF77 Antenna Simulation and DCF77 pulse output can be switched off by means of a timer.

After switch-off, a 2Hz pulse signal is transmitted instead of the time information. Synchronization of the connected system is no longer possible when the signal is modulated in this way.

**For Quartz Clock Setting:**

DCF77 Antenna Simulation (77.5 kHz) and DCF77 Pulse (1Hz) are **always** transmitted. The timer has no function here.

When changing from the "Quartz Clock" setting into another synchronization mode, DCF77 Antenna Simulation is transmitted onward, independent of the set delay value.
The set value only becomes active following a Reset.

There are two settings, each with a different effect:

**2 to 254 Minutes Setting**

The System must be synchronized by DCF77 at least once before beginning to simulate the signal. DCF77 Antenna Simulation output also occurs again following DCF77 synchronization failure, for the set time span. After this time has lapsed, no valid DCF77 signal is then transmitted in the event of ongoing reception faults. The connected devices are no longer synchronized and may trigger an error message as a result.

**255 Minutes Setting**

Simulation always takes place on this setting (independent of synchronization status).

By this means, DCF77 simulation can be produced for any other time entered via the keypad. This setting is mainly used to test time-dependent functions in the connected equipment. In this case please note that the antenna cable should be disconnected from the equipment, since synchronization via the antenna overwrites the time entered manually.

Modulation of the DCF77 pulse (1Hz) only begins after the second minute change following the entry of a time, or 2 minutes after equipment switch-on, if correct back-up clock information is available.



*hopf* Elektronik GmbH
Nottebohmstr. 41 • D-58511 Lüdenscheid • Tel.: +49 (0)2351 9386-86 • Fax: +49 (0)2351 9386-93 • Internet: http://www.hopf.com • E-Mail: info@hopf.com

Viewing and changing the value takes place on the same selection screen with the following command:

Selection screen:

```
DELAY DCF_SIM
STOP   Y/N_
```

Display screen:

```
  DCF-SIM STOP
AFTER >055< MIN.
```

**STANDARD value: 055**

The time is increased with the [ + ] key and reduced with [ - ].

When quitting the program via the [ BREAK ] key, the last-displayed value is saved in fail-safe manner.

Delays cannot be added for system status change and DCF77 simulation. Sample setting: System status change **10** min. / DCF77 simulation **3** min.

DCF77 simulation changes to 2 Hz modulation after 3 minutes reception failure, not after 13 minutes.

Sample calculation for the accuracy of the DCF77 simulation

The time delay to be set is dependent on the accuracy required by the connected Slave system.

In this example, the accuracy of the internal quartz base is given as ±2*10E-6. Minimum accuracy required: **10 msec.**

0.01s / (2 x 10E-6) = 5000s = **83 minutes 20 seconds**

⇨ The **max.** value to be set for **'DCF-SIM STOP AFTER'** is **83 minutes**

### 5.1.4.3 Antenna Alignment

The optimum alignment of the antenna can be calculated with this function.

***hopf*** DCF77 antennas generally have alignment features (the arrow on the underside of the antenna housing must be aligned to the transmitter in Frankfurt am Main in order to guarantee optimum reception).

The System is not synchronized when the **'ALIGN ANTENNA'** function is active.

This function can also be used to test a DCF77 signal which is connected to the System 6855 via a DCF77 antenna switch or DCF77 antenna simulation.

It is possible to quit this function at any time by pressing the [ BREAK ] key. This mode is automatically ended after approx. 5 minutes.

The **'ALIGN ANTENNA'** principle is based on the fact that the minimum field strength of the signal can be calculated more easily than the maximum. This means that, for the alignment procedure, alignment is first calculated with the lowest field strength in order then to rotate the antenna by 90° (the direction of rotation is not important in this instance).

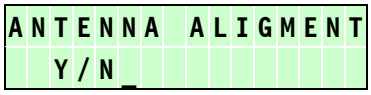


*hopf* Elektronik GmbH
Nottebohmstr. 41 • D-58511 Lüdenscheid • Tel.: +49 (0)2351 9386-86 • Fax: +49 (0)2351 9386-93 • Internet: http://www.hopf.com • E-Mail: info@hopf.com

### 5.1.4.3.1 Alignment Procedure

Rotate the antenna with the marking in the supposed / known direction of Frankfurt am Main. Then start the antenna alignment program.

Selection screen:




After pressing the [Y] key the signal amplifier of the DCF77 receiver is re-aligned. After approximately 20 seconds the DCF77 receiver has calculated and stored the signal amplification required for the installation location.

The current field strength is shown on the display in the form of a bar. The signal amplifier is always adjusted in such a way that this bar fills approx. 75-90% of the display. The bar pulsates every second whilst the DCF77 signal is being received.

Display screen:

The received field strength changes if the antenna is rotated slowly. Since the amplification is fixed there is no readjustment of the amplifier. If the antenna is now rotated away from the direction of Frankfurt am Main then the field strength is reduced - and consequently also the number of displayed bar segments.

From approximately

Display screen:

to

Display screen:

The minimum field strength has been determined when the antenna has been rotated in such a way that 1 to 2 bar segments are displayed permanently.

From this position the antenna is now rotated by 90° (in any direction). The alignment of the antenna is now complete.

### 5.1.4.3.2 Signal Quality

The availability of field strength alone is not conclusive evidence that DCF77 reception is actually possible.

The bar display of the **'ALIGN ANTENNA'** function also provides only a rough estimation of DCF77 reception.

To verify this, the function is re-started after alignment of the antenna has taken place. After approx. 20 seconds a bar appears on the display which fills approx. 75-90% of the display. This bar contracts on the second pulse. This "contraction" represents the time information which is transferred in the DCF77 signal at the start of each second.

The "beat" of this bar in the idle state is one measure of DCF77 reception quality. When an optimum signal is present, the signal "beat" is max. one bar segment and the shortening of the bar on the second pulse is "pin sharp".



hopf Elektronik GmbH
Nottebohmstr. 41 • D-58511 Lüdenscheid • Tel.: +49 (0)2351 9386-86 • Fax: +49 (0)2351 9386-93 • Internet: http://www.hopf.com • E-Mail: info@hopf.com

DCF77 reception should still be possible with a "beat" of 2 bar segments. If the "beat" is greater then it may be reckoned that synchronization will only take place after a longer period, or not at all. In such a case, a location should be sought for the antenna which facilitates better reception.

### 5.1.4.4 Amplification Display

Amplification is controlled by the processor by means of pulse width modulation. A relative percentage value for the control range of the amplifier is calculated from this value.

Selection screen:

```
SHOW DCF-SIGNAL
  RESERVE Y/N_
```

Display screen:

```
   DCF-SIGNAL-
  RESERVE: 047 %
```

This value can be used by ***hopf*** for fault analysis when support is requested.

### 5.1.4.5 Program Reset

This function triggers a software reset of the System 6855 Control Board. All other Function Boards in the System continue to run (except Function Boards without their own processor).

This function has no effect on the failsafe-stored data.

Program Reset is triggered via the following frame:

Selection frame:

```
PROGRAMM RESET
     Y/N _
```

**P**rogram **R**eset is executed by pressing the [Y] key.

### 5.1.4.6 Master Reset

This function triggers a hardware reset of the whole System 6855. All Function Boards present in the System 6855 are reset and restarted.

This function has no effect on the failsafe-stored data.

Selection is made via the following frame:

Selection frame:

```
  MASTER RESET
     Y/N _
```

**M**aster **R**eset is executed by pressing the [Y] key.



*hopf* Elektronik GmbH
Nottebohmstr. 41 • D-58511 Lüdenscheid • Tel.: +49 (0)2351 9386-86 • Fax: +49 (0)2351 9386-93 • Internet: http://www.hopf.com • E-Mail: info@hopf.com

# 6 COM0 / COM1 Serial Interfaces

The System is equipped with two serial interfaces **without** handshake lines which can be set up individually. Data exchange can take place via RS232c (V.24) or RS422 (V.11) signal levels. The signals can be used, for example, to transmit time telegrams to other computers.

Various data strings are available. Customer-specific data strings are available on request. The following settings can be made separately for each serial interface.

## 6.1 Configuration of the Serial Interfaces

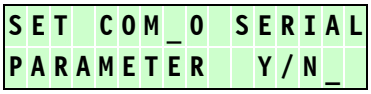
The parameterization and functionality of the serial interfaces is described below.

### 6.1.1 Serial Transmission Parameters

The interfaces are parameterized via the keypad. The baud rate, data bit, stop bit and parity settings are made by pressing the ENTER key and selecting the **SET** menu.
The entry for **COM0**, **COM1** or optical interface (not supported in this equipment version) must be selected in the selection dialog. In the following only the **COM0** interface is described. The same settings are applicable to **COM1**.

- Key ENTER
- Key 1 for **SET** menu
- Pressing Key N until the following menu appears

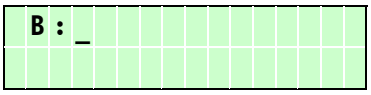
Selection frame:




- Key Y

The interfaces / parameters dialog appears on the display with the following message:

Input frame:




The baud rate must be entered here as a five digit numerical value. Possible inputs are:

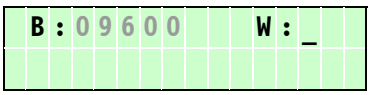
- 19200 for 19,200 baud
- 09600 for 9,600 baud
- 04800 for 4,800 baud
- 02400 for 2,400 baud
- 01200 for 1,200 baud
- 00600 for 600 baud
- 00300 for 300 baud
- 00150 for 150 baud



hopf Elektronik GmbH
Nottebohmstr. 41 • D-58511 Lüdenscheid • Tel.: +49 (0)2351 9386-86 • Fax: +49 (0)2351 9386-93 • Internet: http://www.hopf.com • E-Mail: info@hopf.com

After entering the final figure for the baud rate the following message appears on the display:

Input frame:

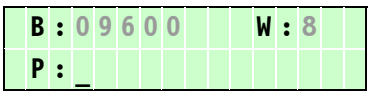



The number of data bits for the transmission must be given here. Possible settings are:

- 8 for 8 data bits
- 7 for 7 data bits

After entering the figure for the number of data bits the following message appears on the display:

Input frame:

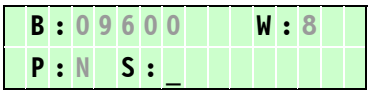



The type of the parity bit for the transmission must be given here. Possible settings are:

- N for no parity bit
- E for even parity
- 0 (zero) for odd parity

After entering the parity function the following message appears on the display:

Input frame:

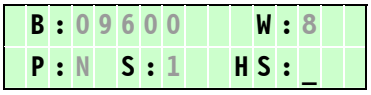



The number of stop bits for the transmission must be selected here:

- 1 for 1 stop bit
- 2 for 2 stop bits

Finally the enabling of the handshake lines RTS and CTS appears.

Input frame:




The following can be entered here:

- N Data transmission **without** handshake ⇦ Setpoint for this equipment version
- Y Data transmission **with** handshake

No handshake lines are available in this version of the device.
Data transmission **without handshake must** be activated in order for the serial interfaces to function correctly.

The **ENTER** key must be activated after the final entry. By doing so a plausibility check of the complete data entry is undertaken. If the data entry is valid the new settings are transferred.



hopf Elektronik GmbH
Nottebohmstr. 41 • D-58511 Lüdenscheid • Tel.: +49 (0)2351 9386-86 • Fax: +49 (0)2351 9386-93 • Internet: http://www.hopf.com • E-Mail: info@hopf.com

### 6.1.2 Configuration of the Data String (Mode Byte)

The received time information can be transmitted via the interfaces in several data strings with indication of the internal synchronization status of the clock.

By this means it is possible for the user to synchronize connected computer equipment with a highly precise time. The respectively desired transmission point of time, string construction and the control characters used can be selected via the data in **Mode Bytes 1 and 2**.

The **SET** menu for the **mode bytes** can be reached via the following key combination:

- Key `ENTER`
- Key `1` for **SET** menu
- Pressing Key `N` until the following menu appears

Selection frame:

```
  SET COM_0
MODE_1  Y N _
```

**or**

Selection frame:

```
  SET COM_0
MODE_2  Y N _
```

- Key `Y`

The input mask for the **Mode Byte** appears:

Input frame:

```
BIT 7654 3210
     _
```

The cursor now lies under bit position 7. Each bit should be understood to be a switch with which settings can be made in the operating type (mode) of the serial interface. Depending on the desired serial interface operating type the following entries must be made under the bit positions:

- 0 - for switch off or
- 1 - for switch on

The meanings of the individual bit positions (switches) are described in the following chapters.

