

INSTRUCTION MANUAL

State-of-the-art technology digital clock

ECO-M-DK





Certification of the Producer

STANDARDS

The digital clock DK 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), 2002/96/EC (WEEE):

EN 60950-1

EN 55032, class B

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.
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1 Description

Elegant and very slim digital clocks for displaying hours, minutes and date in different languages • temperature display and stopwatch support • aluminum metal housing, powder coated • display composed of SMD LED of high luminance provide for excellent readability from various angles of view • display in red and yellow • autonomous operation with internal quartz powered from mains • NTP synchronization powered over PoE (compatible IEEE 802.3af) or mains powered • slave clock operation controlled by MOBALine, ActiveDCF RS485, mains powered • single or double sided clock • wall mounting for single-sided clock • ceiling suspension or wall bracket mounting for double-sided clock • high protection degree IP54 as standard

Basic properties

The Clock

- display of time values (either 12 or 24hours time cycle), four digit (HH:MM)
- display of day of week – 3 characters, day of month - 2 digits, month – 3 characters
- display composed of SMD LED, with 75 mm digit height for time and 50 mm digit height for date; viewing distance up to 32 m
- display in red or yellow
- temperature indication (if a temperature sensor is connected) in °C or °F
- possibility of displaying one or two temperatures (two temperature sensors)
- possibility of alternating display between time and temperature, with adjustable period of displaying the corresponding data

Mechanic

- elegant and slim clock frame, square shape, made of aluminium, powder coated in black or silver colour
- front cover made of dark plexiglass for best readability over a wide viewing angle
- single- or double-sided version for wall mounting, ceiling suspension or wall bracket mounting
- double sided version consist of two pieces single sided clock and wall bracket or ceiling suspension
- easy two-step installation and time-saving maintenance, hanging holes for wall mounting
- pushbuttons, connectors and state LEDs are accessible after dismantling the front plexiglass
- protection degree IP 54
- working temperature

Stopwatch

- counting upwards from zero, up to 24 hours
- counting downwards from a specified value, with stop at zero, with automatic restart or counting into negative values
- display of intermediate time values, "freezing" of display, cumulated intermediate time
- counting in steps of 1 minute, 1 second or 1/100 seconds
- operation via wired keyboard or remote IR controller

- possibility of parallel switching over into the time/date or temperature display mode

Synchronization

- autonomous operation with internal quartz time base with programmable automatic seasonal time change
- NTP multicast or unicast synchronization powered over PoE or mains powered
- slave clock operation with synchronization by MOBALine, ActiveDCF or by RS485 (depending on version), mains powered
- accuracy +/- 0.1 s/day without synchronization (after 24h of synchronization at constant temperature)
- RTC backup by means of lithium battery (supercapacitor on request)

Configuration

- setting of the clock parameters and time, date setting by means of internal push buttons or IR remote controller

For NTP and PoE version only:

- DHCP / manual configuration of the clock parameters or setting over the telnet
- private options of DHCP string for automatic configuration of all clock parameters when connected to network
- configuration and monitoring using MOBA-NMS software or SNMP
- firmware update remotely through the network using the TFTP protocol
- IPv6 support

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 dismantling 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

