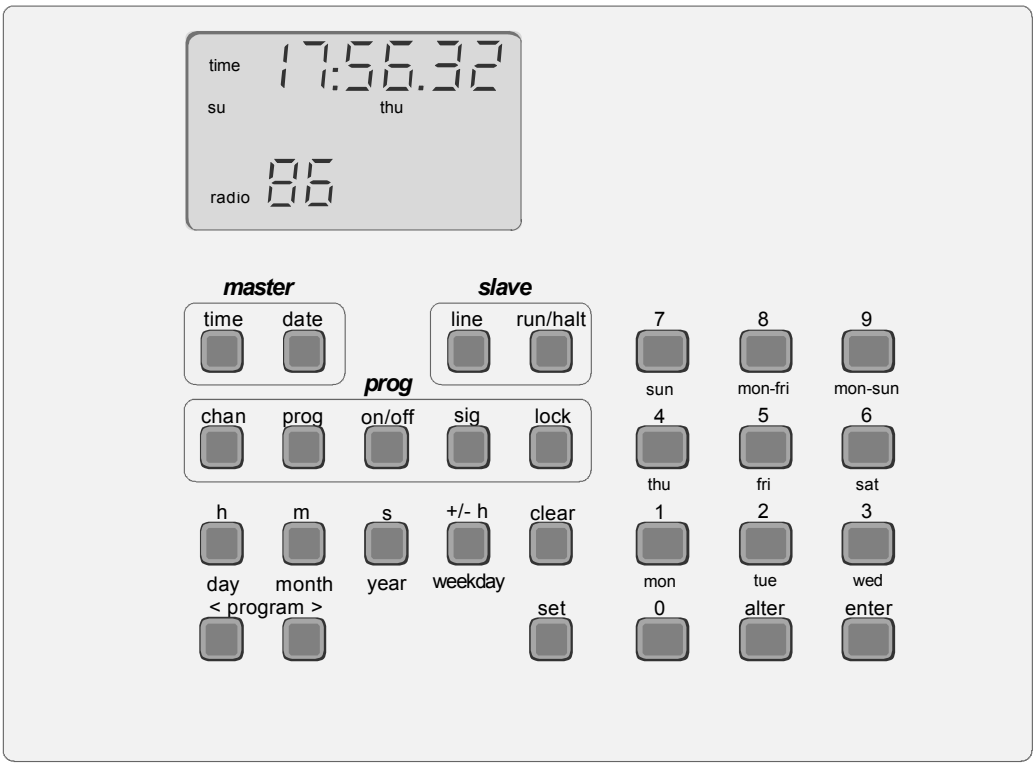
OPERATING MANUAL

Telequartz HN 425 / HN 425 R

Master Clock



Certification of the producer

STANDARDS
The Telequartz HN 425 / HN 425 R has been developed and produced in accordance with the EU Standards 89 / 336 / EEC and 72 / 23 / EEC.

Applied Standards:
EN 50081-1
EN 50082-2
EN 60950

CE

References to the Instruction Manual

1. The information in this instruction Manual can be changed at any time without previous notice.
2. This Instruction Manual has been composed with utmost care, in order to explain all details in respect of the operation of the product. Should you, nevertheless, have questions or discover errors in this Manual, please contact us.
3. We do not answer for direct or indirect damages, which could occur, when using this Manual.
4. Please read the instructions carefully and start the setting-up of the product, only once you have correctly understood all informations for the installation and of the operation.
5. The installation must only be carried out by skilled staff.
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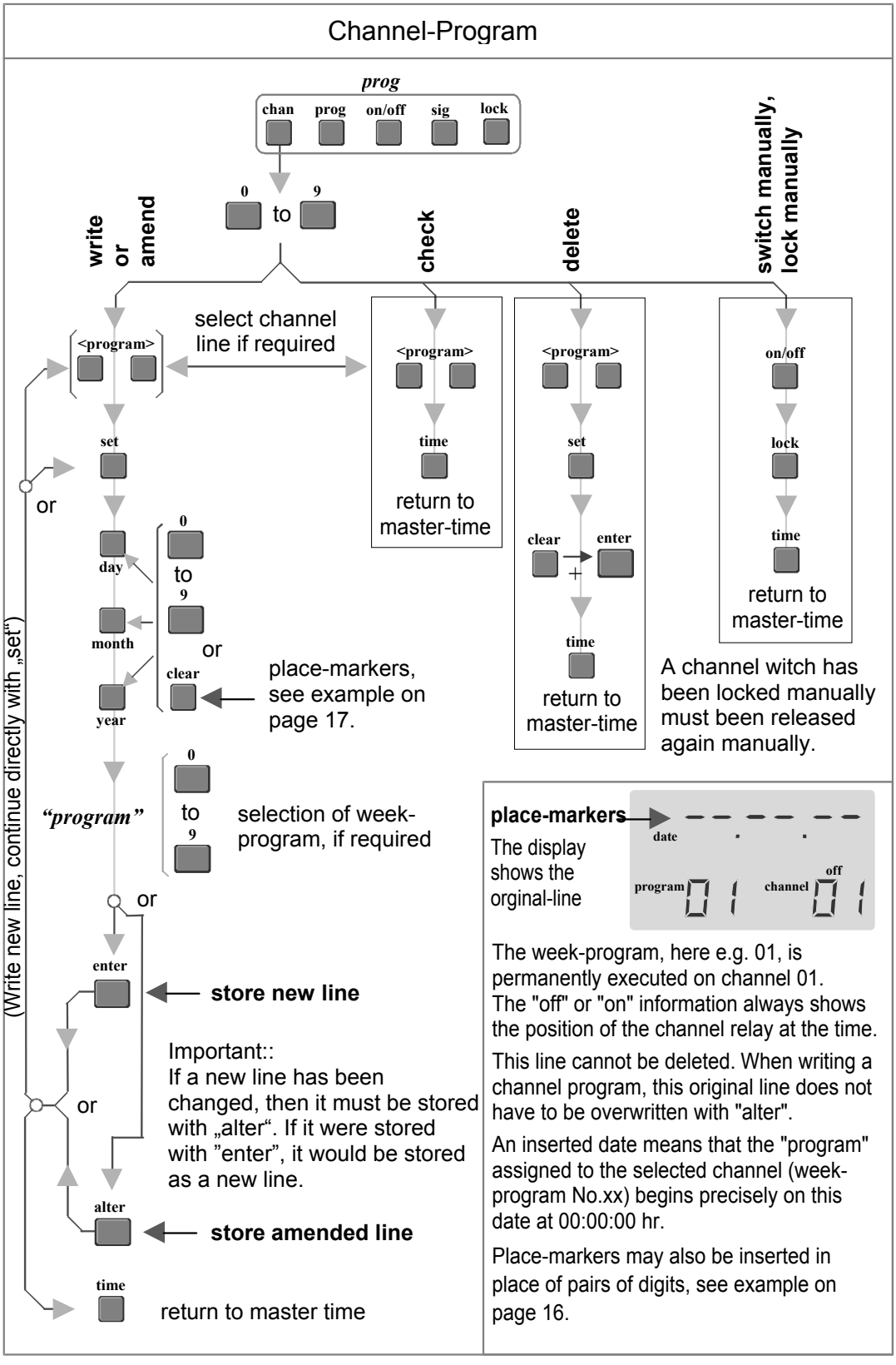
Important!
The front plate with the keyboard and display shall be removed by professional (electronic engineers) only. The software is stored in RAM and could be destroyed when touching the printed circuit.

