

INSTRUCTION MANUAL

In- and Outdoor Digital Clock
ECO-M-DSC Series



Certification of the Producer

STANDARDS

The digital clock DSC has been developed and produced in accordance with the EU Standards 2006/95/ES (LVD), 2004/108/ES (EMC), 2011/65/EU (RoHS), 2002/96/EC (WEEE):

Applied Standards:

EN 60950-1/Cor. (2011)

EN 55022 (2010), class B

EN 55024 (2010)

EN 50121-4/Cor. (2008)

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 on 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

Digital clock of contemporary design and slim appearance. General-purpose digital clock, intended particularly to be used outdoors. The clock meets the requirements of the majority of conventional applications. 7segment display of high luminance LED for excellent readability for up to 75 m distance from various angles of view even on direct sunshine. Autonomous TCXO time base, with the possibility of synchronisation using DCF 77, Active DCF or MOBALine; IRIG-B, GPS, NTP (PoE or mains powered) as option. NTP multicast or unicast synchronization in Ethernet network. Mains powered, DC powering on request

1.1 Basic properties

- digit height of 100, 180, 190 mm, which corresponds to readability distance of 40, 70, 75 m;
- digits in red colour;
- manual or automatic adjustment of the luminosity of LED displays;
- front side glass with dark filter and antiglare surface for improved readability;
- single sided design for wall mounting, single and double sided design for ceiling suspension mounting;
- clock housing made of powder coated metal sheets, RAL9005 colour (black) as standard, any other RAL colour on request;
- adjustment of clock parameters using two pushbuttons inside the clock (behind the cover) or through remote controller;
- autonomous TCXO time base, with the possibility of synchronization using DCF 77, Aktive DCF MOBALine; IRIG-B, GPS, NTP (PoE or mains powered) as option;
- NTP multicast or unicast synchronization in Ethernet network
- mains powered, DC powering on request
- IPv4 and IPv6 support
- configuration / monitoring via MOBA-NMS is possible;
- protection degree IP 65

The clock

- display of time values (either 12 or 24 hours time cycle), four digits (HH:MM) or six digits (HH:MM:SS) format
- display of calendar date in four or six digits format, (DD.MM or DD.MM.YY)
- possibility of leading zero suppression when displaying the time and date;
- display of temperature in °C or °F – up to two sensors connectable;
- alternating indication of time, date and temperature, with adjustable period of each of the displayed data;
- possibility of setting up the time zone.
- Temperature compensated RTC backup by means of lithium battery

Stop watch

- 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/GPS receiver
- magnetic GPS antenna
- remote IR controller

On request

- housing colour

2 Installation



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



Connect the cables always in unpowered state – otherwise the risk of electric shock exist.

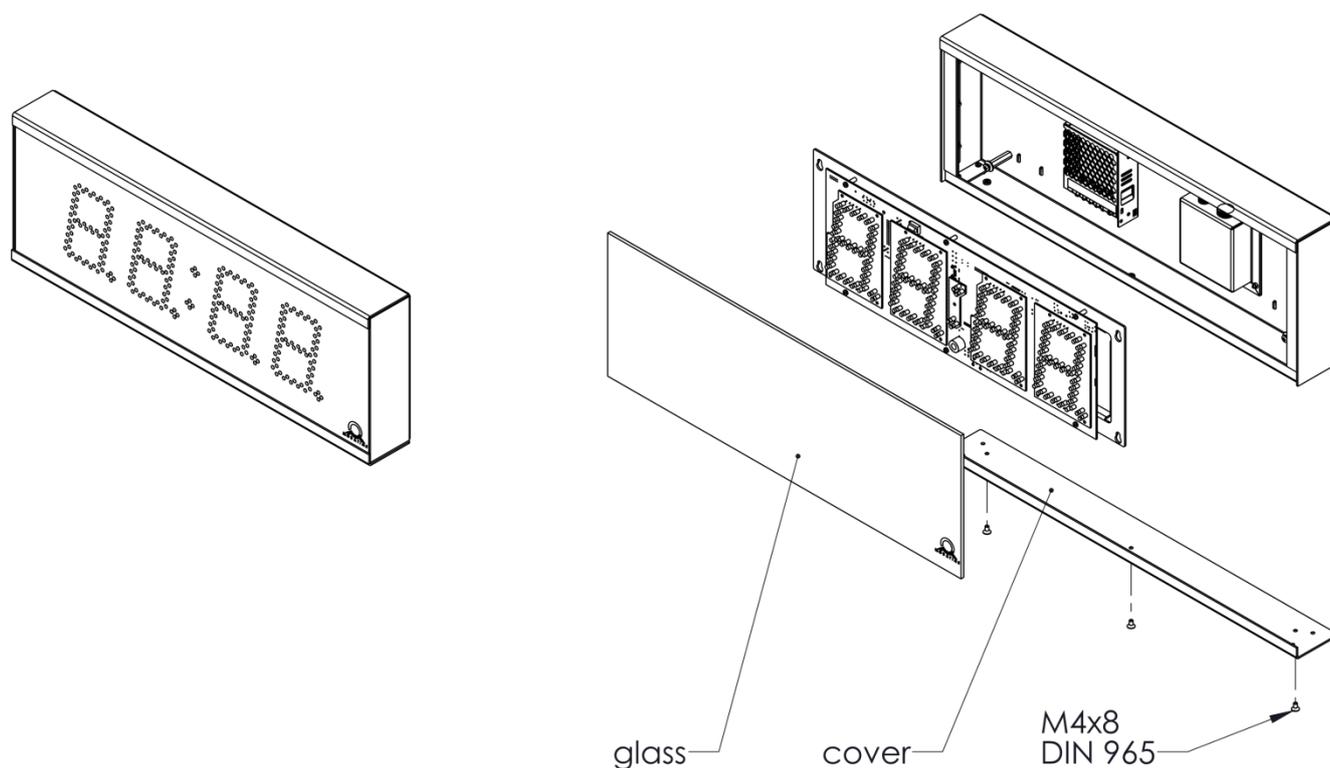


Producer is not responsible for breakdowns caused by unsuitable clock mounting on the bearing surface.