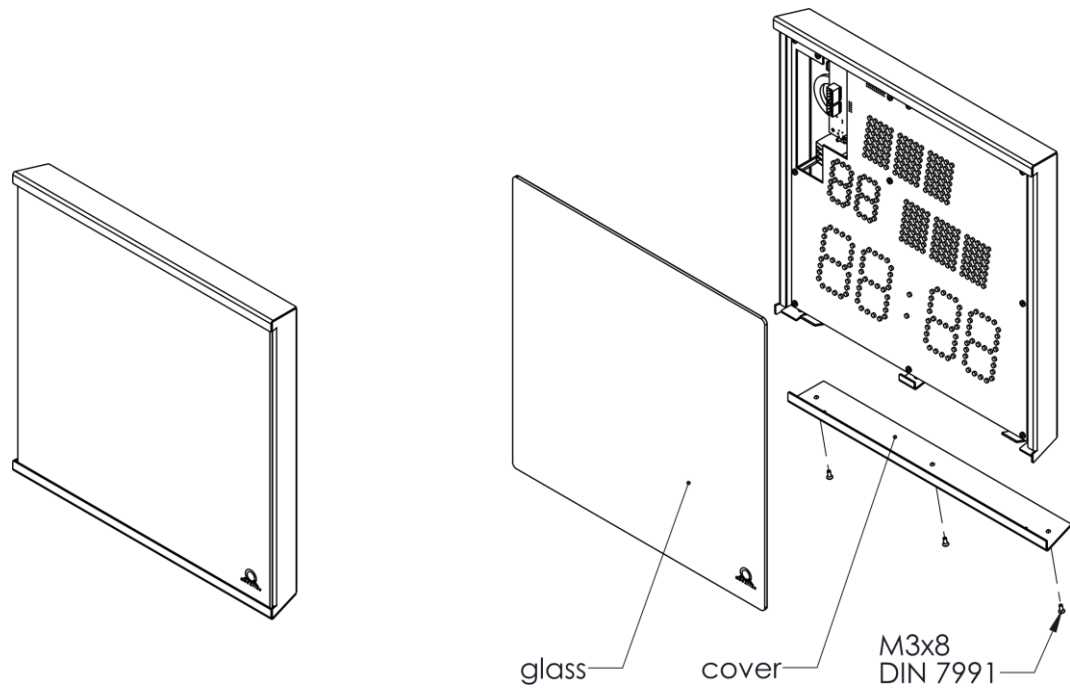
- First, prepare the 2 holes in the wall by hinges pitch on the backside of clock.
- Insert the dowels to the prepared holes and screw the appropriate screws into them.
- Remove the screws on the bottom of the clock. Remove the bottom cover and plexiglass.
- Thread the cable(s) through the grommet and hang the clock on the prepared screws in the wall.
- Cut the cable(s) to the appropriate length and connect the wires to corresponding terminals and/or crimp the RJ45 jack to the Ethernet cable respectively.
- Insert the BATT jumper in order to enable the RTC backup (doesn't apply to clocks with supercapacitor option).
- Mount the plexiglass and bottom cover.

2.2 Double-sided clock

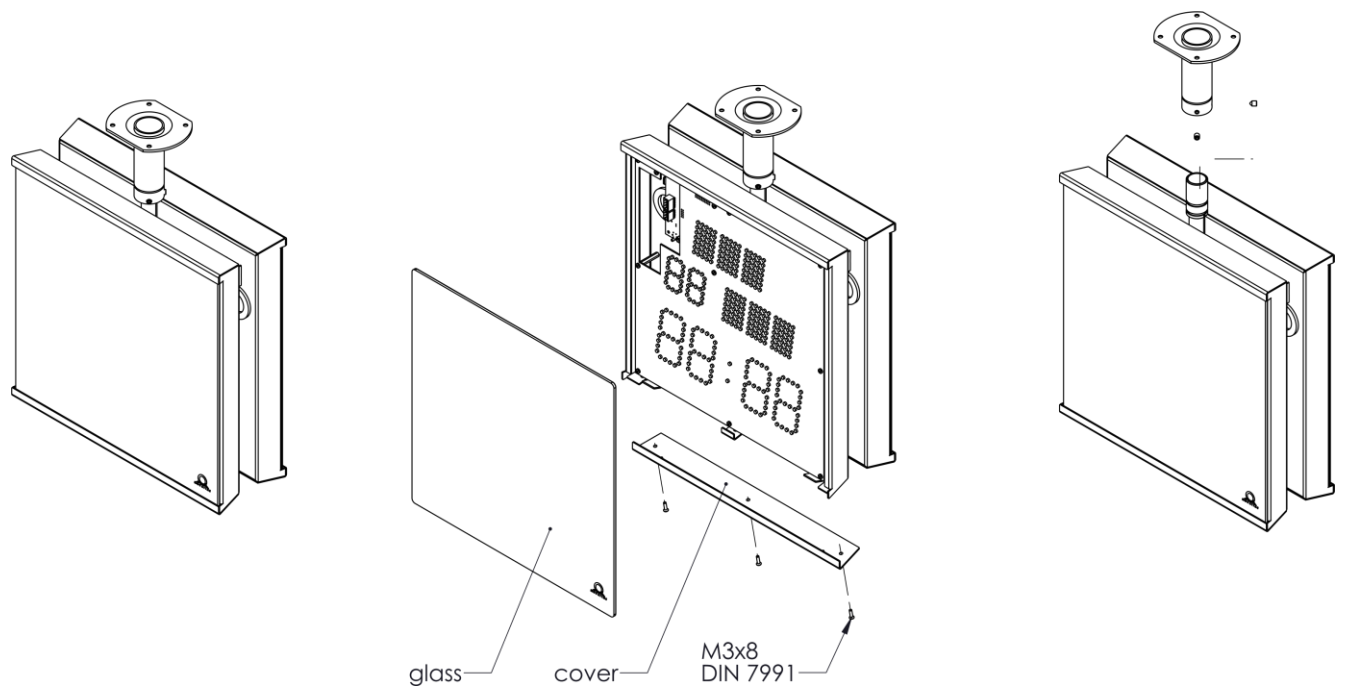
- First, prepare the 4 holes in the ceiling or wall by bracket flange pitch.
- Insert the dowels to the prepared holes and fix into them the ceiling or wall bracket using appropriate screws.
- Remove the screws on the bottom of the Master clock. Remove the bottom cover and plexiglass (see picture in capture 2.3 Assembly diagram).
- Cut the cable(s) to the appropriate length and connect the wires to corresponding terminals and/or crimp the RJ45 jack to the Ethernet cable respectively.
- Insert the BATT jumper in order to enable the RTC backup (doesn't apply to clocks with supercapacitor option).
- Connect the cable from Slave clock to the Master clock.
- Mount the plexiglass and bottom cover.

