Technical Description

Large Scale Display

4985

Safety information

The safety regulations and technical data are important for the smooth running of the devices and the protection of people and equipment. Strict compliance with these regulations is required. In case of non-compliance with these regulations the guarantee and warranty claims for the device expire. There is no liability for possible consequential damages.

Safety of the Devices

The production of this device follows the latest technological standards and safety regulations.

The device must not be assembled by anyone but trained personnel. Please make sure that all the connected cables are laid and fixed properly. The device is to be run with the supply voltage stated on the identification plate only.

Only trained personnel or specialists may operate the device.

Repair on opened devices must not be carried out by anyone but specially trained staff or by the ***hopf*** Elektronik GmbH company.

If the maintenance work requires the opening of a device or if a fuse needs changing the device must be separated from all voltage supplies.

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.

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1 Functions

The basic version of the large display 4985 consists of a matrix measuring 16 x 64 LED. Two lines of 42 mm or one line of 84 mm alphanumeric characters can be displayed on this matrix.

The device can operate as a large display for values such as grid time, difference time and mains frequency which can be transferred from **hopf** System 7001.

Different display and decoding programs are integrated in the large display 4985.

The large display is equipped with a highly accurate quartz clock which can be synchronized with a DCF77 signal. The DCF77 signal can be supplied to the BNC connector via an antenna or as a pulse to the respective inputs. The large display generates a DCF77 pulse and thus synchronizes further devices.

Time and date can be displayed in different formats.

1.1 Initial Operation

The large display 4985 is delivered in its casing ready for operation. It is now only necessary to install the connections required for operation.

To install the display the right side of the housing must be removed and the red filter screen must be pulled out. Now, depending on the requirements, it is possible to connect voltage, antenna or data cables to the display. The cables are fed through the holes located at the back of the housing and connected to the clamps inside. The terminal assignment can be found at the end of this product description.

In the back wall there are also mounting holes so that the display can be screwed to a wall.

PLEASE NOTE: INSTALLATION IS TO BE CARRIED OUT BY TRAINED PERSONNEL ONLY. PLEASE ENSURE THAT THE CABLES ARE DEAD WHEN CONNECTING THE VOLTAGE SUPPLY.

When the voltage supply is switched on the program status and the date appear on the display for 10 sec.:

e.g. **Vers. 05.03**
29 OCT 2003

1.1.1 Selection of hardware

The display 4985 is equipped with a serial interface in the following format:

RS232 (V.24)
RS422 (V.11)

Physically only one interface can be used as an input. No handshake lines are provided for using the RS232 interface (3-conductor operation).

1.1.2 Allocation of the RS422 interface

When several displays are connected parallel to one RS422 interface, the lines RxD and /RxD run to the first display and continue parallel from there to the last display. Jumper J6 (terminator) is to be positioned on the final display in the chain.

1.1.3 Allocation of the DCF77 pulse input

When several displays are connected to a DCF77 pulse, then the lines DCF77-in and /DCF77 run to the first display and continue parallel from there to the last display. Jumper J5 (terminator) is to be positioned on the final display in the chain.

1.1.4 LEDs

During normal operation the green LED shows the DCF77 pulse. The yellow LED is on for as long as signals are emitted via the serial interface.

During an update the green LED flashes in the pulse of the incoming data. In case of error the yellow LED is on permanently.

1.1.5 Initialization via keys

The keys can be accessed after the filter screen has been removed or pushed aside. Functions of the keys:

Key 3+4	Pressing both keys for 5 seconds sets the following functions to standard: Color, display, interface.
Key 3/4	1. Keys 3/4 activated: The display menu is activated and scrolled through forwards (key 3) or backwards (key 4). 2. Key 2 selected: The selected value can be increased (key 3) or diminished (key 4).
Key 2	1. Direct entry into the clock input menu. 2. Enter function. Selection of the displayed menu item/value via key 3/4.
Key 1	Escape function. Cancel the current entry and return to the next higher menu level.

1.2 Operating the Settings Menu

The menu serves to observe and alter respective values. When an item in the menu is selected first the respective values are shown. The menu is a closed loop, i.e. from the first menu item it is possible to scroll back to the last and scroll forward to the first one directly. It is only possible to exit a sub-menu via key 1. The values entered in the individual items of the sub-menu are retained!

To change a value key 2 must continue to be pressed until the respective value flashes in the display. Use keys 3 and 4 to change the value. This value is adopted by continuing to press key 2 until no further value is selected. If key 1 is pressed during this process the alterations of values in this menu item are canceled.

Keys 2-4 take you from the standard display to the main menu.

Key 2: time input
Key 3: date input
Key 4: version

Example of setting process:

System is in standard mode. Time and date are displayed.

Key 2 is pressed ->

The system shows the menu item time input i.e. the following is displayed:

Time:
hh:mm:ss

hh represents current hour, **mm** current minutes and **ss** current seconds.

The displayed time runs.

1. key 2 is pressed ->

The time display stops. The hours start flashing.

2. key 2 is pressed->

The hours stop flashing. The minutes begin to flash.

3. key 3 is pressed->

The minutes are increased by 1, unless the minutes are 59, otherwise they are set to 00. They continue flashing.

4. key 2 is pressed->

The minutes stop flashing. The seconds start flashing.

5. key 2 is pressed->

The seconds stop flashing. The time continues running from the value set.

6. key 1 is pressed->

The display returns to the standard mode. The display shows the (altered) time and date.

Alternatively

4. key 1 is pressed->

The minutes stop flashing. The current time is displayed again (the alteration has been rejected.)

5. key 1 is pressed->

The display returns to the standard mode. The display shows the (unchanged) time and date.

1.3 Main Menu Scheme

Time

Date

Module no.

Time zone _____ Difference time

Changeover of standard/daylight saving time

Changeover daylight saving time/standard time

System bits _____ Display

F-String

Synchronous

System Byte

Serial Port _____ COM:

Mode byte 1

Mode byte 2

Parameter _____ Language

Color

Quartz control value

Time-out status

Time-out DCF77-SIM

DCF77 pulse length LOW HIGH

Enable reset

Alignment of the antenna

Display programme version

1.4 View / Set Time (TIME)

Hours (00..23), minutes (00..59), seconds (00..59) are displayed and changed.

1.5 View / Set Date (DATE)

The day of the week (Monday..Sunday), day (01..last day of the month), month (January..December), year (2000..2099) are displayed and changed.

When the entry is completed the day is checked and, if necessary, reset to the last day of the month. Values between 01 and 31 are possible.

1.6 Module number (MODULE)

The number of the module identifies the device at the serial interface for the remote software (on request).

The number of the module can be set between 00..99.

1.7 Sub-Menu Time Zone (TIME ZONE)

1.7.1 Difference Time (DIFF. TIME)

The difference time can be set between -12:59 and +12:59.

The hours (-12..+12) and the minutes (00..59) are set separately.

Standard: **+01.00**

PLEASE NOTE: THE SETTING OF THE DIFFERENCE TIME IS ONLY POSSIBLE IN THE MODES 'QUARTZ CLOCK', 'SLAVE CLOCK VIA DCF77 PULSE' AND 'DCF77 SIGNAL SIMULATION'.

1.7.2 Start Daylight Saving Time (START DST.)

On this date the time is put forward by 1 hour (in quartz mode only).

The following are displayed and set: the day of the week in that month (0..5), the day of the week (Mon..Su), the month (Jan..Dec), the hour (00..23) of the changeover.

Example:

The 4th Sunday in March 02h. Display: **4.SU.MAR.02**

If the day of the week in that month equals 5 the last possible one occurring is meant.

If the day of the week in that month equals 0 no changeover is carried out (not in the other direction either).

Standard: **5.SU.MAR.02**

1.7.3 End of Daylight Saving Time (END DST.)

On this day the time is set back by 1 hour (in quartz mode only).

Display and setting as START DST.

Standard: **5.SU.OCT.03**

1.8 Sub-Menu System Bits (SYSTEMBITS)

Some features are set in "bits".

The bits are assembled in groups of 8 (bytes).

Every bit works like a switch. A bit has two possible statuses: "0" and "1".

The bits are displayed in the sequence bit7, bit6 ... bit0!

When, for example, only bit 7 is set ("1"), the display is as follows: **1000 0000**

The statuses represent features which are listed in the following tables.

1.8.1 Settings Display (DISPLAY)

Bit	Bit	Bit	Bit	Display	Function
b7	**b6**	**b5**	**b4**		
0	0	x	0	small (42mm)	time and date
0	1	x	0	small (42mm)	Local & UTC
1	0	0	0	large (84mm)	time
1	0	1	0	large (84mm)	time with small seconds
1	1	x	0	large (84mm)	date
0	x	x	1	small (42mm)	Display F-String of Board 7515 in System 7001
1	x	x	1	large (84mm)	Display F-String of Board 7515 in System 7001
b3					not in use
b2					
0					format of date European (day - month - year)
1					format of date US (month - day - year)
b1	**b0**				
0	0				local time with daylight saving time changeover
0	1				local time without daylight saving time changeover
1	x				UTC

Standard: **0000 0000**

Mode Radio Controlled Clock,
display small (time/date), European format of date,
local time with daylight saving time changeover

1.8.2 F-STRING

See "Operation as Matrix Display".

Standard: **00000000**

1.8.3 Clock Functions (SYNCHRONOUS)

Bit	Bit	Bit		Function
b7	**b6**	**b5**		not in use
b4				
0				DCF77 simulation local
1				DCF77 simulation UTC
b3				
0				DCF77 as difference input (like RS422)
1				DCF77 al TTL input
b2				not in use
b1	**b0**			type of synchronization
0	0			quartz clock
0	1			synchronous clock via master/slave string
1	0			synchronous clock via DCF77 pulse
1	1			DCF77 signal / simulation

Standard: **0000 0011** radio controlled clock via antenna input, DCF77-simulation with local time base, difference time 1h (CET).

PLEASE NOTE: THE COLON BETWEEN THE HOURS AND THE MINUTES FLASHES WHEN THE CLOCK IS NOT SYNCHRONOUS. OTHERWISE THE COLON IS ALWAYS VISIBLE.

1.8.4 System Byte (Special Function)

Bit				Function
b7				not allocated
b6				not allocated
b5				not allocated
b4				not allocated
b3				not allocated
b2				not allocated
b1				not allocated
b0				Timeout for F-String 0=active, 1=inactive

Standard: **0000 0000** Timeout for F-String active

1.9 Sub-Menu Serial Interface (SERIAL PORT)

The matrix display is equipped with a serial interface which can be set independently. The data can be exchanged via the signal levels RS232c (V.24) or RS422 (V.11). The interfaces can be used for transmissions of data strings to other computers.

The interface is used as an input for the data which are to be displayed in the matrix display mode. Moreover the firmware updates can be carried out via this interface.

Different data strings for the output are available. Customized data strings can be obtained on request. The following settings can be carried out for the serial interfaces.

