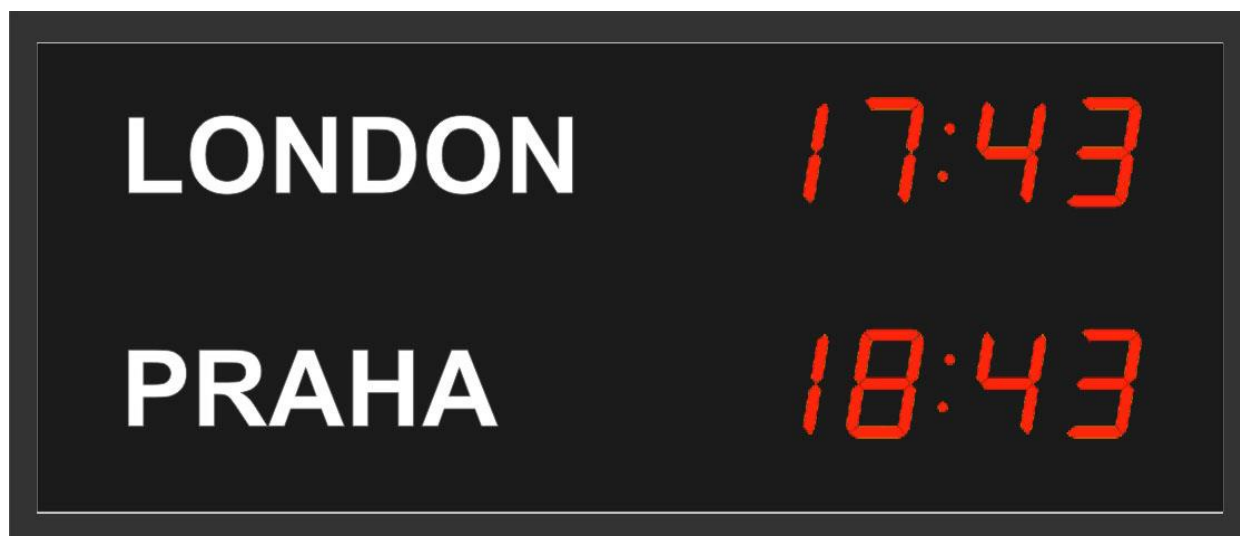


INSTRUCTION MANUAL

Time Zone Displays

TZI series



Certification of the Producer

STANDARDS

The digital clock DC has been developed and produced in accordance with the EU Directives 2014/35/EU and 2014/30/EU, applied standards:

EN 60950-1:2006/Cor.:2011-10

EN 55022:2010/AC:2011-10, class B

EN 55024:2010/A1:2015

EN 50121-4:2006/Cor.:2008-05



References to the Instruction Manual

1. The information in this Instruction Manual can be changed at any time without notice.
The current version is available for download on www.mobatime.com.
2. This Instruction Manual has been composed with the utmost care, in order to explain all details in respect of the operation of the product. Should you, nevertheless, have questions or discover errors in this manual, please contact us.
3. We do not answer for direct or indirect damages, which could occur, when using this Manual.
4. Please read the instructions carefully and only start setting-up the product, after you have correctly understood all the information for the installation and operation.
5. The installation must only be carried out by skilled staff.
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1 Description

Travel and planning projects across time zones requires knowledge of the time in different time zones. Display of World Time offers the perfect solution for airports, transportation terminals, hotels and businesses that communicate at the international level. Accurate and synchronized timekeeping facilitates the management of people and projects across global zones. The clock can be set to show the city specific to your business or range by clients in hotels and airports. Saves time by eliminating manual calculations.

General properties

- digits in red, pure green, yellow, blue or white color
- display of time values (either 12 or 24 hours time cycle), four-digit (HH:MM) or six digit (HH:MM SS) format
- manual or automatic adjustment of the luminosity of LED displays high-quality
- customer choice of time zone location and legend style
- number of time zones max. 8
- option LNx - configurable location name/character size 45/71 mm
- vertical or horizontal layout
- setting the time and the configuration parameters by means of the IR remote unit
- power supply 100 - 240 VAC, 50 / 60 Hz, DC power supply on request
- wall mounting, ceiling suspension or customer specific mounting

Model TZI

- indoor design
- character of 57 or 100 mm height for reading distance up to 25 or 40 m respectively
- 7-segment display with wide viewing angle for easy readability
- front acrylic plexiglass with dark filter and anti-reflective coating prevents light reflection and improves readability
- slim frame made from anodized aluminum profiles in black or silver colour as standard any other RAL colour on request
- installation depth 39 mm
- protection class IP40

Model TZI.C

- indoor design
- 7-segment LED display, circle of second marks
- digit height 57 or 45 mm for hour, minutes and 38 or 32 for second, readability distance up to 25 or 20 m
- display of seconds can be switched off
- horizontal layout only
- front acrylic plexiglass with dark filter and anti-reflective coating prevents light reflection and improves readability
- slim frame made from anodized aluminum profiles in black or silver colour as standard any other RAL colour on request
- installation depth 39 mm
- protection class IP 40

Accessories

- DCF 77 signal receiver
- remote IR controller for clock set up and stopwatch control

On request

- protection degree IP 54

2 Assembly



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



Danger of electric shock when dismantling the cover with warning triangle.