#### 6.1.2.1 Mode Byte 1 / Bit7 - Local Time or UTC in the Serial Output

| Bit Position 7 | Time Zone |
|---|---|
| off | UTC (Universal Coordinated Time) |
| on | Local time |



hopf Elektronik GmbH
Nottebohmstr. 41 • D-58511 Lüdenscheid • Tel.: +49 (0)2351 9386-86 • Fax: +49 (0)2351 9386-93 • Internet: http://www.hopf.com • E-Mail: info@hopf.com

### 6.1.2.2 Mode Byte 1 / Bit 6 - Serial Output Second Forerun

| Bit Position 6 | Second Forerun |
|---|---|
| off | With second forerun |
| on | Without second forerun |

See also ***Chapter 6.2 Data String Transmission Points of Time***.

### 6.1.2.3 Mode Byte 1 / Bit5: STX/ETX Control Characters

This setting is only applicable to telegrams in which control characters are provided as separators between the data strings (see telegram structure for the respective string).

| Bit Position 5 | Control Characters |
|---|---|
| off | With control characters |
| on | No control characters |

### 6.1.2.4 Mode Byte 1 / Bit 4 - Last Control Character at Second Change (On-Time Mark)

The last control character (see data string construction) can be transmitted exactly at the next second change with this setting.

| Bit Position 4 | Control Character at Second Change |
|---|---|
| off | With control character at second change |
| on | Without control character at second change |

See also ***Chapter 6.2 Data String Transmission Points of Time***.

This function is usually used in conjunction with the "with second forerun" setting.

### 6.1.2.5 Mode Byte 1 / Bit 3 - Reverse Control Characters CR and LF

The character sequence CR and LF can be reversed with this switch.

| Bit Position 3 | Control Characters CR and LF |
|---|---|
| off | LF/CR sequence as in string description |
| on | LF/CR sequence reversed from string description |



hopf Elektronik GmbH
Nottebohmstr. 41 • D-58511 Lüdenscheid • Tel.: +49 (0)2351 9386-86 • Fax: +49 (0)2351 9386-93 • Internet: http://www.hopf.com • E-Mail: info@hopf.com

### 6.1.2.6 Mode Byte 1 / Bit 2 - Delayed Transmission

The last character of the data string is transmitted directly at the second change and immediately thereafter the new data string, which is valid for the next second change, is transmitted with the setting "Control Character at Second Change". This can be interpreted as an error on some computers with a high working load. With Bit Position 2, transmission of the new data string can be delayed dependent on the baud rate.

| Bit Position 2 | Transmission Delay |
|---|---|
| off | With delayed transmission |
| on | Without delayed transmission |

See also ***Chapter 6.2 Data String Transmission Points of Time***.

**Example:**

**Baud rate 9600 baud**

| Milliseconds | With delay | Without delay |
|---|---|---|
| 000 | End character ( ETX) | End character ( ETX) |
| 002 | – | New data string |
| 025 | – | End new data string |
| 930 | New data string | – |
| 955 | End new data string | – |
| 000 | End character (ETX) | End character (ETX) |

**Baud rate 2400 baud**

| Milliseconds | With delay | Without delay |
|---|---|---|
| 000 | End character ( ETX) | End character ( ETX) |
| 002 | – | New data string |
| 105 | – | End new data string |
| 810 | New data string | – |
| 913 | End new data string | – |
| 000 | End character (ETX) | End character (ETX) |

### 6.1.2.7 Mode Byte 1 / Bit1-Bit0 - Data String Transmission Point of Time

| Bit 1 | Bit 0 | Transmission Point of Time |
|---|---|---|
| off | off | Transmit every second |
| off | on | Transmit on minute change |
| on | off | Transmit on hour change |
| on | on | Transmit on enquiry only |



hopf Elektronik GmbH
Nottebohmstr. 41 • D-58511 Lüdenscheid • Tel.: +49 (0)2351 9386-86 • Fax: +49 (0)2351 9386-93 • Internet: http://www.hopf.com • E-Mail: info@hopf.com

### 6.1.2.8 Mode Byte 2 / Bit7-Bit6: Non-assigned Bits

Bit7 and Bit6 are not presently assigned and are planned for later extensions.
They are to be set to 0 for compatibility reasons (default setting).

### 6.1.2.9 Mode Byte 2 / Bit5: Standard Time (Winter Time) Output only

Summer time changeover for the serial output can be blocked with Bit 5. This also applies to inquiries with "D" and "U".

In this mode, the string status contains neither "summer time“ information nor changeover announcement.

| Bit Position 5 | Time Information Output |
|---|---|
| off | Local time (**with** ST/WT changeover) |
| on | Standard time (**without** ST/WT changeover) |

### 6.1.2.10 Mode Byte 2 / Bit4: Customer Programs

If a special customer program is installed in the System then this program is enabled via Bit 4. Customer programs are described in a separate description section.

| Bit Position 4 | Program Selection |
|---|---|
| off | Standard program |
| on | Customer program |

### 6.1.2.11 Mode Byte 2 / Bit3-Bit0 - Data String Selection

This mode byte sets the transmitted data string.

| Bit Position | | | | |
|---|---|---|---|---|
| 3 | 2 | 1 | 0 | Data String |
| off | off | off | off | ***hopf*** Standard String (6021) and respectively NTP |
| off | off | off | on | ***hopf*** Standard String (6021) time only |
| off | off | on | off | ***hopf*** DCF-Slave String |
| off | off | on | on | SINEC H1 |
| off | on | off | off | MADAM-S |
| off | on | off | on | IBM Sysplex Timer Modell 1+2 and respectively TimeServ |
| off | on | on | off | ***hopf*** 2000 - 4 digit year output |
| off | on | on | on | T-String |
| on | off | off | off | ABB_S_T-String |
| on | off | off | on | NTGS-String |
| on | off | on | off | ***hopf*** Master/Slave-String |
| on | off | on | on | Free - ***hopf*** Standardstring (6021) at present |
| on | on | off | off | ***hopf*** 5500 date/time |
| on | on | off | on | ***hopf*** 5500 time only |
| on | on | on | off | ***hopf*** Standard String (6021) UTC with local status |
| on | on | on | on | Free - ***hopf*** Standardstring (6021) at present |



***hopf*** Elektronik GmbH
Nottebohmstr. 41 • D-58511 Lüdenscheid • Tel.: +49 (0)2351 9386-86 • Fax: +49 (0)2351 9386-93 • Internet: http://www.hopf.com • E-Mail: info@hopf.com

### 6.1.3 Serial Transmission Data Format

The data is transmitted in ASCII as BCD values and can be presented with any terminal program (TERMINAL.EXE under Windows for example). The following control characters, among others, from the ASCII character set are used in the construction of the data string:

$20 = Space
$0D = CR (carriage return)
$0A = LF (line feed)
$02 = STX (start of text)
$03 = ETX (end of text)

Status values are to be evaluated separately (see data string construction).

### 6.1.4 Serial Data String Request

Serial data string requests that are not included in this Chapter are described under Data Strings.

#### 6.1.4.1 Serial Requests with ASCII Characters (*hopf* Standard and *hopf* 2000)

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 **"U"** - for Time (Local Time)
- 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 "**u**, **d**, **g**" to the clock with a two position multiplication factor.

The clock interprets the multiplication factor as a hexadecimal value.

**Example:**

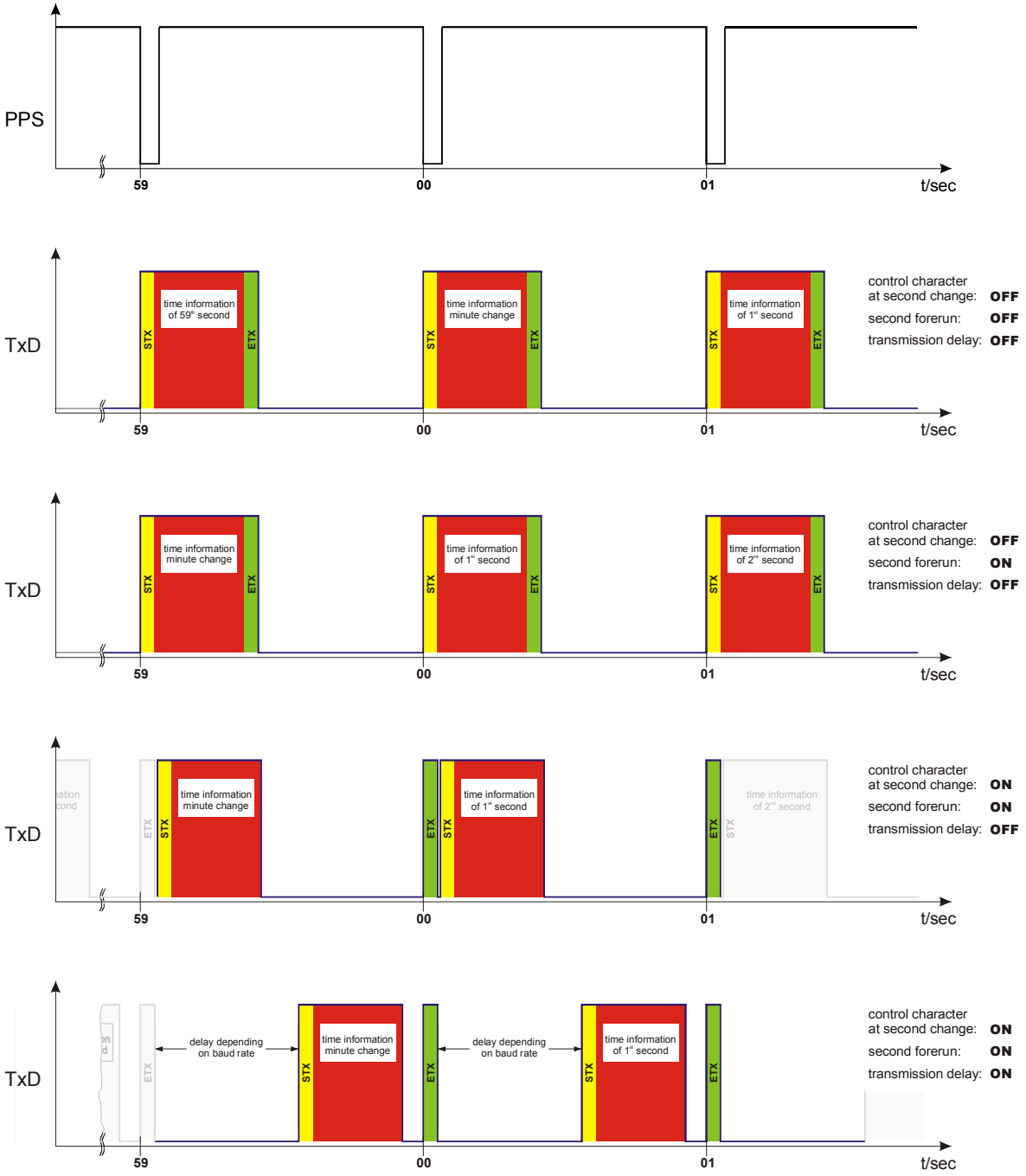
The computer transmits **ASCII gFF** (Hex 67, 46, 46)

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



*hopf* Elektronik GmbH
Nottebohmstr. 41 • D-58511 Lüdenscheid • Tel.: +49 (0)2351 9386-86 • Fax: +49 (0)2351 9386-93 • Internet: http://www.hopf.com • E-Mail: info@hopf.com

## 6.2 Data String Transmission Points of Time




STX ⇨ Start of Text

ETX ⇨ End of Text



hopf Elektronik GmbH
Nottebohmstr. 41 • D-58511 Lüdenscheid • Tel.: +49 (0)2351 9386-86 • Fax: +49 (0)2351 9386-93 • Internet: http://www.hopf.com • E-Mail: info@hopf.com

## 6.3 Data Strings

This Chapter describes the data strings supported by this System.

### 6.3.1 General Information about Data Output of Board 6855 DCF77

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.

The output of control characters CR and LF can be reversed with **Mode Byte 1** on all data strings
(see ***chapter 6.1.2.5 Mode Byte 1 / Bit 3 - Reverse Control Characters CR and LF***).

