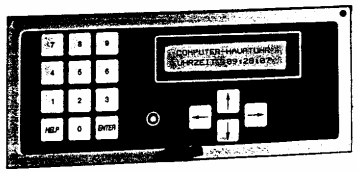
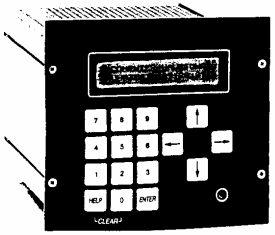
Fully automatic
Computer Signal Master Clock
with radio receiver *KHU 2100*
and
KHU 2440





User Manual

Safety directions

Appointed use

- The equipment is determined exclusively for the control of slave clocks, signal and switch units, which are without own safety functions.
- Every other use must be considered as not appointed. Damages, resulting but of such misuse must be considered as sole risk of the user and are not guaranteed by the manufacturer.
- The equipment is not flameproof.

  An implementation or use of the equipment in explosive hazardous areas or atmospheres ist not considered an appointed use. For damages, resulting out of such use the manufacturer/supplier is not responsible.
- An appointed use of the equipment includes observance of the manufacturer's operation- and maintenance conditions.
- Interventions by manual control may be conducted only, if the particular person is acquainted with the equipment or has been informed of the possible dangers.
- The general rules for the prevention of accidents and other generally acknowledged safety requirements as well as medical rules and regulations are to be observed.
- Unauthorized changes of the equipment exclude any responsibility of the manufacturer on any thus resulting damages.

Directions for the operator

- Operating- and safety directions must be read and observed prior to the implementation of the equipment.
- Opening of equipement only by competent and trained personnel.
- The equipment must be de-energized during maintenance and repair. The insulated parts must be reviewed for de-energization before continuation of the maintenance.
- Maintenance on electric parts of the equipment may be conducted only by an electrician or trained personnel under guidance and supervision of an electrician according to electric-technical regulations.
- Supplementing to the operating directions, general legal and other binding regulations of preventing accidents and observing environmental safety are to be observed.

Directions for equipment safety

- The equipment has been constructed according to present technical level and acknowledged technical safety regulations. However upon improper use, there may be safety hazards for users or third parties, determination of the equipment and other values.
- Equipment is to be used only in unobjectable condition and by observing the implementation directions! Especially distortions, which may impair safety, are to be eliminated immediately.
- Equipment is to be implemented with the voltage, marked on the type label, only. The type label is placed on the inside of the front plate.
- Spare parts must be in accordance with the technical requirements, determinated by the manufacturer. This is always guaranteed with the original spare parts.
- Mounting of clock only by trained personnel.
- For a wall installation use stationary equipment with component conductor connection. Observe existing electrical lines and prewired connections.

Contents

Chapter 1

Introduction

Presentation

The **KHU 2100** family is a newly developed and future oriented series of master clocks including signal devices.

Based on a high performance micro processor this series allows even more and complex utilizations. The comfortable handling makes programming and initial installation very simple.

The **KHU 2100**-series is available with various features and performance levels. Upon request, we conduct the system startup , i. e. the programming of the equipment here at our plant. This would offer the advantage that the device would be applicable immediatly after being delivered and connected to power supply.

If you decide to do the programming yourself, we would recommend to take notes of settings and parameters. You may use the annex pages forseen for these notes. Before programming the device however, you should record all the parameters.

This manual will give you a step by step indication how to handle the **KHU 2100**. It contains all the information about the functions which are important for you as operator or user of this equipment.

We recommend to study this manual carefully prior to implementation or setting of the device and to keep it on hand at any time. You will thus avoid unnecessary and time consuming questions.

The devices are extremely dependable and have undergone thorough tests. If despite of this fact any distortion arise which cannot be corrected with the help of the manual, our service department or your nearest distribution partner will be at your service any time.

The new device - series **KHU 2100** offers many new performance characteristics.

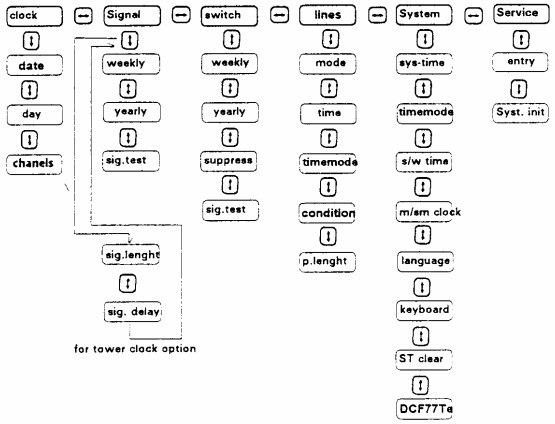
- operating voltage 230 V / 50-60 Hz with power monitoring;
- total performance 12V / 0,5A or 24V / 0,25A;
- total performance 12V / 0,5A , 24V / 0,25A ;
- switchable for 12V or 24V - systems with power monitoring;
- power reserve for the lines;
- up to 2 slave clock lines / free programming of minute-, half minute- or second-lines;
- monitored slave clock lines, short circuit proof;
- up to 2 signal circuits / potential free 250V / 8A;
- operating as quartz clock, submaster clock or radio controlled by DCF 77 - receiver
- dimensions (h / w / d) : 150 / 230 / 88 mm;
- LC-display for clear text indication of all system messages (time, slave clock time, operating times, distortions, etc...);
- programming with operator prompting (auxiliary text) in dialogue regarding display and keyboard;

- automatic time switch summer/winter selective by manual input, endless calender or radio receiver (DCF77)
- control of the receiving quality of DCF77-signals via display, via LED on the keyboard or via LED in the DCF77-receiver box.
- programming of up to 300 operating times.
- data and parameter safeguarding up to 1 year after power failure.
- slave tracking device for lines and circuit suppression after power failure.
- buffered time up to 1 year during storage and up to 3 month after power failure.
- fully automatic line time correction upon implementation, service or after power failure.
- fully automatic line time correction upon implemmentation, service or after power failure.
- various languages (German, English, French).
- keyboard locking by a 4 digit-code.
- free programming of line pulse lenght (fromm 200 ms to 5 s, and fromm 200ms to 10s for tower clock option) for each liner.
- manual control of each channel is possible at any time.
- switching- and signal-times to be programmed as daily, weekly or yearly.
- pulse repetition upon signal funktion to be programmed.
- operating time suppression and single shots to be programmed.
- can be used as a submasterclock.

Presentation of KHU 2442:

The **KHU 2442** complets the functions of the KHU 2100.
The total performance is 100 slave clocks (0,5A/24V or 1A/12V).
The KHU 2440 has 4 signal circuits.
The programming is like the KHU 2100.
Characteristics:
- Total performance 15VA
- Line performance 12V/1A or 24V/0,5A (up to round about 100 slave clock movements)
- 4 signal circuits: potentialfree, changeover relais, 230V/8A for each relais.

Menu-Chart KHU2100 (2442)



Clock series KHU 2100:

Type	minute outlet	second outlet	number of signal circuits	number of slave clock lines
KHU 2101	•	•	-	1
KHU 2102	•	•	-	2
KHU 2111	•	•	1	1
KHU 2122	•	•	2	2
KHU 192101	•	•	-	1
KHU 192102	•	•	-	2
KHU 192111	•	•	1	1
KHU 192122	•	•	2	2

Clock Series KHU 2442:

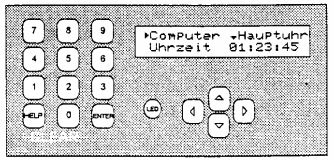
Type	minute outlet	second outlet	number of signal circuits	number of slave clock lines
KHU 2441	•	•	4	1
KHU 2442	•	•	4	2
KHU 192441	•	•	4	1
KHU 192442	•	•	4	2

Order - No. :	Option
OPT - FU 570	radio receiver module (IP 40) with 5 m cable
OPT - FU 570A	radio receiver module for outdoor use (IP 65) with 5 m cable
OPT - KAB	extension flex for the FU 570 (LIYCY 3x0,5 with screening)
OPT - AKKU 270/2	power reserve appr. 270 mAh
OPT-MZW-KHU	tower clock module with interrupt of the follow-up device
OPT-NU 100	greater total output (0,5A / 24V), only for the KHU 2100 serie
OPT-Fremdnetz	Linkage to an external power pack 12 oder 24 V =
OPT - Programm	programming in our plant , control system for a striking mechanism.

Symbols and abbreviations

- use „**enter**"-key;
- use cursor key „**right**";
- use cursor key „**left**";
- use cursor key „**up**";
- use cursor key „**down**";
- use cursor keys „**0**" to „**9**";
- use cursor key „**help**";
- hold key „**Help**" down and use key „**0**";

Symbols in front of menu items indicate possible executable functions.



- ▲▼ Cursor towards up and down
- ◆ Cursor towards right and left
- ◂ Cursor towards left
- ▸ Cursor towards right
- ▾ Cursor towards down
- ▴ Cursor towards up
- ▮ No Cursor

No symbol means, the indicated function is active;
(after using key „ENTER")

Notice : There is a „help" text implemented for each menu item. Always use the help function by pressing the „help"-key down!

Data input / Programming

With the four arrow cursors the display may be switched from menu item to the next one.

Indication of current time

```
▸Computer ▾ma.clock
clock      14:01:23
```

Indication of current date

```
▸Computer ▾ma.clock
▮date      16.05.1995
```

Indication of current weekday

```
▸Computer ▾ma.clock
▮day   . T . . . . .
```

Indication of current channel conditions

```
▸Computer ▾ma.clock
▮cha.      .2
```

By pressing down the „help" key, a help text can be faded in on the second display-line at any time. The help text disappears after releasing „help" key.

