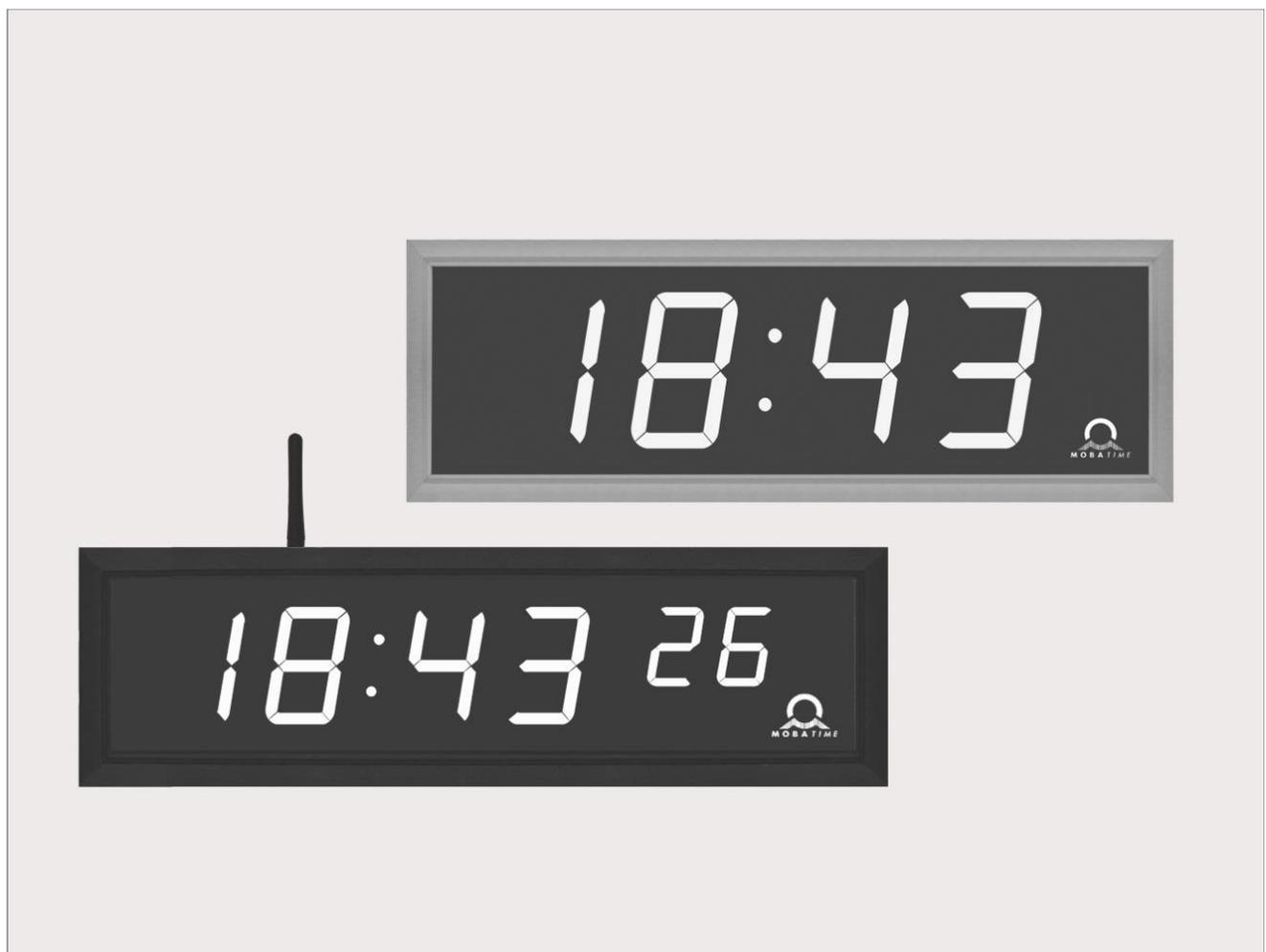# INSTRUCTION MANUAL

DC series

State-of-the-art technology digital clock

CE

Certification of the Producer

STANDARDS

The digital clock DC has been developed and produced in accordance with the
EU Standards 2014/35/EU (LVD), 2014/30/EU (EMC), 2014/53/EU (RED), 2011/65/EU (RoHS),
2012/19/EU (WEEE):
Electrical safety: EN 62368-1
EMC: EN 55032; EN 55024; EN 50121-4

References to the Instruction Manual

1. The information in this Instruction Manual can be changed at any time without notice.
   The current version is available for download on www.mobatime.com.
2. This Instruction Manual has been composed with the 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 only start setting-up the product, after you have correctly understood all the information for the installation and operation.
5. The installation must only be carried out by skilled staff.
6. It is prohibited to reproduce, to store in a computer system or to transfer this publication in a way or another, even part of it. The copyright remains with all the rights with BÜRK MOBATIME GmbH, D-78026 VS-Schwenningen and MOSER-BAER AG – CH 3454 Sumiswald / SWITZERLAND.

Table of contents

1   Description

General purpose digital clock, intended for indoor use • The clock meets the requirements of e majority of conventional applications • 7-segment LED display of high luminance provide for excellent readability from various angles of view • Eight combinations of the height and the number of digits • Autonomous operation with internal quartz powered from mains • NTP multicast or unicast synchronization in Ethernet or WiFi network powered over PoE or mains powered • Slave clock operation in wireless WTD system based on a transmitter which sends the time signal • Slave clock operation controlled by self-setting MOBALine code mains powered • Slave clock operation controlled by built-in RS 232, RS 485 or IRIG-B interface, mains powered • LED display in red, pure green, blue, amber or green • Single or double sided clock • Clock frame made of anodized aluminum profiles • Wall mounting for single sided clock • Ceiling suspension or wall bracket mounting for double as well as single sided clock; panel or rack mounting (model DC.20).

Basic properties

- digit height of 20, 57, 75, 100, 180 or 250 mm, which corresponds to readability distance of approx. 9, 25, 32, 40, 70 or 100 meters

- color of the digits: red, pure green, blue, yellow, white or green

- manual or automatic setting of the LED display light intensity

- anti-reflex front cover acrylic glass which prevents light reflex and improves the digit readability

- single-sided or double-sided design, for wall mounting (for single-sided clock design, only), or to be suspended on ceiling or fixed to a side kick up console

- panel or rack mounting (model DC.20)

- depth of single-sided clock design only 39 mm (66 mm for the 180 mm versions) or 78 mm (130 mm) for the double-sided design)

- clock frame made of anodized aluminum profiles, in black or silver color. Any other RAL tint or imitation of various materials (wood, marble…) on request

- clock setting carried out remotely or using two push-buttons, the latter installed at the upper part of the frame

- autonomous, quartz controlled time base with the possibility of synchronization using the following: DCF 77 radio signal, 24 V minute impulses, the MOBATIME serial code, MOBALine, RS232, RS485, IRIG-B or GPS

- IPv4 and IPv6 support

- NTP multicast or unicast synchronization in Ethernet or unicast synchronization in WiFi network powered over PoE or mains powered

- configuration / supervision by means of MOBA-NMS software or SNMP protocol

- slave clock operation in wireless WTD system (868MHz) based on a transmitter which broadcasts the time signal

- possibility to set up the world time zones with indication of the time shift (DST) for the particular time zone. Control over the DCF receiver or the master clock

The clocks

- time display in 12 or 24 hour cycle; four-digit (HH:MM) or six-digit (HH:MM:SS/ HH:MM:SS format;
- possibility of leading zero suppression when displaying the time and date;
- temperature indication (providing the temperature sensor is connected) in °C or °F;
- alternating indication of time, date and temperature, with adjustable period of each of the displayed data;

Stopwatch

- counting up, starting from zero, up to 99 hours;
- countdown from a set up value, with stop at zero, automatic restart or counting to negative values;
- indication of intermediate times, "freezing" of the display, cumulated interim time;
- counting in steps of one minute, one second or 1/100 second;
- control using the keyboard or IR remote control;
- concurrently, possibility of changeover into the time/date display mode, or the temperature indication.

Accessories

- DCF 77 signal receiver
- temperature sensor with protection degree IP 66
- keyboard for stopwatch control, connected via 5 m cable
- remote IR controller for clock set up and stopwatch control

On request

- internal relay – relay can switch for specified duration, when the stopwatch in the countdown mode reach the zero.
- protection degree IP 54

2   Assembly

⚠️ The connection to the 110/230 V AC power network can only be done by authorized personnel with appropriate qualification and training.

⚠️ Danger of electric shock when dismounting the cover with warning triangle.

⚠️ The connection to the 110/230 V AC power network should be carried out when the mains power is off.

2.1   Single-sided clock

- The frame is fixed using two suspension (at the above) and two sliding springs (at the bottom). Lift-off the anchoring plate using a screwdriver inserted in between the sheet and the frame at the sliding spring point on the clock bottom side (chapter 2.5).

- Disconnect the interconnecting cables by decoupling the terminals on the control PCB.

- Drill three anchoring holes into the wall, of a diameter adequate to accommodate wood-type screws of 4 to 5 mm diameter. As a template for marking the position of the holes the anchoring plate can be used.

- Interlace the incoming conductors through the opening in the anchoring plate and fix the sheet to the wall.

- Connect the incoming conductors in accordance with the descriptive sheet on the terminal board, placed on the anchoring plate (chapter 2.7). Give the conductors an appropriate shape or cut them off to a length that will not obstruct the placement of the clock onto the anchoring plate.

- Check and configure the jumpers according to the type of synchronization signal Line type - JP11, see chap. 2.10.

- Mount the connectors to the cable of the temperature sensor, to the keyboard cable, Ethernet or to the RS 232 and RS 485 interface cables, if these have been delivered.

- Push the temperature sensor connector, the keyboard connector, Ethernet connector or the RS 232 and RS 485 jacks into the corresponding terminals on the control PCB (chapter 2.8 and 2.11). Check the marking of the jack-plugs, in order to prevent their mix-up.

- Connect the interconnecting cables into the corresponding terminals on the clock control PCB.

- Put the clock opposite to the anchoring plate and suspend it onto the upper springs. Care should be taken when placing the cables between the frame edge and the anchoring plate, so as not to nip them. Snap the clock in onto the springs by pushing on the lower part of the frame.

- Check whether the anchoring plate on the sides fits exactly into the groove in the clock frame.

- Remove the blind cap from the opening on the clock bottom side.

- Insert Allen key into the opening on the bottom side of the clock. Turn the key softly in anticlockwise direction. The frame catch will snap in.

- Replace the blind cap on the opening.

- To loosen the frame catch, use the reverse procedure (turn clockwise).

2.2   Double-sided clock

- The double-sided clock consists of two parts, one serving as the control module (this one encompasses the jacks to connect powering voltage, synchronization source, the temperature sensor and the keyboard to the clock), and the other serving as the display module (with the terminal for the connection of the interconnecting cable). Both clock parts are interconnected via a 10-core flat cable. The clock suspension part is delivered separately.

- Interlace the incoming conductors through the pipe which serves as the clock suspension. Secure the ceiling suspension (or the side console) to the ceiling (or the wall), using 4 wood screws of 5 mm diameter.

- The frame is fixed using two suspensions (at the above) and two sliding springs (at the bottom). Lift-off both parts of the clock from the anchoring plate using a screwdriver inserted in between the sheet and the frame at the point where there are the sliding springs on the clock bottom side (chapter 2.5).

- Disconnect the interconnecting cables by decoupling the terminals on the control PCB.

- Interlace the incoming conductors through the pipe insert on the anchoring plate, to the side which finds itself to the opposite of the terminal board. Slip-on the plate onto the suspension in a way that the screws fit into the upper groove on the pipe insert. Fix the connection by tightening the screw using an Allen key.

- Interlace the incoming conductors through the opening located next to the terminal board, and connect the conductors to the terminal board on the anchoring plate, in accordance with the descriptive nameplate (chapter 2.7). Give an appropriate shape to the conductors or cut them off at a length which does not obstruct the mounting of the clock onto the anchoring plate.

- Check and configure the jumpers according to the type of synchronization signal

- Line type - JP11, see chap. 2.10.

- Mount the connectors to the cable of the temperature sensor, to the keyboard cable, Ethernet cable or the RS 232 and RS 485 interface connectors, if these have been delivered.

- Place the display part of the clock to the anchoring plate, at a position which is opposite to the terminal board, and suspend this part onto the upper springs. Interlace the 10-core interconnecting cable through the lower opening which finds itself at the closest to the terminal board on the anchoring plate.

- Care should be taken when placing the cables between the frame edge and the anchoring plate, so as not to nip them. Snap the clock onto the springs by pushing on the lower frame part.

- Connect the 10-core interconnecting cable and the interconnecting cables into the corresponding plugs on the clock control PCB.

- Push the temperature sensor connector, the keyboard connector, Ethernet connector or the RS 232 and RS 485 jacks into the corresponding terminals on the control PCB (chapter 2.8 and 2.11). Check the marking of the jack-plugs, in order to prevent their mix-up.

- Put the control part of the clock opposite to the anchoring plate and suspend it onto the upper springs. Care should be taken when placing the cables between the frame edge and the anchoring plate, so as not to nip them. Snap the clock in onto the springs by pushing on the lower part of the frame.

- Check whether the anchoring plate on the sides fits exactly into the grooves established in both parts of the digital clock (these must be pushed against each other in a way to mask the anchorage plate (after placing the parts the plate shall not be seen).

- Remove the blind cap from the opening on the both lower sides of clock.

- Insert Allen key into the opening on the lower side of the clock. Turn the key softly in anticlockwise direction. The frame catch will snap in. Secure both parts of the clock.
- Replace the blind cap on the opening.
- Loosen the screws on the suspension using Allen key, and lift the clock into the suspension in a way that the screws fit into the lower groove on the pipe insert. Secure the attachment by tightening the screw using the Allen key.
- To loosen the frame catch, use the reverse procedure (turn clockwise).
- Note: during the disassembly first withdraw the clock, and suspend the suspension on the upper groove at the pipe insert.