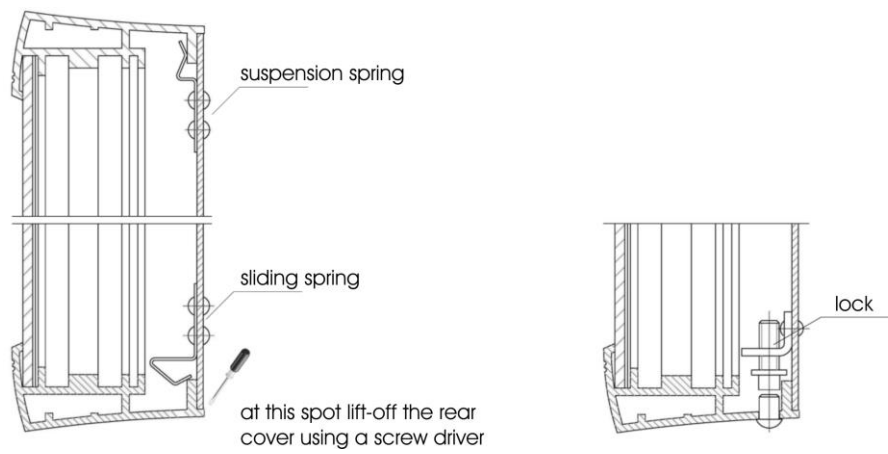


The connection to the 110/230 V AC power network should be carried out when the mains power is off.

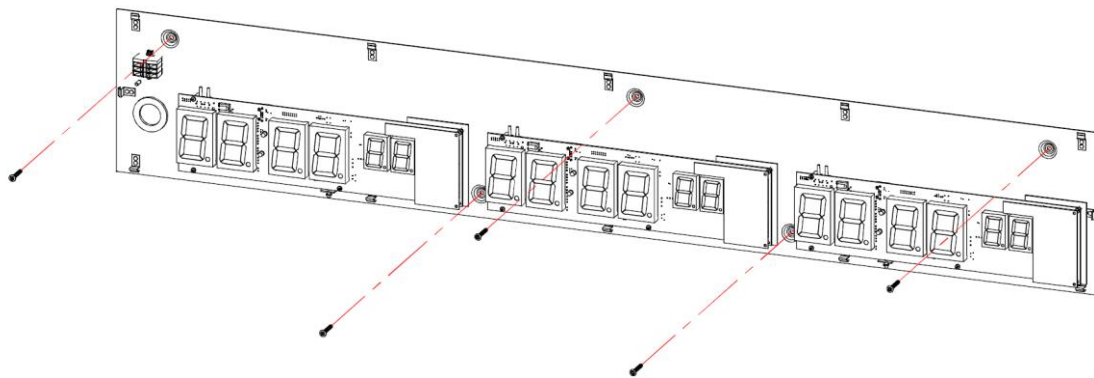
2.1 Single-sided display

- The frame is fixed using suspension (at the above) and sliding springs (at the bottom). Lift-off the anchoring plate using a screwdriver inserted in between the sheet and the frame at the sliding spring point on the clock bottom side (picture A).
- Drill anchoring holes into the wall, of a diameter adequate to accommodate wood-type screws of 4 to 5 mm diameter. As a template for marking the position of the holes the anchoring plate can be used (picture B).
- Interlace the incoming conductors through the opening in the anchoring plate and fix the plate to the wall.
- Connect the incoming conductors in accordance with the descriptive sheet on the terminal board, placed on the anchoring plate (chapter 2.2). Give the conductors an appropriate shape or cut them off to a length that will not obstruct the placement of the clock frame onto the anchoring plate.
- For variant NTP mount the connector to the Ethernet cable and plug it into the Ethernet socket mounted on the anchoring plate.
- For variant SI, where synchronization by means of RS485 interface is required, it's necessary to dismount the most-left clock electronic board and reconnect the interconnecting cable from Lines (JP1) connector to RS485 (JP5) connector – follow the terminals marking to prevent wrong connection.
- Put the clock frame opposite to the anchoring plate and suspend it onto the upper springs. Snap the clock in onto the springs by pushing on the lower part of the frame. Take care to not nip any of the cables between the anchoring plate and clock frame
- Check whether the anchoring plate on the sides fits exactly into the groove in the clock frame.
- Remove the blind cap from the openings on the clock bottom side.
- Insert Allen key into the openings on the bottom side of the clock. Turn the key softly in anticlockwise direction. The frame catch will snap in (picture C).
- Replace the blind cap on the openings.
- To loosen the frame catch, use the reverse procedure (turn clockwise).

