MEINBERG
FUNKUHREN

Technical Information

Operating Instructions

HSC509

Impressum

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General Information about DCF77

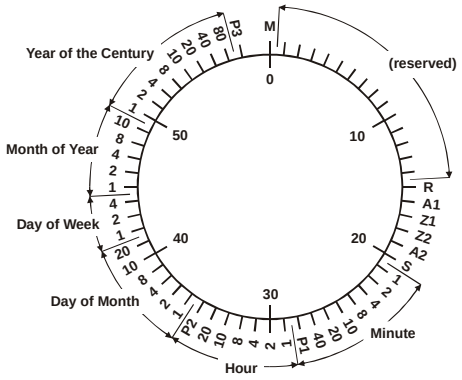
The radio remote clocks made by Meinberg receive the signal from the long wave transmitter DCF77. This long wave transmitter installed in Mainflingen near Frankfurt/Germany transmits the reference time of the Federal Republic of Germany. This time reference is either the Central European Time (Mitteleuropäische Zeit, MEZ) or the Central European Summer Time (Mitteleuropäische Sommerzeit, MESZ). The transmitter is controlled by the atomic clock plant at the Federal Physical Technical Institute (PTB) in Braunschweig/Germany and transmits the current time of day, date of month and day of week in coded second pulses. Once every minute the complete time information is available.

At the beginning of every second the amplitude of the high precision 77.5 kHz carrier frequency is lowered by 75% for a period of 0.1 or 0.2 sec. The length of these time marks represent a binary coding scheme using the short time mark for logical zeroes and the long time mark for logical ones. The information on the current date and time as well as some parity and status bits can be decoded from the time marks of the 15th up to the 58th second every minute. The absence of any time mark at the 59th second of a minute signals that a new minute will begin with the next time mark.

Our radio remote clocks decode the highly accurate information on date and time within a wide range around Germany. So some of our clocks are installed in Bilbao/ Spain as well as in the city of Umeå in northern Sweden - fully satisfying the requirements of the users. The radio remote clocks automatically switch to summertime and back. The reception of the time information is free of charge and does not need to be registered.

Generally it is important to position the antenna in an optimal way. It should be mounted at least 30 centimeters away from the clock unit and from solid steel. The antenna should be aligned at a right angle to the direction of the transmitter (Frankfurt).

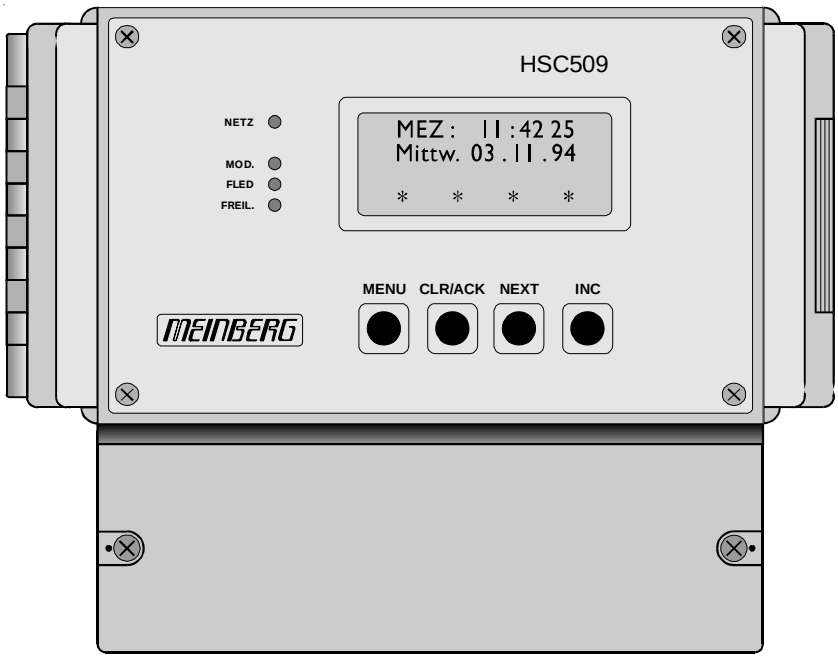
Figure: Decoding Scheme



M	Start of Minute (0.1 s)
R	RF Transmission via secondary antenna
A1	Announcement of a change in daylight saving
Z1, Z2	Time zone identification
	Z1, Z2 = 0, 1: Daylight saving disabled
	Z1, Z2 = 1, 0: Daylight saving enabled
A2	Announcement of a leap second
S	Start of time code information
P1, P2, P3	Even parity bits

HSC509

The radio remote clock HSC509 has been designed for applications where two independent serial interfaces and up to four free programmable relay outputs are needed. The clock also offers the possibility to control slave clocks via the integrated slave clock drivers. The clock is equipped with an internal power supply.



Frontview HSC509

HSC509 Features

The radio clock HSC509 offers a number of functions and is mounted in a plastic housing for wall-mounting. It provides four free programmable relay outputs, a slave clock master with two slave lines and two independent serial interfaces. The 100mm x 160mm wide frontpanel includes a 4 x 16 character LC display, four control LEDs and four keys. The external ferrite antenna is connected to the receiver via a 50 ohm coaxial cable. If the distance between antenna and receiver exceeds 100m an amplifier may be necessary.

The HSC509 contains a new flash EPROM with bootstrap loader that allows the user to upload a new firmware via the serial interface without opening the housing of the clock.