2.3   Assembly of the clock into a rack, single-sided clock DC.20.12… N.R

- The clock designed for the 19-inch rack has built-in height of 1U and similar design as other rack-mounted equipment.
- Specify a position in the rack with minimal height of 1U.
- Fasten cage nuts into the vertical rails (the rails are usually part of the rack) on the mounting position of the clock.
- Interlace all connectors which are to be connected to the clocks (power cord, synchronization, …) to the location of mounting.
- Connect the interconnecting cables into the corresponding terminals on the clock.
- Mount the clock into the rack in a way that back parts of the front panel touch the vertical rail at their sides and the four mounting holes are just in front of the cage nuts.
- Use four M6 screws (again a part of the rack) and secure the clock.
- The clock mounting is thus completed.

2.4   Assembly of the clock DC.20.6…N.F into a panel with back side access

- This type of clock is possible to mount only to the panel with maximum thickness 40 mm. Moreover, access from the back side of the panel is necessary.
- Prepare a rectangular opening with dimensions 138x60 mm in the panel in the mounting location.
- From the back side of the panel interlace all cables which are to be connected to the clock.
- Unscrew L-shaped strips from the top and bottom part of the clock body.
- Mount the clock into the prepared opening.
- Continue the mounting from the back side of the panel.
- Screw L-shaped strips back on the clock body.
- Secure the clock in the panel by tightening of fastener screws in L-shaped strips.
- Connect the interconnecting cables into the corresponding terminals.
  The clock mounting is thus completed.

2.5   Dismantling of the clock rear cover

suspension spring

sliding spring

at this spot lift-off the rear
cover using a screw driver
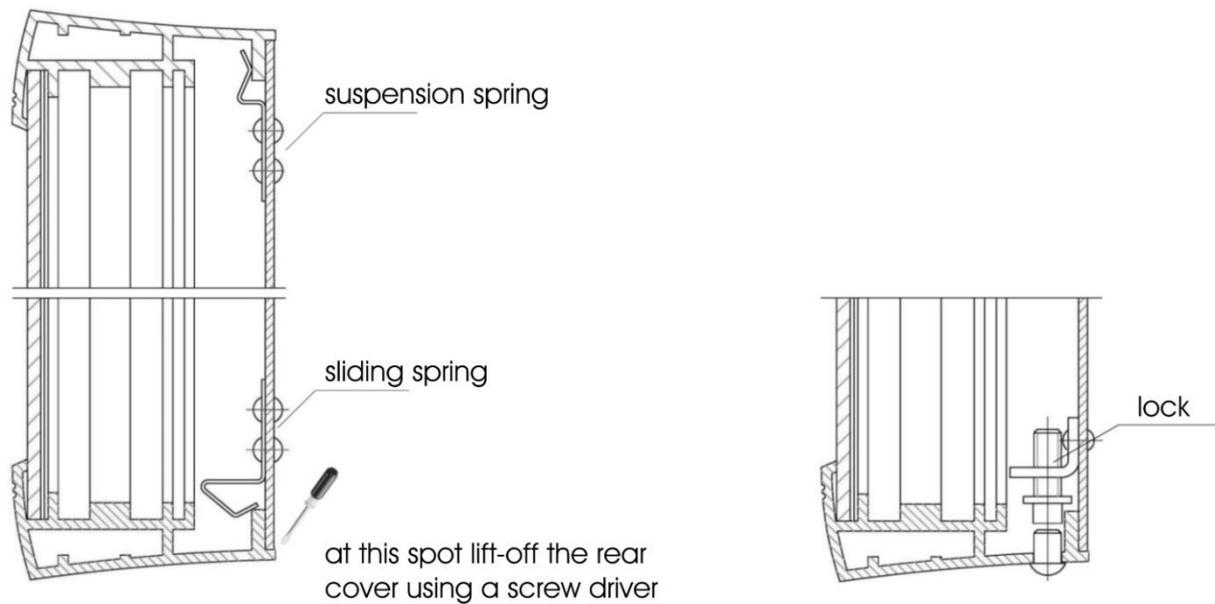
lock

| Unlock clock: | turn the Allen key screw clockwise (to the right). |
| Lock clock: | turn the Allen key screw anti-clockwise (to the left). |

2.6 Assembly diagram
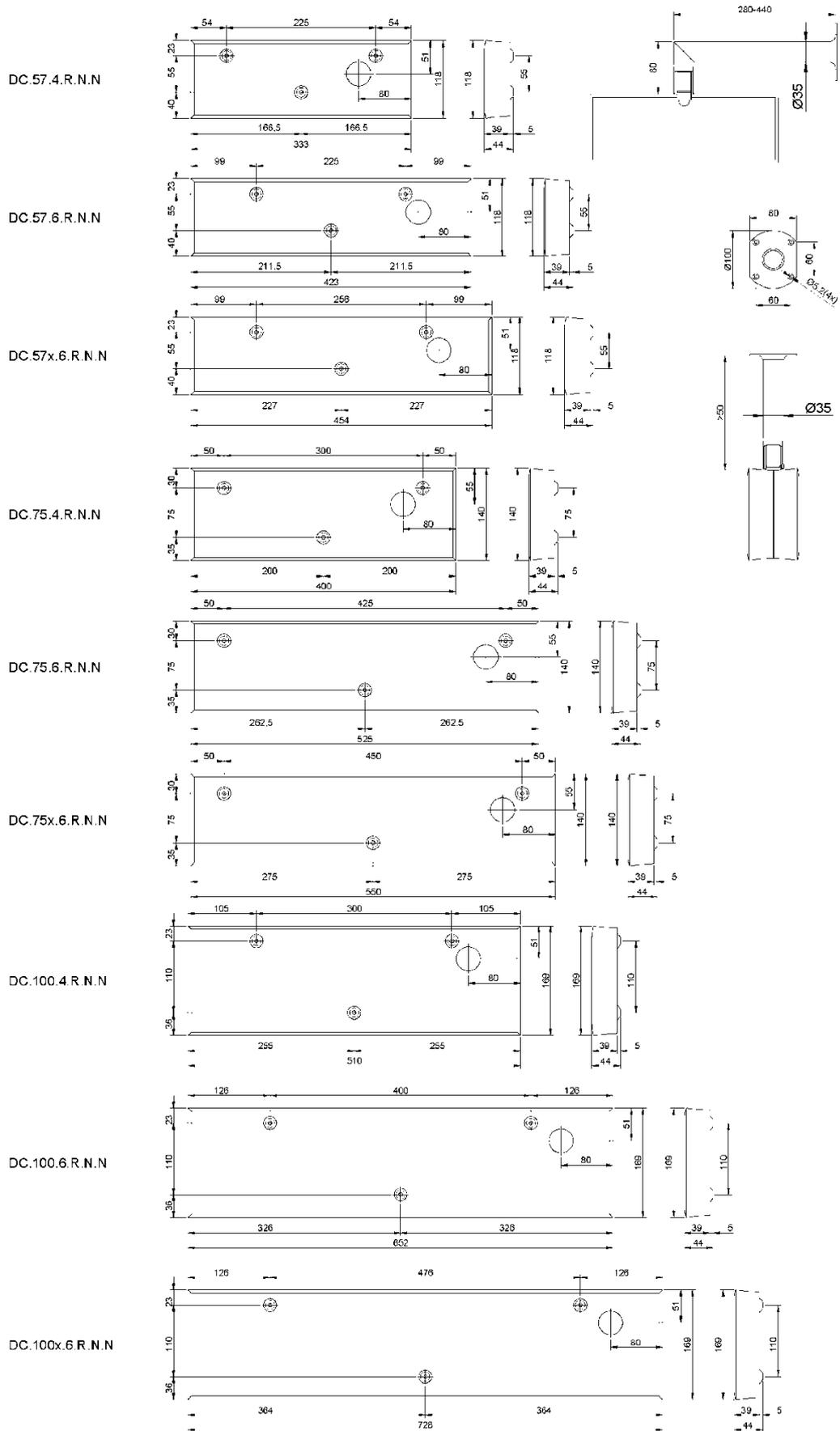
DC.180.4.R.N.N
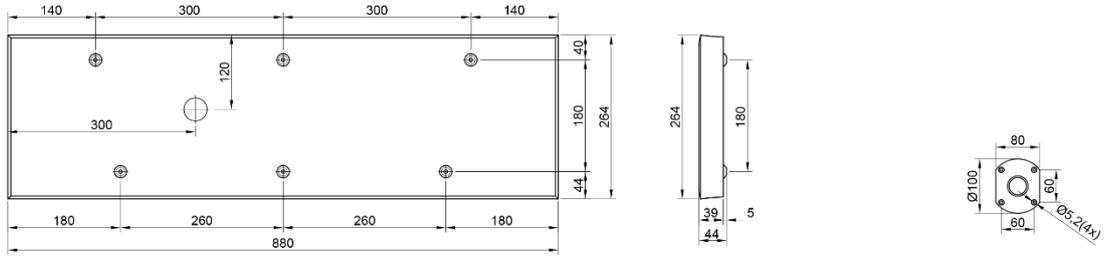
DC.180.6.R.N.N
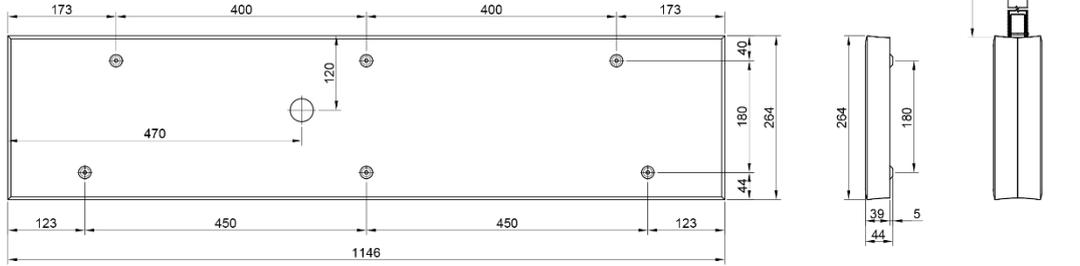
DC.180x.6.R.N.N
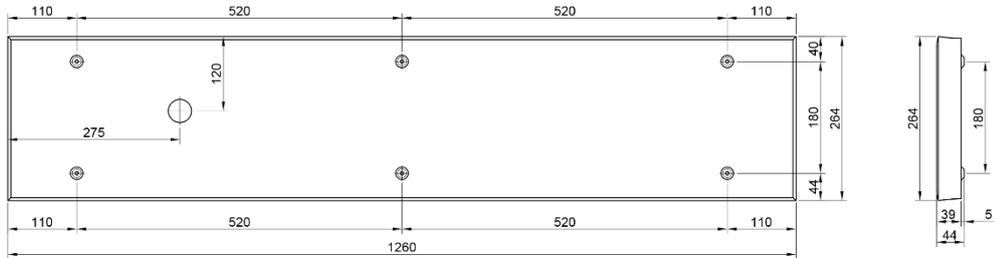
DC.250.4..N.N
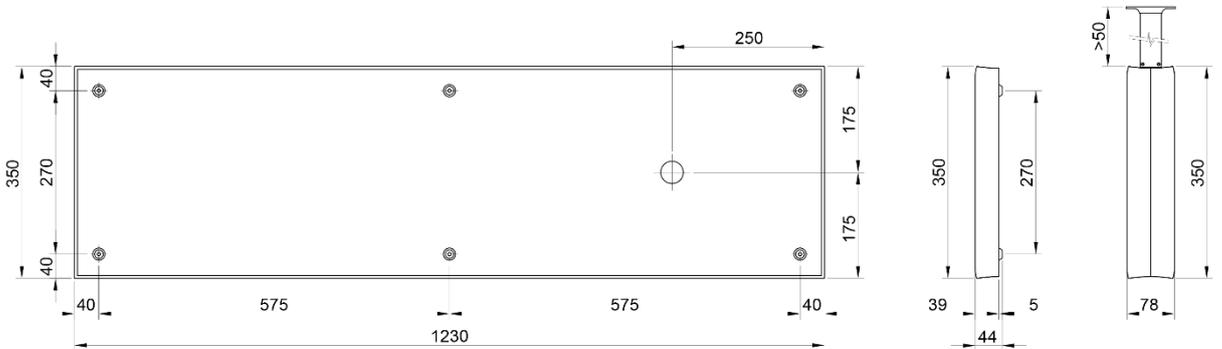
DC.250x.6..N.N
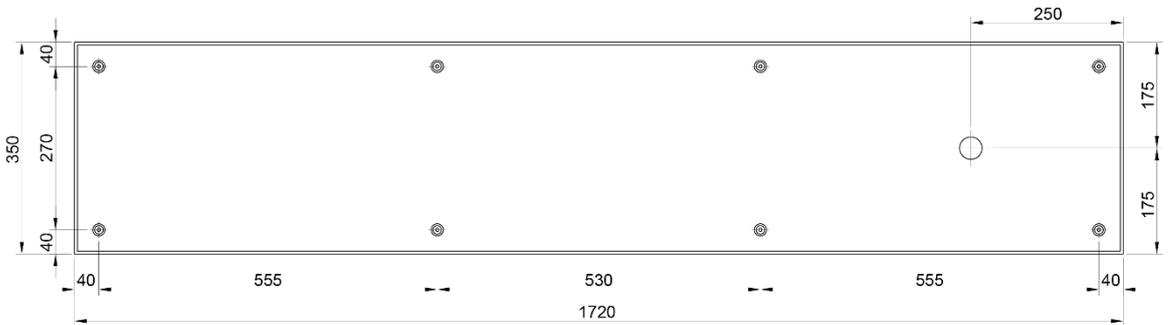
2.6.2 Assembly of the clock DC.20.6…N.F into a panel with back side access
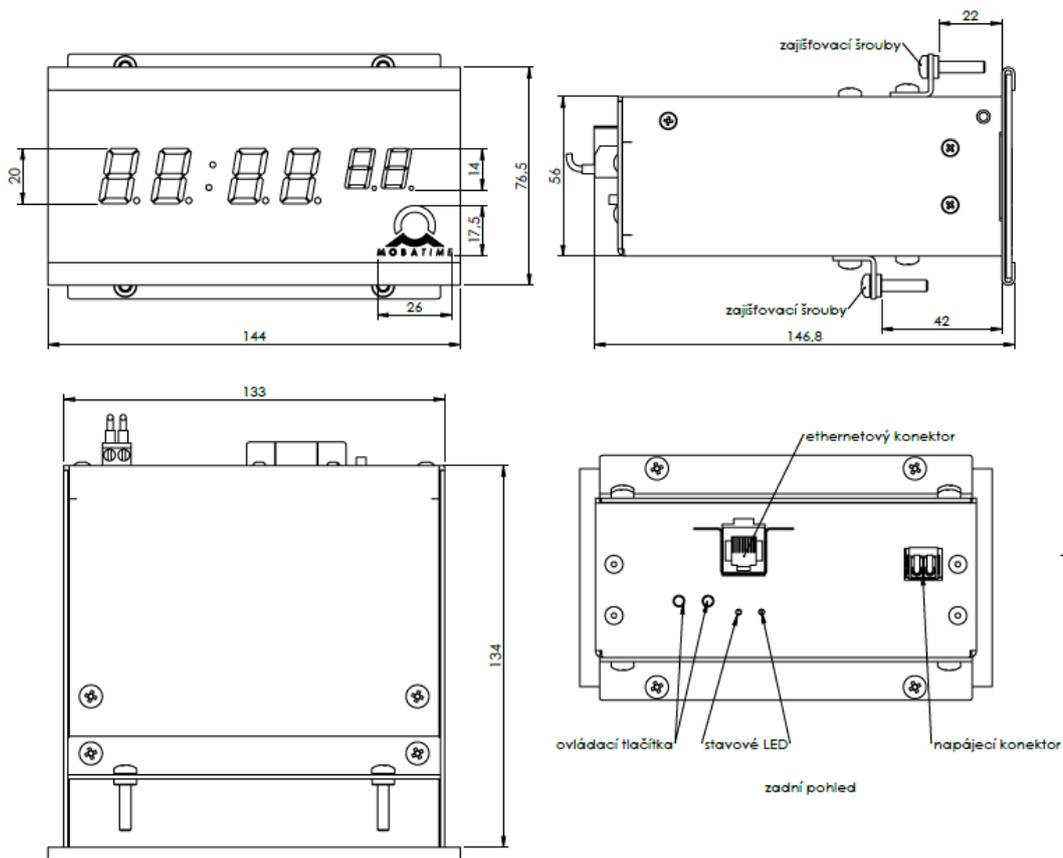
2.6.3 Assembly of the clock into a rack, single-sided clock DC.20.12… N.R
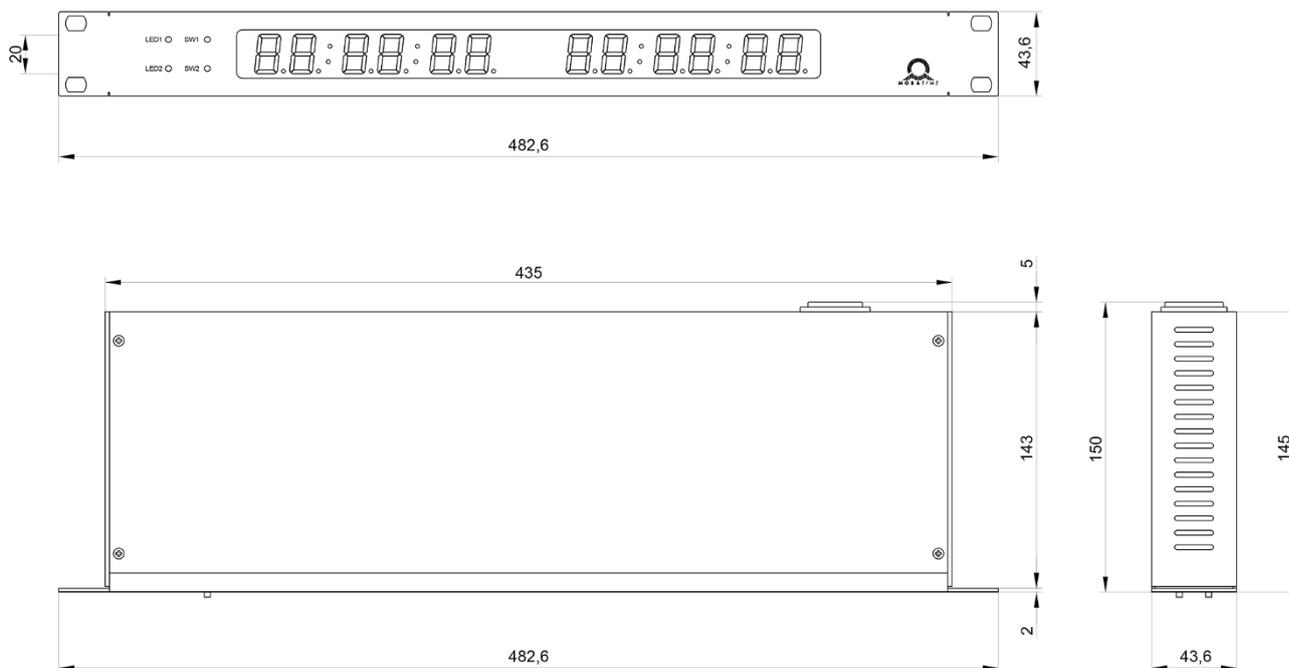
2.7   Connecting terminal block