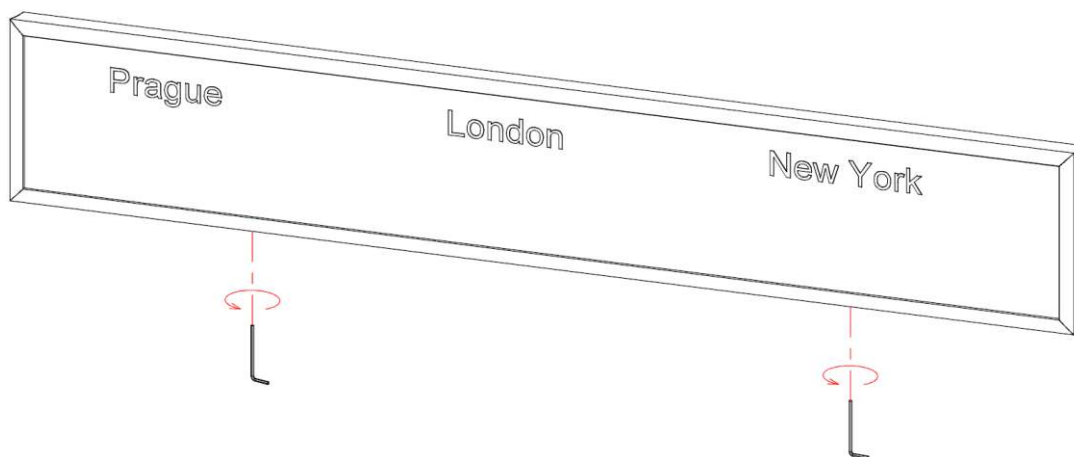
picture A



picture B

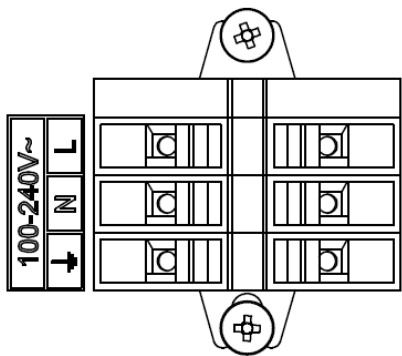


picture C

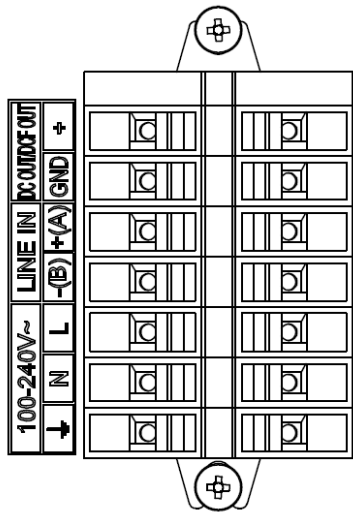


2.2 Connecting terminal block

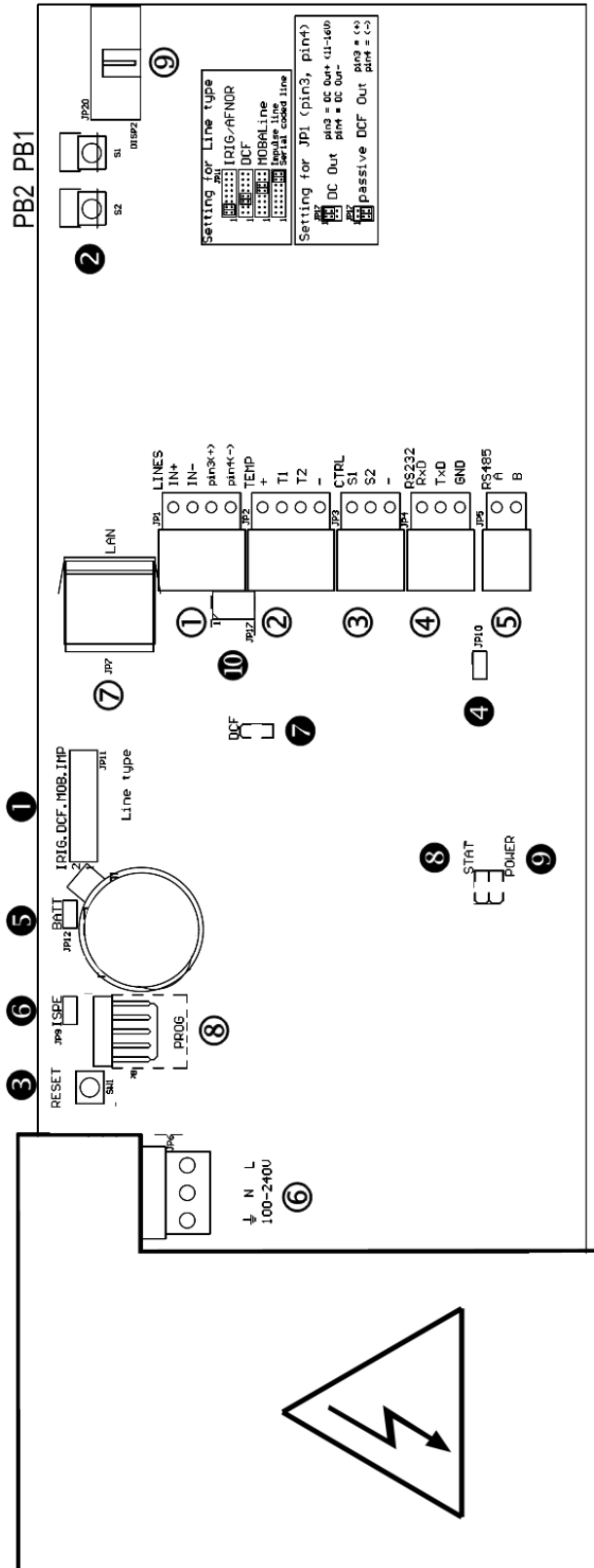
Terminal board for NTP, WTD and WiFi version



Terminal board for remaining versions



2.3



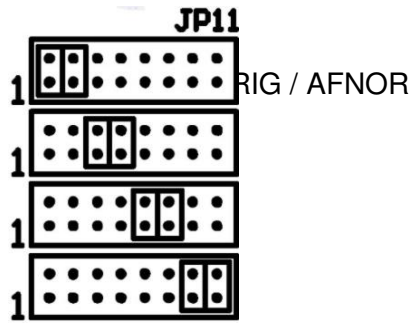
- | | | | | | |
|---|----------------------------------|---|--------------------------------|---|--|
| ① | LINES, DC / DCF OUT - JP1 | ① | jumper Line type - JP11 | ⑥ | jumper ISPE - JP9 |
| ② | TEMP - JP2 | ② | PB1, PB2 buttons | ⑦ | LED indication of receiving DCF signal |
| ③ | CTRL - JP3 | ③ | RESET button | ⑧ | state LED |
| ④ | RS 232 - JP4 (version SI) | ④ | jumper TRE - JP10 (version SI) | ⑨ | LED indication of powering |
| ⑤ | RS 482 - JP5 (version SI) | ⑤ | jumper BATT - JP12 | ⑩ | jumper DC Out / DCF Out - JP17 |
| ⑥ | 100 - 240 VAC - JP6 (except PoE) | | | | |
| ⑦ | LAN - JP7 (version NTP and PoE) | | | | |
| ⑧ | PROG - JP8 | | | | |
| ⑨ | DISP2 - JP20 | | | | |