LF Receiver

An external ferrit antenna is used to receive the signal from DCF77 and supplies it to the on-board direct conversion quadrature receiver with automatic gain control. The demodulated time marks are fed t

o the clock´s microprocessor.

Microprocessor System

The time marks from the receiver circuit are filtered and decoded by the microprocessor system. Parity and consistency checks over a period of two minutes take care for detecting errors in the received time telegram. The checked and decoded time is written to the on-board real time clock and spread by the interfaces. A software watchdog lets the microprocessor recover from malfunction. A power-fail comparator resets the microprocessor if the supply voltage drops below a specified threshold. A flash EPROM is used as program memory which can be loaded with the firmware by the serial interface COM0.

LC Display

The 4 x 16 character LC display is used to show the receiver´s status and let the user edit parameters. The keys described below let the user select the desired menu. The next chapter lists all available menus in detail. A quick reference of the available menus and submenus can be found at the end of this document.

Buffered Real Time Clock and RAM

In case of supply voltage failure the on-board real time clock keeps the time powered by a backup capacitor for at least 100 hours. This capacitor does not need any maintenance. The content of the RAM is buffered also. Alternatively, the clock can be ordered with a lithium battery which has a live time of at least 10 years guaranteed.

Slave Clocck Pulses

The radio clock generates bipolar pulses to drive slave clocks. These DC isolated pulses are generated on a second line and on a minute line. The drivers are short-circuit protected. A short-circuit detection ensures generating the lost pulses after the fault has been eliminated. So the slave clocks catch up the time automatically.

Relay Outputs

The HSC509 provides four relay outputs that can be applied to switching times or cyclic pulses. Eight different plans assigned to the weekdays, sundays or holidays can be edited by the 4 keys in the frontpanel. A plan consists of up to 64 switch-on times and 64 switch-off times. Only one plan per day can be executed.

Alternative to the switching times cyclic pulses with a settable pulse length can be programmed. A table of possible pulses and pulse lengths is given in chapter "Cyclic Pulses". The maximum load to be applied to the relays is 50W.

Serial Interfaces

Two independent asynchronous serial ports can be used to transmit information on date and time to other devices. Both interfaces can be configured either as a RS232 port or as a current loop port. Baudrate, framing and mode of operation can be configured separately for COM0 and COM1. Additionally, a time zone can be assigned to each port: The drivers can be configured individually to transmit either standard time (MEZ/MESZ=CET/CEST), standard time with suppression of daylight saving (always MEZ=CET), or UTC. Both serial ports can send a time string once per second, per minute or only on request The format of the time string is described in the section "Technical Specifications".

Outputs

Both the RS232 and the current loop output of one interface (e.g. COM0) provides the same time string and can be connected simultaneously.

When using the port in the 20mA current loop mode the additional supply voltage of -15V is not essential either when using only the passive outputs or a lower interference immunity is tolerated. In the second case the negative output lines have to be connected to GND.

Inputs

Only when using the output mode "on request" the RS232 input or the 20mA current loop input has to be connected. It is not possible to connect both inputs.

The 20mA current loop input can be driven passive or active (see "Connector Pin Assignment"). It is possible to drive the active input without the -15V supply voltage by connecting the "OUT-" pin to GND.

Installation

Power Supply

The system requires an operating voltage of 230V/50Hz witch is applied via the power supply cord at the bottom of the housing.

Mounting the Antenna

Generally it is important to position the antenna in an optimal way. The antenna should be aligned at a right angle to the direction of the transmitter (Frankfurt). It should be mounted at least 30 centimeters away from the clock unit and from solid steel. A distance of several meters is recommended to all TVs or computer monitors.

The scope of supply includes an active ferrite antenna for indoor mounting (AI01) and 5m of RG174 coaxial cable. When mounting the antenna outdoor the weather proof Antenna AW02 is to use.

Powering Up the System

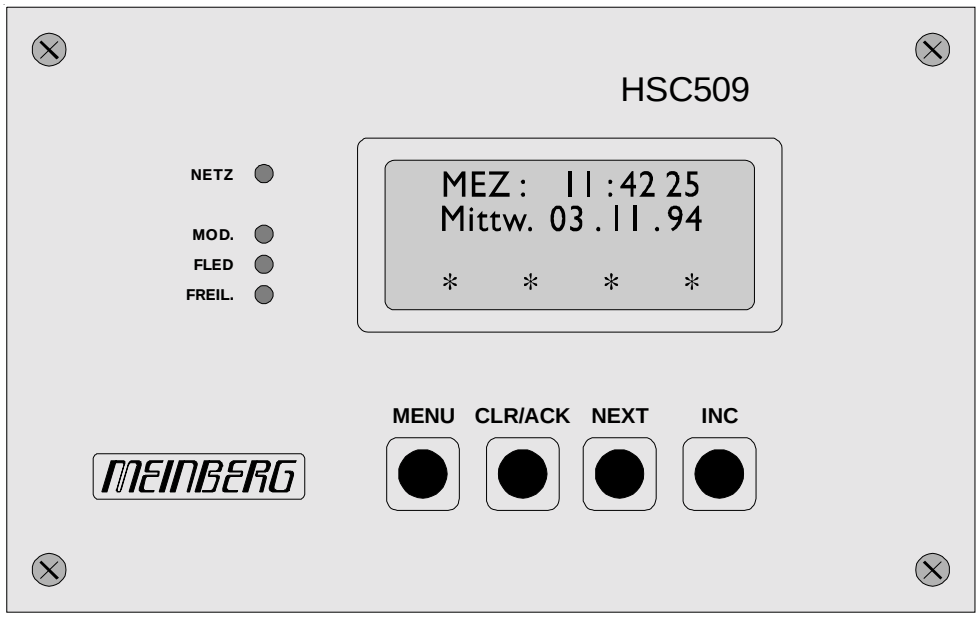
After connecting the power supply and the antenna the system is ready to operate. Time, date and the relay conditions are displayed on the LC display (the timebase choosen for COM0 is displayed).