terminal board for NTP, WTD and WiFi version   terminal board for remaining versions
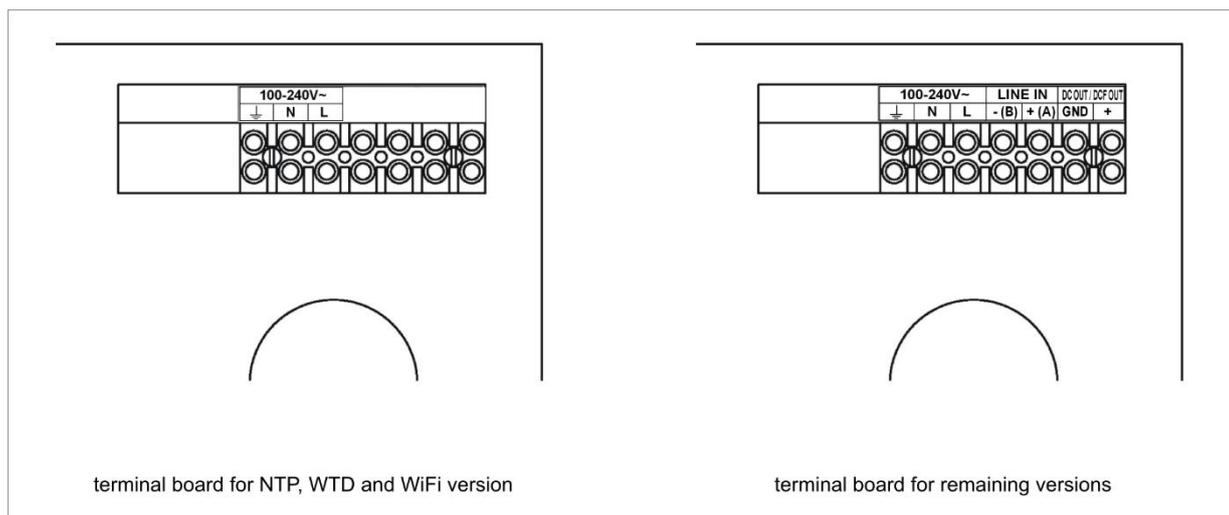
Notes:

1. Does not apply to rack and panel mounted variants.

2. For PoE version is Ethernet cable plugged directly into the connector on the control board (this version is without terminal block)

2.8 Control PCB

① LINES, DC / DCF OUT - JP1
② TEMP - JP2
③ CTRL - JP3
④ RS 232 - JP4 (version SI)
⑤ RS 482 - JP5 (version SI)
⑥ 100 - 240 VAC - JP6 (except PoE)
⑦ LAN - JP7 (version NTP and PoE)
⑧ PROG - JP8
⑨ DISP2 - JP20

❶ jumper Line type - JP11
❷ PB1, PB2 buttons
❸ RESET button
❹ jumper TRE - JP10 (version SI)
❺ jumper BATT - JP12

❻ jumper ISPE - JP9
❼ LED indication of receiving DCF signal
❽ state LED
❾ LED indication of powering
❿ jumper DC Out / DCF Out - JP17

2.9   Function of the plug connectors

① **LINES, DC/DCF OUT** – JP1   time signal inputs: The DCF/GPS receiver,
polarized impulse line, MOBALine, MOBATIME
serial code, IRIG-B,
power supply output: DC OUT 11–19 V
or passive DCF current loop output

② **TEMP** – JP2   connection of the temperature sensor(s)
③ **CTRL** – JP3   connection of the keyboard
④ **RS232** – JP4 (optional)   connection of the RS232 serial line
⑤ **RS485** – JP5 (optional)   connection of the RS485 serial line
⑥ **100 – 240VAC** – JP6   powering 100 - 240 VAC voltage
⑦ **LAN** - JP7 (optional)   RJ45 10BaseT/100TX (IEEE 802.3)
auto negotiation

⑧ **PROG** – JP8   clock firmware programming
⑨ **DISP2** – JP20   connection of the second side
⑩ **RELAY** – JP21(optional)   switching contact (except DC.57.4)

2.10   Setting elements

❶ **Line type** jumper – JP11for the setting of the slave line type
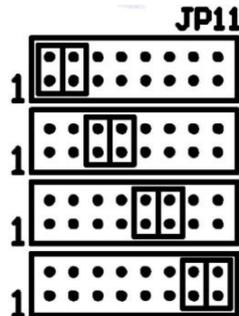
IRIG / AFNOR

DCF receiver

MOBALine

(Un)polarized impulse line
MOBATIME serial code, active DCF

❷ **PB1, PB2**   control pushbuttons
❸ **RESET**   the RESET button
❹ **TRE** jumper – JP10 (optional)   RS485 terminating resistor enable
❺ **BATT** jumper – JP12   backup battery connection
❻ **ISPE** jumper – JP9   invoking the firmware programming mode
❼ **DCF** LED   indication of receiving the DCF signal
□ **STATE** LED   state indication
□ **POWER** LED   power indication
❿ jumper DC Out / DCF Out – JP17 Output signal setting on pins 3, 4
of the JP1 connector

DC Out   pin3 = DC Out + (11-19V)

pin4 = DC Out -

passive DCF Out   pin3 = (+)

pin4 = (-)

2.11 Connection of the cable ends

Installation LINES / DC OUT wire connection
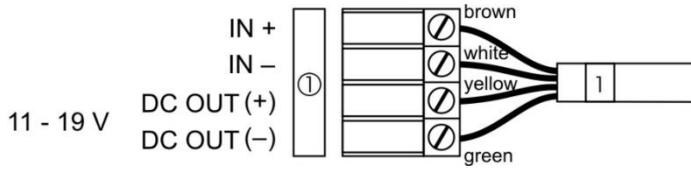
TEMP wire connection – 1 or 2 thermometers

CTRL wire connection
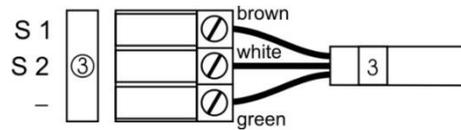
RS-232 wire connection
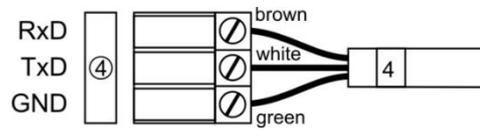
RS-485 wire connection
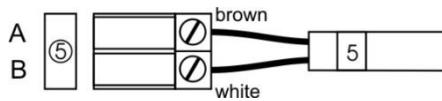
RELAY connection
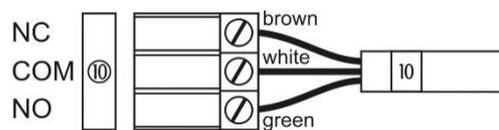
3 Control of the clock using keyboard or pushbuttons

The clock is adjusted and controlled using two pushbuttons located at the upper side of the clock frame. If you use a keyboard for setting the stopwatch, use the pushbuttons **PB1** and **PB2** for the clock setting.

Abbreviations used for the key strokes

PB1L, **PB2L**	pushing the pushbutton for more than 1 second
PB1S, **PB2S**	pushing the pushbutton for less than 1 second

Function of the pushbuttons in the "Clock" mode

PB1S	time correction to the whole minute (±30 sec)
PB2S	changeover of the displayed items
	Time -> date -> temperature -> stopwatch -> time
PB1L	entry into the time and date setting mode
PB2L	entry into the clock menu

3.1 Setting of time and date

The setting of time and calendar date takes place in following steps: year – days – months – hours – minutes. The entry into the time and date setting mode occurs by pushing the **PB1L** pushbutton.

The display shows the following:

The item to be adjusted is now blinking.

Move to another item by pushing the **PB1S** pushbutton. After having adjusted the minutes and by pushing **PB1S,** the entered values are stored (the seconds are set to zero) and the operation of the clock resumes. The clock returns into normal working mode.

Note: When the time zone of displayed time and date (menu item **P7**) is set to the values U1 – U7 or U, the entered time and date is taken as UTC.

Function of the pushbuttons in the "Time and date setting" mode.

PB1S	advancement to another item to be set up
PB2S	increase of the item to be set up by 1
PB2L	continuous increase of the current item

3.2 Menu for the setting of the clock parameters

The entry into the parameter setup menu is done by pushing the **PB2L** button.

The display shows the following:

The item to be adjusted is now blinking

The options for the parameter setup are shown in the clock menu table (chapter 5).

Function of the pushbuttons in the setup menu mode

PB1S	storage of the current item and move to another menu item

PB1L	storage of values and return into normal display mode, or entry into the submenu, where it is permitted by the program
PB2S	increase of the current item by 1
PB2L	continuous increase of the current item
PB1L+PB2L	return into normal display mode, without storage of the data

3.2.1 Submenu for user-specific setting of time constants for data switchover

In menu item **P2** (time constants for automatic switching over of values), set the value **U,** then enter the submenu by pushing **PB1L**. The item to be set is blinking.

By pushing the **PB2S** button, the adjusted value is increased in steps of 1, by pushing the **PB2L** button, the value will be continuously increased.

The display shows the following:

```
 5 : 3
```

Enter the time constant for the display of time in seconds. Push the **PB1S** button and enter the constant for date display in seconds.