2.3 Assembly diagram

Single sided clock

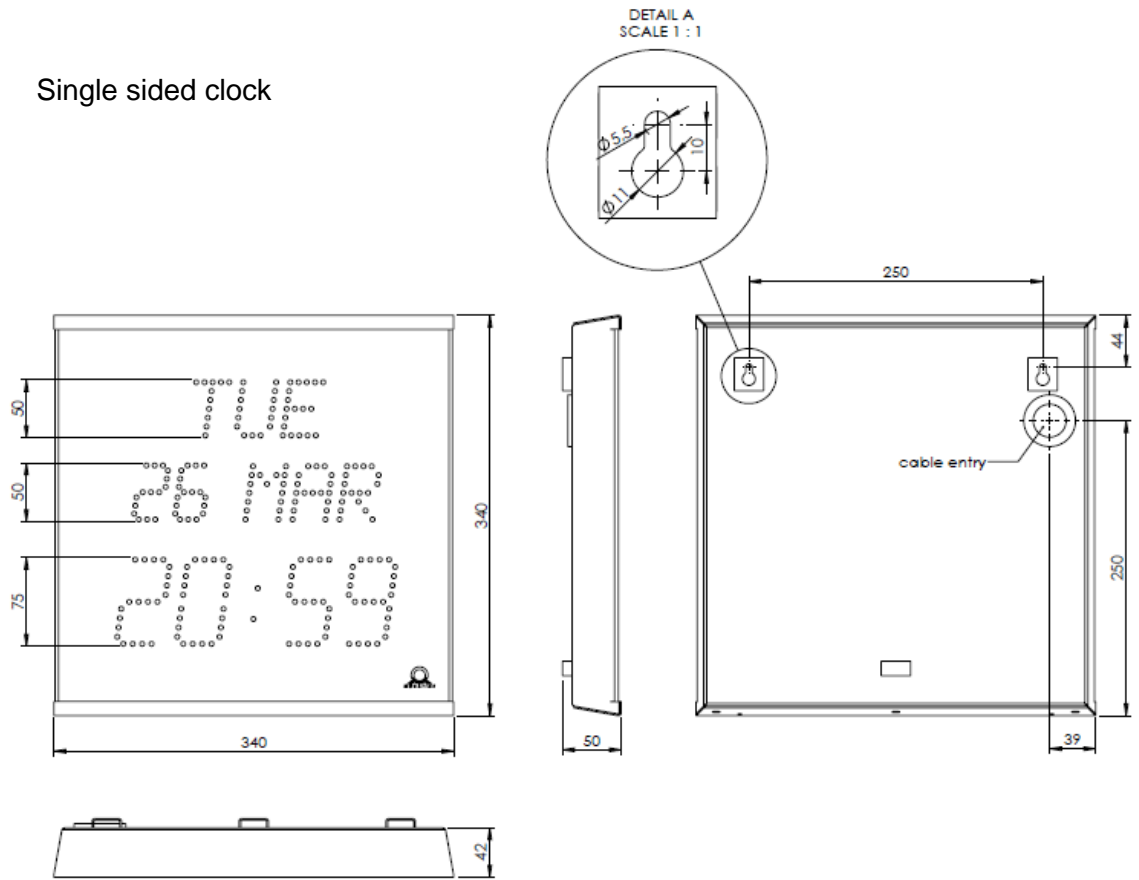


Double sided clock

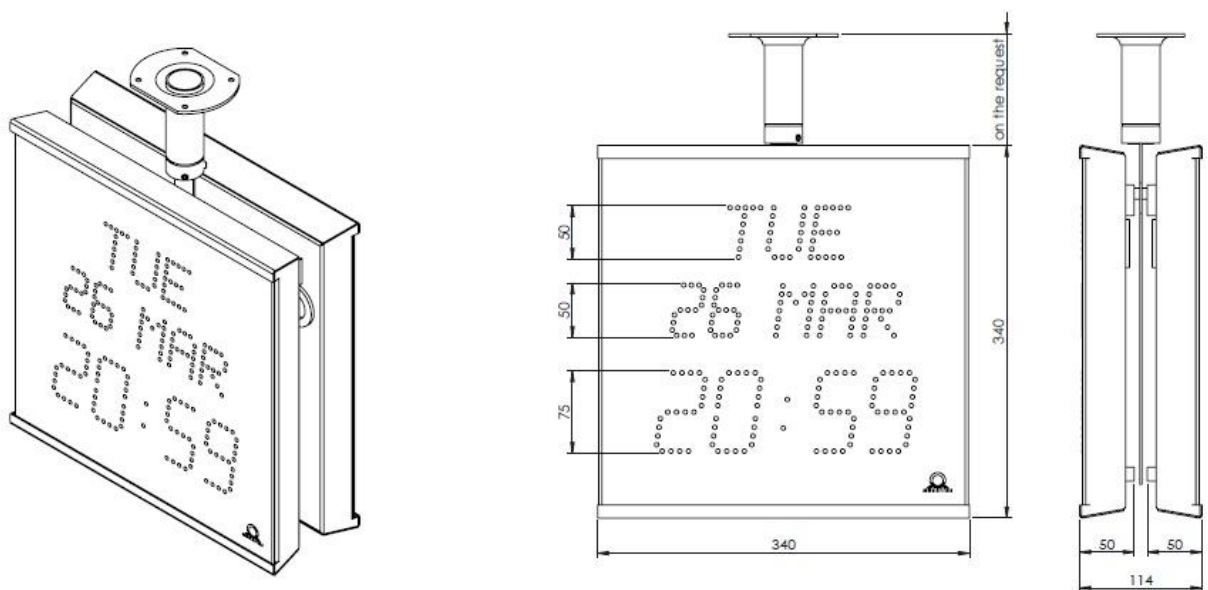


2.4 Mechanical drawing

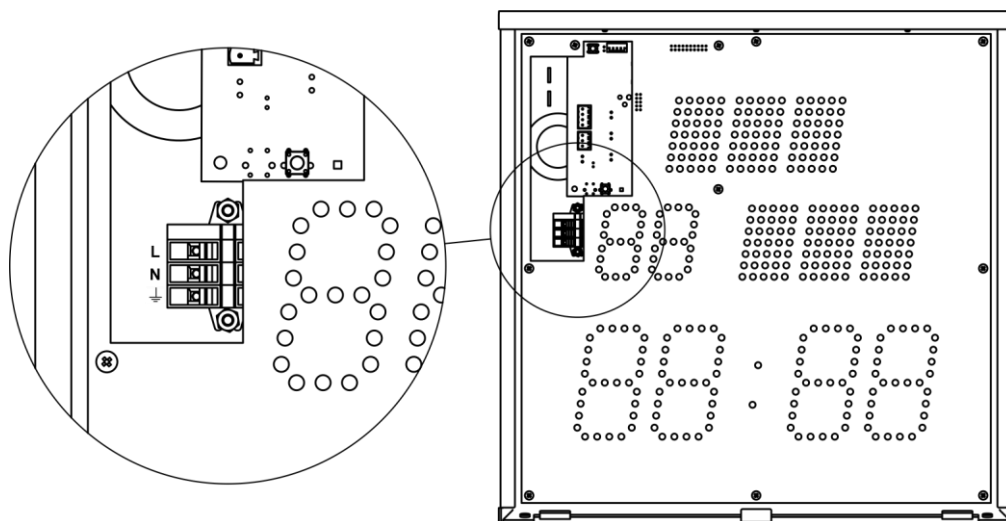
Single sided clock



Double-sided clock



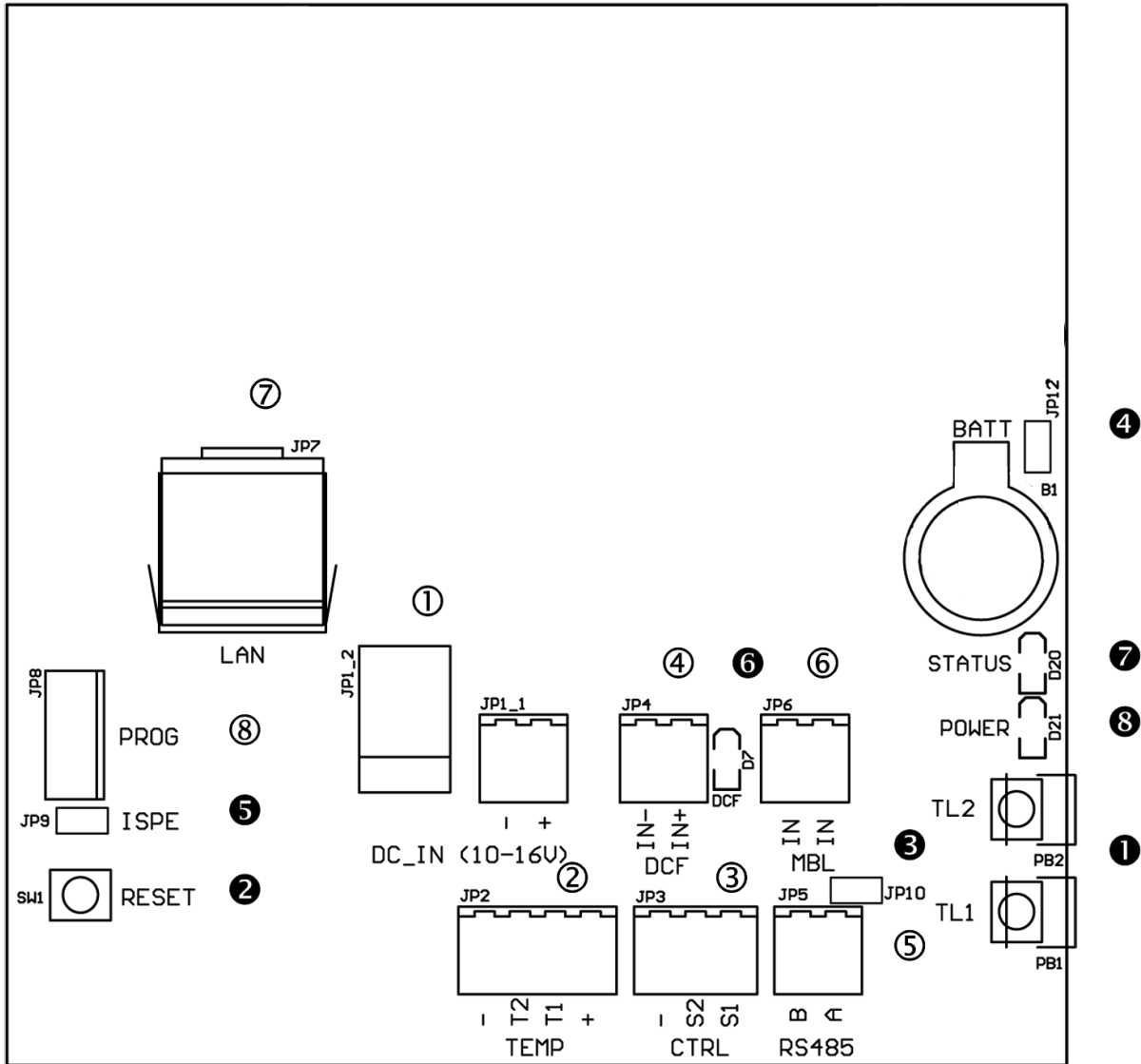
2.5 Connecting terminal block



Notes:

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

2.6 Control PCB



- | | |
|---|--|
| ① DC-IN (10-16 V) - JP1_2, JP1_1 | ① Pb1, PB2 button |
| ② TEMP - JP2 | ② RESET button |
| ③ CTRL - JP3 | ③ jumper TRE - JP10 (RS 485 version) |
| ④ DCF - JP4 (STD version) | ④ jumper BATT - JP12 |
| ⑤ RS 485 - JP5 (RS 485 version) | ⑤ jumper ISPE - JP9 |
| ⑥ MOBALine, ActiveDCF - JP6 (STD version) | ⑥ LED indication of receiving DCF signal |
| ⑦ LAN - JP7 (NTP andPoE version) | ⑦ state LED |
| ⑧ PROG - JP8 | ⑧ LED indication of powering |