2.1 Single-sided clock

- Prepare 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 front glass.
- Loosen the screws and remove the chassis with electronics; on ECO-M-DSC.100 disconnect DC power cable from clock electronics PCB (except PoE/PoE+); on ECO-M-DSC.180 and higher disconnect DC power cable and flat data cable from most left digit
- Remove the small cover, which includes gap with sealings for passage of cables into the clock.
- Put the cable(s) through the opening and hang the clock on the prepared screws in the wall.
- Tight the securing screws which prevent unauthorized demounting of the clock.
- Cut all cables to appropriate length and fix them with the holder in correct positions in order to maintain regular spacing between the cables in the area of passing through sealing; use appropriate force to not to damage the cables insulation.
- Mount back the small cover and tight it's screws with appropriate force.
- Connect the power cable to appropriate power supply terminals (except PoE/PoE+ variant).
- Configure the Line type jumper according to used synchronisation signal (applies only for DCF, MOBALine, polarized impulse line or IRIG-B).
- Connect the synchronisation / temperature / GPS cable to corresponding terminals on the clock electronics PCB and/or crimp the RJ45 jack to the Ethernet cable respectively.
- On ECO-M-DSC.100 connect the DC power cable back to electronics PCB (except PoE/PoE+); on ECO-M-DSC.180 and higher connect DC power cable and flat data cable back to most left digit; mount back the chassis with electronics, tight the fixing screws.
- Mount back the front glass and bottom cover.