Push the **PB1S** pushbutton.

The display shows the following:

```
 3 .   0
```

Enter the time constant for the display of temperature in seconds. Push the **PB1S** pushbutton and enter the constant for stopwatch display in seconds.

Push the **PB1S** pushbutton.

The display shows the following

```
 t2 : 2
```

Enter the time constant to display temperature of second sensor in seconds.

Push the **PB1S** pushbutton.

The display shows the following:

$$h1:0$$

Enter the time constant to display the humidity of the first sensor in seconds.

Push the **PB1S** pushbutton.

The display shows the following:

$$b1:0$$

Enter the time constant to display the pressure of the first sensor in seconds

Push the **PB1S** pushbutton.

The display shows the following:

$$h2:0$$

Enter the time constant to display the humidity of the first sensor in seconds

Push the **PB1S** pushbutton.

The display shows the following:

$$b2:0$$

Enter the time constant to display the pressure of the second sensor in seconds

By pushing the PB1L button are the entered values stored and the clock returns to the menu item P2.

3.2.2 Offset setting for time synchronization

Clocks can run with a defined offset to synchronization source.
In menu item **P4** (synchronization source), push **PB1L** to go to the time synchronization offset setting submenu.
The setting unit is 1/100 second.
Setting range -9.99 to +9.99.
Push **PB1L** to save the setting and return to menu item **P4**.
Push together **PB1L** and **PB2L** to return to **P4** without storage of the data

3.2.3 Submenu for network services configuration

Choose the value **2** or **3** in the item **P19** (network work mode selection) in the clock menu, then enter the submenu by pushing the **PB1L** pushbutton for configuring the network services (Multicast support in unicast work mode, SNMP service, Telnet service). The item to be set is blinking.

The display shows the following:

$$Ac:88$$

Set value **1** for enabling the multicast support in the unicast work mode or value **0** for disabling it by pushing the **PB2S**.

Switch to the next parameter – SNMP communication support by pushing the **PB1S**. The display shows the **Sn: 1**. Set value **1** for enabling the SNMP support or value **0** for disabling it by pushing the **PB2S**.

Switch to the next parameter – Telnet support by pushing the **PB1S**. The display shows the **tn: 1**. Set value **1** for enabling the telnet support or value **0** for disabling it by pushing the **PB2S**.

By pushing **PB1L** save the setting and return to item **P19**.

3.2.4 Manual setting of the IP address of the clock

Choose the item **P20** in the main menu and push the **PB1L** button to enter the submenu for setting the IP address. The item to be set is blinking.
By pushing **PB2S,** the adjusted digit value is increased in steps of 1, by pushing the **PB2L** button, the value will be continuously increased.

The display shows the following:

A1:92

Enter the four octets of the IP address step by step. Switch to next digit or octet respectively by pushing the **PB1S**. Octets are marked by letters **A**, **b**, **C** and **d**.

By pushing the **PB1L** button, the entered values are stored and the clock returns to the menu item **P20.**

3.2.5 Manual setting of the subnet mask

Choose the item **P21** in the main menu and push the **PB1L** button to enter the submenu for setting the subnet mask. The item to be set is blinking.

By pushing **PB2S,** the adjusted value is increased in steps of 1, by pushing the **PB2L** button, the value will be continuously increased.

The display shows the following:

A2:55

Enter the four octets of the subnet mask step by step. Switch to the next octet by pushing the **PB1S** button. Octets are marked by letters **A**, **b**, **C** and **d**.

By pushing the **PB1L** button, the entered values are stored and the clock returns to the menu item **P21.**

3.2.6 Manual setting of default gateway IP address

Choose item **P22** in the main menu and push the **PB1L** button to enter the submenu for setting the default gateway IP address. The item to be set is blinking.
By pushing **PB2S** the adjusted digit value is increased in steps of 1, by pushing the **PB2L** button the value will be continuously increased.

The display shows the following:

A1:92

Enter the four octets of the gateway IP address step by step. Switch to the next digit or octet respectively by pushing the **PB1S** button. Octets are marked by letters **A**, **b**, **C** and **d**.

By pushing **PB1L** button, the entered values are stored and the clock returns to the menu item **P22.**

3.2.7 Submenu for setting the multicast group address

Choose the menu item **P23** and then enter the submenu by pushing the **PB1L** pushbutton for setting the multicast group address. The item to be set is blinking.

By pushing the **PB2S** button, the adjusted digit value is increased in steps of 1; by pushing the **PB2L** button, a continuous increase of the value takes place.

The display shows the following:

Enter the four octets of the IP address step by step. Switch to the next digit or octet respectively by pushing the **PB1S** button. Octets are marked by the letters **A**, **b**, **C** and **d**.

By pushing the PB1L button, the entered values are stored and the clock returns to the menu item P23.

3.2.8 Submenu for the setting of the NTP unicast synchronization

Choose the menu item **P24** then enter the submenu by pushing the **PB1L** pushbutton for setting the parameters of the NTP unicast synchronization. The item to be set is blinking.
By pushing the **PB2S** button, the adjusted digit value is increased in steps of 1; by pushing the **PB2L** button, the value will be continuously increased.

The display shows the following:

Set the four octets of the NTP server's IP address step by step. Switch to the next digit or octet respectively by pushing the **PB1S** button. Octets are marked by letters **A**, **b**, **C** and **d**.

After the last octet setting, set the constant **x** which determines the interval of synchronization in seconds.

By pushing the **PB1L** button, the entered values are stored and the clock returns to the menu item **P24.**

Note: Through the setup menu is possible to set only one NTP server IP address. If more than one NTP server addresses were previously configured (using telnet or MOBA-NMS tool), after opening the **P24** submenu the IP address of currently active NTP server is displayed. When the IP address was modified and the configuration is saved using the setup menu, the IP address is stored to the definition of the first NTP server, the other NTP server addresses are cleared including those defined by the NTP server domain names.

3.2.9 Submenu for displaying IPv6 addresses

Choose the menu item **P25** and push **PB1L** to enter the IPv6 addresses submenu. In the submenu choose required IP address for displaying and push **PB1L** to display the first part of the IPv6 address.

The IPv6 address consists of a total of 8 parts. You can switch to IPv6 address particular part by pushing **PB1S**. The parts are distinguished by the decimal dots on the last three digits. Decimal dots show the order of each IPv6 address parts (0-7) in the binary system.

Push together **PB1L** and **PB2L** to return to **P25.**

Example of IPv6 address display 2001: 0db8: 0000: 0012: f68e: 38ff: fee8: 4a13
2001   – first part of IPv6 address   (000b)
0db8.   – second part of IPv6 address   (001b)
000.0   – third part IPv6 address   (010b)
001.2.   – fourth part of the IPv6 address   (011b)
f6.8e   – fifth part of the IPv6 address   (100b)
38.ff.   – sixth part of the IPv6 address   (101b)
fe.e.8   – seventh IPv6 address   (110b)
4a.1.3.   – eighth part of iPv6 address   (111b)

4 Control of the clock using IR remote control

A 2-digit address is assigned to the clock. With the IR remote control the clock can be locked. The setting of time, date and the clock parameters can only take place at clocks in an unlocked state.

Function of the pushbuttons in normal display mode

pushing **F1** + entry of 2-digit address, using numerical pushbuttons	unlock the clock with the corresponding address
holding down **F1** button	unlock all clocks within the reach of the IR beam of the remote control unit
holding down **F2** button	lock all clocks within the reach of the IR beam of the remote control unit
holding down **F3** button	display the address of all locked clocks within the reach of the IR beam of the remote control

Function of the pushbuttons in the "Clock" operation mode

SET	entry into the time and date setting mode
The **+** button	button brightness increase (not applicable when **P0** is set to **A**)
The **-** button	button brightness decrease (not applicable when **P0** is set to **A**)
CLOCK	visualization of time
DATE	visualization of date
TEMP	visualization of temperature
TIMER	visualization of stopwatch
MENU	entry into the menu of setting of clock parameters
CLR	time correction to the whole minute (±30 sec)

4.1 Setting of time and date

The time and date values are adjusted in the following sequence: year – day – month – hours – minutes. By pushing the **SET** button, enter the time and date setting mode.

The display shows the following:

The item to be set is blinking.

After having set up the minutes the value is blinking. By pushing the **OK** button the value is stored (with seconds reset to zero) and the clock operation resumes. The clock returns into normal working mode.

Note: When the time zone of displayed time and date (menu item P7) is set to the values U1 – U7 or U, the entered time and date is taken as UTC.

Function of the pushbuttons in the "Time and date setting" mode

The **+** pushbutton	increase of the value adjusted, in steps of 1
The **–** pushbutton	decrease of the value adjusted, in steps of 1
Holding down the **+** button	continuous increase of the value set up
Holding down the **–** button	continuous decrease of the value set up
ESC	return into normal display mode, without storage of the data
>>	move to next parameter
<<	move to previous parameter
CLR	entry of zero or minimum value
OK	storage of values set up and return into normal working mode, followed with seconds reset
Pushbuttons **0–9**	entry of the corresponding numerical value

4.2 Menu for the setting of the clock parameters

The entry into the menu for the setting of the clock parameters is done by pushing the **MENU** button.

The display shows the following:

The item to be set is blinking.

The options for the parameters to be set up are shown in the menu table on page (chapter 5).

Function of the pushbuttons in the "MENU" mode

>>	move to next menu item
<<	move to previous menu item
The **+** button	increase of the value adjusted, in steps of 1
The **-** button	decrease of the current value, in steps of 1
Holding down the **+** button	continuous increase of the value set up
Holding down the **–** button	continuous decrease of the value set up
ESC	return into the normal working mode, without storing the modified items
OK	storing of the modified items and return into the normal working mode
SET	enter the sub-menu, where it is possible
Pushbuttons **0–9**	entry of the corresponding numerical value

Note: During entering the numbers in the octets of the IP addresses the editing to the next digit moves automatically.

4.2.1 Submenu for user-specific setting of time constants for data switchover

In menu item **P2** (time constants for automatic switching over of values) set value **U,** then enter the submenu by pushing the **SET** button. The item to be set is blinking. The display shows the following:

`5:3`

Enter the constant for time display, in seconds. Push the >> button and enter the time constant for the display of date, in seconds.

Push the >> button. The display shows the following:

`3. 0`

Enter the time constant for the display of temperature, in seconds. Push the **>>** button and enter the time constant for the display of stopwatch, in seconds.

Push the >> button. The display shows the following:

`t2: 2`

Enter the time constant to display temperature of second sensor in seconds

Push the >> button. The display shows the following:

`h1: 0`

Enter the time constant to display the humidity of the first sensor in seconds.

Push the >> button. The display shows the following:

`b1: 0`

Enter the time constant to display the pressure of the first sensor in seconds.

Push the **>>** button. The display shows the following**:**

`h2: 0`

Enter the time constant to display the humidity of the second sensor in seconds.

Push the >> button. The display shows the following:

`b2: 0`

Enter the time constant to display the pressure of the second sensor in seconds.

By pushing **OK,** the entered values are stored and the clock returns to the menu item **P2**. Return to the item **P2** without storing by pushing **ESC**.

4.2.2 Offset setting for time synchronization

Clocks can run with a defined offset to synchronization source.

In menu item **P4** (synchronization source) push **SET** for enter the submenu setting time synchronization offset.

The setting unit is 1 / 100 second.
Setting range -9.99 to +9.99.
Push **OK** to save the setting and return to menu item **P4**.
Push **ESC** to return to **P4** without storage of the data

4.2.3 Submenu for network services configuration

Choose the value **2** or **3** in the item **P19** (network work mode selection) in the clock menu, then enter the submenu by pushing the **SET** for configuring the network services (Multicast support in unicast work mode, SNMP service, Telnet service). The item to be set is blinking.

The display shows the following:

Set value **1** for enabling the multicast support in the unicast work mode or value **0** for disabling it.

Switch to the next parameter – SNMP communication support by pushing the **>>**. The display shows the **Sn: 1**. Set value **1** for enabling the SNMP support or value **0** for disabling it.

Switch to the next parameter – Telnet support by pushing the **>>**. The display shows the **tn: 1**. Set value **1** for enabling the telnet support or value **0** for disabling it.

By pushing **OK**, the entered values are stored and the clock returns to the menu item **P19**. By pushing **ESC**, the clock returns to **P19** without saving.

4.2.4 Manual setting of the IP address of the clock

Choose the item **P20** in the main menu and push the **SET** button to enter the submenu for setting the IP address. The item to be set is blinking.

The display shows the following:

Enter four octets of the IP address step by step. Switch to another octet by pushing the **<<** and **>>** buttons. Octets are marked by letters **A**, **b**, **C** and **d**.

By pushing **OK,** the entered values are stored and the clock returns to the menu item **P20.** By pushing **ESC** the clock returns to **P20** without storing.

4.2.5 Manual setting of the subnet mask

Choose the item **P21** in the main menu and push the **SET** button to enter the submenu for setting the subnet mask. The item to be set is blinking.

The display shows the following:

Enter the four octets of the subnet mask step by step. Switch to another octet by pushing the **<<** and **>>** buttons. Octets are marked by letters **A**, **b**, **C** a **d**.

By pushing **OK,** the entered values are stored and the clock returns to the menu item **P21.** By pushing **ESC**, the clock returns to **P21** without saving.

4.2.6 Manual setting of default gateway IP address

Choose the item **P22** in the main menu and push the **SET** button to enter the submenu for setting the default gateway IP address, the item to be set is blinking.

The display shows the following:

Enter the four octets of the gateway IP address step by step. Switch to another octet by pushing the **<<** and **>>** buttons. Octets are marked by letters **A**, **b**, **C** and **d**.

By pushing **OK**, the entered values are stored and the clock returns to the menu item **P22**. By pushing **ESC**, the clock returns to **P22** without saving.

4.2.7 Submenu for setting the multicast group address

Choose the menu item **P23** and then enter the submenu by pushing the **SET** for setting the multicast group address. The item to be set is blinking.

The display shows the following:

Enter the four octets of the IP address step by step. Switch to the next digit or octet respectively by pushing the **>>** button. Octets are marked by the letters **A**, **b**, **C** and **d**.