Help text:

```
▸Computer ▾ma.clock
 input = E/cont ◂ ▸▾▴
```

Basic setting (default)

clock mode	24 hour clock (14:00:00)
date mode	DD,MM,JJ (25.05.95)
S/W-switching	AUTO (*on* month 3=march, *off* month 10=october)
relay	all OFF
line 1	minute line, 12 hrs., pulselength 1 sec., pulsedelay 2 sec.
line 2	second line, 12 hrs., pulselength 0.5 sec., pulsedelay 1 sec.

Manual switching:

Here you can switch the channels on or off manually. With the four cursor keys you can change the display from one point of menue to the next.

Display of the actual time t

```
►Computer ▼ma.clock
 clock 01:00:30
```

Display of the actual date

☞↓

```
►Computer ▼ ma.clock
■Date   16.05 1998
```

Display of the actual day of the week

☞↓

```
►Computer ▼ ma.clock
■day  .T.....
```

Display of the actual state of the channels

☞↓

```
►Computer ▼ ma.clock
■channels  .  .  .  .
```

Here it is possible to switch the channels K1 to K2 (K1 to K4 for the KHU2440) on or off manually.
By pressing the key 1 to 2 (1 to 4 for the KHU2440) the corresponding channels are switched on.

Input of the number of the channel;

☞O..9

```
►Computer ▼Hauptuhr
■channels  1 2 3 4
```

If you press the corresponding key again the channel (relais) is switched off. The channel is automatically switched off after the next programmed switch time ''off''.

☞O..9

```
►Computer.▼ ma.clock
■channels  .  .  .  .
```


Examples

Digital input: (i. e. date and time)

After pressing „Enter" or one of the digital keys, the actual input will be initialized into the present menu item.

The present cursor position is represented by means of a blinking signal and can be moved to the left and to the right by the cursor keys. The input of a value is implemented with the digital keys 0..9. After each input the cursor position is automatically moved one digit to the right. To leave the input mode you have to **press the „Enter" key**.

Time:

```
 System     ▲sys-time
▸time     = 01:00:30
```

☞E

```
 System      sys-time
 time      = 01:00:30
```

new time input;

☞O..9

```
 System      sys-time
 time      = 14:00:00
```

☞E

```
 System      sys-time
 date    = 01.01.1994
```

Date:

new date input;

☞O..9

```
 System      sys-time
 date    = 23.05.1994
```

☞E

```
 System     ▲sys-time
▸time     = 01:00:30
```

After pressing the „Enter" key, the new date is set.

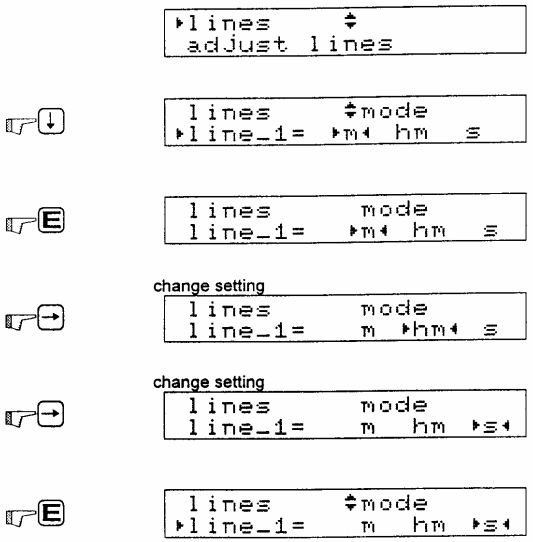
Examples

Input by selection: (line mode - line 1 set from minute to second line)

After pressing the „enter" key, the latest input is initialized to the present menu item. Afterwards the setting can be changed by using the „right" / „left" cursors.

The line may be set as minute, half minute or second line.

First of all, the menu group and the menu item must be selected by using the cursor keys. In addition, the cursor symbols in the first line show the possible selections which could be done by the indicated keys.



After pressing the „Enter" key the new line mode is valid.

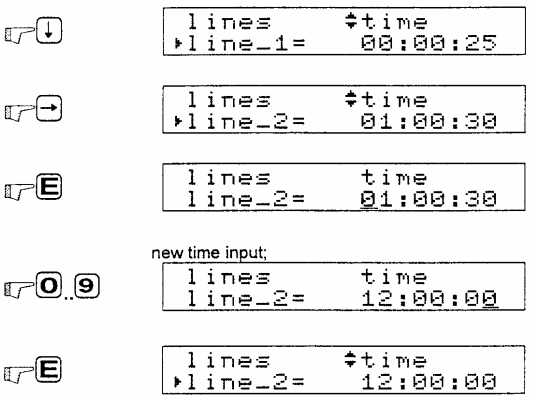
Examples

Setting of line time: (line 2)

Here an input of the actual time on the line must be done

Warning :	**Put the selection switch 12 / 24V of the power supply in the correct position, otherwise the line will remain on „stop".**
Caution :	**All slave clocks of one line must have identical pointer positions and equal polarity.**

First of all, the menu group and the menu item must be selected by using the cursor keys. In addition, the cursor symbols in the first line show the possible selections which could be done by the indicated keys.



After releasing the „Enter" key the the line will **Immediately run on system clock time.**

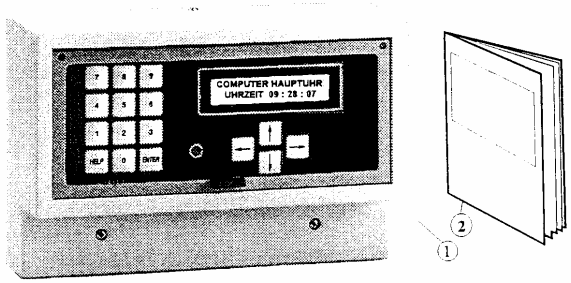
Caution :	**If the actual line is set as a second line (line mode) it will only activate the second input. In accordance after setting a minute or half minute line, the hour and minute input are activated only.**

Chapter 2

Installation

Extension of consignment

The following illustration shows model **HU 2100** for wall mounting without options and accessories.



pic. 1: extension of consignment

(1) Master clock
(2) User and installation manual

Installation conditions

Warning!
The assembly of the equipment as well as cable conducting is a building concerning installation measure by order of the user. Only authorized expert personnel in accordance with the generally valid regulations and instructions may conduct the mounting and operating of electronic/technical devices.

General conditions
The installation site must be selected as to

→ make vibration transfer to the device impossible
→ the device is not exposed to direct solar radiation.
→ limiting values for temperature and humidity are not to be exceeded.
→ intense suspended matters, such as dust, powder, etc. are to be avoided, as well as a direct effect of liquids and damp substances of any kind.
→ the device will be kept clear of dirt intensive manufacturing processes.
→ the device is not exposed to sources of disturbances, such as motors, electric magnets, series inductors etc.

Installation conditions

Connection to power supply

→ Connection to sytem voltage as specified on nameplate only.
→ Minimum diametre of supply conductor 1,5 mm².
→ Litz wires in supply conductor are not permitted.
→ A disconnecting device within the building power current installation, f.ex. fuse, switch etc. is to be foreseen, which makes a contact opening of at least 3 mm per pole possible.
→ Building concerning installation in accordance with VDE 0100 or corresponding national and international regulations in accordance with DIN and ISO and EN is to be observed.

Warning!
Equipment must be sufficiently earthed during installation of cable system.

Building concerning precautions

→ power- and signal- conductor, f.ex. during signal operation or DCF-connection are fixed installed as surface- or flush-type installation.
→ insertion of wiring on upper side of housing.
→ national and international safety regulations are to be observed.

Equipment specific conditions

→ fixed installed lines.
→ installation in interior areas.
→ component conductor connection, fixed wiring.
→ equipment is concipated for continuous operation.

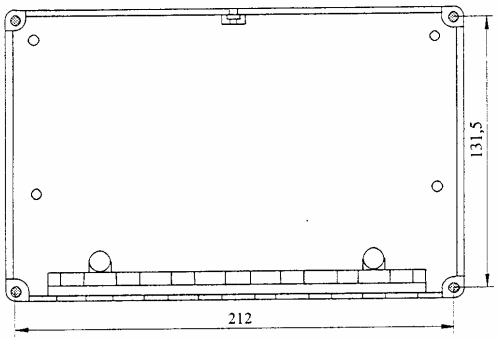
Equipment installation

Warning!
Installation may be conducted only by an authorized electo expert or by skilled and qualified personnel.
During assembly the disconnection of power current supply must be safeguarded.

Preparation:

1. Take off case cover.

Monting:



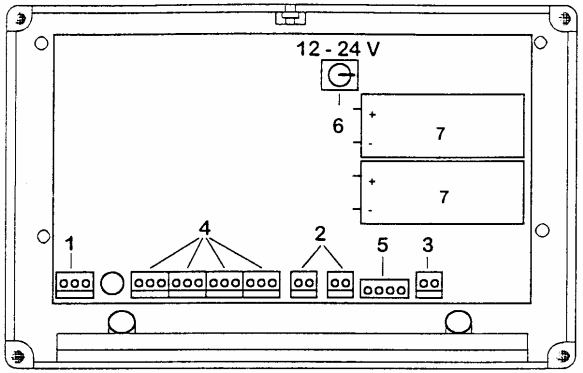
Pic. 2: Monting - plan

1. device is mounted to wall warp-free.
2. minimum size of the screws in dial Ø 4,0 x 25 mm.
3. for better reading of the display, the master clock should be mounted in eye height.