The brighness of the “Feld” LED in the front panel depends on the signal strength of the DCF77 carrier. In order to get the maximum signal, the antenna should be aligned in two steps. First it should be turned **slowly** until the “Feld” LED is mostly dimmed. Finally the antenna must be turned by 90° from this position to obtain maximum signal. If the antenna is installed properly and the signal from DCF77 can be received without strong distortions, the "Mod." LED starts blinking exactly once per second, corresponding to the time marks from DCF77. If this LED flashes intermediately, there is some electrical noise around which prevents the microprocessor from decoding the time message. So a better location for the antenna must be found. In case of correct reception it takes up to three minutes after power-up until the clock is synchronized and the "Freil." LED is turned off. It is turned on again to indicate the loss of or an error in reception. Without RF signal the clock runs on XTAL with an accuracy of 10^{-6}. The "Freil." LED indicates three different alarm conditions by blinking:

1. If the clock has lost reception for more than 12 hours the "Freil." LED starts blinking.
2. Short-circuit on the second-line; alarm message is displayed
3. Short-circuit on the minute-line; alarm message is displayed

The serial outputs are enabled immediately after power up. Baudrate, framing, output mode and time zone can be configured separately by two DIL switches.

Operation



Frontpanel HSC509

MENU Key

This key lets the user step through several display menus showing specific data.

CLR/ACK Key

This key has to be used when parameters are to be modified. When this key is pressed the parameters that have been edited are saved in the battery buffered memory. If the menu is left without pressing CLR/ACK all changes are discarded. If the current menu just displays data (cursor not visible) pressing this key switches to a submenu (if available).

NEXT Key

When editing parameters (LCD cursor is visible) this key moves the cursor to the next digit rsp. to the next parameter to be edited.

INC Key

When editing parameters this key increments the digit or letter at the cursor position.

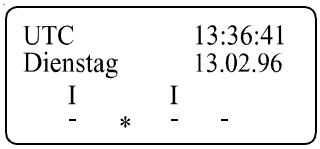
INC Key together with CLR/ACK Key

When pressing CLR/ACK while INC is beeing pressed the currently displayed data is cleared and the cursor jumps to the first position.

The Menus in Detail

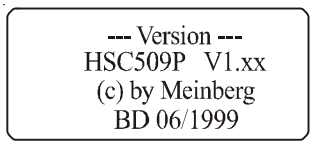
Root Menu

The root menu is shown when the receiver has completed initialization after power-up. The first two lines of the display show the time zone (as defined in the setup menu), the actual time and the date. The third line shows the user if one of the relay output is applied with an impulse (I). The last line shows if an output is currently active (*) or not (-).




```
* means relay on
- means relay off
I means relay applied with cyclic pulse
```

If the INC key is pressed from the root menu a submenu is displayed showing the receiver´s software revision:

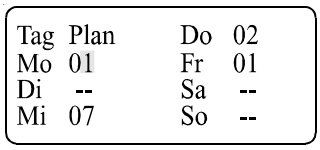


Pic. 2.2: Submenu 1

Pressing MENU or INC again lets the menu return to the root menu.

Menu Day Plan

This menu lets the user assign a plan to a corresponding day of week. The cursor starts at "Mo" (monday) and can be stepped to the next day by pressing **NEXT**.



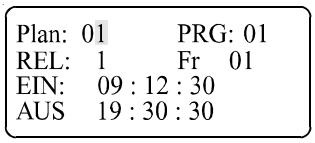
Pic. 2.3: Menu 2

Pressing **INC** increases the no. of the plan (01 ... 08) while **CLR/ACK** saves the edited plan to the RAM. Pressing **INC and CLR/ACK** clears the plan of the currently active day.

Programming a Plan

A **Plan** is a programmed sequence of several switching times. A plan consists of up to 64 switching programs (PRG). A switching program is a set of a switch-on time (EIN), a switch-off time (AUS) and the corresponding relay (Rel.). Up to eight plans can be configured and assigned to any day of the week or holyday.

To program the plans and switching programms the **MENU** key is to press in order to enter menu 3. The following is displayed:



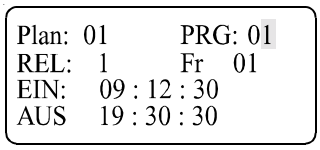
Pic. 2.4: Menu 3

Select a Plan

The no. of the plan to edit (01 ... 08) can be choosen by pressing **INC** while the cursor appears at the corresponding position (PLAN).

Select a Switching Program

The no. of the switching program to edit (01 ... 64) can be choosen by pressing **INC** while the cursor appears at the corresponding position (PRG).



When pressing **INC** while **CLR/ACK** is already pressed the program no. is set back to 01. After the switching program no. is selected the corresponding relay and the switching times can be edited in the same way.