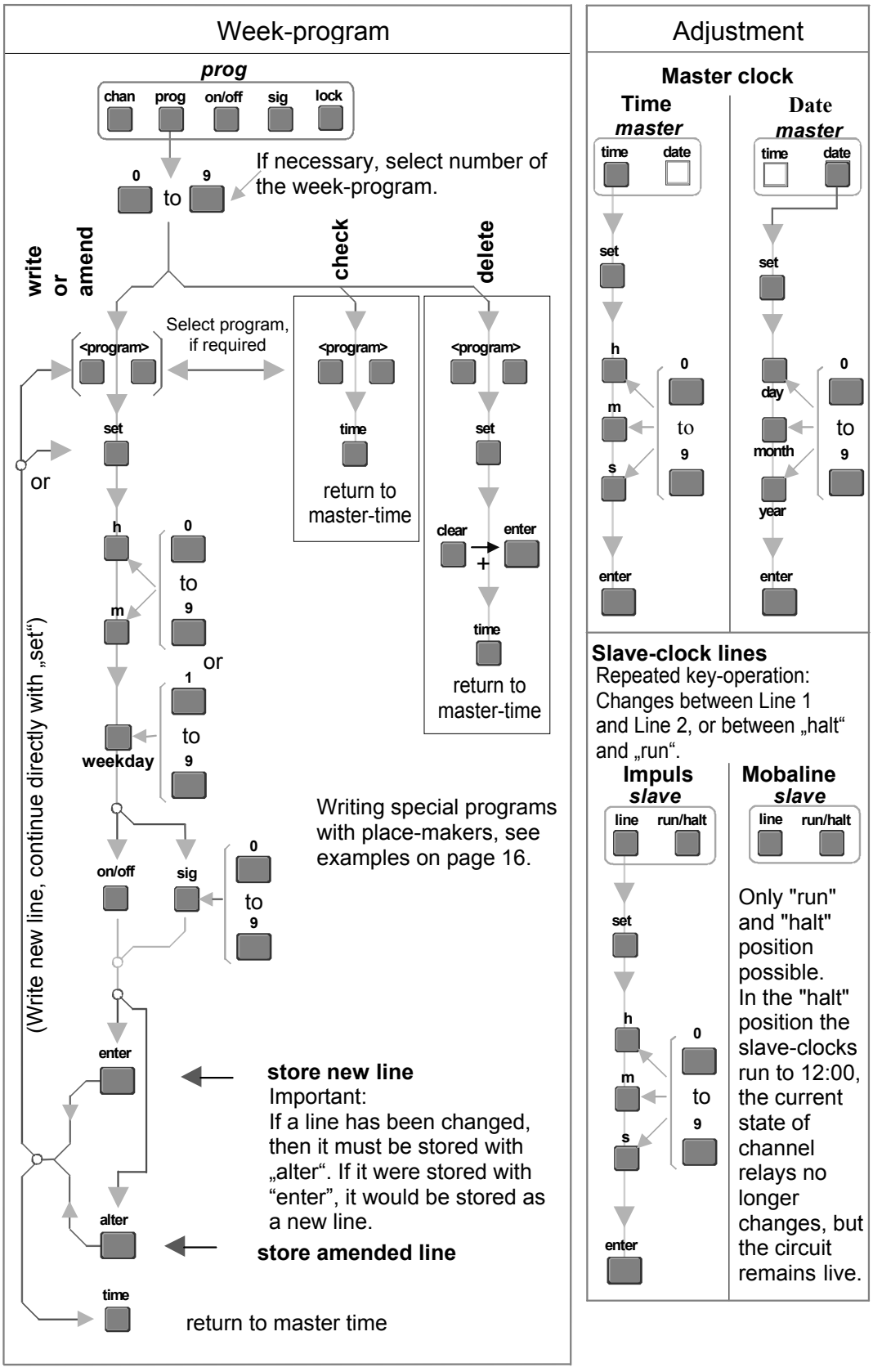
1. Setting the master clock to work

Page numbers in brackets - brief summary
With no brackets - detailed text

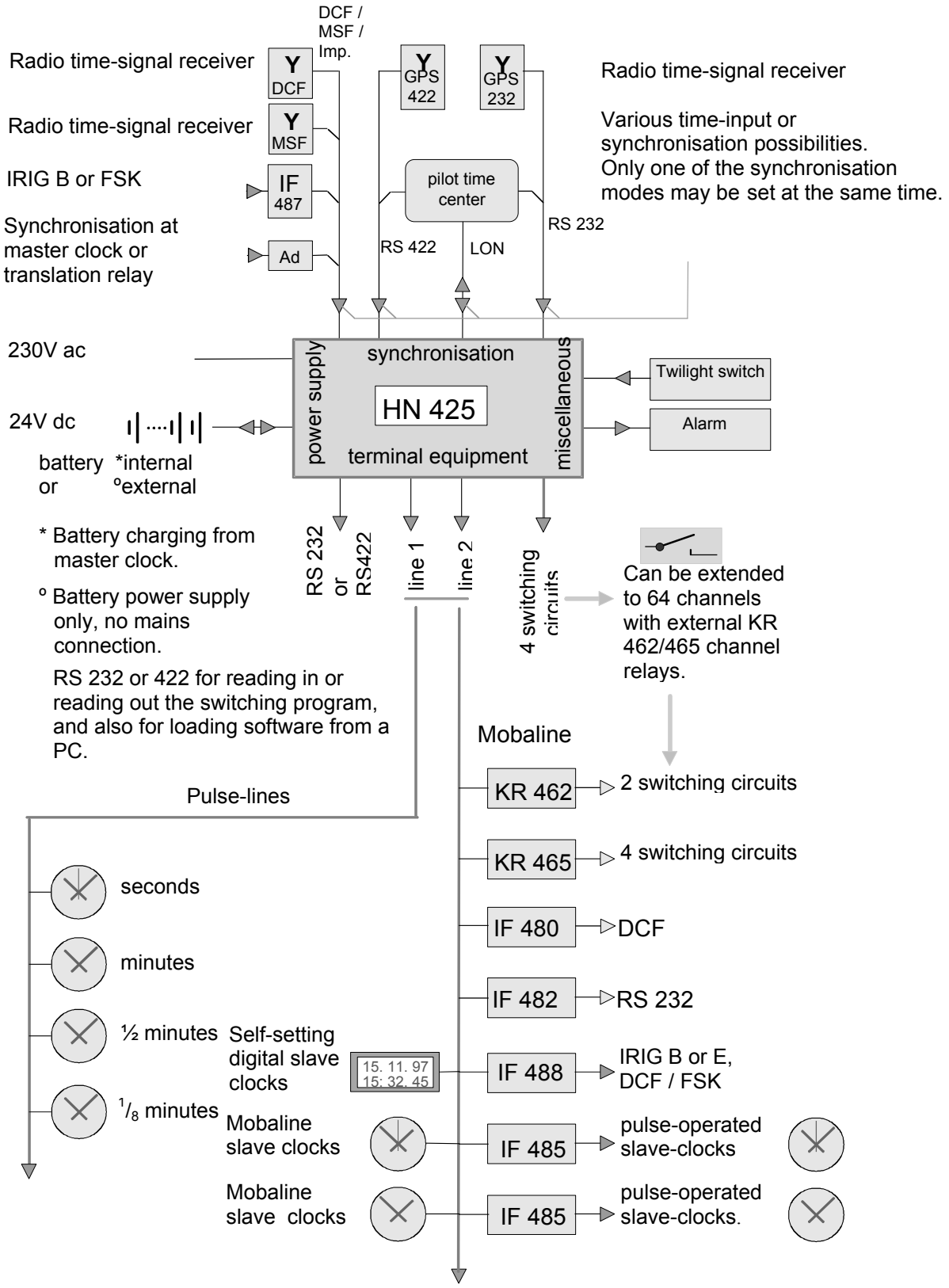
2. Brief introduction (channel-program)



3. Brief introduction (week-program)



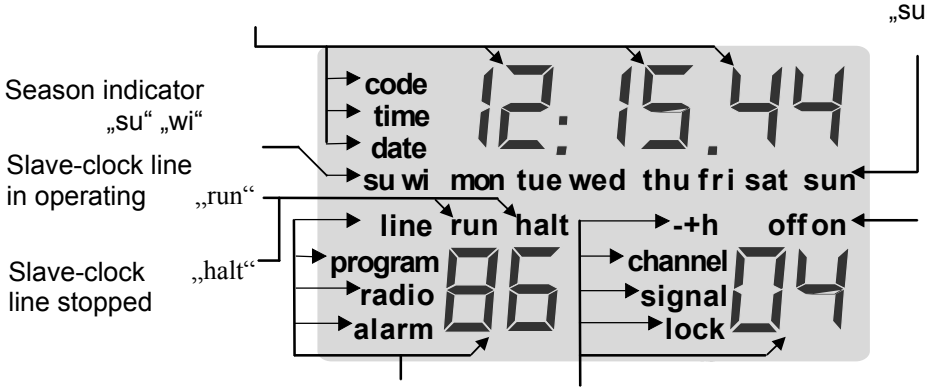
4. Installation (block connection diagram)



5. Display and keyboard explanations

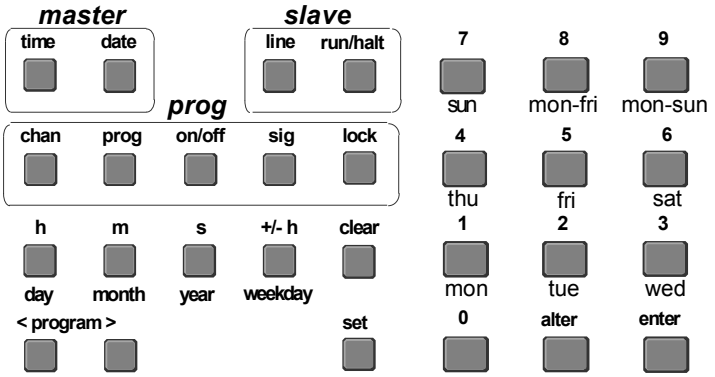
Display

„code“	configuration number	„mon“	Monday	„thu“	Thursday
„time“	time in hr, min, sec	„tue“	Tuesday	„fri“	Friday
„date“	day, month, year	„wed“		„sat“	Saturday
				„sun“	Sunday



Slave-clock line stopped		„- + h“	Time difference in hours
1(01) or 2(02)	„line“	„channel“	channel numbers
Week-program number	„program“	„signal“	Signal duration in seconds
Reception quality	„radio“	„lock“	Channel with this number is blocked
Alarm specification	„alarm“		

Keys



740 Pressing these keys simultaneously blocks the keys
741 Pressing these keys simultaneously releases the keys

„master“ Operation of master clock, date or time.

„slave“ operation of slave-clock lines, Line 1 or Line 2, run or halt

„prog“ entry of signal and/or switching programs
„chan“ > channel-program, **„prog“** > week-program,
„on/off“ > switch condition, **„sig“** restricted switch-on period,
„lock“ blocking in current switch condition

„h, m, s, day, month, year” direct selection of digit group to be changed

„weekday“ setting of day of the week, numbers 1 to 7 (Monday to Sunday)

„clear“ entry of place-markers in place of digits

„set“ select first, for changing or entering data

„<program>“ checking program lines (< forward) (> backward)

„enter“ accepting data

„alter“ overwriting an existing program line

„0 to 9“ entry of numbers

6. Master (master time)

The master is the base for all time-dependent functions.

The time is taken directly from an external time source, e.g. a DCF or GPS radio time-signal receiver, or from a higher-level time standard via the built-in RS 232 interface.

The correct time and date can also be set manually.

If no primary time source is available, then the running accuracy can be regulated manually to suit the local environmental conditions (fine adjustment).

Configuring the master. See Pages 21 & 22.