Equipment connecting:

Survey:

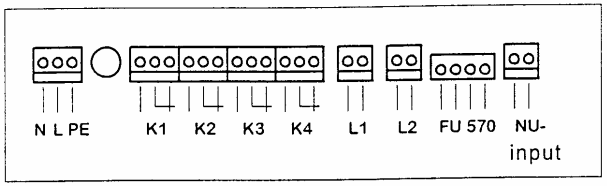
The device family KHU2100 (2442) has seven cable glands at the top of the case, which may be pulled out by heavily pressing the shanks together. The hoods of the cable glands may then be cut off according to thickness of the cable.



pic. 3: equipment view inside

(1) supply terminal for 230V voltage supply
(2) supply terminal for slave clock line 1 and slave clock line 2
(3) supply terminal for slave clock input (cascade for sub master clock-mode)
(4) supply terminal for channels K1 to K2, (K1 to K4 for the KHU 2440)
(5) supply terminal for the radio receiver FU 570 / FU 570A
(6) selector switch 12 / 24 line voltage. The device does only work if you have chosen a line voltage (12 or 24 V).
(7) battery for power reserve (approx. 270 mAh; 6 hours for the KHU 2100; 4 hours for the KHU 2440)

Equipment connecting:

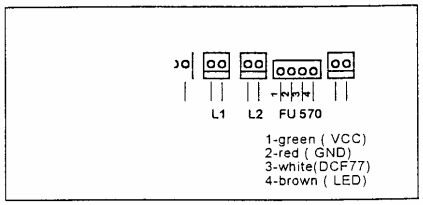


pic4: connection of block

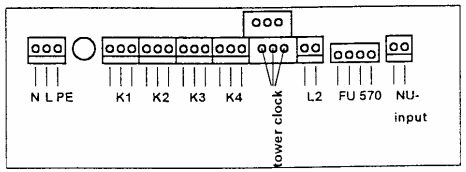
Radio receiver antenna FU570 (A)

only the connection of the radio receiver **FU 570 / FU 570 A** is possible.

Cable : i.e.: EDP-Cablel LIYCY 3 x 0,5 mm^2

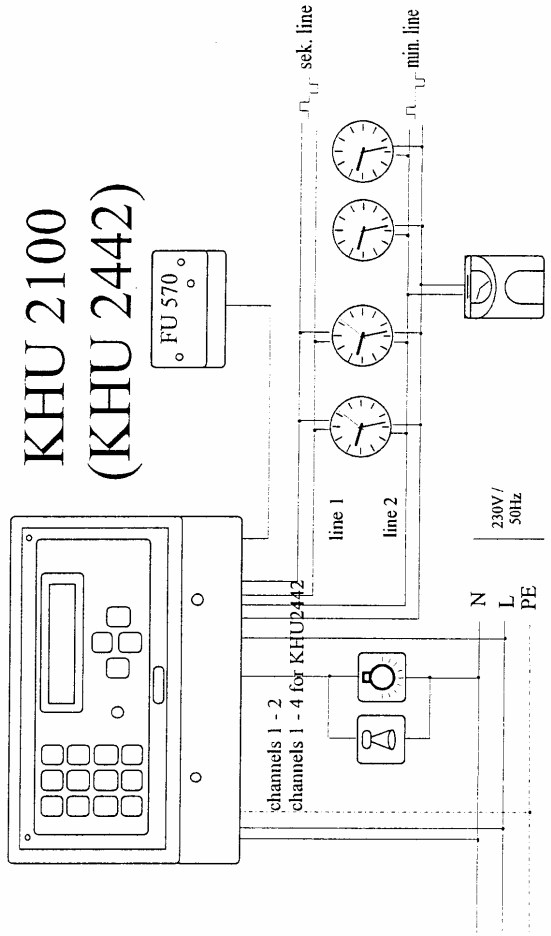


pic. 5



pic. 6

Equipment connecting



Device switch on

Upon first switch on of the device, initiating process ist startet. The device is initiated towards ist basic (default) setting. If you have had your device already programmed at the plant, then it will initiated with the presetted parameters.
Afterwards the internal quartz time is applied to the battery bufferd system time. On the display, the indication „**bat.empty**" may appear for appr. 2 minutes. This indication serves a protection of an optionally integrated power reseve and will disappear automatically.
If correction of system time becomes necessary, the systsm time will proceed in high speed (1/16 second) to the new time, however the lines will not be corrected until then. The device is now ready for operation.

Synchronizing the installation

The indication is normally synchronizing itself towards the exact radio time, internal quartz clock or in the mode of secondary main clock, to the master clock. If however the quartz time should at one time or another appear not to be correct, it may be newly adjusted in the menu system under menu item SYS-time.

Setting slave clock lines

The default - setting of lines are :

- line 1 (1,0 second pulse length)
- line 2 (0,5 second pulse length)
- all lines are 12 hour lines
- all pulse pauses are adjusted to double pulse length

In order to set a line, the corresponding line must be set through input of the actual line time (time as indicated on the slave clock) under menu item „**time**" in the menue „**lines**".
After this the line will be automatically corrected to system time.

It can be an advantage, to set the lines first on „STOP, in order to note the exact line times via the menue item condition and in the menue item lines.

Line making for a tower clock module:

- potential free contacts 230V/8A for the control of a tower clock movement.
- potential free contacts for the follow-upf device.
- lines:
  - line 1: control of the tower clock movement; pulse length 10 seconds adjustable (pulse pause = pulse length); pre-adjusted by us 5 seconds.
  - line 2: minute line; pulse length adjustable up to 10 seconds; pre-adjusted by us 1 second.

Note ! **After return to mains supply or in case of first implementation, the indication „bat.empty" may occur for appr. 2 minuts. This indication is necessary for the first loading minutes of the power reserve battery (it occurs generally even at clocks without a battery). During the indication of „bat.empty", the lines remain inactive.**

Chapter 3

Programming

Main - menu

time (display of current time)

COMPUTER MASTER CLOCK
TIME 14 : 32 : 21

date (display of current system date)

COMPUTER MASTER CLOCK
DATE 24 . 05 . 95

day (display of current weekday)

COMPUTER MASTER CLOCK
DAY . . M . . . . .

channels (display of channel status ; digit = channel **„ON“** ; U = channel **„suppressed“**)

COMPUTER MASTER CLOCK
CHA 1 U

Menu - signal KHU2100 (↵ = „ENTER“ - key)

weekly (input, change and erase of "weekly" signal times)

new /change / erase ↵	channel No. ↵	Mo ... Fr ↵	at 00:00:00 ↵	signal time ↵	repeat ↵

yearly (input, change and erase of "yearly" signal times)

new /change / erase ↵	chanel No. ↵	on 00.00 ↵	at 00:00:00 ↵	signal time ↵	once / always ↵	repeat ↵

Sign.test (hand signal of channels with keys 1.. 2)

channel No.

Menu - switching KHU2100 (↵ = „ENTER“ - key)

weekly (input, change and erase of " weekly" switch times)

new /change / erase ↵	channel No. ↵	Mo ... Fr ↵	at 00:00:00 ↵	on / off ↵

yearly (input, change and erase of " yearly" switch times)

new / change / erase ↵	channel No. ↵	on 00.00 ↵	at 00:00:00 ↵	once / always ↵	on / off ↵

suppressing (input, change and erase of channel suppressing)

new /change / erase ↵	channel No. ↵	on 00.00 ↵	at 00:00:00 ↵	once / always ↵	on / off ↵

sign.test (on-/off switch of channels with keys 1.. 2)

channel No.

Menu - lines KHU2100 (↵ = „ENTER“ - key)

Mode (minute-, halfminute- or second line)

Line_1	⇔	Line_2	⇔	Line_3	⇔	Line_4

Time (present line time)

Line_1	⇔	Line_2	⇔	Line_3	⇔	Line_4	⇔	cascade

Time mode (12 or 24 hour clock)

Line_1	⇔	Line_2	⇔	Line_3	⇔	Line_4	⇔	cascde

Line stop (stop lines for service and setting of secondary clocks)

Line_1	⇔	Line_2	⇔	Line_3	⇔	Line_4	⇔	cascade

pulse length (pulse length of the line pulses)

Line_1	⇔	Line_2	⇔	Line_3	⇔	Line_4	⇔	cascade

Menu - system KHU2100 (↵ = „ENTER“ - key)

SYS-time (date and time for quartz operation)

date	⇔	time

Time mode (changeover of time and date display)

date mode (TT MM / MM TT)	⇔	time mode (12 / 24 hrs clock)

S/W-time (summer- winter-time switchover)

off	⇔	auto	⇔	date

HU - UHU (master clock or sub master clock mode)