After this inputs have been done, it is important to save the switching program by pressing **CLR/ACK** before the next switching program is selected. Otherwise the edited modifikations are lost.

ATTENTION

Because the calculation of the plans is based on greater/less comparations of the switching times it is necessary to sort the switching programs of one relay in a chronological order, but not all successive switching programs have to be programmed.

1. Example: correct programming

PRG: 01 REL.:1 EIN: 08:00:00 AUS: 08:00:03
PRG: 02 REL.:1 EIN: 08:40:00 AUS: 09:45:00
PRG: 03 REL.:1 EIN: — :— :— AUS: —:— :—
.
.
PRG: 09 REL.:1 EIN: — :— :— AUS: —:— :—
PRG: 11 REL.:1 EIN: 23:12:00 AUS: 23:54:00

2. Example: correct programming

PRG: 01 REL.:1 EIN: 08:00:00 AUS: 08:00:03
PRG: 02 REL.:3 EIN: 06:40:00 AUS: 20:45:00
PRG: 03 REL.:1 EIN: 12:30:00 AUS: 12:30:03
.
.
PRG: 09 REL.:2 EIN: 11:55:00 AUS: 11:57:00
PRG: 11 REL.:4 EIN: 23:12:00 AUS: 23:54:00
PRG: 12 REL.:2 EIN: 12:00:00 AUS: —:—:—

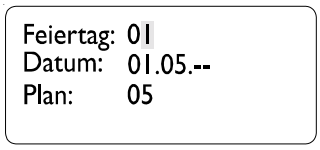
3. Example: incorrect programming

PRG: 01 REL.:1 EIN: 08:00:00 AUS: 08:00:03
PRG: 02 REL.:3 EIN: 06:40:00 AUS: 20:45:00
PRG: 03 REL.:1 EIN: 17:30:00 AUS: 18:00:00
.
.
PRG: 09 REL.:2 EIN: 11:55:00 AUS: —:—:—
PRG: 11 REL.:4 EIN: 23:12:00 AUS: 23:54:00
PRG: 12 REL.:1 EIN: 09:30:00 AUS: 09:30:03

In the third example the execution of the program 03 should switch on the relay no. 1 at 17:30:00. However, the following program no. 12 causes the relay to keep switched off because the actual time is past the switch-off time (09:30:03). The program no. 03 is never executed.

Editing Holydays

It is possible to program up to 99 holydays with higher priority than a weekday. The **MENU** key lets the user enter the following menu:



Pic. 2.6: Menu 4

Each of the holydays are assigned to a specified date and a plan. The date can be entered in two different ways:

1. Variable Holydays:

Day, month and year are to be entered

e.g.: DATUM: 16.03.90

In this case the plan is executed only at the 16. of march in 1990.

2. Fixed Holydays:

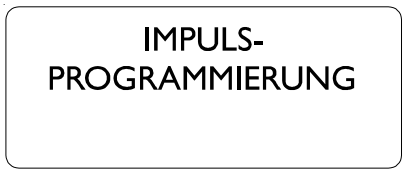
Day and month are to be entered

e.g.: DATUM: 01.05.—

In this case the plan is executed at the 1. of may every year.

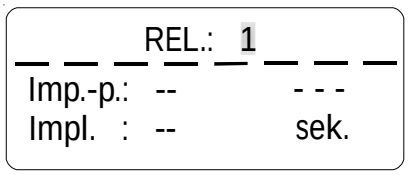
Cyclic Pulses

Instead of switching times it is possible to assign cyclic pulses to a relay. The pulse period is to be configured by setting a two-digit value and the unit, either seconds (sek.), minutes (min.) or hours (std.). The allowed values for the pulse period are given in the following table. The pulse duration can be choosen from 0.1s to 9.9s in steps of 100ms. A pulse has always a higher priority than a switching time that is programmed for the same relay.



Pic. 2.8: Menu 5

When choosing this menu by pressing **CLR/ACK** the following appears on the display:



Pic. 2.9: Menu 5

Example:

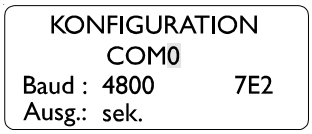
A cyclic pulse with a period of 3 seconds and a duration of 200ms is to program. The relay no. 1 is to select with the keys **NEXT** and **INC**. After this is done the pulse period is to set in the same manner: Press **NEXT** and then **INC** until the value **03** appears. Then press NEXT and then INC again until **sek.** appears. After that the pulse duration is to set to **0.2 sek.** in the same way. If this is done the modifikations are to save by pressing **CLR/ACK**. After that the pulse output is active.

Table of possible Pulse Periods

Period	Unit		Period	Unit		Period	Unit	
01	sek	1-second	01	min	1-minute	01	std	1-hour
02	sek	2-seconds	02	min	2-minutes	02	std	2-hours
03	sek	3-seconds	03	min	3-minutes	03	std	3-hours
04	sek	4-seconds	04	min	4-minutes	04	std	4-hours
05	sek	5-seconds	05	min	5-minutes	06	std	6-hours
06	sek	6-seconds	06	min	6-minutes	08	std	8-hours
10	sek	10-seconds	10	min	10-minutes	12	std	12-hours
12	sek	12-seconds	12	min	12-minutes	00	std	24-hours
15	sek	15-seconds	15	min	15-minutes			
20	sek	20-seconds	20	min	20-minutes			
30	sek	30-seconds	30	min	30-minutes			

Configuration

This menu lets the user configure the serial outputs:



Pic. 3.0: Menu 6

Baudrate

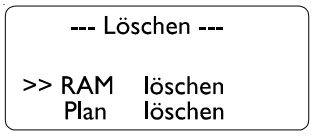
The baudrate is settable for COM0 and for COM1 in the following steps: 600, 1200, 2400, 4800, 9600, 19200, 38400 and 57600. The framing is settable as follows: 7E1, 7E2, 7O2, 7N2, 8E1, 8N1 or 8N2.

