DEVICE OPERATION MANUAL
ZA MATRIX and ZB MATRIX Series Clock

1. Introduction

The devices of ZA MATRIX and ZB MATRIX series are compact clocks with various configuration options. An intuitive user menu operated by a remote control allows you to fully customise the device. The clock is also equipped with a network communication module and allows remote configuration through the "Website" and time synchronization using the Internet time servers.

The clock enables:
- adjusting the time of the presentation: the clock, the date, and the temperature,
- adjusting the date format and the time format (12-hour or 24-hour),
- automatic and manual brightness control,
- working in the ECO mode allowing you to reduce power consumption,
- signaling 30 alarms through a built-in transmitter,
- choosing the shape of the display font,
- automatic time change from the standard time to the daylight saving time and from the daylight saving time to the standard time for various locations (Europe, Australia, the United States of America, Canada, Israel),
- GPS time synchronization (available with GPS option),
- synchronization using the NTP Internet servers (requires the Internet access),
- Master Mode – a local time server compatible with NTP (does not require the Internet access),
- synchronization with the local "Master Mode" server (does not require the Internet access),
- configuration through the built-in "Website" (does not require the Internet access).
- Display (content) synchronization in 3 modes (master, basic slave – master transmits only display information, full slave – master transmits display information and temperature) between any types of clocks (requires the access to the local network),
- setting a unit of measurement for the displayed temperature (Celsius degrees or Fahrenheit degrees),
- setting temperature offset,
- setting an individual clock name (requires the access to the local network),
- setting a language of WWW page (English or Polish, requires the access to the local network),
- stopwatch function, a timer counting up and a timer counting down. The end of counting is signalled by a built-in relay,
- DHCP client function,
- time and content synchronization using the RS-485 interface,
- mode of counting down and signaling breaks (school breaks or breaks at work).

2. Clock connectors

Fig. 1 shows the device's controller connectors that are available after removing the controller housing cover.
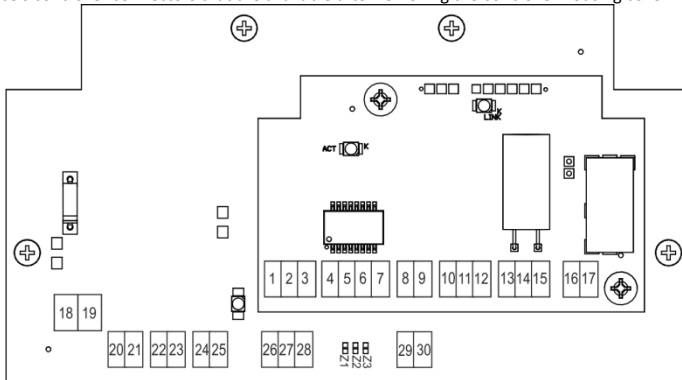

fig. 1 *MATRIX series clock connectors*

Tab. 1. List of the MATRIX series clock connectors

Pin number	Function	Symbol	Remarks	Wire colour	Alternative wire colour
1	RS-485	B	RS-485 interface inverting line	orange	white
2		A	RS-485 interface non-inverting line	red	brown
3		GND	GND line of the RS-485 interface	black	green
4	Ethernet	RX+	Pin no. 3 plugs RJ–45	green-white	
5		RX-	Pin no. 6 plugs RJ–45	green	
6		TX+	Pin no. 1 plugs RJ–45	orange-white	
7		TX-	Pin no. 2 plugs RJ–45	orange	
8	Not used	POE1	-	-	
9		POE2	-	-	
10	Temp. probe	5V	Power supply for temp. probe.	red	brown
11		TEM	Temp. probe signal	orange	white
12		GND	Ground of the system	black	green
13	GPS module	GND	Ground of the system	black	green
14		GPS	GPS module signal	orange	white
15		5V	Power supply for GPS	red	Brown
16	Relay (alarm signalling device)	RB		blue ("input")	
17		RA	Closing contact, normally open;	brown ("return")	
18	Power supply for the controller	POWER 5V	-	red	
19		POWER GND	-	black	
20, 22, 24	Displaying content	S1, S2, S3	LED modules signals	white	
21, 23, 25		GND	Ground of the system	green	brown
26	IR sensor	5V	Power supply for IR sensor	brown	
27		IR	IR sensor signal	white	
28		GND	Ground of the system	-	
29	Brightness sensor	F	Brightness sensor signal	yellow	
30		GND	Ground of the system	green	

To gain access to the controller housing, LED module must be removed. Tab. 2 describes under which LED module the controller is located, counting from the left.