M.C	⇔	S.M.C

Language (selection of language)

germ	⇔	engl	⇔	fren

Keyboard (termination and opening of keyboard)

on / off

ST erasing (erasing of all switch- and signal times)

clear

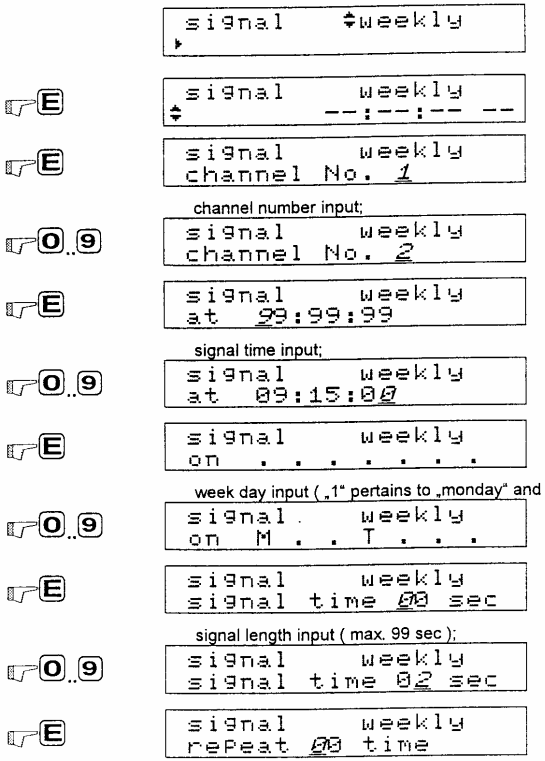
FU-test (DCF 77) (activating radio receiving test)

on / off

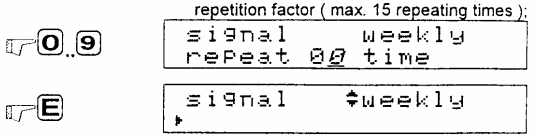
Signal time input:

weekly:

First of all the menu group and then the menu item are selected with the cursor keys. In addition, the displayed symbols in the first line indicate, which selections are possible and which keys can be used.



repetition factor (max. 15 repeating times);



After this the signal time is:

- channel 1 imp Mo,Tue by 09:15 length 2 Sec 1 time programmed.

Examples :

channel 1	imp	Mo,Fr	by 6:59	length 2 sec	1 time
channel 1	imp	Tue,Sa	by 7:00	length 5 sec	2 times

Caution : The repetition factor is used for repetition of the programmed signal time after a pause with the duration of the signal length;

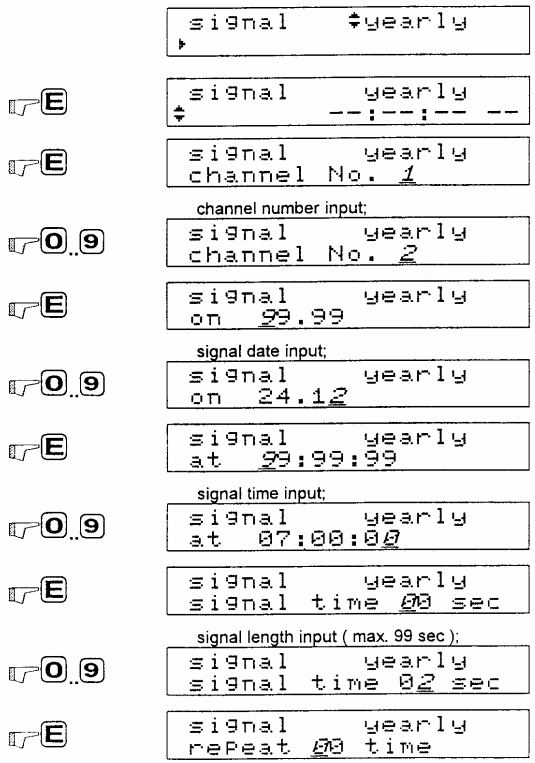
i. e.: 5 seconds signal and repetition factor 1

= 5 seconds signal - 5 seconds pause - 5 seconds signal

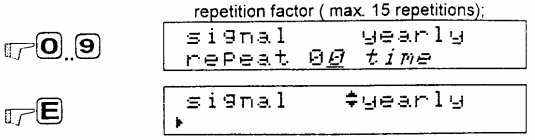
Signal time input:

yearly:

First of all the menu group and then the menu item are selected with the cursor keys. In addition, the displayed symbols in the first line indicate, which selections are possible and which keys can be used.



repetition factor (max. 15 repetitions);



After this the signal time is:

- channel 2 imp at 24.12. by 7:00:00 once length 2 sec 1 time programmed.

Examples :

channel 2 imp at 24.12. by 7:00:00 once length 2 sec 1 time

channel 2 imp at 20.06. by 7:15:00 always length 1 sec 2 times

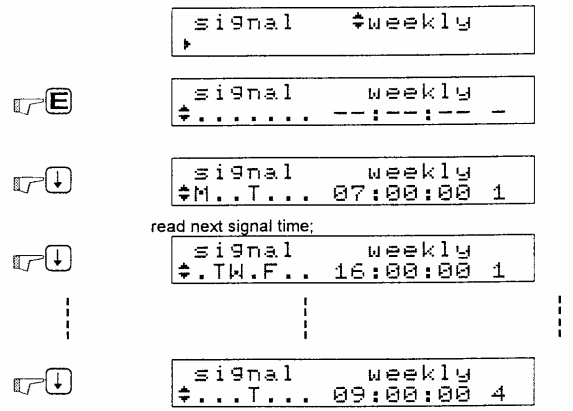
Caution : The repetition factor is used for repetition of the programmed signal time after a pause with the duration of the signal length;

i. e.: 5 seconds signal and repetition factor 1

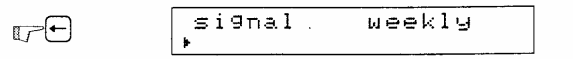
= 5 seconds signal - 5 seconds pause - 5 seconds signal

weekly:

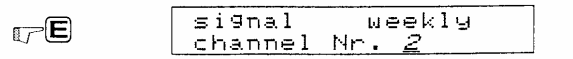
First of all the menu group and then the menu item are selected with the cursor keys. In addition, the displayed symbols in the first line indicate, which selections are possible and which keys can be used.



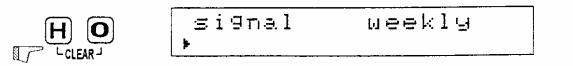
finish reading:



change: (further processing as in new input)

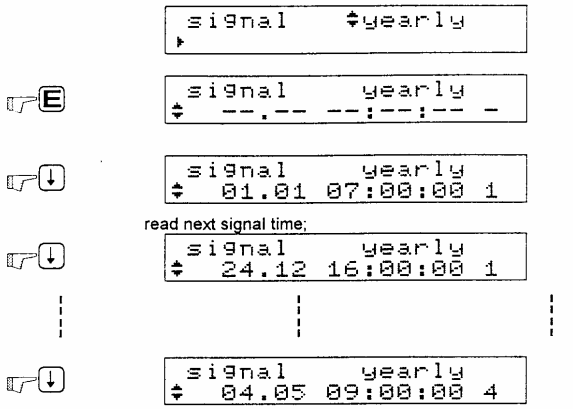


erase: (first press „help"-key , then „0"-key)

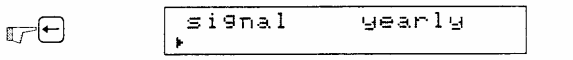


yearly:

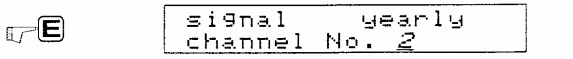
First of all the menu group and then the menu item are selected with the cursor keys. In addition, the displayed symbols in the first line indicate, which selections are possible and which keys can be used.



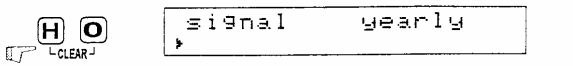
finish reading:



change : (further processing as in new input)

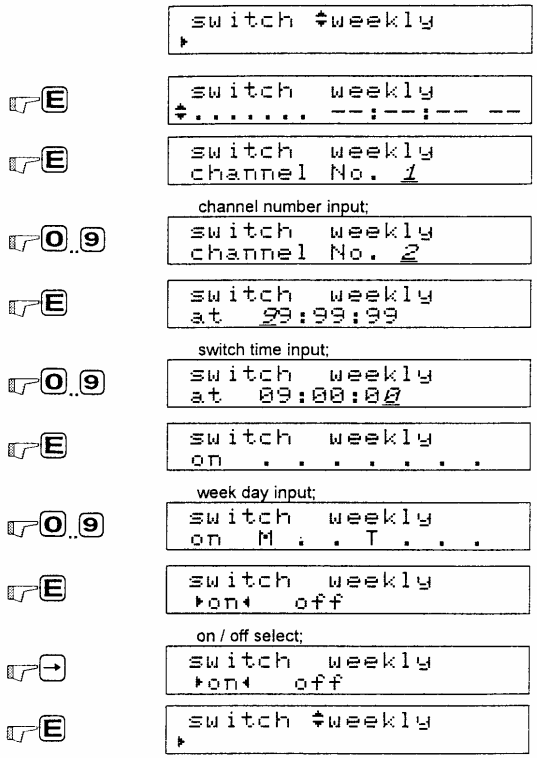


erase : (first press „help"-key, then „0"-key)



Switch time input :

weekly:
First of all the menu group and then the menu item are selected with the cursor keys. In addition, the displayed symbols in the first line indicate, which selections are possible and which keys can be used.



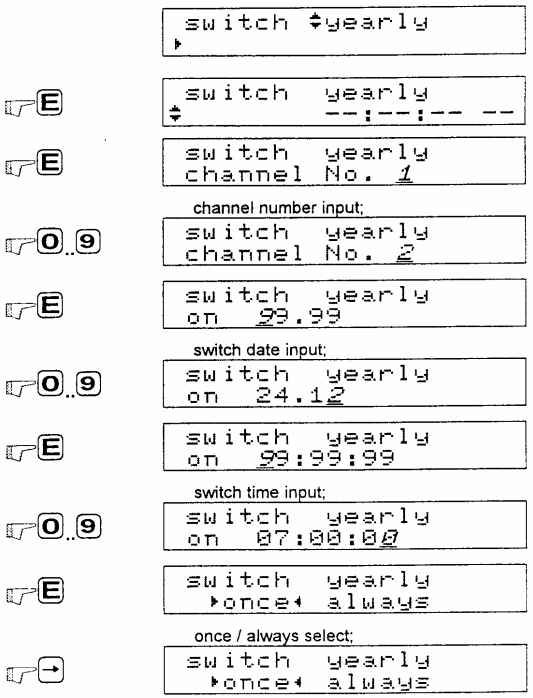
Afterwards the switch time is:
- channel 2 on Mo, Tue at 09:00:00 programmed.