Output Mode

Both of the serial ports send a time string in three different output modes. Either on request only ("auf Anfr."; sending a '**?**' -ASCII-Code 3Fh- to the clock), once per second ("sekuendl.") or once per minute ("minuetlich").

Clear Data

It is possible to to clear each of the plans separate as well as the whole RAM. Press **MENU** as often until the following appears in the display:



Pic. 3.1: Menu ‘Löschen’

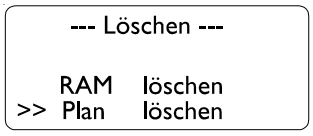
With the **NEXT** key the user can change between the two options (indicated by >>) while the **CLR/ACK** key is used to select one of the options.

Clear RAM

After selecting "RAM löschen" with the **CLR/ACK** key the user is asked to confirm the process again by pressing **CLR/ACK**. ATTENTION: All plans, switching programs, cyclic pulses and other configurations will be cleared. Pressing **NEXT** instead of **CLR/ACK** lets the clock return to the menu "Löschen" without clearing the RAM.

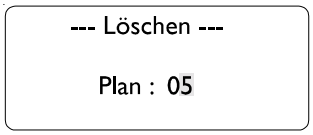
Clear Plan

The user can enter the menu to clear plans by pressing **CLR/ACK** while "Plan löschen" is marked with >>.



Pic. 3.2: Menu ‘Löschen’

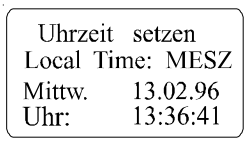
With the **INC** key the user can enter the concerning plan to be cleared (01-08). To abort press **MENU.** To confirm press **CLR/ACK,** the entered plan is cleared now.



Pic. 3.3: Menu ‘Löschen Plan’

Setting the Clock Manually

Setting the clock manually can be done in the menu ‘Uhr stellen’:



Pic. 3.4: Menü ‘Uhr Stellen’

After the time, date and day of week have been set the modifikation has to be confirmed by pressing **CLR/ACK**. Leave the menu by pressing **MENU**.

Configuration Time Zone

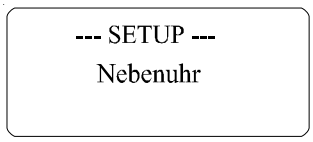
Each of the two serial interfaces can be assigned to a time zone. The user can select one of the following options for each interface: MEZ/MESZ, UTC or MEZ). The front panel display always shows the time zone assigned to COM0. To confirm modifications press **CLR/ACK**.

Slave Clock Operation

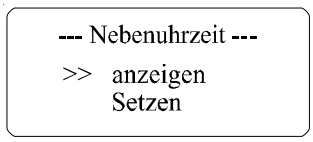
The HSC509 generates slave clock pulses that are able to control slave clocks. These bipolar pulses have a level of 24V.

In case of power supply failure the time is saved in a buffered memory. After restart of the system the lost pulses are generated automatically so that the slave clocks will be set correctly. The extra minute pulses are added every two seconds. The pulse duration of the minute pulses is 1s, the duration of the second pulses is 0.5s.

The master clock has no feedback from the slave clocks to find out what time they show. So if the system is turned on for the first time or slave clocks are added, the slave clocks must be initially set to a well defined state. This can be done in the menu ‘Nebenuhr setzen’.



Pic. 3.5



Pic. 3.6

Pic. 3.5: The menu ‘SETUP Nebenuhr’ lets the user enter the submenu ‘Nebenuhrenzeit’ by pressing **CLR/ACK**.

Pic. 3.6: In this submenu the user can choose eiter to see the slave line time displayed (>>anzeigen) or to set the slave line time/the slave clocks (>>setzen). The choice is done by pressing **NEXT** and confirm with the **CLR/ACK** key.

Display Slave Line Time

The actual slave line time is displayed. There are three modes:

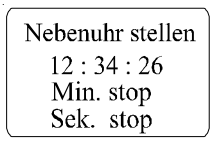
1.) normal mode: slave line time is synchronous with the clock's time

2.) hold mode line time > clock time; line time waits for clock time

3.) follow mode line time < clock time; line time catches up clock time

Set Slave Line Time/Slave Clocks

When the menu '>>setzen' is selected the slave line is stopped and no pulses are generated until the menu is leaved.



Pic. 3.7

In the second line the user can edit the slave line time. Here the current time of the slave clocks should be entered. After confirming with **CLR/ACK** the time is saved in the RAM and the HSC509 starts generating pulses on the slave lines. The slave line time is displayed either waiting for the clock time or trying to catch up the clock time. It is possible to pulse the minute and the second line manually by changing 'stop' into 'run' behind the according line MIN. or SEK.. In this mode the internal slave line time is also incremented, so it is necessary to check it again before the menu is confirmed with the **CLR/ACK** key. The displayed slave line time must match exactly with the slave clocks time. Otherwise the slave line time is to set again.