By pushing OK, the entered values are stored and the clock returns to the menu item P23. By pushing ESC, the clock returns to P23 without saving.

4.2.8 Submenu for the setting of the NTP unicast synchronization

Choose the menu item **P24** and then enter the submenu by pushing the **SET** for setting the parameters of the NTP unicast synchronization. The item to be set is blinking.

The display shows the following:

Set the four octets of the NTP server's IP address step by step. Switch to the next digit or octet respectively by pushing the **>>** button. Octets are marked by letters **A**, **b**, **C** and **d**.

After the last octet setting, set the constant **x** which determines the interval of synchronization in seconds.

By pushing OK, the entered values are stored and the clock returns to the menu item P24. By pushing ESC, the clock returns to P24 without saving.

Note: Through the setup menu is possible to set only one NTP server IP address. If more than one NTP server addresses were previously configured (using telnet or MOBA-NMS tool), after opening the **P24** submenu the IP address of currently active NTP server is displayed. When the IP address was modified and the configuration is saved using the setup menu, the IP address is stored to the definition of the first NTP server, the other NTP server addresses are cleared including those defined by the NTP server domain names.

4.2.9 Submenu for displaying IPv6 addresses

Choose the menu item **P25** and then enter the submenu by pushing the **SET** for display IPv6 address. In the submenu, select the desired IP address to display and push the **SET** button to display the first part of the IPv6 address.

IPv6 address consists of 8 parts. Navigate between the individual parts of the IPv6 address by pushing the **>>** or **<<** button. The parts are differentiated by the decimal dots on the last three digits. Decimal dots display binary order of each IPv6 address (0-7).

Push **ESC** to return to **P25.**

Example of IPv6 address display 2001: 0db8: 0000: 0012: f68e: 38ff: fee8: 4a13
2001   – first part of IPv6 address   (000b)
0db8.   – second part of IPv6 address   (001b)
000.0   – third part IPv6 address   (010b)
001.2.   – fourth part of the IPv6 address   (011b)
f6.8e   – fifth part of the IPv6 address   (100b)
38.ff.   – sixth part of the IPv6 address   (101b)
fe.e.8   – seventh IPv6 address   (110b)
4a.1.3   – eighth part of iPv6 address   (111b)

5 The clock menu table

Program item	Function	Scope of the values (default values are printed in bold)	
P0	Display brightness	1-30, **A** (automatic adjustment, without the possibility of changing in normal display mode) The maximum brightness setting in manual mode can reduce the life cycle of the LED displays in the long run. We recommend leaving the brightness control to "auto" mode (default value).	
P1	Time display format	**24 h,** 12 h	
P2	Time constants for automatic data switching over	**1**-6, U, 0	
		1	continuous display of time
		2	continuous display of date
		3	continuous display of temperature
		4	continuous display of stop watch
		5	display sequence: time 6 sec, date 3 sec.
		6	display sequence: time 8 sec, date 3 sec, temp. 3 sec.
		U*	time constants set up by user, in seconds for each specific displayed data (See chapter 4.2.1)
		0	automatic switching over disabled
P3	Time zone of synchronization source	0 - 64, **A** (automatically)	
P4	Type of synchronization source (check Line type jumper JP11 setting, see the chapters 2.8 and 10 for more information)	1 - 10, **A** (automatically)	
		A*	auto detection, applicable for: DCF, MOBALine, WDT, IRIG-B or NTP
		1*	autonomous operation without synchronization
		2*	synchronization by DCF signal
		3*	the MOBATIME serial code
		4*	MOBALine
		5*	24 V DC impulses, at minute intervals
		6*	24 V DC impulses at half minute intervals
		7*	24 V DC impulses at second intervals
		8*	DCF-FSK, IRIG-B Standard, IRIG-B 123, IRIG-B DIEM, AFNOR A, AFNOR C
		9*	RS232
		10*	RS485
		11*	Internal GPS receiver
		12*	Active DCF code
P5	Impulse line processing mode	**1**-4	
		1	polarized impulses, synchronization and time adjustment
		2	polarized impulses; time synchronization only
		3	non-polarized impulses, synchronization and time adjustment
		4	non-polarized impulses; time synchronization only
P6	Time zone for MOBALine or time zone server MOBATIME	1-20, **0** (off) – for MOBALine synchronization or 1-15, **0** (off) – for NTP synchronization	
P7	Time zone of displayed time and date	0 - 64, **A** (automatically), U* (user time zone, see chap. 9.5) U1-U7 (preconfigured time zone entry by MOBA-NMS)	
Program	**Function**	**Scope of the values**	

item		(default values are printed in bold)		
P8	Clock address for IR remote control and the serial protocols	1-**99** **0**-31, **L** (listen only) at SI version **0**-15 - at WTD version		
P9	IR controller autolock	1-60, **U** ("automatic lock" is OFF) Time in minutes for "automatic lock" since the last depression of button on the IR unit		
P10	Time format display	**1**-2		
		1	time with leading zero	
		2	time without leading zero	
P11	Date format display	1-**2**		
		1	date with leading zero	
		2	date without leading zero	
P12	Temperature format display	**°C**		
		°F		
P13	Protocol for RS232 and RS485 communication	**1** - IF482		
		2 - Supervised RS485		
		3 - DC master		
		4 - DC slave		
		5 – TP … RS485 master		
		6 – TP … RS485 listener		
		7 – DC2 slave		
		8 – T741x master		
		9 – T741x listener		
		10 – ITRON 2000		
		11 – TPHP RS485 Master		
		12 – TPHP RS485 Listener		
		13 – NMEA 0183		
P14	Modulation speed for RS232 and RS485	1-7		
		1	1 200 Baud	
		2	2 400 Baud	
		3	4 800 Baud	
		4	9 600 Baud	
		5	19 200 Baud	
		6	38 400 Baud	
		7	57 600 Baud	
P 15	Transmission parameters for RS232 and RS485	Number of data bits	8	
			7	
P 16		Number of stop bits	**1**	
			2	
P 17		Parity	n no parity	
			o odd	
			E even	
P 18	IP mode	**0**	NTP, PoE: IPv4 / IPv6 dualstack	
			WiFi: not supported	
		1	NTP, PoE: IPv4	
			WiFi: IPv4	
		2	NTP, PoE: IPv6	
			WiFi: not supported	

P19	Network operation	1	multicast (without IP address), WiFi not supported

	mode IPv4	2*	unicast – network param. defined manually
		3*	unicast – network param. defined by DHCPv4
P20	IP address	IP*	edit IPv4 network parameters in manual setting mode or display parameters assigned by DHCPv4
P21	Subnet mask	Su*	
P22	Gateway	Gt*	
P23	Multicast addr.	Mc*	setting IPv4 of multicast group address
P24	Unicast NTP addr	Uc*	setting IPv4 of NTP unicast server address
P25	Network operation mode IPv6	0*	none
		1*	autoconfiguration (SLAAC)
		2*	DHCPv6
		3*	both
P26	WiFi mode	1	user-defined wireless network
		2	default wireless network: MOBA-WIFI
		3	AP mode
SW version		r_._(e.g.: r6.17)	

Note:

- * possibility to enter the submenu* possibility to enter the submenu
- Items P18 to P25 available in NTP, PoE variants only
- Items P18 to P26 available in WiFi variants only
- Adjusting the brightness in manual mode to the maximum can reduce the life of displays in the long run. We recommend leaving the automatic brightness control set.

5.1   IPv6 adress submenu

Program choice	Function
LOCL	Link Local Address e.g. fe80:0000:0000:0000:f68e:38ff:fee8:4a13
SLAC	Address obtained from SLAAC e.g. 2001:0db8:0000:0012:f68e:38ff:fee8:4a13
dHCP	First address received from DHCPv6 e.g. 2001:0db8:0000:0012:0000:0000:0000:1000
MANU	Manually set address e.g. fec0:1234:0000:0000:f68e:38ff:fee8:4a13
PrEF	Prefix of manually set address Range 0 – 128, default 64
GATE not yet supported	Default gateway obtained from SLAAC e.g. 2001:0db8:0000:0012:0000:0000:0000:0001

6 Control of the stopwatch via keyboard

The operation of the stopwatch is controlled and the device is adjusted using three pushbuttons on the connected keyboard. The keyboard cable must be connected to the CTRL plug connector.

Abbreviations used for the key strokes

PB1L, PB2L	pushing of the pushbutton for a period of more than 1 second
PB1S, PB2S, PB3S	short-time pushing of the pushbutton

Function of the pushbuttons in the "Stopwatch" mode

PB2S	indication switch over: time - date - temperature - stopwatch - time
PB2L	stopwatch menu
PB3S, PB1S, PB1L	according to the stopwatch mode setup

6.1 The stopwatch menu

The stopwatch menu is entered by long pushing of the **PB2** pushbutton (stopwatch must be displayed). The parameter adjustment is to be performed according to the menu table (chapter 8).

Function of the pushbuttons in the "Stopwatch Menu" mode

PB1S	move to another menu item
PB1L	storage of the parameters; return to the stopwatch display mode when counting up from zero; or entry into the initial time setting mode when counting down
PB2S	increase of the current value, in steps of 1
PB2L	continuous increase of current value

6.2 Setting of the initial time for counting down

When counting down is selected, the initial time setting mode is entered from the stopwatch MENU or directly from the "Stopwatch" display mode by pushing the **PB1L** button. The item to be set is blinking.
By pushing the **PB2S** button is the adjusted value increased in steps of 1, by pushing the **PB2L** button will be the value continuously increased. By pushing **PB1S** move to the next item. By pushing the **PB1L** save the setting and return to "Stopwatch" display mode.

Enter the data in the following order depending on the item **S2** setting (counting unit):

Counting unit	Data order
1/100 second	<Minute>:<Second>.<Hundredths of second>
1 second	<Hours>:<Minutes>:<seconds>.
1 minute	<Hours>:<Minutes>
1 day	<Days>

By pushing the **PB1L** button, the entered values are stored and the clock returns to the "Stopwatch" display mode.

---

7   Control of the stopwatch using IR remote control

A 2-digit address is assigned to the stopwatch. With the IR remote control, the stopwatch can be locked. Controlling and the stopwatch parameter adjustment are only allowed in unlocked state.

Function of the pushbuttons in the "Stopwatch" mode

pushing the **F1** button + entry of 2-digit address using numerical pushbuttons	unlocking of a clock with the corresponding address
holding down the **F1** button	unlocking of all clocks within the reach of the IR beam of the remote control
holding down the **F2** button	locking of all clocks within the reach of the IR beam of the remote control
holding down the **F3** button	display of the addresses of all locked clocks within the reach of the IR beam of the remote control
CLOCK	visualization of time
DATE	visualization of date
TEMP	visualization of temperature
TIMER	visualization of the stopwatch
MENU	entry into stopwatch parameter setup menu
SET	entry into setting initial time of counting down
S/S, HOLD, RES	function depends on the stopwatch operation mode set

7.1   The stopwatch menu

The stopwatch menu is entered by pushing **MENU** button (stopwatch must be displayed). The parameter adjustment is shown in the stopwatch menu table (chapter 8).

Function of the pushbuttons in the "Stopwatch Menu" operation mode

>>	storing the current value and transition to another menu item
<<	storing the current value and transition to previous menu item
The **+** button	increase of the adjusted value in steps of 1
The **-** button	decrease of the adjusted value in steps of 1
Holding down the **+** button	continuous increase of the item set up
Holding down the **-** button	continuous decrease of the item set up
ESC	return into normal display mode,
OK	storage of the parameters; return into the stopwatch display mode when counting up from zero; or entry into the initial time setting mode when counting down

7.2 Setting of initial time for counting down

When counting down is selected, the initial time setting mode is entered from the stopwatch MENU or directly from the "Stopwatch" display mode by pushing the **PB1L** button. The item to be set is blinking.

Enter data in following order depending on the item **S2** setting (counting unit):

Counting unit	Data order
1/100 second	<Minutes>:<Seconds>.< Hundredths of second >
1 second	<Hours>:<Minutes>:<Seconds>.
1 minute	<Hours>:<Minutes>
1 day	<Days>

By pushing the **OK** button, the entered values are stored and the clock returns to the "Stopwatch" display mode. By pushing **ESC**, the clock returns without storing.

7.3 Switching contact

When counting down mode is applied the switching contact can be used (only for certain types of clocks), which switches at zero-crossing. It is possible to control an external device such as sound devices. There is normally open contact (NO), normally closed contact (NC) and common contact (COM) on the relay port (JP21) available.

8   Stopwatch menu table

Program option	Function	Scope of the values (**default** values are printed in bold)		
S0	Counting direction	**1** - 4		
		1	upwards	
		2	downwards from a time value set in advance, with stop at zero	
		3	downwards from a time value set in advance until zero, with automatic restart from the specified time value	
		4	downwards from a set time value, until zero, and keeping the count into minus value	
S1	Control of intermediate time periods (corresponding keyboard keys are listed in brackets)	**1** – 4		
		1	S/S (PB3S)	Alternating START - STOP -„UNFREEZE" of DISPLAY (if it was frozen)
			HOLD (PB1S)	"Freezing" of displaying data with the counter proceeding in the counting
			RES (PB1L)	Setting the counter to zero in STOP operation mode, for counting up, and return to a present value in all other counting mode
		2	S/S (TL3S)	Alternating START - STOP -„UNFREEZE" of DISPLAY (if it was frozen)
			HOLD (PB1S)	The first depression of this button causes the display to freeze on the respective time achieved and lets the counter running. Further activation of the button shows the intermediate time elapsed from the first depression of the button.
			RES (PB1L)	Reset of the counter in the STOP mode while in counting up. Return to a preset value in other counting modes.
		3	S/S (PB3S)	count up from zero, or from a present value in countdown mode. Next activation of the button causes the display to freeze and to resume the count from zero in counting up, or from a preset value in countdown mode.
			HOLD (PB1S)	Unfreezing of the display, leaving the counter to continue in counting
			RES (PB1L)	Counter reset (to zero), or return to a preset time followed with counter stop
		4	S/S (PB3S)	Triggering the counter
			HOLD (PB1S)	Stopping the counter
			RES (PB1L)	Resetting the counter or return to a preset time, with counter stop

S2	Counting unit		**1** - 4		
		1	Counting in increments of 1/100 sec. (with 4-digit display the counting goes on until 59.99 sec., and then continues with displaying of minutes : seconds), up to 59 minutes and 59.99 seconds, at maximum.		
		2	Counting in increments of 1 second (with 4-digit display the counting goes on until 59 minutes and 59 seconds; and follows with displaying of hours: minutes) until 23 hours, 59 minutes and 59 seconds, at maximum.		
		3	Counting in 1 minute steps, until 23 hours 59 minutes		
		4	Counting in periods after one day. A subtraction or an addition always takes place around midnight. Capacity of counting up to 9999 days. When counting is stopped, the dot is displayed after the last digit.		
S3	Contact closing		1 – 30, **0** (function disabled)		
			Time period of contact closing for stopwatches passing through zero, while operating in countdown mode, starting from a preset time moment.		