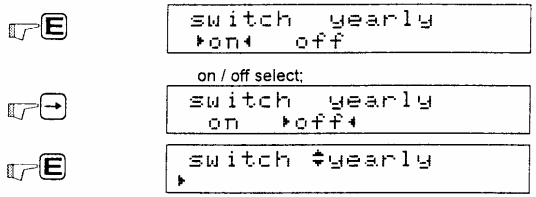
Examples :
channel 2 on Mo,We,Fr at 7:00:00
channel 2 off Tue,Thu,Sa at 17:00:00

Switch time input :

yearly:

First of all the menu group and then the menu item are selected with the cursor keys. In addition, the displayed symbols in the first line indicate, which selections are possible and which keys can be used.





After this the switch time is

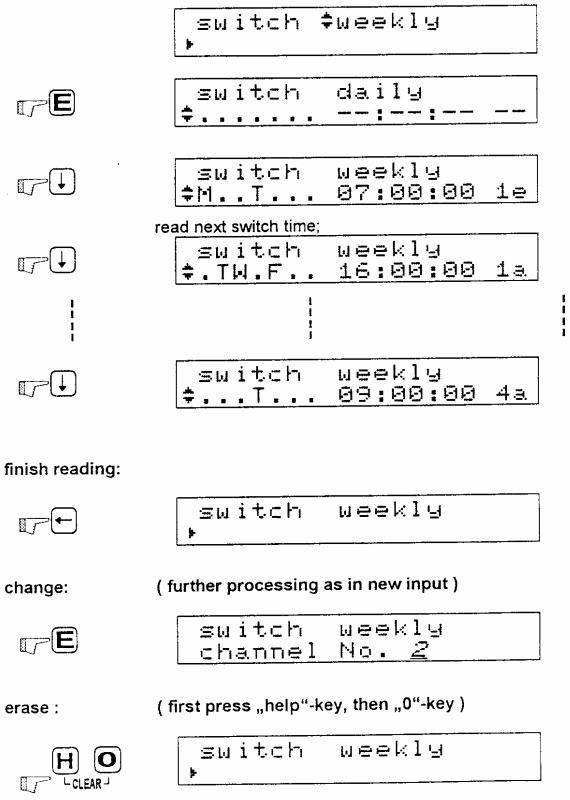
- channel 2 off on 24.12. at 7:00:00 once programmed.

channel 2 on on 02.03. at 7:00:00
channel 2 off on 24.12. at 7:00:00 once

Switch time reading / changing / erasing

weekly:

First of all the menu group and then the menu item are selected with the cursor keys. In addition, the displayed symbols in the first line indicate, which selections are possible and which keys can be used.



finish reading:

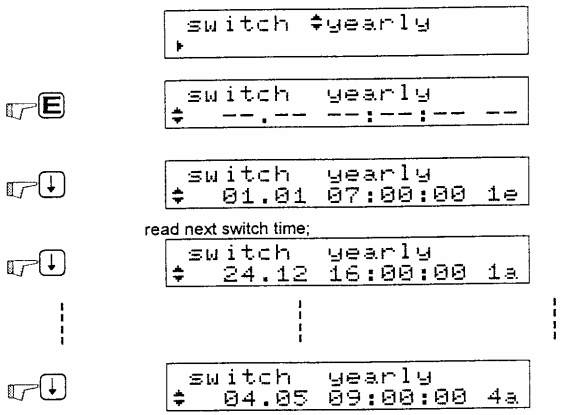
change: (further processing as in new input)

erase : (first press „help"-key, then „0"-key)

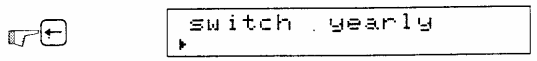
Switch time reading / changing / erasing

yearly:

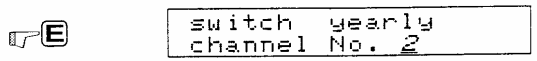
First of all the menu group and then the menu item are selected with the cursor keys. In addition, the displayed symbols in the first line indicate, which selections are possible and which keys can be used.



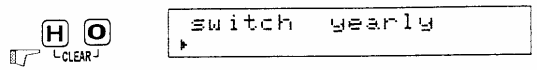
finish reading :



change: **(further processing as in new input)**

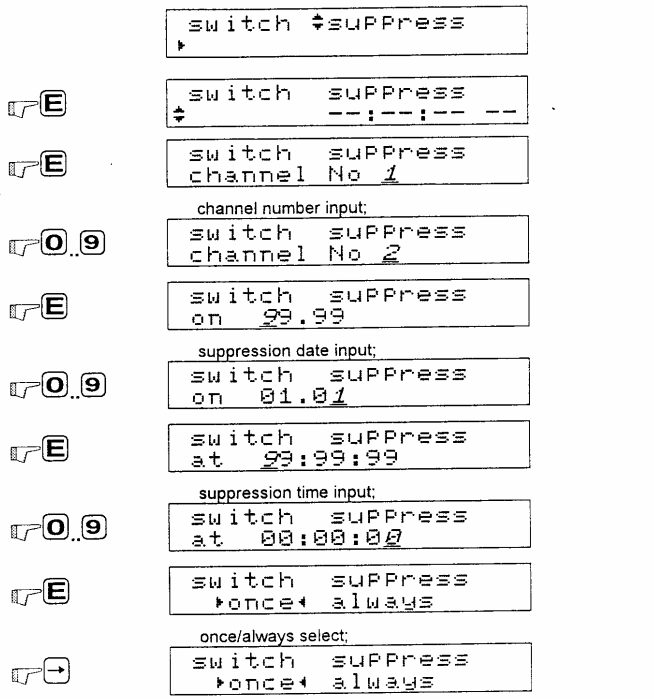


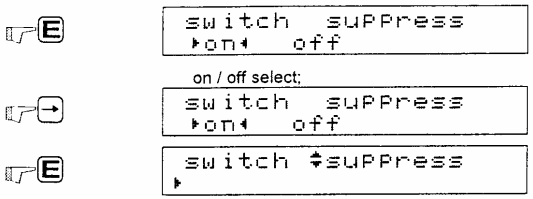
erase : **(first press „help"-key, then „0"-key)**



Suppression input:

First of all the menu group and then the menu item are selected with the cursor keys. In addition, the displayed symbols in the first line indicate, which selections are possible and which keys can be used.





After this the suppression is:
- channel 2 suppression on on 01.01. at 00:00 once
programmed.

Examples :

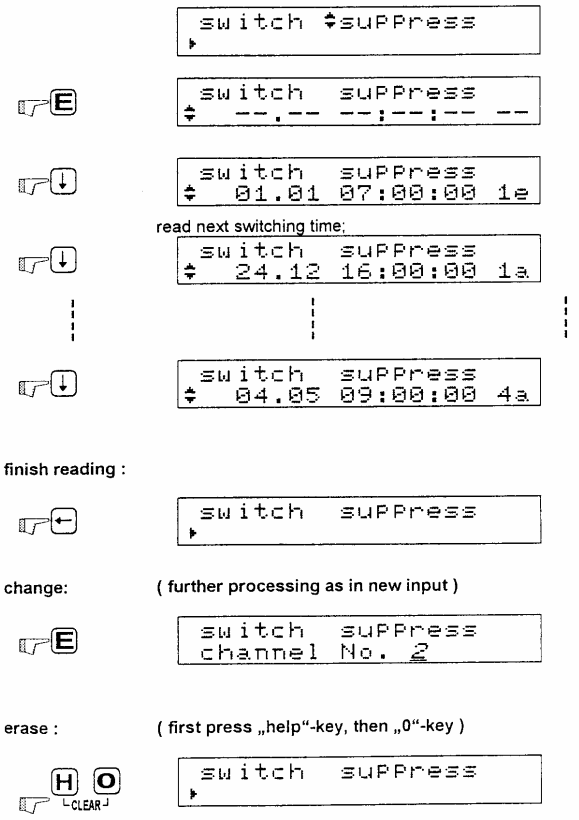
channel 2 suppression on on 01.01. at 07:00 once
channel 2 suppression off on 01.01. at 17:00 once

Warning!

To programme a signal suppression, you have to input the „ON"-suppression-time and the „OFF"-suppression - time.

Suppression reading/changing/erasing :

First of all the menu group and then the menu item are selected with the cursor keys. In addition, the displayed symbols in the first line indicate, which selections are possible and which keys can be used.



finish reading :

change: **(further processing as in new input)**

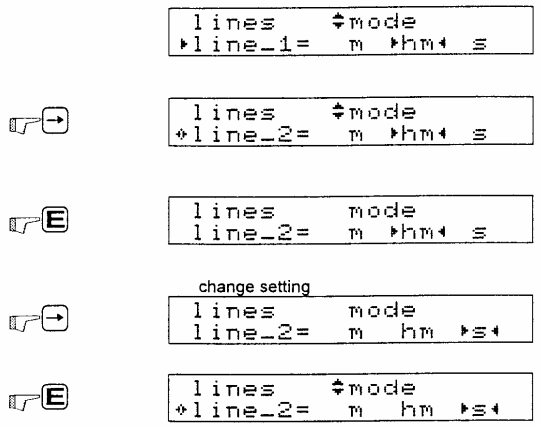
erase : **(first press „help"-key, then „0"-key)**

Setting lines

Line mode :

Here the line can be set as minute, half minute or second line.