1.9.1 Parameter of the serial interface (COM:)

Baud rate:	150, 300, 600, 1200, 2400, 4800, 9600, 19200Bd
Parity:	no, even, odd
Word length:	7Bit, 8Bit
Stop bits:	1, 2
Display e.g.	**COM: 9600Bd**
	NO 8W 1S
Standard:	**9600Bd, no parity, 8 data bits, 1 stop bit**

1.9.2 Configuration of the Data String (Mode byte)

The output of the time information received can be carried out via the interfaces in different data strings by defining the internal status of the clock. This enables the user to synchronise connected computers with the accurate time. The output time individually required, the string structure and the control characters used can be selected via information input in **mode byte 1 and 2.**

The standard setting is **1111 1111** local time, without second advance, with daylight saving time changeover, with control characters on the second change, CR/LF, without delayed transmission, on request only.

1.9.2.1 Local Time or UTC of the Serial Output with Mode byte 1

Bit position 7	Time zone
on	Local time
off	UTC (Universal Time Co-ordinated)

1.9.2.2 Second Advance of the Serial Output with Mode byte 1

Bit position 6	Second advance
off	with second advance
on	without second advance

1.9.2.3 Local Time or Standard Time in the Serial Output with Mode byte 1

Bit position 5	
off	Standard time (wintertime)
on	Local time (with dayl. saving time changeover)

1.9.2.4 Last Control Character as On-Time Marker with Mode byte 1

This setting can be used to transmit the last control character (see structure of data string) absolutely accurately at the edge of the next second change.

Bit position 4	Control characters on the second change
off	Last character on the second change
on	Last character instantly

1.9.2.5 Control Characters CR and LF with Mode byte 1

The order of the characters CR and LF can be exchanged by means of this switch.

Bit position 3	Control characters CR and LF
off	LF/CR
on	CR/LF

1.9.2.6 Delayed Transmission

When the setting is "control characters on the second change" the last character of the data string is transmitted directly on the second change and, immediately after this, the new data string valid for the next second change. This may cause errors in overloaded computers. Bit position 2 can be used to delay the transmission of the new data string depending on the Baud rate.

Example:

Baud rate 9600 Baud

Milliseconds	with delay	without delay
000	final character (ETX)	final character (ETX)
002	–	new data string
025	–	end of new data string
930	new data string	–
955	end of new data string	–
000	final character (ETX)	final character (ETX)

Baud rate 2400 Baud

Milliseconds	with delay	without delay
000	final character (ETX)	final character (ETX)
002	–	new data string
105	–	end of new data string
810	new data string	–
913	end of new data string	–
000	final character (ETX)	final character (ETX)

Bit position 2	Delayed transmission
off	with delay
on	without delay

1.9.2.7 Synchronisation point of time with Mode byte 1

Bit 1	Bit 0	Transmission point of time
off	off	Transmission every second
off	on	Transmission on the minute change
on	off	Transmission on the hour change
on	on	Transmission on request only

1.9.3 Selection of Data String with Mode byte 2

This mode byte sets the data string emitted. At present only bit positions 0-3 have a function. The remaining bits are for later extensions.

Bit position				Structure of data string
3	2	1	0	
off	off	off	off	Standard ***hopf*** data string
off	off	off	on	Standard ***hopf*** with 4-digit year
off	off	on	off	DCF-Master/Slave data string
off	off	on	on	Siemens SINEC H1
off	on	off	off	T-String

1.9.4 User String Identifier

When the display runs in the mode "String display"/user string, the user string is shown with the identification number set here. The identification number can be set from 00 to 99.

1.10 General Display Parameters (Parameter)

1.10.1 LANGUAGE (LANGUAGE)

Setting the language only affects the abbreviations of the time/date output.

The output of the abbreviations of the days of the week and the months can be in the following languages:

- English
- German
- French
- Spanish
- Italian

(ENGLISH DEUTSCH FRANCAIS ESPANOL ITALIANO)

1.10.2 COLOR

The display can be set to red, green or yellow[1].

The standard version is equipped with a red filter screen. This must be replaced by a different colour for the display!

PLEASE NOTE: IF THE DISPLAY IS SET TO GREEN AND THERE IS A RED FILTER SCREEN, THE DISPLAY MAY BE TOO DARK TO READ THE FUNCTION. BY PRESSING THE KEYS 3 AND 4 (FOR ABOUT 5 SECONDS) SIMULTANEOUSLY THE DISPLAY IS RESET TO RED.

1.10.3 Quartz Control Value (QUARTZ)

Only qualified personnel may alter the quartz control value, if the deviation shown in quartz mode is too large. The quartz frequency must then be calibrated by adjusting this value with the aid of a highly accurate reference value.

1.10.4 Status Time-Out in min

Setting the delay which indicates a synchronisation error. The period after which a synchronisation error is indicated can be delayed. The value can be set between 2 and 255 minutes.

1.10.5 DCF77-SIM Time-Out in min

Setting the delay after which the DCF77 pulse output is interrupted if there is a synchronisation error. The value can be set from 2 to 255 minutes, whereby the setting 255 means that simulation is not interrupted (infinite simulation).

1.10.6 DCF77-Simulation Pulse Duration (HIGH/LOW) in ms

The duration of the low pulse can be set from 50-154ms, that of the high pulse from 150-250ms. The standard setting is 100ms for low and 200ms for high.

[1] Yellow is caused by the simultaneous lighting up of red and green LEDs. The colour may vary from orange to greenish yellow depending on the angle.

1.11 Release Reset

Here the program in the clock can be reset. After a reset all the parameters are set anew from the values stored and checked.

The program version is shown for 10 seconds or until the next key is pressed.

After that the clock must be synchronised again.

1.12 Alignment of the Antenna

When this item is selected the signal, which is received by the antenna, is displayed. Only the first part of a second is displayed.

This function helps to remedy reception problems.

Start the programme from the menu with the command **"antenna alignment".**

The display shows the incoming DCF77-signal as an oscillogram.

On every second change (except in the 59th second) the signal should dip distinctly (wave trough). The best reception position is found by slowly turning the antenna position (max. wave trough). The reception suffices when the second pulse is displayed without interference.

After the start of the alignment programme the amplification of the signal is set again. This process takes 20-30 seconds depending on the local strength of the signal. The display shows the DCF77 signal oscillogram with a dipped signal on every second change.

When the antenna is slowly turned away from the set position, the received field strength decreases when the antenna is positioned correctly. This is indicated by a dipping signal line and a gradually decreasing dipping of the signal in the display.

When the antenna is turned by exactly 90°,hardly any DCF77signal should be detected. From this position the antenna is again turned by exactly 90° to the optimum position.

1.13 Display of Version

The version and the date of origin of the programme are shown.

After restart the large display is shown in this menu for 10 seconds or until another key is pressed.

There is no further function in this menu item.

2 Software

2.1 System Requirements for the Remote-Software

The programme requires a PC or notebook with a free serial interface and a Microsoft Windows 95/98, NT, ME or 2000 operating system.

2.2 Installation of the Remote-Software

Remote Software for unit 4985 can be found in directory \\hopf_CD\products\hopfrc\. Before executing the program it should be copied in any directory on the PC. While starting it directly from CD, the made settings are not filed.

The Remote Software is supported by Windows 95/98/NT/ME/2000.

PLEASE NOTE: THE REMOTE SOFTWARE ITSELF DO NOT CHANGE THE REGISTRY OF THE OPERATING SYSTEM.

2.3 Initial Operation of the Large Display 4985 via Remote Software

The serial interface cable supplied is connected between the PC (in the free serial interface) and the radio-controlled clock (COM0).

Before first starting the Remote Software the **REMOTE.INI** must be checked. This is in the directory created during installation.

The configuration file **REMOTE.INI** sets the transmission parameters in the PC for communication with the large display 4985 to, for example, the following values (status on delivery):

- Baud rate: 9600 Baud
- Word length: 8 Bit
- Number of stop bits: 1
- Parity: NO

The serial PC interface (in the example: COM2) which is to be used for communication with the radio-controlled clock is also set.

The transmission parameters for the serial PC interface must correspond to the transmission parameters of the serial interface **COMO** in the radio-controlled clock. It is possible to return to the status on delivery by pressing keys **3** and **4** for 5 seconds.

An alteration in the parameters of the serial interface **COM0** also requires a corresponding alteration of the settings in the serial interface of the PC.

So that the transmission parameters used for the serial interface are always available when the Remote Software is called up, these are stored in the configuration file **REMOTE.INI**. For this reason **REMOTE.INI** is created automatically when the COM Port parameters are changed in the radio-controlled clock.

If required **REMOTE.INI** can also be edited manually. In this case, however, the settings must correspond to the values in the radio-controlled clock.

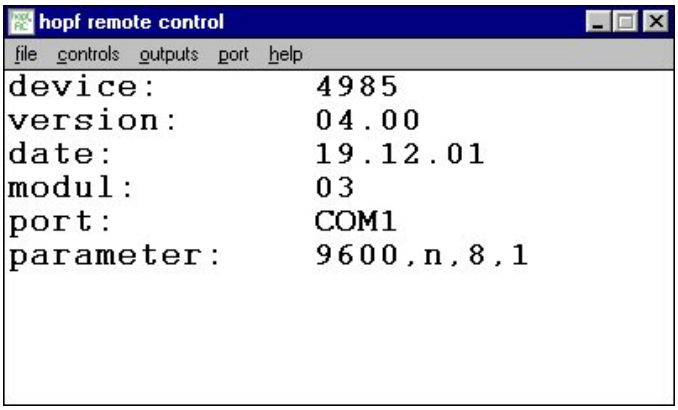
Setting up the file REMOTE.INI	Interpretation of Variables
[Serial parameter]	Section information
String=9600,N, 8,1	Configuration of transmission parameters *Baud rate, parity, word length, number of stop bits*
Port=com2	Serial interface of PC (in the example: COM2)

2.4 Operating the Remote Software

2.4.1 Start Remote Software

The Remote Software is started by double-clicking the **HOPFRC.EXE** file in the corresponding directory or link e.g. on the desktop.

When starting, the programme checks if the serial PC interface which has been set is free. If this check is successful the firmware and the data of the radio-controlled clock are requested and displayed in the main window of the Remote Software (for an example see the following diagram. The transmission parameters of the serial PC interface are displayed together with other information.



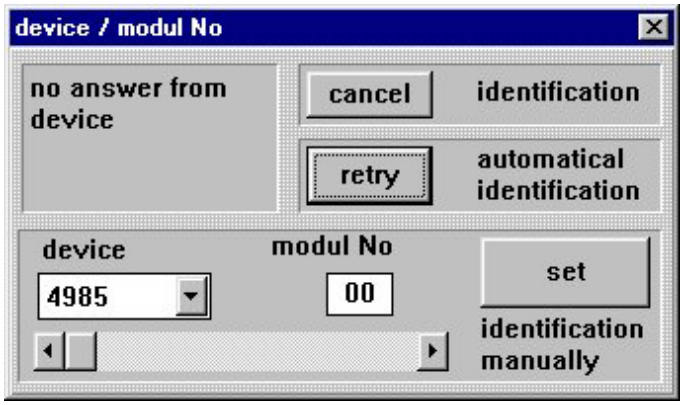
From this main menu it is possible to set and/or display all the functions of the large display 4985.