2.4 Function of the plug connectors

- | | |
|---|---|
| <ul style="list-style-type: none"> ① LINES, DC/DCF OUT – JP1 ④ RS232 – JP4 (optional) ⑤ RS485 – JP5 (optional) ⑥ 100 – 240VAC – JP6 ⑦ LAN - JP7 (optional) ⑧ PROG – JP8 | <p>time signal inputs: The DCF/GPS receiver, polarized impulse line, MOBALine, MOBATIME serial code, IRIG-B,</p> <p>power supply output: DC OUT 11–19 V or passive DCF current loop output</p> <p>connection of the RS232 serial line</p> <p>connection of the RS485 serial line</p> <p>powering 100 - 240 VAC voltage</p> <p>RJ45 10BaseT/100TX (IEEE 802.3)</p> <p>auto negotiation</p> <p>clock firmware programming</p> |
|---|---|

2.5 Setting elements

- | | |
|--|---|
| <ul style="list-style-type: none"> ① Line type jumper – JP11 | <p>for the setting of the slave line type</p> |
|--|---|



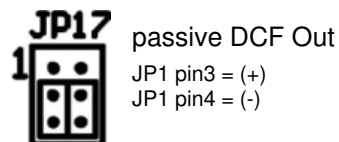
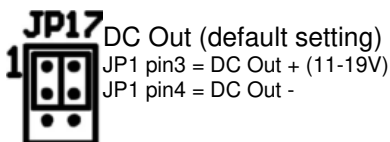
IRIG / AFNOR

DCF

MOBALine

(Un)polarized impulse line
MOBATIME serial code

- | | |
|---|---|
| <ul style="list-style-type: none"> ② PB1, PB2 ③ RESET ④ TRE jumper – JP10 (optional) ⑤ BATT jumper – JP12 ⑥ ISPE jumper – JP9 ⑦ DCF LED ⑧ STATE LED ⑨ POWER LED ⑩ jumper DC Out / DCF Out – JP17 | <p>control pushbuttons</p> <p>the RESET button</p> <p>RS485 terminating resistor enable</p> <p>backup battery connection</p> <p>invoking the firmware programming mode</p> <p>indication of receiving the DCF signal</p> <p>state indication</p> <p>power indication</p> <p>Output signal setting on pins 3, 4 of the JP1 connector</p> |
|---|---|



3 Control of the TZ 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, time zones, location names and the clock parameters can only take place at clocks in an unlocked state. Complete setting is done on the most left zone display.

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 “Normal“ operation mode

SET	entry into the time and date setting mode
The + button	button brightness increase (not applicable when P0 is set to A)
The - button	button brightness decrease (not applicable when P0 is set to A)
CLOCK	visualization of time
DATE	visualization of date
MENU	entry into the menu of setting of clock parameters
holding down 1-9 button	entry into the menu for set time zone and location name for particular zone display

3.1 Setting of UTC 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

3.2 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.

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

The display shows the following:



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

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

3.2.2 Submenu for network services configuration

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

The display shows the following:



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

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

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

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

3.2.3 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.

3.2.4 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.

3.2.5 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.

3.2.6 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.

3.2.7 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.

3.3 Menu for the setting of the time zone and location name

The entry into the menu for the setting of the time zone and location name is done by long pushing (minimal 5 sec) the 1-9 button (the 1 button for setting of the first zone display, the button 2 for setting of the second zone display, etc.).

The order of zone displays is defined from left to right.

The setting of the time zone and location name of all zone displays is displayed only on the first zone display.

The range of time zone is 0 – 64 or U* (user time zone).

The maximum length of the location name is 16 characters, but the number of displayed characters is dependent on variant of TZ panel and on the width of the used characters.

Editing of the location name:

By pushing + or – available characters are listed (the order of characters is depended on the character set). Press >> to move to next position and select next character.

For fast listing through the characters keep the + or – buttons depressed. Insert a space by pushing **CLR**.

3.3.1 Example of setting time zone and location name for third part of the display

In the normal working mode of TZ panel keep pushing **3** until the first part of display shows “**t3:00**” and the location name (if was already defined).

The item to be set is blinking.

By pushing + or – or pushbuttons **0–9** set the value of the time zone.

By pushing >> move to the definition of the location name.

By pushing + or – set the first character of the location name.

By pushing >> move to the next character.

By the same procedure enter whole the location name.

After the last character setting, by pushing **OK** the entered values are stored and the TZ panel returns to the normal working mode.

By pushing **ESC**, the TZ panel returns to the normal working mode without saving.

3.3.2 Submenu for setting of the user-specific time zone

When the desired zone is not listed in the standard time zone table (see chapter 10), choose the value **U** in time zone menu part, then by pushing the **SET** enter the submenu for setting the parameters of the user-specific time zone. The item to be set is blinking.

The display shows the following (example: -12 hours):



Enter the offset of the required time zone compared to UTC time within -12 to +12 hours. Decimal dot means 0,5 hour.

Switch over to setting the way of setting daylight saving time (DST) by pushing >>.

The display shows the following:



Options:

n – no DST is used

F – DST defined by fixed date

C – DST defined by calculated date

Return to the time zone menu part by pushing the **OK** button.

A. DST defined by entering fixed date and time

If the value **F** is set in item **dt:**, by pushing **SET** enter the submenu for entering fixed date and time. The item to be set is blinking.

Symbols on the display:

Fh change to summer time; entry of the hour at daylight saving begins

bh shift back; entry of the hour at daylight saving ends

The display shows the following:



Enter the hour at which the daylight saving time begins.

Push >>.

The display shows the following:



Enter the day of the month. Push >>.
Enter the month in which the daylight saving time begins.

Push >>.

The display shows the following:



Enter the hour at which the daylight saving time ends.

Push >>.

