

INSTRUCTION MANUAL

Economy LED digital clock

ECO DC series



Certification of the Producer

STANDARDS

Electrical safety: EN 62368-1 EMC: EN 55032, EN 55024, EN 50121 - 4
Applied EU Directives CE:
2006/95 / EC (LVD), 2004/108 / EC (EMC),
2011/65 / EC (RoHS), 2002/96 / EC (WEEE)



References to the instruction manual

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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

The Economy series covers low cost elegant and very slim digital clocks in 7 segment LED technique for displaying time and date • The Economy series can be operated in 3 freely selectable modes • Autonomous operation with internal quartz powered from mains • NTP multicast or unicast synchronization Ethernet or WiFi network powered over PoE (compatible IEEE 802.3af) or mains powered • Slave clock operation controlled by self-setting MOBALine code, or optionally by DCF 77 code or by IRIG-B, mains powered • LED display in red, green, pure green, blue, yellow or white colour • Single- or double-sided clock • Plastic case in black color • Wall mounting for single sided clock • Ceiling suspension or wall bracket mounting for double sided clock • Intended for indoor use

Display features

- Time display in four digits (HH:MM) or six digits (HH:MM^{SS} or HH:MM:SS) format, either 12 or 24 hours format
- AM/PM indication for 12-hour time format according to HW version
- Date display in four digits (DD.MM.) or six digits (DD.MM.^{YY} or DD.MM.YY) format
- 7 segment LED with 57 or 100 mm digit height for a viewing distance up to 25 or 40 m
- Alternating display of time and date with adjustable time period
- Display available in the red, green, pure green, blue, yellow or white
- Sensor controlled automatic or manual adjustment of the display brightness

Mechanic

- Anti-reflection front cover made of plexiglass including a filter layer for best readability over a wide viewing angle
- Elegant and slim clock frame, made of plastic in black color
- 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 suspender
- Easy installation and time-saving maintenance, hanging holes for wall mounting,
- Supporting element for distance from wall (can be removed to tilt the clock down)
- All connectors and state LED are accessible on the back side in the recess
- Push-buttons are accessible on the back side in the recess
- Protection degree IP 30
- Equipment protection class II (no PE connection, plastic case)
- Working temperature -5 to +55°C

Synchronization

- Autonomous operation with internal quartz time base with programmable, automatic seasonal time change
- NTP multicast or unicast synchronization in Ethernet or unicast synchronization in WiFi network powered over PoE or mains powered
- Slave clock operation with synchronization by self-setting MOBALine code, or optionally by DCF 77 code or by IRIG-B, mains powered
- Precision 0.3 s/day at constant temperature – software trimming
- RTC backup with supercapacitor

Configuration

- Setting of the clock parameters and time – date setting by means of push buttons

For PoE and NTP version only:

- IPv4 and IPv6 support
- DHCPv4, DHCPv6 / manual configuration of the clock parameters or setting over the telnet
- Private options of DHCPv4 and DHCPv6 string to easy configuration of clock parameters when connected to LAN

For PoE, NTP and WiFi version only:

- Configuration / supervision by means of MOBA-NMS software or SNMP protocol
- Firmware update remotely through the network using the TFTP protocol
- Powered from mains with wide input voltage range 100-240 VAC, optionally from 24 VDC or through PoE (except WiFi)

2 Assembly



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



The connection to the 110/230 VAC power network must be done in accord with the requirements of the connection of the class II equipment.



Danger of electric shock after dismantling the back cover.



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

- Drill two anchoring holes into the wall, of a diameter adequate to accommodate supplied wood-type screws with dowels. See the assembly diagram (chapter 2.3) for appropriate hole spacing.
- Mount the hanging screws with the dowels to drilled holes in a way that the heads of the screws are ca 3-5mm from the wall.
- Shorten all the incoming cables appropriately.
- Mount the wide 2-pin connector to the incoming powering cable.
- Mount the 2-pin connector to the synchronization signal cable or crimp the RJ45 modular connector to the incoming Ethernet cable.
- Connect all the interconnecting cables into the corresponding connectors in the clock's back side recess.
- Hang the clock to the hanging screws.
- If the clock has to be tilted down, cut the supporting element on the bottom of the back side accordingly.