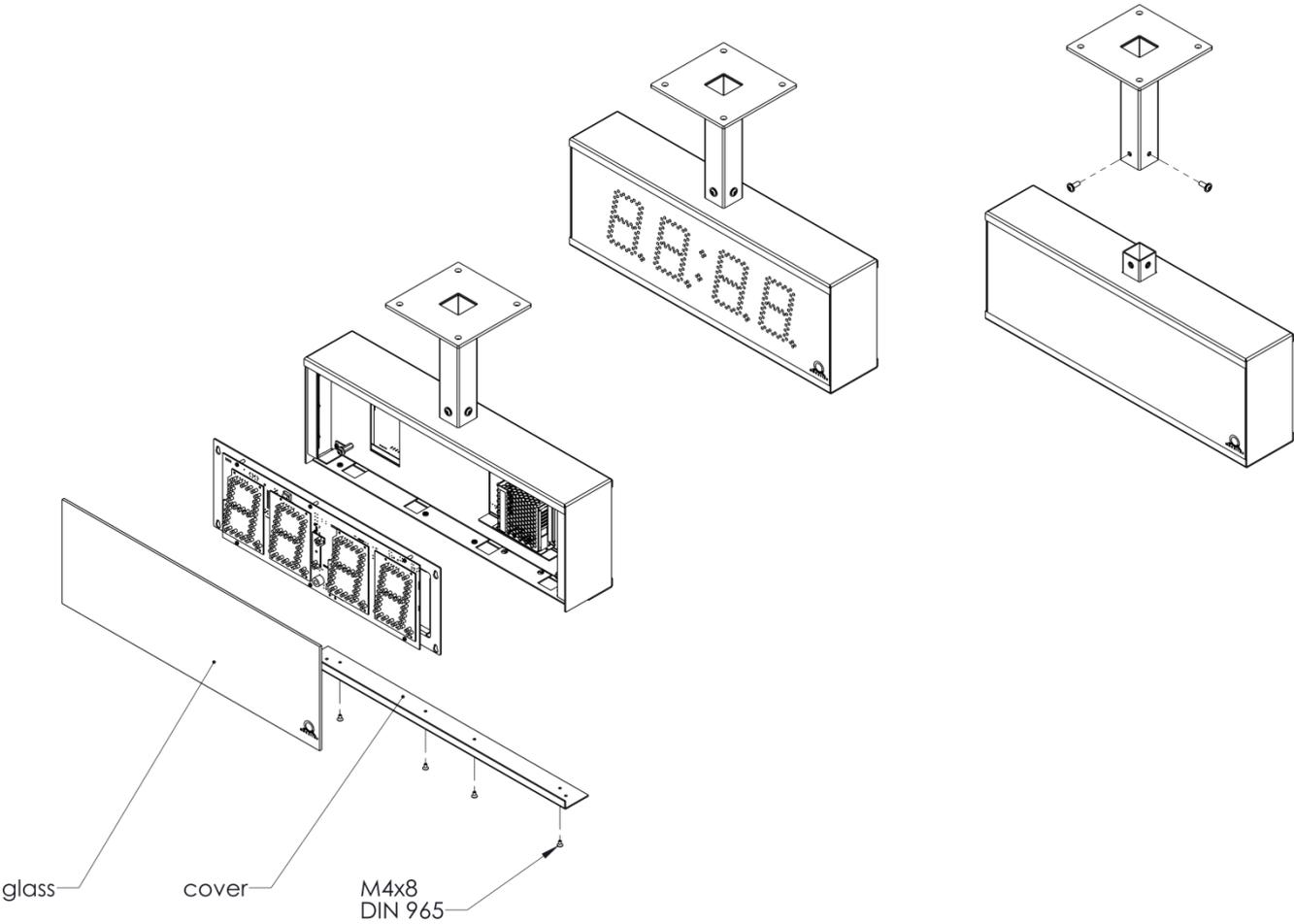
2.2 Assembly diagram



2.3 Double-sided

- Prepare 4 holes for each suspension in appropriate pitch on the ceiling and insert the dowels.
- Put the cables through one of the suspension tube and mount the suspension to the ceiling.
- Remove the screws on the bottom of the clock, on the cover with triangle sign, which identifies the side with access to clock electronics. Remove the cover and front glass.
- Loosen the screws and remove the chassis with electronics; on ECO-M-DSC.100 disconnect DC power cable and flat data cable for second side from clock electronics PCB (except PoE/PoE+); on ECO-M-DSC.180 and higher disconnect DC power cable and flat data cable from most left digit.
- Put the cable(s) through the opening on top side and hang the clock on the prepared ceiling suspension.
- Cut all cables to appropriate length.
- Connect the power cable to appropriate power supply terminals (except PoE/PoE+ variant).
- Configure the Line type jumper according to used synchronisation signal (applies only for DCF, MOBALine, polarized impulse line or IRIG-B).
- Connect the synchronisation / temperature / GPS cable to corresponding terminals on the clock electronics PCB and/or crimp the RJ45 jack to the Ethernet cable respectively.
- On ECO-M-DSC.100 connect the DC power cable and flat data cable for second side back to electronics PCB (except PoE/PoE+); on ECO-M-DSC.180 and higher connect DC power cable and flat data cable back to most left digit; mount back the chassis with electronics, tight the fixing screws.
- Mount back the front glass and bottom cover.

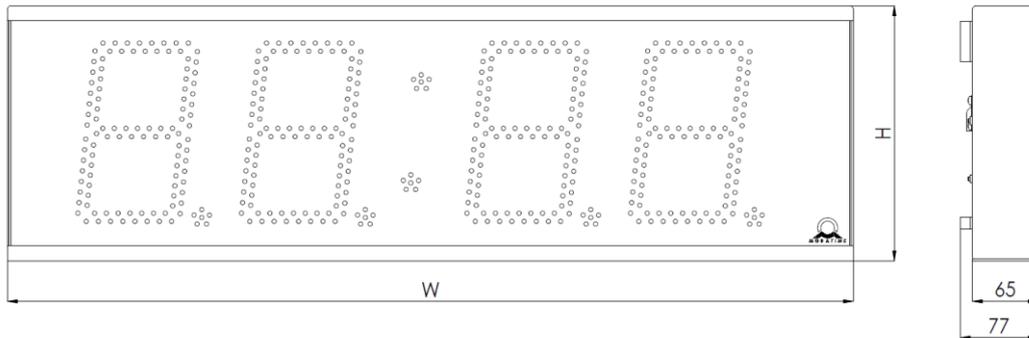
2.4 Assembly diagram



2.5 Mechanical dimensions

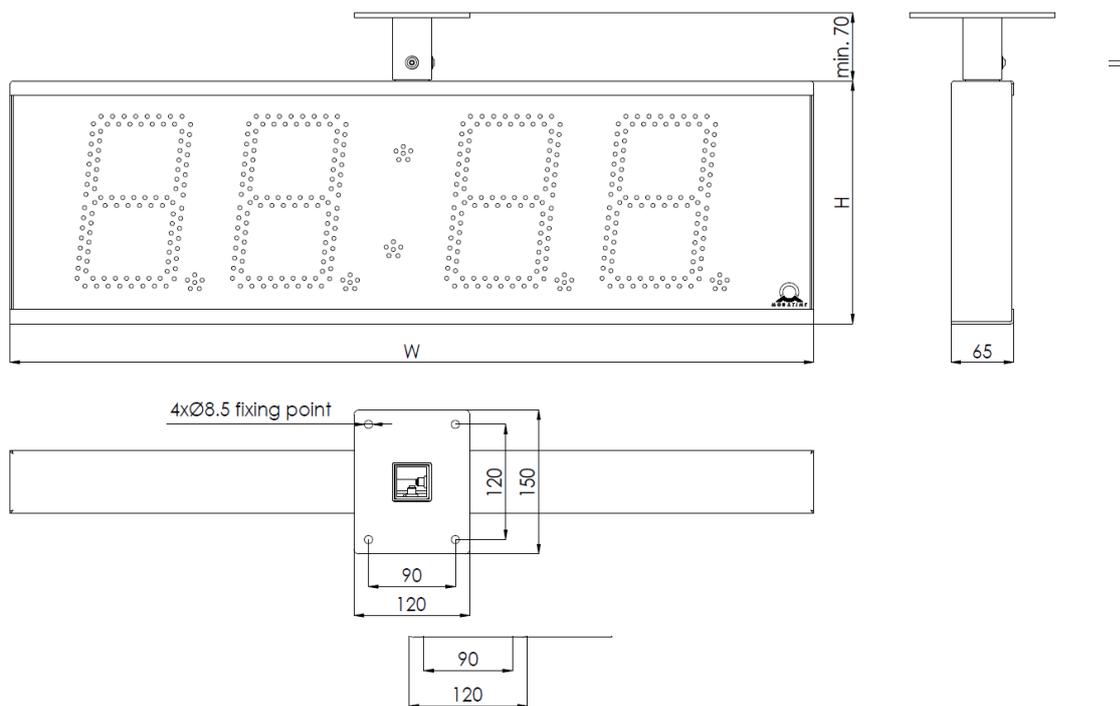
2.5.1 Single-sided clock with wall mounting