The display shows the following:



Enter the day of the month. Push >>.
Enter the hour at which the daylight saving time ends.

The daylight saving time has been set to start on April 28th at 2 o'clock and end on October 10th at 3 o'clock in the above described example.

Save the setting and return to item **dt:** by pushing **OK**, return to the time zone menu part by another push of the **OK** button.

B. By entering calculated date

If the value **C** is set in item **dt:**, by pushing **SET** enter the submenu for the calculated date. The item to be set is blinking.

Symbols in the display:

F change to summer time
b setting the time back

Scope of the setting:

Week

1. – 4., L (the last one), P (last but one)
and H (first after 15th day in the month)

Days of the week

1. – 7. (Mo – Su)

Month

1. – 12.

The display shows the following:



Enter the week in which the daylight saving time begins. Push >>. Enter the day of the week in which the daylight saving time begins.

Push >>.

The display shows the following:



Enter the month in which the daylight saving time begins. . Push >>. Enter the hour in which the daylight saving time begins.

Push >>.

The display shows the following:



Enter the week in which the daylight saving time ends. Push >>. Enter day of the week in which the daylight saving time ends.

Push >>.

The display shows the following:



Enter the month in which the daylight saving time ends. Push >>. Enter the hour in which the daylight saving time ends.

The daylight saving time has been set to start on last Sunday in March at 2 o'clock and end on last Sunday in October at 3 o'clock in the above described example.

By pushing **OK** save the setting and return to item **dt:**. Another push of the **OK** button returns to the time zone menu part.

4 The clock menu table

Program item	Function	Scope of the values (default values are printed in bold)																										
P0	Display brightness	1-30, A (automatic adjustment, without the possibility of changing in normal display mode) The maximum brightness setting in manual mode can reduce the life cycle of the LED displays in the long run. We recommend leaving the brightness control to "auto" mode (default value).																										
P1	Time display format	24 h , 12 h																										
P2	Time constants for automatic data switching over	1-3 , U <table><tr><td>1</td><td>continuous display of time</td></tr><tr><td>2</td><td>continuous display of date</td></tr><tr><td>3</td><td>display sequence: time 6 sec, date 3 sec.</td></tr><tr><td>U*</td><td>time constants set up by user, in seconds for each specific displayed data</td></tr></table>	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																		
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																											
P3	Time zone of synchronization source	0 - 64																										
P4	Type of synchronization source (check Line type jumper JP11 setting, see the chapters 2.8 and 10 for more information)	1 - 10, A (automatically) <table><tr><td>A</td><td>auto detection, applicable for: DCF, the Mobatime serial code, MOBALine, WDT, IRIG-B or NTP</td></tr><tr><td>1</td><td>autonomous operation without synchronization</td></tr><tr><td>2</td><td>synchronization by DCF signal</td></tr><tr><td>3</td><td>the MOBATIME serial code</td></tr><tr><td>4</td><td>MOBALine</td></tr><tr><td>5</td><td>24 V DC impulses, at minute intervals</td></tr><tr><td>6</td><td>24 V DC impulses at half minute intervals</td></tr><tr><td>7</td><td>24 V DC impulses at second intervals</td></tr><tr><td>8</td><td>DCF-FSK, IRIG-B Standard, IRIG-B 123, IRIG-B DIEM, AFNOR A, AFNOR C</td></tr><tr><td>9</td><td>RS232</td></tr><tr><td>10</td><td>RS485</td></tr><tr><td>11</td><td>Internal GPS receiver</td></tr><tr><td>12</td><td>Active DCF code</td></tr></table>	A	auto detection, applicable for: DCF, the Mobatime serial code, MOBALine, WDT, IRIG-B or NTP	1	autonomous operation without synchronization	2	synchronization by DCF signal	3	the MOBATIME serial code	4	MOBALine	5	24 V DC impulses, at minute intervals	6	24 V DC impulses at half minute intervals	7	24 V DC impulses at second intervals	8	DCF-FSK, IRIG-B Standard, IRIG-B 123, IRIG-B DIEM, AFNOR A, AFNOR C	9	RS232	10	RS485	11	Internal GPS receiver	12	Active DCF code
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7	24 V DC impulses at second intervals																											
8	DCF-FSK, IRIG-B Standard, IRIG-B 123, IRIG-B DIEM, AFNOR A, AFNOR C																											
9	RS232																											
10	RS485																											
11	Internal GPS receiver																											
12	Active DCF code																											
P5	Impulse line processing mode	2 , 4 <table><tr><td>2</td><td>polarized impulses; time synchronization only</td></tr><tr><td>4</td><td>non-polarized impulses; time synchronization only</td></tr></table>	2	polarized impulses; time synchronization only	4	non-polarized impulses; time synchronization only																						
2	polarized impulses; time synchronization only																											
4	non-polarized impulses; time synchronization only																											
P6	Time zone for MOBALine or time zone server MOBATIME	1-20, 0 (off) – for MOBALine synchronization or 1-15, 0 (off) – for NTP synchronization																										
P7	Character set for location names	1 – CP-1252 (English, German, French) 2 – CP-1250 (Czech, Slovak, Polish, Hungarian, Slovene, Bosnian, Croatian, Serbian) 3 – CP-1251 (Russian, Bulgarian, Serbian Cyrillic)																										
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																										