2.2 Double-sided clock

- The double-sided clock consists of two parts, one serving as the control module (this one encompasses the terminals to connect powering voltage and synchronization source), and the other serving as the display module (with the terminal for the connection of interconnecting cable). Both clock parts are interconnected via a 10-core flat cable. The clock suspension part is delivered separately.
- Drill four anchoring holes into the ceiling (or wall), of a diameter adequate to accommodate supplied wood-type screws with dowels.
- Interlace the incoming cables through the suspension pipe. Fasten the ceiling suspension (or the side console) to the ceiling (or the wall), using 4 wood screws of 5 mm dia.
- Interlace the incoming cables through the pipe insert on the anchoring plate Slip-on the plate onto the suspension in a way that the screws fit into the upper groove on the pipe insert. Fix the connection by tightening the screw using an Allen key.
- Hang the display part of the clock to one side of the anchoring plate.
- Shorten all the incoming cables appropriately.
- Mount the wide 2-pin connector to the incoming powering cable.
- Mount the 2-pin connector to the synchronization signal cable or crimp the RJ45 modular connector to the incoming Ethernet cable.
- Connect all the interconnecting cables into the corresponding connectors in the clock's back side recess.
- Hang the clock to the hanging screws.
- If the clock has to be tilted down, cut the supporting element on the bottom of the back side accordingly.

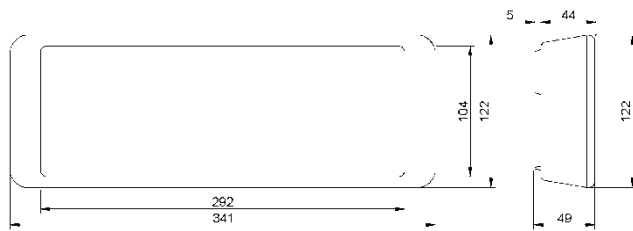
- Loosen the screws on the suspension using the Allen key, and lift the clock into the suspension in a way that the screws fit into the lower groove on the pipe insert. Secure the attachment by tightening the screw using the Allen key.

Note: during the disassembly first withdraw the clock and suspend the suspension on the upper groove at the pipe insert.

