Industriefunkuhren

hopf Elektronik GmbH

Technical Manual

Slim Line System

Model 6842 GPS

ENGLISH

Version: 07.01 – 11.06.2007

Valid for Devices 6842 GPS with FIRMWARE Version: **07.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 chapter 3.3 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

1 System Description: 6842 GPS Slim Line (1U)

The proven and tested ***hopf*** System 6842 GPS 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 6842 GPS is available in the 1U design. This allows tailor-made solutions to be realized with the System 6842 GPS. 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 high reliability and complete freedom from maintenance.

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 6842 GPS 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 is possible with **one satellite** only
- 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)
- **High freewheel accuracy** due to GPS-supported control of the internal quartz base
- **DCF77 antenna simulation** (77.5kHz) for the synchronization of an additional DCF77 clock system
- **Potential isolation** of the GPS 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 6842 GPS Slim Line (1U) Design

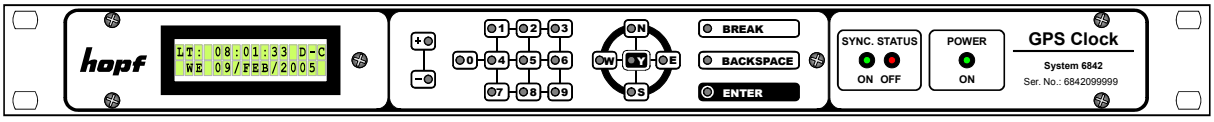
The system can be individually configured for various applications due to its partly modular design and can be easily upgraded or converted to suit changes in the application conditions.

1.1.1 19" Module Rack (1U)

The base system consists of the following:

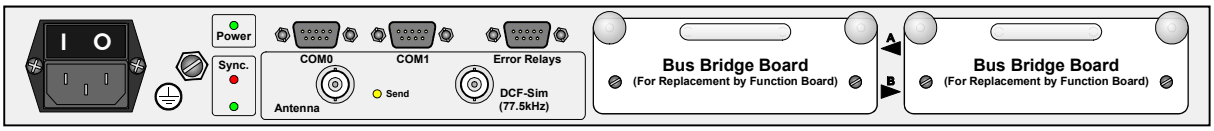
- 1/1 19" module rack 1U/84HP (Slim Line)
- Wide-ranging power supply unit from 100-240V AC / 20VA (47-63Hz)
  Other input voltages available
- Voltage input with mains switch and line filter
- Connection for protection earth (PE) cables up to 16mm²
- System front panel with LCD-Display (2x16), keypad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

System front panel:



- Control Board 6842 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

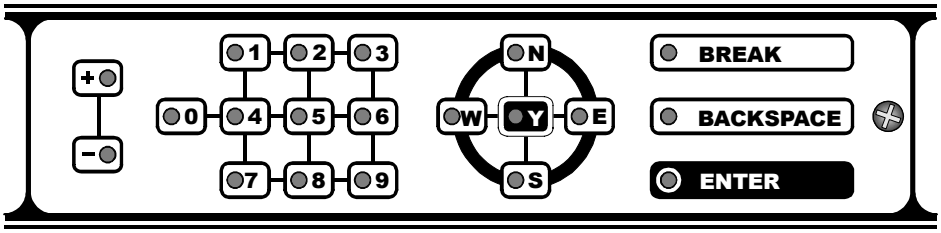
The display consists of a two-line LCD-Display (Liquid Crystal Display) with 2x16 characters and back-lighting.

The lighting is activated by pressing a key and switches off automatically after approx. 4 minutes with no action required on the keypad.

For a description of the display functions please see ***Chapter 4 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 3.4 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 ON	Power	**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. STATUS ON OFF	Sync.	**Sync.** (red)	ON	The system is **not** currently synchronized by GPS
		Sync. (green)	ON	The system is currently synchronized by GPS 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 6842 and the Function Boards are connected, can be found in the System 6842.

The System Bus serves to provide:

- Distribution of the time information
- Communication between Control Board 6842 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 6842)
- 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 6842 GPS 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 6 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

- Earthing System / connect power supply
- Connect GPS antenna
- Switch on power supply
- Input local time and date
- Input time offset
- Input position
- Input changeover point of time **S ⇨ D**
- Input changeover point of time **D ⇨ S**
- Wait for minute change
- Trigger program reset
- Check for correct acquisition of the time offset using the **SHOW** function
- Check for correct acquisition of the position using the **SHOW** function
- Check for correct acquisition of the changeover point of time **S ⇨ D** using the **SHOW** function
- Check for correct acquisition of the changeover point of time **D ⇨ S** using the **SHOW** function
- Trigger master reset

The equipment should be synchronous within less than 30 minutes.

This can be checked by means of the:

- LCD-Display
- Status LEDs
- 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 Installation

The following describes the installation of the System hardware.

2.1 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 cables to the System.

2.2 Earthing

The System 6842 GPS 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.

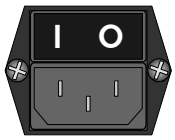
2.3 AC Power Supply

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 6842 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

2.3.1 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 6842 GPS 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.

2.3.2 Power Supply Unit Specifications

All AC power supply specifications are contained in ***Chapter 9 Technical Data System 6842 GPS Slim Line (1U)***.

2.3.3 Fusing

Pay attention to the correct fusing of the power supply when connecting the System 6842 GPS Slim Line (1U)

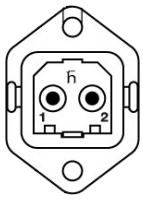
The corresponding performance data can be taken from the equipment nameplate. The System 6842 GPS Slim Line (1U) is currently fitted with a power supply unit with a power consumption of max. 20VA.

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

2.4 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 6842 GPS Slim Line (1U):

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

The System 6842 can be damaged if incorrect voltage is connected.

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

2.4.1 Power Supply Unit Specifications

All DC power supply specifications are contained in ***Chapter 9 Technical Data System 6842 GPS Slim Line (1U)***.

2.4.2 Fusing

Pay attention to the correct fusing of the power supply when connecting the System 6842 GPS Slim Line (1U).

The corresponding performance data can be taken from the equipment nameplate. The System 6842 GPS 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.

2.4.3 Reverse Voltage Protection

The version of System 6842 GPS 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

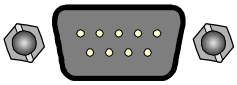
2.5 Synchronization Source Connection (GPS)

The GPS antenna equipment coaxial cable is connected to the BNC socket marked **"Antenna"** on the rear side of the System. More detailed specifications for the installation of the antenna equipment, such as cable lengths and types, can be found in the manual "Antenna Equipment GPS".

2.6 COM0 / COM1 Serial Interfaces Connection

The serial interfaces are assigned as follows:

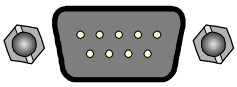
SUB-D connector
9 pin



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

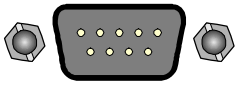


COM1

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)

2.7 Error Relays Connection

SUB-D connector
9 pin



Error Relays

Pin	Assignment
1	
2	PWR - REL2 Common 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 Common contact (c)
9	SYNC - REL1 Normally open contact (no)

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

2.8 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.

2.9 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

3 Commissioning

This chapter describes the commissioning of the system 6842.

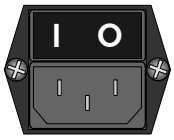
3.1 General Procedure

The commissioning procedure is as follows:

- Check the cabling:
  - Earth
  - Power supply
  - GPS 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)
- GPS antenna equipment connection to remain in place
- Switch on System 6842
- 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 6842
- 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

3.2 Switching on the Operating Power Supply

AC power supply:



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

The System 6842 GPS Slim Line (1U) runs and the firmware version and programming date are shown on the display
(see ***Chapter 3.3 Display after System Start/Reset (Firmware)***).

DC power supply:

Switch on external power supply source.

The System 6842 GPS Slim Line (1U) runs and the firmware version and programming date are shown on the display
(see ***Chapter 3.3 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

3.3 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 06.00
 22/MAY/2006
```

⇨ Control Board 6842 firmware
⇨ Firmware programming date

3.3.1 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.

3.3.2 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
 TU  03/AUG/2004
```

The meaning of the individual items is as follows:

LT : 08:45:48	On adjustment: show **local time** on the display.
UT : 06:45:48	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**
12/JUL/2004	Display of the date: **Day / Month abbreviation / Year**

Status display:

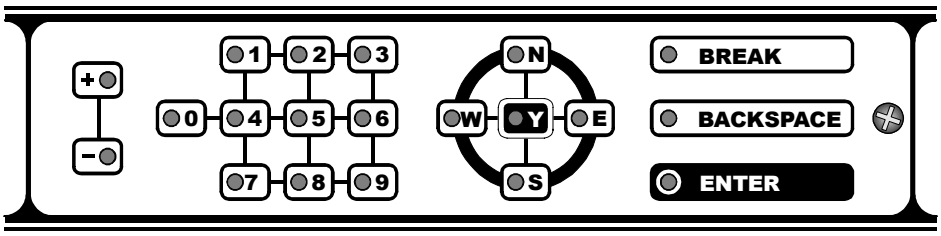
Position 1: X--	**"D"** **"S"**	For summer time (Daylight-saving time) For winter time (Standard time)
Position 2: -X-	**"A"** **"_"**	Announcement of ST/WT changeover (summer time/ winter time changeover) to another time zone. This announcement takes place approx. 1 hour before the time zone change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

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 Keypad Functions

The following describes the keypad design and operation.

