

Industriefunkuhren



Technical Manual

Model 6855 DCF77 Slim Line (1U)

ENGLISH

Version: 12.00 – 05.03.2013

Valid for Devices 6855 DCF77 with FIRMWARE Version: **12.xx**

Version number (Firmware / Manual)

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

SEE:

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

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

Downloading Technical Manuals

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

Homepage: <http://www.hopf.com>

E-mail: info@hopf.com

Symbols and Characters



Operational Reliability

Disregard may cause damages to persons or material.



Functionality

Disregard may impact function of system/device.



Information

Notes and Information.



Safety regulations

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

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



Safety of the device

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

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

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

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

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

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

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

CE-Conformity



This device fulfils the requirements of the EU directive 2004/108/EC "Electromagnetic compatibility" and 2006/95/EC "Low voltage equipment".

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

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

Contents	Page
1 System Description: 6855 DCF77 Slim Line (1U).....	11
1.1 System 6855 DCF77 Slim Line (1U) Design	13
1.1.1 19" Module Rack (1U).....	13
1.1.2 Display	14
1.1.3 Keypad	14
1.1.4 Status LEDs	14
1.1.5 System Bus 6000	15
1.1.6 Function Board Slots.....	15
1.1.7 Temperature-controlled Forced Ventilation	15
1.2 Quick Install - with DCF77 Antenna	16
2 System 6855 DCF77 Synchronization	17
2.1 System 6855 DCF77 Synchronization Principle.....	17
2.1.1 Operation in the CET Time Zone (Europe)	17
2.1.2 Operation in a different Time Zone (Worldwide)	18
2.1.3 Quartz Clock Operation (CET / Worldwide)	18
2.2 Summary / Synchronization Source Settings	18
2.2.1 Synchronization with DCF77 Antenna - CET Time Zone only.....	19
2.2.2 Synchronization with DCF77 Antenna Simulation (77.5kHz) - CET / WORLDWIDE	19
2.2.3 Synchronization with DCF77 Pulse (Option) - CET / WORLDWIDE	19
2.2.4 Synchronization via Serial Interface - CET / WORLDWIDE	19
2.2.5 Quartz Clock Operation - CET / WORLDWIDE	20
3 Installation.....	21
3.1 Installation of the 19" Rack	21
3.2 Earthing.....	21
3.3 AC Power Supply	21
3.3.1 Safety and Warning Instructions	22
3.3.2 Power Supply Unit Specifications	22
3.3.3 Fusing	22
3.4 DC Power Supply (Option)	23
3.4.1 Power Supply Unit Specifications	23
3.4.2 Fusing	23
3.4.3 Reverse Voltage Protection	23
3.5 Synchronization Source Connection.....	24
3.5.1 DCF77 Antenna	24
3.5.2 DCF77 Antenna Simulation (77.5kHz).....	24
3.5.3 DCF77 Pulse (Option).....	24
3.5.4 Serial String.....	24
3.6 COM0 / COM1 Serial Interfaces Connection	25
3.7 Error Relays Connection	25
3.8 DCF77 Antenna Simulation Connection (77.5kHz)	25
3.9 Function Boards Connection	25

4	Commissioning	26
4.1	General Procedure	26
4.2	Switching on the Operating Power Supply	26
4.3	Selection of Display Language	27
4.4	Display after System Start/Reset (Firmware)	27
4.4.1	Standard Display without Valid Time	27
4.4.2	Standard Display with Valid Time	27
4.5	Keypad Functions	28
4.5.1	Keypad Layout	28
4.5.2	Key Assignment	28
4.5.3	Keypad Inputs / Main Menu Activation	29
4.6	Initialization	29
5	System Parameterization and Operation	30
5.1	Menu Structure	30
5.1.1	SET Menu – Basic Settings System 6855	32
5.1.1.1	Input Time / Date	32
5.1.1.1.1	Set Time when setting Quartz Clock	33
5.1.1.2	Input Local Time to UTC Time Offset (Time Zone)	33
5.1.1.3	Input ST/WT Changeover Points of Time	34
5.1.1.4	Enter Day Offset (Option)	35
5.1.1.5	Serial Interface Parameters	36
5.1.1.5.1	Selection Frames for COM0 Serial Interface Parameters	36
5.1.1.5.2	Selection Frames for COM1 Serial Interface Parameters	36
5.1.1.6	LAN Board Parameters (Option)	37
5.1.1.6.1	Selection Frames for LAN Board 1 Parameters	37
5.1.1.6.2	Selection Frames for LAN Board 2 Parameters	37
5.1.1.7	System Status Byte	38
5.1.1.8	Special Byte	38
5.1.1.9	Status and Pulse Output	39
5.1.1.10	Fail-safe Storage of the Input Data	39
5.1.2	SHOW Menu - Display of the System 6855 Base Settings	40
5.1.2.1	Time Offset	40
5.1.2.2	ST/WT Changeover Points of Time	40
5.1.2.3	Day Offset	41
5.1.2.4	Serial Interface Parameters	42
5.1.2.4.1	Display Frames for the COM0 Serial Interface Parameters	42
5.1.2.4.2	Display Frames for the COM1 Serial Interface Parameters	42
5.1.2.5	LAN Board Parameters (Option)	43
5.1.2.5.1	Display Frames for LAN Board 1 Parameters	43
5.1.2.5.2	Display Frames for LAN Board 2 Parameters	43
5.1.2.6	System Status Byte	44
5.1.2.7	Special Byte	44
5.1.2.8	Status and Pulse Output	44
5.1.3	S.CLOCK Menu - Back-up Clock Control with Function Board 7406	44
5.1.4	INI Menu - System 6855 Extended Settings/Functions	45
5.1.4.1	Delayed Sync. Status Change	45
5.1.4.2	Delayed DCF77 Antenna Simulation and Pulse Switch-off	46
5.1.4.3	Antenna Alignment	47
5.1.4.3.1	Alignment Procedure	48
5.1.4.3.2	Signal Quality	48
5.1.4.4	Amplification Display	49
5.1.4.5	Program Reset	49
5.1.4.6	Master Reset	49

6	COM0 / COM1 Serial Interfaces	50
6.1	Configuration of the Serial Interfaces	50
6.1.1	Serial Transmission Parameters	50
6.1.2	Configuration of the Data String (Mode Byte)	52
6.1.2.1	Mode Byte 1 / Bit7 - Local Time or UTC in the Serial Output	52
6.1.2.2	Mode Byte 1 / Bit 6 - Serial Output Second Forerun	53
6.1.2.3	Mode Byte 1 / Bit5: STX/ETX Control Characters	53
6.1.2.4	Mode Byte 1 / Bit 4 - Last Control Character at Second Change (On-Time Mark)	53
6.1.2.5	Mode Byte 1 / Bit 3 - Reverse Control Characters CR and LF	53
6.1.2.6	Mode Byte 1 / Bit 2 - Delayed Transmission	54
6.1.2.7	Mode Byte 1 / Bit1-Bit0 - Data String Transmission Point of Time	54
6.1.2.8	Mode Byte 2 / Bit7-Bit6: Non-assigned Bits	55
6.1.2.9	Mode Byte 2 / Bit5: Standard Time (Winter Time) Output only	55
6.1.2.10	Mode Byte 2 / Bit4: Data String Selection	55
6.1.3	Serial Transmission Data Format	56
6.1.4	Serial Data String Request	56
6.1.4.1	Serial Requests with ASCII Characters (hopf Standard and hopf 2000)	56
6.2	Data String Transmission Points of Time	57
6.3	Data Strings	58
6.3.1	General Information about Data Output of Board 6855 DCF77	58
6.3.2	hopf Standard String (6021)	59
6.3.2.1	Specified Settings	59
6.3.2.2	Structure	59
6.3.2.3	Status	59
6.3.2.4	Example	60
6.3.3	NTP (Network Time Protocol)	61
6.3.3.1	Specified Settings	61
6.3.3.2	Structure	61
6.3.3.3	Status	61
6.3.3.4	Example	61
6.3.4	hopf DCF-Slave-String	62
6.3.4.1	Specified Settings	62
6.3.4.2	Structure	62
6.3.4.3	Status	63
6.3.4.4	Example	63
6.3.5	SINEC H1	64
6.3.5.1	Specified Settings	64
6.3.5.2	Structure	64
6.3.5.3	Status	65
6.3.5.4	Example	65
6.3.6	MADAM-S	66
6.3.6.1	Specified Settings	66
6.3.6.2	Structure	66
6.3.6.2.1	MADAM-S with Request :ZSYS:	66
6.3.6.2.2	MADAM-S with Request :WILA:	67
6.3.6.3	Status	68
6.3.6.4	Example	68
6.3.7	IBM Sysplex Timer Model 1+2	69
6.3.7.1	Specified Settings	69
6.3.7.2	Structure	69
6.3.7.3	Status	70
6.3.7.4	Example	70

6.3.8 TimeServ for Windows NT PCs	71
6.3.8.1 Specified Settings	71
6.3.8.2 Structure	71
6.3.8.3 Status	71
6.3.8.4 Example	71
6.3.9 hopf 2000 - 4 Digit Year Output	72
6.3.9.1 Specified Settings	72
6.3.9.2 Structure	72
6.3.9.3 Status	73
6.3.9.4 Example	73
6.3.10 T-String	74
6.3.10.1 Specified Settings	74
6.3.10.2 Structure	74
6.3.10.3 Status	74
6.3.10.4 Example	74
6.3.11 ABB_S_T	75
6.3.11.1 Specified Settings	75
6.3.11.2 Structure	75
6.3.11.3 Status	75
6.3.11.4 Example	75
6.3.12 Data String NTGS-String	76
6.3.12.1 Specified Settings	76
6.3.12.2 Structure	76
6.3.12.3 Status	76
6.3.12.4 Example	76
6.3.13 hopf Master/Slave-String	77
6.3.13.1 Specified Settings	77
6.3.13.2 Structure	78
6.3.13.3 Status	79
6.3.13.4 Example	79
6.3.14 SINEC H1 Extended	80
6.3.14.1 Specified Settings	80
6.3.14.2 Structure	80
6.3.14.3 Status	81
6.3.14.4 Example	81
6.3.15 hopf 5500	82
6.3.15.1 Specified Settings	82
6.3.15.2 Structure	82
6.3.15.2.1 hopf 5500 - Output Date/Time	82
6.3.15.2.2 hopf 5500 - Output Time Only	83
6.3.15.3 Status	83
6.3.15.4 Example	83
6.3.16 hopf Standard String (6021) UTC with Local Status	84
6.3.16.1 Specified Settings	84
6.3.16.2 Structure	84
6.3.16.3 Example	84
6.3.17 DCF77 Analysis String	85
6.3.17.1 String Description	85
6.3.17.1.1 String Output without detected DCF77 Minute Mark - After Start/Reset	85
6.3.17.1.2 String Output after detected Minute Mark	86
6.3.17.2 Structure	87
6.3.17.3 Synchronisation Mode	89
6.3.17.4 Status	89
6.3.17.5 Example	90