First of all the menu group and then the menu item are selected with the cursor keys. In addition, the displayed symbols in the first line indicate, which selections are possible and which keys can be used.



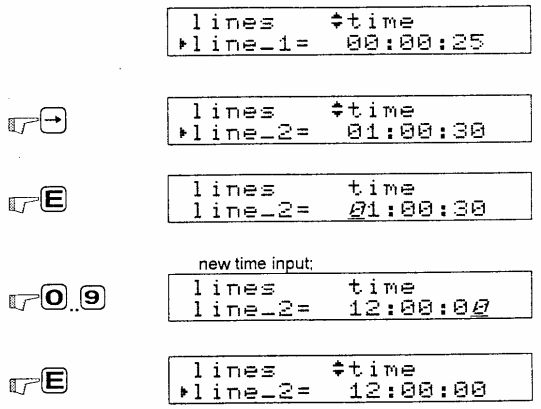
The new mode is valid after confirmation of the new line by the "enter" - key.

Setting lines

Line time :

The current line time can be set here. If the line had been halted before via "stop", it will be released by the finalizing input with "enter"..

First of all the menu group and then the menu item are selected with the cursor keys. In addition, the displayed symbols in the first line indicate, which selections are possible and which keys can be used.



After confirmation of the new time with the "enter" - key, the line will run on system clock time after key pressure.

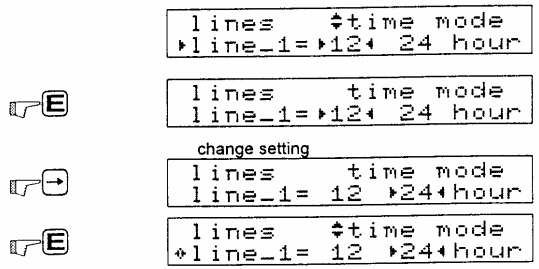
In the line mode " **minute**" and "**half minute**" the input seconds are ignored.
In the line mode "**second**" the input hours and minutes are ignored.

Caution : Programmed **minute lines** are always adjusted 1 minute prior to the system time and remain waiting for the synchronization with the system time. If the time to be adjusted is more than 11 hrs 54 minutes, the line for synchronization will stop. Programmed **second lines** remain on stop and synchronize themselves with the system second.

Setting lines

Line time mode:

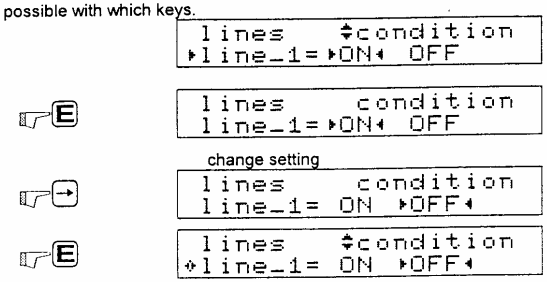
The current line can be set here as 12 or 24 hour clock. After setting of a 24 hour clock and possible follow-up a connected digital clock with a 24 hour display will also be considered.
First of all the menu group and then the menu item are selected with the cursor keys. In addition, the displayed symbols in the first line indicate, which selections are possible and which keys can be used.



The new mode is valid after confirmation of the new line mode with the "enter" - key.

Line stop :

Here the line can be stopped or started again for adjustment- or service-purposes. First of all the menu group and then menu item will be selected with the cursor keys. In addition, the indicated symbols on the first line indicate, which selections are possible with which keys.

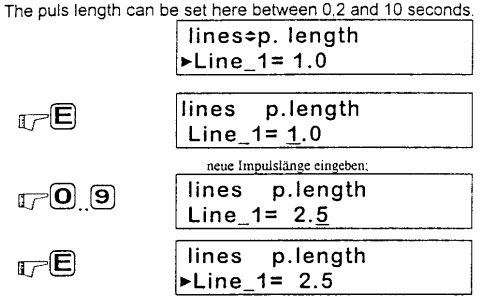


The new mode is valid after confirmation of the new line mode with the "enter" - key.

Setting lines

Puls length:

The puls length can be set here between 0,2 and 10 seconds.



The new pulse length is valid after confirmation of the new time with the „enter"-key.

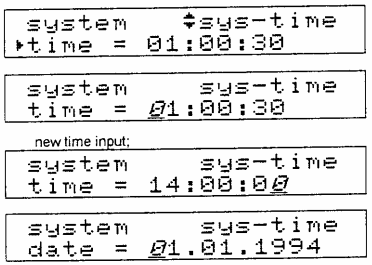
Caution!
The pulse pause is always adjusted to the double pulse length. (i.e.: pulse length = 1 sec => pulse pause = 2 sec)
Option tower clock module: pulse length = pulse pause, i.e. pulse length 10 sec, input must be 9.9.

Setting system time

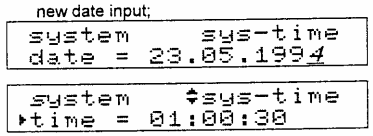
System time and system date can be set here.

First of all the menu group and then the menu item are selected with the cursor keys. In addition, the displayed symbols in the first line indicate, which selections are possible and which keys can be used.

Time:



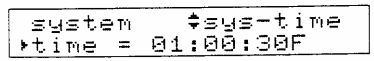
Date:



The new date is set after confirmation of the new date by the "enter" - key.

Indication radio receiver :

An "F" behind the system time, indicates that the radio receiver of the master clock is active. The radio receiver is started 2 times per night (2 and 3 o'clock). After system recovery, initial implementation and after radio reception test, the radio receiver will also be activated.



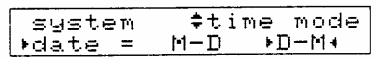
Caution : Radio receiver will also be activated without connection of a radio receiver. The advantage of this is, that a retrofitted radio receiver will be automatically identified.

Setting time mode

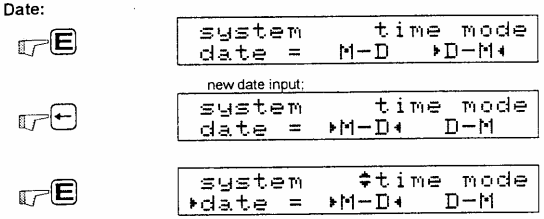
The system time display and the system date can be set here.

Caution : **The change of time display has no effect on the time input (system time, signal- and switch times)**

First of all the menu group and then the menu item are selected with the cursor keys. In addition, the displayed symbols in the first line indicate, which selections are possible and which keys can be used.



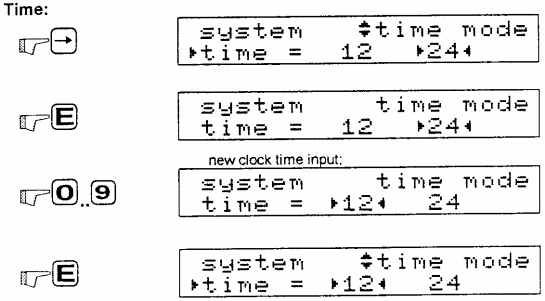
Date:



After confirmation with the "enter" - key, the new date mode is set. Afterwards the date of 23 June 1994 would be indicated as:

- 06 . 23 (.1994)

Time:



After confirmation with the "enter" - key, the new date mode is set. Afterwards i. e. the time of $14^{\underline{00}}$ h would be indicated as:

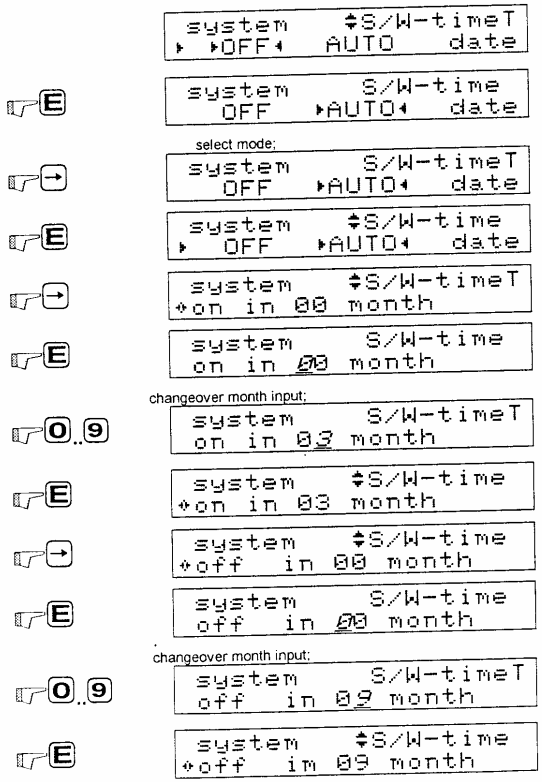
- 2 p (2 pm)

Summer- / Wintertime changeover

The mode summer-/ wintertime changeover can be changed here.
This menu item is active only as long as there is no radio receiver active(no FU 570 connected or reception distored).