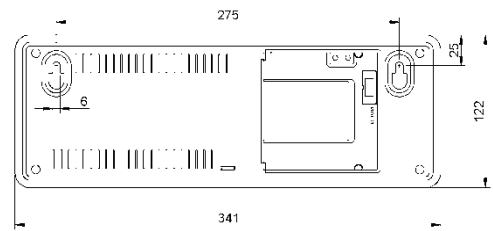
2.3 Assembly diagram

2.3.1 ECO-DC.57

Single sided clock

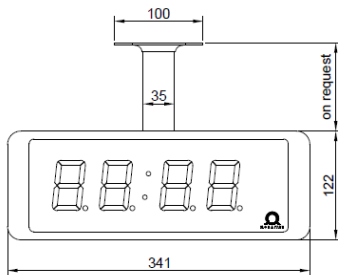


back side's recess

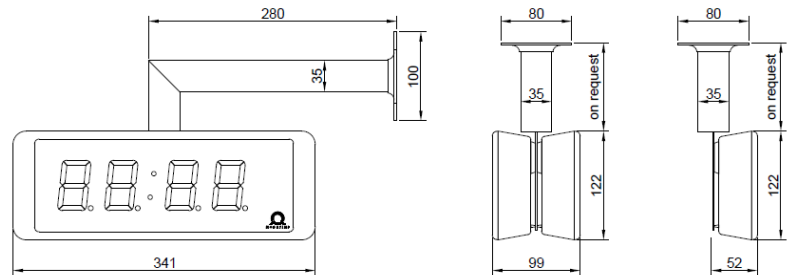


Double sided clock

ceiling suspension mounting

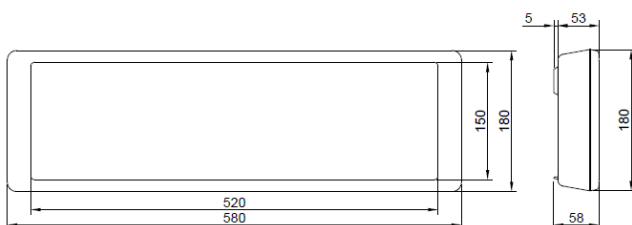


wall bracket mounting

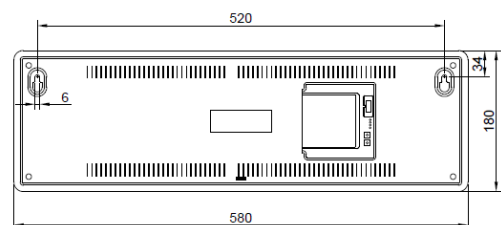


2.3.2 ECO-DC.100

Single sided clock



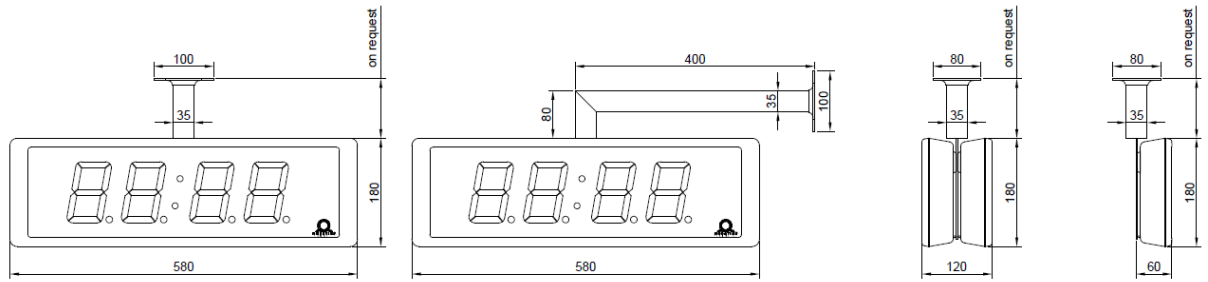
back side's recess



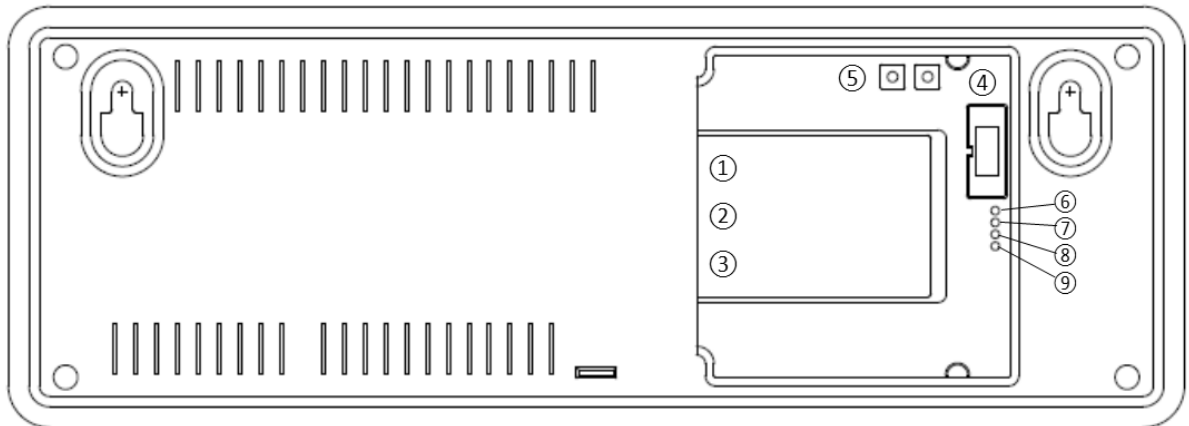
Double sided clock

ceiling suspension mounting

wall bracket mounting



2.4 Control elements



- ① **Ethernet** connector (PoE, NTP only)
- ② **Line-IN** connector (MBL, MBLDCF, IRIG only)
- ③ **Power supply** connector (not in PoE)
- ④ **DISP2** connector
- ⑤ **PB1, PB2**
- ⑥ **LINK LED** (PoE, NTP only)
- ⑦ **ACTIVITY LED** (PoE, NTP only)
- ⑧ **STATE LED**
- ⑨ **POWER LED**