2.7 Function of the plug connectors

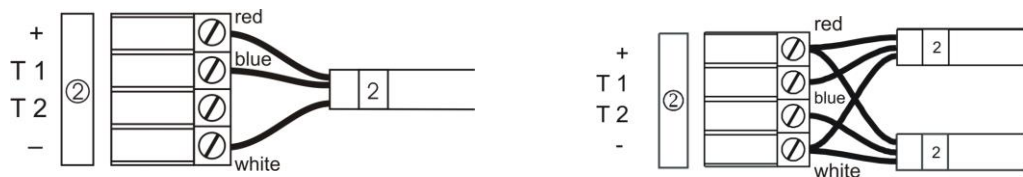
① DC-IN – JP1_2. JP1_2	powering 10 – 16 VDC
② TEMP – JP2	connection of the temperature sensor(s)
③ CTRL – JP3	connection of the keyboard
④ DCF – JP4 (STD version)	connection of the DCF/GPS receiver
⑤ RS485 – JP5 (RS 485 version)	connection of the RS485 serial line
⑥ MOBALine, ActiveDCF – JP6 (STD version)	time signal input MOBALine, ActiveDCF
⑦ LAN - JP7 (NTP, PoE version)	RJ45 10BaseT/100TX (IEEE 802.3) auto negotiation
⑧ PROG – JP8	clock firmware programming

2.8 Setting elements

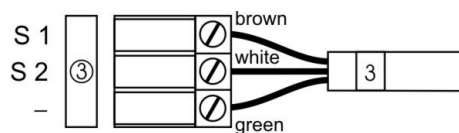
① PB1, PB2	control pushbuttons
② RESET	the RESET button
③ TRE jumper – JP10 (RS 485 version)	RS485 terminating resistor enable
④ BATT jumper – JP12	backup battery connection
⑥ ISPE jumper – JP9	invoking the firmware programming mode
⑦ DCF LED	Indication of receiving the DCF signal
⑧ STATE LED	state indication
⑨ POWER LED	power indication

2.9 Connection of the cable ends

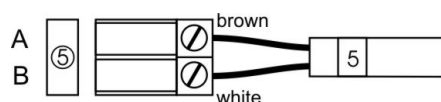
TEMP wire connection – 1 or 2 thermometers



CTRL wire connection



RS-485 wire 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 keystrokes

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 \rightarrow time + temperature \rightarrow stopwatch \rightarrow time + date
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 menu is consisted of two pages.

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 (page no. 1)	storage of values and entry to menu page no. 2 or entry into the submenu, where it is permitted by the program
PB1L (page no. 2)	storage of values and return into normal display mode
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.

The display shows the following:



Enter the constant for "time + date" display in seconds. Push the **PB1S** button and enter the time constant for the display "time + temperature 1" in seconds.

Push **PB1S**. The display shows the following:



Enter the time constant for the display of stopwatch, in seconds.

Push **PB1S**. The display shows the following:



Enter the time constant to display "time + temperature 2" of second sensor in seconds.

Push **PB1S**. The display shows the following:



Enter a time constant to display the "time + humidity 1" of the first sensor in seconds.

Push **PB1S**. The display shows the following:



Enter a time constant to display the "time + pressure 1" of the first sensor in seconds.

Push **PB1S**. The display shows the following:



Enter a time constant to display the “time + humidity 2” of the second sensor in seconds.

Push **PB1S**. The display shows the following:



Enter a time constant to display the “time + pressure 2” 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:



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:



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:



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**.

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:



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**.

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)

3.2.10 Menu page no.2 – display language parameters

The menu page no. 2 is opened after saving the menu page no. 1 by pushing the **PB1L** button.

After saving the menu page no. 2 by pushing the **PB1L** button, the clock returns to the normal display mode.

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)
DATE	visualization of time + date
TEMP	visualization of time + temperature
TIMER	visualization of stopwatch
>>	changeover of the displayed items: time + date → time + temperature → stopwatch → time + date
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

Press **>>** to move to next value. The item to be set is blinking. 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 menu is consisted of two pages.

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
F1	storing of the modified items and switch to menu page no. 1
F2	storing of the modified items and switch to menu page no. 2
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:



Enter the constant for “time + date” display in seconds. Push the **>>** button and enter the time constant for the display “time +temperature 1” in seconds.

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



Enter the time constant for the display of stopwatch, in seconds.

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



Enter the time constant to display “time + temperature 2” of second sensor in seconds.

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



Enter a time constant to display the “time + humidity 1” of the first sensor in seconds.

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



Enter a time constant to display the “time + pressure 1” of the first sensor in seconds.

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



Enter a time constant to display the “time + humidity 2” of the second sensor in seconds.