ECO-M-DSC.x.4.N.N



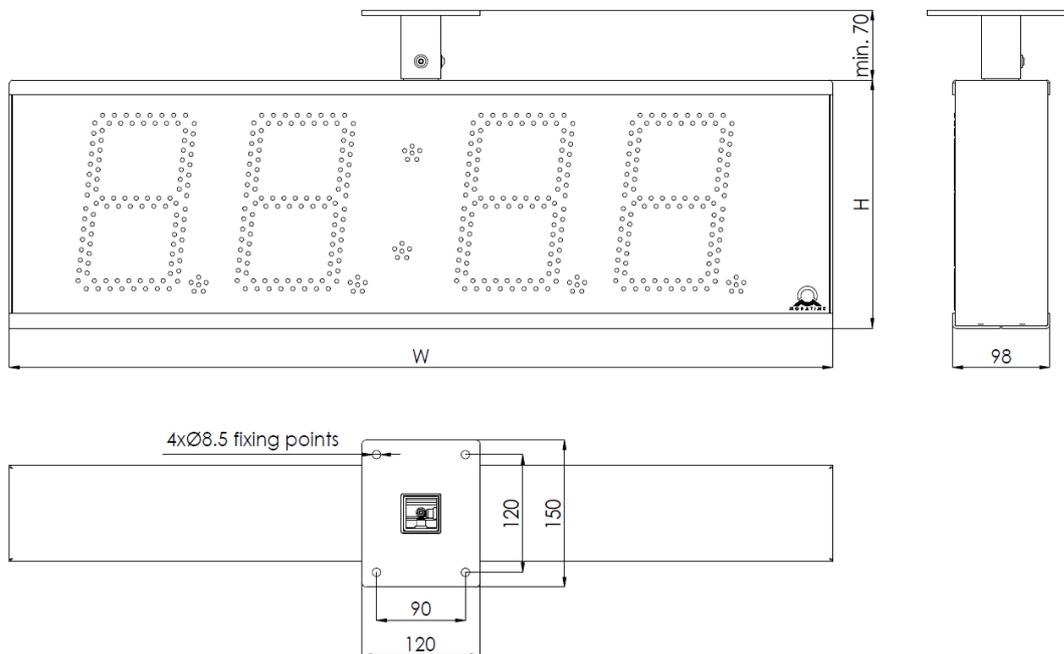
2.5.2 Single-sided clock with ceiling suspension mounting

ECO-M-DSC.x.4.N.S



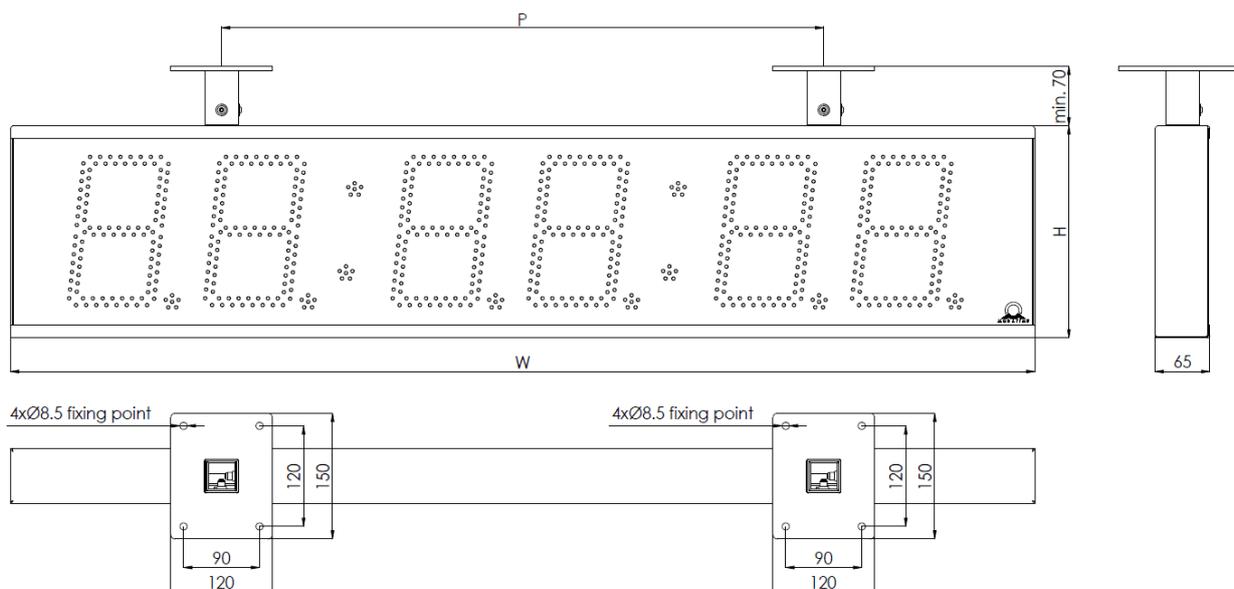
2.5.3 Double-sided clock with ceiling suspension mounting – 4 digits

ECO-M-DSC.x.4.D.S



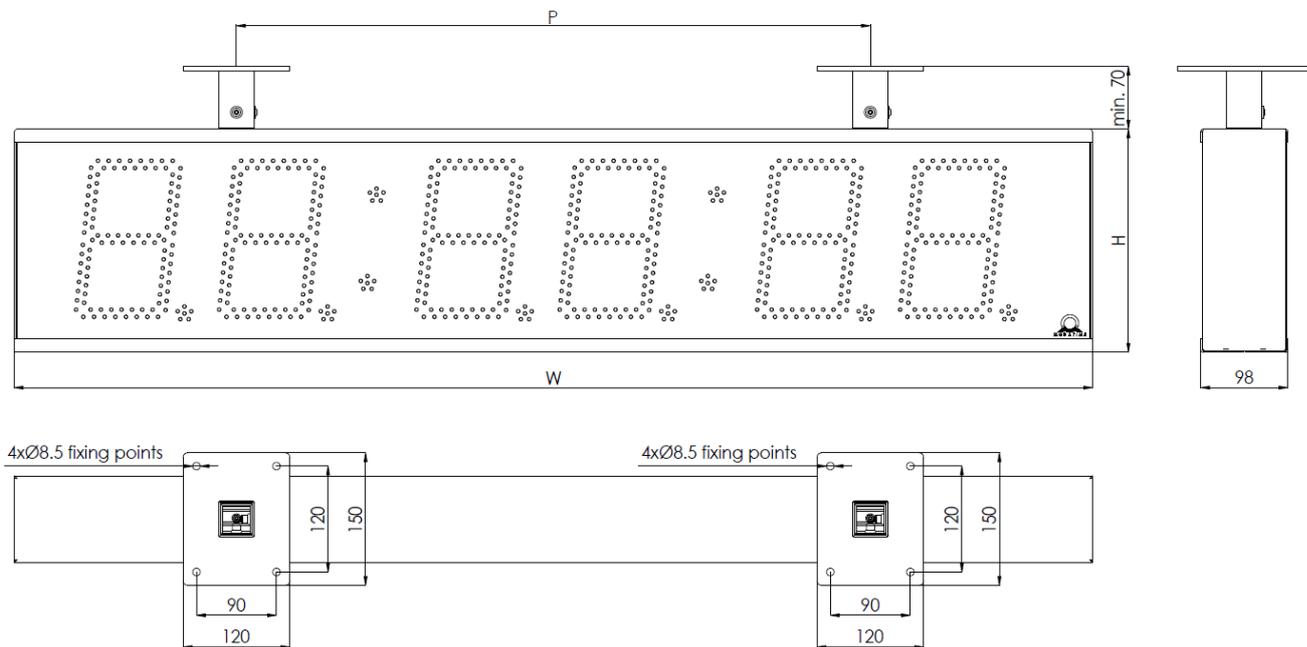
2.5.4 Single-sided clock with ceiling suspension mounting – 6 digits