PLEASE NOTE: IF OVER A PERIOD OF 4 MINUTES NO COMMAND IS SENT TO THE DISPLAY THE CONNECTION WITH THE VERSION REQUEST MUST BE ACTIVATED , BECAUSE THE DISPLAY HAS CANCELLED THE CONTACT.

2.4.1.1 Operating from devices with parallel connection

When several devices are connected parallel to the interface of the PC the programme does not receive a feedback! The connected devices must have different module numbers.

When the programme is started then the following dialogue will appear after a few seconds:



With the **Cancel Button** the identification of the connected device is cancelled. In this way the programme is not just specific to one device!

With **Retry Button** the automatic identification can be repeated if there was only an error in the connection to the device.

With the **Set Button** a module can be selected manually. All the following commands are only executed by the selected module. Since there is no feedback it is only possible to check whether the settings have been changed successfully by observing the behaviour of the device.

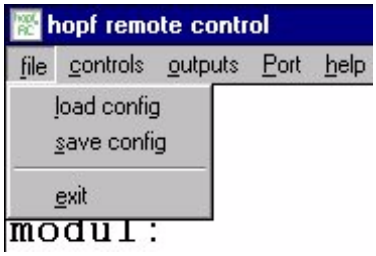
When the general version inquiry is made the module numbers on all the devices connected are displayed to simplify the selection of the device to be addressed.

Before sending settings from a dialogue to the device, all the settings of the dialogue must be checked carefully, since it is not possible to adopt the current device settings and this could therefore lead to unintentional changes in the parameters!

Another module can be selected when the item "firmware" in the menu "controls" is re-activated. The selection dialogue "device/module" then appears after a few seconds.

2.4.2 Menu "file"

The sub-menu "file" contains the following points:



"**exit**" – end Remote Software

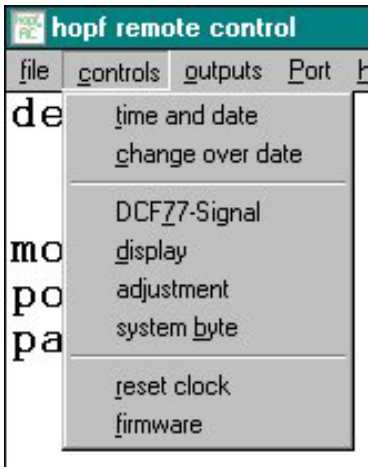
"**load config**" – load and save the total configuration of the functions from the radio-controlled clock. The file receives the ending *.dvp.

"**save config**" – load an available *.dvp (total configuration) into the radio-controlled clock.

PLEASE NOTE: AFTER LOADING AND SAVING THE TOTAL CONFIGURATION OF THE RADIO-CONTROLLED CLOCK SUCCESSFULLY **"DATA ACKNOWLEDGED"** WILL APPEAR IN THE BOTTOM LINE IN THE MAIN MENU WINDOW.

2.4.3 Menu "controls"

All the system functions of the radio-controlled clock are found under this menu item.



"**time and date**" –set or display time, date, day of the week, difference time and status timeout

"**changeover date**" – activate daylight saving time and display daylight saving/standard, standard/daylight saving changeover points

"**DCF77-Signal**" – present reception signal

"**display**" – display and synchronization settings

"**adjustment**" – display quartz adjustment, quartz value

"**system byte**" – set or display system byte

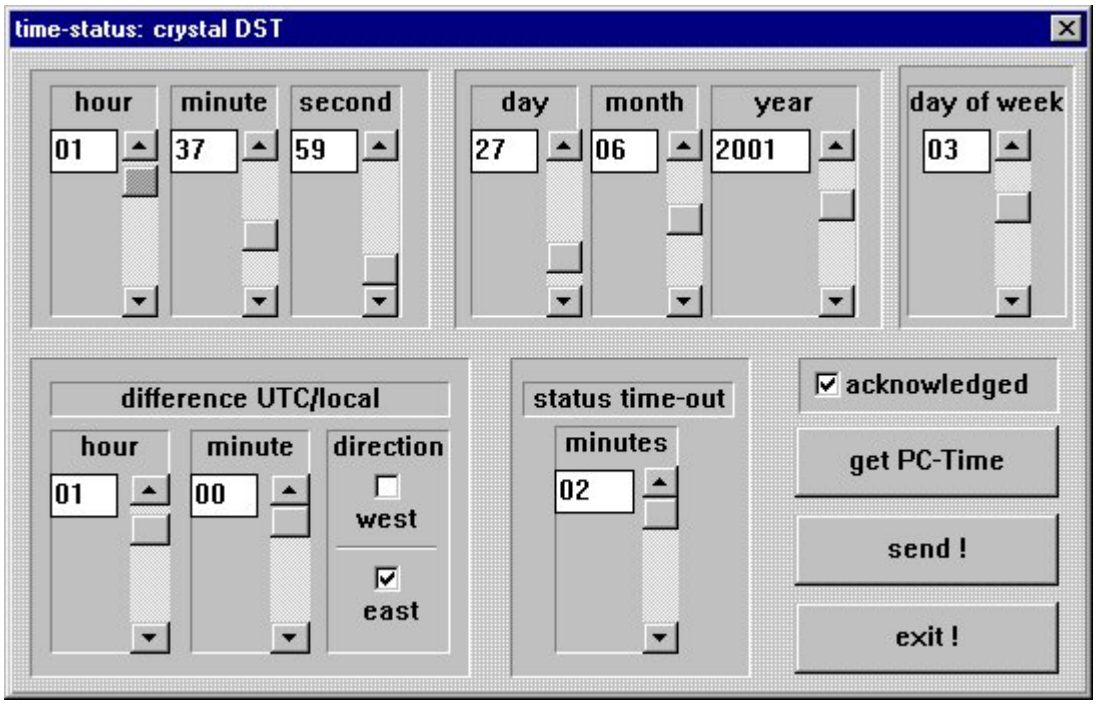
"**reset clock**" – release hardware reset of the rc-clock

"**firmware**" – read in again and display firmware data

2.4.3.1 Menu item "time and date"

In this menu item time, date, day of week, difference time and status timeout are set or displayed.

By selection of the corresponding menu item the respective dialogue is shown.



The time the date and other variables are changed in this dialogue by moving the scroll bars next to the respective display fields.

When entering the difference time (between local time and world time [UTC - time]), entries can be made regarding hours, minutes and information as to whether the place of operation lies west or east of the Greenwich Meridian (0 degrees).

e.g. West 08:00 for USA and Canada (Pacific Time)
e.g. East 01:00 for Germany

In the field group **"status timeout"** resetting the radio bits in the time status can be delayed by increasing the duration of timeout (2 – 255 minutes).

In the upper status bar of the **"time and date"** dialogue window the current clock status is displayed and is of purely informal character. Here a difference is made between synchronization or time status and this is defined as follows:

Synchronization status

- *crystal* – the radio-controlled clock is in quartz mode
- *radio precision* – the radio-controlled clock is in radio-controlled mode
- *radio high precision* – the radio-controlled clock is in radio-controlled mode with high accuracy

Time status

- *standard time* – local time is standard (including winter time)
- *DST* – local time is summertime (Daylight saving time)
- *announce* – local time with indication of the changeover second or indication of the changeover time

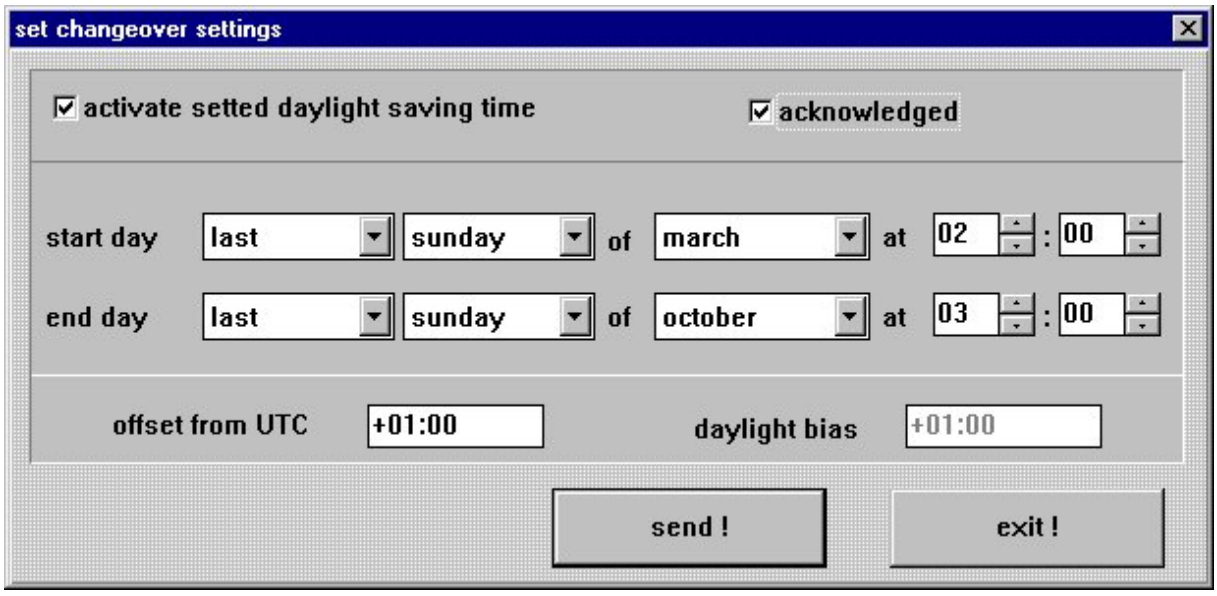
After these settings have been carried out transmission to the radio-controlled clock is started with the **"send"** button.

When the new settings have been received by the radio-controlled clock and have been evaluated an updated data string is transmitted to the PC and in this way the dialogue field is updated. If the transmission is completed successfully a tick appears in the **"acknowledged"** check field. As soon as one of the values have been overwritten the tick in the **"acknowledged"** check field is deleted.

By clicking the **"exit"** button this dialogue menu is ended.

2.4.3.2 Menu item "changeover date"

Under this menu item the daylight saving/standard and standard/daylight saving changeover times can de displayed and altered.



By activating the dialogue window the current settings can be read out from the radio-controlled clock and displayed in the editing fields. Here the changeover times can be entered at which the changeover is to be made in the course of the year at the place of operation.

In the line **start day** the starting point for summertime is indicated. The line **end day** shows the finishing time for summertime. The changeover can take place on the first, second, third, fourth or last weekday in the month. In addition it is also necessary to indicate the time in hours and minutes.