Possible string-specific settings are specified for all data strings.
These are differentiated as follows:

| | |
|---|---|
| **Automatic:** | Automatic string settings are set “automatically“ by the System immediately after the selection of a data string. Customer settings are not required. |
| **Required:** | Required string settings must be set by the customer after selection of a data string in the mode byte. |
| **Blocked:** | Blocked settings are **not** permissible for a data string. The System does not accept such an input and the data string is transmitted without an error message and with the previously set parameters. |

The transmitted data strings are at present compatible with the data strings of the following ***hopf*** radio-controlled clock boards:

- Board 6020/6021 Standard with control characters
- Board 7200/7201 Standard with control characters
- Board 7220/7221 Standard with control characters
- Board 7240/7245 Standard with control characters
- Board 6840/6841 Standard with control characters
- System 4465 Standard with control characters
- System 6870 Standard with control characters



hopf Elektronik GmbH
Nottebohmstr. 41 • D-58511 Lüdenscheid • Tel.: +49 (0)2351 9386-86 • Fax: +49 (0)2351 9386-93 • Internet: http://www.hopf.com • E-Mail: info@hopf.com

## 6.3.2 *hopf* Standard String (6021)

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

### 6.3.2.1 Specified Settings

| | |
|---|---|
| **Automatic:** | **no** |
| **Required:** | **no** |
| **Blocked:** | **no** |

### 6.3.2.2 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 |

### 6.3.2.3 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 |
|---|---|---|---|---|---|---|
| **Status:** | x | x | x | 0 | | no announcement hour |
| | x | x | x | 1 | | announcement (ST-WT-ST) |
| | x | x | 0 | x | | standard time (WT) |
| | x | x | 1 | x | | daylight saving time (ST) |
| | 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) |



*hopf* Elektronik GmbH
Nottebohmstr. 41 • D-58511 Lüdenscheid • Tel.: +49 (0)2351 9386-86 • Fax: +49 (0)2351 9386-93 • Internet: http://www.hopf.com • E-Mail: info@hopf.com

| | | | | | | |
|---|---|---|---|---|---|---|
| **Day of the Week:** | 0 | x | x | x | | CEST / CET |
| | 1 | x | x | x | | UTC - time |
| | x | 0 | 0 | 1 | | Monday |
| | x | 0 | 1 | 0 | | Tuesday |
| | x | 0 | 1 | 1 | | Wednesday |
| | x | 1 | 0 | 0 | | Thursday |
| | x | 1 | 0 | 1 | | Friday |
| | x | 1 | 1 | 0 | | Saturday |
| | x | 1 | 1 | 1 | | Sunday |

| Status | operation mode | time | announcement SZ-WZ-SZ |
|---|---|---|---|
| 0 = 0000 | 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 |

### 6.3.2.4 Example

**(STX)E4123456180702(LF)(CR)(ETX)**

- It is Thursday 18.07.2002 - 12:34:56 o'clock.
- radio operation (high accuracy)
- daylight saving time
- no announcement
- ( ) - ASCII-control characters e.g. (STX)



hopf Elektronik GmbH
Nottebohmstr. 41 • D-58511 Lüdenscheid • Tel.: +49 (0)2351 9386-86 • Fax: +49 (0)2351 9386-93 • Internet: http://www.hopf.com • E-Mail: info@hopf.com

### 6.3.3 NTP (Network Time Protocol)

NTP or also xNTP is a batch of programs to synchronize different computers and operating systems with network support. It is the standard for the Internet Protocol TCP/IP (RFC-1305). Source code and documentation are available as freeware in the internet under the following address:

The data string must be set in mode byte 2 / Bit3-Bit0 as ***hopf*** standard string (see ***chapter 6.1.2.11*** ).

Source code and documentation are available as freeware under:

http://www.ntp.org

Completely compiled NTP versions are available at the ***hopf*** Internet site:

http://www.hopf.com

#### 6.3.3.1 Specified Settings

| | |
|---|---|
| **Automatic:** | **no** |
| **Required:** | The following values are automatically set if the string is selected:<br>**parameter of transmission:**<br>• baud rate 9600<br>• 8 data bit<br>• parity no<br>• 1 stop bit<br>**mode of transmission:**<br>• ***hopf*** Standard String<br>• UTC as time base<br>• output with second advance<br>• control character (STX...ETX) enabled<br>• with control character at second change<br>• output time and date<br>• output every second |
| **Blocked:** | **no** |

#### 6.3.3.2 Structure

NTP is according to the ***hopf*** Standard String (6021), (see ***Chapter 6.3.2*** ).

#### 6.3.3.3 Status

The Status is according to the ***hopf*** Standard String (6021), (see ***Chapter 6.3.2*** ).

#### 6.3.3.4 Example

See ***Chapter 6.3.2.4 hopf*** Standard String (6021) with UTC as Time Base (3. ASCII character)



***hopf*** Elektronik GmbH
Nottebohmstr. 41 • D-58511 Lüdenscheid • Tel.: +49 (0)2351 9386-86 • Fax: +49 (0)2351 9386-93 • Internet: http://www.hopf.com • E-Mail: info@hopf.com

## 6.3.4 *hopf* DCF-Slave-String

This data string is used for the synchronisation of ***hopf*** DCF-Slave systems. It is the same string as the ***hopf*** standard string (6021), there is only a difference in the status byte.

### 6.3.4.1 Specified Settings

| | |
|---|---|
| **Automatic:** | To synchronise the ***hopf*** Slave-systems the following setting are fixed:<br>• output every minute<br>• output with second advance<br>• ETX at second change; selectable: data string at the beginning or at the end of the 59. second.<br>• local time<br>• word length 8 Bit<br>• parity no<br>• baud rate 9600 |
| **Required:** | **no** |
| **Blocked:** | **no** |

These settings guarantees an optimal regulation of the time base in the slave-systems.

When selecting this string all transmission parameters are set automatically. However, the according parameter bytes continue to show the finally selected settings.

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



*hopf* Elektronik GmbH
Nottebohmstr. 41 • D-58511 Lüdenscheid • Tel.: +49 (0)2351 9386-86 • Fax: +49 (0)2351 9386-93 • Internet: http://www.hopf.com • E-Mail: info@hopf.com

### 6.3.4.3 Status

| | b3 | b2 | b1 | b0 | Meaning |
|---|---|---|---|---|---|
| **Status:** | x | x | x | 0 | no announcement hour |
| | x | x | x | 1 | announcement (ST-WT-ST) |
| | x | x | 0 | x | standard time (WT) |
| | x | x | 1 | x | daylight saving time (ST) |
| | x | 0 | x | x | no announcement second |
| | x | 1 | x | x | announcement second |
| | 0 | x | x | x | crystal operation |
| | 1 | x | x | x | radio operation |
| **Day of the Week:** | 0 | 0 | 0 | 1 | Monday |
| | 0 | 0 | 1 | 0 | Tuesday |
| | 0 | 0 | 1 | 1 | Wednesday |
| | 0 | 1 | 0 | 0 | Thursday |
| | 0 | 1 | 0 | 1 | Friday |
| | 0 | 1 | 1 | 0 | Saturday |
| | 0 | 1 | 1 | 1 | Sunday |

### 6.3.4.4 Example

**(STX)84123456180702(LF)(CR)(ETX)**

- It is Thursday 18.07.2002 - 12:34:56 o'clock
- radio operation
- standard time
- no announcement ST/WT change over



hopf Elektronik GmbH
Nottebohmstr. 41 • D-58511 Lüdenscheid • Tel.: +49 (0)2351 9386-86 • Fax: +49 (0)2351 9386-93 • Internet: http://www.hopf.com • E-Mail: info@hopf.com

### 6.3.5 SINEC H1

Below the data string SINEC H1 is described.

**String request**

The data string SINEC H1 can also send by request. The time of output will be set to "send only by request" and the string will be requested with the ASCII character **"?"**.

#### 6.3.5.1 Specified Settings

| | |
|---|---|
| **Automatic:** | **no** |
| **Required:** | **no** |
| **Blocked:** | **no** |

#### 6.3.5.2 Structure

| Character No. | Meaning | Hex-Value |
|---|---|---|
| 1 | STX (start of text) | $02 |
| 2 | "D" ASCII D | $44 |
| 3 | ":" colon | $3A |
| 4 | tens day | $30-33 |
| 5 | unit day | $30-39 |
| 6 | "." point | $2E |
| 7 | tens month | $30-31 |
| 8 | unit month | $30-39 |
| 9 | "." point | $2E |
| 10 | tens year | $30-39 |
| 11 | unit year | $30-39 |
| 12 | ";" semicolon | $3B |
| 13 | "T" ASCII T | $54 |
| 14 | ":" colon | $3A |
| 15 | day of the week | $31-37 |
| 16 | ";" semicolon | $3B |
| 17 | "U" ASCII U | $55 |
| 18 | ":" colon | $3A |
| 19 | tens hour | $30-32 |
| 20 | unit hour | $30-39 |
| 21 | "." point | $2E |
| 22 | tens minute | $30-35 |
| 23 | unit minutes | $30-39 |
| 24 | "." point | $2E |
| 25 | tens second | $30-36 |
| 26 | unit second | $30-39 |
| 27 | ";" semicolon | $3B |
| 28 | "#" or space | $23 / $20 |
| 29 | "*" or space | $2A / $20 |
| 30 | "S" or space | $53 / $20 |
| 31 | "!" or space | $21 / $20 |
| 32 | ETX (end of text) | $03 |



hopf Elektronik GmbH
Nottebohmstr. 41 • D-58511 Lüdenscheid • Tel.: +49 (0)2351 9386-86 • Fax: +49 (0)2351 9386-93 • Internet: http://www.hopf.com • E-Mail: info@hopf.com

### 6.3.5.3 Status

The characters 28-31 in the data string SINEC H1 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 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 |
| | " " (space) | standard time |
| character no. 31 = | "!" | announcement of a WT/ST or ST/WT changeover |
| | " " (space) | no announcement |

### 6.3.5.4 Example

**(STX)D:18.07.02;T:4;U:12.34.56; _ _ _ _ (ETX)** ( _ ) = Space

- It is Thursday 18.07.2002 - 12:34:56 o'clock
- radio operation
- standard time
- no announcement ST/WT changeover



hopf Elektronik GmbH
Nottebohmstr. 41 • D-58511 Lüdenscheid • Tel.: +49 (0)2351 9386-86 • Fax: +49 (0)2351 9386-93 • Internet: http://www.hopf.com • E-Mail: info@hopf.com

## 6.3.6 MADAM-S

Below the data string MADAM-S is described.

### 6.3.6.1 Specified Settings

| | |
|---|---|
| **Automatic:** | **no** |
| **Required:** | The synchronisation process in case of output MADAM-S requires the following setting on the board:<br>• output on the minute change<br>• output with second advance<br>• output ETX on the second change<br>• output with control characters<br>• output CR/LF |
| **Blocked:** | **no** |

### 6.3.6.2 Structure

The structure if the data string depends on the request string (:ZSYS: oder :WILA:).