6.3.18 Contronic P (PCZ 77 / 5050H&B)	91
6.3.18.1 Contronic P (PCZ 77 / 5050H&B) - Time/Date	91
6.3.18.1.1 Status- and Day of the Week Nibble	92
6.3.18.1.2 Example	92
6.3.18.2 Contronic P (PCZ77 / 5050H&B) - Time only	92
6.3.19 SAT 1703 Time String	93
6.3.19.1 Specified Settings	93
6.3.19.2 Structure	93
6.3.19.3 Status	94
6.3.19.4 Example	94
7 Function Boards	95
7.1 General	95
7.2 Function Boards for the System 6855 DCF77 Slim Line (1U) – Summary	96
7.3 Exchanging a Function Board	97
7.4 Installation of an Additional Function Board	97
7.5 Removing Function Boards	98
8 System Indicators / Fault Analysis / Troubleshooting	99
8.1 Status and Fault Indicators	99
8.1.1 Status LEDs	99
8.1.1.1 "Power ON" LED	99
8.1.1.2 "Sync. Status" LEDs	99
8.1.2 LCD-Display	99
8.1.2.1 System Status on the Display	99
8.1.3 Error Relays	99
8.1.3.1 "Power" Relay	99
8.1.3.2 "Sync" Relay	99
8.1.4 Send LED	100
8.1.5 Auto-Reset Logic (System Bus)	100
8.1.6 Serial Output of Data Telegrams	100
8.2 Error Patterns	101
8.2.1 Complete Failure	101
8.2.2 Power LED "ON" - No Display and No Output	101
8.2.3 Power LED "ON" - No Display but Valid Signal Output	101
8.2.4 Power LED "ON" - Cyclical Flickering of the Displays	102
8.2.5 No DCF77 Reception / No Synchronization	102
8.2.6 No DCF77 Antenna Simulation / DCF77 Pulse	102
8.2.7 No (or incorrect) Serial Output	103
8.2.8 Incorrect Time Output	103
8.2.8.1 Incorrect Local Time	103
8.2.8.2 Incorrect UTC Time	104
8.2.9 No ST/WT Changeover	104
8.2.10 Output and Function Errors of Individual Function Boards	104
8.3 Support from the hopf Company	105

9 Maintenance / Care	106
9.1 General Guidelines for Cleaning	106
9.2 Cleaning the Housing	106
9.3 Cleaning the Display and Keypad	106
10 Technical Data System 6855 DCF77 Slim Line (1U)	107
11 System Drawing	110
12 Appendix	111
12.1 DCF77 (German Long-Wave Transmitter Frankfurt 77.5kHz)	111
12.1.1 DCF77 General	111
12.1.1.1 DCF77 Signal Structure	111
12.1.1.2 Advantages and Disadvantages DCF77	113
12.1.2 DCF77 Generation by <i>hopf</i> Clocks	113
12.1.2.1 DCF77 Signal Simulation (77.5kHz)	113
12.1.2.2 DCF77 Pulse (1Hz)	113
13 Glossary	114

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

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

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

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

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

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

Some of the System's base functions:

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

Extension options

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

1.1 System 6855 DCF77 Slim Line (1U) Design

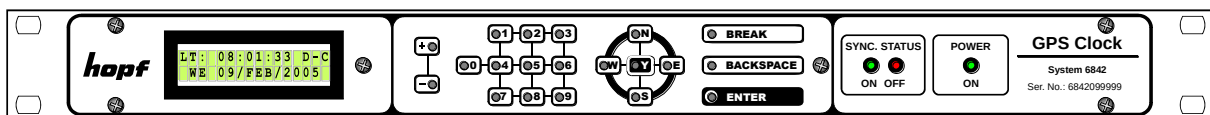
The system can be individually configured for various applications due to its partly modular design and can be easily upgraded or converted to suit changes in the application conditions.

1.1.1 19" Module Rack (1U)

The base system consists of the following:

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

System front panel:



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

System rear side / connection side:



1.1.2 Display

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

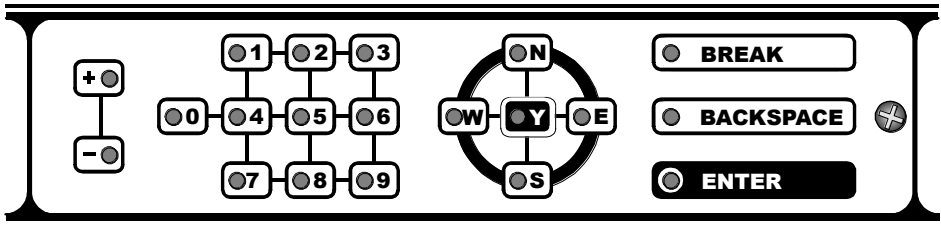


The lighting is activated by pressing a key and switches off automatically after approx. 4 minutes when the keypad is not pressed.

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

1.1.3 Keypad

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



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

1.1.4 Status LEDs

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

The LEDs indicate the following System conditions:

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

1.1.5 System Bus 6000

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

The System Bus serves to provide:

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

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

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

1.1.6 Function Board Slots

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

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



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

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

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

1.1.7 Temperature-controlled Forced Ventilation

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

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



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

1.2 Quick Install - with DCF77 Antenna

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

The equipment should be synchronous within less than 30 minutes.

Verifiable by:

- LCD display
- Status LED's
- Error Relays

2.1.2 Operation in a different Time Zone (Worldwide)

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



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

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

2.1.3 Quartz Clock Operation (CET / Worldwide)

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

2.2 Summary / Synchronization Source Settings

System synchronization options and their required settings:

MENU 1: SET (see Chapter 5.1.1)		DCF77 Antenna Signal		DCF77 Pulse (Option)		Serial Data String		Quartz Clock
		CET	World- wide	CET	World- wide	CET	World- wide	CET / World- wide
1.01	TIME	0	0	0	0	0	0	+
1.02	TIME OFFSET	-	+	-	+	-	+	+
1.03	CHANGEOVER TIME W ⇨ S (Standard- ⇨ Summer time)	-	-	-	-	-	-	(+)
1.04	CHANGEOVER TIME S ⇨ W (Summer- ⇨ Standard time)	-	-	-	-	-	-	(+)
1.20	SYSTEM STATUS (Bit2 - Bit0)	001	100	010	101	011	110	000

- + Always required
- (+) Only when necessary
- o Not required – but possible
- Input not possible or no function

2.2.1 Synchronization with DCF77 Antenna - CET Time Zone only

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

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

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

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

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

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

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

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

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

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



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

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

2.2.4 Synchronization via Serial Interface - CET / WORLDWIDE

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

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

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

Functional Description for Synchronization via Serial Data String

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

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

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

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



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

2.2.5 Quartz Clock Operation - CET / WORLDWIDE

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

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

3 Installation

The following describes the installation of the System hardware.

3.1 Installation of the 19" Rack

The following steps are to be carried out:

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



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

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

3.2 Earthing

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

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

3.3 AC Power Supply

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

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

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

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



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



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

3.3.1 Safety and Warning Instructions

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



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

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

Before commissioning ensure that:

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

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

3.3.2 Power Supply Unit Specifications

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

3.3.3 Fusing

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

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

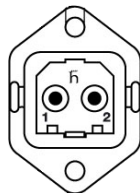


If the internal fuse (device protection) trips it is highly probable that the equipment is faulty. In this case the device should be checked in the factory.

3.4 DC Power Supply (Option)



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



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

+V_{in}: Positive pole (contact 1)

-V_{in}: Negative pole (contact 2)

PE: Earth



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



Earthing:

By default the minus pole (-V_{in}) and earthing (PE) are connected system-sided.

3.4.1 Power Supply Unit Specifications

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

3.4.2 Fusing

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

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



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

3.4.3 Reverse Voltage Protection

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

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

3.5 Synchronization Source Connection

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

3.5.1 DCF77 Antenna

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

3.5.2 DCF77 Antenna Simulation (77.5kHz)

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

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

3.5.3 DCF77 Pulse (Option)

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

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

3.5.4 Serial String

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

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

3.6 COM0 / COM1 Serial Interfaces Connection

The serial interfaces are assigned as follows:

SUB-D connector
9 pin



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



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

3.7 Error Relays Connection

SUB-D connector
9 pin



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

PWR = Power / Operation – SYNC = Synchronous

3.8 DCF77 Antenna Simulation Connection (77.5kHz)

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

3.9 Function Boards Connection

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

4 Commissioning

This chapter describes the commissioning of the system 6855.

4.1 General Procedure

The commissioning procedure is as follows:

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

4.2 Switching on the Operating Power Supply

AC power supply:



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

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

DC power supply:



Switch on external power supply source.

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

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

4.3 Selection of Display Language

System 6855 has both English and German language display menus.