RJ45 10BaseT/100TX (IEEE 802.3) auto-negotiation
PoE version compatible with IEEE 802.3af

time signal input: MOBALine, DCF 77 or IRIG-B

powering 100 - 240 VAC voltage connection of the second side (for double sided clock)

control pushbuttons

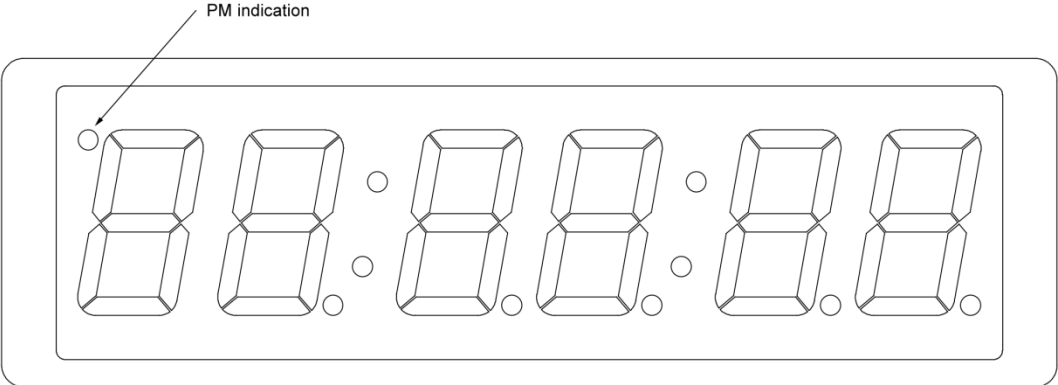
Ethernet link connected

Ethernet connection activity

state indication

indication of power applied

AM /PM indication



3 MBL, MBLDCF and IRIG clock type operation

3.1 MBL type

- Connect the MOBALine signal to the two-pin input signal connector and the mains voltage to the two-pin power connector
- Set the menu items according to following **P3:A, P4:A, P6:A**
- After the connection, the time and date are adjusted automatically following the receipt of valid time information. The synchronization takes 6-15 seconds.
- It is possible to use the MOBALine time zone function, the zone is selected by menu item P5.

The colon permanently lit during the time display signalizes the synchronized clock. See the chapter 8 for further description of parameter setting.

3.2 MBLDCF type

- Connect the MOBALine or Active DCF 77 signal to the two-pin input signal connector and the mains voltage to the two-pin power connector
- Set the menu items according to following **P3:A, P4:A, P6:A**
- After the connection, the time and date are adjusted automatically following the receipt of valid time information. The synchronization takes 6-15 seconds for MOBALine or 3-5 minutes for Active DCF 77.
- For MOBALine it is possible to use the time zone function, the zone is selected by menu item P5.

The colon permanently lit during the time display signalizes the synchronized clock. See the chapter 8 for further description of parameter setting.

3.3 IRIG type

- Connect the IRIG signal to the two-pin input signal connector and the mains voltage to the two-pin power connector
- DCF-FSK, IRIG-B Standard, IRIG-B 123, IRIG-B DIEM, AFNOR A, AFNOR C variants of time signal are supported
- Set the menu items according to following **P3:A, P4:A, P6:A**
- After the connection, the time and date are adjusted automatically following the receipt of valid time information. The synchronization takes 6-15 seconds.

The colon permanently lit during the time display signalizes the synchronized clock. See the chapter 8 for further description of parameter setting.