#### 6.3.6.2.1 MADAM-S with Request :ZSYS:

When the superior computer (PROMEA-MX) requests with the string **:ZSYS:** the clock answers with the following data string:

| Character No. | Meaning | Hex-Value |
|---|---|---|
| 1 | STX (start of text) | $02 |
| 2 | ":" colon | $3A |
| 3 | "Z" ASCII Z | $5A |
| 4 | "S" ASCII S | $53 |
| 5 | "Y" ASCII Y | $59 |
| 6 | "S" ASCII S | $53 |
| 7 | ":" colon | $3A |
| 8 | status of the change over | $00, 01, 7F |
| 9 | time scale identification | $30-33 |
| 10 | day of the week | $31-37 |
| 11 | tens year | $30-39 |
| 12 | unit year | $30-39 |
| 13 | tens month | $30-31 |
| 14 | unit month | $30-39 |
| 15 | tens day | $30-33 |
| 16 | unit day | $30-39 |
| 17 | tens hour | $30-32 |
| 18 | unit hour | $30-39 |
| 19 | tens minute | $30-35 |
| 20 | unit minute | $30-39 |
| 21 | tens second | $30-35 |
| 22 | unit second | $30-39 |
| 23 | CR (carriage return) | $0D |
| 23 | LF (line feed) | $0A |
| 24 | ETX (end of text) | $03 |



hopf Elektronik GmbH
Nottebohmstr. 41 • D-58511 Lüdenscheid • Tel.: +49 (0)2351 9386-86 • Fax: +49 (0)2351 9386-93 • Internet: http://www.hopf.com • E-Mail: info@hopf.com

#### 6.3.6.2.2 MADAM-S with Request :WILA:

When the superior computer (PROMEA-MX) requests with the string **:WILA:** the clock answers with the following data string:

| Character No. | Meaning | Hex-Value |
|---|---|---|
| 1 | STX (start of text) | $02 |
| 2 | ":" colon | $3A |
| 3 | "W" ASCII W | $57 |
| 4 | "I" ASCII I | $49 |
| 5 | "L" ASCII L | $4C |
| 6 | "A" ASCII A | $41 |
| 7 | ":" colon | $3A |
| 8 | status | $00, 01, 7F |
| 9 | time scale ident. | $30-33 |
| 10 | day of the week | $31-37 |
| 11 | tens year | $30-39 |
| 12 | unit year | $30-39 |
| 13 | tens month | $30-31 |
| 14 | unit month | $30-39 |
| 15 | tens day | $30-33 |
| 16 | unit day | $30-39 |
| 17 | tens hour | $30-32 |
| 18 | unit hour | $30-39 |
| 19 | tens minute | $30-35 |
| 20 | unit minute | $30-39 |
| 21 | tens second | $30-35 |
| 22 | unit second | $30-39 |
| 23 | CR (carriage Return) | $0D |
| 23 | LF (line feed) | $0A |
| 24 | ETX (end of text) | $03 |



hopf Elektronik GmbH
Nottebohmstr. 41 • D-58511 Lüdenscheid • Tel.: +49 (0)2351 9386-86 • Fax: +49 (0)2351 9386-93 • Internet: http://www.hopf.com • E-Mail: info@hopf.com

### 6.3.6.3 Status

**8. byte** of the transmission: announcement of a change over

This byte can have the following values

| | |
|---|---|
| Nul (Hex 00) | no announcement |
| SOH (Hex 01) | announcement change over<br>daylight saving time / standard time<br>standard time / daylight saving time |
| DEL (Hex 7F) | no radio time available |

**9. byte** of the transmission: time scale ident.

| | |
|---|---|
| ASCII 0 (Hex 30) | standard time |
| ASCII 1 (Hex 31) | daylight saving time + announcement |
| ASCII 3 (Hex 33) | daylight saving time |

The day of the week nibble can have the values

ASCII 1 (Hex 31 ⇔ MO) to ASCII 7 (Hex 37 ⇔ SO)

In case of an invalid time the byte with ASCII 0 (Hex 30) is transmitted.

### 6.3.6.4 Example

**(STX):WILA:NUL32040706123456(CR)(LF)(ETX)**

- It is Tuesday 06.07.2004 - 12:34:56 o'clock
- daylight saving time, no announcement
- ( ) - ASCII-control characters e.g. (STX)



hopf Elektronik GmbH
Nottebohmstr. 41 • D-58511 Lüdenscheid • Tel.: +49 (0)2351 9386-86 • Fax: +49 (0)2351 9386-93 • Internet: http://www.hopf.com • E-Mail: info@hopf.com

## 6.3.7 IBM Sysplex Timer Model 1+2

This protocol is used for the synchronization of an IBM 9037 Sysplex Timer. The IBM Sysplex Timer expects the time at its input every second.

While starting the Sysplex Timer the ASCII-sign **"C"** is sent to the connected radio controlled clock. The listed protocol in the table is automatically given out every second by that.

### 6.3.7.1 Specified Settings

| | |
|---|---|
| **Automatic:** | The following parameters are activated **after a reset** automatically<br>• 9600 baud<br>• 8 data bit<br>• odd parity<br>• 1 stop bit<br>• sending on request without forerun and without control characters |
| **Required:** | **no** |
| **Blocked:** | **no** |

The setting UTC or local time is optional.

The above parameters can be changed manually after activating. But after a reset or a system reboot the parameters will be overwritten with the above parameters again.

### 6.3.7.2 Structure

| Character No. | Meaning | Hex-Value |
|---|---|---|
| 1 | SOH (start of header) | $02 |
| 2 | hundreds current day of the year | $30-33 |
| 3 | tens current year | $30-39 |
| 4 | unit current year | $30-39 |
| 5 | ":" colon | $3A |
| 6 | tens hour | $30-32 |
| 7 | unit hour | $30-39 |
| 8 | ":" colon | $3A |
| 9 | tens minute | $30-35 |
| 10 | unit minute | $30-39 |
| 11 | ":" colon | $3A |
| 12 | tens second | $30-35 |
| 13 | unit second | $30-39 |
| 14 | Quality Identifier | $20, 41, 42, 43, 58 |
| 15 | CR (carriage return) | $0D |
| 16 | LF (line feed) | $0A |



hopf Elektronik GmbH
Nottebohmstr. 41 • D-58511 Lüdenscheid • Tel.: +49 (0)2351 9386-86 • Fax: +49 (0)2351 9386-93 • Internet: http://www.hopf.com • E-Mail: info@hopf.com

### 6.3.7.3 Status

The 14th character ("Quality Identifier") informs about the synchronisation status of the clock. Possible values and their meaning are listed below.

| | | | | |
|---|---|---|---|---|
| "?" | = | question mark | = | no radio controlled time |
| " " | = | space | = | radio controlled time at hand |
| "A" | = | Hex 41 | = | crystal operation for more than 20 minutes |
| "B" | = | Hex 42 | = | crystal operation for more than 41 minutes |
| "C" | = | Hex 43 | = | crystal operation for more than 416 minutes |
| "X" | = | Hex 58 | = | crystal operation for more than 4160 minutes |

### 6.3.7.4 Example

**(SOH)050:12:34:56 _ (CR) (LF)** ( _ ) = Space

- It is 12:34:56 o'clock
- radio operation
- 50th day of the year



hopf Elektronik GmbH
Nottebohmstr. 41 • D-58511 Lüdenscheid • Tel.: +49 (0)2351 9386-86 • Fax: +49 (0)2351 9386-93 • Internet: http://www.hopf.com • E-Mail: info@hopf.com

## 6.3.8 TimeServ for Windows NT PCs

The synchronization of a Computer running Windows NT version 3.51 and higher is done with these data string.

The data string must be set in mode byte 2 / Bit3-Bit0 as IBM Sysplex Timer (see ***chapter 6.1.2.11*** ).

To install **"TimeServ"** on the WinNT-computer you need the program files which can be found on the Microsoft Windows NT Recource Kit CD. The newest version of the program is although available free of charge on the Microsoft Internet site:

**ftp://ftp.microsoft.com/bussys/winnt/winnt-public/reskit/nt40/i386**

A short description how to setup the PC software is available on the ***hopf*** internet site:

**http://www.hopf.com**

### 6.3.8.1 Specified Settings

| | |
|---|---|
| **Automatic:** | **no** |
| **Required:** | The following parameters must be activated after selecting this string:<br>• data string IBM Sysplex Timer<br>• transmission every second<br>• baud rate 9600<br>• 8 data bit<br>• no parity<br>• 1 stop bit<br>• without second advance<br>• transmission without control characters<br>• output UTC |
| **Blocked:** | **no** |

### 6.3.8.2 Structure

The data string is the same described in ***Chapter 6.3.7 IBM Sysplex Timer Model 1+2***.

### 6.3.8.3 Status

See ***Chapter 6.3.7 IBM Sysplex Timer Model 1+2***.

### 6.3.8.4 Example

See ***Chapter 6.3.7 IBM Sysplex Timer Model 1+2***.



*hopf* Elektronik GmbH
Nottebohmstr. 41 • D-58511 Lüdenscheid • Tel.: +49 (0)2351 9386-86 • Fax: +49 (0)2351 9386-93 • Internet: http://www.hopf.com • E-Mail: info@hopf.com

## 6.3.9 *hopf* 2000 - 4 Digit Year Output

Below the data string ***hopf*** 2000 - 4 Digit Year Output is described.

The structure of the data string is the same as the standard string and differs only in as much as the year is transmitted with 4 digits.

### 6.3.9.1 Specified Settings

| | |
|---|---|
| **Automatic:** | **no** |
| **Required:** | **no** |
| **Blocked:** | **no** |

### 6.3.9.2 Structure

| Character No. | Meaning | Hex-Value |
|---|---|---|
| 1 | STX (start of text) | $02 |
| 2 | status (internal clock status) | $30-39, $41-46 |
| 3 | day of the week (1=Monday ... 7=Sunday)<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 | thousandths year | $31-32 |
| 15 | hundreds year | $30, $39 |
| 16 | tens year tens digit | $30-39 |
| 17 | unit year unit digit | $30-39 |
| 18 | LF (line feed) | $0A |
| 19 | CR (carriage return) | $0D |
| 20 | ETX (end of text) | $03 |



*hopf* Elektronik GmbH
Nottebohmstr. 41 • D-58511 Lüdenscheid • Tel.: +49 (0)2351 9386-86 • Fax: +49 (0)2351 9386-93 • Internet: http://www.hopf.com • E-Mail: info@hopf.com

### 6.3.9.3 Status

The second and the third ASCII-character contain the status and the day of the week. The status is decoded binary. Structure of these characters :

| | b3 | b2 | b1 | b0 | | Meaning |
|---|---|---|---|---|---|---|
| **Status:** | x | x | x | 0 | | no announcement hour |
| | x | x | x | 1 | | announcement (ST-WT-ST) |
| | x | x | 0 | x | | standard time (WT) |
| | x | x | 1 | x | | daylight saving time (ST) |
| | 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) |
| **Day of the Week:** | 0 | x | x | x | | CEST / CET |
| | 1 | x | x | x | | UTC - time |
| | x | 0 | 0 | 1 | | Monday |
| | x | 0 | 1 | 0 | | Tuesday |
| | x | 0 | 1 | 1 | | Wednesday |
| | x | 1 | 0 | 0 | | Thursday |
| | x | 1 | 0 | 1 | | Friday |
| | x | 1 | 1 | 0 | | Saturday |
| | x | 1 | 1 | 1 | | Sunday |

### 6.3.9.4 Example

**(STX)E412345618072002(LF)(CR)(ETX)**

- It is Thursday 18.07.2002 - 12:34:56 o'clock
- radio operation (high accuracy)
- daylight saving time
- no announcement
- ( ) - ASCII-control characters e.g. (STX)



hopf Elektronik GmbH
Nottebohmstr. 41 • D-58511 Lüdenscheid • Tel.: +49 (0)2351 9386-86 • Fax: +49 (0)2351 9386-93 • Internet: http://www.hopf.com • E-Mail: info@hopf.com

## 6.3.10 T-String

Below the T-String is described.

The T-string can be transmitted in all modes (e.g. **forerun** or **last control characters on the second change**). The data string can be requested by "**T**".

### 6.3.10.1 Specified Settings

| | |
|---|---|
| **Automatic:** | **no** |
| **Required:** | **no** |
| **Blocked:** | **no** |

### 6.3.10.2 Structure

| Character No. | Meaning | Hex-Value |
|---|---|---|
| 1 | "T" ASCII T | $54 |
| 2 | ":" colon | $3A |
| 3 | tens year | $30-39 |
| 4 | unit year | $30-39 |
| 5 | ":" colon | $3A |
| 6 | tens month | $30-31 |
| 7 | unit month | $30-39 |
| 8 | ":" colon | $3A |
| 9 | tens day | $30-33 |
| 10 | unit day | $30-39 |
| 11 | ":" colon | $3A |
| 12 | tens day of the week | $30 |
| 13 | unit day of the week | $31-37 |
| 14 | ":" colon | $3A |
| 15 | tens hour | $30-32 |
| 16 | unit hour | $30-39 |
| 17 | ":" colon | $3A |
| 18 | tens minute | $30-35 |
| 19 | unit minute | $30-39 |
| 20 | ":" colon | $3A |
| 21 | tens second | $30-36 |
| 22 | unit second | $30-39 |
| 23 | CR (carriage return) | $0D |
| 24 | LF (line feed) | $0A |

### 6.3.10.3 Status

No status contained in the T-String.

### 6.3.10.4 Example

**T:02:07:18:04:12:34:56(CR)(LF)**

- It is Thursday 18.07.02 - 12:34:56 o'clock



hopf Elektronik GmbH
Nottebohmstr. 41 • D-58511 Lüdenscheid • Tel.: +49 (0)2351 9386-86 • Fax: +49 (0)2351 9386-93 • Internet: http://www.hopf.com • E-Mail: info@hopf.com

## 6.3.11 ABB_S_T

Below the T-String is described.

### 6.3.11.1 Specified Settings

| | |
|---|---|
| **Automatic:** | By selecting this data string the following settings are fixed:<br>• baud rate 4800<br>• word length 7 bit<br>• parity odd<br>• 2 stop bit<br>• output every minute |
| **Required:** | **no** |
| **Blocked:** | **no** |

### 6.3.11.2 Structure

The data string is according to the T-String (see ***Chapter 6.3.10 T-String***).