9 Local time calculation

9.1 Basic setting – control according to source of synchronization

P3	A	Time zone is taken over according to the source of synchronization
P4	2 – 10, A	Synchronization signal type
P6	0	Neither MOBALine time zone nor time zone server are used
P7	A	Display time and date according to source of synchronization incl. daylight saving time

This setting is suitable for digital clocks synchronized by a DCF receiver or controlled by a master clock as slave clock in a time distribution system. The internal time zone table isn't used.

9.2 Calculation using MOBALine time zones

P3	A	Time zone is taken over according to the source of synchronization. The UTC time calculation is based on the MOBALine information.
P4	4	MOBALine
P6	1 - 20	Selection of the MOBALine time zone
P7	A	Display time and date according to chosen MOBALine time zone, incl. daylight saving time

This setting is suitable for digital clocks controlled by a master clock as a MOBALine slave clock in a time distribution system with possibility to display different MOBALine time zones.

9.3 Calculation using time zone server MOBATIME

P3	A	NTP protocol uses UTC time zone
P4	A	Automatic
P6	1 - 15	Selection of the time zone server time zone
P7	A	Display time and date according to chosen time zone server time zone, incl. daylight saving time

This setting is suitable for NTP and PoE digital clocks controlled by MOBATIME NTP servers which support the time zone server functionality.

9.4 Calculation using time zone entries preconfigured by MOBA-NMS software

P3	A	NTP protocol uses UTC time zone
P4	A	automatic

P6	0	No time zone server is used
P7	U1-U7	Display time and date according to chosen preconfigured time zone entry, incl. daylight saving time

This setting is suitable for NTP and PoE digital clocks, where several user defined time zone entries should be used. The time zone entries are preconfigured by means of the MOBA-NMS software.

9.5   Calculation according to internal time zone table

P3	0 – 64	According to the time zone in which source of synchronization works (e.g. value 2 for DCF in west Europe)
P4	1 – 10, A	Autonomous operation or any type of the synchronizing signal
P6	0	Neither MOBALine time zone nor time zone-server are used
P7	0 – 64, U	Display time and date by calculation from the UTC time according to chosen time zone, incl. daylight saving time

This setting is suitable for autonomous digital clocks or in cases where the displayed time is needed in another time zone than provided by the synchronization source. Displayed time and date calculation is based on the internal time zone table or on the user–specific time zone parameters. See the chapter 15 with actual Time zone definition table.
If you want to use the zone outside the internal time zone table, follow the "Custom Time Zone settings" appendix.

10   Non-network clock operation

Configure the jumper JP11 according to table (chapter 2.8) if the source of synchronization is a DCF signal, Mobatime serial code, polarized impulse line, MOBALine or IRIG-B. Choose the item **P4** in main MENU (chapter 5) and set the type of synchronization. The auto detection mode (P4:A), when the type of synchronization signal is set automatically, is applicable for DCF signal, Mobatime serial code, MOBALine, IRIG-B, WTD. The permanently lit colon during the time display signalizes the clock is synchronized by the synchronization source.

10.1   Autonomous clock synchronized by DCF 77 receiver

- Set value **A** in items **P3**, **P4** and **P7** in the main MENU (chapter 5).
- Connect the DCF 77 receiver to the clock terminal board placed on the anchoring plate (LINE IN terminals) using a twin-wire cable.
- The maximum wire length depends on its diameter (app.100 - 300 m).
- In case the connection is correct and the input signal is at high level, the LED on the receiver is flashing periodically once a second, with 1 pulse left out at the 59th second.
- If the polarity is incorrect, the LED does not flash. In such a case, interchange the two wires.
- Install the receiver at a place with a high-level radio signal. Don't install the receiver near sources of interfering signals, such as the personal computers, TV sets or other types of power consumers (the digital clock itself generates interfering signals too).
- Position the receiver with its transparent cover (DCF 450) or the arrow on the cover (DCF 4500) facing the transmitter (located in Frankfurt, Germany). Presuming the good quality DCF 77 signal the synchronization takes place in approx. 3 to 4 minutes. In case of poor quality of the signal (mainly during the day time) the first time setting is to be done manually. The red LED of the receiver displays a working connection by flashing once a second without flickering.

10.2   Autonomous clock synchronized by GPS receiver

- Set value **A** in items **P3, P4** and the desired time-zone in the **P7** item in the main MENU (chapter 5).
- Using jumper JP17 set the power supply output (DC OUT) on pins 3, 4 of the JP1 connector.
- Connect GPS receiver to the clock terminal board placed on the anchoring plate (LINE IN and DC OUT/DCF OUT terminals) using a four-wire cable. Please note the correct polarity of the wires – see the GPS user manual.
- For the correct placing of the receiver please follow the GPS user manual.
- Presuming the good position of the GPS receiver the synchronization takes place in approx.10 to 20 minutes.

10.3   Slave clock controlled by synchronizing impulses

On digital clock connected in time distribution system controlled by synchronizing impulses choose the item **P4** in the main menu and set it according type impulse lines (one minute, half minute, second pulses) and in item **P5** choose mode of processing impulse line (polarized / unpolarized impulses, synchronization and time setting / synchronization only). Set the value **A** in items **P3** and **P7**.

10.3.1   Synchronization and time setting – P5 mode 1 and 3

- Clocks are set according to the slave line time on the Master clock.
- Stop the slave line on Master clock.
- Set all slave clocks on the same time. Set the current date on the digital clock. The clocks stand still and the colon flashes in 2 second interval.
- Set the time of the slave line to the same time as on slave clocks.
- Run the slave line on Master clock.
- After receiving each impulse is displayed time increased by one minute (or by 30 seconds or 1 second respectively)
- After the expiration of run-out time the slave clocks are synchronized by the time information generated by the master clock, the colon flashes constantly.
- In case of the line fault the clock displays the right time information based on its own quartz time base. When the normal operation of the line resumes, the slave clock adjusts itself to the time equal to the master clock.

10.3.2   Synchronization only – P5 mode 2 and 4

- The clock time-base is synchronized by incoming pulses in normal operation of the slave line.
- Set current date and time on the slave clocks according the master clock time with accuracy of ±30 seconds (or ±15 seconds, or ±0,5 second respectively).
- The colon flashes in 2 second interval.
- After 2-3 minutes are the clocks synchronized with the master clock. The colon is permanently lit during the time display.
- In case of the line fault the clock displays the right time information based on its own quartz time base. When the normal operation of the line resumes, the clock synchronizes with the incoming pulses.

10.4   Slave clock controlled by MOBATIME serial code, MOBALine, or IRIG-B

- After the connection of the digital clock to the signal source, time and date are adjusted automatically, following the receipt of valid time information.
- The time setting with using the serial coded line takes place within at least 3 to 4 minutes, for MOBALine and IRIG-B within 6 to 15 seconds.

10.5   Slave clock controlled by IF482 over RS232 or RS485

- After the connection of the digital clock to the line, time and date are adjusted automatically, following the receipt of valid time information.
- Setting the tune takes place within at least 5 minutes.

10.6   Slave clock controlled by supervised RS485

Supervised RS485 line available on the DTS.480x timeservers offers exact time synchronization as well as monitoring the correct function of connected slave clocks.

- If the DC clock should be monitored set in menu item **P8** unique address in the range 1 to 32. The value "L" means that the clocks are synchronized only (without monitoring).
- It is necessary to register the clock under the used address in DTS.
- The time synchronization starts within a few tens of seconds after start-up.

- Failure of slave clock function is signalized by an alarm in DTS.
- On the RS485 you can use the jumper TRE - JP10 to connect the termination resistor 120R between the signals A and B for the correct termination of RS485.

10.7 Cascaded connection of the DCF/GPS synchronized clock

- Connect the DCF 77 receiver to the clock terminal board placed on the anchoring plate (LINE IN terminals) using a twin-wire cable.
- Set the passive DCF OUT output 3, 4 of the JP1 connector using the jumper JP17.
- When using the GPS receiver, the external power supply is needed - parameters 12-24 VDC – min. 5VA.
- Interconnect the cascaded clock using a twin-wire cable from the DC OUT / DCF OUT terminals to the LINE IN terminals of the next clock.
- In case the connection is correct and the input signal is at a high level, the LED on the receiver and the green LED in the clock is flashing periodically once a second, with 1 pulse left out at the 59th second.

10.8 Synchronization in WTD system

- The items P3, P4 and P7 are set to value A by the production.
- Set the P8 item to the address of the WTD-T transmitter.
- The colon is permanently lit after successful signal receiving from WTD-T transmitter.

10.9 Connecting the slave displays through RS485

The clock equipped with the SI interface allows connecting up to 32 slave displays, which show the same information as the main display. The RS485 (JP5) interface is used for the connection. Two signals (A, B) and the ground connection GND (from the JP4) are used. For the signals A and B it is recommended to use the twisted pair (pay attention for the same polarity by all displays), another twisted pair is used for the GND connection.

If the overall length of the RS485 bus is longer than ca. 500m, enabling the TRE – JP10 is recommended in the last clock.

- In the clock serving as the master display, set the **P13** to value **3** (DC master)
- In the slave displays set the **P13** to value **4** (DC slave)
- Items **P14** to **P17** are set automatically to 9600 baud, 8 bits, even parity, 1 stop-bit.
- In case of communication problems it is possible to lower the communication speed. The modification of the items **P14** to **P17** is necessary to proceed in all connected displays identically.

11 NTP and PoE clock operation

Clocks support IPv4 and IPv6 protocols. You can disable individual protocols by setting parameter **P18.** The default clock setting allows both protocols at the same time (P18: 0).
For IPv4 mode, DHCPv4 is enabled by default (option P19: 3).
IPv6 mode allows up to 4 different priority IP addresses in downward order:

- DHCPv6
- manually configured IP address (fix)
- autoconfiguration. (SLAAC / RA)
- local address link

By setting parameter **P25**, you can disable DHCPv6 and/or auto-configuration (SLAAC).
For IPv6 mode, DHCPv6 and autoconfiguration (SLAAC) are enabled by default (P25: 3).

Calculate of Link Local Address:
fe80 :: 2 [2. octet MAC]: [3. octet MAC] ff: fe [4. octet MAC]: [5. octet MAC] [6. octet MAC]

Example: MAC: 00: 16:91 : 12:34:56

IPv6:   fe80 ::216:91ff: fe12:3456

11.1 Unicast mode

The clock is synchronized to UTC (Universal Time Coordinated) from a NTP server (up to four IPv4/IPv6 addresses for NTP server configurable) and must have assigned its own IPv4/IPv6 address. The clock requests in defined intervals the actual time from the NTP server. If the server is not available, the clock tries to contact the other defined servers in cyclic way until the valid response from the NTP server is received.

This operating mode supports the monitoring and configuration of the movement via the network connection by means of the Telnet, SNMP or the MOBA-NMS software tool. For supervision and configuration with MOBA-NMS the clock's IPv4/IPv6 address can be used or the multicast group address having last octet cleared to zero (presuming the multicast is not disabled).

It is necessary to set appropriate time-zone for correct displaying of local time and date – see the chapter 9 for details.

Default network parameters:

IP mode	IPv4 / IPv6
IPv4 address	0.0.0.0
IPv4 subnet mask	0.0.0.0
IPv4 default gateway	0.0.0.0
NTP server address 1	0.0.0.0 / 0:0:0:0:0:0:0:0
NTP server address 2	0.0.0.0 / 0:0:0:0:0:0:0:0
NTP server address 3	0.0.0.0 / 0:0:0:0:0:0:0:0
NTP server address 4	0.0.0.0 / 0:0:0:0:0:0:0:0
NTP request time [s]	10
DNS server	0.0.0.0 / 0:0:0:0:0:0:0:0
SNMP manager 1	0.0.0.0 / 0:0:0:0:0:0:0:0
SNMP manager 2	0.0.0.0 / 0:0:0:0:0:0:0:0

multicast config address	239.192.54.1 / FF38::EFC0:3601 (FF38::239.192.54.1)
alive notification interval [min]	30
configuration port number	65532
time zone client port number	65534
DHCPv4	enabled
SNMP	enabled
Multicast support	enabled
Telnet	enabled
IPv6 fix address / prefix	0:0:0:0:0:0:0:0/ 64
IPv6 link local address	fe80::2[2. octet MAC]:[3. octet MAC]ff:fe[4. octet MAC]:[5. octet MAC][6. octet MAC]
DHCPv6	enabled
autoconfiguration (SLAAC)	enabled

11.1.1   Network parameters assignation by DHCP

IP clock mode must be set to IPv4 mode (P18: 0/1).The menu item **P19** must be set to value **3** (default). Network parameters are automatically obtained from a DHCPv4 server.
The following DHCP options will be evaluated automatically:
[50] IP address
[3] Gateway address
[1] Subnet mask
[42] list of up to four NTP server addresses / time zone server address (usually the same as the NTP server address)
[6] DNS servers
[26] MTU
[60] Vendor Class ID
[43] or [224] Additional options (refer to document BE-800793)

The network administrator must configure the DHCPv4 options accordingly. Assigned parameters can be checked in the submenu of items **P20** to **P22**.

11.1.2   Manual setting through setup menu

The menu item **P19** must be set to value **2**.