4 NTP and PoE clock operation

Clocks support IPv4 and IPv6 protocols. You can disable individual protocols by setting parameter **P7**. The default clock setting allows both protocols at the same time (P7: 0). For IPv4 mode, DHCPv4 is enabled by default (option P8: 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 **P14**, you can disable DHCPv6 and/or auto-configuration (SLAAC). For IPv6 mode, DHCPv6 and autoconfiguration (SLAAC) are enabled by default (P14: 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

4.1 Unicast mode

The clock is synchronized to UTC (Universal Time Coordinated) from a NTP server (up to four NTP server IPv4/IPv6 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 6 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
NTP server address 2	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
NTP server address 4	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
SNMP manager 1	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
multicast config address	239.192.54.1 / FF38::EFC0:3601 (FF38::239.192.54.1)
alive notification interval [min]	30

configuration port number	65532
time zone client port number	65534
DHCPv4	enabled
SNMP	enabled
Multicast support	enabled
Telnet	enabled
IPv6 fix address / prefix	0:0:0:0:0:0:0/ 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
autokonfigurace (SLAAC)	enabled

4.1.1 Network parameters assignation by DHCPv4

IP clock mode must be set to IPv4 mode (P7: 0/1). The menu item **P8** 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 **P9** to **P11**.

4.1.2 Manual setting through setup menu

The menu item **P8** must be set to value **2**.

- See chapter 8.2.2 for setting the clock's IPv4 address in the item **P9** submenu
- See chapter 8.2.3 for setting the subnet mask in the item **P10** submenu
- See chapter 8.2.4 for setting the gateway in the item **P11** submenu
- See chapter 8.2.5 for setting the multicast group address in the item **P12** submenu
- See chapter 8.2.6 for setting the unicast NTP server address in the item **P13** submenu.

4.1.3 You can set only one IPv4 address of the NTP server via the clock menu

4.1.4 Manual setting parameters over 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 "Programs and Features", click on "Turn Windows features on or off" and find the "Telnet Client" check box in the window "Windows Features". Allow the system to install the appropriate files – this 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.

4.1.5 Setting network parameters over DHCPv6

IP clock mode must be set to IPv6 mode (P7: 0/2). Menu item **P14** 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 **P14** submenu.

4.1.6 Setting network parameters over autoconfiguration (SLAAC)

IP clock mode must be set to IPv6 mode (P7: 0/2). Menu item **P14** 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 **P14** submenu

4.1.7 SNMP

The ECO-DC 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 ECO-DC (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 or 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

4.2 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 6 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 **P8** must be set to value **1**. See chapter 8.2.5 for setting the multicast group address in the item **P12** submenu.

5 WiFi clock operation

In the item **P15**, choose if the clock will behave like WiFi AP, or will connect to wireless network set by user, where network parameters could be set manually (telnet, clock menu) or automatically (DHCP). If the DHCPv4 is used, the parameters assigned by the server can be checked in the items **P9** to **P11** submenus.

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

- set your WiFi router to the following default wireless network parameters
Net name (SSID): **MOBA-WIFI**
Used coding: **WPA/WPA2**
Coding key: **hgfedcba**
DHCP v4: **allowed**
Clock's IP address: display using item **P9** submenu
- set value **2** in item **P15** in the main MENU
- display clock's IP address in the item **P9** submenu
- connect your computer to the default MOBA-WIFI wireless network
- connect clock using telnet, see chap. 5.3.

5.2 Setting via AP mode (Configure using)

- set value **3** in item **P15** in the main MENU
- connect your computer to the MOBAxxxxxx wireless network with the following parameters:
Net name (SSID): **MOBAxxxxxx**
(where xxxxxx represents certain octets WiFi clock's MAC address)
Used coding: **WPA2**
Coding key: **password**
DHCPv4: **allowed**
Clock's IP address: **192.168.2.1**
- connect clock using telnet, see chap. 5.3.