### 6.3.11.3 Status

See ***Chapter 6.3.10 T-String***.

### 6.3.11.4 Example

See ***Chapter 6.3.10 T-String***.



hopf Elektronik GmbH
Nottebohmstr. 41 • D-58511 Lüdenscheid • Tel.: +49 (0)2351 9386-86 • Fax: +49 (0)2351 9386-93 • Internet: http://www.hopf.com • E-Mail: info@hopf.com

## 6.3.12 Data String NTGS-String

The NTGS-string can be transmitted with all modes (e.g.. **forerun** or **"last control character on the second change"**).

In the standard mode this string is transmitted every minute in the 59th second with the data of the next minute change. A minute pulse must be used for the precise synchronisation in the connected computer.

### 6.3.12.1 Specified Settings

| | |
|---|---|
| **Automatic:** | **no** |
| **Required:** | **no** |
| **Blocked:** | **no** |

### 6.3.12.2 Structure

| Character No. | Meaning | Hex-Value |
|---|---|---|
| 1 | "T" ASCII T | $54 |
| 2 | tens year | $30-39 |
| 3 | unit year | $30-39 |
| 4 | tens month | $30-31 |
| 5 | unit month | $30-39 |
| 6 | tens day | $30-33 |
| 7 | unit day | $30-39 |
| 8 | day of the week | $31-37 |
| 9 | tens hour | $30-32 |
| 10 | unit hour | $30-39 |
| 11 | tens minute | $30-35 |
| 12 | unit minute | $30-39 |
| 13 | status ($30 ⇨ local time; $31 ⇨ UTC) | $30-31 |
| 14 | CR (carriage return) | $0D |
| 15 | LF (line feed) | $0A |

### 6.3.12.3 Status

The 13th character in the NTGS-string has information about the synchronisation status of the clock:

- "0" ($30) ⇨ local time
- "1" ($31) ⇨ UTC time

### 6.3.12.4 Example

**T020718412340(CR)(LF)**

- It is Thursday 18.02.2002 - 12:34 o'clock
- local time



hopf Elektronik GmbH
Nottebohmstr. 41 • D-58511 Lüdenscheid • Tel.: +49 (0)2351 9386-86 • Fax: +49 (0)2351 9386-93 • Internet: http://www.hopf.com • E-Mail: info@hopf.com

## 6.3.13 *hopf* Master/Slave-String

The ***hopf*** Master/Slave-String can be used to synchronize slave systems with the time data of the master system up to an accuracy of ± 0.5msec. It differs from the ***hopf*** DCF-Slave string in as much as the difference to the UTC time is included in the transmission.

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
- and status information (announcement of ST/WT changeover, announcement of a leap second and the status of reception of the Master/Slave-String source)

### 6.3.13.1 Specified Settings

| | |
|---|---|
| **Automatic:** | **no** |
| **Required:** | The following settings are required for the synchronisation of the ***hopf*** slave-systems:<br>• output every minute<br>• output second advance<br>• ETX on the second change; selectable: data string at the beginning or at the end of the 59. second.<br>• local time<br>• 9600 baud, 8 bit, 1 stop bit, no parity<br>This setting guarantees the best control of the time basis in the slave systems. |
| **Blocked:** | **no** |



*hopf* Elektronik GmbH
Nottebohmstr. 41 • D-58511 Lüdenscheid • Tel.: +49 (0)2351 9386-86 • Fax: +49 (0)2351 9386-93 • Internet: http://www.hopf.com • E-Mail: info@hopf.com

### 6.3.13.2 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 is transmitted in hours and minutes following the year. The transmission is done in BCD. The difference time may be up to ± 11.59h.

The operational sign is shown as the highest bit in the hours.

logic **1** = local time before UTC
logic **0** = local time after UTC

**Example:**

| Data String | Tens Difference Time Nibble | Difference Time |
|---|---|---|
| (STX)831234560301960300(LF)(CR)(ETX) | **0000** | - 03:00h |
| (STX)831234560301961100(LF)(CR)(ETX) | **0001** | - 11:00h |
| (STX)831234560301968230(LF)(CR)(ETX) | **1000** | + 02:30h |
| (STX)831234560301969100(LF)(CR)(ETX) | **1001** | + 11:00h |



hopf Elektronik GmbH
Nottebohmstr. 41 • D-58511 Lüdenscheid • Tel.: +49 (0)2351 9386-86 • Fax: +49 (0)2351 9386-93 • Internet: http://www.hopf.com • E-Mail: info@hopf.com

### 6.3.13.3 Status

| | b3 | b2 | b1 | b0 | | Meaning |
|---|---|---|---|---|---|---|
| **Status:** | x | x | x | 0 | | no announcement hour |
| | x | x | x | 1 | | announcement (ST-WT-ST) |
| | x | x | 0 | x | | standard time (WT) |
| | x | x | 1 | x | | daylight saving time(ST) |
| | x | 0 | x | x | | no announcement leap second |
| | x | 1 | x | x | | announcement leap second |
| | 0 | x | x | x | | crystal operation |
| | 1 | x | x | x | | radio operation |
| **Day of the Week:** | 0 | 0 | 0 | 1 | | Monday |
| | 0 | 0 | 1 | 0 | | Tuesday |
| | 0 | 0 | 1 | 1 | | Wednesday |
| | 0 | 1 | 0 | 0 | | Thursday |
| | 0 | 1 | 0 | 1 | | Friday |
| | 0 | 1 | 1 | 0 | | Saturday |
| | 0 | 1 | 1 | 1 | | Sunday |

| Status | Operating Mode | Time | Changeover ST-WT-ST | Leap Second |
|---|---|---|---|---|
| 0 = 0000 | quartz | winter | no announcement | no announcement |
| 1 = 0001 | quartz | winter | announcement | no announcement |
| 2 = 0010 | quartz | summer | no announcement | no announcement |
| 3 = 0011 | quartz | summer | announcement | no announcement |
| 4 = 0100 | quartz | winter | no announcement | announcement |
| 5 = 0101 | quartz | winter | announcement | announcement |
| 6 = 0110 | quartz | summer | no announcement | announcement |
| 7 = 0111 | quartz | summer | announcement | announcement |
| 8 = 1000 | radio | winter | no announcement | no announcement |
| 9 = 1001 | radio | winter | announcement | no announcement |
| A = 1010 | radio | summer | no announcement | no announcement |
| B = 1011 | radio | summer | announcement | no announcement |
| C = 1100 | radio | winter | no announcement | announcement |
| D = 1101 | radio | winter | announcement | announcement |
| E = 1110 | radio | summer | no announcement | announcement |
| F = 1111 | radio | summer | announcement | announcement |

### 6.3.13.4 Example

**(STX)841234561807028230(LF)(CR)(ETX)**

- It is Thursday 18.07.2002 - 12:34:56 o'clock
- radio operation
- standard time
- no announcement
- The difference time to UTC is +2.30 h



hopf Elektronik GmbH
Nottebohmstr. 41 • D-58511 Lüdenscheid • Tel.: +49 (0)2351 9386-86 • Fax: +49 (0)2351 9386-93 • Internet: http://www.hopf.com • E-Mail: info@hopf.com

## 6.3.14 *hopf* 5500

Below the data string ***hopf*** 5500 is described.

### 6.3.14.1 Specified Settings

| | |
|---|---|
| **Automatic:** | **no** |
| **Required:** | **no** |
| **Blocked:** | **no** |

### 6.3.14.2 Structure

The data string can be set to the following versions 'Output with date and time' and 'Output time only'.

#### 6.3.14.2.1 *hopf* 5500 - Output Date/Time

| Character No. | Meaning | Hex-Value |
|---|---|---|
| 1 | STX (start of text) | $02 |
| 2 | status (internal clock status) | $30-39,$41-46 |
| 3 | " " space | $20 |
| 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 | " " space | $20 |
| 11 | tens day | $30-33 |
| 12 | unit day | $30-39 |
| 13 | tens month | $30-31 |
| 14 | unit month | $30-39 |
| 15 | tens year | $30-39 |
| 16 | unit year | $30-39 |
| 17 | " " space | $20 |
| 18 | day of the week | $31-37 |
| 19 | CR (carriage return) | $0A |
| 20 | LF (line feed) | $0D |
| 21 | ETX (end of text) | $03 |



*hopf* Elektronik GmbH
Nottebohmstr. 41 • D-58511 Lüdenscheid • Tel.: +49 (0)2351 9386-86 • Fax: +49 (0)2351 9386-93 • Internet: http://www.hopf.com • E-Mail: info@hopf.com

#### 6.3.14.2.2 *hopf* 5500 - Output Time Only

| Character No. | Meaning | Hex-Value |
|---|---|---|
| 1 | STX (start of text) | $02 |
| 2 | tens hour | $30-39,$41-46 |
| 3 | unit hour | $20 |
| 4 | tens minute | $30-32 |
| 5 | unit minute | $30-39 |
| 6 | tens second | $30-35 |
| 7 | unit second | $30-39 |
| 8 | CR (carriage return) | $30-36 |
| 9 | LF (line feed) | $30-39 |
| 10 | ETX (end of text) | $0A |

### 6.3.14.3 Status

| | b3 | b2 | b1 | b0 | Meaning |
|---|---|---|---|---|---|
| **Status:** | x | x | x | 0 | radio operation |
| | x | x | x | 1 | crystal operation |
| | x | x | 0 | x | no announcement WT-ST-WT |
| | x | x | 1 | x | announcement WT-ST-WT |
| | x | 0 | x | x | standard time |
| | x | 1 | x | x | daylight saving time |
| | 1 | 0 | 0 | x | UTC |
| **Day of the Week:** | 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 |

### 6.3.14.4 Example

Data string example with output date and time:

**(STX)1 123456 180702 4(CR)(LF)(ETX)**

- It is Thursday 18.07.2002 - 12:34:56 o'clock
- crystal operation
- no announcement
- standard time



*hopf* Elektronik GmbH
Nottebohmstr. 41 • D-58511 Lüdenscheid • Tel.: +49 (0)2351 9386-86 • Fax: +49 (0)2351 9386-93 • Internet: http://www.hopf.com • E-Mail: info@hopf.com

## 6.3.15 *hopf* Standard String (6021) UTC with Local Status

This string is a special variant of the ***hopf*** Standard String (6021).

Since UTC time does not include ST/WT changeover, no summer/winter time status information or ST/WT changeover announcement is output in the data string when data strings are transmitted with UTC time base. In this case the bit for summer or winter time is set permanently to winter time (standard time) and the ST/WT changeover announcement is not transmitted.

**Output with Local Time Base**

This is identical to the ***hopf*** Standard String (6021).

**Output with UTC Time Base**

If output with UTC time base is configured for this data string then the following two variations from the ***hopf*** Standard String (6021) are applicable (status in the data string).

The status of the data string is handled differently in the two following locations:

- **Status Bit0** — If a local time announcement is present then this is transmitted instead of the UTC setting
- **Status Bit1** — The bit is not set permanently to winter time but transmits the current local time information

In this way, Systems which are synchronized with UTC time receive both information about an imminent ST/WT changeover as well as information about whether summer or winter time is applicable to the local time.

This setting has no impact on the time information shown on the display.

### 6.3.15.1 Specified Settings

| | |
|---|---|
| **Automatic:** | **no** |
| **Required:** | **no** |
| **Blocked:** | **no** |

### 6.3.15.2 Structure

The structure of the data string is according to the ***hopf*** Standard String (6021), (see ***Chapter 6.3.2*** ).

### 6.3.15.3 Example

See ***chapter 6.3.2.4 Example hopf*** Standard String (6021) with UTC as time base.



*hopf* Elektronik GmbH
Nottebohmstr. 41 • D-58511 Lüdenscheid • Tel.: +49 (0)2351 9386-86 • Fax: +49 (0)2351 9386-93 • Internet: http://www.hopf.com • E-Mail: info@hopf.com

# 7 Function Boards

This Chapter describes the relevant points for handling the function boards for the System 6855 DCF77 Slim Line.

## 7.1 General

Certain points should be noted when handling Function Boards:

**Electrical Properties**

The System and Function Boards do **not** support **hot plug**.

If it is necessary to exchange a board the System **must** be switched off first. Otherwise the System or Function Board could be damaged.

**Power Supply**

All Function Boards are powered by the operating voltage via the internal System bus.

**Mechanics**

Function Boards with front panel mechanics adapted for the 1U-System are required for installation.