The changeover times can only be set when **activate set daylight saving time** has been activated. The changeover is only carried out when the check field **activate set daylight saving time** has been clicked. The fields **offset from UTC** and **daylight bias** are only of informal character.

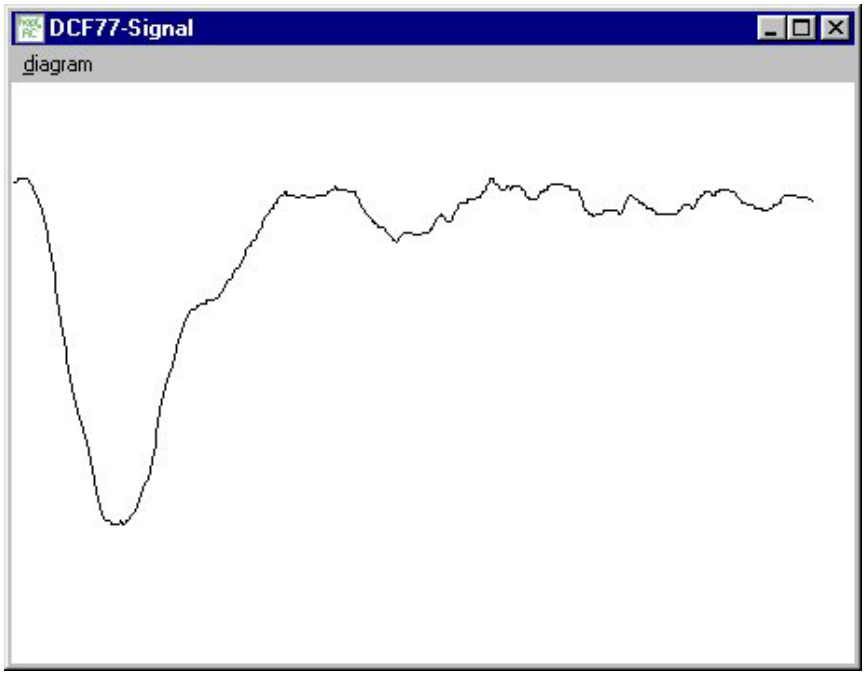
After the data have been entered transmission to the radio-controlled clock is started with the **"send"** button. If the transmission has been completed successfully a tick appears in the **"acknowledged"** check field. As soon as one of the values have been overwritten the tick in the **"acknowledged"** check field is deleted.

By clicking the **"exit"** button this dialogue menu is ended.

PLEASE NOTE: IF NO CHANGEOVER IS REQUIRED THEN **"ACTIVATE SET DAYLIGHT SAVING TIME"** SHOULD BE DEACTIVATED AND THIS SUBSEQUENTLY CONFIRMED WITH **"SEND".**

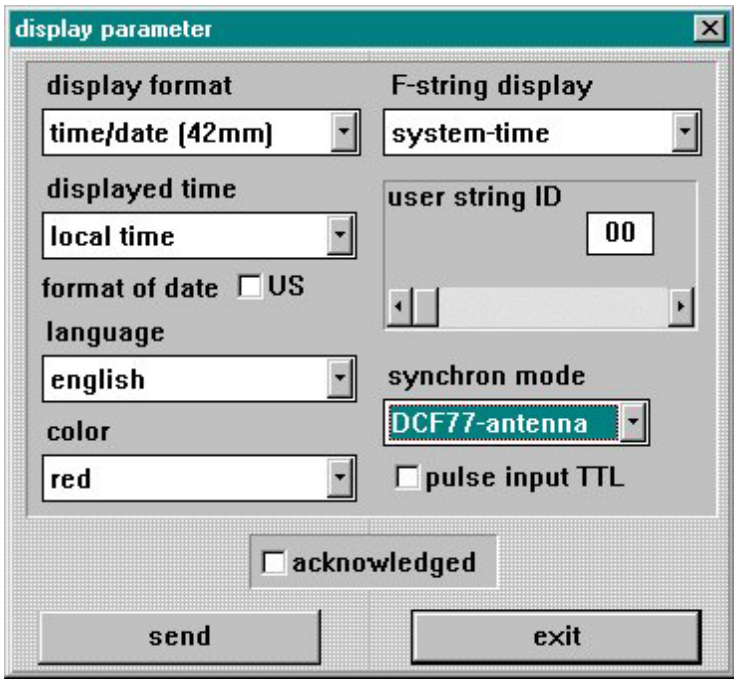
2.4.3.3 Menu item "DCF77-Signal"

This menu item activates a window in which the amplitude of the (filtered) DCF77 signal is presented via the time. In the menu "diagram" of this window the appearance of the curve(s) can be changed.



Since the graphics make great demands on the speed of the PC, not every setting can be recommended for every computer.

2.4.3.4 Menu item "Display"



"Display format" selects a format for displaying time and/or date or of the incoming strings.

"displayed time" enables selection between displaying local time (with summer-/wintertime changeover), UTC or (local) standard time (without changeover).

The checkbox ***"format of date: US"*** provides the USA date format (month / day / year) for the date display.

"language" is for setting the language in which the abbreviations for days and months are presented in the date output.

"color" enables selection of the color of the information displayed.

"F-string display" is created for selecting special strings for presentation in the display.

Finally with the settings **"F-string display":** *user string* and **"display format":** *string* the scroll bar ***"user string ID"*** selects the identification number of the string to be presented by this display.

"clock mode" shows or defines the method of synchronization of the clock. Possible sources of time are at present: none (the clock is running on an internal quartz basis); master/slave string via interface, DCF77 pulse via pulse inputs, DCF77 signal via BNC connector (antenna).

The checkbox ***"pulse input TTL"*** switches the DCF77 input to TTL mode, i.e. /DFC-In is set to approx. 2V.

After the data have been entered transmission to the radio-controlled clock is started with the **"send"** button. If the transmission has been completed successfully a tick appears in the **"acknowledged"** check field. As soon as one of the values have been overwritten the tick in the **"acknowledged"** check field is deleted.

By clicking the **"exit"** button this dialogue menu is ended.

2.4.3.5 Menu item "adjust"

Here the internal quartz control value is presented.

This value determines the freewheeling properties / the running accuracy in quartz mode.

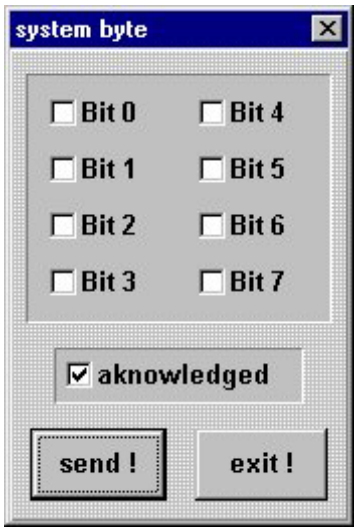
If the clock is synchronous the value is adjusted to balance out temperature influences and the aging of the quartz.

The value is hexadecimal and lies between 1000h und F000h.

The value can be only be changed manually on the device itself.

2.4.3.6 Menu item"system byte"

With this function internal programme functions can be switched on and off.



Bit No.:	set	not set
0	Timeout for F-String deactivated	Timeout for F-String activated
1 - 7	reserved for later applications	reserved for later applications

After the data have been entered, transmission to the radio-controlled clock is started with the **"send"** button. If the transmission has been completed successfully a tick appears in the **"acknowledged"** check field. As soon as one of the values have been overwritten the tick in the **"acknowledged"** check field is deleted.

By clicking the **"exit"** button this dialogue menu is ended.

2.4.3.7 Menu item "reset clock"

With this function a restart of the radio-controlled clock is released. The function does not change previously made settings.

Reset is activated via the menu item **"controls"** and the entry **"reset clock"**. When reset is completed the radio-controlled clock sends a control string as confirmation and the following message appears:

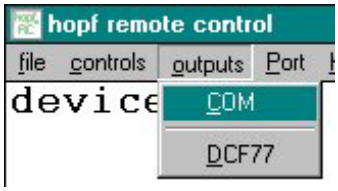
This menu item can be left by clicking the OK button and further functions of the radio-controlled clock can be processed.

2.4.3.8 Menu item "firmware"

The firmware data can be accessed again and updated via the menu item **"controls"** and the entry **"firmware"**. This information is displayed in the main window and is only of informal character.

2.4.4 The menu "outputs"

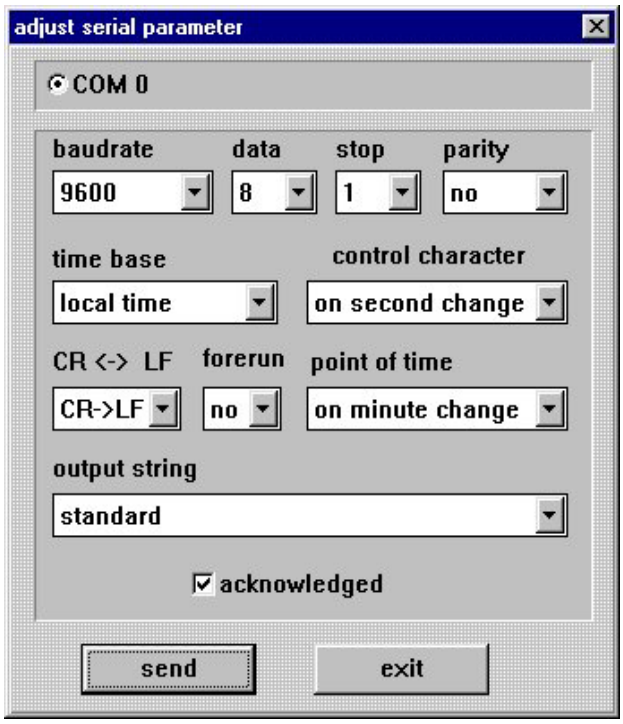
From this menu all inputs and outputs of the radio-controlled clock can be configured.



"***COM***" – configuration of the serial interfaces (global).

"***DCF77 simulation***" – configuration of the DCF77 simulation (global).

2.4.4.1 Menu item"COM"



In this menu item the transmission parameters and the output of the data strings of the serial interfaces of the radio-controlled clock can be configured. The dialogue field and the input possibilities are the same for each interface.

In order to configure an interface e.g. **COM0** the appropriate check field next to the font must be selected.

Here the radio-controlled clock requests the configuration data of the interface which are then presented accordingly in the dialogue window.

When clicking a register button next to the parameter field an index with a selection of possible settings is made available.