Master time display with reception quality

Master time display with alarm

Master date display

radio 86 Radio time-signal reception quality, always „99“ with good reception. The first digit gives the number of messages correctly received during the last 9 minutes. The second digit gives the number of second-markers correctly received during the previous 9 second.

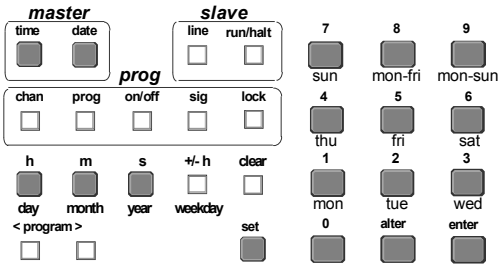
When it is synchronised with the radio time-signal receiver „GPS 2000“, the reception quality is only given by one digit (1 to 9, number of messages received correctly during the previous 9 minutes).

alarm 04

„01“ overload line 1
„02“ overload line 2
„03“ Immediately after mains failure
„04“ Failure of external time-signal input
„05“ Software error

Operation

The keys shown dark in the diagram are those needed to set the master manually.



Pressing the number keys simultaneously
740 to block the keyboard
741 to release the keyboard

If time or date is changed manually, then changement will remain for a few minutes only. If at the least 3 faultless time signals could be received from the receiver, the radio time is accepted again.

Special feature concerning time synchronisation, see configuration pages 21 & 22.

Setting the time manually

time	Display shows the current master-time.
set	Ready to set the time. The time shown on the display can now be changed as desired; the master clock continues to run normally. It is in each case the flashing digit which can be changed.
h,m,s	Direct choice of the digit group to be changed.
0....9	Entry of the desired digits; the digit which is flashing is changed.
+/- h	Select summer/winter time.
enter	Acceptance of values, setting the new time in the master and automatic alignment of line and program times. Until "enter" has been pressed, it is always possible to bring back the original master-clock time by pressing "time".

Setting the date manually

date	Display shows the current master-date.
set	Ready to set the date. This can now be changed as desired on the display; the master clock continues to run normally. It is in each case the flashing digit which can be changed.
month day year	Direct choice of the digit group to be changed.
0....9	Entry of the desired digits; the digit which is flashing is changed.
enter	Acceptance of values, setting the new date in the master and automatic alignment of line and program times. Until "enter" has been pressed, it is always possible to bring back the original master-clock time by pressing "time".

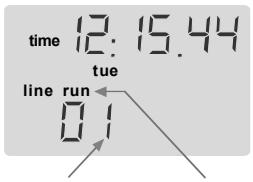
7. Slave (slave-clock lines)

Two separate slave-clock lines are available. They can be configured alternatively for seconds, $^{1}/_{8}$-minutes, half-minutes or minutes lines, for driving pulse-operated slave-clocks. Each line can also be configured to Mobaline code, for self-aligning clocks and other terminal equipment.

For the configuration of slave-clock lines, see pages 23, 24.

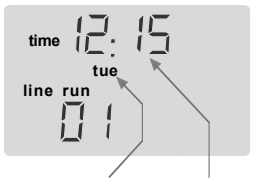
Display

Line 1
Seconds line, Mobaline code in use



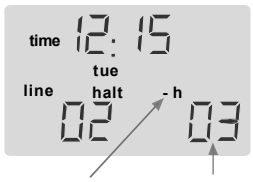
Line number Line condition

Line 2
Line in use for minutes-pulses



Day of the week Line-time

Line 2
Line for minute-pulses with 3-hour time-shift, in halt-position



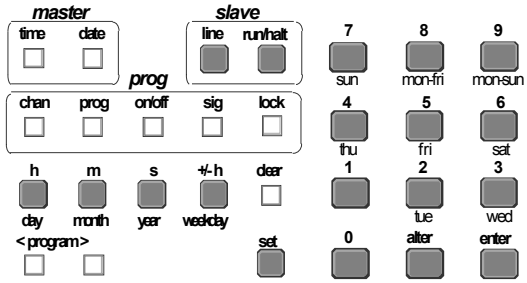
Direction of time difference Time shift in hours

Mains failure

During a mains failure, all units connected to the system stop ; when the mains supply is restored, all connected terminals will automatically be reset to correct time.

Operation

The keys shown dark in the diagram are those needed to set the master manually.



Pressing number keys simultaneously
740 to block the keyboard
741 to release the keyboard

Operation of the slave-clocks with Mobaline

Mobaline code lines always have the same time as the master clock, except for +/- hour shifts.

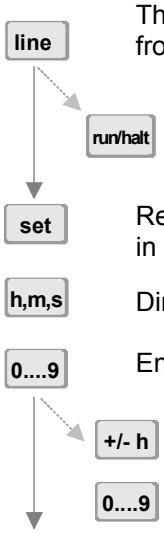
line — The display shows the current line time; pressing the key changes the display from Line 1 to Line 2, or vice versa.

run/halt — Starting or stopping the line; pressing the key changes the line condition from "run" (line operating) to "halt" (line stopped), or vice versa.

In the "halt" setting Mobaline slave-clocks run to 12:00 hr and stop. The state of channel relays is "frozen" in the current state; **the line remains under voltage.**

Operation of pulse-lines

With pulse-operated lines, in order to align the slave-clocks the current time of the slave-clocks connected must be entered; in the "run" setting they are automatically brought into alignment with the master time.



The display shows the current line time; pressing the key changes the display from Line 1 to Line 2, or vice versa.

(if required) Starts or stops the line; pressing the key changes the line condition from "run" (line operating) to "halt" (line stopped), or vice versa.

Ready to set the time. The line selected goes to "halt" and can be changed. It is in each case the flashing digit which can be changed.

Direct choice of the digit group to be changed.

Entry of the desired digits; the digit which is flashing is changed.

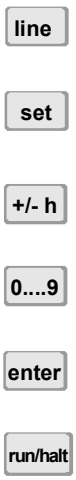
If required, programs a time-shift of the selected line with respect to the master time; pressing the key changes from +h to -h or vice versa.

Entry of the desired digits; the digit which is flashing is changed.

Acceptance of the entries.

Starts the line. Pressing the key changes the line condition from "run" (line operating) to "halt" (line stopped), or vice versa.

Time-difference of a line compared to the master time



The display shows the current line time; pressing the key changes the display from Line 1 to Line 2, or vice versa.

Ready to enter a time-shift with respect to the master-clock time. It is in each case the flashing digit which can be changed.

Selection of the direction of a time-shift of the selected line with respect to the master-clock time; pressing the key changes from +h to -h or vice versa.

Entry of the desired digits, in steps of whole hours; the digit which is flashing is changed.

Acceptance of the entries.

Starts the line. Pressing the key changes the line condition from "run" (line operating) to "halt" (line stopped), or vice versa.

8. Week-program

This program is most frequently used; it is very easy to set up and offers a wide range of possibilities for practical applications.

For simple operation, it is sufficient to write week-programs. 4 switching circuits are available, and the first 4 week-programs are automatically allocated to the first 4 channels, if no channel-programs are written.

1000 lines of program can be written into the memory; one line consists of time, days of the week and function.

The tables shown on pages 19 and 32 of the operating instructions provide a useful aid to writing week-programs.

Example 1

Week-program 1 on/off channel 1

hrs	min	mon	tue	wed	thu	fri	sat	sun	Function
08	00	x	x	x	x	x			on
11	45	x	x	x	x	x			off
13	30	x	x	x	x				off

The display shows the first program line

Exemple 2

Week-program 2 signal 10 s (pause signals)

hrs	min	mon	tue	wed	thu	fri	sat	sun	Function
08	00	x	x	x	x	x			*signal 10*
11	45	x	x	x	x	x			*signal 06*
13	30	x	x	x	x				*signal 10*

The display shows the second program line

In Example 2 the channel number is not on the display, but could be made to appear at any time by pressing **chan** . Having appeared, the digit group (02) will flash, but should not be changed. By pressing **sig** , for example, the display can be changed again at any time.

.

Exemple 3

Week-program 3 Special program, periodic

hrs	min	mon	tue	wed	thu	fri	sat	sun	Funktion
--	30	x	x	x	x	x	x		on
--	35	x	x	x	x	x	x		off
--	42	x	x	x	x	x	x		*signal 02*
--	--	x	x	x	x	x	x	x	*signal 05*

The display shows the first program-line

-- Instead of digits, a "place-marker" can be inserted by pressing **clear** .

Program lines 1 and 2:
Switching "on" at minute 30, switching "off" at minute 35, every hour from Monday to Saturday.

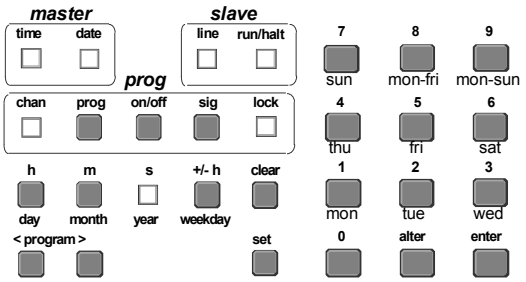
Program line 3:
Switching on for 2 seconds at minute 42, every hour from Monday to Saturday.

Program line 4:
Switching on for 5 seconds at every minute throughout the whole week.

In each of the examples shown, the number of program lines can be extended as you wish.

Week-program operation

The keys shown dark in the diagram are those needed to edit programs.



Pressing number keys simultaneously
740 to block the keyboard
741 to release the keyboard

Writing a week-program

prog Enter program mode.

0....9 Entry of the week-program number; if the number remains the same, go on directly to **set**.

set Ready to enter the switching-time and switching function. It is in each case the flashing digit, which can be changed.

h, m Direct jump to the digit group to be changed.