3.4.1 Keypad Layout



3.4.2 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. 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

3.4.3 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
  TU  03/AUG/2004
```

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.

3.5 Initialization

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

To initialize the System 6842 GPS the menu items presented below are to be parameterized accordingly (see ***Chapter 4.1.1 SET Menu – Basic Settings System 6842***). 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

```
1.01   TIME
1.02   DIF.-TIME
1.03   CHANGE-OVERDATE (Changeover Standard time / Summer time)
1.04   CHANGE-OVERDATE (Changeover Summer time / Standard time)
1.05   POSITION
1.25   STATUS OR PULSE OUTPUT (only verification)
1.26   TIME OUTPUTS DISPLAY/DCF
```

All additional settings are to be carried out in accordance with the requirements 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

4 System Parameterization and Operation

The following explains the menu structure and the individual menus.

4.1 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   CHANGE-OVERDATE (Changeover Standard time ⇨ Summer time)
1.04   CHANGE-OVERDATE (Changeover Summertime ⇨ Standard time)
1.05   POSITION
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   OPTICAL TRANS - SERIALPARAMETER  (No function in this equipment version)
1.13   OPTICAL TRANS - MODE 1           (No function in this equipment version)
1.14   OPTICAL TRANS - MODE 2           (No function in this equipment version)
1.15   LAN1 - ADR             (No Board 7270 in the System ⇨ no function)
1.16   LAN1 - GATEWAY         ( ------------------- " ------------------ )
1.17   LAN1 - NET-MASK        ( ------------------- " ------------------ )
1.18   LAN1 - CONTROL-BYTE    ( ------------------- " ------------------ )
1.19   LAN2 - ADR             (No 2nd Board 7270 in the System ⇨ no function)
1.20   LAN2 - GATEWAY         ( ------------------- " ---------------------- )
1.21   LAN2 - NET-MASK        ( ------------------- " ---------------------- )
1.22   LAN2 - CONTROL-BYTE    ( ------------------- " ---------------------- )
1.23   FREQUENCY              (No Board 7530 in the System ⇨ no function)
1.24   FREQUENCY OUTPUT DELAY ( ------------------- " ------------------ )
1.25   STATUS OR PULSE OUTPUT
1.26   TIME OUTPUTS DISPLAY/DCF
1.27   SYSTEM STATUS
1.28   KEY-WORD
```


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   CHANGE-OVERDATE (changeover point of time Standard ⇨ Summer)
2.03   CHANGE-OVERDATE (changeover point of time Summer ⇨ Standard)
2.04   POSITION
2.05   SATELLITES
2.06   COM0 - SERIALPARAMETER
2.07   COM0 - MODE 1
2.08   COM0 - MODE 2
2.09   COM1 - SERIALPARAMETER
2.10   COM1 - MODE 1
2.11   COM1 - MODE 2
2.12   OPTICAL TRANS - SERIALPARAMETER (No function in this equipment version)
2.13   OPTICAL TRANS - MODE 1          (No function in this equipment version)
2.14   OPTICAL TRANS - MODE 2          (No function in this equipment version)
2.15   LAN1 - ADR              (No Board 7270 in the System ⇨ no function)
2.16   LAN1 - GATEWAY          ( ------------------- " ------------------ )
2.17   LAN1 - NET-MASK         ( ------------------- " ------------------ )
2.18   LAN1 - CONTROL-BYTE     ( ------------------- " ------------------ )
2.19   LAN2 - ADR              (No 2nd Board 7270 in the System ⇨ no function)
2.20   LAN2 - GATEWAY          ( ------------------- " ---------------------- )
2.21   LAN2 - NET-MASK         ( ------------------- " ---------------------- )
2.22   LAN2 - CONTROL-BYTE     ( ------------------- " ---------------------- )
2.23   FREQUENCY               (No Board 7530 in the System ⇨ no function)
2.24   FREQUENCY OUTPUT DELAY  ( ------------------- " ------------------ )
2.25   STATUS OR PULSE OUTPUT
2.26   SYSTEM STATUS
2.27   ERROR BYTE
```

MENU 3: #S.CLOCK

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

MENU 4: #INI

```
4.01   TIME-OUT FOR STATUS CHANGE
4.02   TIME-OUT FOR DCF SIMULATION
4.03   DCF-HIGH-PULS
4.04   DCF-LOW-PULS
4.05   POS.-FIX/3-D ACCURACY
4.06   PROGRAMM RESET
4.07   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

4.1.1 SET Menu – Basic Settings System 6842

Input of the basic setting functions such as Time / Date, Position, Time Offset etc.

Grey lettering on the display corresponds to a 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.

4.1.1.1 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
```

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	1990 ... 2089

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.

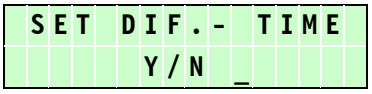
The changeover dates are to be entered for countries which change their time zone during the year.

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

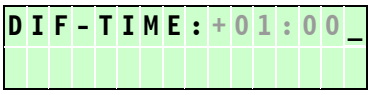
4.1.1.2 Input Local Time to UTC Time Offset (Time Zone)

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

Selection frame:



Input frame:



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.

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 +01:00h time offset and +01:00h for the summer time offset (changeover points of time must be set for this purpose).

4.1.1.3 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.

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

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 is **not** to be activated all values have to be entered as 0. The System 6842 then only operates with the standard time (winter time) set via the time offset.

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:

```
S-->D hh/d/w/MM
      >03/7/5/10<
```

The meaning of the individual items is as follows:

hh	The hour in which the changeover is to take place	00 ... 23 hours
d	The weekday on which the changeover is to take place	1 = Mo ... 7 = Su
w	the appearance of weekday in the month on which the changeover is to take place	1 ... 4 ⇨ 1.-4. appearance 5 ⇨ last appearance in the month
MM	The month in which the changeover is to take place	

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

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

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

4.1.1.4 Input Position

The geographical position of the equipment is entered with this function. This function is helpful during the first commissioning and shortens the first synchronization of the GPS receiver.

Selection frame:

```
 SET POSITION
    Y/N _
```

Input frame:

```
LT. N51°12,3651'
LN.E007°37,8426'
```

The entries for the latitude and longitude positions take place in degrees and minutes.

The operational sign for the degrees of latitude - **LT.** is:

N	Northern hemisphere
S	Southern hemisphere

and for the degrees of longitude - **LN.**:

E	East of the Null Meridian (Greenwich)
W	West of the Null Meridian (Greenwich)

The latitude position is entered first under **PGG°MM,SSSS**, where the meanings are as follows:

P	N or S, North or South	
GG	Degrees of **Latitude** from	00 - 89
MM	Minutes of **Latitude** from	00 - 59
SSSS	Minutes of **Latitude** decimal places	0000 - 9999

There then follows the entry of the longitude position under **pGGG°MM**,**SSSS**, where the meanings are as follows:

p	E or W, East or West	
GGG	Degrees of **Longitude** from	000 - 179
MM	Minutes of **Longitude** from	00 - 59
SSSS	Minutes of **Longitude** decimal places	0000 - 9999

The position of ***hopf*** Elektronik GmbH is given in the above example.

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

In order to speed up the synchronization of the GPS receiver it is sufficient for the position to be input to an accuracy of 1-2 degrees (without minutes or decimal places).

If the position is unknown **0** should be entered in all places.

If the position is not known during commissioning and the antenna position is adverse, the GPS evaluation should be changed from Position-fix to 3D (***Chapter 4.1.4.4 3D / Position-fix GPS Reception and Synchronization Mode***). Otherwise this may lead to the **output of an imprecise time** when synchronizing with less than four satellites.
After calculating the actual position by means of the clock system, the GPS evaluation can be changed back to Position-fix.

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

4.1.1.5 Serial Interface Parameters

The serial interface parameters and the output mode can be input separately for each of the two serial interfaces. The following selection frames appear (for parameterization see ***Chapter 5 COM0 / COM1 Serial Interfaces***).

4.1.1.5.1 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_
```

4.1.1.5.2 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.