Parameter fields

Baud rate	Input of the Baud rate: between **150**, **300**, **600**, **1200**, **2400**, **4800**, **9600** and **19200** Baud
data	Input of the word length: **8** or **7 Bit**
stop	Number of stop bits: **1** or **2**
parity	Input of the parity: **no**, **odd**, **even**
time base	Time basis for the data string: **local time, UTC or standard time**
control character	Output of **ETX** in the data string: **at once** (**ETX** together with the data string, **on second change** (**ETX** on second change) or **with string delay** (**ETX** at the second change with Baud rate delay)
CR <-> LF	Sequence for CR and LF: **CR->LF** or **LF->CR**
forerun	Output of the data string with forerun: **no**, **1s** (with 1 second forerun)
point of time	Output of the data string: **on second change**, **on minute change on hour change, on request only**
output string	Form of the data string: **standard**, **standard with year 2000**, **master/slave**, **sinec H1**, **T-String**

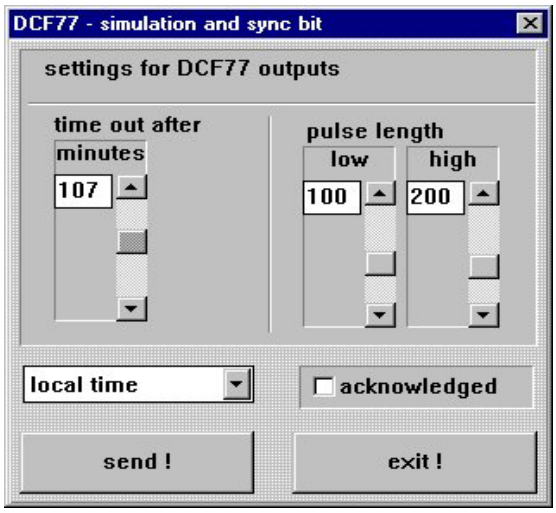
When the Baud rate, word length, number of stop bits or the parity of the interface are changed, the corresponding parameters are also re-set at the PC interface, so that communication with the device is still possible. When the programme is ended these parameters are stored in the file **remote.ini** so that the new parameters are available when the programme is next started. If several devices are used with different parameters these should be noted so that they can be adjusted manually in the menu item **"Port"**.

After the data have been entered, transmission to the radio-controlled clock is started with the **"send"** button. If the transmission has been completed successfully a tick appears in the **"acknowledged"** check field. As soon as one of the values have been overwritten the tick in the **"acknowledged"** check field is deleted.

By clicking the **"exit"** button this dialogue menu is ended.

2.4.4.2 Menu item "DCF77 simulation"

In this menu item settings can be made for the DCF77 pulse. These are global settings and are valid for all outputs which emit the DCF77 pulse. Following settings can be made:



In the group field **"timeout after"** the timeout time for the output of the simulation when changing to quartz mode can be set. If the value is set at **255** the DCF77 pulse will not be switched off.

With the lower register field the time basis **"local time"** or **"UTC"** can be selected for the DCF77 pulse.

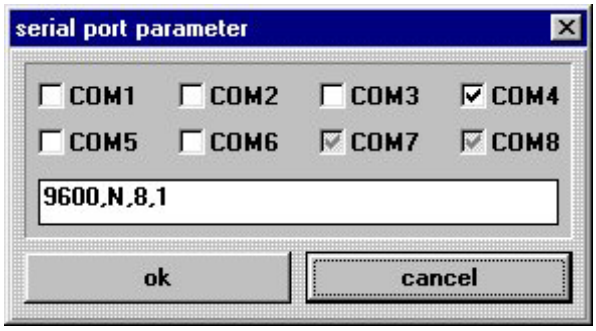
In group field **"pulse length"** details for the length for high and low pulse duration of the DCF77 pulse can be set.

After the data have been entered transmission to the radio-controlled clock is started with the **"send"** button. If the transmission has been completed successfully a tick appears in the **"acknowledged"** check field. As soon as one of the values have been overwritten the tick in the **"acknowledged"** check field is deleted.

By clicking the **"exit"** button this dialogue menu is ended.

2.4.5 Menu "port"

From this menu dialogue configuration can be started for the PC interface which is used by the Remote Software for communication with the radio-controlled clock.



The serial PC interfaces which are already being used by other programmes or which are not available are recognized by the Remote Software and are presented as non-selectable (check field background grey). By activating the corresponding **COMx** check field the free PC serial interface (check field background white) can be selected.

2.4.6 The menu "help"

In this window information about the programme status and contact addresses to ***hopf*** Elektronik GmbH can be found.

3 Large display as radio-controlled clock

Under the menu item DISPLAY you can choose between display as radio-controlled clock or as large display (see 1.8.1 - Settings Display (DISPLAY)).

Bit 4 = 0 Radio Controlled Clock
Bit 4 = 1 Matrix Display

The control board for the large display contains a DCF77 receiver which is used to decode the time/date information. The DCF77 signal can be supplied by an active ***hopf*** antenna or a DCF77 simulation or by the DCF77 pulse.

A ***hopf*** antenna or the DCF77-simulation are electrically the same. The DCF77 decoder program under the menu SYNCHRON is activated for this supply (see 1.8.3 Clock Functions (SYNCHRONOUS)).

b1	b0		type of synchronization
0	0		quartz clock
0	1		synchronous clock via master/slave string
1	0		synchronous clock via DCF77 pulse
1	1		DCF77 signal / simulation

The clock requires about 6 minutes to synchronise itself with the DCF77 signal.

3.1 Installation of the Antenna

Use a coaxial cable RG 59 to connect the ***hopf*** antenna supplied or a DCF77 antenna signal to the BNC connector on the control board.

The length of the cable must not exceed 500m if you use a ***hopf*** antenna or a DCF77 simulation.

Please consider the following points when installing the antenna.

- The antenna is of wide-band design to achieve a high short-term accuracy of ±1msec. of the decoded DCF77 signal. Therefore do not place the antenna near electric or magnetic sources (< 5 m) of interference like monitors, engines, power control cabinets etc.
- When using an indoor antenna also take into account the shielding effect of buildings, reinforced concrete walls or corrugated iron sheeting as they are HF-proof to a large extent. The ***hopf*** antenna should be installed as close as possible to a window.

3.1.1 Alignment of the antenna

All the ***hopf*** antennas, except for the all-round antenna 4437, are of directional design. They must therefore be aligned to the DCF77 transmitter situated in Mainflingen near Frankfurt /Main.

The indoor and outdoor antennas have an arrow below the antenna housing which must point to Frankfurt.

If you need help aligning the antenna or if there is interference in reception call up the menu item "antenna alignment" which shows the antenna signal in the display (see 1.12).

PLEASE NOTE: IF THE COLON BETWEEN THE HOUR AND THE MINUTES FLASHES IN THE DISPLAY, THE CLOCK DOES NOT RECEIVE (NO LONGER RECEIVES) A RADIO SIGNAL.

3.1.2 Indirect Lightning Protection

To avoid lightning striking via the antenna into the large display the antenna can be protected by an indirect lightning protection. When using an outdoor antenna lightning protection should be installed.

3.1.3 DCF77-Pulse Synchronization

All the **hopf** clocks and systems send a decoded DCF77 pulse. This pulse can also be used for synchronization. To feed this in the DCF77 pulse input is activated via menu (see 1.8.3 Clock Functions (SYNCHRONOUS)).

Bit 1 = 1 decoding DCF77
Bit 0 = 0 decoding DCF77 pulse input

The DCF77-pulse signal is connected to the "DCF-T in" terminals. The signals from the terminals "DCF-T out" of a different large display or from the pulse outputs of other **hopf** clocks can be used as a source.

It takes 6 minutes for the clock to synchronise itself with the DCF77 pulse.

3.1.4 Synchronization by Master/Slave-String

The large display can also be synchronized by another **hopf** clock via the serial interface. The time, for example, can be adopted from a GPS system where a DCF77 signal is not available. The setting is made via the menu (see 1.8.3 Clock Functions (SYNCHRONOUS)

Bit 1 = 0 no DCF77 decoding
Bit 0 = 1 Master/Slave-String serial interface

It takes approx. 4 minutes for the clock to synchronize itself via the interface.

3.1.5 Quartz Clock Operation

If the large display should not be or cannot be synchronized by external time sources it can also operate with the internal accuracy of a quartz clock. The settings can be made by menu (see 1.8.3 Clock Functions (SYNCHRONOUS)

Bit 1 = 0 no DCF77 decoding
Bit 0 = 0 quartz mode

In this operating mode the synchronisation status is not indicated by the colon between hour and minute: the colon is permanently on.

The accuracy of the operating mode depends on external parameters, above all on the temperature and time since the last calibration. Trained personnel can calibrate the clock using the parameter quartz value in the menu or by operating in a synchronised mode (also see 1.10.3).

3.2 Time/Date Display

The output of the time can be set to different formats under the menu DISPLAY (see 1.8.1 Settings Display (DISPLAY)).

Please take note of the settings under PARAMETER / LANGUAGE for the output of time and date (see pt. 1.10.1 / 1.9.2.1).

4 Operation as Matrix Display

If connected to the system 7001 the large displays are connected to board 7515 via RS422 (V.11) to achieve the so-called party-line operation (see diagram in the appendix). Depending on the setting of System Byte 1 the display can filter and display the following data strings from the serial interface boards 7515. The data of the serial interface are checked for identification (F0-F8) and the values in the display are updated if a data string valid for this display arrives. Via System Byte 1, Bit 0-5, it is possible to determine which string is shown in the matrix display.

B5	B4	B3	B2	B1	B0	Identification	display
0	0	0	0	0	0	F0	System time
0	0	0	0	0	**1**	F1	Grid time
0	0	0	0	**1**	0	F2	Difference time
0	0	0	0	**1**	**1**	F3	Frequency (50Hz)
1	0	0	0	**1**	**1**	F3	Frequency (60Hz)
0	**1**	0	0	**1**	**1**	F3	Difference frequency (50Hz)
1	**1**	0	0	**1**	**1**	F3	Difference frequency (60Hz)
0	0	0	**1**	0	0	F4	Temperature und Humidity
0	0	0	**1**	0	**1**	F5	Power 1
0	0	0	**1**	**1**	0	F6	Power 2
0	0	0	**1**	**1**	**1**	F7	Synchronization via string
0	0	**1**	0	0	0	F8	Customized string

The setting large/small characters of System Byte 0 (Bit7) also influences the output of the F-strings. For further details please see description of the respective string.

PLEASE NOTE : WHEN OPERATING AS MATRIX DISPLAY THE BAUD RATE SHOULD BE SET TO AT LEAST 4800 BAUD.

4.1 F0 = system time

When system time is set the 4985 board filters the following string from serial transmission.

Structure of string:

Character no.:	Meaning	Range of values in Hex
1	STX (Start of Text)	02
2	"F"	46
3	"0"	30
4	"S"	53
5	"y"	79
6	space	20
7	hour tens	30-32
8	hour unit	30-39
9	colon	3A
10	minute tens	30-35
11	minute unit	30-39
12	colon	3A
13	second tens	30-36
14	second unit	30-39
15	ETB (End of Block)	17
16	ETX (End of Text)	03

Once the above data string has been received the hours, minutes and seconds are displayed as follows:

12:34:56

If the display is set to "small characters" (height of characters 42mm) a second string (grid time) is filtered from the serial transmission and shown in the bottom line of the display. It appears as follows:

Sy 12:34:56

N1 12:34:57

4.2 F1 = grid time

In the setting grid time the 4985 board filters the following string from the serial transmission.