5.3 Setting the network parameters using telnet

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

Example of setting network parameters using telnet – WPA and DHCPv4:

- command **wifi -s mobatime** set network name (SSID) of new wireless network
- command **wifi -w 7** set version of used coding on PEAP
- command **wifi-u eapuser** set user name for EAP authentication to “eapuser”
- command **wifi -p abcdefg** set password for EAP authentication
- command **conf -u1 pool.ntp.org** set IP address of NTP server on “pool.ntp.org”. Both NTP name and IP address can be use.
- command **conf -p8:03** set the clock for connecting to the new initiated wireless network with DHCPv4 report
- command **exit** ends telnet and writes changes into Flash

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

- command **wifi -s mobatime** set network name (SSID) of new wireless network
- command **wifi -w 4** set version of used coding on WPA2 for new wireless network
- command **wifi -p abcdefg** set encryption key for new wireless network
- command **wifi -m 1** set wifi mode to user-defined wireless network
- command **conf -u1 pool.ntp.org** set IP address of NTP server on “pool.ntp.org”. Both NTP name and IP address can be use.
- command **conf -p8:02** set the clock for connecting to the new initiated wireless with manually set network parameters
- command **conf -i 192.168.0.254** set clock’s IP address to 192.168.0.254
- command **conf -s 255.255.255.0** set clock’s subnet mask on 255.255.255.0
- command **conf -g 192.168.0.254** set clock’s default gateway 192.168.0.254
- command **exit** ends telnet and writes changes into Flash

6 Local time calculation

6.1 Basic setting – control according to source of synchronization

P4	A	Time zone is carried over from the source of synchronization
P5	0	Neither MOBALine time zone nor time zone server are used
P6	A	Display time and date according to source of synchronization incl. daylight saving time

This setting is suitable for digital clocks controlled by a master clock as slave clocks in a time distribution system using the MOBALine, Active DCF 77 or IRIG time signal. An internal time zone table is not used.

6.2 Calculation using MOBALine time zones

P4	A	Time zone is carried over from the source of synchronization. The UTC time calculation is based on the MOBALine information.
P5	1 - 20	Selection of the MOBALine time zone
P6	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 MOBALine slave clocks in a time distribution system with the possibility to display different MOBALine time zones.

6.3 Calculation using Time-zone server MOBATIME

P4	A	NTP protocol uses UTC time zone
P5	1 - 15	Selection of the time zone server time zone
P6	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.

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

P4	A	NTP protocol uses UTC time zone
P5	0	No time zone server is used
P6	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.

6.5 Calculation according to internal time zone table

P4	0 – 64	According to time zone in which source of synchronization works
P5	0	Neither MOBALine time zone nor time zone server are used
P6	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 is needed from another time zone than provided by the synchronization source. Displayed time and date calculation is based on the internal time zone table, see chapter 10 – current definition. This setting is useful also for the NTP synchronization when no time zone server is available.

If you want to use the zone outside the internal time zone table, follow the “Custom Time Zone” appendix.

7 The clock menu table

Program item	Function	Scope of the values (default values are printed in bold)	
0	Display brightness	1-30, A (automatic)	
P1	Time display format	24h	24-hour time format
		12h	12-hour time format, **AM/PM indication according to HW version
P2	Display mode	1-3	
		1	continuous display of time
		2	continuous display of date
		3	display sequence: time 6 sec, date 3 sec
	U*	time constants set up by user, in seconds for each specific displayed data (available for Option E only)	
P3	Source of synchronization	A (automatically)	
P4	Time zone of synchronization source	0 - 64, A (automatically)	
P5	Time zone for MOBALine or time zone server MOBATIME	1-20, 0 (off) – for MOBALine synchronization or 1-15, 0 (off) – for NTP synchronization	
P6	Time zone of displayed time and date	0 - 64, A (automatically), U* (user time zone, see chap. 6.5) U1-U7 (preconfigured time zone entry by MOBA-NMS)	
P7	IP mode	0	IPv4 / IPv6
		1	IPv4
		2	IPv6
P8	Network operation mode IPv4	1*	multicast (without IP address)
		2*	unicast – network param. defined manually
		3*	unicast – network param. defined by DHCPv4
P9	IP addresss	IP*	
P10	Subnet mask	Su*	
P11	Gateway	Gg*	
P12	Multicast address	Mc* setting multicast group address	
P13	Unicast NTP addr.	Uc* setting NTP unicast server address	
P14	Network operation mode IPv6	0*	none
		1*	autoconfiguration (SLAAC)
		2*	DHCPv6
		3*	both
P15	WiFi mode	1	user-defined wireless network
		2	default wireless network: MOBA-WIFI
		3	AP mode
P16	Clock address for IR remote control (available for Option E only)	1-99	
P17	IR controller autolock (available for Option E only)	1-60 , U (autolock is off)	
Verze SW		r_._ (např.: r6.17)	