0....9 Entry of the desired digit; the flashing digit changes.

clear Entry of place-markers (--) instead of the flashing digit group. For the function of these place-markers, see program example no.3 on page 13.

weekday Move into entry of days of the week. At least one day must be entered, otherwise this program line is not executed.

1....9 The days of the week are inserted or deleted with keys 1 "mon" to 7 "sun". Key 8 inserts or deletes "mon" to "fri" together. Key 9 inserts or deletes "mon" to "sun" together. The days set flash until the "weekday" function is left, by pressing another selection key.

The appropriate function is selected with one of the two following steps:

on/off Switch function, "ON" or "OFF"; pressing the key changes from one state to the other.

or

signal Signal function: Switch-on occurs for a limited selectable time of from 1 to 99 seconds in one-second steps.

0....9 Setting the time during which the switch contact must be closed. If the number of seconds already shown on the display is correct, then it is accepted directly.

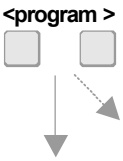
enter Entry of the week-program line in the memory.

For more complex programs, in addition to the week-program the channel-program is also used. A maximum of 64 channel-programs and 99 week-programs are available.

Checking and amending an existing weekly-program line

prog Ready to select the week-program number.

0....9 Entry of the week-program number; if the program number remains the same, proceed directly with **< program>** .



Bring the program line to be checked to the display, using the forward (>) or backward (<) keys.

time Back to master display, or continue with **set** .

set Ready to change the line. The selected line can now be changed, as in the normal programming procedure.

alter Instead of using **enter** , the amended line must be stored by pressing **alter** .

If **enter** were to be pressed instead of **alter** , then the original line is retained, and the amended line stored as a new line.

Deleting an existing weekly-program line

prog Ready to select the week-program line.

0....9 Entry of the week-program number; if the program number remains the same, proceed directly with **< program>** .

Bring the program line to be checked onto the display, using the forward (>) or backward (<) keys.

set Ready to change the line.

clear + **enter** Hold down 'clear' and also press 'enter'; the program line displayed is immediately deleted and the next line appears.

Manual operation of a channel, or switching circuit

chan Ready to select the channel number.

0....9 If required, select the desired channel.

on/off Selects the switch setting. The channel takes up the switch setting selected directly; external channel relays switch with a delay of 2 to 4 seconds. If the chosen switch setting is not blocked with **lock** , then after ca. 1 to 2 minutes the channel relay reverts to the setting specified in the program.

lock Blocks the channel in the current state; the program is no longer executed. **The blocking action can only be released manually.**

time Back to the normal time display.

9. Channel-program

The channel-program is used to define phases of operation, which depend on the date. An operating phase begins with the date entered at 00:00 hr and ends with the start of a new operating phase on a later date at 24:00 hr. When the operating phase changes over, the switching states of the channel relays are up-dated immediately.

This program opens up a great many possibilities for the user. If one line is programmed for Mobaline, or even both lines, then by using external channel relays up to 64 independent channels or switching circuits can be operated.

With 99 different week-programs, which can be used with the channel-program as a function of the date, highly complex systems can be operated as a function of time.

It is advisable to write out complex programs first on the work-sheets attached; the overall picture is then clear, so making programming much easier.

Given the appropriate software and the necessary option, programs can very conveniently be written on a PC and loaded into the program memory by means of the RS 232 interface. See pages 22, 26, 27 and 29.

For signal circuits the "holiday" or "vacation" phase means "OFF", for switching circuits it can mean either "ON" or "OFF".

It is therefore sensible to specify week-programs for vacation periods as follows:

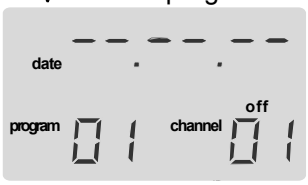
hrs	min	Mon	tue	wed	thu	fri	sat	sun	Function
--	--	x	x	x	x	x	x	x	*on*

Week-program 98 „on“
for continuous switch-on during a specified operating phase

hrs	min	Mon	tue	wed	thu	fri	sat	sun	Function
--	--	x	x	x	x	x	x	x	*off*

Week-program 99 „off“
for continuous switch-off during a specified operating phase

Display when no channel-program has yet been written. The "off" indication corresponds to the current switching state of the channel relay in accordance with the week-program.



In this "original line" all positions in the date entry are occupied by place-markers. What is shown on the display is independent of the date and is thus always valid. Week-program 01 applies to channel 01 permanently, unless we now write a channel-program.

Initially the channel number flashes. The desired channel is now selected, and the "program" digit also changes at the same time; no notice should be taken of this as yet. Pressing "set" allows a date to be entered; when all digits have been entered, then the "program" number flashes again, and the appropriate week-program can now also be assigned.

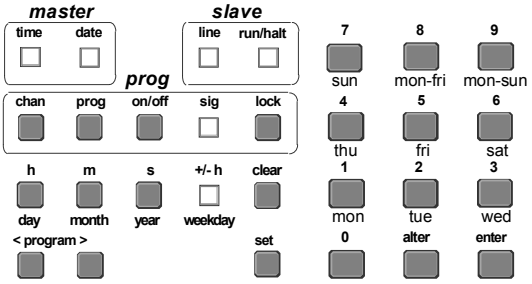
valid for all years Examples **valid only for year 98**

Channel 1 switched off with week-program 99 on 1 August at 00:00:00 hr.

Channel 1 changes from week-program 99 to week-program 7 on 2 August at 00:00:00 hr.

Channel-program operation

The keys shown dark in the diagram are those needed to edit programs.



Pressing number keys simultaneously
740 to block the keyboard
741 to release the keyboard

The tables shown on pages 19, 20 and 32 of the operating instruction provide a useful aid to write channel programs.

Writing a channel-program

chan Ready to select the channel number.

0....9 If required, select desired channel.

set Enter programming mode. Date can be entered.

day **month** **year** Direct selection of digit group to be changed.

0....9 Insert date, flashing digit changes.

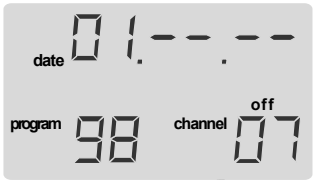
clear If required, insertion of place-markers (--) in place of the flashing digit group. If for example a place-marker is inserted instead of the year number, then the date entered applies to all years. Place-markers for the month or day act in a similar way.

"program" When the date has been inserted, the "program" digit continues to flash; the desired week-program must therefore now be selected.

0....9 If required, select the desired week-program.

enter Enters the channel-program line.

Special example with place-markers



On the first day of each month on channel 7, at 00:00:00 hr the channel switches to week-program 98 (see page 15), and on the second day at 00:00:00 hr to week-program 06 again, in all years.

Place-markers primarily simplify the writing of cyclical programs. They may be inserted in place of any two-digit group in the date line. See also examples on page 16.

Checking or amending an existing channel-program line

chan Ready to select the channel number.

0....9 If required, select the desired channel.

< program> Bring the program line to be checked onto the display, by using the forward (>) or backward (<) keys.

If only a check has been made, it is possible to return to the normal time display at any time by pressing **time**.

set Enter programming mode.

day **month** **year** Direct selection of digit group to be changed.

0....9 Insert date, flashing digit changes.

"program" When the date is inserted, the "program" digit continues to flash; the desired week-program must therefore now be selected.

alter Instead of **enter**, the amended line must be stored by pressing **alter**.

If **enter** were to be pressed instead of **alter**, then the orginal line is retained, and the amended line would be stored as a new line.

Deleting an existing channel-program line

chan Ready to elect the channel number.

0....9 If required, select the desired channel.

< program> Bring the program line to be checked onto the display, by using the forward (>) or backward (<) keys.

set Enter programming mode.

clear + **enter** Hold down 'clear' and also press 'enter'; the program line displayed is immediately deleted and the next line appears.

Manual operation of a channel or switching circuit

chan Ready to select channel number.

0....9 If required, select the desired channel.

on/off Choice of switch setting. The channel takes up the switch setting selected directly; external channel relays switch with a delay of 2 to 4 seconds. If the chosen switch setting is not blocked with [lock], then after ca. 1 to 2 minutes the channel relay reverts to the position specified in the program.

lock Blocks the channel in the current state; the program is no longer executed. **The locking action can only be released manually.**

time Back to the normal time display.

10. Examples (week- and channel-program)

Examples of week-programs

If you have written week-programs only, then these are executed, even if no channel-program exists. The week-programs are then executed on the channel on which they are written. The channel number is shown on the display, at the bottom to the right.

By means of the channel-program, a date-dependent time schedule for executing any week-programs can be set up.

The changeover to a different week-program always takes place at 24.00 hr, or at 00.00 hr on the current date.

If you wish, the same week-programs can be assigned to several channels at the same time.

Attached you will find prepared tables for writing your programs. It is advisable to enter the programs in these tables first, as it is then much easier to keep track of them. Program steps which are no longer valid are immediately evident and can be deleted. This is particularly true for date-dependent program steps in the channel-program.