**Configuration**

In principle there are two board types:

- Boards which are configured via DIP switches and jumpers only (the board must be configured prior to installation)
- Boards which are configured via the System 6855 menu (and DIP switches or jumpers), (the base configuration of the board must be set prior to installation; the other settings are then carried out via the System 6855 DCF77 menu).

**Factory Pre-wired Slots**

In addition, some Function Boards require system-internal wiring in order to achieve the desired functionality. Where boards are to be delivered with this wiring integrated into the System the wiring is carried out in the factory.

The details of slots which are wired at the time of delivery can be found in the System drawing / specifications.



hopf Elektronik GmbH
Nottebohmstr. 41 • D-58511 Lüdenscheid • Tel.: +49 (0)2351 9386-86 • Fax: +49 (0)2351 9386-93 • Internet: http://www.hopf.com • E-Mail: info@hopf.com

## 7.2 Function Boards for the System 6855 DCF77 Slim Line (1U) – Summary

In principle all the Function Boards presented here can be retrofitted by the customer. However, for certain functionalities some boards require system-internal wiring.

Provided that they have been integrated into the System in the factory, all boards have suitable system-internal wiring or an adapted slot.

The following summary describes the Function Boards that are currently available and the customer retrofit information:

| **Function Boards (max. 2 Boards per System possible)** | |
|---|---|
| Adapted board versions for operation in the System 6855 DCF77 Slim Line (1U): | • **7270** LAN Board for NTP/SINEC H1 LAN BUS<br>- Suitable for retrofit<br>• **7265** IRIG-B Output Board<br>- Suitable for retrofit<br>• **7266** IRIG-B Output Board<br>- Suitable for retrofit<br>• **7406** Slave Clock Board<br>- limited suitability for retrofit<br>(external line voltage feed required)<br>• **7112** Optical Coupler Board for Pulse Output<br>- Suitable for retrofit<br>• **7121** Relay Board for Pulse Output<br>- Suitable for retrofit<br>• **7317** DCF77 Antenna Distributor<br>- Suitable for retrofit<br>• **7247** FO Converter F-ST<br>- limited suitability for retrofit<br>(for PPS and DCF77 pulse output only (1Hz))<br>• **7170** Optical Coupler Board<br>- limited suitability for retrofit<br>(for PPS and DCF77 pulse output only (1Hz))<br>• **6841H1** Converter Board to TTL, **on enquiry**<br>• **6841H2** Converter Board to FO-plastic **on enquiry** |

The list of available Function Boards is continuously being increased.
If you require a function that is not covered by the Function Boards listed please ask us!



hopf Elektronik GmbH
Nottebohmstr. 41 • D-58511 Lüdenscheid • Tel.: +49 (0)2351 9386-86 • Fax: +49 (0)2351 9386-93 • Internet: http://www.hopf.com • E-Mail: info@hopf.com

## 7.3 Exchanging a Function Board

To exchange a Function Board for an identical board model whilst retaining all previous functions requires the following steps:

- Switch the equipment off
- Remove all connections to the Function Board to be exchanged
- Unscrew the Function Board and pull it out of the System
- Transfer all DIP and jumper settings from the old Function Board to the new board
- Insert the new Function Board into the System and tighten the screws
- Remake all connections
- Switch the equipment back on
- Set Function Board to the desired configuration via the System 6855 DCF77 menu if necessary

Software settings must **always** be set after replacing a function board by using the menu in order that the new function board takes over the parameters. Otherwise the parameters of the old board will be displayed but the new board doesn't take over the new one.

## 7.4 Installation of an Additional Function Board

In principle every Function Board can be installed at any desired point on the System 6855 DCF77.

**Exceptions:**

- Slave Line Board 7406 with any internal line voltage wiring

  If the System is not prepared for the Board 7406 in the factory then the required line voltage must be made available for the Board 7406 externally.
- Function Boards with any system-internal wiring

The details of slots which are wired at the time of delivery can be found in the System drawing / specifications.



hopf Elektronik GmbH
Nottebohmstr. 41 • D-58511 Lüdenscheid • Tel.: +49 (0)2351 9386-86 • Fax: +49 (0)2351 9386-93 • Internet: http://www.hopf.com • E-Mail: info@hopf.com

A slot with a Bus Bridge Board must be available.

- Switch the equipment off.
- Unscrew the Bus Bridge Board and pull it out of the System.
- Set all DIP and jumper settings for the desired functions on the Function Board.
- Insert the new Function Board into the System and tighten the screws.
- Make all connections to the Function Board.
- Switch the equipment back on.
- Configure the Function Board via the System 6855 menu as necessary.

## 7.5 Removing Function Boards

The following steps are required in order to remove a Function Board from the System:

- Switch the equipment off.
- Isolate all connections to the Function Board to be removed.
- Unscrew the Function Board and pull it out of the System.
- Insert the Bus Bridge Board into the System and tighten the screws.
- Switch the equipment back on.

A removed Function Board **must** be replaced by a Bus Bridge Board in order to guarantee the operation of the System.



hopf Elektronik GmbH
Nottebohmstr. 41 • D-58511 Lüdenscheid • Tel.: +49 (0)2351 9386-86 • Fax: +49 (0)2351 9386-93 • Internet: http://www.hopf.com • E-Mail: info@hopf.com

# 8 System Indicators / Fault Analysis / Troubleshooting

The System 6855 DCF77 Slim Line (1U) provides a variety of indicators for presenting the System status and for problem analysis. This status information can also be used for monitoring the clock system by means of a supervisory management system.

The System 6855 monitors itself and the installed Function Boards for faults. These may be, for example, reception failures or Function Board errors.

Faults that arise are displayed or transmitted via various elements.

## 8.1 Status and Fault Indicators

The System status und faults arising can be identified with the aid of the following elements:

### 8.1.1 Status LEDs

The System has Status LEDs on both the front and rear side (see ***Chapter 1.1.4 Status LEDs***).

#### 8.1.1.1 "Power ON" LED

The "Power ON" LED lights up as soon as the System is provided with power and switched on. This LED goes out if the operating voltage fails, the System is switched off or the power supply unit is faulty.

#### 8.1.1.2 "Sync. Status" LEDs

The "Sync. Status ON" LED lights up as soon as the System attains "Sync" status (r, R on the display). A change from ON (green) to OFF (red) signals the loss of synchronization. The action of the LEDs can be influenced by the "Status Change After" setting (see ***Chapter 5.1.4.1 Delayed Sync. Status Change***).

### 8.1.2 LCD-Display

A variety of status information can be read and fault analysis carried out with the aid of the LCD-Display.

#### 8.1.2.1 System Status on the Display

The synchronization status can be read directly on the display (see ***Chapter 4.4.2 Standard Display with Valid Time***).

### 8.1.3 Error Relays

There is a SUB-D connector with two relay outputs for the status output on the rear side of the System (see ***Chapter 3.7 Error Relays Connection***).

#### 8.1.3.1 "Power" Relay

The "Power" error relay is activated as soon as the System is supplied with the operating voltage. This relay drops out if the operating voltage fails, the System is switched off or the power supply unit is faulty.

#### 8.1.3.2 "Sync" Relay

The "Sync" error relay is activated as soon as the System reaches "Sync" status (r, R on the display). A fall-off signals the loss of synchronization. The action of the relay can be influenced by the "Status Change After" setting (see ***Chapter 5.1.4.1 Delayed Sync. Status Change***).



hopf Elektronik GmbH
Nottebohmstr. 41 • D-58511 Lüdenscheid • Tel.: +49 (0)2351 9386-86 • Fax: +49 (0)2351 9386-93 • Internet: http://www.hopf.com • E-Mail: info@hopf.com

## 8.1.4 Send LED

**Boards without a Send LED**

Function Boards without a Send LED are supplied with the appropriate time information such as DCF77 pulse and PPS directly from the Control Board. The output of serial strings is also possible for this board type (additional system-internal wiring is required).

**Boards with a Send LED**

Function Boards with a Send LED have their own processor. They are provided with information via the System bus. These boards can prepare this time information and output it in the respective board-specific form.

## 8.1.5 Auto-Reset Logic (System Bus)

The System has circular auto-reset logic. This means that each board inserted into the System bus is integrated into a reset circuit. In the event that:

- a board is removed from the System
- a board is defective
- a Function Board is in an undefined condition (program malfunction)

then this is recognized by the Control Board 6855 and the System triggers a system-wide hardware-reset.

Bus-Bridge Boards installed in the factory are integrated into the auto-reset circuit and can be replaced by suitable Function Boards without system-internal modifications.

**Auto-Reset Logic Operating Principle**

There is a watch-dog module on the Control Board 6855. An output signal transmitted from the Control Board to the System bus must be fed back to this module; otherwise a cyclical hardware-reset is triggered on the System bus.

This signal is forwarded from one Function Board to the next Function Board on the System bus. The signal is fed back to the Control Board from the last board via a bus termination.

In the event that a fault (e.g. program malfunction) arises on a board or the auto-reset circuit is broken (board was removed from the System), then the signal is no longer forwarded by this board and the Control Board triggers a system-wide hardware-reset via the System bus. After this all boards perform a defined program restart.

All boards with their own processor are actively integrated into the System's auto-reset logic. On boards without a processor the circulating signal is bridged on the System bus and by this means the pulse is forwarded directly to the next board.

## 8.1.6 Serial Output of Data Telegrams

Many serial data telegrams contain status information that also contains the synchronization status of the System.

The status of the clock system can be ascertained in a connected System by means of this status (see ***Chapter 6.3 Data Strings***).

The recording of these data telegrams (e.g. via "hyper terminal") enables long-term analysis of the reception status.



hopf Elektronik GmbH
Nottebohmstr. 41 • D-58511 Lüdenscheid • Tel.: +49 (0)2351 9386-86 • Fax: +49 (0)2351 9386-93 • Internet: http://www.hopf.com • E-Mail: info@hopf.com

## 8.2 Error Patterns

This Chapter describes various error patterns which enable the customer to make a preliminary problem analysis. In addition they provide an indication about how to describe the error when contacting ***hopf*** Support.

### 8.2.1 Complete Failure

**Description**

- The power LEDs are off
- "Power" error relay has tripped
- Display not active

**Cause / Problem Solution**

- Equipment is switched off
- Power supply failure
- Power supply unit defective

### 8.2.2 Power LED "ON" - No Display and No Output

**Description**

- The power LEDs are lit
- Display not active
- The complete System is not functioning

**Cause / Problem Solution**

- The Control Board is faulty
- The voltage provided by the power supply unit is too low
  ⇨ The external power supply is too low
  ⇨ The power supply unit is set incorrectly / faulty

### 8.2.3 Power LED "ON" - No Display but Valid Signal Output

**Description**

- The power LEDs are lit
- Display not active or shows only dark bars
- Send LEDs of all boards light up cyclically
- Data Strings are available on the serial interfaces

**Cause / Problem Solution**

- The display is faulty
- The connection cable between the Control Board and the display is not plugged in correctly or is faulty



*hopf* Elektronik GmbH
Nottebohmstr. 41 • D-58511 Lüdenscheid • Tel.: +49 (0)2351 9386-86 • Fax: +49 (0)2351 9386-93 • Internet: http://www.hopf.com • E-Mail: info@hopf.com

### 8.2.4 Power LED "ON" - Cyclical Flickering of the Displays

**Description**

- The System start frame appears on the display for a short time and then resets permanently
- Function Boards start up for a short period

**Cause**

- System running in auto-reset

**Problem Solution**

- There is a board in one of the board slots
- A board that is integrated into the System is faulty

### 8.2.5 No DCF77 Reception / No Synchronization

**Description**

- The System status on the display is "C"
- The red synchronization status OFF LED illuminates
- "Sync" error relay has de-energized
- Quartz status is output in the serial strings

**Cause / Problem-solving**

- The System was configured as Quartz Clock
- **DCF77 Antenna**
  - Reception via DCF77 antenna is faulty
  - The antenna equipment is faulty
  - The antenna cable is connected to the wrong BNC socket (e.g. “DCF-SIM“ socket instead of “Antenna“)
- **Other Synchronization Sources**
  - The System is not being supplied with the required synchronization signal
  - Transmission of the synchronization signal is faulty
  - The synchronization signal transmitter has failed
  - The System was configured for a different synchronization signal

### 8.2.6 No DCF77 Antenna Simulation / DCF77 Pulse

**Description**

- A System that is connected to DCF77 Antenna Simulation or DCF77 pulse does not synchronize.