Program item	Function	Scope of the values (default values are printed in bold)	
P9	IR controller autolock	1-60, U ("automatic lock" is OFF) Time in minutes for "automatic lock" since the last depression of button on the IR unit	
P10	Time format display	1-2	
		1	time with leading zero
		2	time without leading zero
P11	Date format display	1-2	
		1	date with leading zero
		2	date without leading zero
P12	Temperature format display	°C	
		°F	
P13	Protocol for RS232 and RS485 communication	1 - IF482	
		2 - Supervised RS485	
		3 - ITRON 2000	
P14	Modulation speed for RS232 and RS485	1-7	
		1	1 200 Baud
		2	2 400 Baud
		3	4 800 Baud
		4	9 600 Baud
		5	19 200 Baud
		6	38 400 Baud
		7	57 600 Baud
P 15	Transmission parameters for RS232 and RS485	Number of data bits	8
			7
P 16		Number of stop bits	1
			2
P 17		Parity	n no parity
			o odd
			E even
P 18	Special operation mode	0	normal mode
		1	special mode 1
		2	special mode 2
P19	Network operation mode	1	NTP: multicast (without IP address) WiFi: AP mode
		2*	NTP: unicast – network param. defined manually WiFi: wireless network defined by user, IP address set manually
		3*	NTP: unicast – network param. defined by DHCP WiFi: wireless network defined by user, IP address assigned by DHCP
P20	IP address	IP*	edit network parameters in manual setting mode or display parameters assigned by DHCP
P21	Subnet mask	Su*	
P22	Gateway	Gt*	
P23	Multicast addr.	Mc*	setting of multicast group address
P24	Unicast NTP addr	Uc*	setting of NTP unicast server address
SW version		r._.(e.g.: r6.07)	

* possibility to enter the submenu (Items P19 to P24 available in NTP and WiFi variants only)

5 Non-network clock operation

Configure the jumper JP11 according to table (chapter 2.5) if the source of synchronization is a DCF signal, Mobatime serial code, polarized impulse line, MOBALine or IRIG-B. Choose the item **P4** in main MENU (chapter 5) and set the type of synchronization. The auto detection mode (P4:A), when the type of synchronization signal is set automatically, is applicable for DCF signal, Mobatime serial code, MOBALine, IRIG-B, WTD. The permanently lit colon during the time display signalizes the clock is synchronized by the synchronization source. Set time-zone parameters for each zone display (chapter 3.3).

5.1 Autonomous clock synchronized by DCF 77 receiver

- Set **P3:2** and **P4:A** in the main MENU (chapter 4).
- Connect the DCF 77 receiver to the clock terminal board placed on the anchoring plate (LINE IN terminals) using a twin-wire cable.
- The maximum wire length depends on its diameter (app.100 - 300 m).
- In case the connection is correct and the input signal is at high level, the LED on the receiver is flashing periodically once a second, with 1 pulse left out at the 59th second.
- If the polarity is incorrect, the LED does not flash. In such a case, interchange the two wires.
- Install the receiver at a place with a high-level radio signal. Don't install the receiver near sources of interfering signals, such as the personal computers, TV sets or other types of power consumers (the digital clock itself generates interfering signals too).
- Position the receiver with its transparent cover (DCF 450) or the arrow on the cover (DCF 4500) facing the transmitter (located in Frankfurt, Germany). Presuming the good quality DCF 77 signal the synchronization takes place in approx. 3 to 4 minutes. In case of poor quality of the signal (mainly during the day time) the first time setting is to be done manually. The red LED of the receiver displays a working connection by flashing once a second without flickering.

5.2 Autonomous clock synchronized by external GPS receiver

- Set value **P3:0** and **P4:A** in the main MENU (chapter 4).
- Connect GPS receiver to the clock terminal board placed on the anchoring plate (LINE IN and DC OUT/DCF OUT terminals) using a four-wire cable. Please note the correct polarity of the wires to ensure the GPS generates UTC timecode – see the GPS user manual.
- For the correct placing of the receiver please follow the GPS user manual.
- Presuming the good position of the GPS receiver the synchronization takes place in approx.10 to 20 minutes.

5.3 Slave clock controlled by synchronizing impulses

On digital clock connected in time distribution system controlled by synchronizing impulses choose the item **P4** in the main menu and set it according to impulse periodicity (one minute, half minute, second pulses) and in item **P5** choose type of synchronization impulses (polarized / unpolarized). Set the value **P3:0**. 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.

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

- Set timezone of the synchronization signal in item **P3** and value **A** in **P4** in the main MENU (chapter 4).
- After the connection of the digital clock to the signal source, time and date are adjusted automatically, following the receipt of valid time information.
- The time setting with using the serial coded line takes place within at least 3 to 4 minutes, for MOBALine and IRIG-B within 6 to 15 seconds.

5.5 Slave clock controlled by IF482 over RS232 or RS485

- Set timezone of the synchronization signal in item **P3** and value **A** in **P4** in the main MENU (chapter 4).
- After the connection of the digital clock to the line, time and date are adjusted automatically, following the receipt of valid time information.
- Setting the tune takes place within at least 5 minutes.

5.6 Slave clock controlled by supervised RS485

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

- Set timezone of the synchronization signal in item **P3** and value **A** in **P4** in the main MENU (chapter 4).
- If the clock should be monitored set in menu item **P8** unique address in the range 1 to 32. The value "L" means that the clocks are synchronized only (without monitoring).
- It is necessary to register the clock under the used address in DTS.
- The time synchronization starts within a few tens of seconds after start-up.
- Failure of slave clock function is signalized by an alarm in DTS.
- On the RS485 you can use the jumper TRE - JP10 to connect the termination resistor 120R between the signals A and B for the correct termination of RS485.

5.7 Cascaded connection of the DCF/GPS synchronized clock

- Set **P3:2** and **P4:A** in the main MENU (chapter 4).
- Connect the DCF 77 receiver to the clock terminal board placed on the anchoring plate (LINE IN terminals) using a twin-wire cable.
- Set the passive DCF OUT output 3, 4 of the JP1 connector using the jumper JP17.
- When using the external GPS receiver, the external power supply is needed - parameters 12-24 VDC – min. 5VA.
- Interconnect the cascaded clock using a twin-wire cable from the DC OUT / DCF OUT terminals to the LINE IN terminals of the next clock.