Week-program

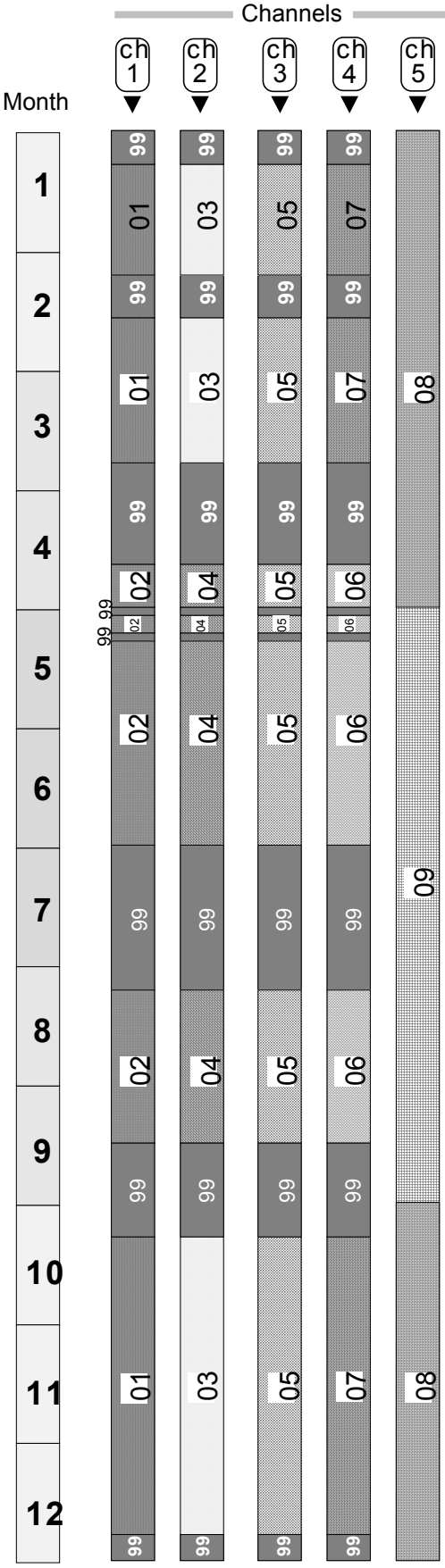
Prog.Nr.	hrs	min	mon	tue	wed	thu	fri	sat	sun	Function
01	07	30	x	x	x	x	x	x		sig 08
	09	30	x	x	x	x	x	x		03
	09	45	x	x	x	x	x	x		03
	11	45	x	x	x	x	x	x		03
	13	45	x	x		x	x	x		08
	15	30	x	x		x	x			03
	15	45	x	x		x	x			03
	16	45	x	x		x	x			03
02	07	15	x	x	x	x	x	x		sig 08
	09	15	x	x	x	x	x	x		03
	09	30	x	x	x	x	x	x		03
	11	30	x	x	x	x	x	x		03
	13	15	x	x		x	x	x		08
	15	15	x	x		x	x			03
	15	30	x	x		x	x			03
	16	30	x	x		x	x			03
06	07	15	x	x	x	x	x	x		off
	12	00	x	x	x	x	x	x		on
	13	05	x	x		x	x			off
	16	50	x	x		x	x			on
07	07	30	x	x	x	x	x	x		off
	12	00	x	x	x	x	x	x		on
	13	05	x	x		x	x			off
	16	00	x	x		x	x			on
08	20	00	x	x	x	x	x	x		on
	00	00	x	x	x	x	x	x		off
	04	30	x	x	x	x	x	x		on
	06	30	x	x	x	x	x	x		off

Week-program

Prog.Nr.	hrs	min	mon	tue	wed	thu	fri	sat	sun	Function
03	07	40	x	x	x	x	x	x		sig 08
	09	40	x	x	x	x	x	x		03
	09	55	x	x	x	x	x	x		03
	11	55	x	x	x	x	x	x		03
	13	30	x	x		x	x	x		08
	15	15	x	x		x	x			03
	15	30	x	x		x	x			03
	16	30	x	x		x	x			03
04	07	30	x	x	x	x	x	x		sig 08
	09	30	x	x	x	x	x	x		03
	09	45	x	x	x	x	x	x		03
	11	45	x	x	x	x	x	x		03
	13	20	x	x		x	x	x		08
	15	20	x	x		x	x			03
	15	35	x	x		x	x			03
	16	35	x	x		x	x			03
05	08	00	x	x	x	x	x	x		sig 08
	09	45	x	x	x	x	x	x		03
	10	00	x	x	x	x	x	x		08
	11	35	x	x	x	x	x	x		03
	13	50	x	x		x	x			08
	14	45	x	x		x	x			03
	15	00	x	x		x	x			08
	16	15		x		x	x			03
09	17	15	x	x	x	x	x	x	x	on
	00	00	x	x	x	x	x	x	x	off
	04	30	x	x	x	x	x	x	x	on
	08	00	x	x	x	x	x	x	x	off
99	--	--	x	x	x	x	x	x	x	off

99 Special week-program, see page 16.

Example of a channel-program with the week-programs shown on page 19



In order to implement this program, an external channel relay for channel No.5 was already needed.

Channel-programmes 1 to 4 inclusive are programmed for year 97. Channel-program 5 is valid for any year.

Channel-program lines which include a date with a year number should, when this date has been passed, be deleted when programming next takes place, in order to release space in the memory again.

Channel-program

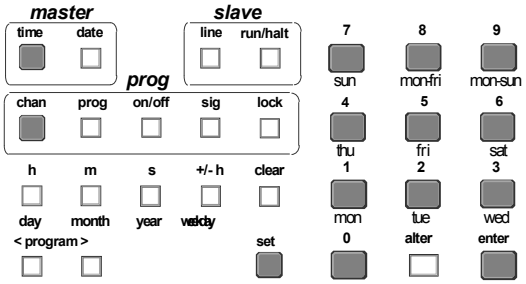
	„chan“ No.	day	month	year	Prog. No.
ch 1	01	05	01	97	01
		10	02	97	99
		17	02	97	01
		24	03	97	99
		17	04	97	02
		01	05	97	99
		05	05	97	02
		08	05	97	99
		12	05	97	02
		30	06	97	99
		11	08	97	02
		15	09	97	99
		06	10	97	01
		24	12	97	99
		05	01	98	01
ch 2	02	05	01	97	03
		10	02	97	99
		17	02	97	03
		24	03	97	99
		17	04	97	04
		01	05	97	99
		05	05	97	04
		08	05	97	99
		12	05	97	04
		30	06	97	99
		11	08	97	04
		15	09	97	99
		06	10	97	03
		24	12	97	99
		05	01	98	03

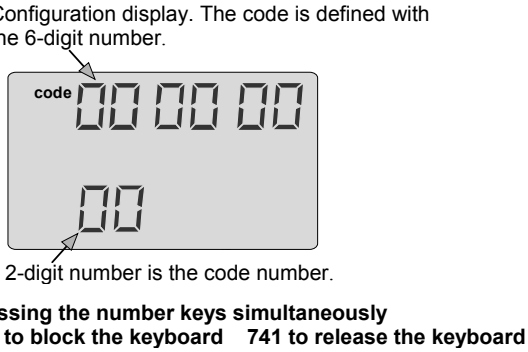
Channel-program

	„chan“ No.	day	month	year	Prog. No.
ch 3	03	05	01	97	05
		10	02	97	99
		17	02	97	05
		24	03	97	99
		17	04	97	05
		01	05	97	99
		05	05	97	05
		08	05	97	99
		12	05	97	05
		30	06	97	99
		11	08	97	05
		15	09	97	99
		06	10	97	05
		24	12	97	99
		05	01	98	05
ch 4	04	05	01	97	07
		10	02	97	99
		17	02	97	07
		24	03	97	99
		17	04	97	06
		01	05	97	99
		05	05	97	06
		08	05	97	99
		12	05	97	06
		30	06	97	99
		11	08	97	06
		15	09	97	99
		06	10	97	07
		24	12	97	99
		05	01	98	07
ch 5	05	01	05	--	08
		01	10	--	09

11. Configuring master (master clock)

The keys shown dark in the diagram are those needed to configuring the master clock.





Pressing the number keys simultaneously
740 to block the keyboard 741 to release the keyboard

Configuring procedure

time + **chan**	Press both keys at the same time.
0...9	Entry of desired code number
set	Ready to enter code at the 6-figure digit group
0...9	Edits the code
enter	Activates the code entered
time	Return to master time display

Configuring the „Master" section of the master clock

The standard or works configuration (WC) is in each case shown as WC(xx xx xx) in the individual sections. It is valid from software version 00 01 02 onward.

Note: each changement of configuration causes an alarm for about 20 seconds.

Time input to the master clock

Code-number 00	**Code**
no receiver	00 00 00
DCF receiver	00 00 01
MSF receiver	00 00 02
GPS-TAIP (RS 232)*	00 00 03
GPS-TSIP (RS 422)	00 00 04
Serial interface 1 (232)	00 00 05
Serial interface 2 (422)	00 00 06
LON	00 00 07
Synch. with minute pulses	00 00 08
Translation relay	00 00 09
	WC(00 00 01)

Remarks :

Code 00 00 00; Setting for operation with no receiver; otherwise after 24 hours an alarm is triggered. See also Code 02

Code 00 00 01 to 00 00 07; incl.: If a radio time-signal receiver or a time-input interface has been selected, then the manually-programmed seasonal time changeover is ignored (* only possible with a 422 > 232 conversion box)

Code 00 00 08; Only possible with a special interface. Pre-programming of the seasonal time changeover necessary. No reaction to re-setting pulses. If pulses fail, the clock continues to run with its internal accuracy. Maximum synchronisation capability is +/- 30 sec.

Code 00 00 09; The translation relay must always be provided with a back-up power supply, e.g. an external battery. It transmits only the primary pulses which it receives.

Type of time input

Code-number 01	**Code**
With time transfer	00 00 01
synch. +/-30sec.	00 00 00
	WC(00 00 01)

Code 00 00 00; Reading in and acceptance of time and date information is suppressed. If the master-clock time is the same as the receiver time within +/- 30 sec., then it is synchronised to the exact time. If the difference between receiver time and master-clock is greater than +/- 30 sec. then synchronisation takes place only within +/- 0.5 sec.