**Cause / Problem-solving**

- The System is not synchronous and the DCF77 Antenna Simulation timer has lapsed.



hopf Elektronik GmbH
Nottebohmstr. 41 • D-58511 Lüdenscheid • Tel.: +49 (0)2351 9386-86 • Fax: +49 (0)2351 9386-93 • Internet: http://www.hopf.com • E-Mail: info@hopf.com

## 8.2.7 No (or incorrect) Serial Output

**Description**

- The connected Systems are not receiving serial strings
- The connected Systems are receiving serial strings with a time that is different from the System time

**Cause / Problem-solving**

- The serial interfaces are not configured correctly (e.g. only transmit on inquiry, active handshake, UTC output, etc.).
- The serial interface connections are not correct (e.g. TxD and RxD cables transposed).

## 8.2.8 Incorrect Time Output

Transmission errors can occur in both local time and UTC time if the configuration is incorrect.

**Only** local time may be entered via the keypad

### 8.2.8.1 Incorrect Local Time

**Description**

- Transmitted **local time** is different from current local time

**Cause / Problem-solving**

- Time was set manually and System is running in quartz mode
- **Quartz Clock**
  - Time has drifted
  - ST/WT changeover points of time not set or set incorrectly
- **DCF77 Antenna**
  - Time has drifted because System has been operating for a long time in quartz mode
  - The System is synchronizing with an incorrect DCF77 antenna simulation instead of via antenna
  - The System is not configured for synchronization via antenna
- **Other Synchronization Sources**
  - Time has drifted because System has been operating for a long time in quartz mode
  - The synchronization signal is not transmitting the local time



hopf Elektronik GmbH
Nottebohmstr. 41 • D-58511 Lüdenscheid • Tel.: +49 (0)2351 9386-86 • Fax: +49 (0)2351 9386-93 • Internet: http://www.hopf.com • E-Mail: info@hopf.com

#### 8.2.8.2 Incorrect UTC Time

In this connection it is assumed that the local time is correct.

**Description**

- Transmitted **UTC time** is different from current UTC time

**Cause / Problem-solving**

- **Quartz Clock**
  - UTC/local time offset not set or set incorrectly
  - UTC/local time offset is different from the time offset configured in the System 6855 ⇨ Fault on Control Board 6855
- **DCF77 Antenna**
  - The System is not configured for synchronization via antenna
- **Other Synchronization Sources**
  - CET and WORLDWIDE were confused or transposed when setting the synchronization source
  - WORLDWIDE - UTC/local time offset not set or set incorrectly
  - Local time/UTC time offset is different from the time offset configured in the System 6855 ⇨ Fault on Control Board 6855

### 8.2.9 No ST/WT Changeover

**Description**

- "S" for summer time does not appear on the display
- The bit for summer time is not set in the data string status.

**Cause / Problem-solving**

- **Quartz Clock**
  ST/WT changeover points of time not set or set incorrectly
- **DCF77 Antenna**
  The System has been running without synchronization since announcement and execution of the changeover. The System is in "C" (Crystal) status or the status change delay is active.
- **Other Synchronization Sources**
  The synchronization signal is not containing the ST/WT changeover information

### 8.2.10 Output and Function Errors of Individual Function Boards

The respective board description should be consulted for error analysis of an individual Function Board.



hopf Elektronik GmbH
Nottebohmstr. 41 • D-58511 Lüdenscheid • Tel.: +49 (0)2351 9386-86 • Fax: +49 (0)2351 9386-93 • Internet: http://www.hopf.com • E-Mail: info@hopf.com

## 8.3 Support from the *hopf* Company

Should the System demonstrate error descriptions other than those listed in ***Chapter 8.2 Error Patterns***, please contact Support at ***hopf*** Elektronik GmbH with an exact description of the fault and the following information:

- Serial number of the System (front panel and nameplate on the housing cover)
- Occurrence of the error during commissioning or operation
- Exact error description
- In the case of DCF77 reception/synchronization problems ⇨ description of the antenna equipment used:
  - Components used (antenna, indirect lightning protector, etc.)
  - Cable type used
  - Total length of the antenna equipment
  - Sequence of components and cable lengths between the components
  - Antenna installation position (e.g. signal shading by building)

  and
  - Settings and System Status Byte

Please write to the following E-mail address with the above information:

**support@hopf.com**

Providing a detailed description of the error and the information listed above avoids the need for additional clarification and leads to faster processing by our Support team.



*hopf* Elektronik GmbH
Nottebohmstr. 41 • D-58511 Lüdenscheid • Tel.: +49 (0)2351 9386-86 • Fax: +49 (0)2351 9386-93 • Internet: http://www.hopf.com • E-Mail: info@hopf.com

# 9 Maintenance / Care

The System 6855 is generally maintenance-free. The following points should be noted if it is necessary to clean the System 6855:

## 9.1 General Guidelines for Cleaning

The following **must not** be used to clean the System 6855:

- Fluids
- Cleaning agents containing solvents
- Cleaning agents containing acids
- Abrasive media

The use of such cleaning agents or media could damage the System 6855.

Do not use a wet cloth to clean the System 6855.
**There is the danger of an electric shock**.

**To clean the System 6855 use a cloth that is:**

- Antistatic
- Soft
- Non-fabric
- Damp

## 9.2 Cleaning the Housing

Make sure that connections or cables are not loosened whilst cleaning the housing of an active system. There is a risk that the system could become damaged and lose functionality.

## 9.3 Cleaning the Display and Keypad

Minimum pressure should be exerted when cleaning the display and keypad. Excessive pressure may cause mechanical damage.

When cleaning the active System 6855 make sure that System functions are not altered by accidentally pressing a key.



hopf Elektronik GmbH
Nottebohmstr. 41 • D-58511 Lüdenscheid • Tel.: +49 (0)2351 9386-86 • Fax: +49 (0)2351 9386-93 • Internet: http://www.hopf.com • E-Mail: info@hopf.com

# 10 Technical Data System 6855 DCF77 Slim Line (1U)

| **General Data** | |
|---|---|
| Operation: | Via keypad<br>and LCD-Display (illuminated) |
| Housing protection class: | IP20 |
| Protection class: | I, with PE connection. Additional earth screw for cables up to 16mm$^2$ |
| Housing construction: | Sheet steel / aluminium, closed |
| Housing dimensions: | 19" system, 1U / 84HP, depth 230mm |
| Cooling: | Active cooling by fans, temperature-controlled. Air inlets left / right |
| Display: | • LCD-Display 2x16 digit<br>• Character height 5mm<br>• Display type: alphanumeric<br>• Status LEDs:<br>- Power<br>- Sync |
| Keypad: | 20 keys |
| Maintenance-free buffering of the internal back-up clock: | 3 days |
| MTBF (Base Board 6855): | > 300,000 hours |
| Weight: | approx. 3kg |

| **AC Power Supply** (with wide input range) | |
|---|---|
| Nominal input voltage: | 100 - 240V AC / 47 - 63Hz<br>Connection via input connector compliant with IEC/EN 60320-1/C14 |
| Input voltage range: | 85-264V AC 110-370V DC |
| Frequency: | 47-63Hz 0Hz |
| Current consumption (at nominal values): | Approx. 0.37A (120V AC) / 0.23A (230V AC) |
| Starting current: | Typically 15A ($I_O$ = 100%) 120V AC<br>Typically 30A ($I_O$ = 100%) 230V AC |
| Mains failure bridging at nominal load: | > 20msec. (> 100V AC) |
| Turn-on time after application of mains voltage: | < 500msec. |
| Transient overvoltage protection: | Overvoltage category II (EN 60664-1) |
| Input fuse - internal: | 2A (equipment protection) |
| Recommended pre-fuse: | Line protection switch 6A, 10A characteristic B (EN 60898) |
| PE leakage current: | < 0.75mA (60Hz, compliant with EN 60950) |
| Insulation voltage input / PE: | 2000V AC, 1 minute, residual current = 10mA, 500V DC, 50MΩ at least (at room temp.) |
| **Output Data (internal only)** | |
| Internal nominal output voltage: | 5V DC |
| Nominal output current $I_N$ 0°C ... +55°C | 3A ($U_{OUT}$ = 5V DC) |
| Efficiency | > 74% (at 230V AC and nominal values) |
| Function display (Power LED) | Green LED |



hopf Elektronik GmbH
Nottebohmstr. 41 • D-58511 Lüdenscheid • Tel.: +49 (0)2351 9386-86 • Fax: +49 (0)2351 9386-93 • Internet: http://www.hopf.com • E-Mail: info@hopf.com

| **DC Power Supply 24V or 48V (Option)** | | |
|---|---|---|
| Nominal input voltage: | 24V DC or | 48V DC |
| Input voltage range: | 18-36V DC or | 36-76V DC |
| Current consumption (at nominal values): | 0.69A | 0.35A |
| Turn-on time after application of mains voltage: | < 200msec. | |
| Input fuse - internal: | 2A, fast-acting or | 1A, fast-acting |
| Insulation voltage input / output: | 1500V DC 1 minute, 500V DC 50MΩ at least (20°C ± 15°C) | |
| **Output Data (internal only)** | | |
| Internal nominal output voltage | 5V DC | |
| Nominal output current $I_N$ 0°C ... +55°C | 3A ($U_{OUT}$ = 5V DC) | |
| Efficiency | > 85% | |
| Function display (Power LED) | Green LED | |

| **Environmental Conditions** | | |
|---|---|---|
| Temperature range: | Operation: | 0°C to +55°C |
| | Storage: | -20°C to +75°C |
| Humidity: | | Max. 90%, not condensed |

| **CE compliant in accordance with EMC Directive 89/336/EEC and Low Voltage Directive 73/23/EEC** | |
|---|---|
| Safety / Low Voltage Directive: | DIN EN 60950-1:2001 + A11 + Corrigendum |
| EN 61000-6-4: | |
| EMC (Electromagnetic Compatibility) / Interference Resistance: | EN 610000-4-2 /-3/-4/-5/-6/-11 |
| EN 61000-6-2: | EN 61000-3-2 /-3 |
| Interference voltage EN 55022: | EN 55022 Class B |
| Interference radiation EN 55022: | EN 55022 Class B |



hopf Elektronik GmbH
Nottebohmstr. 41 • D-58511 Lüdenscheid • Tel.: +49 (0)2351 9386-86 • Fax: +49 (0)2351 9386-93 • Internet: http://www.hopf.com • E-Mail: info@hopf.com

| Accuracy - for DCF77 Reception via Antenna | |
|---|---|
| Internal PPS pulse on DCF77 reception: | < ± 2msec compared to the DCF77 signal at the antenna |
| VCO control<br>of the internal quartz base: | < ± 2ppm, after at least 1 hour<br>DCF77 reception |
| Freewheel accuracy: | < ± 2ppm after at least 1 hour<br>DCF77 reception / T = +20°C<br>• Drift for T = +20°C (constant):<br>- after 1h: 7.2msec.<br>- after 24h: 172.8msec. |
| Internal back-up clock | ± 25ppm /<br>for T = +10°C to +50°C |

| Signal Outputs | |
|---|---|
| Full-duplex serial interfaces (independent from each other, without handshake): | Via 9 pin SUB-D connectors<br>• COM 0: RS232 and RS422<br>• COM 1: RS232 and RS422 |
| DCF77 Antenna Simulation (77.5kHz): | Via BNC socket<br>• Signal level 3-5m$V_{ss}$ an 50Ω<br>• Carrier frequency 77.5kHz ± 25ppm |
| Status Relays<br>(Power / Sync): | Resistive circuit-breaking capacity:<br>max. 200mA / 60V DC<br>Contacts<br>• Normally open contact (no)<br>• Common contact (c)<br>• Normally closed contact (nc) |