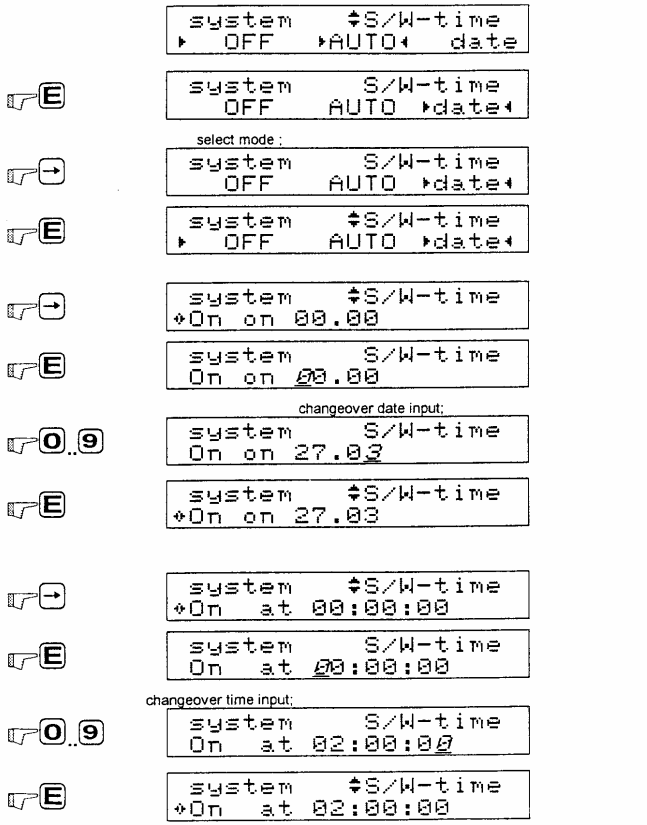
Off : No changeover here.

Auto :
After input of the changeover months the endless calendar is able to compute the exact changeover dates for all future years. (last Sunday within the programmed month at 2:00:00 CET)
First of all the menu group and then the menu item are selected with the cursor keys. In addition, the displayed symbols in the first line indicate, which selections are possible and which keys can be used.

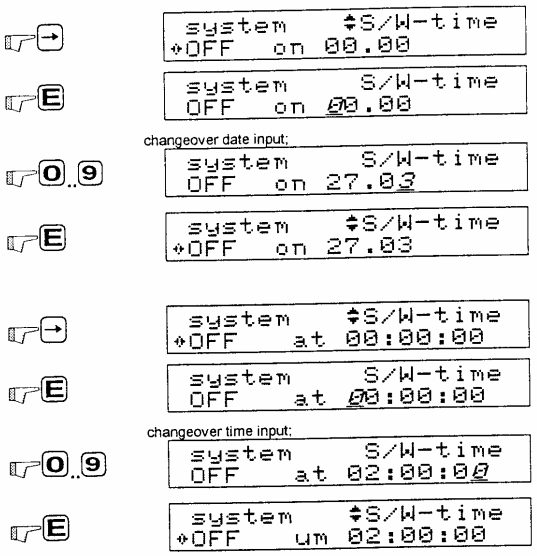


Summer- / Wintertime changeover

Date:
The input of any given date is used for changeover times (This date will remain unchanged even for following years).



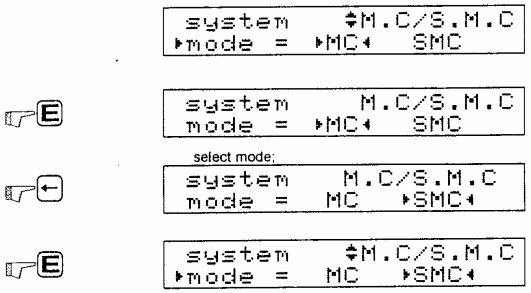
Summer- / Wintertime changeover



Master clock / Sub-master clock

Here the system can be equipped as master clock or as sub-master clock.

First of all the menu group and then the menu item are selected with the cursor keys. In addition, the displayed symbols in the first line indicate, which selections are possible and which keys can be used.

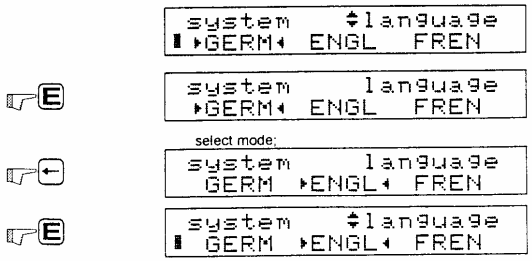


After confirmation with the "enter" - key the master clock is in the sub-master clock mode.

Language

The language of operating prompting and help texts can be set here.

First of all the menu group and then the menu item are selected with the cursor keys. In addition, the displayed symbols in the first line indicate, which selections are possible and which keys can be used.



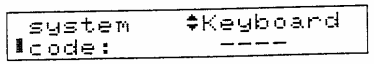
After confirmation with the "enter" - key the selected language is used

Keyboard

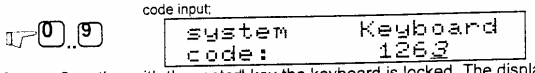
The keyboard can be locked and released here. (keyboard code = 1, 2, 6, 3)

Locking:

First of all the menu group and then the menu item are selected with the cursor keys. In addition, the displayed symbols in the first line indicate, which selections are possible and which keys can be used.



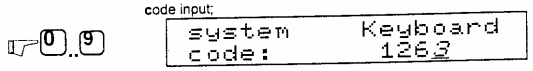
code input;



After confirmation with the „enter"-key the keyboard is locked. The display is on main menu, i. e.only the main menu can be selected with the cursor keys.

Releasing:

code input;



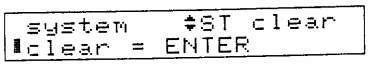
After confirmation with the „enter"-key the keyboard is released again. The display is on main menu.

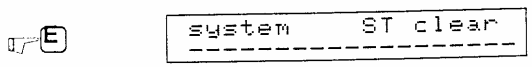
Switching times-erasing (all)

All programmed switch- and signal times can be erased here.

Caution: **All switch-respectively signal times will be erased without repeated query.**

First of all the menu group and then the menu item are selected with the cursor keys. In addition, the displayed symbols in the first line indicate, which selections are possible and which keys can be used.





After prolonged operation of the „enter"-key (approx. 5 sec.) all switch- and signal times are erased and the system orders a new start (software reset).

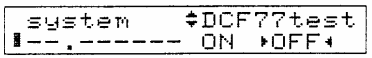
Setting of options

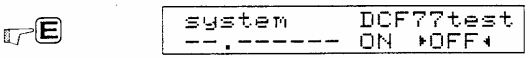
DCF 77 (FU 570) :

After connection of the aerial cable as described in chapter 2, page 2-5, the master clock receives the DCF 77 - signal automatically every **49th minute of each hour.** Under menu item **„DCF77 test"** an operation and test control of the radio signal is available.

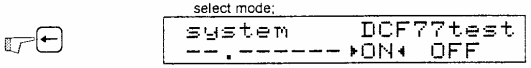
Installation of radio receiver„FU 570":

First of all the menu group and then the menu item are selected with the cursor keys. In addition, the displayed symbols in the first line indicate, which selections are possible and which keys can be used.





select mode;



Now the LED in front (sealed keyboard) of the master clock starts to blink.
The LED of the radio receiver FU570 blinks simultaneously to the LED display in front of the master clock.

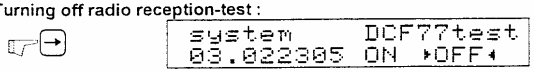
LED indication :

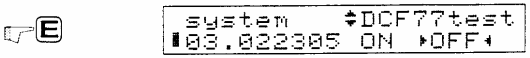
OFF	radio distortion / FU570 defective
blinks irregular	low radio reception
blinks in second cycle	good radio reception
blinks in sec. cycle long pulses	good radio reception/time data valid

Installation site :

Installation site is to be selected to the effect that light-emitting diode is blinking in second cycle (short blinking).
Afterwards, after one minute at most, the light-emitting diode should change to long blinking second cycle. This long blinking should last at least 3-4 minutes.
Each back switching to short blinking signifies a discontinuation of time decoding by the master clock. (Data contents of time telegram are not correct)
If a correct time telegram was received, the read in time is indicated in the display (f. ex. :03.02 23.05).

Turning off radio reception-test :





Setting of options

DCF 77 (FU 570) :

Radio receiver :

As with any receiver, the radio receiver FU 570 may also be subject to certain reception limitations and transmission distortions.
With the horizontal placed aerial, reception is possible from all directions.
During low reception conditions it may be of advantage to place the aerial (ferrite rod) in right angled position towards the connection line between the DFC 77-time unit transmission (Mainflingen near Frankfurt a. M. 50° 01´ north, 09° 00´ east) and the reception site.

Sources of distortion :

constant

- electric inductive loads (shooter, motors)
- neon tubes
- electric ringing devices
- high voltage- or light voltage power lines (distance at least 1 m)
- high voltage discharges (corona effects)
- computer, television sets (distance at least 2 m)

parttime

- large mobile machines within reception area of receiver
- on- respectively off-switch operations of electric inductive loads (shooters, motors)
- weather influences, static re-charges during thunder storms

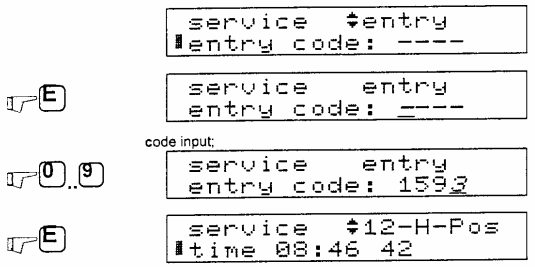
The building screening of special buildings (steel concrete) is to be especially observed in regard to the sources of distortion mentioned above. A screening of this type may interfere considerably with radio reception.The site of installation should be as far as possible from any sources of distortion (at least 3 m) and should not be selected within close distance to the screened effect of special buildings.