4.1.1.5.3 Selection Frames for Optical Interface Parameters

```
SET OPTICAL TRNS
PARAMETER  Y/N_
```

The optical interface is not supported in this equipment version. However, the selection frames are present in the same way as 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

4.1.1.6 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.

4.1.1.6.1 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_
```

4.1.1.6.2 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

4.1.1.7 Frequency Output (Option)

When the System is extended with the Frequency Output Board, the frequency output can be set between 1Hz and 10MHz in steps of 1Hz using this function.

The input mode is explained in the description of the Frequency Output Board.

Frequency Input

Selection frame:

```
SET FREQUENCY
    Y/N_
```

Input frame:

```
  FREQUENCY
>10.000.000< Hz
```

⇦ corresponds to 10MHz

Frequency Output Delay

Selection frame:

```
 SET FREQUENCY
OUTPUT DELAY Y/N
```

Input frame:

```
 DELAY ON / OFF
   >000 / 000<
```

4.1.1.8 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**

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

4.1.1.9 Selection of the Display and DCF77 Simulation Time Base

For the display and DCF77 simulation selection can be made between local and UTC time.

Selection frame:

```
SET TIME-OUTPUTS
DISPLAY/DCF Y/N
```

Input frame:

```
LOC.T.=0 UTC= 1
Display/DCF :0/1
```

The selection can only be changed completely. The following combinations are possible:

Display	DCF77 Simulation	Input
Local time	Local time	0 / 0
Local time	UTC	0 / 1
UTC	Local time	1 / 0
UTC	UTC	1 / 1

4.1.1.10 System Status Byte

Functions can be switched on and off with the individual bits in the System byte. No bits are allocated at present.

Selection frame:

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

Input frame:

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

⇦ These bit combinations 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

4.1.1.11 Key-Word Function for Keypad

The System can be protected by a key-word against unauthorized changes to the settings.

In order to avoid delays during commissioning, the key-word should only be set after commissioning has been completed. The key-word should be kept in a safe place and protected against unauthorized access.

If a key-word has been set then this is requested after a selection has been made from the main menu.

If the key-word is entered correctly then the display changes to the selected menu. The key-word protection is then deactivated until the selected menu has been exited. The key-word protection is automatically reactivated after exiting the menu by pressing **BREAK** or after 255 seconds without pressing a key.

No key-word is set up in the factory. Setup is carried out by the customer in the **"SET"** menu.

Selection frame:

```
SET KEY-WORD
     Y/N_
```

Input frame:

```
KEY-WORD >_
```

A 4 digit number can now be entered as the key-word. The entry must be completed by pressing the **ENTER** key. The number sequence **0000** is an exception.

Input frame:

```
KEY-WORD >0000<
```

With this sequence of numbers the current key-word (if set) **is deleted** and the key-word protection is deactivated.

Caution!

If the key-word is lost the System **must** be returned to the manufacturer.

The key-word becomes active when the next selection is made from the main menu.

Input frame:

```
KEY-WORD >****<
```

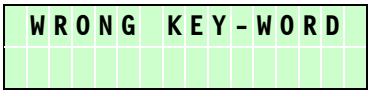
A star is displayed for each digit entry and is always automatically completed by an arrow after the fourth entry.

The key-word is confirmed by pressing the **ENTER** key. If the key-word is correct entry is gained to the corresponding menu item.

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

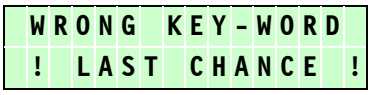
After the first incorrect entry the following display appears for 5 seconds:

Display frame:



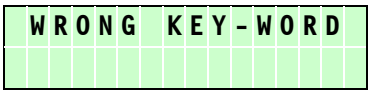
After the second incorrect entry the following display appears for 5 seconds:

Display frame:



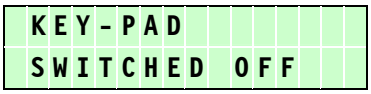
After the third incorrect entry the following display appears for 5 seconds:

Display frame:



When the next attempt is made to start the menu the following display appears:

Display frame:



No further entries can be made for four hours. Switching the System on and off does not delete the lockout time.

In this condition the System remains fully functional as before. The display reverts back to the standard frame automatically after four minutes or by pressing the **BREAK** key.

4.1.1.12 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

4.1.2 SHOW Menu - Display of the System 6842 Base Settings

The **SHOW** function is called up to check the values entered or the values updated via the GPS receiver. 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:

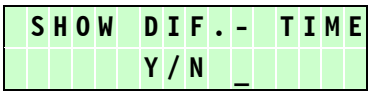
- The next selection frame is displayed by entering **ENTER** or **N**.
- The corresponding display frame is called up by entering **Y**.
- The display jumps to the next selection frame if **ENTER** or **N** are entered in the display frame.
- The **SHOW** menu can be exited at any time by pressing **BREAK**.

The individual functions of the System 6842 GPS are explained below.

4.1.2.1 Time Offset

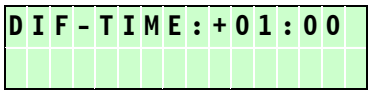
The current time offset between the local time and UTC time can be viewed with this display frame.

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.

4.1.2.2 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 S ⇨ D

This function shows the changeover point of time from
Standard 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.

Time Zone Changeover D ⇨ S

This function shows the changeover point of time from
Daylight 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:03:00:00
7.30/10/2005 S>D
```

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

4.1.2.3 Position

The input position of the equipment (antenna) or the position updated by GPS is shown on this display frame. The position data is updated by GPS every second (the display frame is only updated after the menu item has been called up again or by pressing [Y]).

Selection frame:

```
 SHOW POSITION
    Y/N _
```

Display frame:

```
LT. N51°12,6993'
LN.E007°39,7994'
```

LT = Degree of latitude, **LN** = Degree of longitude

In the above example the position of ***hopf*** Elektronik GmbH is displayed.

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

4.1.2.4 Satellite Values (GPS)

This display function indicates the number of satellites that theoretically lie in the visibility range of the antenna, the satellites that are being received and a relative measurement of reception performance. This information is particularly helpful during installation and analysis of reception problems (see ***Chapter 7 System Indicators / Fault Analysis / Troubleshooting***).

If the System is set for 3D synchronization (see ***Chapter 4.1.4.4 3D / Position-fix GPS Reception and Synchronization Mode***), it is necessary for four satellites to be in the visibility range of the antenna in order to synchronize the GPS System 6842 with UTC and to calculate the position. Under optimum conditions approx. 9-14 satellites are in the visibility range of the antenna, of which 12 can be received in parallel.

In the Position-fix mode at least one satellite is required for synchronization (however the position is not calculated in this case).

Selection frame:

```
SHOW SATELLITES
    Y/N _
```

If values are available in the System then the display frame may appear as follows (example):

Display frame:

```
 V 20:095 13:090
10 07:057    :
```

10 satellites are theoretically within visibility range, of which satellite 20 is captured by the GPS receiver with a relative signal/noise ratio of 95 and satellite 7 with a relative signal/noise ratio of 57, etc.

A maximum of eight satellites can be shown on the display. This takes place on two frames which are shown alternately every five seconds.

The number of satellites which are visible at this location with a theoretically optimum antenna position appears under **V** (visible). During the first reception process or after a lengthy voltage failure the value **00** appears under **V**.

If there are no figures under **V** ⇨ there is a fault on the GPS receiver.

The figure before the colon is the Satellite Pseudo Random Number. The satellites are not identified by 1, 2, 3 etc. but by the Pseudo Random Number under which the satellite radiates its information. If a satellite fails a reserve satellite can be activated under the same number.

The number after the colon indicates the signal/noise ratio as a relative value. This can vary between 0 and 255.

After the first installation it can take up to 30 minutes under the most unfavourable conditions until anything is presented on the display frame. This is dependent on the start information which the System receives (see Input Time, Position etc.) as well as the antenna position, e.g. no free antenna visibility to the sky.

Meaning of the Display Values	Signal/Noise Ratio
No satellite received	**~~~**
Under poor signal/noise conditions the values lie between	**010 - 030**
Under satisfactory to good signal/noise conditions the values lie between	**031 - 070**
Under very good signal/noise conditions the values are	**> 070**

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

4.1.2.5 Serial Interface Parameters

With this menu the serial interface parameters can be shown.

4.1.2.5.1 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 5 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_
```

4.1.2.5.2 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.

4.1.2.5.3 Display Frames for the Optical Interface

The optical interface is not supported in this equipment version. However, the display functions 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

4.1.2.6 LAN Board Parameters (Option)

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

4.1.2.6.1 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_
```

4.1.2.6.2 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

4.1.2.7 Frequency Output (Option)

The frequency set for the Frequency Output Board is displayed on this display frame.