ECO-M-DSC.x.6.N.S

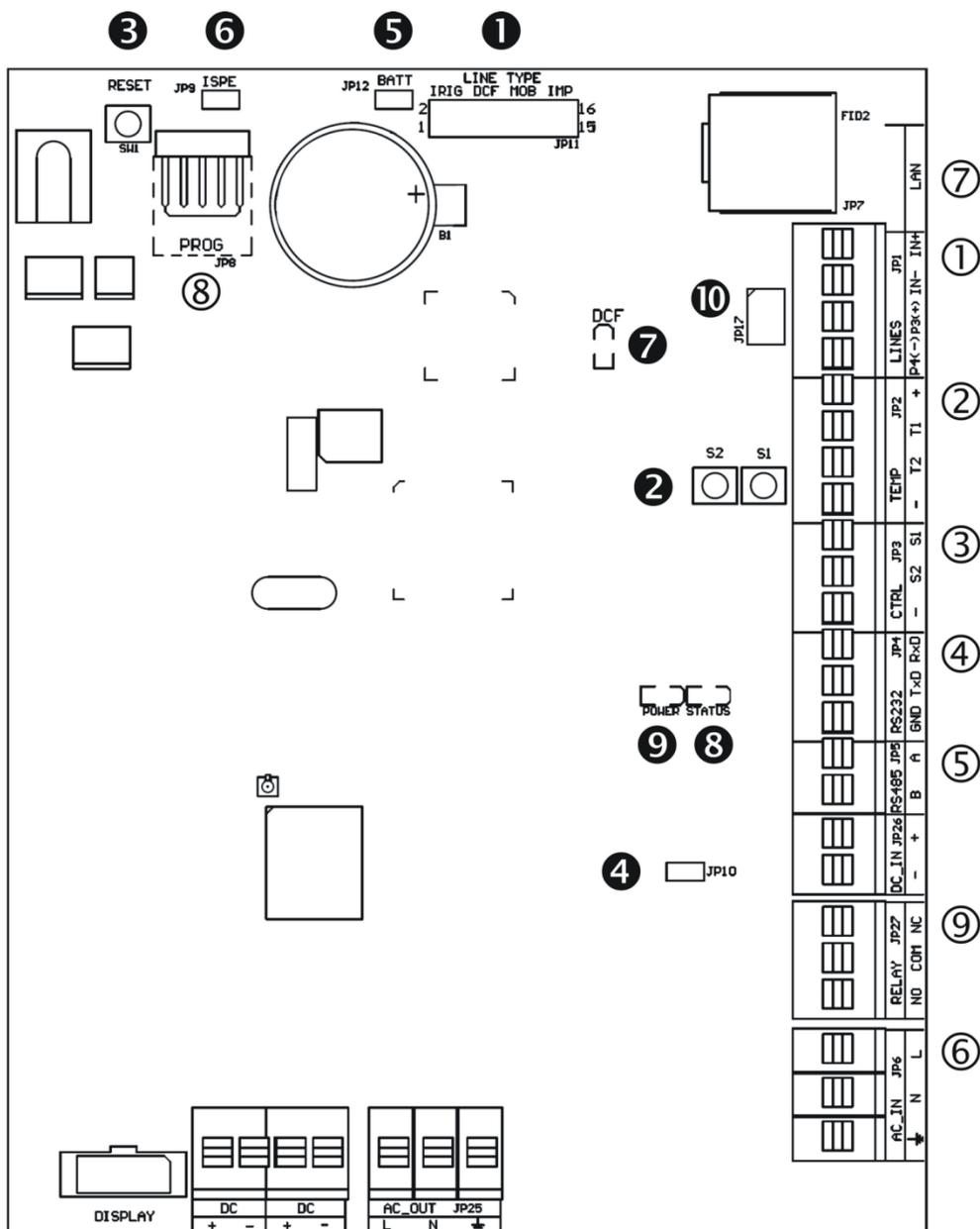


2.5.5 Double-sided clock with ceiling suspension mounting

ECO-M-DSC.x.6.D.S



2.6 Connectors and control elements



- | | |
|-------------------------------|-------------------------------------|
| ① LINES, DC/DCF OUT – JP1 | ① Line type jumper – JP11 |
| ② TEMP – JP2 | ② PB1, PB2 buttons |
| ③ CTRL – JP3 | ③ RESET button |
| ④ RS232 – JP4 (not available) | ④ TRE jumper – JP10 (not available) |
| ⑤ RS485 – JP5 (not available) | ⑤ BATT jumper – JP12 |
| ⑥ 100 – 240VAC – JP6 | ⑥ jumper ISPE – JP9 |
| ⑦ LAN - JP7 (version NTP) | ⑦ LED indication of DCF signal |
| ⑧ PROG – JP8 | ⑧ state LED |
| ⑨ RELAY – JP27 (optional) | ⑨ LED indication of powering |
| | ⑩ jumper DC Out / DCF Out – JP17 |

Note: The placement of particular connectors and control elements is different for the ECO-M-DSC.100 clocks.