- See chapter 4.2.4 for setting the clock's IP address in the item **P20** submenu

- See chapter 4.2.5 for setting the subnet mask in the item **P21** submenu

- See chapter 4.2.6 for setting the gateway in the item **P22** submenu

- See chapter 4.2.7 for setting the multicast group address in the item **P23** submenu

- See chapter 4.2.8 for setting the unicast NTP server address in the item **P24** submenu.

11.1.3   Manual setting through telnet

- connect to the clock and make the needed settings by windows command **telnet <IP address>**
  example: telnet 192.168.0.190

- request for entering the password appears after connection (default password is 718084)

- the information about software and hardware version followed by the MAC address is displayed after entering the correct password

- inserted commands must be confirmed by pushing the Enter key, use the Backspace key for correcting typing errors
- command **help** or **?** displays help with a command list
- command **reset** resets the clock (changes are written to Flash)
- command **conf -p** displays current parameters from setup menu
- command **conf –n** displays current network parameters
- command **conf -?** displays help for command conf parameters
  example: conf -i 192.168.0.190 sets the clock's IP address to 192.168.0.190
- it is necessary to end telnet connection by command **exit**

Windows 7 note: The telnet is not activated in Windows 7 by default. For activating it go to the "Control Panel" in "Start menu", click on "Uninstall a program (link)" in "Control Panel", click on "Turn Windows features on or off (link)" in "Programs and Features", click in "Windows Features" box and find the "Telnet Client" check box. Allow the system to install the appropriate files – should take only a few seconds. The administrator rights are necessary for this operation.

Hyperterminal note: The Hyperterminal application can be used as an alternative to telnet. It is necessary to activate the "Send line ends with line feeds" and "Echo typed characters locally" in the Properties -> Settings -> ASCII setup window.

11.1.4 Setting network parameters over DHCPv6

IP clock mode must be set to IPv6 mode (P18: 0/2). Menu item **P25** must be set to **3** (default setting) or **2**. The network parameters are automatically retrieved from the DHCPv6 server.

The following DHCPv6 options can be processed:
[3] non-temporary addresses
[16] vendor class
[17] vendor options
[23] DNS servers
[24] DNS domain
[25] Identity Association for Prefix Delegation
[31] SNTP servers

The network administrator must set the DHCPv6 options on the server accordingly.
Assigned parameters can be checked in the **P25** submenu.

11.1.5 Setting network parameters over autoconfiguration (SLAAC)

IP clock mode must be set to IPv6 mode (P18: 0/2). Menu item **P25** must be set to **3** (default setting) or **1**.
The following SLAAC options can be processed:
[3] Prefix info
[5] MTU
[24] Route info
[25] RDNSS

The network administrator must set the SLAAC options on the server accordingly.
Assigned parameters can be checked in the **P25** submenu

11.1.6 SNMP

The DC clock supports SNMP version 2c notifications and parameter reading and setting by means of SNMP GET and SET commands. This allows integrating the clock to a network management system. The DC clock (SNMP agent) can send alarm and alive notifications to a SNMP manager. The IP address of the SNMP manager can be provided to the clock by DHCP, Telnet, SNMP or the MOBA-NMS. The structure of supported parameters is defined in a MIB file (refer to document BE-800793 for details). In addition the clock supports the "system" node parameters defined by MIB-2 (RFC-1213)

> Alarm notifications are asynchronous messages and are used to inform the manager about the appearance / disappearance of alarms.
> Alive notifications are sent out periodically to report availability and state of the clock. The interval time can be configured.

SNMP community strings:

read community	romobatime
read / write community	rwmobatime
notification (trap) community	trapmobatime

11.2 Multicast mode

The clock is synchronized to UTC (Universal Time Coordinated) from a NTP server. The clock receives NTP multicast packets transmitted by the NTP server in a specified time cycle. This type of synchronization requires no clock's own IP address and is therefore suitable for an easy commissioning of the large systems of slave clocks. Further this mode supports monitoring and parameter configuration by means of MOBA-NMS software.

For supervision and configuration with MOBA-NMS the multicast group address can be used or the multicast group address having last octet cleared to zero.
The Multicast operating mode signifies only a minimum amount of configuration work for a network administrator.

It is necessary to set appropriate time-zone for correct displaying of local time and date – see the chapter 9 for details.

Default network parameters:

IPv4 multicast group address	239.192.54.1
IPv4 multicast config address	239.192.54.0
IPv6 multicast group address	FF38::EFC0:3601 (FF38::239.192.54.1)
IPv6 multicast config address	FF38::EFC0:3600 (FF38::239.192.54.0)
configuration port number	65532
time zone client port number	65534

The menu item **P19** must be set to value **1**. See chapter 4.2.7 for setting the IPv4 multicast group address in the item **P23** submenu.

12 WiFi clock operation

In the item **P26,** choose if the clock will behave like WiFi AP, or will connect to wireless network set by user, where network parameters could be set manually (telnet, clock menu) or automatically (DHCP). If the DHCPv4 is used, the parameters assigned by the server can be checked in the items **P20** to **P22** submenus.
The WiFi variant supports configuration using the default MOBA-WIFI network.
The WiFi 2.4/5GHz variant supports configuration using the default MOBA-WIFI network or AP mode.

12.1 Setting via default MOBA-WIFI wireless network (Configure using)

- Use the procedure described in the "Quick Installation Guide" on www.mobatime.com to enable the Hotspot function on your computer

  or set your WiFi router to the following default wireless network parameters:

Net name (SSID):	**MOBA-WIFI**
Used coding:	**WPA/WPA2**
Coding key:	**hgfedcba**
DHCP v4:	**allowed**
Clock's IP address:	display using item **P20 submenu**

- set value **2** in item **P26** in the main MENU

- display clock's IP address in the item **P20** submenu

- connect your computer to the default MOBA-WIFI wireless network

- connect clock using telnet, see chap. 12.3.

12.2 Setting via AP mode (Configure using)

- set value **3** in item **P26** in the main MENU

- connect your computer to the MOBAxxxxxx wireless network with the following parameters:

Net name (SSID):	**MOBAxxxxxx**
	(where xxxxxx represents certain octets of the WiFi clock's MAC address)
Used coding:	**WPA2**
Coding key:	**password**
DHCPv4:	**allowed**

- Clock's IP address: **192.168.2.1**

- connect clock using telnet, see chap. 12.3.

12.3   12.3   Setting the network parameters using telnet

- Open a telnet connection to the clock via Putty, e.g. using IP address **192.168.2.1**
- the request for the password appears (initial password is 718084)
- the software and hardware version displays if password entering was successful
- inserted commands can be sent off using Enter key, the Backspace key serves for correction of the typing errors
- command **help** or **?** displays help with command's list
- command **reset** resets the clock (setting modifications are written to data flash)
- command **conf –p** displays the current setting of the menu parameters
- command **conf –n** displays the current network parameters, MAC address and wireless network parameters
- command **conf –?** displays help for the command conf parameters
- command **wifi -n** displays the wireless network setting
- command **wifi -?** displays helpfor wifi parameters
- it is necessary to end telnet by command **exit**

Example of setting network parameters using telnet – WPA and DHPCv4 (valid only for WiFi 2.4 / 5 GHz):

- command **wifi –s mobatime** set network name (SSID) of new wireless network
- command **wifi –w 7** set version of used coding on PEAP
- command **wifi –u eapuser** set user name for EAP authentication to "eapuser"
- command **wifi –p abcdefg set** password for EAP authentication
- command **conf –u1 pool.ntp.org** set IP address of NTP server on "pool.ntp.org". Both NTP name and IP address can be use.
- command **conf –p19:03** set the clock for connecting to the new initiated wireless network with DHCPv4 report
- command **exit** ends telnet and writes changes into Flash

Example of setting network parameters using telnet – WPA2 with static IP

- command **wifi –s mobatime** set network name (SSID) of new wireless network
- command **wifi –w 4** set version of used coding on WPA2 for new wireless network
- command **wifi –p abcdefg** set encryption key for new wireless network
- command **wifi –m 1** set wifi mode to user-defined wireless network
- command **conf –u1 pool.ntp.org** set IP address of NTP server on
- "pool.ntp.org". Both NTP name and IP address can be use.
- command **conf –p19:02** set the clock for connecting to the new initiated wireless with manually set network parameters
- command **conf –i 192.168.0.254** set clock's IP address to 192.168.0.254
- command **conf –s 255.255.255.0** set clock's subnet mask on 255.255.255.0
- command **conf –g 192.168.0.254** set clock's default gateway 192.168.0.254
- command exit ends telnet and writes changes into Flash

13   Testing mode, parameter reset

13.1   Synchronization test

The synchronization signal receive process can be displayed in special testing mode.
This can be useful for example when the problems with the DCF signal receipt appear.

Display description during synchronization test mode:

Two digits on the left side show the current DCF bit number (goes up from 0 to 58).
Third digit shows the type of current DCF bit (0 or 1). The last digit shows the number
of successfully received DCF telegrams. The colon indicates that the DCF bit is
currently received. The dot behind the last digit signalizes synchronized clock.

Entering the synchronization test mode:

- Enter the clock menu, move to the software version item by several pushes of the
  PB1S.

- Keep pushing both buttons on the clock frame simultaneously until the display
  shows **C0:00**

- Use the **PB2** or **+** button on IR to set the value behind the colon to **03**

- Keep pushing simultaneously both clock buttons or the DISP button on IR, until the
  display shows synchronization information

13.2   Parameter reset

If necessary, the clock parameters can be set to factory defaults by the following
procedure.

- Activating the parameter reset:

- Enter the clock menu, move to the software version item by several pushes of the
  PB1S.

- Keep pushing both buttons on the clock frame simultaneously until the display
  shows **C0:00**

- Using the **PB2** or **+** button on IR set the value behind the colon to **04**

- Keep pushing simultaneously both buttons or the DISP button on IR, until the
  display shows FAC1 and clock makes reset

14 Firmware update

14.1 Update firmware trought TTL UART by protocol YMODEM 1K

Connect the jumper to pins 2 and 3 (TxD and RxD) of the PROG connector (JP8). While pressing the PB1 or PB2 button turn the clock on or reset by pressing the RESET button.

Pin description
1=GND
2=TXD
3=RXD
4=RESET
5=3V3
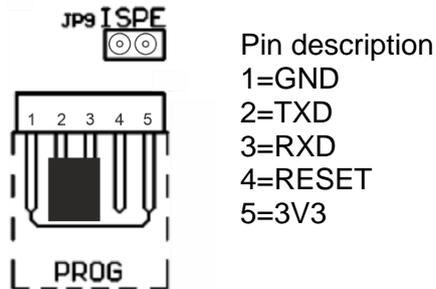
- Remove the jumper from the PROG connector
- Connect the clock to the computer using the USB to TTL UART (3V3) adapter. On the clock side, connect the adapter to the PROG connector.
- On a computer, run a terminal supporting file transfer using the YMODEM 1K protocol (eg ExtraPuTTY) with parameters 57600 bps, 8 databits, 1 stop, no parity, no control.
- In the terminal, open a valid COM port corresponding to the connected USB to TTL UART adapter.
- Connect the jumper to the ISPE header (JP9). The terminal will then display the initial information about the firmware update.
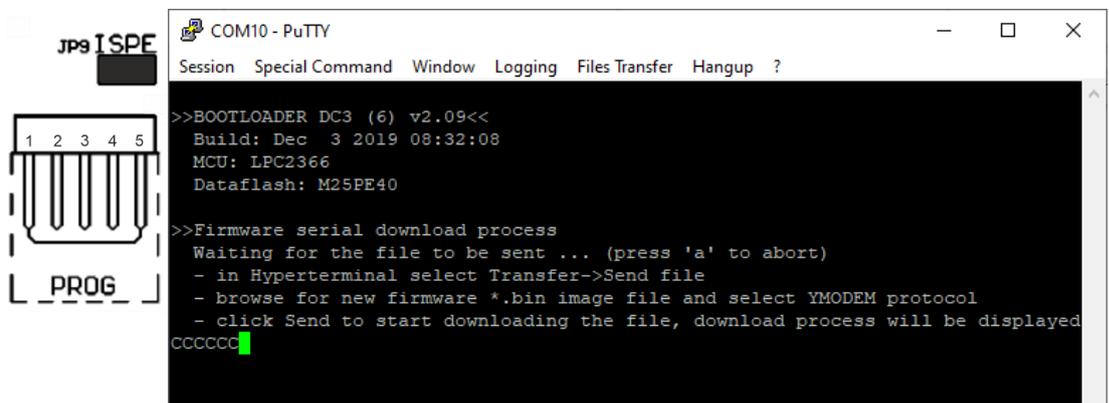
- Set the devapp.bin file via the YMODEM 1K protocol to the clock via the terminal menu. A window will appear in the terminal informing you of the progress of the file sending to clock.
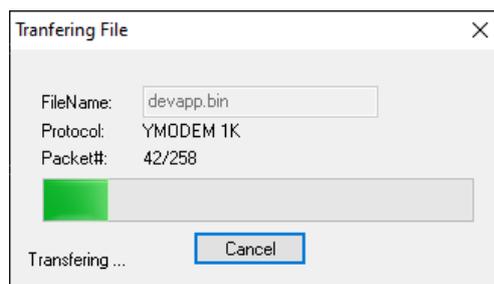
- After successful file transfer, the terminal displays information about the received firmware. The firmware check is then started automatically, then the firmware is written to the clock processor and started.

```
Dataflash: M25PE40

>>Firmware serial download process
  Waiting for the file to be sent ... (press 'a' to abort)
  - in Hyperterminal select Transfer->Send file
  - browse for new firmware *.bin image file and select YMODEM protocol
  - click Send to start downloading the file, download process will be displayed
  CCCCCCCCCCCC

  Download completed successfully!
  -----------------------------------
  Name: devapp.bin
  Size: 262400 Bytes
  -----------------------------------

>>BOOTLOADER DC3 (6) v2.10<<
  Build: Feb 26 2020 00:37:50
  MCU: LPC2366
  Dataflash: M25PE40
  Calculating HMAC ...................... done
  Writing firmware ...................... done
  Running firmware
```

- Remove the jumper from the ISPE header.
- You can check the firmware version in the terminal list after starting the clock.