- In case the connection is correct and the input signal is at a high level, the LED on the receiver and the green LED in the clock is flashing periodically once a second, with 1 pulse left out at the 59th second.

5.8 Synchronization in WTD system

- Set timezone of the synchronization signal in item **P3** and value **A** in **P4** in the main MENU (chapter 4).
- Set the **P8** item to the address of the WTD-T transmitter.
- The colon is permanently lit after successful signal receiving from WTD-T transmitter.

6 NTP clock operation

6.1 Unicast mode

The clock is synchronized to UTC (Universal Time Coordinated) from a NTP server (up to four NTP server IP addresses configurable) and must have assigned its own IP 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 IP address can be used or the multicast group address having last octet cleared to zero (presuming the multicast is not disabled).

Set time-zone parameters for each zone display (chapter 3.3).

Default network parameters:

IP address	0.0.0.0
subnet mask	0.0.0.0
default gateway	0.0.0.0
NTP server address 1	0.0.0.0
NTP server address 2	0.0.0.0
NTP server address 3	0.0.0.0
NTP server address 4	0.0.0.0
NTP request time [s]	10
DNS server	0.0.0.0
SNMP manager 1	0.0.0.0
SNMP manager 2	0.0.0.0
multicast config address	239.192.54.0
alive notification interval [min]	30
configuration port number	65532
time zone client port number	65534
DHCP	enabled
SNMP	enabled
Multicast support	enabled
Telnet	enabled

6.1.1 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 with up to four NTP server addresses

[42] Time zone server address (usually same as NTP server address)

[234] SNMP manager address

[43] or [224] Additional options (refer to document BE-800793)

The network administrator must configure the DHCP options accordingly.

Assigned parameters can be checked in the submenu of items **P20** to **P22**.

6.1.2 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.

6.1.3 Manual setting through telnet

The menu item **P19** must be set to value **1** or **2**. To establish the first connection through telnet, the following procedure is needed because the initial IP address of the clock is 0.0.0.0:

- assign a new IP address to the clock's MAC address (marked on the product label) by windows command **arp -s <IP address> <MAC address>**
example: `arp -s 192.168.0.190 00-16-91-FE-90-00`
- reset the clock or power-cycle it and do the following within 2 minutes
- the IP address is temporarily matched to the clock (only valid when the current IP address is 0.0.0.0) by windows command **ping <IP address>**, the clock should answer the two last ECHO requests at least
example: `ping 192.168.0.190`
- do the following within 30 seconds after the ping
connect to the clock and make the needed settings (see lower) by windows command **telnet <IP address>** or use the Hyperterminal application

Setting parameters over telnet:

- 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
- command `tz -d` displays current time zones and location names
- command `tz -zX YY` set time zone to value YY for the display ID = X
example: `tz -z3 15` sets the time zone to 15 for third display (ID = 3)
- command `tz -nX AAA` set location name to AAA for the display ID = X
example: `tz -n3 Prague` sets the location name to Prague for third display (ID = 3)
- 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.

6.1.4 SNMP

The DC clock supports SNMP version 2c notifications and parameter reading and setting by means of SNMP GET and SET commands. This allows integrating the clock to a network management system. The DC clock (SNMP agent) can send alarm and alive notifications to a SNMP manager. The IP address of the SNMP manager can be provided to the clock by DHCP, Telnet, SNMP or the MOBA-NMS. The structure of supported parameters is defined in a MIB file (refer to document BE-800793 for details). In addition the clock supports the "system" node parameters defined by MIB-2 (RFC-1213) Alarm notifications are asynchronous messages and are used to inform the manager about the appearance / disappearance of alarms. Alive notifications are sent out periodically to report availability and state of the clock. The interval time can be configured.

SNMP community strings:

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

6.2 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.

Set time-zone parameters for each zone display (chapter 3.3).

Default network parameters:

multicast group address	239.192.54.1
multicast config address	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 multicast group address in the item **P23** submenu.

7 WiFi clock operation

In the item **P19**, 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 DHCP is used, the parameters assigned by the server can be checked in the items **P20** to **P22** submenus.

Set time-zone parameters for each zone display (chapter 3.3).

7.1 Setup mode WiFi AP parameters

Net name (SSID): **WiConnect-XYZ**
Used coding: **WPA/WPA2**
Coding key: **password**
DHCP: **allowed**

7.2 Setting process

- connect to WiFi AP with mobile phone, tablet or PC using parameters listed above. XYZ in network name will be last 3 digits of MAC address of the clocks.
- in the web browser type address <http://setup.com>
- select appropriate network from the list and configure network parameters
- saving parameters will change the WiFi mode to client and automatically connects to selected network
- NTP server must be set using telnet command `conf -u`
- revert back to setup mode is possible by setting 1 to item P19

Setting the network parameters using telnet:

- 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 -u pool.ntp.org** sets pool.ntp.org as NTP server. It is possible to use name or IP address.
- command **conf -?** displays help for the command conf parameters
- it is necessary to end telnet by command **exit**

Example of setting network parameters using telnet:

- command **conf -l mobatime** set network name of new wireless network
- command **conf -w 4** set version of used coding on WPA2 for new wireless network
- command **conf -d abcdefg** set the security key for new wireless network
- command **conf -u 192.168.0.130** set IP address of NTP server on 192.168.0.130
- command **conf -p19:02** set the clock for connecting to the new initiated wireless network with manually preset network parameters
- command **conf -i 192.168.0.190** set clock IP address to 192.168.0.190
- command **conf -s 255.255.255.0** set subnet mask of the clock on 255.255.255.0
- command **conf -g 192.168.0.254** set gateway of the clock on 192.168.0.254
- command **exit** ends telnet and writes changes into Flash

8 Testing mode, parameter reset

8.1 Synchronization test

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

Display description during synchronization test mode:

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

Entering the synchronization test mode:

- Enter the clock menu, move to the software version item by several pushes of the >> button on IR controller.
- Keep pushing **DISP** button until the display shows **C0:00**
- Use the + button set the value behind the colon to **03**
- Keep pushing **DISP** button, until the display shows synchronization information

8.2 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 >> button on IR controller.
- Keep pushing **DISP** button until the display shows **C0:00**
- Using the + button set the value behind the colon to **04**
- Keep pushing **DISP** button, until the display shows FAC1 and clock makes reset

9 Firmware update

9.1 Firmware update using RS232

- Switch off the clock.
- Install and run the Flash Magic software.
- Open the configuration file „LPC2366 dc3.fms“ over the File -> Open Settings menu
- Set used COM Port and open file firmware „DC3_<version>.hex“ (e.g. DC3_NTP_POE_v349.hex) using the Browse key
- Connect the programmer to serial COM Port of computer (the USB-RS232 converter can be used) and connect the power supply to the jack on the programmer.
- Install the jumper ISPE (JP9).
- Connect the programmer to connector PROG (JP8). The POWER LED placed on the clock lights up.
- Click the Start button to run programming; after completion, a “Finished” message will be displayed in the bottom part of the widow
- Disconnect the programmer and remove the ISPE jumper.
- Firmware version can be checked in the last item of the clock menu.

9.2 Firmware update over Ethernet on NTP versions

- Create a folder on the computer disk and copy "tftpd32.ini", "tftpd32.chm" and "tftpd32.exe" in it. Copy the new firmware file "devapp.bin" as well.
- Run "tftpd32.exe", let only the TFTP Server in the window Settings -> Global Settings be active, don't change other settings.
- Using the Browse key, open choice of active directory and find the one which contains the given firmware
- Connect to the clock by the windows command **telnet <clock IP address>**
example: telnet 192.168.0.190
- The page of telnet requesting will appear, after the password entered identification of current software version and clock MAC address displays.
- Enter the command **fu** in telnet window to start the automatic clock firmware update from the "dc3app.bin" file.
- Information about sending file and its progress displays in the tftpd32 program window after the command entering. Connection to telnet is ended automatically.
- Wait about 1 minute after downloading the file. Connect the telnet to the clock again.
- After entering the password, check if the firmware version is correct, if it isn't, it is necessary to repeat the whole procedure.
- Close the telnet window and end the program tftpd32 with the command **exit**.

10 Time zone table

Time zone entries in the standard time zone table (version 10.1).

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, Istanbul, Helsinki, Riga, Tallinn, Sofia, Vilnius	+2	Yes	Last Sun. Mar. (03:00)	Last Sun. Oct. (04:00)
04	Bucharest, Romania	+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	Kuwait City, Minsk, Moscow, St. 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, Calcutta, Madras, New Delhi, Colombo	+5.5	No		
16	Astana, Thimphu, Dhaka, Novosibirsk	+6	No		
17	Bangkok, Hanoi, Jakarta, Krasnoyarsk	+7	No		
18	Beijing, Chongqing, Hong kong, Singapore, Taipei, Urumqi, Irkutsk	+8	No		
19	Tokyo, Osaka, Sapporo, 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, Magadan, 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.), 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, Santiago	-3	No		
34	Newfoundland, Labrador	-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, Easter Island, Chile	-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	Scoresbysund, 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	Qaanaaq, Greenland	-4	Yes	2 nd Sun. Mar. (02:00)	1 st Sun. Nov. (02:00)
57	Western Australia: Perth	+8	No		
58	Caracas	-4.5	No		
59	CET standard time	+1	No		
60	Santiago, Chile	-4	Yes	2 nd Sun. Oct. (00:00)	2 nd Sun. Mar. (00:00)
61	Chile, Easter Island	-6	Yes	2 nd Sat. Oct. (22:00)	2 nd Sat. Mar. (22:00)
62	Baku	+4	Yes	Last Sun. Mar. (04:00)	Last Sun. Oct. (05:00)
63	UTC (GMT)	0	No		
64	UTC (GMT)	0	No		

For zones where the DST switch date changes annually, the time zone parameters have to be defined manually (chapter 3.3).

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:

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

11.1 Standard design of the display

Technical data		TZI.57.4	TZI.57.6	TZI.100.4	TZI.C.45	TZI.C.57
Display	digit height	57 mm	57/38 mm	100 mm	45/32 mm	57/38 mm
	number of digits	4	4+2	4	4+2	4+2
	format	HH:MM	HH:MM ^{SS}	HH:MM	HH:MM ^{SS}	HH:MM ^{SS}
Max. number of time zones	vertical	8	8	6	-	-
	horizontal	6	4	3	7	5
Power supply	AC standard	100 - 240 VAC, 50 - 60 Hz				
	DC on request	18 - 56 VDC				
Power consumption per time zone	AC or DC power	7 VA	8 VA	8 VA	6 VA	6 VA
Operating temperature		- 5 to + 55 °C (0 to 95 % humidity non condensing)				
Crystal base	running reserve	6 years				
	accuracy	±0,3 sec/day (at 20 °C without synchronization)				
Protection degree		IP 40				

Value of weights and dimensions are given with drawings

Accessories: remote IR controller included

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 µA
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 µA – 2 mA

12 Accessories

- | | |
|---|------------------------------------|
| • Allen key for unlocking and locking the frame catch | 1 pc |
| • Instruction manual | 1 pc |
| • Additional spacers | 3 pcs |
| • Wood screws for fixing the anchoring plate inclusive dowels | quantity to match number of fixing |
| • Additional spacers | quantity to match number of fixing |

13 Cleaning

Clean surface of clock only. Use soft rags and antistatic detergents.

14 Disposal of used batteries



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

15 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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