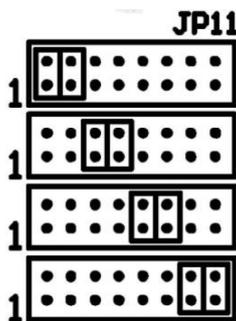
2.7 Function of the plug connectors

- ① **LINES, DC/DCF OUT** – JP1
- ② **TEMP** – JP2
- ③ **CTRL** – JP3
- ⑥ **100 – 240VAC** – JP6
- ⑦ **LAN** - JP7 (optional)
- ⑧ **PROG** – JP8
- ⑨ **RELAY** – JP27(optional)

time signal inputs: The DCF/GPS receiver, polarized impulse line, MOBALine, IRIG-B, power supply output: DC OUT 12–40 VDC or passive DCF current loop output
 connection of the temperature sensor(s)
 connection of the keyboard
 powering 100 - 240 VAC voltage
 RJ45 10BaseT/100TX (IEEE 802.3)
 auto negotiation
 clock firmware programming
 switching contact connection

2.8 Setting elements

- ① **Line type jumper** – JP11 for the setting of the slave line type



IRIG / AFNOR

DCF

MOBALine

(Un)polarized impulse line

Active DCF code

- ② **PB1, PB2**
- ③ **RESET**
- ⑤ **BATT jumper** – JP12
- ⑥ **ISPE jumper** – JP9
- ⑦ **DCF LED**
- ⑧ **STATE LED**
- ⑨ **POWER LED**
- ⑩ **jumper DC Out / DCF Out** – JP17

control pushbuttons
 the RESET button
 backup battery connection
 invoking the firmware programming mode
 indication of receiving the DCF signal
 state indication
 power indication
 output signal setting on pins 3, 4 of the JP1 connector



DC Out

pin3 = DC Out + (12-40V)
 pin4 = DC Out -

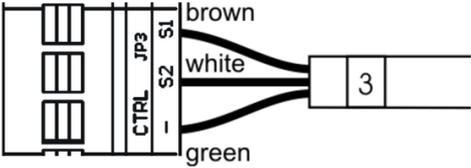
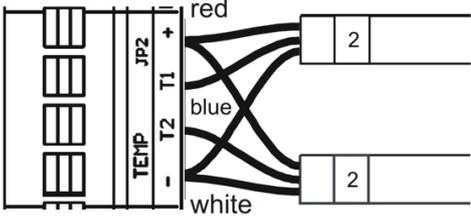
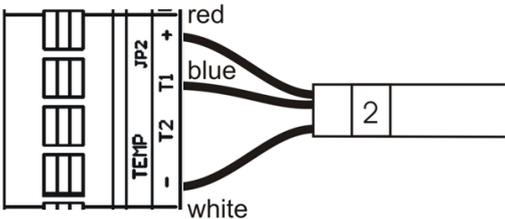


passive DCF Out

pin3 = (+)
 pin4 = (-)

2.9 Connection of the cable ends

TEMP wire connection – 1 or 2 thermometers



CTRL wire connection

3 Control of the clock using keyboard or pushbuttons

The clock is adjusted and controlled using two pushbuttons located on the control PCB. If you use a keyboard for setting the stopwatch, then 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.

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 value **U**, then by pushing the **PB1L** enter the submenu. 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:



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:



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:



Enter the time constant to display temperature of 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 workmode selection) in the clock menu, then enter the submenu by pushing the **PB1L** pushbutton for configuring the network services (Multicast support in unicast workmode, 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 workmode 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**.

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:



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 are the entered values 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	visualisation of time
DATE	visualisation of date
TEMP	visualisation of temperature
TIMER	visualisation 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.

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 by pushing the **SET** enter the submenu. The item to be set is blinking.

The display shows the following:



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

Push **SET**,

The display shows the following:



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.



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

By pushing **OK** are the entered values stored and the clock returns to the menu item **P2**.

By pushing **ESC** return to **P2** item without storing.

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 workmode selection) in the clock menu, then enter the submenu by pushing the **SET** for configuring the network services (Multicast support in unicast workmode, 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 workmode 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

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)
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, temperature 3 sec.
		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, MOBALine, IRIG-B, NTP or GPS
		1* autonomous operation without synchronization
		2* synchronization by DCF signal
		3* the MOBATIME serial code (not used)
		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 (not used)
		10* RS485 (not used)
		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 Timezone-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 RS232 and RS485 communication (not used)	1 - IF482	
		2 - Supervised RS485	
		3 - DC master	
		4 - DC slave	
		5 - TP RS485 master	
		6 - TP RS485 listener	
		7 - DC2 slave	
		8 - TPHB RS485 master	
		9 - TPHB RS485 listener	
		10 - ITRON2000	
		11 -TPHP RS485 master	
		12 -TPHP RS485 listener	
		13 -NMEA 0183	
P14	Modulation speed for RS232 and RS485 (not used)	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 (not used)	Number of data bits	8
P 16		Number of stop bits	7
			1
P 17		Parity	2
			n no parity
			o odd
P 18	Special operation 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 mode	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*	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 (not used)	1	user-defined wireless network
		2	default wireless network: MOBA-WIFI
		3	AP mode
SW version		r._._(e.g.: r6.17)	

- * 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

5.1 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 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 (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	visualisation of time
DATE	visualisation of date
TEMP	visualisation of temperature
TIMER	visualisation 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 optional switching contact can be used, 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 (JP27) 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 moment set in advance, with stop at zero	
		3	downwards from a time moment set in advance until zero, with automatic restart from a specified time moment	
		4	downwards from a set time moment, 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 (TL3K)	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).
		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).
		3	Counting in 1 minute steps
		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.	