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

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

4.4 Display after System Start/Reset (Firmware)

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

V	E	R	S	I	O	N	0	9	.	0	3				
2	4	.	O	C	T	.	2	0	0	3					

⇒ Control Board 6855 firmware
⇒ Firmware programming date

4.4.1 Standard Display without Valid Time

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

L	T	:	0	0	.	0	0	.	0	1	-	-	-		
-	-		0	0	/	-	-	-	/	2	0	0	0		



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

4.4.2 Standard Display with Valid Time

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

L	T	:	1	4	:	5	6	:	2	7	S	-	C		
M	O		2	4	/	J	A	N	/	2	0	0	6		

The meaning of the individual items is as follows:

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

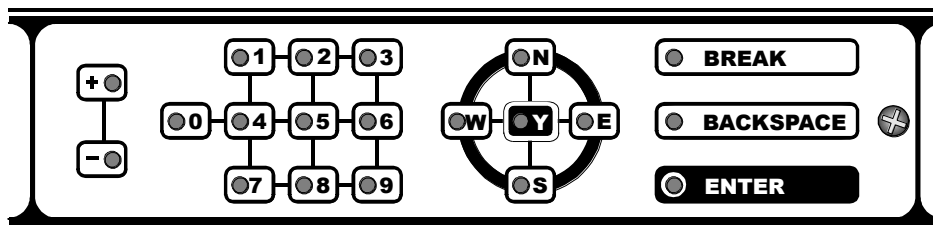
Status display:

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 DCF77 without internal quartz base control "R" = Clock system is synchronized with DCF77 with internal quartz base control (R=Radio)

4.5 Keypad Functions

The following describes the keypad design and operation.

4.5.1 Keypad Layout



4.5.2 Key Assignment

Key	Function
+ / -	Input of the operational signs for numerical values
0 ... 9	Input of the digits
N, E, S, W	Input keys
Y	Call up menu group selection frame
BREAK	Aborts all key controls. Quits the input menu at any time and in any position. All inputs following the most recent activation of the ENTER key are discarded.
BACKSPACE	Deletes the last character entered
ENTER	Calls up the main menu from the standard display. 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.

4.5.3 Keypad Inputs / Main Menu Activation

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

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

Standard frame:

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

Main menu:

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

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

4.6 Initialization

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

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

Menu items required for the base parameterization:

MENU 1: #SET

1.20 SYSTEM STATUS

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

5 System Parameterization and Operation

The following explains the menu structure and the individual menus.

5.1 Menu Structure

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

The menu structure is constructed as follows:

MENU 1: #SET

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

MENU 2: #SHOW

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

MENU 3: #S.CLOCK

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

MENU 4: #INI

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

5.1.1 SET Menu – Basic Settings System 6855

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



Grey script on the display corresponds to possible customer input.

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

5.1.1.1 Input Time / Date

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

Selection frame:

S	E	T	T	I	M	E	Y	/	N	_	

Input frame:

T	I	M	E	:	H	H	:	M	M	:	S	S		
d	.	D	D	/	M	M	/	Y	Y	Y	Y	.	Z	_

The meaning of the individual items is as follows:

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

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

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

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

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

5.1.1.1.1 Set Time when setting Quartz Clock

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

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



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

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

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

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



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

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

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

Selection frame:

S	E	T	D	I	F	.	-	T	I	M	E
				Y	/	N		-			

Input frame:

D	I	F	-	T	I	M	E	:	+	0	1	:	0	0	-
---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---

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).

5.1.1.3 Input ST/WT Changeover Points of Time

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



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

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

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

Selection frame:

S	E	T	C	H	A	N	G	E	_	O	V	E	R
D	A	T	E	S	-	>	D	Y	,	N			

For winter / summer time changeover
(Standard time ⇒ Daylight saving time)

Input frame:

S	-	-	>	D				h	h	.	d	.	w	.	M	M		
								>	0	2	.	7	.	5	.	0	3	<

Selection frame:

S	E	T	C	H	A	N	G	E	_	O	V	E	R
D	A	T	E	D	-	>	S	Y	,	N			

For summer / winter time changeover
(Daylight saving time ⇒ Standard time)

Input frame:

D	-	-	>	S				h	h	.	d	.	w	.	M	M		
								>	0	3	.	7	.	5	.	1	0	

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	1 = January ... 12 = December

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

5.1.1.4 Enter Day Offset (Option)

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

Selection screen:

S	E	T	D	I	F	.	-	T	I	M	E
			Y	,	N		-				



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

5.1.1.5 Serial Interface Parameters

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



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

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

5.1.1.5.1 Selection Frames for COM0 Serial Interface Parameters

Setting the Serial Parameters

Selection frame:

SET	COM_0	SERIAL	
PARAMETER	Y/N_		

The parameters for **Baud rate**, **Word length**, **Parity bit**, **Stop bit** and **HandShake** 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	7	6	5	4	3	2	1	0
	1	1	1	0	1	1	0	0

Setting Mode Byte 2

Selection frame:

SET	COM_0		
MODE_2	Y,N_		

Input frame:

BIT	7	6	5	4	3	2	1	0
	1	1	1	0	1	1	0	0

5.1.1.5.2 Selection Frames for COM1 Serial Interface Parameters

SET	COM_1	SERIAL	
PARAMETER	Y/N_		

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

5.1.1.6 LAN Board Parameters (Option)

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

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

5.1.1.6.1 Selection Frames for LAN Board 1 Parameters

Setting the IP address

Selection frame:

				S	E	T		L	A	N		1		
				A	D	R	.		Y	/	N	_		

Input frame:

L	A	N		1		>	1	9	2	.	1	6	8	.
							0	0	1	.	0	1	0	<

Setting the Gateway address

Selection frame:

				S	E	T		L	A	N		1		
				G	A	T	E	W	A	Y		A	D	R
											Y	/	N	_

Input frame:

G	.	W		1		>	1	9	2	.	1	6	8	.
							0	0	1	.	0	0	5	<

Setting the Network Mask

Selection frame:

				S	E	T		L	A	N		1		
				N	E	T	-	M	A	S	K	.	Y	/
											N	_		

Input frame:

				N	E	T	-	M	A	S	K		L	A	N		1
												>	2	4	<	_	

⇔ corresponds to 255.000.000.000

Setting the Control Byte

Selection frame:

				S	E	T		L	A	N		1		
				C	N	T	R	L	.	-	B	Y	T	E
											Y	/	N	_

Input frame:

B	I	T		7	6	5	4		3	2	1	0		
				1	0	1	0		0	0	0	1	-	

5.1.1.6.2 Selection Frames for LAN Board 2 Parameters

Selection frame:

				S	E	T		L	A	N		2		
				A	D	R	.		Y	/	N	_		

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

5.1.1.7 System Status Byte

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

The meaning of the individual bits is as follows:

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

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

Selection screen:

```

SET SYSTEM
STATUS Y/N_

```

Input screen:

```

BIT 7 6 5 4 3 2 1 0
    0 0 0 0 0 0 0 1

```

Standard setting

5.1.1.8 Special Byte

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

Selection screen:

```

SET SPECIAL
BYTE Y,N_

```

Input screen:

```

BIT 7 6 5 4 3 2 1 0
    0 0 0 0 0 0 0 0

```

⇐ This bit combination should always be set for compatibility reasons

5.1.1.9 Status and Pulse Output

This function is not available in this equipment version.



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

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

Selection frame:

SET	STATUS-	OR
PULS-	OUTPUT	Y/N

Input frame:

BIT	7	6	5	4	3	2	1	0		
			0	0	0	0	0	0	1	—

↔ Setpoint

5.1.1.10 Fail-safe Storage of the Input Data

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

5.1.2 SHOW Menu - Display of the System 6855 Base Settings

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

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

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

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

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

5.1.2.1 Time Offset

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

Selection frame:

S	H	O	W	D	I	F	.	-	T	I	M	E
				Y	/	N	-					

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

Display frame:

D	I	F	-	T	I	M	E	:	+	0	1	:	0	0	-
---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---



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

5.1.2.2 ST/WT Changeover Points of Time

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



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

Time Zone Changeover D ⇒ S

This function shows the changeover point of time from Daylight saving time (summer time) to Standard time (winter time).

Selection frame:

S	H	O	W		C	H	A	N	G	E	_	O	V	E	R
D	-	-	>	S		Y	,	N		_					

After entering the following frame appears (example):

Display frame:

T	I	M	E	:	0	2	:	0	0	:	0	0			
7	.	3	0	/	1	0	/	2	0	0	5		D	>	S

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

Time Zone Changeover S ⇒ D

This function shows the changeover point of time from Standard time (winter time) to Daylight saving time (summer time).

Selection frame:

S	H	O	W		C	H	A	N	G	E	_	O	V	E	R
S	-	-	>	D		Y	/	N		_					

After entering the following frame appears (example):

Display frame:

T	I	M	E	:	0	2	:	0	0	:	0	0			
7	.	2	7	/	0	3	/	2	0	0	5		S	>	D

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

If an invalid changeover time is set the following appears:

Display frame:

N	O		C	H	A	N	G	E	_	O	V	E	R		

5.1.2.3 Day Offset

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

Selection screen:

S	H	O	W		D	I	F	.	-	D	A	Y	S		

After entering the following image appears (example):

Selection screen:

D	-	T	A	G	E	:	-	0	0	3	6	5	_		

 (e.g. for -365 days)



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

5.1.2.4 Serial Interface Parameters

With this menu the serial interface parameters can be shown.