Service - functions

Release

Here the service menu is released by input of correct code.
(keyboard code = 1, 5, 9, 3)

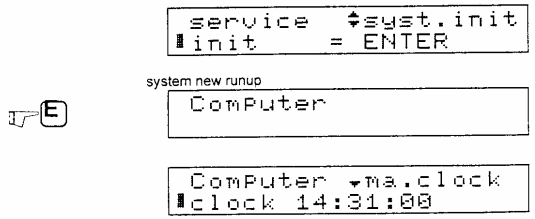
First of all the menu group and then the menu item are selected with the cursor keys. In addition, the displayed symbols in the first line indicate, which selections are possible and which keys can be used.



Upon confirmation with "enter" - key the service menu is released.

Syst.Init

Here the master clock can be set back to its basic condition (condition of delivery). All system parameters (system setting, line settings) are set in its basic condition (default)
All programmed switch- respectively signal-times remain safed.



Afterwards the system is in its basic condition.

Chapter 4

Description of functions

Normal operation

During normal operation the main clock runs as independent quartz clock on the basis of a 4,194394 MHz quartz.

The integrated micro controller controls constantly the functional sequence of all programmed and activated functions. The micro controller is monitored by a integrated watchdog.

If the option „**radio receiver**" is integrated, the independent quartz clock will be synchronized to radio time (DCF77) 2 times per night (2 and 3 o'clock). The detecting code of the option „**radio receiver**" follows automatically. If radio receiving is not possible (low reception) the main clock continues to run as quartz clock.
With the quartz clock mode the summer-/wintertime change-over can be effected by calendar or by date. The summer-/wintertime changeover can also be suppressed entirely.

Caution: The summer/wintertime change-over of the quartz clock is also active during low radio reception. Therefore and in spite of the option „radio receiver" the summer/wintertime change-over of the quartz clock mode should be effected by calendar (mode „auto").

The lines are on a follow up operation of the set parameters in accordance to the exact second of the system time. If two lines have to be controlled at the same second, the lines will be switched at a time interval (approx. 30 ms).

The channels are switched ON/OFF at the exact second in accordance to the programmed switching- or signaltimes. If two channels have to be controlled at the same second, the channels will be switched at a time interval (approx. 30 ms).

Sub-master clock

If the master clock is switched into sub-master clock mode with the system parameter „**M.C.-S.M.C.**", the system is waiting at the slave clock input for bipolar minute pulses in a field of 3 to 60 V.

The sub-master clock synchronizes itself by the accurate second to the transmitted minute pulses of the master clock.

If no minute pulses are transmitted (f. ex. change-over from summer to wintertime) the sub-master clock will stand still.

A possible programmed summer- respectively wintertime change-over is ignored. All other functions are operating as in the master clock mode.

Emergency power supply

To bridge over power failures, the master clock has a slave track operation of appr. 3 month. With the option „power reserve" the slave clock lines can also be operated at least for 6 hours without power supply (only minute- and half -minute lines, all sekond lines will come to stop). If the option „power reserve" is integrated, the indication „main Failure" is shown on the display in case of a power failure. After consumption of the battery, the indication „bat.empty" will appear on the display. At the same time the lines will be halted and the actual line times are stored by the system.

During power failure the channels are not switched.

System recovery

In case of system recovery within 3 months (slave tracking device is active) the lines will be automatically corrected to system time after approx. 1-2 minutes (battery recovery time). The channels will be set to the correct condition. Afterwards a new radio time is read with the option „ radio receiver" and the system time will be synchronized.

In case of system recovery not within 3 months time (run down of slave tracking device), the internal quartz clock shows the time **00:00:00** and must be newly set without the option „ radio receiver".

With the option „ radio receiver" the system time will be automatically corrected. Thus the system time runs at high speed from 00:00:00 to the new system time. This may take some time (f. ex. new system time 15:00:00), because the system runs with a speed of 16 times faster than normal, i. e. for 16 hours the system requires an overtravel time of 1 hour. This can be avoided by manual input of the system time.

Control of a tower clock module

To control a tower clock motor movement (i.e.: tower clock of a church) you need the option tower clock module.

Characteristics:
- line 1 as the control of the tower clock module (potential free changing relais 230V/8A).
- interrupt of the follow-up device (potential free contact) for the interrupt of the control of the bells during the follow-up device.
- the pulse length of line 1 must be 5 seconds (the pulse pause: 5 Sek.).
- line 2 as line 12/24V for approx. 40 slave clocks.

See also Chapter2 / Installation 2-6.

Initialization

Three initialization processes are to be distinguished.

1. Software reset
   This reset may be induced by a short voltage interruption of the power supply (fuse / switch).
   The device stores all data (switch- and signal times) and settings (system parameter), the linetime are stored as well.

2. Hardware reset
   This reset is induced by operating the reset-key (left corner on backside of the logic module).
   The device stores all data (switch- and signal times) and settings (system parameter), the line times will be **lost.**
   Caution: lines are to be set new!

3. System-Init
   This reset is induced in the menu group "service" under menu item "**Syst.Init**" .
   This reset is a software reset (see above), in addition all system parameters are set to basic settings.
   All lines are also set to basic settings.
   All data (switch- and signaltimes) remain unchanged.

Default-settings:

clock mode	24 hour clock (14:00:00)
date mode	TT,MM,JJ (25.10.94)
S/W-changeover	AUTO (on in month 3 , off in month 10)
relays	all OFF
Line1	minute line, 12 hrs, pulse length 1 sec , pulse delay 1 sec
Line2	second line, 12 hrs, pulse length 0.5 sec pulse delay 0,5 sec

Chapter 5

Error analysis

Error messages

Distortions of the device are indicated in clear text on the LCD - display. If it is not possible to clear a distortion, please inform your competent distribution- or service partner.

Error group "sytem":

fault	possible reason for fault
digital time display are at stop, menu functions are existing	1. The system is waiting for synchonization; (system does not advance 23 hrs, but stops for 1 hr) - only with radio receiver; 2. The mode " sub-masterclock" has been switched on, but at the "slave clock input" no masterclock has been connected;

Error group "lines":

fault	possible reason for fault
Line is not running	1. Line is turned off (menu "lines", mode "condition") 2. Line is waiting for synchronization (upon advancing of 12 hrs 58 min, line is waiting for 2 minutes); 3. selection switch 12 / 24 V on module "power supply" is on (OFF);
Line cannot be set (time input is not accepted / line remains on stop)	1. Line is on short circuit; 2. Power reserve is defective (disconnected batteries); 3. selection switch 12 / 24 V on module "power supply" is on (OFF);
Line looses minutes/seconds	1. selection switch 12 / 24 V on module "power supply" is on 12V-position with 24V movements; 2. Pulse duration has been selected too small (standard: 1 sec for minute movement / 0,5 sec for second movement
Line looses minutes during line correction	1. Power supply is overloaded, extend pulse delay; 2. Maximum load is exceeded;

Error group "channels" :

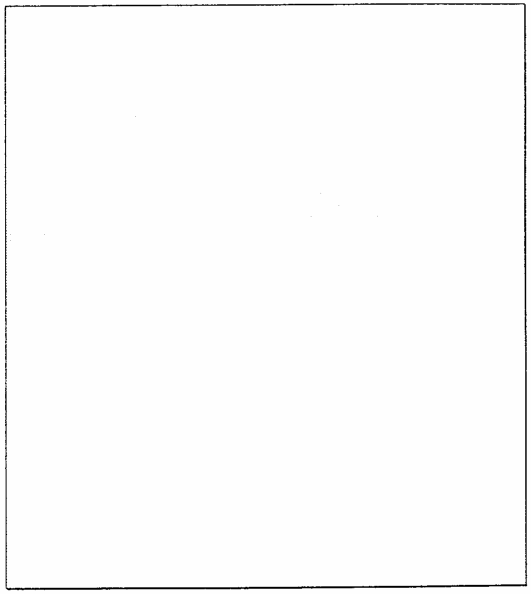
fault	possible reason for fault
switch- / signal times are not performing	switch- respectively signal suppressions are programmed;

Error group "power failure" :

fault	possible reason for fault
indication "power failure" remains after power recovery	1. fuses must be checked;
indication "bat. empty" remains after power recovery	1. exhaustive discharge of batteries (after 3 - 5 minutes the indication disappears) 2. batteries of power reserve are defective;
display remains dark after system recovery	fuses must be checked ;

Appendix A

Technical Data



Technical Data KHU2100

Power supply:	primary : 230 V ~ +/- 10%
Current consumption:	max.: 10 W
Slave tracking device:	approx. 3 months
Power reserve:	approx. 6 hours (with max. load)
Environment:	temperature: 0°C up to 45° C (14°F up to 113°F) air humidity: between 10% and 90% (not condensed)
Dimensions:	150 mm x 230 mm x 88 mm
Case:	plastic material (protection type IP40)
Weight:	appr. 900g
Emergency power supply (option):	the batteries are loaded prior to delivery. time and date are stored >1 year.
Signal-outputs:	potentialfree relay-contacts. load: max. 250V , 8A (cos Phi = 1)
Clock accuracy:	+/- 0,3 seconds/day at + 25° C (77° F)
Installation site:	- only inside - dust free environment - no to direct sunlight