- possibility to enter the submenu
- Items P7 to P14 available in NTP, PoE and WiFi variants only
- Item P15 available in WiFi variant only
- Items P16 to P17 available for option E variants only

7.1 Submenu IPv6 adres

Menu item	Function
LOCL	Link local adress e. g. fe80:0000:0000:0000:f68e:38ff:fee8:4a13
SLAC	Address obtained from autoconfiguration (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 manuallyset address Range 0 – 128, default 64
GATE not yet supportred	Default gateway obtained from autoconfiguration (SLAAC) např. 2001:0db8:0000:0012:0000:0000:0000:0001

8 Control and configuration of the clock using pushbuttons

The clock is controlled and configured using two pushbuttons located in the back side recess.

Abbreviations used for the key strokes

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

Functioning of the pushbuttons in the “Clock“ mode (time or date displayed)

PB1S time correction to the whole minute (± 30 sec)
PB2S switch between the time and date display
PB1L entry into the time and date setting mode
PB2L entry into the setup menu

8.1 Setting of time and date

The setting of time and calendar date takes place in the 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.

Push the **PB1S** pushbutton to move to another item. After having adjusted the minutes and by pushing the **PB1S**, the entered values are stored (the seconds are set to zero) and the clock returns back to “Clock” mode.

Note: When the time zone for local time and date calculation (menu item P6) 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

8.2 Setup menu for the setting of the clock parameters

The entry into the parameter setup menu is done by the pushing of 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 (chap. 7).

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

8.2.1 Submenu for network services configuration

Choose the value **2** or **3** in the item **P8** (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.

In der Anzeige erscheint:



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 **P8**.
Push together **PB1L** and **PB2L** to return to **P8** without storage of the data

8.2.2 Manual setting of the IPv4 address of the clock

Choose the item **P9** 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 the 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 **P9**.
Push together **PB1L** and **PB2L** to return to **P9** without storage of the data

8.2.3 Manual setting of the IPv4 subnet mask

Choose item **P10** 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. The 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 **P10**.

Push together **PB1L** and **PB2L** to return to **P10** without storage of the data

8.2.4 Manual setting of the default gateway IPv4 address

Choose the item **P11** 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.

In der Anzeige erscheint:



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. The 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 **P11**.

Push together **PB1L** and **PB2L** to return to **P11** without storage of the data

8.2.5 Submenu for setting the IPv4 multicast group address

Choose the menu item **P12** 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 **P12**.

Push together **PB1L** and **PB2L** to return to **P12** without storage of the data

8.2.6 Submenu for setting of the NTP unicast synchronization

Choose the menu item **P13** 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 **P13**.

Push together **PB1L** and **PB2L** to return to **P13** without storage of the data

Note: Through the setup menu, it 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 **P13** 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.

8.3 Submenu for displaying IPv6 addresses

Choose the menu item **P14** 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 **P14**.

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)

8.4 Parameter reset

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

- Enter the clock menu, move to the software version item by several pushes of the **PB1S**
- Keep pushing both buttons on the clock frame simultaneously until the display shows **C0:00**
- Use the **PB2** button to set the value behind the colon to **04**
- Keep pushing both buttons simultaneously until the display shows **FAC1** and the clock resets