Structure of the string

Character no.:	Meaning	Range of values in Hex
1	STX (Start of Text)	02
2	"F"	46
3	"1"	31
4	"N"	4E
5	"1"	31
6	space	20
7	hour tens	30-32
8	hour unit	30-39
9	colon	3A
10	minute tens	30-35
11	minute unit	30-39
12	colon	3A
13	second tens	30-36
14	second unit	30-39
15	ETB (End of Block)	17
16	ETX (End of Text)	03

Once the above data string has been received the hours, minutes and seconds are displayed as follows:

12:34:56

If the display is set to "small characters" (height of characters 42mm) a second string (grid time) is filtered from the serial transmission and shown in the bottom line of the display. It appears as follows:

N1 12:34:56

Sy 12:34:57

4.3 F2 = Difference time

In the setting difference time the 4985 board filters the following string from the serial transmission.

Structure of the string

Character no.:	Meaning	Range of values in Hex
1	STX (Start of Text)	02
2	"F"	46
3	"2"	30
4	"t"	53
5	column	7F
6	column	7F
7	sign (+/-)	2B-2D
8	column	7F
9	column	7F
10	hour tens	30-32
11	hour unit	30-39
12	colon	3A
13	minute tens	30-35
14	minute unit	30-39
15	colon	3A
16	second tens	30-36
17	second unit	30-39
18-22	5 * Space	20
23	CR (Carriage Return)	0D
24	millisecond hundreds	30-39
25	millisecond tens	30-39
26	millisecond unit	30-39
27	ETB (End of Block)	17
28	ETX (End of Text)	03

After receiving the above string seconds and milliseconds appear as follows in the display:

+ 06,447

If the display is set to "small characters" (height of characters 42mm) the difference time in hours, minutes, seconds and milliseconds is presented as follows:

t + 00:00:06

447

4.4 F3 = Mains frequency and difference frequency

In the setting mains frequency the 4985 board filters the following string from serial transmission.

Structure of the string

Character no.:	Meaning	Range of values in Hex
1	STX (Start of Text)	02
2	"F"	46
3	"3"	33
4	"f"	66
5	"1"	31
6	space	20
7	frequency tens	30-39
8	frequency unit	30-39
9	comma	2C
10	frequency 1/10	30-39
11	frequency 1/100	30-39
12	frequency 1/1000	30-39
13	space	20
14	"H"	48
15	"z"	7A
16	ETB (End of Block)	17
17	ETX (End of Text)	03

In addition to the size of the characters it is also possible to select a basis of 50 or 60 Hz for the display of the frequency and the difference frequency (see 4, Operation as Matrix Display).

The display mains frequency appears as follows:

49,998 height of digits 84 mm

f1 49,998 Hz height of digits 42 mm

df -00,002 Hz

The display of the difference frequency appears as follows:

+00,002 height of digits 84 mm

df +00,002 Hz height of digits 42 mm

f1 50,002 Hz

4.5 F4 = Temperature and Humidity

When set to temperature and humidity the 4985 board filters the following string from serial transmission.

Structure of the string:

Character no.:	Meaning	Range of values in Hex
1	STX (Start of Text)	02
2	"F"	46
3	"4"	34
6	tens temperature	30-39
7	unit temperature	30-39
8	"°"	40 (@)
9	"C"	43
10	tens humidity	30-39
11	unit humidity	30-39
12	"%"	25
13	"H"	48
14	ETB (End of Block)	17
15	ETX (End of Text)	03

After the above data string has been received temperature and humidity are displayed as follows:

32° C 56%H

This data string is displayed in digits of 84mm height only.

4.6 F5 / F6 = Power 1 und 2

In the setting power the 4985 board filters the following strings from the serial input.

Structure of string:

Character no.:	Meaning	Range of values in Hex
1	STX (Start of Text)	02
2	"F"	46
3	"5"/"6"	35/36
6	Power 1000s	30-39
7	Power 100sr	30-39
8	Power tens	30-39
9	Power unit	30-39
10	ETB (End of Block)	17
11	ETX (End of Text)	03

When the above data string has been received either power 1 or 2 is transmitted to the display.

1235 MW

This data string is displayed in digits of 84mm height only.

4.7 F7 = Master/Slave Data String

This data string serves to supply the large display with time information via the 7515 board. The data string includes the difference time of the base system so that UTC can be displayed with the correct difference to the local time.

The string is transmitted in the 59th second with the data of the next complete minute. The final character "ETX" is transmitted exactly on the second change and switches the data valid in the large display.

The status is structured as follows:

	b3	b2	b1	b0	Meaning
Status nibble:	x	x	x	0	No announcement hour
	x	x	x	1	Announcement DST-ST-DST)
	x	x	0	x	Standard time (ST)
	x	x	1	x	Daylight saving time (DST)
	x	0	x	x	No announcement leap second
	x	1	x	x	Announcement leap second
	0	x	x	x	Quartz mode
	1	x	x	x	Radio-controlled mode
Day of the week nibble:	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

The difference time is transmitted in hours and minutes. Transmission is in BCD. The difference time can be up to ± 12:59 h.

The sign is inserted as the highest bit in the hours.

Logic "1" = local time before UTC
Logic "0" = local time after UTC

Example :

90.00	difference time	+ 10:00 hrs.
01.30	difference time	- 01:30 hrs.

The time is displayed as if operating as (radio-controlled) clock. The format of the display is set under the menu DISPLAY (see 1.8.1 Settings Display (DISPLAY)).

Structure of string:

Character no.:	Meaning	Range of values in Hex
1	STX (Start of Text)	02
2	"F"	46
3	"7"	37
4	status high-nibble	30-39, 41-46
5	status low-nibble	30-39, 41-46
6	tens hour	30-32
7	unit hour	30-39
8	tens minute	30-35
9	unit minute	30-39
10	tens second	30-36
11	unit second	30-39
12	tens day	30-33
13	unit day	30-39
14	tens month	30-31
15	unit month	30-39
17	tens year	30-39
18	unit year	30-39
19	tens difference hours	30, 31, 38, 39
20	unit difference hours	30-39
21	tens difference minutes	30-35
22	unit difference minutes	30-39
23	CR	0D
24	LF	0A
25	ETX	03

4.8 F8 = Special string

This setting can be used to present your own data on the large display. The presentation can be either:

1-line:

height of characters :	84 mm
max. no. of characters:	6 [1]
ASCII characters :	HEX 20 - HEX 5A
	Special characters, digits and capital letters

or

2-line:

height of characters:	42 mm
max. no. of characters:	10 characters / line
ASCII characters:	HEX 20 - HEX 7A
	Special characters, digits, capital and small letters

The following control characters are used:

STX	= Start of Text	HEX02	
ETX	= End of Text	HEX03	
LF	= Linefeed	HEX0A	to change lines
DEL	= Delete	HEX7F	to insert an empty column

Fewer than the maximum number of characters can also be used. LF or ETX are always the first or final characters.

1 to be able to delete the display with spaces 16 characters are permitted in the string. 6 large characters fit over the full width of the display.

The strings must be structured as follows:

1-line:

Character no.:	Meaning	Range of values in Hex
1	STX (Start of Text)	02
2	"F"	46
3	"8"	38
4	"1" for 1-line	31
5	1st character	20-5A
:		
:		
20	final character	
21	ETX	03

2-line:

Character no.:	Meaning	Range of values in Hex
1	STX (Start of Text)	02
2	"F"	46
3	"8"	38
4	"2" for 2-line	32
5	1st character – 1st line	20-7A
:		
:		
14	final character – 1st line	
15	LF line feed	0A
16	1st character – 2nd line	20-7A
:		
:		
25	final character – 2nd line	
26	ETX	03

4.9 U/u = User string

To present a user string the same setting is required as for the F8 string.

After the identification number **"u"** or **"U"** the user string includes a reference number from 00 to 99. The string received is only presented if this reference number corresponds with the reference number in the device.

The F- string is always displayed. Therefore it is a user string for all identification numbers.

The user string can be used to display different individual data on different large displays. These are displayed either

1-line:

height of characters:	84 mm
max. no. of characters:	6 [2]
ASCII characters:	HEX 20 - HEX 5A
	Special characters, digits and capital letters

or

2-line:

height of characters:	42 mm
max. no. of characters:	10 characters/line
ASCII characters:	HEX 20 - HEX 7A
	Special characters, digits, capital and small letters

The following control characters are used:

STX	= Start of Text	HEX02	
ETX	= End of Text	HEX03	
LF	= Linefeed	HEX0A	to change lines
DEL	= Delete	HEX7F	to insert an empty column

Fewer than the maximum number of characters can also be used. LF or ETX are always the first and final characters.

[2] to be able to delete the display with spaces 16 characters are permitted in the string. 6 large characters fit over the full width of the display.

The strings must be structured as follows:

1-line:

Character no.:	Meaning	Range of values in Hex
1	STX (Start of Text)	02
2	"U"	55
3	Identification 1st digit	30-39
4	Identification 2nd digit	30-39
5	1st character	20-5A
:		
:		
20	final character	20-5A
21	ETX	03

2-line:

Character no.:	Meaning	Range of values in Hex
1	STX (Start of Text)	02
2	"u"	75
3	Identification 1st digit	30-39
4	Identification 2nd digit	30-39
5	1st character – 1st line	20-7A
:		
:		
14	final character – 1st line	
15	LF line feed	0A
16	1st character – 2nd line	20-7A
:		
:		
25	final character – 2nd line	
26	ETX	03

5 Output diagrams

Unless otherwise indicated all values are given in 2 digits without operational sign.

5.1 Mode Radio Controlled Clock

5.1.1 Time/date small (42mm)

1st line: day of the week (abbreviation) hour:minute:second
2nd line: day month (abbreviation) year (4-digit)

In US format 2nd line: month (abbreviation), day, year (4-digit)

Example 1: (German abbreviation / European date format)

DI 08:28:30
31 JUL 2001

Example 2: (English abbreviation / US date format)

TU 08:28:30
JUL 31 2001

5.1.2 Local Time and UTC

1st line: LOC hour:minute:second
2nd line: UTC hour:minute:second

Example:

LOC 08:28:30
UTC 06:28:30

5.1.3 Time large (84mm)

One line: hour:minute:second

Example 1: (normal)

08:34:58

Example 2: (small seconds)

08:34 58

5.1.4 Date large (84mm)

One line: day/month/year

in US format: month/day/year

Example1: (European format)

31/07/01

Example 2: (US format)

07/31/01

5.2 Mode Matrix Display

PLEASE NOTE: IF THE CONNECTION TO THE BOARD 7515 IS BROKEN OR THE SYSTEM 7001 IS DOWN, THE MESSAGE "CONNECTION LOST" APPEARS IN THE DISPLAY AFTER APPROX. 5 SECONDS.