<i>The stopwatch count range</i>	Counting direction			
	Upwards	Downwards		
<i>Counting unit Format</i>	S0: 1 Max.	S0: 2;3 Min.	S0: 4 Min.	S0: 2;3;4 Max.
<i>1/100 second MM:SS.HS</i>	59:59.99	00:00.00	-9:59.99	59:59.99
<i>1 second HH:MM:SS</i>	99:59:59	00:00:00	-9:59:59	99:59:59
<i>1 minute HH:MM</i>	99:59	00:00	-9:59	99:59
<i>1 day DDDD</i>	9999	0000	0000	9999

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 – 12, A	Synchronization signal type
P6	0	Neither MOBALine time zone nor Timezone-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 Timezone-server MOBATIME

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

This setting is suitable for NTP digital clocks controlled by MOBATIME NTP servers which support the Timezone-server functionality.

9.4 Calculation using timezone entries preconfigured by MOBA-NMS software

P3	A	NTP protocol uses UTC time zone
P4	A	automatic
P6	0	No timezone server is used
P7	U1-U7	Display time and date according to chosen preconfigured timezone entry, incl. daylight saving time

This setting is suitable for NTP digital clocks, where several user defined timezone entries should be used. The timezone 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 – 12, A	Autonomous operation or any type of the synchronizing signal
P6	0	Neither MOBALine time zone nor Timezone-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 when the displayed time in another time zone than the one provided by the synchronization source is needed. 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 2.7.) if the source of synchronization is DCF signal, 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, MOBALine, IRIG-B.

The permanently lit colon during the time display signalizes the clock is synchronized by the synchronisation source.

10.1 Autonomous clock synchronized by DCF 77 receiver

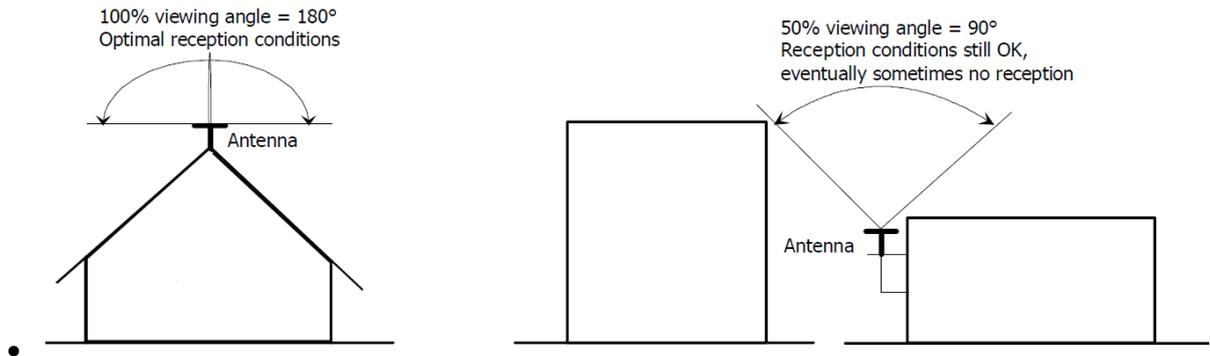
- Set value **A** in items **P3**, **P4** and **P7** in the main MENU (chapter 5).
- Connect the DCF 77 receiver to the LINES connector (IN+, IN- terminals) using a twin-wire cable.
- The maximum wire length depends on its diameter (app.100 - 300 m).
- In case the connection is correct and the input 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.
- In case the polarity is incorrect, the LED does not flash. In such a case, interchange the two wires.
- Install the receiver at a place with 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 synchronisation 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 GPS4500 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 LINES connector (IN+, IN- terminals for the signal and P3+, P4- terminals for antenna powering) 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 synchronisation takes place in approx.10 to 20 minutes.

10.3 Autonomous clock synchronized by internal GPS receiver

- Set value **A** in items **P3** and **P4** and the desired time-zone in the **P7** item in the main MENU (chapter 5).
- Connect the GPS antenna cable to dedicated SMA connector.
- Place the GPS antenna according to following recommendation



- Presuming the good position of the GPS antenna the synchronisation takes place in approx. 6 to 8 minutes.
- Reception of the GPS data is indicated by blinking GPS LED on the PCB.

10.4 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**.

10.4.1 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.

10.4.2 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.

10.5 Slave clock controlled by MOBALine, Active DCF code 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.
- In case of Active DCF code set the menu item **P4** to value **12**, otherwise use the value **A**.
- The time setting with using Active DCF code takes place within at least 3 to 4 minutes, for MOBALine and IRIG-B within 6 to 15 seconds.

10.6 Cascaded connection of the DCF/GPS synchronised clock

- Connect the DCF 77 receiver to the LINES connector (IN+, 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 LINES connector (P3+, P4- terminals) to the LINES connector (IN+, 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.

11 NTP 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 IP addresses 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-Adresse	0.0.0.0
IPv4 Subnetzmaske	0.0.0.0
IPv4 Default-Gateway	0.0.0.0
NTP-Serveradresse 1	0.0.0.0 / 0:0:0:0:0:0:0:0
NTP-Serveradresse 2	0.0.0.0 / 0:0:0:0:0:0:0:0
NTP-Serveradresse 3	0.0.0.0 / 0:0:0:0:0:0:0:0
NTP-Serveradresse 4	0.0.0.0 / 0:0:0:0:0:0:0:0
NTP-Anfragenzeit [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-Konfigurationsadresse	239.192.54.0

Alive-Benachrichtigungsintervall [min]	30
Nummer Konfigurations-Port	65532
Nummer Zeitzone-Client-Port	65534
DHCPv4	enabled
SNMP	enabled
Multicast-Unterstützung	enabled
Telnet	enabled
IPv6 fix address / prefix	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

The menu item **P19** must be set to value **3** (default). Network parameters are automatically obtained from a DHCP 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 DSC clock supports SNMP version 2c notifications and parameter reading and setting by means of SNMP GET and SET commands. This allows to integrate the clock to a network management system. The DSC clock (SNMP agent) can send alarm notifications 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 TE-800728 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	romobatetime
read / write community	rwmobatetime
notification (trap) community	trapmobatetime

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 Synchronisation test

The synchronisation 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 synchronisation test mode:

Two digits on the left side show the current DCF bit number (goes up from 0 to 58). Third digit show 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 synchronised clock.