5.1.2.4.1 Display Frames for the COM0 Serial Interface Parameters

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

COM 0 Interface Parameter Displays

<u>Selection frame:</u>	SHW	COM_0	SERIAL		
	PARAMETER		Y/N		
<u>Display frame:</u>	B:09600		W:8		
	P:N	S:1	HS:N_		

Mode Byte 1 Displays

<u>Selection frame:</u>		SHOW	COM_0		
		MODE_1	Y/N_		
<u>Display frame:</u>	BIT	7654	3210		
		1111	0100_		

Mode Byte 2 Displays

<u>Selection frame:</u>		SHOW	COM_0		
		MODE_2	Y/N_		
<u>Display frame:</u>	BIT	7654	3210		
		0000	0000_		

5.1.2.4.2 Display Frames for the COM1 Serial Interface Parameters

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

5.1.2.5 LAN Board Parameters (Option)

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

5.1.2.5.1 Display Frames for LAN Board 1 Parameters

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

IP Address Displays

<u>Selection frame:</u>	SHOW LAN 1
	ADR. Y/N_
<u>Display frame:</u>	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

<u>Selection frame:</u>			S	H	O	w	L	A	N		1
	G	A	T	E	w	A	y	A	D	R.	Y/N
<u>Display frame:</u>	G	.	W		1	>	1	9	2	.	1
							6	8	.		
							0	0	1	.	0
							0	0	5	<	

Network Mask Displays

Selection frame:

		S	H	O	W	L	A	N		1	
		N	E	T	-	M	A	S	K		Y/N_

Display frame:

		N	E	T	-	M	A	S	K	L	A	N		1
										>	2	4	<	_

Control Byte Displays

[illegible]

5.1.2.5.2 Display Frames for LAN Board 2 Parameters

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

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

5.1.2.6 System Status Byte

The System Status Byte is displayed with this display frame.

<u>Selection frame:</u>	SHOW SYSTEM									
	STATUS Y/N_									
<u>Display frame:</u>	BIT 7654 3210									
	0000 0000_									

5.1.2.7 Special Byte

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

<u>Selection frame:</u>	SHOW SPECIAL									
	BYTE Y/N_									
<u>Display frame:</u>	BIT 7654 3210									
	0000 0000_									

No function is assigned to these bits at present.

5.1.2.8 Status and Pulse Output

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

<u>Selection frame:</u>	SHOW STATUS- AND									
	PULS-OUTPUT Y/N									
<u>Display frame:</u>	BIT 7654 3210									
	0000 0001_									

⇨ Setpoint for this equipment version

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

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

<u>Selection frame:</u>	SLAVE CLOCK NO.									
	1 - 4 >_									

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

5.1.4 INI Menu - System 6855 Extended Settings/Functions

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

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

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

5.1.4.1 Delayed Sync. Status Change

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

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

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

Freewheel Accuracy Calculation Example

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

For example, if the freewheel accuracy is $\pm 2 \times 10^{-6}$ and the required minimum system accuracy is **10 msec.**, the following calculation results:

$$0.01s / (2 \times 10^{-6}) = 5000s = \mathbf{83 \text{ minutes } 20 \text{ seconds}}$$

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

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

Selection frame:

DELAY	STATUS-								
CHANGE	Y/N_								

Display frame:

STATUS	CHANGE								
AFTER	>	002	<	MIN.					

STANDARD value: 002

The currently valid time delay is shown.

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

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

5.1.4.2 Delayed DCF77 Antenna Simulation and Pulse Switch-off

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

These signals do not contain synchronization status information for the transmitting device (Master). For this reason, connected equipment is always radio-synchronous with this signal; even when the transmitting device is running on its own internal quartz base.

In order to identify a possible Master System synchronization problem in the Slave System, DCF77 Antenna Simulation and DCF77 pulse output can be switched off by means of a timer.

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

**For Quartz Clock Setting:**

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



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

There are two settings, each with a different effect:

2 to 254 Minutes Setting

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

255 Minutes Setting

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

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



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

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

Selection screen:

DELAY	DCF_SIM				
STOP	Y/N_				

Display screen:

DCF-SIM	STOP				
AFTER	>055<	MIN.			

STANDARD value: 055

The time is increased with the key and reduced with .

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



Delays cannot be added for system status change and DCF77 simulation.
Sample setting: System status change **10 min.** / DCF77 simulation **3 min.**
DCF77 simulation changes to 2 Hz modulation after 3 minutes reception failure, not after 13 minutes.

Sample calculation for the accuracy of the DCF77 simulation

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

In this example, the accuracy of the internal quartz base is given as $\pm 2 \cdot 10^{-6}$. Minimum accuracy required: **10 msec.**

$$0.01s / (2 \times 10^{-6}) = 5000s = \mathbf{83 \text{ minutes } 20 \text{ seconds}}$$

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

5.1.4.3 Antenna Alignment

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

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



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

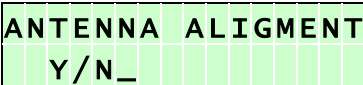
This function can also be used to test a DCF77 signal which is connected to the System 6855 via a DCF77 antenna switch or DCF77 antenna simulation.

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

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

5.1.4.3.1 Alignment Procedure

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

Selection screen: 

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

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

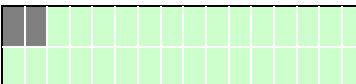
Display screen: 

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

From approximately

Display screen: 

to

Display screen: 

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

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

5.1.4.3.2 Signal Quality

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

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

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

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

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

5.1.4.4 Amplification Display

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

Selection screen:

S	H	O	W	D	C	F	-	S	I	G	N	A	L		
				R	E	S	E	R	V	E		Y	/	N	_

Display screen:

				D	C	F	-	S	I	G	N	A	L	-		
				R	E	S	E	R	V	E	:		0	4	7	%

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

5.1.4.5 Program Reset

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



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

Program Reset is triggered via the following frame:

Selection frame:

P	R	O	G	R	A	M	M		R	E	S	E	T
				Y	/	N		_					

Program Reset is executed by pressing the **Y** key.

5.1.4.6 Master Reset

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



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

Selection is made via the following frame:

Selection frame:

				M	A	S	T	E	R		R	E	S	E	T
				Y	/	N		_							

Master Reset is executed by pressing the **Y** key.

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

Input frame:

B	:	0	9	6	0	0	W	:	_

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:

B	:	0	9	6	0	0	W	:	8
P	:	_							

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:

B	:	0	9	6	0	0	W	:	8
P	:	N	S	:	_				

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:

B	:	0	9	6	0	0	W	:	8
P	:	N	S	:	1	HS	:	_	

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.

6.1.2 Configuration of the Data String (Mode Byte)

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

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

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

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

Selection frame:

or

Selection frame:

- Key **Y**

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

Input frame:

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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



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

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

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

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

6.1.2.6 Mode Byte 1 / Bit 2 - Delayed Transmission

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

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

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

Example:

Baud rate 9600 baud

<u>Milliseconds</u>	<u>With delay</u>	<u>Without delay</u>
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

<u>Milliseconds</u>	<u>With delay</u>	<u>Without delay</u>
000	End character (ETX)	End character (ETX)
002	–	New data string
105	–	End new data string
810	New data string	–
913	End new data string	–
000	End character (ETX)	End character (ETX)

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

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

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

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

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

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

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

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

6.1.2.10 Mode Byte 2 / Bit4: Data String Selection

This mode byte sets the transmitted data string.

Bit Position					Data String
4	3	2	1	0	
off	off	off	off	off	hopf Standard String (6021) and respectively NTP
off	off	off	off	on	hopf Standard String (6021) time only
off	off	off	on	off	hopf DCF-Slave String
off	off	off	on	on	SINEC H1
off	off	on	off	off	MADAM-S
off	off	on	off	on	IBM Sysplex Timer Modell 1+2 and respectively TimeServ
off	off	on	on	off	hopf 2000 - 4 digit year output
off	off	on	on	on	T-String
off	on	off	off	off	ABB_S_T-String
off	on	off	off	on	NTGS-String
off	on	off	on	off	hopf Master/Slave-String
off	on	off	on	on	SINEC H1 Extended
off	on	on	off	off	hopf 5500 date/time
off	on	on	off	on	hopf 5500 time only
off	on	on	on	off	hopf Standard String (6021) UTC with local status
off	on	on	on	on	DCF77 Analysis String
on	off	off	off	off	Contronic P (PCZ77 / 5050H&B) - Time / Date
on	off	off	off	on	Contronic P (PCZ77 / 5050H&B) - Time
on	off	off	on	off	SAT 1703 Time String
on	off	off	on	on	Free - hopf Standard String (6021) at present
...	...	...	...	...	
on	on	on	on	on	Free - hopf Standard String (6021) at present

6.1.3 Serial Transmission Data Format

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

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



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

6.1.4 Serial Data String Request

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

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

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

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

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

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

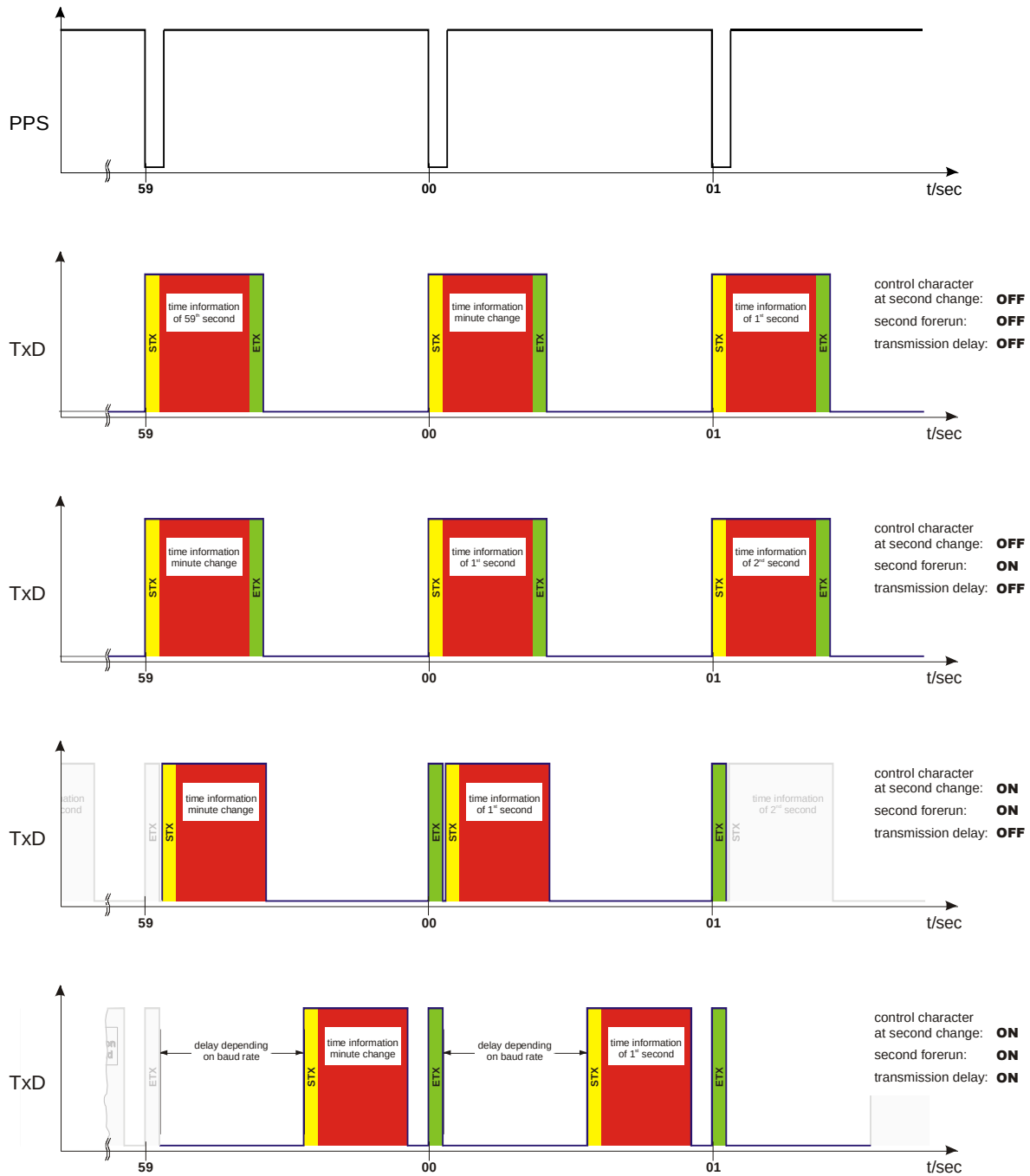
The clock interprets the multiplication factor as a hexadecimal value.