5.2.1 F0/F1 System and grid time

5.2.1.1 System and grid time small (F0 small)

1st line: "Sy" hour:minute:second(system time)
1st line: "N1" hour:minute:second (grid time)

Example:

Sy 12:34:56
N1 12:34:57

5.2.1.2 Grid and system time (F1 small)

1st line: "N1" hour:minute:second (grid time)
1st line: "Sy" hour:minute:second (system time)

Example:

N1 12:34:57
Sy 12:34:56

5.2.1.3 System time large (FO large)

One line: hour:minute:second (system time)

Example:

12:34:56

5.2.1.4 System time large (F1 large)

One line: hour:minute:second (grid time)

Example:

12:34:57

5.2.2 F2 Difference time

5.2.2.1 Difference time (F2 small)

1st line: "t" operational sign hour:minute:second
1st line: milliseconds

Example:

t + 00:00:06
447

5.2.2.2 Difference time (F2 large)

One line: operational sign seconds, milliseconds

Example:

+ 06,447

PLEASE NOTE: DISPLAY UP TO ± 99,999. IN CASE OF OVERFLOW ± 99,999 IS DISPLAYED.

5.2.3 F3 Frequency/Difference frequency

5.2.3.1 Frequency/Difference frequency (F3 small)

1st line: "f1" frequency with 2 pre- and 3 post-comma digits "Hz"
1st line: "df" difference frequency with 2 pre- and 3 post-comma digits "Hz"

Example:

f1 49,998 Hz
df -00,002 Hz

5.2.3.2 Frequency/Difference frequency (F3 small/difference)

1st line: "df" difference frequency with 2 pre- and 3 post-comma digits "Hz"
1st line: "f1" frequency with 2 pre- and 3 post-comma digits "Hz"

Example:

df +00,002 Hz
f1 50,002 Hz

5.2.3.3 Frequency (F3 large)

One line: frequency with 2 pre- and 3 post-comma digits

Example:

49,998

5.2.3.4 Difference frequency (F3 large/difference)

One line: operational sign and frequency with 2 pre- and 3 post-comma digits

Example:

+00,002

5.2.4 F4 Temperature and humidity (always large)

One line: temperature "°C" and humidity "%H"

Example:

32°C 56%H

5.2.5 F5 & F6 Power (always large)

one line: power (4-digit) "MW"

Example:

5467 MW

5.2.6 F7 Master/Slave

see 5.1 Mode Radio Controlled Clock

5.2.7 F8 & U/u: User Strings

5.2.7.1 User String small

1st line max. 10 characters over the full width
2nd line max. 10 characters over the full width

If the text contains smaller characters slimmer characters are possible per line.

Example 1:

Nil values
measured

Example 2:

25 cm
new snow

5.2.7.2 User String large

one line: 6 characters digits/ special characters/capital letters

Example:

WAIT

6 Data strings

6.1 General Information on the Serial Output of the 4985 Board

If ETX on the second change is set a transmission gap occurs of up to 970 msec depending on the baud rate. Please take this into consideration when programming a Time-Out on the reception side.

In all the strings it is possible to change the order of CR and LF via **Mode byte 1.**

6.2 Data Format of the Serial Transmission

The data are transmitted in ASCII as BCD values and can be shown by any terminal programme (example: **TERMINAL.EXE** under Windows). The following ASCII control characters are possibly used in the structure of the data string

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

PLEASE NOTE: STATUS VALUES ARE TO BE DECODED SEPARATELY (SEE STRUCTURE OF DATA STRING)

6.3 Serial Request

The requests of data strings which are not listed in this section are described under the respective data strings.

6.3.1 Serial Requests with ASCII Characters (Standard and Standard 2000)

On request the data string can also be emitted by an ASCII character entered by the user. The following characters release a transmission of the data string:

ASCII "D" – for time/ date (Local-Time)
ASCII "G" – for time/date (UTC-Time)

The system responds with the corresponding data string within 1 msec.

This is often too fast for the requesting computer. Therefore it is possible to delay the response in steps of 10msecs when requested via software. To delay the transmission of the data string the small letters "d, g" with a two-digit multiplication factor are transmitted from the requesting computer to the clock.

The multiplication factor is interpreted by the clock as a hexadecimal value.

Example:

The computer transmits **ASCII gFF** (Hex 67, 46, 46)
After about 2550 milliseconds the clock transmits the data string time/date (UTC-time).

6.4 Structure of the Hopf Standard String

Character no.:	meaning	
1	STX (Start of Text)	
2	Status (internal status of the clock)	; see 6.4.1
3	Day of the week (1=Monday ... 7=Sunday)	; see 6.4.1
	In UTC time bit 3 in the day of the week is set to 1	
4	tens hour	
5	unit hour	
6	tens minute	
7	unit minute	
8	tens second	
9	unit second	
10	tens day	
11	unit day	
12	tens month	
13	unit month	
14	tens year	
15	unit year	
16	LF (Line feed)	; see 6.1
17	CR (Carriage Return)	; see 6.1
18	ETX (End of Text)	

6.4.1 Status and day of the week nibble in the Hopf Standard Data String

The second and third ASXCII characters in the data string contain the status and the day of the week nibble. The status is decoded binarily. Structure of these characters:

	b3	b2	b1	b0	Meaning
Status nibble:	x	x	x	0	No announcement hour
	x	x	x	1	Announcement (DST-ST-DST)
	x	x	0	x	Standard time (ST)
	x	x	1	x	Daylight saving time (DST)
	0	0	x	x	Time/date invalid
	0	1	x	x	Quartz mode
	1	0	x	x	Radio-controlled mode
	1	1	x	x	Radio-controlled mode (high accuracy))
Day of the week nibble:	0	x	x	x	CESZ/ 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

6.4.2 Example of a Transmitted Hopf Standard Data String

(STX)E3123456170496(LF)(CR)(ETX)

Radio operation (high accuracy)
Daylight saving time
No announcement
It is Wednesday 17.04.96 - 12:34:56 h
( ) - ASCII- control characters e.g. (STX)

6.5 Standard Hopf Data String 2000

The structure of the data string is identical to the standard string. The only difference is the 4-digit year.

Character no.:	Meaning	
1	STX (Start of Text)	
2	Status (internal status of clock)	; see 6.4.1
3	Day of the week (1=Monday ... 7=Sunday)	; see 6.4.1
	In UTC time bit 3 in the day of the week is set to 1	
4	tens hour	
5	unit hour	
6	tens minute	
7	unit minute	
8	tens second	
9	unit second	
10	tens day	
11	unit day	
12	tens month	
13	unit month	
14	tens century	
15	unit century	
16	tens year	
17	unit year	
18	LF (line feed)	; see 6.1
19	CR (Carriage Return)	; see 6.1
20	ETX (End of Text)	

6.5.1 Data String 2000 Status- and Day of the Week Nibble

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

	b3	b2	b1	b0	Meaning
Status nibble:	x	x	x	0	No announcement hour
	x	x	x	1	announcement (DST-ST-DST)
	x	x	0	x	Standard time (ST)
	x	x	1	x	Daylight saving time (DST)
	0	0	x	x	Time / date invalid
	0	1	x	x	Crystal operation
	1	0	x	x	Radio operation
	1	1	x	x	Radio operation (high accuracy)
Day of the week nibble:	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

6.5.2 Example of a Transmitted Data String 2000

(STX)E312345603011996(LF)(CR)(ETX)

radio operation (high accuracy)
daylight saving time
no announcement
It is Wednesday 03.01.1996 - 12:34:56 h.
( ) - ASCII-control characters e.g. (STX)

6.6 Data string SINEC H1

The control characters STX and ETX are transmitted only if the output "with control characters" is set. Otherwise these control characters will be dropped.

The data string can be requested via **"?"**.

Character no.:	Meaning	Value (range of values)	
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	";" semi-colon	$3B	
13	"T" ASCII T	$54	
14	":" colon	$3A	
15	day of the week	$31-37	
16	"; " semi-colon	$3B	
17	"U" ASCII U	$55	
18	":" colon	$3A	
19	tens hours	$30-32	
20	unit hours	$30-39	
21	"." point	$2E	
22	tens minutes	$30-35	
23	unit minutes	$30-39	
24	"." point	$2E	
25	tens seconds	$30-36	
26	unit seconds	$30-39	
27	";" semicolon	$3B	
28	"#" or space	$23 / $20	; see 6.6.1
29	"*" or space	$2A / $20	; see 6.6.1
30	"S" or space	$53 / $20	; see 6.6.1
31	"!" or Space	$21 / $20	; see 6.6.1
32	ETX (end of text)	$03	

6.6.1 Status in the Data String SINEC H1

The characters 28-31 in the data string SINEC H1 indicate the status of the synchronization of the clock.

Meaning:

Character no.: 28 =	"#"	No radio synchronization after reset, time invalid
	Space	radio synchronization after reset, clock minimum quartz mode
Character no.: 29 =	"*"	time from the internal quartz of the clock
	Space	time via radio reception
Character no.: 30 =	"S"	Daylight saving time
	Space	Standard time
Character no.: 31 =	"!"	announcement of a ST/DST or DST/ST changeover
	Space	no announcement

6.6.2 Example of a Transmitted Data String SINEC H1

(STX)D:03.01.96;T:1;U:12.34.56; _ _ _ _ (ETX) (_) = Space

- Radio operation
- no announcement
- standard time
- it is Wednesday 03.01.96 – 12:34:56 h

6.7 Radio-operated data String T-String

The T-String can be transmitted with all modes (e.g. with advance or final character on the second change.

The data string can be requested via **"T"** .

Character no.:	Meaning	Value (range of values)
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 week	$30
13	unit day of 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

6.7.1 Example of a transmitted data string T-string

T:96:01:03:03:12:34:56(CR)(LF)

It is Wednesday 03.01.96 - 12:34:56 h

6.8 Master/Slave-String

The Master/Slave-String is used to synchronize slave-systems with the time data of the master system with an accuracy of ± 0,5 msec. In the data string the difference time to UTC is also transmitted.

After the transmission of the year index the difference time is transmitted in hours and minutes. Transmission is in BCD. The difference time may be up to ± 11.59 hours.