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



Enter a time constant to display the “time + pressure 2” 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** and **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

5.1 Menu page no. 1 – basic clock parameters

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 + date
		2 continuous display of time + temperature
		3 reserve
		4 continuous display of stopwatch
		5 display sequence: time + date 6 sec, time + temperature 3 sec.
		6 reserve
		U* time constants set up by user, in seconds for each specific displayed data
0 automatic switching over disabled		
P3	Time zone of synchronization source	0 - 64, A (automatically)
P4	Type of synchronization source	1 - 10, A (automatically)
		A* auto detection, applicable for: DCF, the Mobatime serial code, MOBALine, ActiveDCF 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* not used
		9* not used
		10* RS485
		11* not used
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

Program item	Function	Scope of the values (default values are printed in bold)	
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)	
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 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 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 RS485	Number of data bits	8
P 16		Number of stop bits	1
			2
P 17		Parity	n no parity
			o odd
			E even

Program item	Function	Scope of the values (default values are printed in bold)	
P 18	IP mode	0	NTP, PoE: IPv4 / IPv6 dualstack
		1	NTP, PoE: IPv4
		2	NTP, PoE: IPv6
P19	Network operation mode IPv4	1	multicast (without IP address), WiFi not supported
		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*	
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
SW version		r_._(e.g.: r6.50)	

Note:

- * possibility to enter the submenu
- Items P18 to P25 available in NTP, PoE 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.

5.2 Menu page no. 2 – display language parameters

Program item	Function	Scope of the values (default values are printed in bold)
E0	First language selection	10 languages to choose from
		1 Czech
		2 Slovak
		3 English
		4 German
		5 French
		6 Italian
		7 Russian
		8 Spanish
		9 Portuguese
10 Polish		
E1	Second language selection	10 languages + option N – “none”
		1 – 10, N
E2	Temperature units for second selected language	°C
		°F
E3	Third language selection	10 languages + option N – “none”
		1-10, N
E4	Temperature units for second selected language	°C
		°F
E5	Language switch mode for automatic language switching over in one display alternating cycle	A all languages
		S single language
SW version		r._(e.g.: r6.50)

5.3 IPv6 address 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 keystrokes

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 → time + temperature → stopwatch → time + date

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
DATE	visualization of time + date
TEMP	visualization of time + 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

Enter the parameters according to the stopwatch MENU table. When counting down from a preset time is selected, enter the desired time value as follows. Enter the submenu by pushing **OK** button, or directly from the stopwatch display mode with **SET** 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.

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.

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 14 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

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, Active DCF. 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).
- Face the radio receiver with the front cover (with screws) towards the Mainflingen DCF transmitter (approximately to the west). If the DCF reception is good, the time base on the connected clock will be synchronized automatically within a few minutes. In case of poor reception (especially during the day), the first setting must be made manually so that the LED flashes regularly.

10.2 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**.

10.2.1 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.

10.2.2 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 $\pm 0,5$ 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.

10.3 Slave clock controlled by MOBATIME code, MOBALine, or ActiveDCF

- 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 MOBATIME serial coded line or ActiveDCF takes place within at least 3 to 4 minutes, for MOBALine within 6 to 15 seconds.

10.4 Slave clock controlled by IF482 over 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.

10.5 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 ECO-M-DK 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.

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/ 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 ECO-M-DK 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 ECO-M-DK 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	romobotime
read / write community	rwmobotime
notification (trap) community	trapmobotime

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 Testing mode, parameter reset

12.1 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** or by pushing the **>>** button on IR remote control.
- Keep pushing both buttons on the clock frame or the **DISP** button on IR 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

12.2 Parameter reset

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

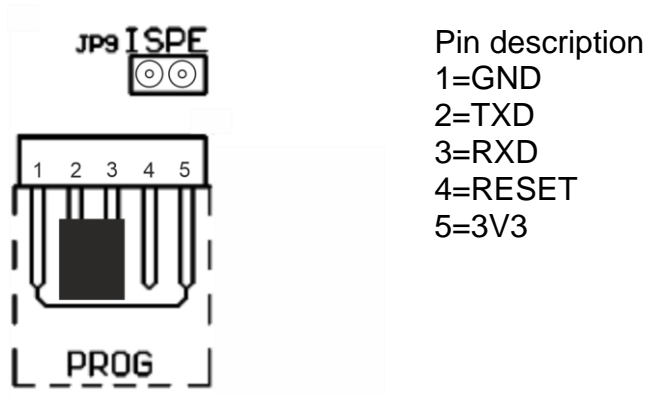
Activating the parameter reset:

- Enter the clock menu, move to the software version item by several pushes of the **PB1S** or by pushing the **>>** button on IR remote control.
- Keep pushing both buttons on the clock frame or the **DISP** button on IR 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