In the set-manually mode it is easy to check the right polarity of the bipolar minute and second line pulses:

If an odd value for the slave line minute or the slave line second is displayed, the corresponding hand of the slave clocks must move to an odd count. The even values must behave correspondingly. If one of the slave clocks behaves contrary, it must be connected to the master clock with reverse polarity.

Setup Relay State

In the menu 'SETUP Schaltzustände' it is possible to set or to clear the relays manually regardless of the switching programs. The display shows the four relays with the corresponding state. Using **NEXT** and **INC** lets the user switch on or off each of the relays.

With the **MENU** key the user leaves this menu. The relays return to the state they have had before entering the setup relay state menu.

Firmware Updates

Whenever the on-board software must be upgraded or modified, the new firmware can be downloaded to the internal flash memory via the serial port COM0.

If the **MENU** key is pressed while the system is powered up, a bootstrap-loader is actived and waits for instructions from the serial port COM0. The new firmware can be sent to the HSC509 from any standard PC with serial interface. A loader program will be shipped together with the file containing the image of the new firmware.

The contents of the program memory will not be modified until the loader program has sent the command to erase the flash memory. So if the **MENU** key is pressed unintentionally while the system is powered up, the firmware will not be changed accidentially. After the next power-up, the system will be ready to operate again.

Inquiring Serial Number and Software Revision

The serial number and the revision of the loaded software can be red out by sending the three characters "**SN!**" via COM0 to the clock that starts sending the following string:

```
SN:HSC509 9041260  REV:01.00/01
```

The software revision is updated automatically with every update of the firmware. The serial number is fixed in an I^2C bus EEPROM and can not be changed.

Technical Specifications HSC509

HOUSING:	plastic housing for wall mounting, Bopla RegloCard-Plus 1700 Front panel aluminium (100mm high, 160mm wide)
PROTECTION RATING:	IP43
PHYSICAL DIMENSIONS:	193mm wide x 160mm high x 131mm deep

Rear Panel Connectors

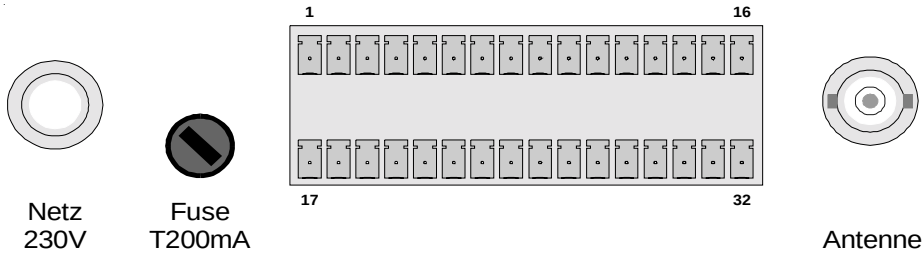
Name	Type	Signal	Cable
ST1	32pin Phoenix MCD		unshielded
Antenna	BNC	77.5 kHz	shielded coaxial cable
Power supply	power cord receptacle	230V/50Hz	power supply cord

CE Label

CE

This device conforms to the directive 89/336/EWG on the approximation of the laws of the Member States of the European Community relating to electromagnetc compatibility.

Pin Assignment of the Phoenix MCD Connector



	oben		unten
1	P_SEK gerade	17	TxD (COM0)
2	P_SEK ungerade	18	RxD (COM0)
3	P_MIN gerade	19	GND
4	P_MIN ungerade	20	OUT- (COM0)
5	REL1 on	21	OUT+ (COM0)
6	REL1 off	22	VCC
7	REL1 com	23	IN+ (COM0)
8	REL2 on	24	IN- (COM0)
9	REL2 off	25	TxD (COM1)
10	REL2 com	26	RxD (COM1)
11	REL3 on	27	GND
12	REL3 off	28	OUT- (COM1)
13	REL3 com	29	OUT+ (COM1)
14	REL4 on	30	VCC
15	REL4 off	31	IN+ (COM1)
16	REL4 com	32	IN- (COM1)

Technical Specifications

RECEIVER:	Direct conversion quadrature receiver with automatic gain control Bandwidth: approx. 20Hz
DISPLAY:	LC-Display, 4 x 16 characters Power (Netz), modulation (Mod.), field strength (Feld) and running on XTAL (Freil.) indicated by LEDs
TIMECODE CHECK:	multiple software check of the incoming timecode parity and consistency check over a period of two minutes
RUNNING ON XTAL:	without RF signal the clock runs on XTAL with an accuracy of 10^{-6}
BUFFERING:	In case of supply voltage failure the on-board RTC keeps the time based on XTAL and the content of the RAM for more than 100 hours (buffer capacitor) optional lithium backup battery (life time: 10 years)
RELIABILITY OF OPERATION:	A software watchdog lets the microprocessor recover from malfunction. A power-fail comparator resets the microprocessor if the supply voltage drops below a specified threshold.
SLAVE LINE OUTPUTS:	bipolar slave clock pulses (minute and second), DC isolated, short circuit proofed pulse voltage: 24V pulse current: 0.6A max. pulse width: 1s (minute slave line) 0.5s (second slave line)
OUTPUTS:	4 relay outputs (changeover contact); max. 50W load each