Further information and an explanation of the parameters can be found in the description of the respective Frequency Output Board.

Frequency Display

Selection frame:

```
SHOW FREQUENCY
    Y/N_
```

Display frame:

```
   FREQUENCY
>10.000.000< Hz
```

Frequency Output Delay Display

Selection frame:

```
SHOW FREQUENCY
OUTPUT DELAY Y/N
```

Display frame:

```
DELAY ON / OFF
   >000 / 000<
```

4.1.2.8 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

4.1.2.9 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_
```

No function is assigned to these bits 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

4.1.2.10 Error Byte

Erroneous functions or modules are displayed in the Error Byte for faster fault analysis. Logic "0" indicates that the function or module is operating perfectly. Logic "1" indicates that there is a fault condition.

Selection frame:

```
  SHOW ERROR-
   BYTE  Y/N_
```

Display frame:

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

At present the following bits are allocated in the Error Byte:

Bit 7 = Free
Bit 6 = Free
Bit 5 = Free
Bit 4 = Free
Bit 3 = Free
Bit 2 = Free
Bit 1 = Error in GPS week counter
Bit 0 = Error in the local time to UTC time offset calculation

Error Bit 1 = 1

The GPS receiver is unable to detect the correct time frame due to erroneous base initialization.

It is necessary to re-enter the time and date, the time offset and the changeover points of time for summer / winter time (if used).

Error Bit 0 = 1

The base initialization of the System is missing in order to calculate the relation between UTC time and local time.

It is necessary to re-enter the time offset and the changeover points of time for summer / winter time (if used).

For further error analysis see ***Chapter 7 System Indicators / Fault Analysis / Troubleshooting***.

4.1.3 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

4.1.4 INI Menu - System 6842 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.

4.1.4.1 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 GPS), 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 ±1x10E-6 and the required minimum system accuracy is **5 msec.**, the following calculation results:

0.005s / (1x10E-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:

```
TIME-OUT FOR STA
TUS-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

4.1.4.2 Delayed DCF77 Simulation and DCF77 Pulse Switch-off

The System 6842 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.

There are two settings, each with a different effect:

2 to 254 Minutes Setting

The System must be synchronized by GPS 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.

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

Selection frame:

```
TIME-OUT FOR DCF
 SIMULATION Y/N_
```

Display frame:

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

STANDARD Value: 055

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

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.

DCF77 Sim.-Signal Accuracy Calculation Example

The time delay to be set depends on the required accuracy of the connected sub-system.

The accuracy of the internal quartz base is assumed to be ±1*10E-6 in this example. The minimum accuracy required is **5msec.**

0.005s / (1 x 10E-6) = 5000s = **83 minutes 20 seconds**

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

4.1.4.3 DCF77 Pulse Width

The time information is transmitted in BCD format in the DCF77 time telegram. In this case logic 1 corresponds to a pulse length of 200msec. and logic 0 to 100msec. (see ***Chapter 11.2 DCF77 (German Long-Wave Transmitter Frankfurt 77.5kHz)***).
Some manufacturers do not adhere to this definition and transmit shortened pulses, for example 160msec. for Logic 1 and 70msec. for Logic 0. The pulse width is adjustable in order to be able to synchronize this equipment as well.

For the "**true**" DCF77 signal the pulse widths are defined as follows:

- LOW pulse = 100msec. (Logic 0)
- HIGH pulse = 200msec. (Logic 1)

For the synchronisation of ***hopf*** devices only these pulse widths are used.

Displaying and Changing the DCF77 HIGH Pulse

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

Selection frame:

```
   SET DCF
HIGH-PULS Y/N_
```

Display frame:

```
 DCF-HIGH-PULS
   >200< MSEC_
```

STANDARD Value: 200

The currently valid DCF77 pulse width 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

Displaying and Changing the DCF77 LOW Pulse

The LOW pulse setting is called up in the same way.

Selection frame:

```
   SET DCF
LOW-PULS Y/N_
```

Display frame:

```
DCF-LOW-PULS
  >100< MSEC_
```

STANDARD Value: 100

The HIGH pulse can be set from 150-250msec. and the LOW pulse from 50-150msec.

4.1.4.4 3D / Position-fix GPS Reception and Synchronization Mode

3D Evaluation

The accuracy of the time evaluation is defined by the exact positional calculation of the installation location. A minimum of four satellites is required for this calculation (3D evaluation). The signal transmission times to several satellites are defined from the calculated position and the exact second mark is produced from their mean value.

Position-fix Evaluation

In the Position-fix mode the System can be synchronized with only one received satellite. In this case the accuracy depends heavily on the exact entry of the installation position location. The second mark is then calculated on the basis of the position entered. If four or more satellites are received in Position-fix mode then the evaluation switches automatically into 3D mode for this time period and calculates the exact position. By this means the accuracy of the Position-fix evaluation increases to the accuracy of the 3D evaluation.

When the position is entered to ±1 minute degree the accuracy of the second mark is already better than ±20µsec.

Position-fix Evaluation Features	3D Evaluation Features
• Clock can synchronize with only one received satellite. • Accuracy depends on the exact entry of the position. • If four or more satellites are received in this mode then the evaluation switches automatically into 3D mode for this time period and calculates the exact position. • The antenna can also be installed in locations from where less than ¼ of the sky is visible.	• The System can not be synchronized if less than four satellites are received. • The position is calculated automatically. • The accuracy of the synchronization is increased by the exact calculation of position. • The antenna usually requires more than ¼ free visibility of the sky.

The modes are set as follows:

Selection frame:

```
SET POS. FIX/3-D
 ACCURACY Y/N_
```


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 [Y] is pressed the mode that is currently set appears on the display.

For the Position-fix evaluation this is:

Display frame:

```
ACT. IS POS.FIX
FOR 3-D  PUSH +
```

STANDARD Value: POS.FIX

The evaluation can be changed to 3D with the [+] sign.

The following frame appears for 3D evaluation:

Display frame:

```
ACT. IS 3-D  FOR
 POS.FIX PUSH -
```

The evaluation can be changed to Position-fix with the [-] sign.

4.1.4.5 Program Reset

This function triggers a software reset of the System 6842 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 _
```

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

4.1.4.6 Master Reset

This function triggers a hardware reset of the whole System 6842. All Function Boards present in the System 6842 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 _
```

Master **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

5 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.

5.1 Configuration of the Serial Interfaces

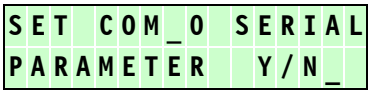
The parameterization and functionality of the serial interfaces is described below.

5.1.1 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

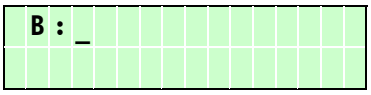
Selection frame:



- Key Y

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

Input frame:



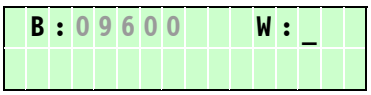
The baud rate must be entered here as a five digit numerical value. Possible inputs are:

- 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:

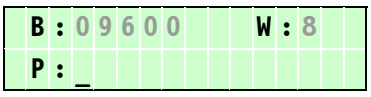


The number of data bits for the transmission must be given here. Possible settings are:

- 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:

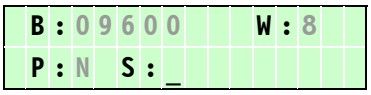


The type of the parity bit for the transmission must be given here. Possible settings are:

- 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:

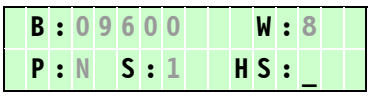


The number of stop bits for the transmission must be selected here:

- 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

5.1.2 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.

5.1.2.1 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

5.1.2.2 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 5.2 Data String Transmission Points of Time***.

5.1.2.3 Mode Byte 1 / Bit 5 - Bit 5 currently no function

Bit Position 5	
Off	Free
On	Free

5.1.2.4 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 5.2 Data String Transmission Points of Time***.

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

5.1.2.5 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

5.1.2.6 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 5.2 Data String Transmission 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

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)

5.1.2.7 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

5.1.2.8 Mode Byte 2 / Bit7-Bit3: Non-assigned Bits

Bit7 until Bit3 are not presently assigned and are planned for later extensions.
They are to be set to 0 for compatibility reasons (default setting).

5.1.2.9 Mode Byte 2 / Bit2-Bit0 - Data String Selection

This mode byte sets the transmitted data string.