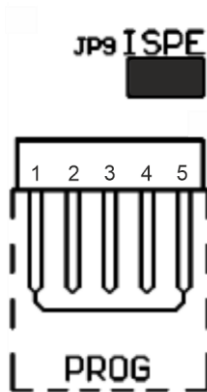
13 Firmware update

13.1 Update firmware through TTL UART by protocol YMODEM 1K

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



- 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.



```

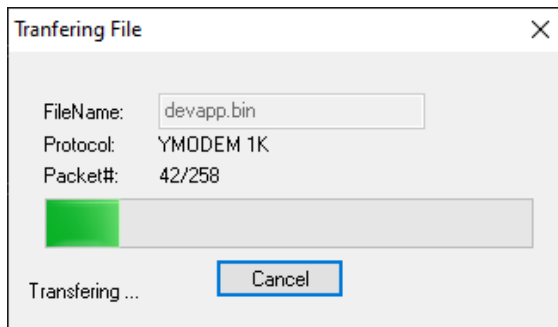
COM10 - PuTTY
Session Special Command Window Logging Files Transfer Hangup ?

>>BOOTLOADER DC3 (6) v2.09<<
  Build: Dec  3 2019 08:32:08
  MCU: LPC2366
  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
CCCCC█

```

- 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
CCCCCCCCC

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

```

00:07:55 Connected SERIAL/57600 8 N 1

- Remove the jumper from the ISPE header.

- You can check the firmware version in the terminal list after starting the clock.

13.2 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**.

14 Time zone table v.11

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	1 st Sun. Oct (02:00)	1 st 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	1 st Sun. Oct. (02:00)	1 st Sun. Apr. (03:00)
25	UTC (GMT)	0	No		
26	UTC (GMT)	0	No		

27	Honiara (Solomon Is.), Madagan, Noumea (New Caledonia),	+11	No		
28	Auckland, Wellington	+12	Yes	Last Sun. Sep. (02:00)	1 st 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	3 rd Sun. Oct. (00:00)	3 rd Sun. Feb. (00:00)
33	Buenos Aires,	-3	No		
34	Newfoundland	-3.5	Yes	2 nd Sun. Mar. (02:00)	1 st Sun. Nov. (02:00)
35	Atlantic Time (Canada)	-4	Yes	2 nd Sun. Mar. (02:00)	1 st Sun. Nov. (02:00)
36	La Paz	-4	No		
37	Bogota, Lima, Quito	-5	No		
38	New York, Eastern Time (US & Canada)	-5	Yes	2 nd Sun. Mar. (02:00)	1 st Sun. Nov. (02:00)
39	Chicago, Central Time (US & Canada)	-6	Yes	2 nd Sun. Mar. (02:00)	1 st Sun. Nov. (02:00)
40	Tegucigalpa, Honduras	-6	No		
41	Phoenix, Arizona	-7	No		
42	Denver, Mountain Time	-7	Yes	2 nd Sun. Mar. (02:00)	1 st Sun. Nov. (02:00)
43	Los Angeles, Pacific Time	-8	Yes	2 nd Sun. Mar. (02:00)	1 st Sun. Nov. (02:00)
44	Anchorage, Alaska (US)	-9	Yes	2 nd Sun. Mar. (02:00)	1 st Sun. Nov. (02:00)
45	Honolulu, Hawaii (US)	-10	No		
46	Midway Islands (US)	-11	No		
47	Mexico City, Mexico	-6	Yes	1 st Sun. Apr. (02:00)	Last Sun. Oct. (02:00)
48	Adak (Aleutian Is.)	-10	Yes	2 nd Sun. Mar. (02:00)	1 st 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

15 Engineering data

15.1 Standard design of the clock

Technical parameters		ECO-M-DK
Display	height of the digits	75/50
	number of digits	4/date
Time display	HH : MM	✓
Date display	day of week	2 or 3 characters
	month	2 characters
	supported languages	English, German, French, Czech, Slovak, Italian, Russian, Spanish, Portuguese, Polish
Powering	100 – 240 VAC	✓
	PoE / PoEclass (IEEE802.3af)	✓
Max. power consumption [VA]	single sided	7
	double	11
Quarz base	running reserve (time + date)	1 year with lithium battery / 12 hours with supercapacitor
	accuracy	+/- 0.1 s/day without synchronization (after 24h synchronization at constant temp.)
Accuracy of temperature measurement	range -25 to +85 °C	±0,5 °C
	range -50 to +125 °C	±2,0 °C
Operating condition	temperature	-5 to +55 °C
	humidity	0 to 95% (without condensation)
	protection degree	IP 54
Weight in kg	single sided design	0,9
	double sided design	2
Dimensions (W x H x D) mm	single sided design	340 x 340 x 42
	double sided design	340 x 340 x 115

15.2 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

16 Accessories and Maintenance

16.1 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

16.2 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

17 Cleaning

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

18 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.

19 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

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