14.2 Firmware update over Ethernet on NTP and PoE versions

- Create a folder on the computer disk and copy "tftpd32.ini", "tftpd32.chm" and "tftpd32.exe" in it. Copy the new firmware file "devapp.bin" as well.
- Run "tftpd32.exe", let only the TFTP Server in the window Settings -> Global Settings be active, don't change other settings.
- Using the Browse key, open choice of active directory and find the one which contains the given firmware
- Connect to the clock by the windows command **telnet <clock IP address>**
- example: telnet 192.168.0.190
- The page of telnet requesting will appear, after the password entered identification of current software version and clock MAC address displays.
- Enter the command **fu** in telnet window to start the automatic clock firmware update from the "devapp.bin" file.
- Information about sending file and its progress displays in the tftpd32 program window after the command entering. Connection to telnet is ended automatically.
- Wait about 1 minute after downloading the file. Connect the telnet to the clock again.
- After entering the password, check if the firmware version is correct, if it isn't, it is necessary to repeat the whole procedure.
- Close the telnet window and end the program tftpd32 with the command **exit**.

15 Time zone table

Time zone entries in the standard time zone table (version 11).

Time zone	City / State	UTC Offset	DST Change	Standard → DST	DST → Standard
00	UTC (GMT), Monrovia, Casablanca	0	No		
01	London, Dublin, Edinburgh, Lisbon	0	Yes	Last Sun. Mar. (01:00)	Last Sun. Oct. (02:00)
02	Brussels, Amsterdam, Berlin, Bern, Copenhagen, Madrid, Oslo, Paris, Rome, Stockholm, Vienna, Belgrade, Bratislava, Budapest, Ljubljana, Prague, Sarajevo, Warsaw, Zagreb	+1	Yes	Last Sun. Mar. (02:00)	Last Sun. Oct. (03:00)
03	Athens, Helsinki, Riga, Tallinn, Sofia, Vilnius	+2	Yes	Last Sun. Mar. (03:00)	Last Sun. Oct. (04:00)
04	Bucharest	+2	Yes	Last Sun. Mar. (03:00)	Last Sun. Oct. (04:00)
05	Pretoria, Harare, Kaliningrad	+2	No		
06	Amman	+2	Yes	Last Thu. Mar. (23:59)	Last Fri. Oct. (01:00)
07	UTC (GMT)	0	No		
08	Istanbul, Kuwait City, Minsk, Moscow, Saint Petersburg, Volgograd	+3	No		
09	Praia, Cape Verde	-1	No		
10	UTC (GMT)	0	No		
11	Abu Dhabi, Muscat, Tbilisi, Samara	+4	No		
12	Kabul	+4.5	No		
13	Adamstown (Pitcairn Is.)	-8	No		
14	Tashkent, Islamabad, Karachi, Yekaterinburg	+5	No		
15	Mumbai, Kolkata, Chennai, New Delhi, Colombo	+5.5	No		
16	Astana, Thimphu, Dhaka, Novosibirsk	+6	No		
17	Bangkok, Hanoi, Jakarta, Krasnoyarsk	+7	No		
18	Beijing, , Hong kong, Singapore, Taipei, , Irkutsk	+8	No		
19	Tokyo, Seoul, Yakutsk	+9	No		
20	Gambier Island	-9	No		
21	South Australia: Adelaide	+9.5	Yes	1st Sun. Oct (02:00)	1st Sun. Apr. (03:00)
22	Northern Territory: Darwin	+9.5	No		
23	Brisbane, Guam, Port Moresby, Vladivostok	+10	No		
24	Sydney, Canberra, Melbourne, Tasmania: Hobart	+10	Yes	1st Sun. Oct. (02.00)	1st Sun. Apr. (03:00)
25	UTC (GMT)	0	No		
26	UTC (GMT)	0	No		

				Standard → DST	DST → Standard
27	Honiara (Solomon Is.), Madagan, Noumea (New Caledonia),	+11	No		
28	Auckland, Wellington	+12	Yes	Last Sun. Sep. (02:00)	1st Sun. Apr. (03:00)
29	Majuro (Marshall Is.), Anadyr	+12	No		
30	Azores	-1	Yes	Last Sun. Mar. (00:00)	Last Sun. Oct. (01:00)
31	Middle Atlantic	-2	No		
32	Brasilia	-3	Yes	3rd Sun. Oct. (00:00)	3rd Sun. Feb. (00:00)
33	Buenos Aires,	-3	No		
34	Newfoundland	-3.5	Yes	2nd Sun. Mar. (02:00)	1st Sun. Nov. (02:00)
35	Atlantic Time (Canada)	-4	Yes	2nd Sun. Mar. (02:00)	1st Sun. Nov. (02:00)
36	La Paz	-4	No		
37	Bogota, Lima, Quito	-5	No		
38	New York, Eastern Time (US & Canada)	-5	Yes	2nd Sun. Mar. (02:00)	1st Sun. Nov. (02:00)
39	Chicago, Central Time (US & Canada)	-6	Yes	2nd Sun. Mar. (02:00)	1st Sun. Nov. (02:00)
40	Tegucigalpa, Honduras	-6	No		
41	Phoenix, Arizona	-7	No		
42	Denver, Mountain Time	-7	Yes	2nd Sun. Mar. (02:00)	1st Sun. Nov. (02:00)
43	Los Angeles, Pacific Time	-8	Yes	2nd Sun. Mar. (02:00)	1st Sun. Nov. (02:00)
44	Anchorage, Alaska (US)	-9	Yes	2nd Sun. Mar. (02:00)	1st Sun. Nov. (02:00)
45	Honolulu, Hawaii (US)	-10	No		
46	Midway Islands (US)	-11	No		
47	Mexico City, Mexico	-6	Yes	1st Sun. Apr. (02:00)	Last Sun. Oct. (02:00)
48	Adak (Aleutian Is.)	-10	Yes	2nd Sun. Mar. (02:00)	1st Sun. Nov. (02:00)
49	UTC (GMT)	0	No		
50	UTC (GMT)	0	No		
51	UTC (GMT)	0	No		
52	UTC (GMT)	0	No		
53	UTC (GMT)	0	No		
54	Ittoqqortoormiit, Greenland	-1	Yes	Last Sun. Mar. (00:00)	Last Sun. Oct. (01:00)
55	Nuuk, Qaanaaq,Greenland	-3	Yes	Last Sat. Mar. (22:00)	Last Sat. Oct. (23:00)
56	Myanmar	+6,5	No		
57	Western Australia: Perth	+8	No		
58	Caracas	-4.5	No		
59	CET standard time	+1	No		
60	Not used				
61	Not used				
62	Baku	-4.0	Yes	Last Sun. Mar. (04:00)	Last Sun. Oct. (05:00)
63	UTC (GMT)	0	No		
64	UTC (GMT)	0	No		

In countries where the DST switch date changes annually (e.g. Iran, Israel), the time zone has to be defined manually in the user time zone table (entries 80 – 99).

Legend:
UTC:	Universal Time Coordinate, equivalent to GMT
DST:	Daylight Saving Time
DST Change:	Daylight Saving Time changeover
Standard → DST:	Time change from Standard time (Winter time) to Summer time
DST → Standard:	Time change from Summer time to Standard time (Winter time)

Example:
2nd last Sun. Mar. (02:00)	Switch over on the penultimate Sunday in March at 02.00 hours local time

16 Engineering data

16.1 Standard design of the clock

Specifications		DC.20.6...F	DC.20.12...R	DC.57.4	DC.57.6	DC.57x.6	DC.75.4	DC75.6	DC75x.6	DC.100.4	DC.100.6	DC.100x.6	DC.180.4	DC.180.6	DC.180x.6	DC.250.4..SL	DC.250x.6..SL
Display	height of the	20/14	20	57	57/38	57	75	75/38	75	100	100/57	100	180	180/100	180	250	250
	number of digits	4+2	12	4	4+2	6	4	4+2	6	4	4+2	6	4	4+ 2	6	4	6
Time and date display format	HH : MM DD. MM			✓			✓			✓			✓			✓	
	HH : MM SS DD. MM. yy	✓			✓			✓			✓			✓			
	HH : MM : SS DD.MM.YY		✓			✓			✓			✓			✓		✓
Powering	standard	Note	100-240 VAC, 50-60Hz →														
	option VDC		18 - 56 VDC, Note 2 →														
	option VDC 12V		12 - 16 VDC →														
	PoE (IEEE 802.3 af-Class 0)			✓	✓	✓	✓	✓	✓	✓	✓	✓	Note 3	Note 4	-	Note 4	Note 5
	PoE (IEEE 802.3 af-Class 3)			✓	✓	✓	✓	✓	✓	✓	✓	✓	Note 3	Note 4	-	Note 4	Note 3
Power consumption AC or DC version [VA]	single sided	3	5	7	8	8	7	8	8	7	8	10	25	30	36	8	12
	double sided	-	-	11	16	16	11	16	16	11	16	18	50	60	75	16	22
Power consumption PoE version [VA]	single sided	3	5	7	8	8	7	8	8	7	18	10	6	-	7	8	12
	double sided	-	-	11	15	15	11	15	15	11	15	15	10	-	13	-	-
Reserve capacity	passive (time + data)	6 years (except PoE version) →															
Accuracy at 20 °C	without synchronization	±0,3 sec/day →															
Accuracy of temp. measurement in	-25...+80 °C	±0,5 °C →															
	-50...+125 °C	±2,0 °C →															
Scope of the operating temp.		0 to + 50 °C, relative humidity 0 - 95%, without condensation →															
Protection degree		IP 40		IP 40, optionally IP 54 or IP 65 →												IP 40, optionally IP 65 →	
Weight in kg	single sided design	0,55	2,2	1,4	1,8	1,9	1,9	2,4	2,5	2,4	3,1	3,5	6,3	9,3	10,4	10	14
	double sided design	-	-	2,6	3	3,2	3,5	4,2	4,3	4,4	5,6	6	10,2	15,3	17,6	15	20
Dimensions (W x H x D) mm	single sided design	144 / 77 / 147	483 / 44 / 145	333 / 118 / 39	423 / 118 / 39	454 / 118 / 39	400 / 140 / 39	525 / 140 / 39	550 / 140 / 39	510 / 169 / 39	652 / 169 / 39	728 / 169 / 39	880 / 264 / 39	1146 / 264 / 39	1260 / 264 / 39	1230 / 350 / 39	1720 / 350 / 39
	double sided design	-	-	333 / 118 / 78	423 / 118 / 78	454 / 118 / 78	400 / 140 / 78	525 / 140 / 78	550 / 140 / 78	510 / 169 / 78	652 / 169 / 78	728 / 169 / 78	880 / 269 / 78	1146 / 264 / 78	1260 / 264 / 78	1230 / 350 / 78	1720 / 350 / 78

Notes:

1. With external AC/DC adapter.
2. For red and yellow display colour only.
3. For single sided clock only.
4. For red and yellow display with option SL only.
5. For single sided clock with red and yellow display only.

- option .SL can only be combined with model DC.57, DC.100, DC.180 and DC.250 and display in red, pure green, blue, yellow or white colour
- DC.20 available with red and green display colour only
- we don´t recommend wall bracket mounting for DC.180x.6, DC.250.4 and DC.250x.6
- temperature sensors TP 3 m and TP 30 m can´t be used for model DC.180..WiFi
- temperature sensors TP 3 m and TP 30 m for NTP and PoE version on request only
- accessories for all models are listed in the "Easy to ordering" table

16.2 Voltage range and electric current consumption of the lines

Type of slave line	Voltage range	Electric current consumption
MOBALine	5 – 30 VAC	6 – 34 uA
MIN, CODE	+- 12 – 30 V	3 - 7 mA
MIN, CODE (on request)	+- 30 – 60 V	3 - 7 mA
IRIG B	20 mVpp – 2 Vpp	20 uA – 2 mA

17 Accessories and Maintenance

17.1 Single-sided clock

• Allen key for unlocking and locking the frame catch	1 pc
• Instruction manual	1 pc
• Additional spacers	3 pcs
• Wood screws for fixing the anchoring plate inclusive dowels	3 pcs

17.2 Double-sided clock

• Allen key for unlocking and locking the frame catch and the suspension	1 pc
• Instruction manual	1 pc
• Wood screws for fixing the suspension including dowels	4 pcs

18 Cleaning

Clean surface of clock only. Use soft rags and antistatic detergents. Don't use synthetics.

19 DISPOSAL OF USED BATTERIES

The user is lawfully obligated to return unusable batteries. Disposal of used batteries through household waste is prohibited! Batteries which contain dangerous substances are labeled with a picture of a crossed out trash bin. The symbol means that this product may not be disposed through household waste. Below the symbol, the dangerous substance is indicated with an abbreviation: Cd = Cadmium, Hg = Quicksilver, Pb = Lead. Unusable batteries can be returned free of charge at appropriate collection points of your waste disposal company or at shops that sell batteries. By doing so, you fulfill your legal responsibilities and help protect the environment.

20 GUARANTEE AND MAINTENANCE

- The device is intended for a normal operational environment according to the corresponding norm.
- The following circumstances are excluded from the guarantee:
  - inappropriate handling or interventions
  - chemical influences
  - mechanical defects
  - external environmental influences (natural catastrophes)
- Repairs during and after the guarantee period are assured by the manufacture

Headquarters/Production
Sales Worldwide

MOSER-BAER AG | Spitalstrasse 7 | CH-3454 Sumiswald
Tel. +41 34 432 46 46 | Fax +41 34 432 46 99
moserbaer@mobatime.com | www.mobatime.com

Sales Switzerland

MOBATIME AG | Stettbachstrasse 5 | CH-8600 Dübendorf
Tel. +41 44 802 75 75 | Fax +41 44 802 75 65
info-d@mobatime.ch | www.mobatime.ch

MOBATIME SA | En Budron H 20 | CH-1052 Le Mont-sur-Lausanne
Tél. +41 21 654 33 50 | Fax +41 21 654 33 69
info-f@mobatime.ch | www.mobatime.ch

Sales Germany/Austria

BÜRK MOBATIME GmbH
Postfach 3760 | D-78026 VS-Schwenningen
Steinkirchring 46 | D-78056 VS-Schwenningen
Tel. +49 7720 8535 0 | Fax +49 7720 8535 11
buerk@buerk-mobatime.de | www.buerk-mobatime.de