Alarm after failure of an external time source

Code-number 02	**Code**
Code structure	00 nn nn
	WC(00 14 40)

Alarm triggered nn nn minutes after failure of the external time source. Range 00 00 00 minutes to 00 99 99 minutes.
(WC corresponds to 24 hours).

Serial time and date output

Code-number 05	**Code**
no messages	00 00 00
Serial interface 1 standard	00 00 01
Serial interface 2 standard	00 00 02
Serial interface 1 Diem	00 00 03
Serial interface 2 Diem	00 00 04
	WC (00 00 00)

Remarks:

Output of the time and date code at the appropriate interface.

For definition of interfaces, see page 31.

Data exchange serial interface 1

Code-number 50	**Code**
no function	00 00 00
Master clock receives data	00 00 01
Master clock transmits data	00 00 02
	WC (00 00 00)

The master clock can read in (receive) switch programs or new software from a PC.

When transmitting, the switch program can be read back to the PC.

Time zones

Code-number 40	**Code**
Plus sign (+)	00 00 XX
Minus sign (-)	00 01 XX
	WC (00 00 00)

Difference from master time to receiver time. The direction of the difference in hours (+) or (-) is specified by 0 or 1 in the middle digit group, the difference in whole number of hours must be inserted in the last digit group, with XX = 0 to 12.

Seasonal time change on a specified date

Code-number wi>su 41	**Code**
Code-number so>wi 42	tt mm jj
Or seasonal time change, last Sunday in March and October, respectively	
Code-number wi>su 41	00 03 00
Code-number su>wi 42	00 10 00

The changeover-date code consists of:
Day of the month (tt), (01...31), first digit group
Month (mm), (01...12), second digit group
Year (jj), (00...99), third digit group
41 WC (00 03 00)
42 WC (00 10 00)

Changing the changeover time

Code-number wi>su 43	**Code**
Code-number su>wi 44	hh mm ss
	43 WC(01 59 59)
	44 WC(02 59 59)

The changeover-date code consists of:
Day of the month (tt), (01...31), first digit group
Month (mm), (01...12), second digit group
Year (jj), (00...99), third digit group

The standard setting for the changeover time is wi>su at 02 :00 and su>wi at 03 :00, but the changeover time can be altered if the master clock **is not programmed to accept time from a receiver (see "type of time input").**

Fine adjustment of clock accuracy

Code-number 94	**Code**
	00 00 XX
	WC (00 00 10)

Only necessary when operating with no radio time-signal receiver or with no synchronisation.

Possible correction in steps of 0.5 sec. per week, within a range of +/- 5 sec, as shown in the following table:

A	20	19	18	17	16	15	14	13	12	11	10	09	08	07	06	05	04	03	02	01	00
B	+5	+4,	+4	+3,	+3	+2,	+2	+1,	+1	+0,	0	-0,5	-1	-1.5	-2	-2,5	-3	-3,5	-4	-4,5	-5

A: Number XX B: Correction in seconds / week

LON Adress

Code-number 91	**Code**
	00 00 nn
	WC(00 00 00)
LON inactiv	00 00 00
Master clock No. 1	00 00 01
...	...
Master clock No. 16	00 00 16

LON (Local Operating Network). With this system up to 16 master clocks can be linked into a common network. This network can transmit the time to the master clocks, and the master clocks transmit any errors to the central control position.

Miscellaneous displays

Code-number 88: Master-clock type
Code-number 97: Last fault which occurred (p. 9)

Code-number 98: Software-number
Code-number 99: Software-version number

12. Configuring slave (slave-clock lines)

Configuring procedure

The keys shown dark in the diagram are those needed to configuring slave clock lines.

time + **chan**	Press both keys at the same time
0...9	Entry of desired code number
set	Ready to enter code at the 6-figure digit group.
0...9	Editing the code
enter	Activates the code entered
time	Return to master time display

Configuring the "Slave" section of the master clock (slave-clock lines)

The standard or works configuration (WC) is in each case shown as WC(xx xx xx) in the individual sections. It is valid from software version 00 01 02 onward.

Type of line

Code-number Line 1 10
Code-number Line 2 20

	Code
Mobaline	00 00 00
Seconds line	00 00 01
Half-minutes line	00 00 02
Minutes line	00 00 03
$^1/_8$-minutes line	00 00 05

Remarks:

Each line can be configured individually. For example, via code-number 10 one of the five operating modes shown to the left can be selected for line 1; the same applies for line 2 via code-number 20.

10 WC (00 00 03) 20 WC(00 00 00)

Special features with Mobaline

Code-number Line 1 11
Code-number Line 2 21

	Code
continuous	00 00 00
½ minutes stepping	00 00 01
minute stepping	00 00 02

11, 21 WC (00 00 00)

Continuous: the minute hand moves forwards in small steps.
½ minutes: the minute hand makes a forward step at second 00 and 30.
Minute: the minute hand makes a step only every 60 seconds.

Seasonal time change yes/no

Code-number line 1 12
Code-number line 2 22

	Code
Time change yes	00 00 00
Time change no	00 00 01

12, 22 WC (00 00 00)

For each line it is possible to specify whether the seasonal time change which the master section makes is also made on the lines.

Individual setting of pulse duration with pulse-operated lines

Seconds

Code-number line 1 30
Code-number line 2 60

Half-minutes / $^1/_8$-minutes

Code-number line 1 32
Code-number line 2 62

Minutes

Code-number line 1 34
Code-number line 2 64

The code structure is based on the entry of:
1 second in the middle digit group (m)
1/100 second in the last digit group (n)

Code
00 mm nn 00 mm .. duration in seconds
00 .. nn duration in 1/100 seconds

30,60 WC(00 00 30)
32, 34, 62, 64 WC(00 01 50)

Individual adjustment of pulse interval with pulse-operated lines

Seconds

Code-number Line 1	**31**
Code-number Line 2	**61**

Half-minutes / $^1/_8$-minutes

Code-number Line 1	**33**
Code-number Line 2	**63**

Minutes

Code-number Line 1	**35**
Code-number Line 2	**65**

The code structure is based on the entry of:
1 second in the middle digit group (m)
1/100 second in the last digit group (n)

Code

00 mm nn 00 mm .. duration in seconds
00 .. nn duration in 1/100 seconds

31, 61 WC(00 00 20)
33, 35, 63, 65 WC(00 01 50)

Catch-up periodicity with pulse-operated lines

Seconds

Code-number Line 1	**36**	
Code-number Line 2	**66**	**Code**
60 seconds		00 00 00
12 hours		00 00 01

For second impulse slave-clocks the 12 hour cycle is usual.
36, 66 WC(00 00 01)

Half-minutes / $^1/_8$-minutes

Code-number Line 1	**37**	
Code-number Line 2	**67**	**Code**
12 hours		00 00 00
24 hours		00 00 01
1 week		00 00 02

37, 67 WC(00 00 01)

Minutes

Code-number Lige 1	**38**	
Code-number Lige 2	**68**	**Code**
12 hours		00 00 00
24 hours		00 00 01
1 week		00 00 02

38, 68 WC(00 00 01)

When setting up a terminal operation on a weekly cycle please note :.
Before the adjustment of the connected line, the master clock date must be adjusted to correspond to the weekday of the concerned terminal.
After the line time has been adjusted to that of the terminals, and the line is operating again, the master-clock date can be set correctly again.

Re-loading the works configuration

Code-number 95	**Code**
Normal indication	00 00 00
Load works configuration	00 00 01

After the loading code 00 00 01 has been acknowledged with "enter", the code indicator jumps automatically to 00 00 00 again. All clock parameters which can be varied again correspond to the works configuration.
The parameters are set out in each section using the designation WC (xx yy zz).

Miscellaneous displays

Code-number 88: Master-clock type
Code-number 97: Last fault which occurred (see page 9)
Code-number 98: Software-number
Code-number 99: Software-version number

13. Configuring program section

Configuring procedure

The keys shown dark in the diagram are those needed to configuring slave clock lines.

time + chan	Press both keys at the same time
0...9	Entry of desired code number
set	Ready to enter code at the 6-figure digit group.
0...9	Editing the code
enter	Activates the code entered
time	Return to master time display

Pressing the number keys simultaneously
740 to block the keyboard 741 to release the keyboard

Configuring the Program section

The standard or works configuration (WC) is in each case shown as WC (xx xx xx) in the individual sections. It is valid from software version 00 01 02 onward.

Allocation of the inputs for automatic twilight-switch controllers to the desired channel.

Code-number 70	**Code**
Input No. 1	00 00 xx
Input No. 2	00 xx 00
Input No. 3	xx 00 00
	WC (00 00 00)

For each control input the digits designated XX must be replaced by the desired channel number (01 .. 64). Only one channel can be allocated to each control input.

Deleting program memory

Code-number 90	**Code**
Normal display	00 00 01
Delete	00 00 00
	WC (00 00 01)

Only data which are in the program memory are deleted; after the delete code 00 00 00 has been acknowledged with "enter", the code indicator automatically jumps to 00 00 01 again.

Loading a program

To load a complete switching program from a personal computer via an interface, see page 22 Code No. 50 and pages 26, 27 and 29.