Example:

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

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

6.2 Data String Transmission Points of Time



STX ⇒ Start of Text

ETX ⇒ End of Text

6.3 Data Strings

This Chapter describes the data strings supported by this System.

6.3.1 General Information about Data Output of Board 6855 DCF77

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

The output of control characters CR and LF can be reversed with **Mode Byte 1** on all data strings

(see **chapter 6.1.2.5 Mode Byte 1 / Bit 3 - Reverse Control Characters CR and LF**).

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

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

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

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

6.3.2 **hopf** Standard String (6021)

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

6.3.2.1 Specified Settings

Automatic:	no
Required:	no
Blocked:	no

6.3.2.2 Structure

Character No.	Meaning	Hex-Value
1	STX (start of text)	\$02
2	status (internal clock status)	\$30-39, \$41-46
3	day of the week (1=Monday ... 7=Sunday) for UTC time bit 3 is set to 1 in the day of the week	\$31-37
4	tens hour	\$30-32
5	unit hour	\$30-39
6	tens minute	\$30-35
7	unit minute	\$30-39
8	tens second	\$30-36
9	unit second	\$30-39
10	tens day	\$30-33
11	unit day	\$30-39
12	tens month	\$30-31
13	unit month	\$30-39
14	tens year	\$30-39
15	unit year	\$30-39
16	LF (line feed)	\$0A
17	CR (carriage return)	\$0D
18	ETX (end of text)	\$03

6.3.2.3 Status

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

	b3	b2	b1	b0	Meaning
Status:	x	x	x	0	no announcement hour
	x	x	x	1	announcement (ST-WT-ST)
	x	x	0	x	standard time (WT)
	x	x	1	x	daylight saving time (ST)
	0	0	x	x	time / date invalid
	0	1	x	x	crystal operation
	1	0	x	x	radio operation
	1	1	x	x	radio operation (high accuracy)

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

Status	operation mode	time	announcement SZ-WZ-SZ
0 = 0000	time invalid	winter	no announcement
1 = 0001	time invalid	winter	announcement
2 = 0010	time invalid	summer	no announcement
3 = 0011	time invalid	summer	announcement
4 = 0100	quartz	winter	no announcement
5 = 0101	quartz	winter	announcement
6 = 0110	quartz	summer	no announcement
7 = 0111	quartz	summer	announcement
8 = 1000	radio	winter	no announcement
9 = 1001	radio	winter	announcement
A = 1010	radio	summer	no announcement
B = 1011	radio	summer	announcement
C = 1100	radio	winter	no announcement
D = 1101	radio	winter	announcement
E = 1110	radio	summer	no announcement
F = 1111	radio	summer	announcement

6.3.2.4 Example

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

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

6.3.3 NTP (Network Time Protocol)

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



The data string must be set in mode byte 2 / Bit3-Bit0 as **hopf** standard string (see **chapter 6.1.2.10**).

Source code and documentation are available as freeware under:

<http://www.ntp.org>

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

<http://www.hopf.com>

6.3.3.1 Specified Settings

Automatic:	no
Required:	The following values are automatically set if the string is selected: <u>parameter of transmission:</u> • baud rate 9600 • 8 data bit • parity no • 1 stop bit <u>mode of transmission:</u> • 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

6.3.3.2 Structure

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

6.3.3.3 Status

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

6.3.3.4 Example

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

6.3.4 **hopf** DCF-Slave-String

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

6.3.4.1 Specified Settings

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

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



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

6.3.4.2 Structure

Character No.	Meaning	Hex-Value
1	STX (start of text)	\$02
2	status	\$30-39, \$41-46
3	day of the week	\$31-37
4	tens hour	\$30-32
5	unit hour	\$30-39
6	tens minute	\$30-35
7	unit minute	\$30-39
8	tens second	\$30-36
9	unit second	\$30-39
10	tens day	\$30-33
11	unit day	\$30-39
12	tens month	\$30-31
13	unit month	\$30-39
14	tens year	\$30-39
15	unit year	\$30-39
16	LF (line feed)	\$0A
17	CR (carriage return)	\$0D
18	ETX (end of text)	\$03

6.3.4.3 Status

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

6.3.4.4 Example

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

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

6.3.5 SINEC H1

Below the data string SINEC H1 is described.

String request

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

6.3.5.1 Specified Settings

Automatic:	no
Required:	no
Blocked:	no

6.3.5.2 Structure

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

6.3.5.3 Status

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

The characters mean the following:

character no. 28 = "#" no radio synchronisation after reset, time invalid
 " " (space) radio synchronisation after reset, clock in crystal operation

character no. 29 = "*" time from internal crystal in the clock
 " " (space) time by radio reception

character no. 30 = "S" daylight saving time
 " " (space) standard time

character no. 31 = "!" announcement of a WT/ST or ST/WT changeover
 " " (space) no announcement

6.3.5.4 Example

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

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

6.3.6 MADAM-S

Below the data string MADAM-S is described.

6.3.6.1 Specified Settings

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

6.3.6.2 Structure

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

6.3.6.2.1 MADAM-S with Request :ZSYS:

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

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

6.3.6.2.2 MADAM-S with Request :WILA:

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

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

6.3.6.3 Status

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

This byte can have the following values

NUL (Hex 00)	no announcement
SOH (Hex 01)	announcement change over daylight saving time / standard time standard time / daylight saving time
DEL (Hex 7F)	no radio time available

9. byte of the transmission: time scale ident.

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

The day of the week nibble can have the values

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

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

6.3.6.4 Example

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

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

6.3.7 IBM Sysplex Timer Model 1+2

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

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

6.3.7.1 Specified Settings

Automatic:	The following parameters are activated after a reset automatically • 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.

6.3.7.2 Structure

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

6.3.7.3 Status

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

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

6.3.7.4 Example

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

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

6.3.8 TimeServ for Windows NT PCs

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



The data string must be set in mode byte 2 / Bit3-Bit0 as IBM Sysplex Timer (see **chapter 6.1.2.10**).

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

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

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

<http://www.hopf.com>

6.3.8.1 Specified Settings

Automatic:	no
Required:	The following parameters must be activated after selecting this string: • 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

6.3.8.2 Structure

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

6.3.8.3 Status

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

6.3.8.4 Example

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

6.3.9 **hopf2000 - 4 Digit Year Output**

Below the data string **hopf2000 - 4 Digit Year Output** is described.

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

6.3.9.1 Specified Settings

Automatic:	no
Required:	no
Blocked:	no

6.3.9.2 Structure

Character No.	Meaning	Hex-Value
1	STX (start of text)	\$02
2	status (internal clock status)	\$30-39, \$41-46
3	day of the week (1=Monday ... 7=Sunday) 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

6.3.9.3 Status

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

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

6.3.9.4 Example

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

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

6.3.10 T-String

Below the T-String is described.

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

6.3.10.1 Specified Settings

Automatic:	no
Required:	no
Blocked:	no

6.3.10.2 Structure

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

6.3.10.3 Status

No status contained in the T-String.

6.3.10.4 Example

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

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

6.3.11 ABB_S_T

Below the T-String is described.

6.3.11.1 Specified Settings

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

6.3.11.2 Structure

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

6.3.11.3 Status

See **Chapter 6.3.10 T-String**.

6.3.11.4 Example

See **Chapter 6.3.10 T-String**.

6.3.12 Data String NTGS-String

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

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

6.3.12.1 Specified Settings

Automatic:	no
Required:	no
Blocked:	no

6.3.12.2 Structure

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

6.3.12.3 Status

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

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

6.3.12.4 Example

T020718412340(CR)(LF)

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

6.3.13 **hopf** Master/Slave-String

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

The **hopf** Master/Slave-String transmits:

- the full time information (hour, minute, second)
- the date (day, month, year [2 digits])
- the difference time local to UTC (hour, minute)
- the day of the week
- and status information (announcement of ST/WT changeover, announcement of a leap second and the status of reception of the Master/Slave-String source)

6.3.13.1 Specified Settings

Automatic:	no
Required:	The following settings are required for the synchronisation of the hopf slave-systems: • output every minute • output second advance • 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

6.3.13.2 Structure

Character No.	Meaning	Hex-Value
1	STX (start of text)	\$02
2	status	\$30-39, \$41-46
3	day of the week	\$31-37
4	tens hour	\$30-32
5	unit hour	\$30-39
6	tens minute	\$30-35
7	unit minute	\$30-39
8	tens second	\$30-36
9	unit second	\$30-39
10	tens day	\$30-33
11	unit day	\$30-39
12	tens month	\$30-31
13	unit month	\$30-39
14	tens year	\$30-39
15	unit year	\$30-39
16	difference time tens hour / operational sign	\$30-31, \$38-39
17	difference time unit hour	\$30-39
18	difference time tens minutes	\$30-35
19	difference time unit minutes	\$30-39
20	LF (line feed)	\$0A
21	CR (carriage Return)	\$0D
22	ETX (end of text)	\$03

The difference time is transmitted in hours and minutes following the year. The transmission is done in BCD. The difference time may be up to $\pm 11.59\text{h}$.