**Special production:**

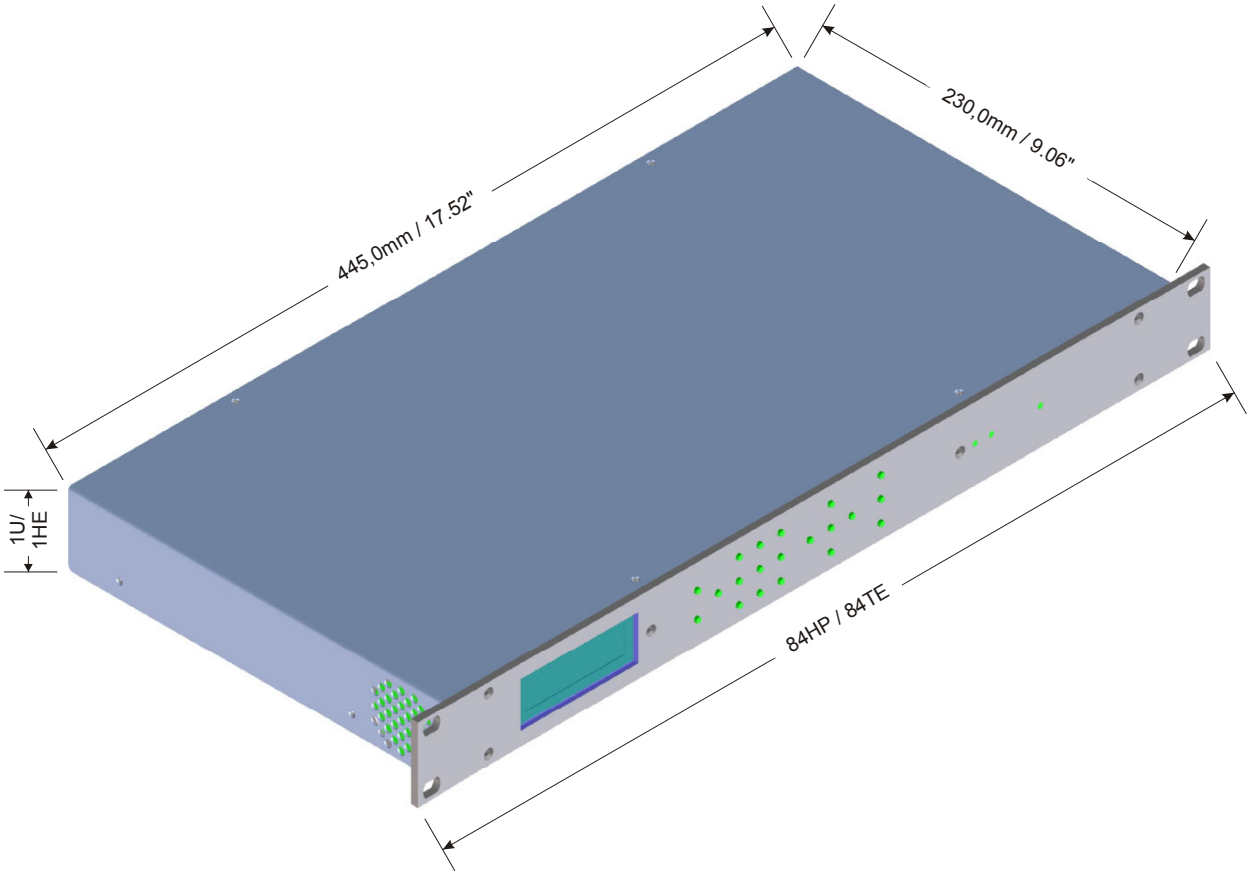
Modifications can be made to hardware and software in accordance with customer specifications.

The ***hopf*** Company reserves the right to modify hardware and software at any time.



***hopf*** Elektronik GmbH
Nottebohmstr. 41 • D-58511 Lüdenscheid • Tel.: +49 (0)2351 9386-86 • Fax: +49 (0)2351 9386-93 • Internet: http://www.hopf.com • E-Mail: info@hopf.com

# 11 System Drawing






hopf Elektronik GmbH
Nottebohmstr. 41 • D-58511 Lüdenscheid • Tel.: +49 (0)2351 9386-86 • Fax: +49 (0)2351 9386-93 • Internet: http://www.hopf.com • E-Mail: info@hopf.com

# 12 Appendix

## 12.1 DCF77 (German Long-Wave Transmitter Frankfurt 77.5kHz)

DCF77[1] is a time signal that is radiated via a terrestrial long-wave transmitter in Frankfurt, Germany, with a carrier frequency of 77.5kHz.

The transmission of the data is amplitude modulated whereas the transmission of the time information is bit serial.

### 12.1.1 DCF77 General

The DCF77 signal transmits central European time (CET) or central European summer time (CEST). This time is calculated from UTC plus one hour (CET) or two hours (CEST).

The DCF77 signal contains complete time information: minute, hour, day-of-week and date. The following information is transmitted:

- Local time
- Current time zone (ST or WT)
- Announcement bit for ST/WT changeover
- Announcement bit for the leap second

If UTC is to be calculated from the local time transmitted by DCF77 then the receiver must know the time offset (local time to UTC). In the CET zone this is +1 hour in an easterly direction. A ***hopf*** system calculates the correct UTC time from the local time, via the internally set time offset and the ST/WT changeover points.

#### 12.1.1.1 DCF77 Signal Structure

The complete time information is transmitted in every minute. A part of time information is transmitted every second of every minute, with the exception of the 59$^{th}$ second. The missing signal in this second gives notice of an impending minute change in the next second.

The amplitude of the 77.5kHz carrier frequency is reduced from 100% to 25% at the beginning of every second for a duration of 100 or 200ms (amplitude modulation). The beginning of each reduction marks the precise second change.

The duration of reductions of 100 and 200ms (binary 0 and 1) is converted into a BCD code and in this way decodes the transmitted time telegram.

The data string is sub-divided into different groups. Three of them followed by a parity check:

- P1 = parity of minutes
- P2 = parity of hours
- P3 = parity of current day-of-year, day-of-week, month and year

The binary 1s' of a group are calculated and supplemented with the parity bit to form an even number.

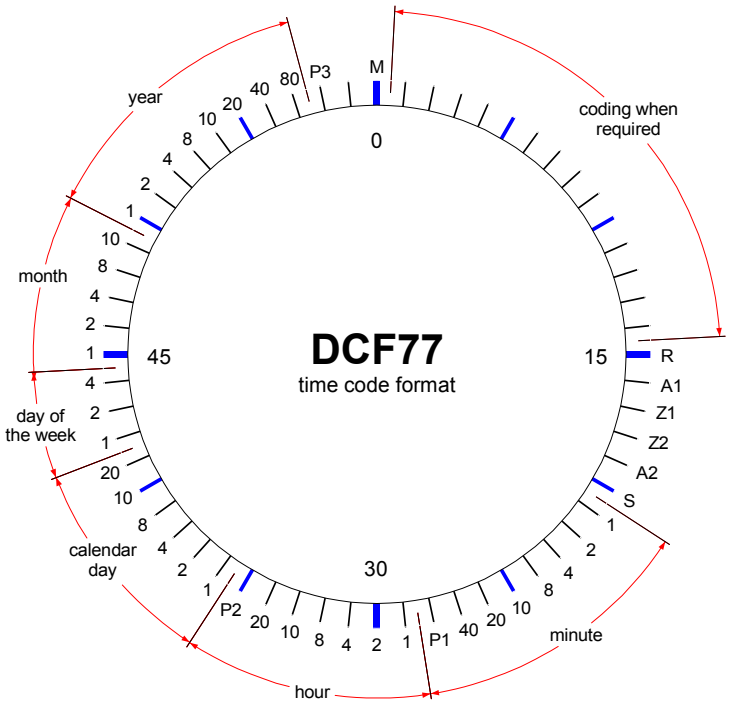
[1] DCF77: **D** = Deutscher (German), **C** = Long-wave transmitter, **F** = Frankfurt, **77** = frequency



*hopf* Elektronik GmbH
Nottebohmstr. 41 • D-58511 Lüdenscheid • Tel.: +49 (0)2351 9386-86 • Fax: +49 (0)2351 9386-93 • Internet: http://www.hopf.com • E-Mail: info@hopf.com

When valid time information is transferred from CEST, the 17th second mark has a duration of 200ms. One hour before changeover from CEST to CET, or vice-versa, the 16th second mark has a duration of 200ms.

The coding is shown in the following illustration:




| | |
|---|---|
| **M** | Minute mark (100msec.) |
| **R** | The second mark no. 15 has a duration of 200msec. when radiation takes place via the standby antenna. |
| **A1** | Announcement of an imminent change from CET to CEST or vice-versa. |
| **Z1, Z2** | Time zone bits |
| **A2** | Announcement of a leap second |
| **S** | Start bit of the coded time information |
| **P1, P2, P3** | Test bits |



hopf Elektronik GmbH
Nottebohmstr. 41 • D-58511 Lüdenscheid • Tel.: +49 (0)2351 9386-86 • Fax: +49 (0)2351 9386-93 • Internet: http://www.hopf.com • E-Mail: info@hopf.com

#### 12.1.1.2 Advantages and Disadvantages DCF77

+ DCF77 receivers are generally less expensive than GPS receivers
+ Reception of the legal time in Germany
+ The antenna can be installed inside a building under favorable conditions (no lightning protection or expensive laying of antenna cable is necessary)
- Sensitive to interference signals (atmospheric interference or radiation from electric motors, monitors or other switched, inductive loads)
- Installation limited to within approx. 1500km of Frankfurt, Germany
- Transmitter may be switched off when there is bad weather at the transmission location
- Lower short-term accuracy when compared with GPS

### 12.1.2 DCF77 Generation by *hopf* Clocks

***hopf*** clocks can simulate the DCF77 signal for other clocks in order to operate DCF77 clocks in locations where the DCF77 signal is not available.

This can realized as DCF77 antenna simulation (77.5kHz) and also as DCF77 pulse (1Hz).

#### 12.1.2.1 DCF77 Signal Simulation (77.5kHz)

An analogue, amplitude-modulated carrier signal is generated by the clock system. A connected, standard DCF77 radio-controlled clock is unable to differentiate this signal from an "original" DCF77 signal received via an antenna. It is also possible to use time bases other than only CET/CEST to simulate the signal.

The term **DCF77 Antenna Simulation** or, in short, **DCF77 Sim** is commonly used in ***hopf*** literature to describe this term.

#### 12.1.2.2 DCF77 Pulse (1Hz)

The DCF77 pulse uses the same coding procedure as that used by the DCF77 signal radiated by the transmitter. The difference lies in the fact that an amplitude-modulated carrier signal is not used for transmission. The 100 and 200msec. long reductions are represented by logical signal levels.

In this digital form the signal can then also be transmitted via a fiber optic cable, for example.



*hopf* Elektronik GmbH
Nottebohmstr. 41 • D-58511 Lüdenscheid • Tel.: +49 (0)2351 9386-86 • Fax: +49 (0)2351 9386-93 • Internet: http://www.hopf.com • E-Mail: info@hopf.com

# 13 Glossary

| | |
|---|---|
| **A - F** | |
| Baud (short cut: Bd) | Baud-Rate; Bit/s |
| Bit | Binary Digit (shortest digital information unit, 0 or 1) |
| BNC | Bayonet Nut Coupling |
| Bus | Line system for data communication |
| Byte | Digital information unit: 1 Byte = 8 Bit |
| c | Relay contact - common |
| CEST | Central European Summer Time |
| CET | Central European (Winter-) Time |
| DCF77 | German Long-wave transmitter Frankfurt on 77.5kHz |
| Dry Contact | Potential free Contact |
| Ethernet | Network protocol 10 Mbit/s (IEEE-Norm 802.3) |
| Fast Ethernet | Network protocol 100 Mbit/s (IEEE-Norm 802.3) |
| FO | Fiber Optic |
| **G - L** | |
| GPS | Global Positioning System |
| HE | Panel high for 19" housings (German) |
| HP | Panel width for 19" housings (English) |
| IRIG-B | Time coding method |
| LCD | Liquid Crystal Display |
| LED | Light Emitting Diode |
| Local time | Locale time if applicable with ST/WT changeover |
| LWL | Fiber Optic |
| **M - N** | |
| M/S-String | ***hopf*** Master/Slave-String |
| nc | Relay contact (normally close) |
| no | Relay contact (normally open) |
| Nibble | Digital Information unit: 1 Nibble = 4 Bit |
| NTP | Network Time Protocol |
| **O - Q** | |
| PPM | Pulse per Minute |
| ppm | Parts per Million |
| PPS | Pulse Per Second |
| **R - T** | |
| RC | Remote Control |
| Standard time | Local time without summer time offset (wintertime) |
| SyncOFF | ***hopf*** Timer for the sync status OFF |
| SyncON | ***hopf*** Timer for the sync status ON |
| ST/WT changeover | Summertime- / Wintertime changeover |
| TE | Panel width for 19" housings (German) |
| **U - Z** | |
| U | Panel high for 19" housings (English) |
| UTC | Coordinated Universal Time |



***hopf*** Elektronik GmbH
Nottebohmstr. 41 • D-58511 Lüdenscheid • Tel.: +49 (0)2351 9386-86 • Fax: +49 (0)2351 9386-93 • Internet: http://www.hopf.com • E-Mail: info@hopf.com