Miscellaneous displays

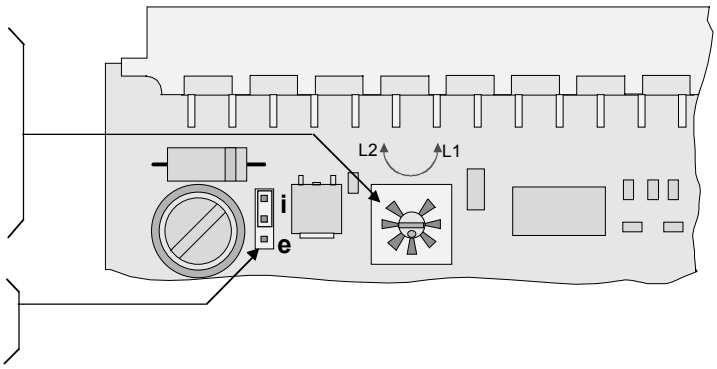
Code-number 88: Master-clock type
Code-number 97: Last fault which occurred (see page 9)
Code-number 98: Software-number
Code-number 99: Software-version number

14. HN 425 R terminal connections (rack mounted model)

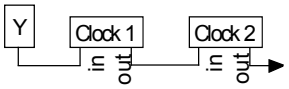
The same terminal connections will be used both for the rack model HN 425 R and the wall mounting model HN 425. The terminal designations are the same. The connection designation on page 28 and 29 are thus valid for both models.

Slave clock lines :
Adapt the individual line current, pull out the master clock from the rack and adjust the potentiometer above the terminal plug as per the instructions on page 28.

External or internal battery for the correct jumper position “e” or “i” see page 28.



Operation of several master clocks with one receiver.



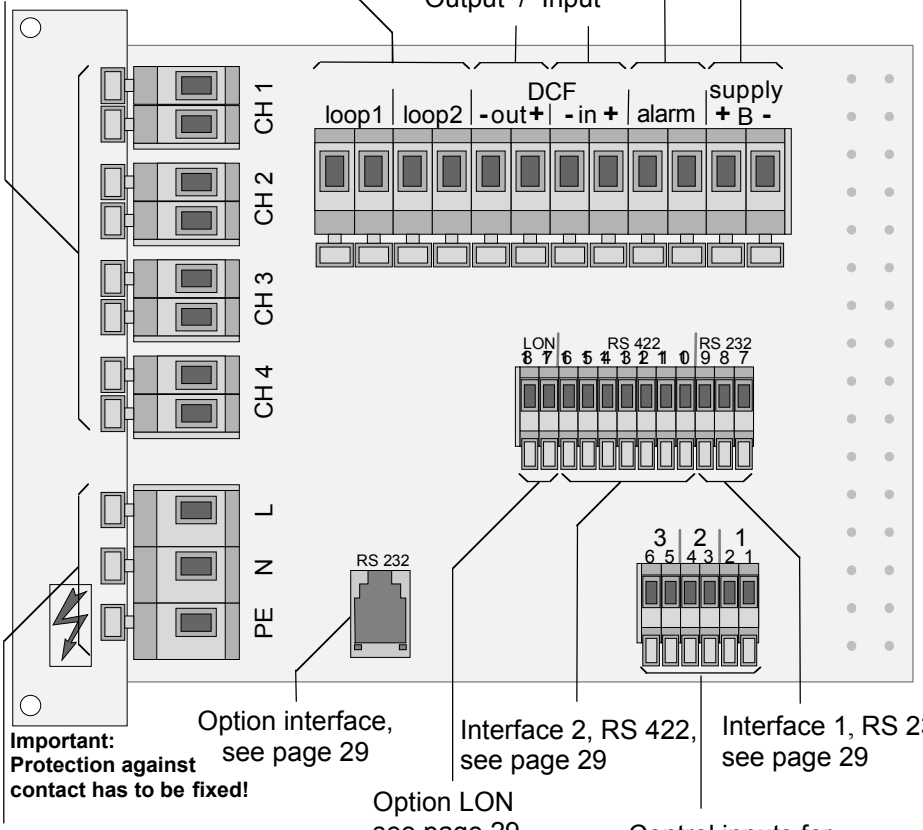
Slave clock lines

Alarm see page 28

Programm, see page 28.

Time signal receiver, see page 28.
Output / Input

Battery connection, see page 28.



Important: Protection against contact has to be fixed!

Option interface, see page 29

Interface 2, RS 422, see page 29

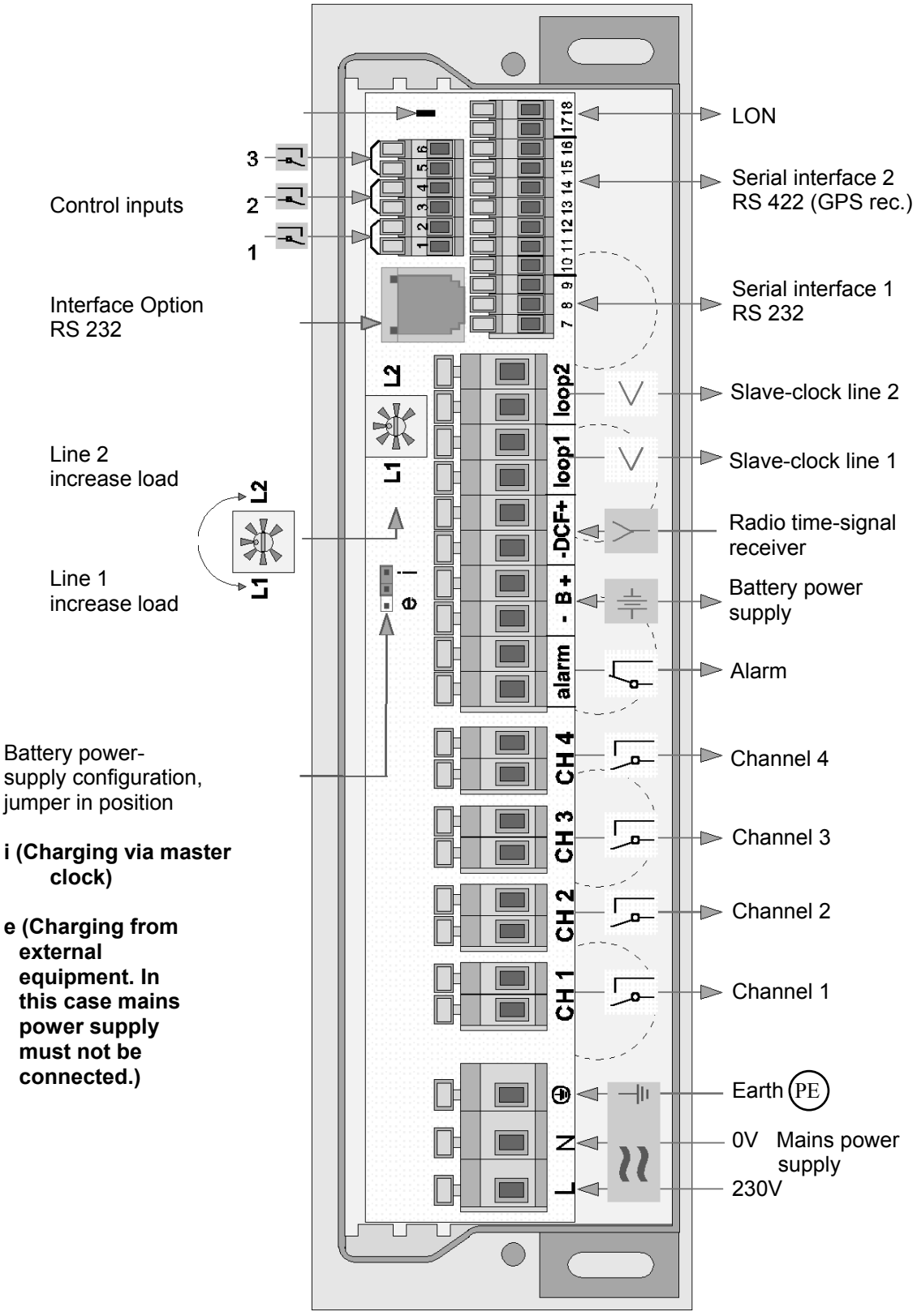
Interface 1, RS 232, see page 29

Option LON see page 29

Control inputs for twilight switch, see page 29.

Mains connection, see page 28.

15. HN 425 terminal box (wall-mounted model)



16. Connections (explanations for HN 425 and HN 425 R)

Mains power supply

Standard voltage 230V +/- 10%, 50/60 Hz. Master clocks for other mains voltages can be supplied on request.

Before connection to the mains supply, the operating voltage must always be checked against the information on the data-plate.

When the system is connected to an external (externally charged) battery, the mains supply must not be connected.

Slave clock lines

Loop 1
Loop 2

Each line can be configured individually for pulse-driven clocks, or terminal equipment for Mobaline code.

The maximum total load of both lines is 1A for pulse-driven equipment, 0.7A for Mobaline.

Where the lines have an unequal load, the current in the lines can be adjusted with the potentiometer by a factor of 1:10. Turning towards L1 as far as the stop means that Line 1 can carry a load of c.0.9 A, while Line 2 can carry only 0.1 A, or correspondingly less for Mobaline.

For line configuration, see pages 23, 24.

Works configuration: Line 1 minutes line, Line 2 Mobaline.

Program switch clock

Channel 1 to 4

4 electrically isolated channels (switching circuits) with individual switching possibilities.

If one of the slave-clock lines is configured for Mobaline, then the program section can be extended to up to 64 channels by the use of channel relays fitted externally.

For programming, see pages 13 to 20, or 5 and 6. For configuration possibilities, see page 25.

24V battery power supply. Mains power supply with back-up battery

-
B
+

Charging from the master clock. The jumper must be plugged in at position "i". Floating charging at 27.8 to 27.9 V, 0.5 A. Capacity as required up to 7Ah. Standard 2.3 Ah. **Always ensure correct polarity.**

24V battery power supply. Power supply by externally charged battery

-
B
+

The mains power supply must not be connected. The jumper must be plugged in at position "e".