INTERFACES:	2 independent interfaces (COM0 and COM1) baudrate, framing, output mode and time zone are configurable for each interface
COM0:	1 RS232 output, 1 RS232 input 1 active/passive current loop output 1 active/passive current loop input
COM1:	1 RS232 output, 1 RS232 input 1 active/passive current loop output 1 active/passive current loop input
TRANSMISSION SPEED:	configurable by menu 600, 1200, 2400, 4800, 9600, 19200, 38400 or 57600 baud
FRAMING:	configurable by menu 7E1, 7E2, 7N2, 7O2, 8E1, 8N1 or 8N2
OUTPUT MODE :	configurable by menu once per second, once per minute, only on request ("**?**")
TIME ZONE:	configurable by menu MEZ/MESZ=CET/CEST, MEZ=CET, UTC
OUTPUT STRING:	refer to: "Format of the Meinberg Standard Time String"
CONNECTORS:	Phoenix MCD 1,5/16-G1-3,81 (32pin connector) coaxial RF connector (BNC type)
ANTENNA:	active external ferrite antenna in a plastic case Length of the cable: up to 100m or more without amplifier
POWER REQUIREMENTS:	230V AC, 50Hz, @100mA
HOUSING:	Bopla RegloCard-Plus 1700 193mm wide x 160mm high x 131mm deep protection rating: IP43
AMBIENT TEMPERATURE:	0 ... 50°C
HUMIDITY:	max. 85 %
OPTIONS:	Hardware and software modifications accordding to customer specification

Format of the Meinberg Standard Time String

The Meinberg Standard Time String is a sequence of 32 ASCII characters starting with the STX (start-of-text) character and ending with the ETX (end-of-text) character. The format is:

<STX>D:*dd.mm.yy*;T:*w*;U:*hh.mm.ss*;*uvxy*<ETX>

The letters printed in *italics* are replaced by ASCII numbers whereas the other characters are part of the time string. The groups of characters as defined below:

<STX> Start-Of-Text (ASCII code 02h)

dd.mm.yy the current date:

dd	day of month	(01..31)
mm	month	(01..12)
yy	year of the century	(00..99)

w the day of the week (1..7, 1 = Monday)

hh.mm.ss the current time:

hh	hours	(00..23)
mm	minutes	(00..59)
ss	seconds	(00..59, or 60 while leap second)

uv clock status characters:

u: '#' clock has not synchronized after reset
' ' (space, 20h) clock has synchronized after reset
v: '*' DCF77 clock currently runs on XTAL
' ' (space, 20h) DCF77 clock is sync'd with transmitter

x time zone indicator:

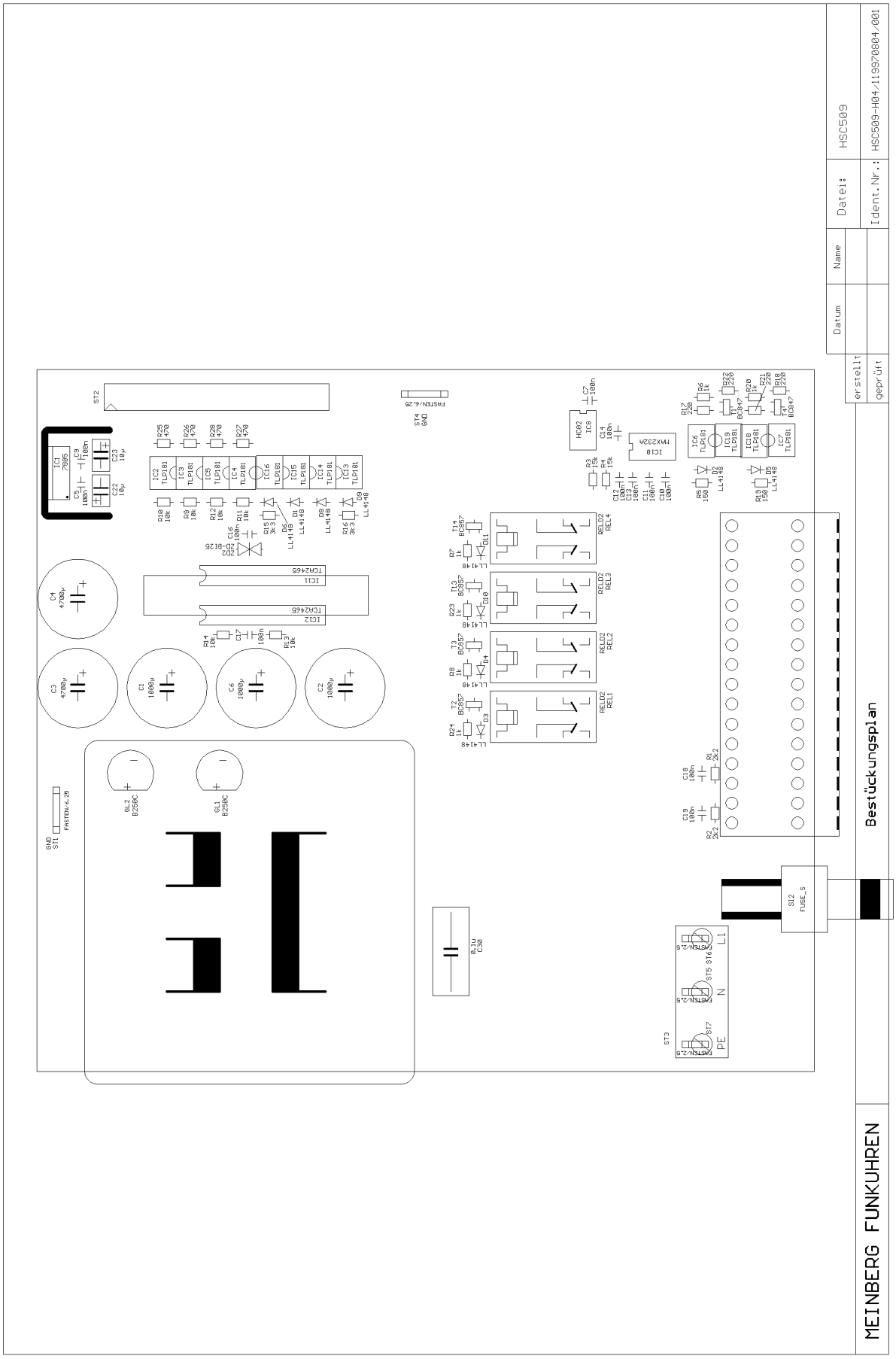
'U'	UTC	Universal Time Coordinated, formerly GMT
' '	MEZ	European Standard Time, daylight saving disabled
'S'	MESZ	European Summertime, daylight saving enabled