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

logic **1** = local time before UTC

logic **0** = local time after UTC

Example:

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

6.3.13.3 Status

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

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

6.3.13.4 Example

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

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

6.3.14 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 "?".

6.3.14.1 Specified Settings

Automatic:	no
Required:	no
Blocked:	no

6.3.14.2 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

6.3.14.3 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 = "*" space	time from internal crystal in the clock time by radio reception
character no. 30 = "S"	daylight saving time
"U"	UTC (see chapter 6.1.2.1)
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

6.3.14.4 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

6.3.15 **hopf**5500

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

6.3.15.1 Specified Settings

Automatic:	no
Required:	no
Blocked:	no

6.3.15.2 Structure

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

6.3.15.2.1 **hopf**5500 - Output Date/Time

Character No.	Meaning	Hex-Value
1	STX (start of text)	\$02
2	status (internal clock status)	\$30-39,\$41-46
3	" " space	\$20
4	tens hour	\$30-32
5	unit hour	\$30-39
6	tens minute	\$30-35
7	unit minute	\$30-39
8	tens second	\$30-36
9	unit second	\$30-39
10	" " space	\$20
11	tens day	\$30-33
12	unit day	\$30-39
13	tens month	\$30-31
14	unit month	\$30-39
15	tens year	\$30-39
16	unit year	\$30-39
17	" " space	\$20
18	day of the week	\$31-37
19	CR (carriage return)	\$0A
20	LF (line feed)	\$0D
21	ETX (end of text)	\$03

6.3.15.2.2 *hopf* 5500 - Output Time Only

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

6.3.15.3 Status

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

6.3.15.4 Example

Data string example with output date and time:

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

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

6.3.16 **hopf** Standard String (6021) UTC with Local Status

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

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

Output with Local Time Base

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

Output with UTC Time Base

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

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

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

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

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

6.3.16.1 Specified Settings

Automatic:	no
Required:	no
Blocked:	no

6.3.16.2 Structure

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

6.3.16.3 Example

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

6.3.17 DCF77 Analysis String

This DCF77 analysis string can be used for the analysis of DCF77 reception problems. Analysable DCF77 reception signals are the following:

- DCF77 Antenna Signal
- DCF77 Antenna Simulation (77.5kHz)
- DCF77 Pulse



The output of the DCF77 analysis string only happens with the synchronisation of a DCF77 synchronisation source (DCF77 antenna / DCF77 pulse input) see also **Chapter 5.1.1.7 System Status Byte**.

The DCF77 analysis string is based on the configuration of the telegram broadcasted by the DCF77 transmitter (see also **Chapter2 System 6855 DCF77 Synchronization**).

6.3.17.1 String Description

There are two output status of the DCF77 analysis string.

6.3.17.1.1 String Output without detected DCF77 Minute Mark - After Start/Reset

In case of non radio-synchronous DCF77 reception, briefly the DCF77 minute mark has not been detected, the DCF77 bits received every second are directly and without analysis given out via the serial interface. This output status is kept up to the detected minute mark.

Example:

```
111111111111111111111111X00011000100111000110010001111000011*<CR><LF>
```

Output	Description
0	Reception of a LOW DCF77-Bit
1	Reception of a HIGH DCF77-Bit
*<CR><LF>	Detection of DCF77 minute mark with subsequent start of DCF77-analysis (see chapter 6.3.17.1.2 String Output after detected Minute Mark)
x	Detection of a non analysable signal. In this second no LOW- or HIGH DCF77 bit was received or rather the DCF77 minute mark was detected

Based on a long-term (around 5 minutes) non radio-synchronous DCF77 reception, a restart of the DCF77 transmitter and of the DCF77 analysis is carried out. The string displays this restart with <RESET>. After that the string output occurs without detected minute mark.

Example:

<CR><LF>

RESET<CR><LF>

Output	Description
<CR><LF>RESET<CR><LF>	Restart of the DCF77 receiver and DCF77 analysis

6.3.17.1.2 String Output after detected Minute Mark

The DCF77 protocol is set up for a full minute. The DCF77 analysis string is built up accordingly.

Example:

```
001011010100101;000101;11000000;OK_;03;0010100;OK_;14;100100;101;010
00;111000000;OK_;FR090207;OK_;6B9C;01;D000031409050207<CR><LF>
```

(The character "_" in the string describes a "SPACE")

After each received DCF77 parity bit (P1-P3) the according bit sequence is proved upon parity. Afterwards the associated time information of this bit sequence is stated in decimal way.

Output	Description
0	Reception of a LOW DCF77-Bit
1	Reception of a HIGH DCF77-Bit
1100000 0; OK_ / ERR; 03;	DCF77 minute, -parity bit (P1); parity check without errors / error in parity check minute: 03
001010 0; OK_ / ERR; 14;	DCF77 hour, -parity bit (P2); parity check without errors / error in parity check hour: 14
100100;101;01000;11100000 0; OK_ / ERR; FR 09 02 07	DCF77 day of the week with -date, -parity bit (P3); parity check without errors / error in parity check day of the week, day, month, year: Friday 09. Feb. 2007

With the reception of the minute mark in second 59 the set up of the DCF77 analysis string is finished. The current system status with current system time stamp and control figures finalize the string.

Example:

```
...OK_;6B9C;01;D000031409050207<CR><LF>
```

(The character "_" in the string describes a "SPACE")

Output	Description
OK_ ERR;	detection of the 59th second none detection of the 59th second
6B9C;	Control character of the DCF77 receiver (for internal hopf analysis)
01;	Synchronisation mode: DCF77 antenna (MEZ)
D0 00 03 14 09 05 02 07<CR><LF>	system status: second, minute, hour: 14:03:00 o'clock day, day of the week, month, year: Friday 09. Feb. 2007

6.3.17.2 Structure

```
cccccccccccccccc;ssssss;mmmmmmmp;P1_;MM;hhhhhhp;P2_;HH;dddddd;www;mmm  
mmm;jjjjjjjjp;P3_;WWDDMMJJ;Mm_;RRRR;QQ;SSSSsSmShSdSwSMSj<CR><LF>
```

(The character "_" in the string describes a "SPACE")

Character no.	String Character	No. of Character	Meaning	Value	
				ASCII	Hex-Value
1-15	c	15	DCF77-Bits special coding	0 (LOW) 1 (HIGH)	\$30 \$31
16	;	1	Separator	;	\$3b
17-22	s	6	DCF77 bits status bits	0 (LOW) 1 (HIGH)	\$30 \$31
23	;	1	Separator	;	\$3b
24-30	m	7	DCF77 bits Minute	0 (LOW) 1 (HIGH)	\$30 \$31
31	p	1	DCF77 parity bit 1	0 (LOW) 1 (HIGH)	\$30 \$31
32	;	1	Separator	;	\$3b
33-35	P1	3	Check of Parity (Minute)	OK_ ERR (Error)	\$4f 4b 20 \$45 52 52
36	;	1	Separator	;	\$3b
37-38	M	2	Minute (decimal)	00-59	\$30 30 – \$35 39
39	;	1	Separator	;	\$3b
40-45	h	6	DCF77 bits Hour	0 (LOW) 1 (HIGH)	\$30 \$31
46	p	1	DCF77 parity bit 2	0 (LOW) 1 (HIGH)	\$30 \$31
47	;	1	Separator	;	\$3b
48-50	P2	3	Check of Parity (Hour)	OK_ ERR (Error)	\$4f 4b 20 \$45 52 52
51	;	1	Separator	;	\$3b
52-53	H	2	Hour (decimal)	00-23	\$30 30 – \$32 33
54	;	1	Separator	;	\$3b
55-60	d	6	DCF77 bits day	0 (LOW) 1 (HIGH)	\$30 \$31
61	;	1	Separator	;	\$3b
62-64	w	3	DCF77 bits day of the week	0 (LOW) 1 (HIGH)	\$30 \$31
65	;	1	Separator	;	\$3b
66-70	m	5	DCF77 bits month	0 (LOW) 1 (HIGH)	\$30 \$31
71	;	1	Separator	;	\$3b
72-79	j	8	DCF77 bits year	0 (LOW) 1 (HIGH)	\$30 \$31
80	p	1	DCF77 parity bit 3	0 (LOW) 1 (HIGH)	\$30 \$31
81	;	1	Separator	;	\$3b