9 Update firmware of NTP and PoE version using TFTP32 tool

- create a folder on the computer hard drive and copy the files "tftpd32.ini", "tftpd32.chm" and "tftpd32.exe" into it, then run "tftpd32.exe"
- copy the new firmware file " devapp.bin " as well
- run "tftpd32.exe", leave only the TFTP Server in the window Settings -> Global Settings checkbox active, don't change other settings
- open the active folder setting window with the Browse button and browse for the folder containing the firmware file
- connect to the clock by the windows command **telnet <IP address>**
example: telnet 192.168.0.190
- the request for the telnet password will appear; after entering the valid password, the information about the software and hardware version followed by the MAC address appears
- enter the command **fu** in the telnet window for starting the automatic update of the clock's firmware from the "devapp.bin" file
- after the command is entered, information about the sent file and its progress is displayed in the tftpd32 window; the telnet connection is then terminated automatically
- wait approx. 1 minute after the file sending is finished, connect again to the clock through telnet
- after successfully entering the password, check if the indicated firmware version is correct, otherwise it is necessary to repeat the whole procedure
- enter the **exit** command to close the telnet connection, close the tftpd32 window

10 Time zone table

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.

11 Technical data

11.1 Standard design of the clock

Technical data		ECO-DC	57.4	57.6	57x.6	100.4	100.6	100x.6
Display	height of the digits		57	57/38	57	100	400/57	100
	number of digits		4	4+2	6	4	4+2	6
Time display format	HH : MM		✓			✓		
	HH : MM:SS			✓			✓	
	HH : MMSS				✓			✓
Date display format	DD. MM		✓			✓		
	DD.MM ^{YY}			✓			✓	
	DD.MM.YY				✓			✓
Automatic or manual display brightness		✓						
Viewing distance		25 m			40 m			
Autonomous operation		Internal quartz base						
Synchronization	MBL	MOBALine time code, mains powered						
	MBLDCF	MOBALine or active DCF 77 time code, mains powered						
	IRIG	IRIG-B, mains powered						
	NTP, WiFi	NTP protocol, mains powered						
	PoE	NTP protocol, powered over PoE (compatible IEEE 802.3af)						
Power supply		100 - 240 VAC / 50 - 60 Hz						
		24 VDC (option, not for PoE version)						
Power consumption AC/DC version	single sided design	7 VA	8 VA	8 VA	7 VA	8 VA	8 VA	10 VA
	double sided design	11 VA	16 VA	16 VA	11 VA	16 VA	16 VA	18 VA
Power consumption PoE version	single sided design	7 VA	8 VA	8 VA	7 VA	8 VA	8 VA	10 VA
	double sided design	11 VA	15 VA	15 VA	11 VA	15 VA	15 VA	15 VA
Quartz accuracy at 20°C	accuracy without synchronization	±0,3 sec/day						
	RTC backup	supercapacitor for 12 hours						
Operating temperature		-5 to + 55°C						
Protection degree		IP 30 (IP40 on request)						
Weight [kg]	single sided design	0,75	1,15	1,25	1,8	1,9	1,9	2
	double sided design	2	2,8	3	4,1	4,3	4,3	4,5
Dimensions (WxHxD) [mm]	single sided design	341 x 122 x 49			580 x 180 x 60			
	double sided design	341 x 122 x 99			580 x 180 x 120			



Note for the IP40 modification (excluding PoE variant): The power connector can be considered as an IP40 only if it is connected to the clock. Otherwise it is considered as an IP30 accessory.

11.2 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
Active DCF 77	+ - 12 – 30 V	3 - 7 mA
IRIG B	20 mVpp – 2 Vpp	20 uA – 2 mA

12 Accessories and Maintenance

12.1 Single sided clock

- instruction manual 1 pc
- wood screws including dowels 2 pcs

12.2 Double sided clock

- instruction manual 1 pc
- wood screws including dowels for fastening the console 4 pcs
- interconnecting cable for second side 1 pc
- Allen key for fastening the console 1pc

12.3 Cleaning

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



HEADQUARTERS / PRODUCTION

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

SALES WORLDWIDE

MOSER-BAER SA EXPORT DIVISION
19 ch. du Champ-des-Filles, CH-1228 Plan-les-Ouates
Tel. +41 22 884 96 11 / Fax + 41 22 884 96 90
export@mobatime.com / www.mobatime.com

SALES SWITZERLAND

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

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

SALES GERMANY, AUSTRIA

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