Bit Position				
3	2	1	0	Data String Construction
off	off	off	off	***hopf*** Standard String (6021) and respectively NTP
off	off	off	on	***hopf*** 2000 - 4 digit year output
off	off	on	off	***hopf*** Master/Slave-String
off	off	on	on	SINEC H1
off	on	off	off	T-String
off	on	off	on	IBM Sysplex Timer Model 1+2 and respectively TimeServ
off	on	on	off	ALOHA data string
off	on	on	on	**Data String Construction**
on	off	off	off	NMEA - GPRMC
on	off	off	on	SAT-1703 Time 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

5.1.3 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).

5.1.4 Serial Data String Request

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

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

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

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

The clock interprets the multiplication factor as a hexadecimal value.

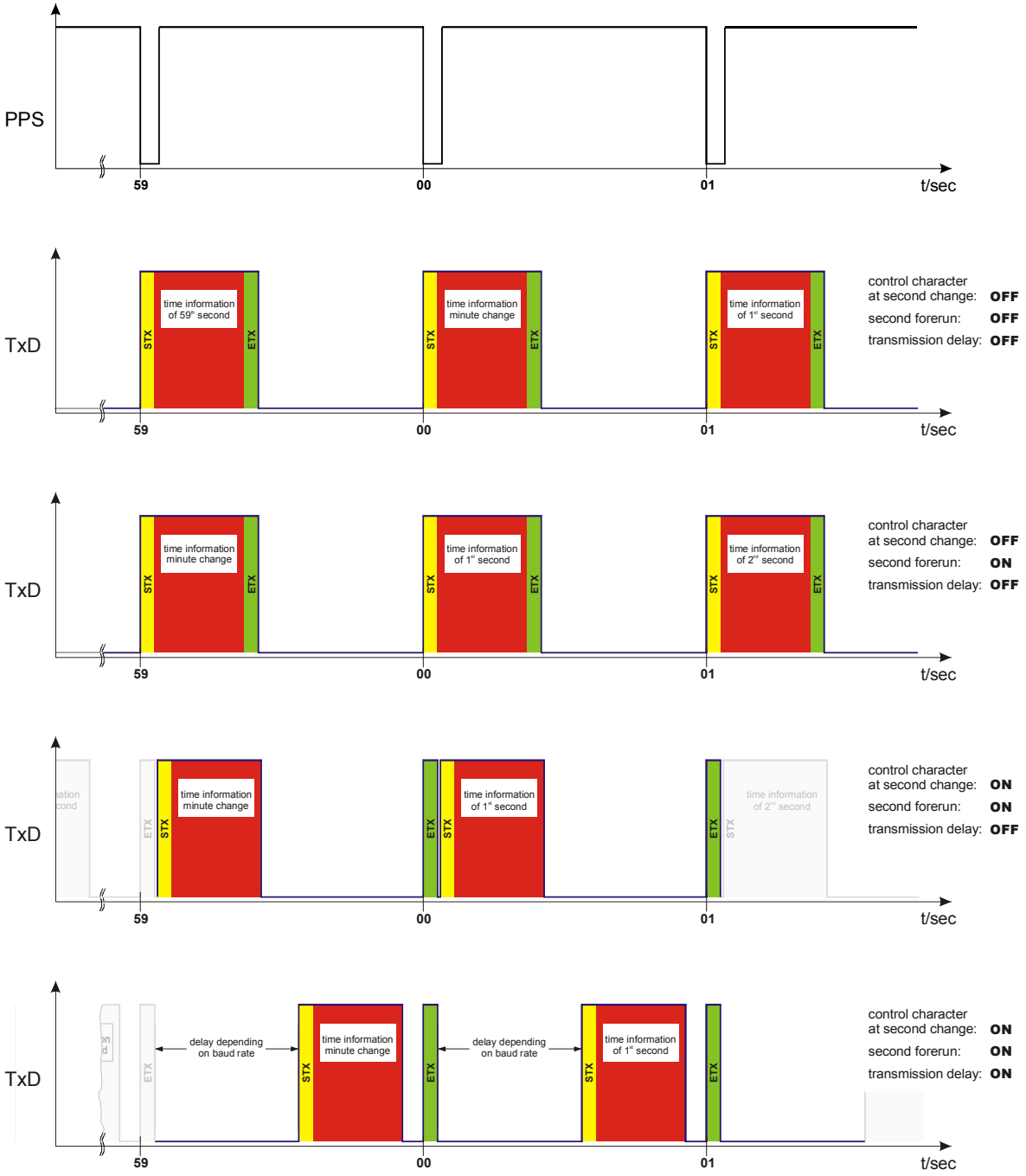
Example:

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

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

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

5.2 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

5.3 Data Strings

This Chapter describes the data strings supported by this System.

5.3.1 General Information about Data Output of Board 6842 GPS

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 5.1.2.5 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

5.3.2 *hopf* Standard String (6021)

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

5.3.2.1 Specified Settings

Automatic:	**no**
Required:	**no**
Blocked:	**no**

5.3.2.2 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) for UTC time bit 3 is set to 1 in the day of the week	$31-37
4	tens hour	$30-32
5	unit hour	$30-39
6	tens minute	$30-35
7	unit minute	$30-39
8	tens second	$30-36
9	unit second	$30-39
10	tens day	$30-33
11	unit day	$30-39
12	tens month	$30-31
13	unit month	$30-39
14	tens year	$30-39
15	unit year	$30-39
16	LF (line feed)	$0A
17	CR (carriage return)	$0D
18	ETX (end of text)	$03

5.3.2.3 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

5.3.2.4 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

5.3.3 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 / Bit2-Bit0 as ***hopf*** standard string (see ***chapter 5.1.2.9***).

Source code and documentation are available as freeware under:

http://www.ntp.org

5.3.3.1 Specified Settings

Automatic:	**no**
Required:	The following values have to be entered: **parameter of transmission:** • baud rate 9600 • 8 data bit • parity no • 1 stop bit **mode of transmission:** • ***hopf*** Standard String • UTC as time base • output with second advance • control character (STX...ETX) enabled • with control character at second change • output time and date • output every second
Blocked:	**no**

5.3.3.2 Structure

NTP is according to the ***hopf*** Standard String (6021), (see ***Chapter 5.3.2***).

5.3.3.3 Status

The Status is according to the ***hopf*** Standard String (6021), (see ***Chapter 5.3.2***).

5.3.3.4 Example

See ***Chapter 5.3.2.4 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

5.3.4 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 **"?"**.

5.3.4.1 Specified Settings

Automatic:	**no**
Required:	**no**
Blocked:	**no**

5.3.4.2 Structure

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

5.3.4.3 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 W/S or S/W change over
	space	no announcement

5.3.4.4 Example

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

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

5.3.5 *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.

5.3.5.1 Specified Settings

Automatic:	**no**
Required:	**no**
Blocked:	**no**

5.3.5.2 Structure

Character No.	Meaning	Hex-Value
1	STX (start of text)	$02
2	status (internal clock status)	$30-39, $41-46
3	day of the week (1=Monday ... 7=Sunday) for UTC time bit 3 is set to 1 in the day of the week	$31-37
4	tens hour	$30-32
5	unit hour	$30-39
6	tens minute	$30-35
7	unit minute	$30-39
8	tens second	$30-36
9	unit second	$30-39
10	tens day	$30-33
11	unit day	$30-39
12	tens month	$30-31
13	unit month	$30-39
14	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

5.3.5.3 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

5.3.5.4 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

5.3.6 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**".

5.3.6.1 Specified Settings

Automatic:	**no**
Required:	**no**
Blocked:	**no**

5.3.6.2 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

5.3.6.3 Status

No status contained in the T-String.

5.3.6.4 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

5.3.7 *hopf* Master/Slave-String

The ***hopf*** Master/Slave-String can be used to synchronise slave systems with the time data of the master system up to an accuracy of ± 0.5msec. It differs from the ***hopf*** DCF77 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 change over, announcement of a leap second and the status of reception of the Master/Slave-String source)

5.3.7.1 Specified Settings

Automatic:	**no**
Required:	The following settings are required for the synchronisation of the ***hopf*** slave-systems: • output every minute • output second forerun • ETX on the second change; selectable: data string at the beginning or at the end of the 59. second. • local time • 9600 baud, 8 bit, 1 stop bit, no parity 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

5.3.7.2 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

5.3.7.3 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	Change over 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

5.3.7.4 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

5.3.8 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.

5.3.8.1 Specified Settings

Automatic:	The following parameters are activated **after a reset**: automatically • 9600 baud • 8 data bit • odd parity • 1 stop bit • 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.

5.3.8.2 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

5.3.8.3 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

5.3.8.4 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

5.3.9 SINEC H1 Extended

Below the data string SINEC H1 Extended is described.

String request

The data string SINEC H1 Extended 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 **"?"**.