Entering the synchronisation test mode:

- Enter the clock menu, move to the software version item by several pushes of the PB1S on the control PCB or >> on IR.
- Keep pushing both buttons on control PCB simultaneously or button DISP on IR 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 PCB buttons or the DISP button on IR, until the display shows synchronisation information

12.2 Parameter reset

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

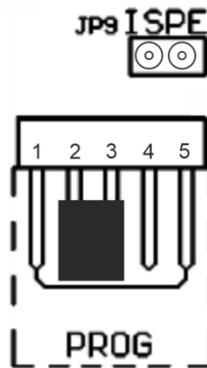
Activating the parameter reset:

- Enter the clock menu, move to the software version item by several pushes of the PB1S on the control PCB or >> on IR.
- Keep pushing both buttons on control PCB simultaneously or button DISP on IR 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 clock PCB buttons or the DISP button on IR, until the display shows FAC1 and clock makes reset

13 Update firmware

13.1 Update firmware through TTL UART by protocol YMODEM 1K

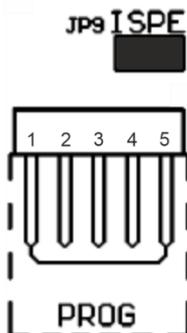
- Connect the jumper to pins 2 and 3 (TxD and RxD) of the PROG connector (JP8) and turn the clock on or reset by pressing the RESET button. Remove the jumper from the PROG connector



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.

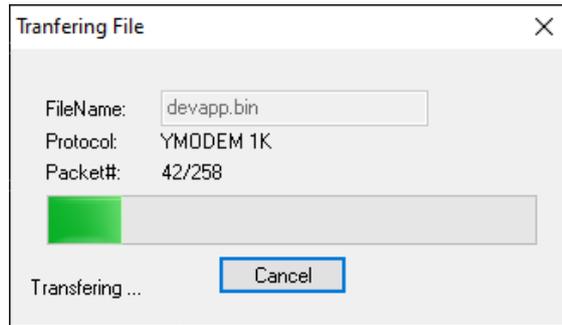


```
COM10 - PuTTY
Session SpecialCommand Window Logging Files Transfer Hangup ?

>>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
CCCCCCCCCCC

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 Update firmware over Ethernet at NTP version

- Create a folder on the computer disk and copy "tftpd32.ini", "tftpd32.chm" and "tftpd32.exe" in it. Copy the file of new firmware "devapp.bin" as well.
- Run "tftpd32.exe" let only TFTP Server in the window Settings -> Global Settings set, don't change other settings.
- By 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 <ip clock 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 for start the automatic update clock firmware from the "devapp.bin" file.
- Information about sending file and its progress displays in the tftpd32 programme window after the command entering. Connection to telnet is ended automatically.
- Wait about 1 minute after end of sending. Connect the telnet to 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

Time zone entries in the standard season 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

Specifications		ECO-M-DSC.100.4	ECO-M-DSC.100x.6	ECO-M-DSC.180.4	ECO-M-DSC.180x.6	ECO-M-DSC.190.4	ECO-M-DSC.190x.6
Display	digit height [mm]	100	100	180	180	190	190
	number of digits	4	6	4	6	4	6
Time display format	HH : MM	✓		✓		✓	
	HH : MM : SS		✓		✓		✓
Date display format	DD. MM.	✓		✓		✓	
	DD. MM. YY		✓		✓		✓
Reading distance up to [m]		40		70		75	
Powering	100-240V~, 50-60 Hz	✓					
	VDC (on request) 18-56 VDC (18-40 VAC)	✓					
	PoE (IEEE 802.3af) single sided	✓	-	-	-	-	-
	PoE+ (IEEE 802.3at) single sided	-	✓	✓	-	-	-
	PoE+ (IEEE 802.3at) double sided	✓	-	-	-	-	-
Power consumption [VA]	single-sided	15	22	23	33	23	33
	double-sided	29	42	44	66	44	66
Timekeeping in ambient temperature -25 ÷ +60 °C	running reserve	2 years					
	accuracy	± 0.1 s / day without synchronization (after 24 hours of synchronization at constant temperature)					
Environment	temperature	-25 ÷ +60 °C					
	humidity	0 - 95% (without condensation)					
	protection degree	IP 65					
Weight [kg]	single-sided N.N and NS version	4,3	4,9	6,4	8,9	6,4	8,9
	double-sided D.S version	6,9	7,6	9,7	13,5	9,7	13,5
Dimensions [mm] (W x H x D)	single-sided N.N / NS version	533 193 77/65	753 193 77/65	833 253 77/65	1213 253 77/65	833 253 77/65	1213 253 77/65
	double-sided D.S version	533 193 98	753 193 98	833 253 98	1213 253 98	833 253 98	1213 253 98

Notes:

- Dimensions and weights of clock versions N.S and D.S are without ceiling suspension part.
- Standard ceiling suspension lengths (70, 100, 150, 300 or 500 mm) or custom length on request.
- Accessories for all models can be chosen from the table "Order reference".

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 μ A
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 μ A – 2 mA

16 Accessories

16.1 Single sided clock

- Instruction manual 1 pc
- Wood screws inclusive dowels 4 (6) pcs

16.2 Double sided clock

- Instruction manual 1 pc
- Wood screws inclusive dowels 4 (8) pcs

16.3 Optional accessories

- AD 450 radiosignal receiver
- GPS 4500 receiver
- magnetic GPS antenna for internal GPS receiver with cable 5m

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 labelled 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 fulfil 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 manufacturer.

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