82-84	P3	3	Check of Parity (Date)	OK_ ERR (Error)	\$4f 4b 20 \$45 52 52
85	;	1	Separator	;	\$3b
86-87	WW	2	Day of the week (ASCII)	-- - invalid MO - Monday TU - Tuesday WE - Wednesday TH - Thursday FR - Friday SA - Saturday SU - Sunday	\$2d 2d \$4d 4f \$54 55 \$57 45 \$54 48 \$46 52 \$53 41 \$53 55
88-89	DD	2	Day (decimal)	01 – 31	\$30 31 – \$33 31
90-91	MM	2	Month (decimal)	01 - 12	\$30 31 – \$31 32
92-93	JJ	2	Year (decimal)	00 - 99	\$30 30 – \$39 39
94	;	1	Separator	;	\$3b
95-97	Mm	3	59 second (minute mark) (ASCII)	OK_ ERR (Error)	\$4f 4b 20 \$45 52 52
98	;	1	Separator	;	\$3b
99-102	Rp	4	Control value of DCF77 receiver (HEX)	0100- F500	\$30 31 30 30- \$46 35 30 30
103	;	1	Separator	;	\$3b
104-105	QQ	2	Synchronisation modus (HEX)	00-FF	\$30 30 - \$46 46 see 6.3.17.3
106	;	1	Separator	;	\$3b
107-108	SS	2	System status (HEX)	00-FF	\$30 30 – \$46 46 see 6.3.17.4
109-110	Ss	2	System second (decimal)	00-59	\$30 30 – \$35 39
111-112	Sm	2	System minute (decimal)	00-59	\$30 30 – \$35 39
113-114	Sh	2	System hour (decimal)	00-23	\$30 30 – \$32 33
115-116	Sd	2	System day (decimal)	00 - invalid 01-31	\$30 30 \$30 31 – \$33 31
117-118	Sw	2	System day of the week (decimal)	00 - invalid 01 - Monday 02 - Tuesday 03 - Wednesday 04 - Thursday 05 - Friday 06 - Saturday 07 - Sunday	\$30 30 \$30 31 \$30 32 \$30 33 \$30 34 \$30 35 \$30 36 \$30 37
119-120	SM	2	System month (decimal)	00 - invalid 01-12	\$30 30 \$30 31 – \$31 32
121-122	Sj	2	System year (decimal)	00-99	\$30 30 – \$39 39
123	<CR>	2	Control Character	cr	\$0d
124	<LF>	2	Control Character	lf	\$0a

6.3.17.3 Synchronisation Mode

Output	Synchronisation Mode of Board 6855
01	DCF77 antenna (CET)
02	DCF77 pulse input (CET)
04	DCF77 antenna (worldwide)
05	DCF77 pulse input (worldwide)

See also **Chapter 5.1.1.7 System Status Byte**.

6.3.17.4 Status

Bit 7	Bit 6	Synchronisation Status
0	0	Time/Date invalid
0	1	Crystal operating
1	0	Radio operating without adjustment of the internal quartz basis
1	1	Radio operating with adjustment of the internal quartz basis
Bit 5		Leap seconds
0		no announcement of leap second
1		announcement of leap second
Bit 4		Winter time (WT) / Standard time
0		-
1		Winter time (WT) / Standard time
Bit 3		MESZ Summer time
0		-
1		Summer time (ST)
Bit 2		Announcement of ST/WT changeover
0		no announcement hour
1		announcement of ST/WT changeover
Bit 1		A leap second was carried out in the last hour
0		no
1		yes
Bit 0		A ST/WT changeover was carried out in the last hour
0		no
1		yes

6.3.17.5 Example

1. `<CR><LF>`
2. `RESET<CR><LF>`
3. `11111111111111111111XXXX00011000100111000110010001111000011*<CR><LF>`
4. `001011010100101;000101;11000000;OK_;03;0010100;OK_;14;100100;101;`
5. `01000;111000000;OK_;FR090207;OK_;6B9C;01;D000031409050207<CR><LF>`

(The character "_" in the string describes a "SPACE")

Row 1 and 2

Restart (Reset) of the DCF77 receiver and of the DCF77 analysis

Row 3

String output without detected DCF77 minute mark - after start/reset:

- Detection of a non analysable signal
- Direct output of the received DCF77 bits
- Detection of the DCF77 minute mark followed by start of the DCF77 analysis

Row 4 and 5

String output after detected minute mark:

- DCF77 Outputs
 - No notification of leap-second/changeover of winter time (MEZ)
 - DCF77 time: 14:03:00h on Friday, 09.02.2007
 - Complete and clean parity control, 59th second (minute mark) detected
- System Outputs
 - Control character of the DCF77 receiver (hex 6B9C) for internal **hopf** analysis
 - Synchronisation mode: DCF77 antenna (MEZ)
 - Radio operation with control of the internal crystal basis, winter time (MEZ)
 - No notification of leap-second/changeover
 - No leap-second/switchover was carried out in the last hour
 - System time: 14:03:00h on Friday, 09.02.2007

6.3.18 Contronic P (PCZ 77 / 5050H&B)

This data string is compatible to the serial data string of the board 6830. The internal designation of the "Hartmann und Braun" radio controlled clock is **PCZ 77**.

The following parameters have to be set for the data transmission:

- baud rate: 1200
- word length: 7 Bit
- parity: even
- stop bit: 1
- handshake: no
- string output: every minute
- one second forerun
- control character: <CR> <LF>
- end character: to the minute change

6.3.18.1 Contronic P (PCZ 77 / 5050H&B) - Time/Date

character no.:	meaning	value
1	tens hour	\$30-32
2	unit hour	\$30-39
3	space	\$20
4	tens minute	\$30-35
5	unit minute	\$30-39
6	space	\$20
7	tens second	\$30-35
8	unit second	\$30-39
9	space	\$20
10	tens day	\$30-33
11	unit day	\$30-39
12	space	\$20
13	tens month	\$30-31
14	unit month	\$30-39
15	space	\$20
16	tens year	\$30-39
17	unit year	\$30-39
18	space	\$20
19	status	\$30-39, \$41-46
20	day of the week	\$31-37
21	CR (carriage return)	\$0D
22	LF (Line Feed)	\$0A

6.3.18.1.1 Status- and Day of the Week Nibble

	b3	b2	b1	b0	meaning
Status nibble:	x	x	x	0	radio operation
	x	x	x	1	crystal operation
	x	x	0	x	no announcement (ST-DS-ST)
	x	x	1	x	announcement (ST-DS-ST)
	x	0	x	x	CET (UTC + 1h)
	x	1	x	x	CEST (UTC + 2h)
	1	0	0	x	UTC
Day of the week nibble:	x	0	0	1	Monday
	x	0	1	0	Tuesday
	x	0	1	1	Wednesday
	x	1	0	0	Thursday
	x	1	0	1	Friday
	x	1	1	0	Saturday
	x	1	1	1	Sunday

6.3.18.1.2 Example

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

radio operation, no announcement, standard time

It is Wednesday, 03.01.96 - 12:34:56h.

6.3.18.2 Contronic P (PCZ77 / 5050H&B) - Time only

character no.:	meaning	value
1	tens hour	\$30-32
2	unit hour	\$30-39
3	space	\$20
4	tens minute	\$30-35
5	unit minute	\$30-39
6	space	\$20
7	tens second	\$30-35
8	unit second	\$30-39
9	space	\$20
10	CR (carriage return)	\$0D
11	LF (Line Feed)	\$0A

6.3.19 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 "?".

6.3.19.1 Specified Settings

Automatic:	no
Required:	no
Blocked:	no

6.3.19.2 Structure

Character No.	Meaning	Hex-Value	
1	STX (start of text)	\$02	
2	tens day	\$30-33	
3	unit day	\$30-39	
4	". "	\$2E	
5	tens month	\$30-31	
6	unit month	\$30-39	
7	". "	\$2E	
8	tens year	\$30-39	
9	unit year	\$30-39	
10	"/"	\$2F	
11	unit day of the week	\$31-37	
12	"/"	\$2F	
13	tens hours	\$30-32	
14	unit hours	\$30-39	
15	". "	\$3A	
16	tens minutes	\$30-35	
17	unit minutes	\$30-39	
18	". "	\$3A	
19	tens seconds	\$30-35	
20	unit seconds	\$30-39	
21	"M" or "M" or "U"	(Standard time, Daylight saving time or UTC)	\$4D, \$4D, \$55
22	"E" or "E" or "T"		\$45, \$45, \$54
23	"Z" or "S" or "C"		\$5A, \$53, \$43
24	" " or "Z" or " "		\$20, \$5A, \$20
25	" " (\$20 ⇒ synchronous) or "*" (\$2A ⇒ not synchronous)	\$20 \$2A	
26	" " (\$20 ⇒ no announcement) or "!" (\$21 ⇒ announcement of a DST or standard time changeover)	\$20 \$21	
27	CR (carriage return)	\$0D	
28	LF (line feed)	\$0A	
29	ETX	\$03	

6.3.19.3 Status

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

The characters mean the following:

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

6.3.19.4 Example

(STX)18.07.02/4/02:34:45UTC__ _ (CR)(LF)(ETX)

- It is Thursday 18.07.02 - 02:34:45 o'clock UTC
- The clock is synchronous

7 Function Boards

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

7.1 General

Certain points should be noted when handling Function Boards:

Electrical Properties



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

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

Power Supply

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

Mechanics

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

Configuration

In principle there are two board types:

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

Factory Pre-wired Slots

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



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

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

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

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

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

Function Boards (max. 2 Boards per System possible)	
Adapted board versions for operation in the System 6855 DCF77 Slim Line (1U):	• 7273 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) • 7112 Optical Coupler Board for Pulse Output - Suitable for retrofit • 7121 Relay Board for Pulse Output - Suitable for retrofit • 7318 DCF77 Antenna Distributor - Suitable for retrofit • 7248 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!

7.3 Exchanging a Function Board

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

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



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

7.4 Installation of an Additional Function Board

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

Exceptions:

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



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

A slot with a Bus Bridge Board must be available.

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

7.5 Removing Function Boards

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

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



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

8 System Indicators / Fault Analysis / Troubleshooting

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

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

Faults that arise are displayed or transmitted via various elements.