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

Logic "1" = local time before UTC
Logic "0" = local time after UTC

Example:

90.00 difference time + 10.00 h
01.30 difference time – 01.30 h
81.30 Difference time + 01.30 h

The complete string is structured as follows:

Character no.:	Meaning	Value (range of values)	
1	STX (start of text)	$02	
2	Status	$30-39,$41-46	; see 6.8.1
3	day of the week	$31-37	; see 6.8.1
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	tens diff. time + op. sign. hr.	$30,$31,$38,$39	
17	unit diff. time hr.	$30-39	
18	tens diff. time minute	$30-35	
19	unit diff. time minute	$30-39	
20	LF (line feed)	$0A	; see 6.1
21	CR (carriage return)	$0D	; see 6.1
22	ETX (end of text)	$03	

6.8.1 Status in the Data String Master-Slave

	b3	b2	b1	b0	Meaning
Status nibble:	x	x	x	0	No announcement hour
	x	x	x	1	Announcement (DST-ST-DST)
	x	x	0	x	Standard time (ST)
	x	x	1	x	Daylight saving time (DST)
	x	0	x	x	No announcement leap second
	x	1	x	x	Announcement leap second
	0	x	x	x	Radio operation
	1	x	x	x	Radio operation (high accuracy)
Day of the week nibble:	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

6.8.2 Example of a Transmitted Data string Master-Slave

(STX)831234560301968230(LF)(CR)(ETX)

Radio operation, no announcement, standard time, Wednesday, 03.01.96, 12:34:56 h
The difference time to UTC is + 2.30 h.

6.8.3 Setting

To synchronize the ***hopf*** Slave the following settings ***must*** be observed :

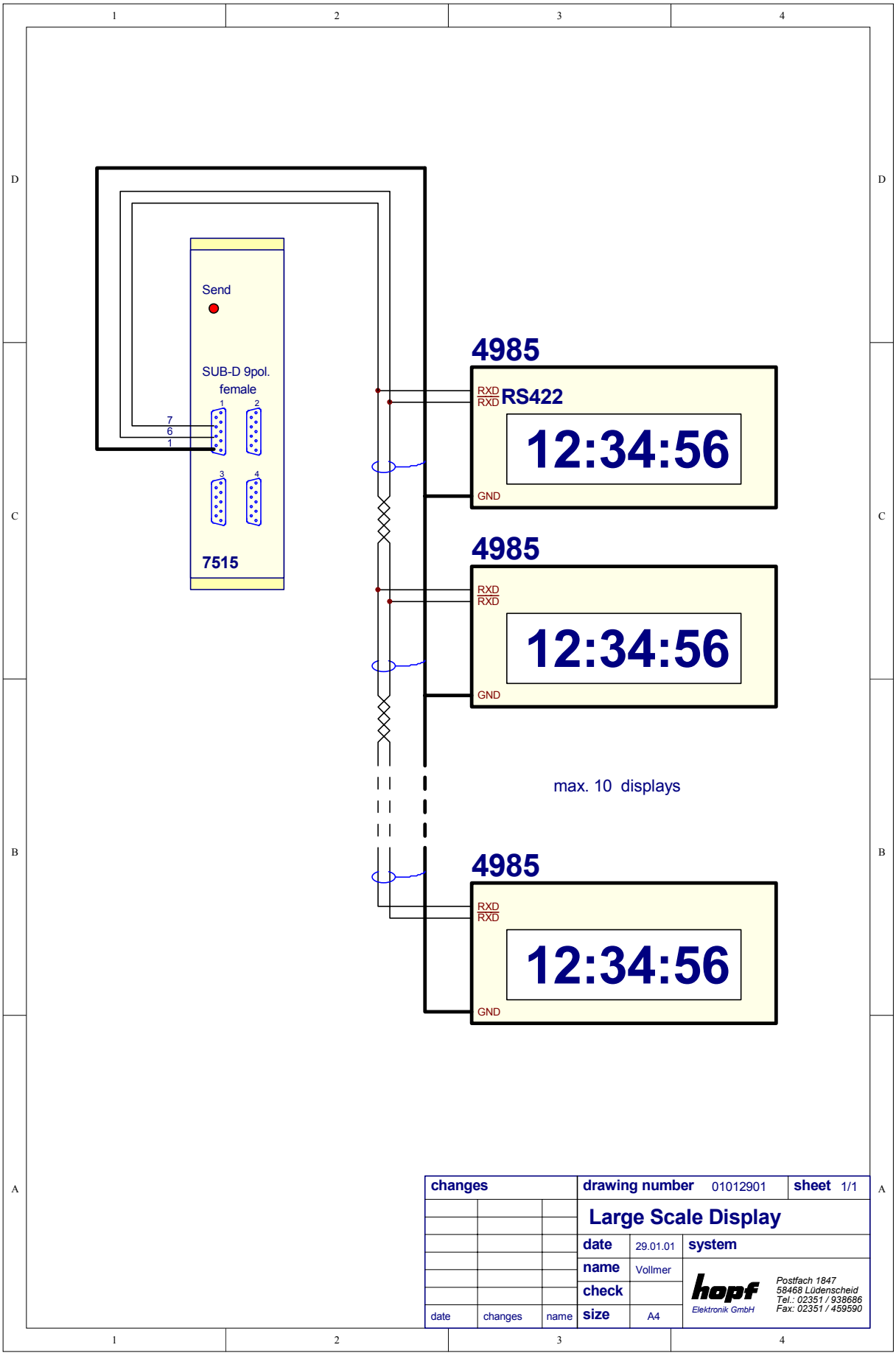
- Output every minute
- Output second advance
- ETX on the second change
- 9600 Baud, 8 Bit, 1 Stop bit, no parity

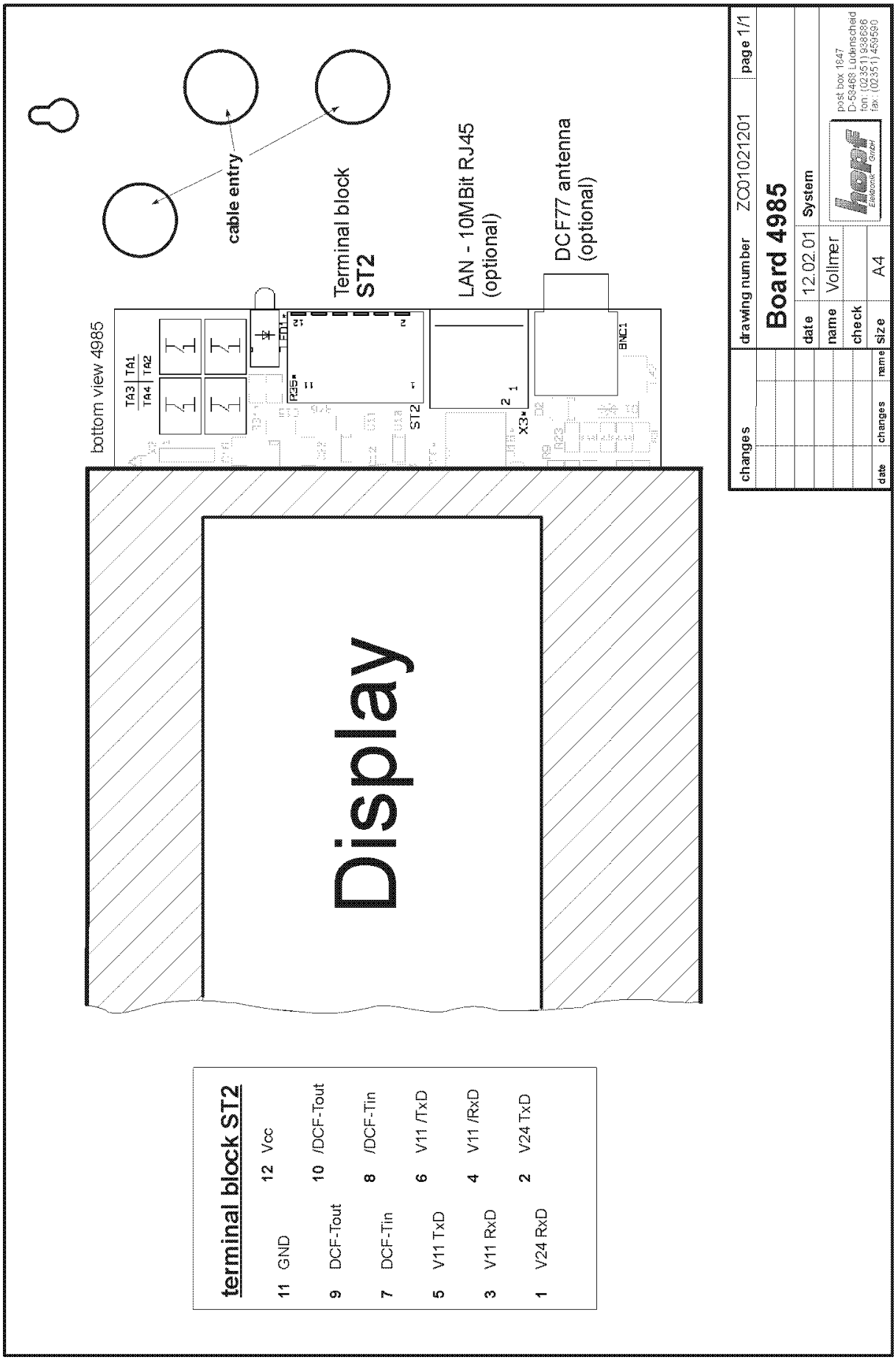
In this setting the best control of the time basis is achieved in the slave systems.

7 Technical data radio-controlled clock large display 4985

Voltage supply:	100-240 V AC / 50-60 Hz, 20 VA
Operating voltage 4985 board:	+ 5 V DC ± 5%
Display:	+ 5 V DC ± 5%
Power consumption:	ca. 2.5 A at 5 V
housing dimensions:	640 x 190 x 85 mm (B x H x T)
Serial interface:	RS232 and RS422 without Handshake
DCF77pulse input:	RS422 Hardware or TTL gauge
DCF77pulse output:	RS422 Hardware
Temperature range:	0-70° C
Readability:	in 2 lines each with 42 mm high characters ⇨ 20 m In 1 line each with 84 mm high characters ⇨ 40 m
Custom-made products:	Hard- and software solutions according to customer specifications

PLEASE NOTE: ***HOPF*** RESERVES THE RIGHT TO MAKE ANY MODIFICATIONS TO THE HARD- AND SOFTWARE AT ANY TIME.


Send
SUB-D 9pol.
female
7
6
1
7515
4985
RXD
RXD
RS422
12:34:56
GND
4985
RXD
RXD
12:34:56
GND
max. 10 displays
4985
RXD
RXD
12:34:56
GND
changes
drawing number 01012901
sheet 1/1
Large Scale Display
date 29.01.01
system
name Vollmer
check
size A4
date changes name
Postfach 1847
58468 Lüdenscheid
Tel.: 02351 / 938686
Fax: 02351 / 459590


cable entry
Terminal block
ST2
LAN - 10MBit RJ45
(optional)
DCF77 antenna
(optional)
bottom view 4985
Display
terminal block ST2
12 Vcc
11 GND
10 /DCF-Tout
9 DCF-Tout
8 /DCF-Tin
7 DCF-Tin
6 V11 /TxD
5 V11 TxD
4 V11 /RxD
3 V11 RxD
2 V24 TxD
1 V24 RxD
changes
drawing number ZC01021201
page 1/1
Board 4985
date 12.02.01
System
name Vollmer
check
size A4
post box 1847
D-58468 Lüdenscheid
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