y anouncement of discontinuity of time, enabled during last hour before discontinuity comes in effect:

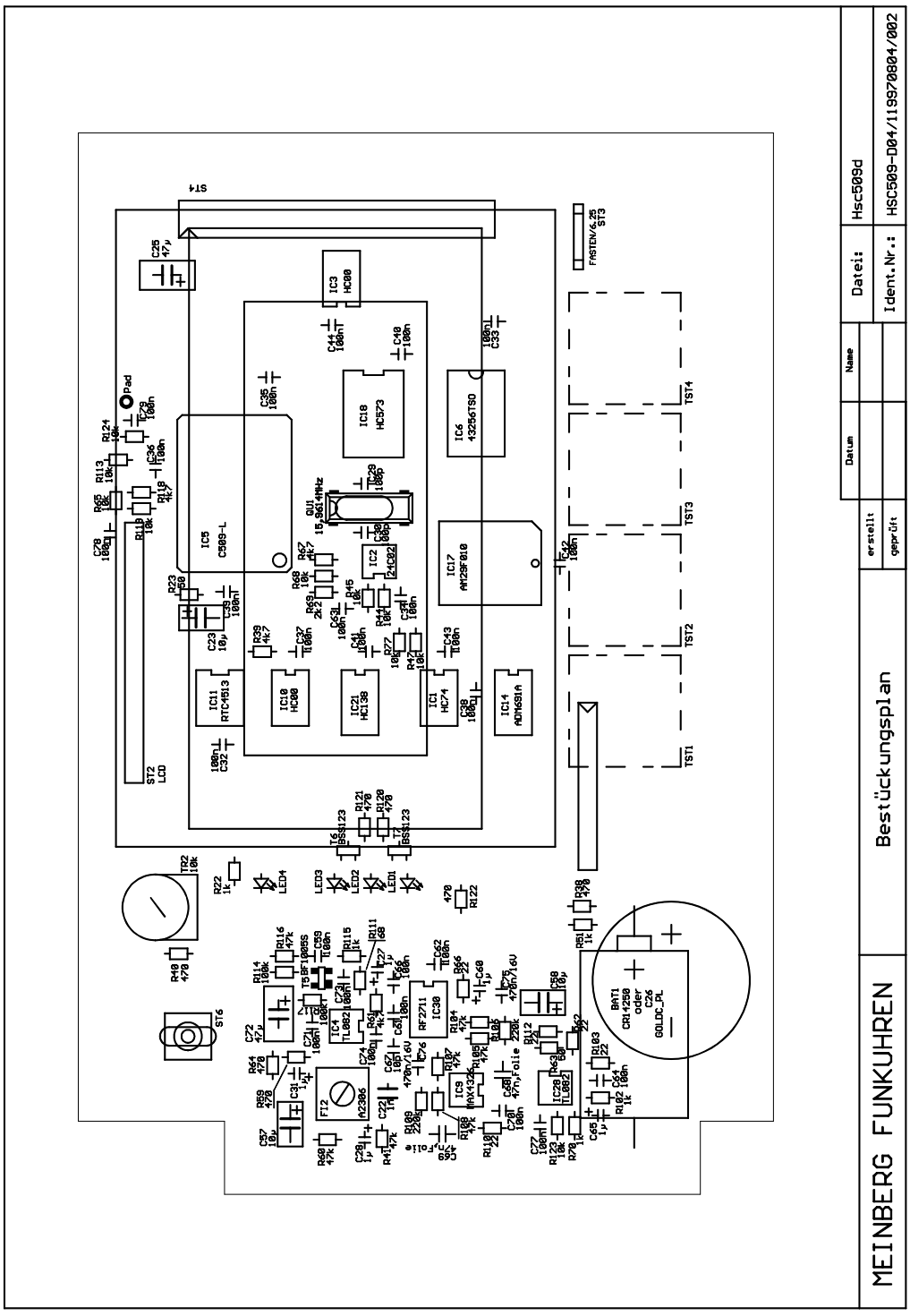
'!' announcement of start or end of daylight saving time
'A' announcement of leap second insertion
' ' (space, 20h) nothing announced

<ETX> End-Of-Text (ASCII code 03h)

Component Layout Main Board



Component Layout Display Board



Menu Quick Reference