5.3.9.1 Specified Settings

Automatic:	**no**
Required:	**no**
Blocked:	**no**

5.3.9.2 Structure

Character No.	Meaning	Hex-Value
1	STX (start of text)	$02
2	"D" ASCII D	$44
3	":" colon	$3A
4	tens day	$30-33
5	unit day	$30-39
6	"." point	$2E
7	tens month	$30-31
8	unit month	$30-39
9	"." point	$2E
10	tens year	$30-39
11	unit year	$30-39
12	";" semicolon	$3B
13	"T" ASCII T	$54
14	":" colon	$3A
15	day of the week	$31-37
16	";" semicolon	$3B
17	"U" ASCII U	$55
18	":" colon	$3A
19	tens hour	$30-32
20	unit hour	$30-39
21	"." point	$2E
22	tens minute	$30-35
23	unit minutes	$30-39
24	"." point	$2E
25	tens second	$30-36
26	unit second	$30-39
27	";" semicolon	$3B
28	"#" or space	$23 / $20
29	"*" or space	$2A / $20
30	"S", "U" or space	$53 / $55 / $20
31	"!", "A" or space	$21 / $41 / $20
32	ETX (end of text)	$03

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

5.3.9.3 Status

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

The characters mean the following:

character no. 28 =	"#"	no radio synchronisation after reset, time invalid
	space	radio synchronisation after reset, clock in crystal operation
character no. 29 =	"*"	time from internal crystal in the clock
	space	time by radio reception
character no. 30 =	"S"	daylight saving time
	"U"	UTC (see chapter 5.1.2.1)
	space	standard time
character no. 31 =	"!"	announcement of a W/S or S/W change over
	"A"	announcement of a leap second
	space	no announcement

5.3.9.4 Example

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

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

5.3.10 NMEA - GPRMC

The full NMEA data string GPRMC contains the position-, rate- and time data (UTC) calculated by the GPS receiver. The different information is separated in the data string by a comma. Only a comma is set if an information is not available.

5.3.10.1 Specified Settings

The following settings must be done on the board:

Automatic:	**no**
Required:	• baud rate = 4800 baud • word length = 8 bit • stop bit = 1 • parity = no parity • transmission point = every second • forerun off • ETX immediately • transmission delay off • time base = UTC
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

5.3.10.2 Structure

Character No.	Meaning	Hex-Value
1	"$" string start	$24
2	"G" ASCII G	$47
3	"P" ASCII P	$50
4	"R" ASCII R	$52
5	"M" ASCII M	$4D
6	"C" ASCII C	$43
7	"," comma	$2C
8	tens hour	$30-32
9	unit hour	$30-39
10	tens minute	$30-35
11	unit minute	$30-39
12	tens second	$30-35
13	unit second	$30-39
14	"." point as separation	$2E
15	tenth second	$30-39
16	hundredth second	$30-39
17	"," comma as separation	$2C
18	"A" ASCII A	$41
19	"," comma	$2C
20	"," comma	$2C
21	"," comma	$2C
22	"," comma	$2C
23	"," comma	$2C
24	"," comma	$2C
25	"," comma	$2C
26	tens day	$30-33
27	unit day	$30-39
28	tens month	$30-31
29	unit month	$30-39
30	tens year	$30-39
31	unit year	$30-39
32	"," comma	$2C
33	"," comma	$2C
34	"*" string limitation	$2A
35	tens checksum	$30-39
36	unit checksum	$30-39
37	CR (carriage return)	$0D
38	LF (line feed)	$0A

The checksum will be calculated from the XOR function of all transmitted ASCII characters between **$** and ***.

All information will be transmitted as ASCII 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

5.3.10.3 Status

No status contained in data string NMEA GPRMC.

5.3.10.4 Example

$GPRMC,101640.00,A,,,,,,150904,,*03 <CR><LF>

- It is the 15.09.2004
- 10:16:40 o'clock and 00 hundredth seconds
- checksum 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

5.3.11 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 / Bit2-Bit0 as IBM Sysplex Timer (see ***chapter 5.1.2.9***).

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

5.3.11.1 Specified Settings

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

5.3.11.2 Structure

The data string is the same described in ***Chapter 5.3.8 IBM Sysplex Timer Model 1+2***.

5.3.11.3 Status

See ***Chapter 5.3.8 IBM Sysplex Timer Model 1+2***.

5.3.11.4 Example

See ***Chapter 5.3.8 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

5.3.12 Data String ALOHA

The ALOAH data string refers to the data string IBM 9037 Sysplex Timer. All settings like transmission parameters and points of transmission can be set freely.

5.3.12.1 Specified Settings

Automatic:	**no**
Required:	**no**
Blocked:	Except for the following points all settings are possible: • **CR** and **LF** can't be swapped • the output of the last character (**LF**) is not possible at the second change

5.3.12.2 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

5.3.12.3 Status

Character number 14 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

5.3.12.4 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

5.3.13 SAT-1703 Time String

All modes can be transmitted with the SAT-1703 Time String (e.g. with forerun or end character at second change).

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

5.3.13.1 Specified Settings

Automatic:	**no**
Required:	**no**
Blocked:	**no**

5.3.13.2 Structure

Character No.	Meaning		Hex-Value
1	STX (start of text)		$02
2	tens day		$30-33
3	unit day		$30-39
4	"."		$2E
5	tens month		$30-31
6	unit month		$30-39
7	"."		$2E
8	tens year		$30-39
9	unit year		$30-39
10	"/"		$2F
11	unit day of the week		$31-37
12	"/"		$2F
13	tens hours		$30-32
14	unit hours		$30-39
15	":"		$3A
16	tens minutes		$30-35
17	unit minutes		$30-39
18	":"		$3A
19	tens seconds		$30-35
20	unit seconds		$30-39
21	"M" or "M" or "U"	(Standard time, Daylight saving time or UTC)	$4D, $4D, $55
22	"E" or "E" or "T"		$45, $45, $54
23	"Z" or "S" or "C"		$5A, $53, $43
24	" " or "Z" or " "		$20, $5A, $20
25	" " ($20 ⇨ synchronous) or "*" ($2A ⇨ not synchronous)		$20 $2A
26	" " ($20 ⇨ no announcement) or "!" ($21 ⇨ announcement of a WT/ST- or ST/WT change over)		$20 $21
27	CR (carriage return)		$0D
28	LF (line feed)		$0A
29	ETX		$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

5.3.13.3 Status

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

The characters mean the following:

Character no. 21-24 =	"MESZ"	Central European Summertime (Daylight Saving Time)
	"MEZ"	Central European Time (Standard Time / Wintertime)
	"UTC"	Coordinated Universal Time
Character no. 25 =	"*"	time from internal crystal in the clock
	" " (space)	time by radio reception
Character no. 26 =	"!"	announcement of a WT/ST or ST/WT change over
	space	no announcement

5.3.12.5 Example

(STX)`18.07.02/4/02:34:45UTC___`**(CR)(LF)(ETX)**

- It is Thursday 18.07.02 - 02:34:45 o'clock UTC
- time synchronisation by GPS

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 Function Boards

This Chapter describes the relevant points for handling the function boards for the System 6842 GPS Slim Line.

6.1 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 6842 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 6842 GPS 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

6.2 Function Boards for the System 6842 GPS 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 6842 GPS Slim Line (1U):	• **7270** LAN Board for NTP/SINEC H1 LAN BUS - Suitable for retrofit • **7265** IRIG-B Output Board - Suitable for retrofit • **7266** IRIG-B Output Board - Suitable for retrofit • **7406** Slave Clock Board - limited suitability for retrofit (external line voltage feed required) • **7530** Frequency Output Board - Suitable for retrofit (**max. 1 Board per System**) • **7112** Optical Coupler Board for Pulse Output - Suitable for retrofit • **7121** Relay Board for Pulse Output - Suitable for retrofit • **7317** DCF77 Antenna Distributor - Suitable for retrofit • **7247** FO Converter F-ST - limited suitability for retrofit (for PPS and DCF77 pulse output only (1Hz)) • **7170** Optical Coupler Board - limited suitability for retrofit (for PPS and DCF77 pulse output only (1Hz)) • **6841H1** Converter Board to TTL, **on enquiry** • **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

6.3 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 6842 GPS 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.

6.4 Installation of an Additional Function Board

In principle every Function Board can be installed at any desired point on the System 6842 GPS.

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 6842 menu as necessary.

6.5 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

7 System Indicators / Fault Analysis / Troubleshooting

The System 6842 GPS 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 6842 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.

7.1 Status and Fault Indicators

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

7.1.1 Status LEDs

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

7.1.1.1 "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.

7.1.1.2 "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 4.1.4.1 Delayed Sync. Status Change***).