8.1 Status and Fault Indicators

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

8.1.1 Status LEDs

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

8.1.1.1 "Power ON" LED

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

8.1.1.2 "Sync. Status" LEDs

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

8.1.2 LCD-Display

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

8.1.2.1 System Status on the Display

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

8.1.3 Error Relays

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

8.1.3.1 "Power" Relay

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

8.1.3.2 "Sync" Relay

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

8.1.4 Send LED

Boards without a Send LED

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

Boards with a Send LED

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

8.1.5 Auto-Reset Logic (System Bus)

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

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

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

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

Auto-Reset Logic Operating Principle

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

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

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

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

8.1.6 Serial Output of Data Telegrams

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

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



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

8.2 Error Patterns

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

8.2.1 Complete Failure

Description

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

Cause / Problem Solution

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

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

Description

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

Cause / Problem Solution

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

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

Description

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

Cause / Problem Solution

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

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

Description

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

Cause

- System running in auto-reset

Problem Solution

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

8.2.5 No DCF77 Reception / No Synchronization

Description

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

Cause / Problem-solving

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

8.2.6 No DCF77 Antenna Simulation / DCF77 Pulse

Description

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

Cause / Problem-solving

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

8.2.7 No (or incorrect) Serial Output

Description

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

Cause / Problem-solving

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

8.2.8 Incorrect Time Output

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



Only local time may be entered via the keypad

8.2.8.1 Incorrect Local Time

Description

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

Cause / Problem-solving

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

8.2.8.2 Incorrect UTC Time

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

Description

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

Cause / Problem-solving

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

8.2.9 No ST/WT Changeover

Description

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

Cause / Problem-solving

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

8.2.10 Output and Function Errors of Individual Function Boards

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

8.3 Support from the **hopf** Company

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

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

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

support@hopf.com



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

9 Maintenance / Care

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

9.1 General Guidelines for Cleaning

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

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

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



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

To clean the System 6855 use a cloth that is:

- Antistatic
- Soft
- Non-fabric
- Damp

9.2 Cleaning the Housing



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

9.3 Cleaning the Display and Keypad

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



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

10 Technical Data System 6855 DCF77 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 6855):	> 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

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 50M Ω at least (20°C $\pm$ 15°C)
Output Data (internal only)	
Internal nominal output voltage	5V DC
Nominal output current I_N 0°C ... +55°C	3A ($U_{OUT} = 5V$ DC)
Efficiency	> 85%
Function display (Power LED)	Green LED

Environmental Conditions		
Temperature range:	Operation:	0°C to +55°C
	Storage:	-20°C to +75°C
Humidity:		Max. 95%, 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 61000-4-2 /-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

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

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

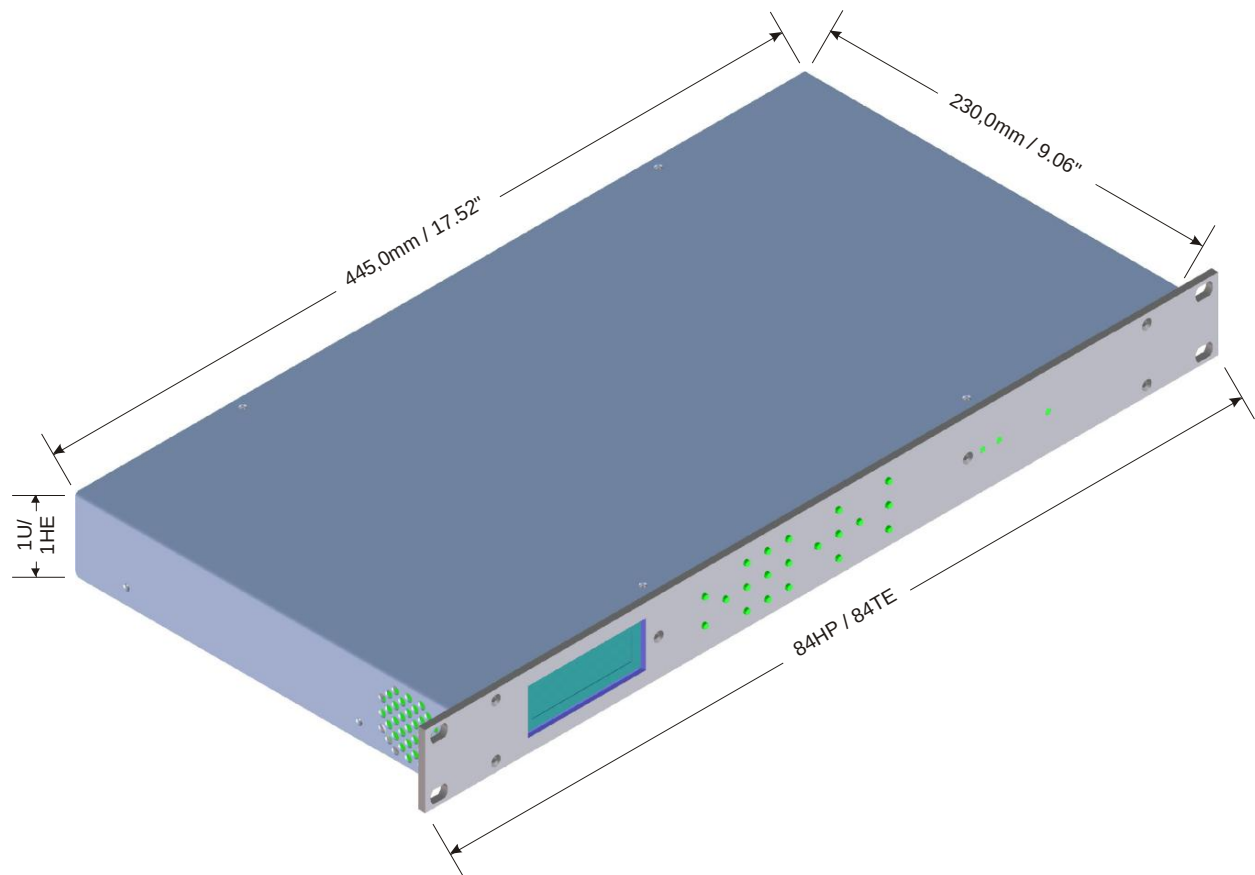
Special production:

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



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

11 System Drawing



12 Appendix

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

DCF77¹ is a time signal that is radiated via a terrestrial long-wave transmitter in Frankfurt, Germany, with a carrier frequency of 77.5kHz.

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

12.1.1 DCF77 General

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

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

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

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

12.1.1.1 DCF77 Signal Structure

The complete time information is transmitted in every minute. A part of time information is transmitted every second of every minute, with the exception of the 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:

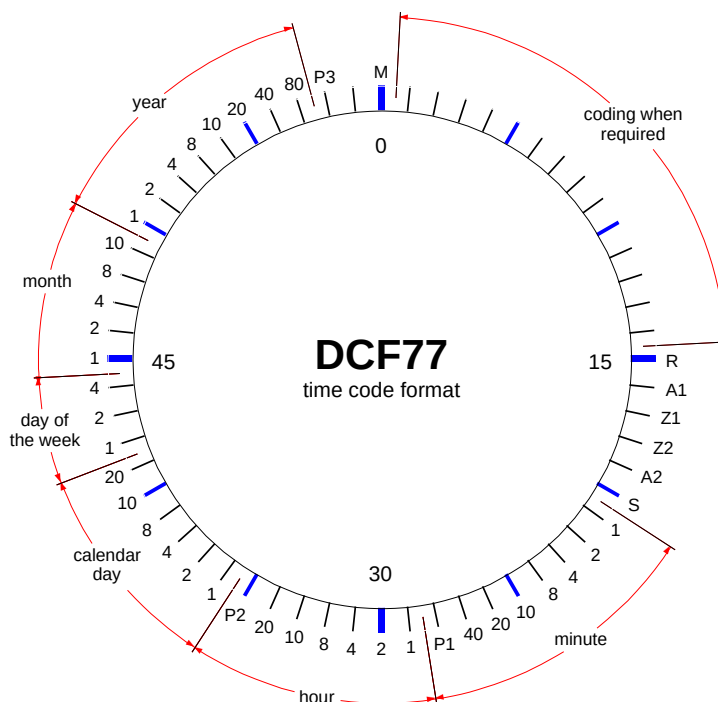
- P1 = parity of minutes
- P2 = parity of hours
- P3 = parity of current day-of-year, day-of-week, month and year

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

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

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

The coding is shown in the following illustration:



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

12.1.1.2 Advantages and Disadvantages DCF77

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

12.1.2 DCF77 Generation by **hopf**Clocks

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

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

12.1.2.1 DCF77 Signal Simulation (77.5kHz)

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

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

12.1.2.2 DCF77 Pulse (1Hz)

The DCF77 pulse uses the same coding procedure as that used by the DCF77 signal radiated by the transmitter. The difference lies in the fact that an amplitude-modulated carrier signal is not used for transmission. The 100 and 200msec. long reductions are represented by logical signal levels.

In this digital form the signal can then also be transmitted via a fiber optic cable, for example.

13 Glossary

A - F	
Baud (short cut: Bd)	Baud-Rate; Bit/s
Bit	Binary Digit (shortest digital information unit, 0 or 1)
BNC	Bayonet Nut Coupling
Bus	Line system for data communication
Byte	Digital information unit: 1 Byte = 8 Bit
c	Relay contact - common
CEST	Central European Summer Time
CET	Central European (Winter-) Time
DCF77	German Long-wave transmitter Frankfurt on 77.5kHz
Dry Contact	Potential free Contact
Ethernet	Network protocol 10 Mbit/s (IEEE-Norm 802.3)
Fast Ethernet	Network protocol 100 Mbit/s (IEEE-Norm 802.3)
FO	Fiber Optic
G - L	
GPS	Global Positioning System
HE	Panel high for 19" housings (German)
HP	Panel width for 19" housings (English)
IRIG-B	Time coding method
LCD	Liquid Crystal Display
LED	Light Emitting Diode
Local time	Locale time if applicable with ST/WT changeover
LWL	Fiber Optic
M - N	
M/S-String	hopf Master/Slave-String
nc	Relay contact (normally close)
no	Relay contact (normally open)
Nibble	Digital Information unit: 1 Nibble = 4 Bit
NTP	Network Time Protocol
O - Q	
PPM	Pulse per Minute
ppm	Parts per Million
PPS	Pulse Per Second
R - T	
RC	Remote Control
Standard time	Local time without summer time offset (wintertime)
SyncOFF	hopf Timer for the sync status OFF
SyncON	hopf Timer for the sync status ON
ST/WT changeover	Summertime- / Wintertime changeover
TE	Panel width for 19" housings (German)
U - Z	
U	Panel high for 19" housings (English)
UTC	Coordinated Universal Time