Radio time-signal receiver

DCF

Connection via a two-wire circuit. Length up to 200m. There are no special requirements for the quality of the circuit. The receiver should however be placed at least 2m away from the master clock. If reception suffers interference, the receiver can be powered by a 9V battery. With the receiver now independent of mains cable, a favourable location can be found for it. However, reception quality may deteriorate again somewhat after connection to the master clock. Compare the configuration possibilities for the master section given on pages 21 and 22.

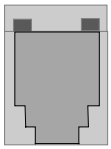
When making the connections check receiver polarity and type in the receiver documentation.

Alarm

Zero-potential contact. Break-contact max 80Vac or 50Vdc. There are certain configuration possibilities in connection with the radio time-signal receiver, see page 21.

Terminal box

Interface option



By using a jack-plug connection on a plug-in supplementary circuit-board, a PC can be connected in "parallel" with Interface 1 (RS 232). When this plug is inserted, the interface to the master clock is automatically changed over from the terminals to the jack-plug.

By using a transfer cable to a personal computer and special software (switch editor), switching programs prepared on the PC can be loaded into the program section of the master clock, or read back into the PC. It is also possible to load new software for the master clock.

For the rack-mounted version, this jack-plug can be obtained on a 3HE X 7TE front plate, including a connecting cable.

For configuration, see page 21.

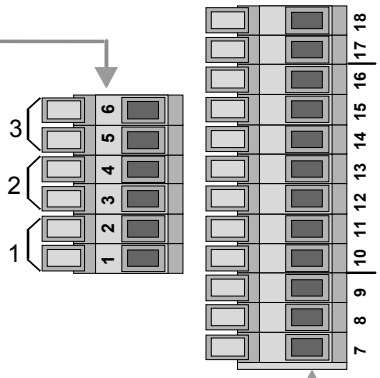
Control inputs for twilight switches

1 + / 2 -) 1
3 + / 4 -) 2
5 + / 6 -) 3

These override the channel. If in accordance with the program the channel relay should be closed, then it will close only when the remote-control contact also closes, the delay time being 1 to 2 minutes. The channel relay however opens in accordance with the program, even if the remote-control contact is still closed. Program and remote-control contact are linked by "AND" logic.

Three separate inputs are available, each of which can be allocated to any desired channel, see configuring the program section on page 25. The input is an active 24V 20mA current loop.

Control via relay contact or open transistor collector, take care over polarity.



Serial interface 2, RS 422

10 RXD +
11 RXD –
12 TXD +
13 TXD –
14 1 pps
15 supply +
16 supply -

Standard message configuration for reading in or reading out time and date, generally as shown in the table on page 31. The GPS receiver must be connected to this interface. For further explanations, see configuring the master section on pages 21 and 22.

Serial interface 1, RS 232

7 TXD
8 RXD
9 GND

When using these connections, note the possibilities and restrictions referred to under "Interface option". Standard message configuration for reading in or reading out time and date, generally as shown in the table on page 31. For further explanations, see configuring the master section on pages 21 and 22.

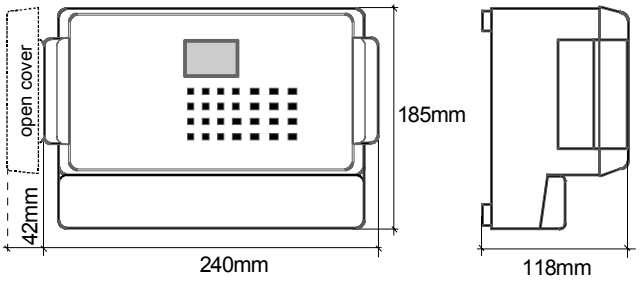
LON-Bus (Option)

18 / 17)

"Local Operating Network" communication by means of an central unit providing overall control, for transfer of time and date to the master clock and fault messages back to the central unit. Connection not dependent on polarity.

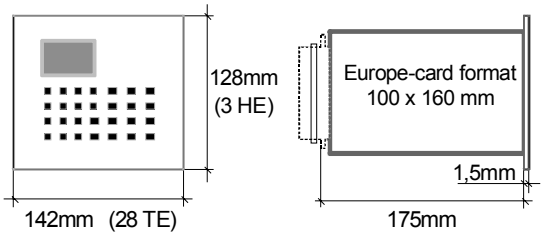
The terminal position indicated here corresponds to the allocation.

17. Specifications



HN 425
Wall-mounted case

Stone-grey with transparent cover
Typ Reglo Card RCP 2000



HN 425 R
Rack-mounting

Front panel anodised, natural colour, black lettering.
Can be plugged in via DIN 41 612D, or 41 612H spring-clips, ready fitted on connection circuit-board.

Mains power supply	230V, +/-10%, 50/60Hz, <30VA (depending on external load)	
Battery supply	24V, +/-15%	120mA (with DCF or MSF receiver, without external load) 210mA (with GPS receiver, without external load)

For calculating the necessary battery capacity , in case of MOBALINE calculate with a permanent load: slave clock types: (SAM, SAD: 6mA),
(SAA-, SAM-, SFA-, SFM 130/140: 12mA)
Interfaces: (IF480, IF482, IF483: 6mA), (IF485: 18mA).

For impuls line slave clocks calculate with 6 mA per slave, this load depends on the pulse duration, usally 1/40, also calculate only 1/40 of the calculated current.

Slave clock lines

2 individually configurable lines with unlimited pulse memory;
- Pulse lines, seconds, minutes, half-minutes or $^1/_8$-minutes Code lines, Mobaline time and date information.
- Maximum current load capacity of both lines together is 1A for pulse lines, 0.7A for Mobaline.
- The permissible current can be varied between the lines by a potentiometer by a factor of 1 to 10.

Program switching clock

4 switching circuits, max. 8A 250V ac (2000 VA), or 5A 30V dc (150W), max. 0.5A at 60 V dc, closing contacts. Capacity of program memory, 1000 line
By the use of channel relays fitted externally, up to 64 individual switching circuits (channels) can be controlled. For this application at least one line must be configured for Mobaline code. Channel relays with 2 and with 5 channels are available.

Passive back-up battery

Internal lithium battery for program and pulse memory, and for maintaining the time. Working life at least 20 years. If no mains power or external battery power is provided, the working life is at least 2 years.

Mains power with active back-up battery option

For the wall-mounted model a wall-unit incorporating 2.3 Ah accumulators is available. In the standard version the charge regulator is located in the master clock, maximum charging current 0.5A.

An accumulator package is also available for the rack-mounted model, with 3.2Ah accumulators. Fitting dimensions, 3HE x 28 TE.

Alarm

1 potentiel-free contact. Opening contact, maximum 0,5 A, 125 V~ (60 VA) or 1 A, 60 V= or 1 A, 60 V~ or 1 A, 30 V= or 0,1 A 60 V=.

Control inputs

In the program switching section the operation of up to 3 twilight switches can each be made to override any desired channel.

Seasonal time change

Via radio time-signal receiver or from a central control unit.
With no receiver or central control unit, can be programmed in various ways.

Clock accuracy

Absolute, with radio receiver or synchronised.
Better than 0.1 sec per day with no receiver or synchronisation.

Temperature limits

on work: 0°C to 50°C, 75% humidity relativ, without condensing
in depot: -10°C to 65°C, 90% humidity relativ, without condensing

Lifetime

MTBF more than 40'000 hours.

Weight

Wall-mounting model: 1,98 kg Rack-mounting model 1,88 kg

Serial interface RS 232 / RS422

9600 bit/sec, 7 data bits, even parity, 1 stop bit, one message per second (ASCII), ending at the start of the second designated in the message. The message configuration is given in the table below.

Standard

Sequence	*Meaning*	*Indication*	*Sequence*	*Meaning*	*Indication*
1	-	O	10	Monday .. Sunday	1 to 7
2	Monitoring	A or M	11	Hours, tens	0 to 2
3	Seasonal time	W or S	12	Hours, units	0 to 9
4	Year, tens	0 to 9	13	Minutes, tens	0 to 5
5	Year, units	0 to 9	14	Minutes, units	0 to 9
6	Month, tens	0 or 1	15	Seconds, tens	0 to 5
7	Month, units	0 to 9	16	Seconds, units	0 to 9
8	Day, tens	0 to 3	17	End of message	CR
9	Day, units	0 to 9			

Monitoring: information in connection with the time input from DCF, GPS or central control unit. "A" correct receipt, "M" reception suffers interference over a period, see master-clock configuration, pages 21 and 22.

Diem

1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	Sequence
T	:	9	9	:	1	2	:	3	1	:	0	7	:	2	3	.	5	9	:	5	9	CR	LF	Indication
		Year			month			day			weekday			hour			minute			second				Meaning

Interfaces for time input to the master clock from a central control unit or from a GPS receiver. A time output is also possible at both interfaces, but both cannot be configured for reading in or for providing output at the same time. For further information, see configuration on pages 21 and 22, and terminal connections on page 26, 27 and 29.

18. Tables for switching programs

Annex to Operating Instruction

week-program

																																			Prog. No.
																																			hrs
																																			min
																																			mon
																																			tue
																																			wed
																																			thu
																																			fri
																																			sat
																																			sun
																																			Function

week-program

																																			Prog. No.
																																			hrs
																																			min
																																			mon
																																			tue
																																			wed
																																			thu
																																			fri
																																			sat
																																			sun
																																			Function

Projekt

channel-program

																																			“chan” No.
																																			day
																																			month
																																			year
																																			prog. No.

Programmed

channel-program

																																			“chan” No.
																																			day
																																			month
																																			year
																																			prog. No.

Valid from

channel-program

																																			“chan” No.
																																			day
																																			month
																																			year
																																			prog. No.

to

channel-program

																																			“chan” No.
																																			day
																																			month
																																			year
																																			prog. No.

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19. Notes

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