7.1.2 LCD-Display

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

7.1.2.1 System Status on the Display

The synchronization status can be read directly on the display (see ***Chapter 3.3.2 Standard Display with Valid Time***).

7.1.2.2 Number of Satellites

An analysis of reception can be carried out with the display of satellite values. It can be seen whether the GPS receiver is receiving satellites and, if so, their reception values (see ***Chapter 4.1.2.4 Satellite Values (GPS)***).

7.1.2.3 Position Display

Depending on the position entered manually by the user, it can be identified from the position display whether the GPS receiver calculated the position correctly and was / is therefore synchronous (see ***Chapter 4.1.2.3 Position***).

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

7.1.2.4 Error Byte Display

Internal System errors can be identified during a faulty synchronization by means of the Error Byte (see ***Chapter 4.1.2.10 Error Byte***).

7.1.3 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 2.7 Error Relays Connection***).

7.1.3.1 "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.

7.1.3.2 "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 4.1.4.1 Delayed Sync. Status Change***).

7.1.4 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.

7.1.5 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 6842 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.

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

Auto-Reset Logic Operating Principle

There is a watch-dog module on the Control Board 6842. 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 and by this means the pulse is forwarded directly to the next board.

7.1.6 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 5.3 Data Strings***).

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

7.2 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.

7.2.1 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

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

7.2.2 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

7.2.3 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

7.2.4 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

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

7.2.5 No GPS Reception / No Synchronization

Description

- System Status "C" is on the display
- The red Sync.-Status OFF LED lights
- "Sync" error relay has tripped
- Quartz status is transmitted in the serial strings

Cause / Problem Solution

- System was not initialized correctly / completely
- Check for errors in the Error Byte (see ***Chapter 4.1.2.10 Error Byte***)

The following describes various effects and their possible causes on a non-synchronizing system:

Case 1:

Effect: After the first installation, no satellite appears on the display after several hours and **00** is displayed under **V**.

Possible errors:

- The antenna cable is too long
- An incorrect cable type was used for the length of the antenna equipment
- The antenna cable is faulty
- The antenna cable is not connected
- The antenna is faulty
- The lightning protector is faulty
- The antenna cable is connected to the wrong BNC socket (e.g. “DCF-SIM“ socket instead of “Antenna“)

Case 2:

Effect: There are 7 satellites in the visibility range (**V=07**) but a maximum of 2 appear on the display frame. However, the value of these satellites is 70 or above.

Possible error:

- The visibility range of the antenna to the sky is limited

Case 3:

Effect: 9 satellites in the visibility range (**V=09**), 6 satellites appear on the display frame. The signal/noise ratios are all between 10 and 30. The equipment does not synchronize.

Possible errors:

- The cable is too long
- An incorrect cable type was used for the length of the antenna equipment
- The BNC plugs are poorly connected
- The cable is crimped or broken
- Indirect lightning protector irreversibly damaged by excess voltage
- Antenna 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

Case 4:

Effect: The equipment was working perfectly but has not been receiving for several days. 7 satellites appear in the visibility range (**V=07**). However no satellite is displayed.

Possible errors:

- The cable has been damaged
- There was excess voltage on the antenna equipment and the indirect lightning protector is faulty
- Antenna faulty
- The GPS receiver of Control Board 6842 is faulty
- A building change has had an effect on the antenna equipment (e.g. shading of the antenna caused by subsequent building installation, or the laying of cables with a high electrical alternating field in the immediate vicinity of the GPS antenna cable)
- Electronic equipment with an interference effect on the GPS signal has been put into operation in the vicinity of the GPS antenna equipment / GPS receiver (e.g. transmitter for pagers)

Further information on the subject of the GPS antenna equipment can be consulted in the manual “Antenna Equipment GPS".

7.2.6 No DCF77 Antenna Simulation / DCF77 Pulse

Description

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

Cause / Problem Solution

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

7.2.7 No or Incorrect Serial Output

Description

- The connected Systems do not receive a serial string
- The connected Systems receive serial strings with a time that differs from the System

Cause / Problem Solution

- The serial interfaces are not configured correctly (e.g. only transmit on enquiry, active handshake, UTC output, etc.).
- The connection to the serial interfaces is not correct (e.g. TxD and RxD cables transposed).

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

7.2.8 Incorrect Time Output

A wrong configuration can cause errors on the output of the local time as well as of the UTC time.

Only the local time can be entered by means of the keypad.

Local Time Description

- Transmitted **local time** is different from the actual local time

Cause / Problem Solution

- UTC/local time offset set incorrectly or not set
- ST/WT changeover points of time set incorrectly or not set
- Time was set manually, System running in quartz mode
- Time has drifted because the System has been running in quartz mode for a long period
- Local time to UTC time offset differs from the time offset configured in the System 6842 ⇨ Fault on Control Board 6842
- Check for errors in the Error-Byte (see ***Chapter 4.1.2.10 Error Byte***)

UTC Time Description

- **UTC time** transmitted differs from the actual UTC time

Cause / Problem Solution

- Time has drifted because the System has been running in quartz mode for a long period
- Time was set manually, System running in quartz mode
  Cause of incorrect UTC time on manual setting: incorrect local time entered (the local time must always be entered when setting)
  or System incorrectly configured (time offset, ST/WT changeover)
- Check for errors in the Error Byte (see ***Chapter 4.1.2.10 Error Byte***)

7.2.9 No ST/WT Changeover

Description

- "D" for “daylight saving time“ (summer time) does not appear on the display
- The bit "daylight saving time" is not set in the status of the data string.

Cause / Problem Solution

- Changeover points of time not set or set incorrectly
- Output/display was configured for UTC and not for local time

7.2.10 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

7.3 Support from the *hopf* Company

Should the System demonstrate error descriptions other than those listed in ***Chapter 7.2 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 GPS 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

8 Maintenance / Care

The System 6842 is generally maintenance-free. The following points should be noted if it is necessary to clean the System 6842:

8.1 General Guidelines for Cleaning

The following **must not** be used to clean the System 6842:

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

The use of such cleaning agents or media could damage the System 6842.

Do not use a wet cloth to clean the System 6842.
There is the danger of an electric shock.

To clean the System 6842 use a cloth that is:

- Antistatic
- Soft
- Non-fabric
- Damp

8.2 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.

8.3 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 6842 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

9 Technical Data System 6842 GPS Slim Line (1U)

General Data	
Operation:	Via keypad 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 • Character height 5mm • Display type: alphanumeric • Status LEDs: - Power - Sync
Keypad:	20 keys
Maintenance-free buffering of the internal back-up clock:	3 days
MTBF (Base Board 6842):	> 300,000 hours
Weight:	approx. 3kg

AC Power Supply (with wide input range)	
Nominal input voltage:	100 - 240V AC / 47 - 63Hz 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 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		

GPS Data	
Receiver type:	12 channel phase tracking receiver, C/A code
Evaluation:	L1 frequency (1575.42MHz)
Sensitivity:	-143dB
Synchronization time:	• Cold start: 5min - 30min (first initialization without position input) • Warm start: < 1min (voltage failure < 3 days)
Antenna connection:	• Via BNC socket • For active antennas, Ub = 5V DC • Antenna power fed via Board 6842 BNC socket

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 (absolutely to UTC ⇨ emitted via GPS)	
Internal **PPS** pulse on GPS reception:	< ± 250ns (95%)
VCO control of the internal quartz base:	< ± 0.1ppm, after 30min GPS reception
Freewheel accuracy (after at least four hours continuously synchronization):	± 0.1ppm / T = +20°C • Drift for T = +20°C (constant): - after 1h: < 0.36msec.
Internal back-up clock	± 25ppm / for T = +10°C to +50°C

Signal Outputs (internal, System-Bus)	
PPS pulse	• Signal level: TTL (5V) • Accuracy: like int. PPS pulse • Pulse duration: 2 .. 20ms / ± 5ms
DCF77 pulse / system bus (time base: local / UTC)	• Signal level TTL (5V) • Accuracy: like int. PPS pulse • Offset to internal PPS: ± 5µs • Pulse duration tolerance: ± 2ms

Signal Outputs (external)	
Full-duplex serial interfaces (independent from each other, without handshake):	Via 9 pin SUB-D connectors • COM 0: RS232 and RS422 • COM 1: RS232 and RS422
DCF77 Antenna Simulation (77.5kHz):	Via BNC socket • Signal level: 3-5mVss at 50Ω • Carrier frequency: 77.5kHz ± 25ppm • Accuracy: like int. **DCF77 pulse**
Status Relays (Power / Sync):	Resistive circuit-breaking capacity: max. 200mA / 60V DC Contacts • Normally open contact (no) • Common contact (c) • Normally closed contact (nc)

Generating PPS and 1kHz the systems crystal frequency is the leading dimension and also deciding for the systems accuracy.

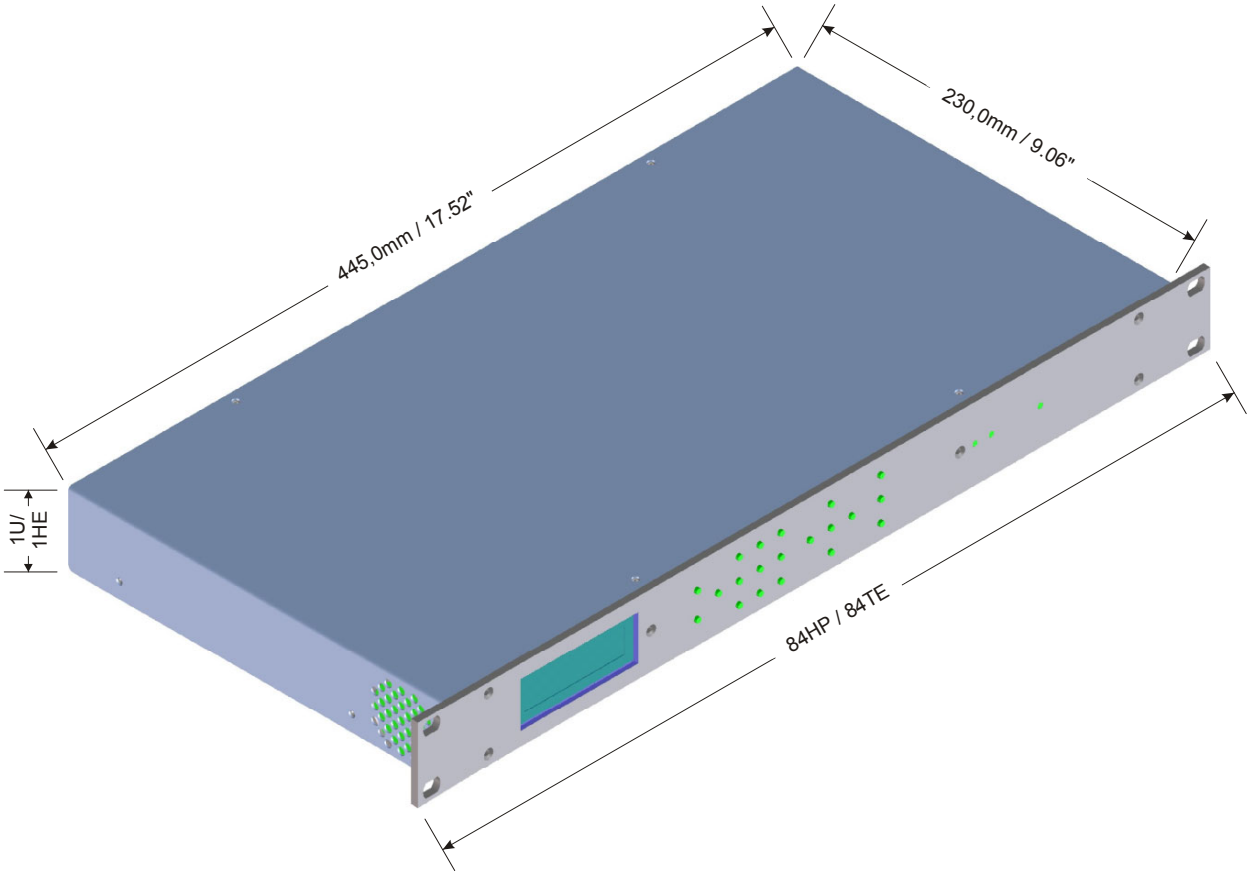
Special production:

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

10 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

11 Appendix

11.1 GPS (Global Positioning System)

Satellites circumnavigate the earth about twice per day at an altitude of approximately 20,000 km, on 6 different courses and at different angles.

The GPS system was developed based on 18 satellites with 3 replacement satellites. In order to prevent short-term gaps in coverage the number was increased during development to 21 satellites with 3 replacement satellites. Above any point on the skyline, therefore, there are always between 6 and 11 satellites visible. Highly precise atomic clocks are on board every satellite (accuracy min. $1*10^{-12}$).

A base frequency of 10.23 MHz is taken from the atomic clocks. The two carrier frequencies used, L1 and L2, are produced from this base frequency.

- Transmission frequency L1 = 154 * Base frequency = 1575.42 MHz
- Transmission frequency L2 = 120 * Base frequency = 1227.60 MHz

Each satellite sends all important navigation and system data by modulation on these two carrier frequencies. In the public domain, data transmitted on L1 frequency may be evaluated. The precise time can be calculated from this data by defining the position via the antenna.

The GPS antenna receives the signals of all satellites that are within sighting range above the skyline and forwards them to the GPS receiver via a coaxial cable. 4 satellites are required for continuous time evaluation.

hopf GPS radio-controlled clocks have a **Position-fix function** for difficult antenna positions that do not permit continuous reception from 4 satellites (where satellite signals may be screened by surrounding buildings or in mountain valleys, for example). This function also permits synchronization with only one satellite.

Time calculation

The GPS receiver calculates world time UTC (Universal Coordinated Time) from GPS world time (GPS-UTC) radiated by the satellite, by subtracting the leap seconds; at present (status: January 1999) world time is running 13 seconds behind GPS-UTC time. The difference is not constant and changes with the insertion of leap seconds.

The current standard time for the respective time zone is calculated by the addition of a time offset to the UTC time. The time offset is the time difference between UTC time and the time zone in which the clock system is situated, is set in the clock system by the user during commissioning of the clock.

Any ST/WT changeover that is due in the time zone is carried out via a switching function that is to be configured in the clock system.

Advantages/Disadvantages GPS:

+ High accuracy
+ High security against interference
+ Worldwide application possible
+ High security against failure (terrestrial transmitters are often switched off when bad weather conditions prevail at the transmission location)
+ High independent clock accuracy
– Outdoor antenna required
– Limited antenna cable lengths

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

11.2 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.

11.2.1 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.

11.2.1.1 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 59th 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

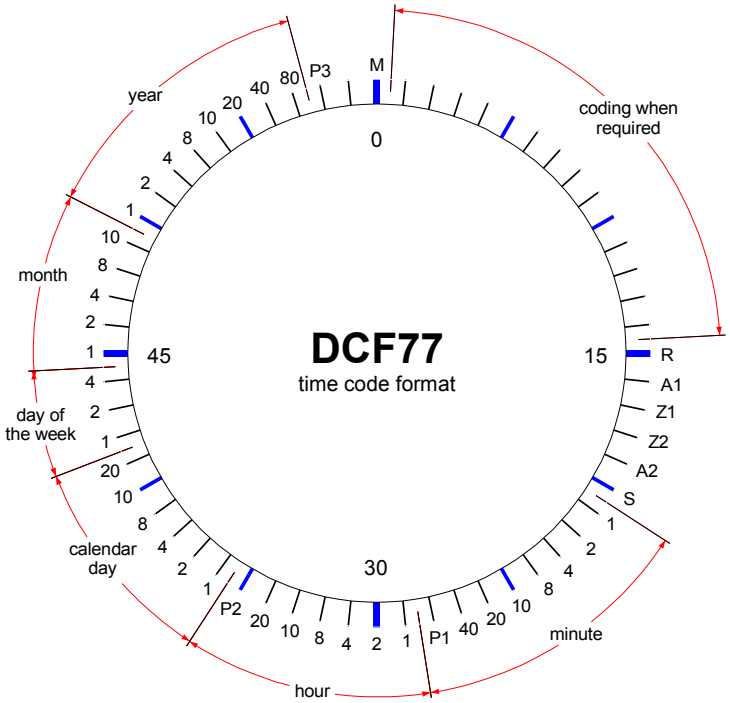
The binary 1s' of a group are calculated and supplemented with the parity bit to form an even number.

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.

[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

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

11.2.1.2 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

11.2.2 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).

11.2.2.1 DCF77 Signal Simulation

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.

11.2.2.2 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

12 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
DCF77	German Long-wave transmitter Frankfurt auf 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 SZ / WZ change over
LWL	Fiber Optic
M - N	
M/S-String	***hopf*** Master/Slave-String
MESZ	Central European Summer Time
MEZ	Central European (Winter-) Time
common - c	Relay - common
Nibble	Digital Information unit: 1 Nibble = 4 Bit
NTP	Network Time Protocol
O - Q	
normally close - nc	Relay contact (normally close)
PPM	Pulse per Minute
ppm	Parts per Million
PPS	Pulse Per Second
R - T	
RC	Remote Control
normally open - no	Relay contact (normally open)
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
SZ/WZ-Umschaltung	Summertime- / Wintertime change over
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