Tab. 2 Controller location in MATRIX series clocks

Model of the clock	ZA30-L MATRIX	ZB30-L MATRIX	ZA40-L MATRIX	ZB40-L MATRIX
Numbers of the LED modules	1, 2	1, 2	2	2

NOTE! Removing the housing cover should be carried out with the power disconnected. This task must be performed with caution.

3. Configuring the clock using the menu

The basic configuration method is by means of the remote control through the user menu.

fig. 1 shows the remote control, along with the explanation of the function of each button. You enter the user menu using the **MENU** button. You navigate and modify the respective parameters using the buttons ↑ , ↓, ← and →.
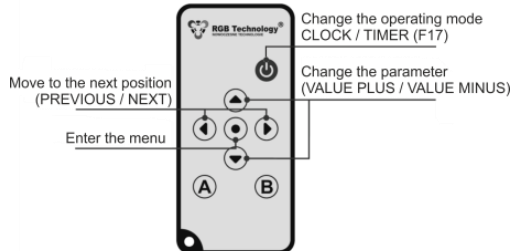

fig. 2 *Remote control*

To **add a remote control** to the device:
- plug in device (if it was plugged in, unplug for about 10 seconds, then plug in again);
- direct remote control to the display, and enter the following sequence of buttons:

A, B, ↓, A, ↓, ↓, B;

The time between pressing next buttons must be shorter than 1s.

Word "SAVE" should appear for a moment (if the remote has already been in the memory of the clock, it should display "dub").

NOTE! Key sequence should be entered within 120 seconds after plug in.

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Tab. 3 shows the structure of the main menu functions with the description.

Tab. 3 *Main menu structure*

Menu position	Function description
F1	Manual setting of the time and the date
F2	Configuration of the presented parameters
F3	Configuration of the date format
F4	Configuration of the time synchronization[1]
F5	Configuration of the display brightness
F6	Configuration of the alarms
F7	Configuration of the ECO mode
F8	Configuration of the display font
F9	Restoring the default settings
F10	Configuration of temperature offset
F11	Configuration of display synchronization
F12	Displaying information about the signal strength or disconnection of the GPS module
F13	Regional settings, such as location, time zones, daylight saving time/standard time
F14	Stopwatch / timer / long-range timer function
F15	Configuration of the device network settings (static addressing IP/DHCP)
F16	Configuration of the RS-485 interface mode (the mode display synchronization)
F17	Quick-access timer configuration
F18	Configuration of blocking the restoration of the factory settings by shorting the GPS pin to GND

To **set the clock (enter the current date and time),** you should:
1) Call the configuration menu by pressing the **MENU** key.
2) Select the „**F1"** function using the ↑ and ↓ keys and confirm it with the → key. →.
3) Using the ↑ and ↓ keys, modify the date and the time. Successively enter: the day of the month, the month, the year, the hour, the minute, and confirm the parameters with the → key.
4) After entering the complete time, the clock will automatically exit the menu.

NOTE! **Before setting time from the website, the menu or automatically, configure regional settings.**

NOTE! A blinking number indicates the time or date parameter which is being modified.

NOTE! To ensure that your device makes automatic changes between the daylight saving time and the standard time correctly, you should properly configure the time zone and activate taking into account the daylight saving time.

NOTE! When you set the clock on the last Sunday in March or on the last Sunday in October, take into account the information included in point **4. Daylight Saving Time.**

To **activate/deactivate displaying individual information and to modify the time of its presentation (the clock, the date, the thermometer)**, you should:
1) Call the configuration menu by pressing the **MENU** key.
2) Select the „**F2"** function using the ↑ and ↓ keys and confirm it with the → key.
3) To activate displaying the clock **(C)** set **Y** using the ↑ and ↓ keys and confirm it with the → key.
4) Next, using the ↑ and ↓ keys, modify the clock display time „**Cd"** and confirm it with the → key.
5) To activate the display of the date **(d)** set **Y** using the ↑ and ↓ keys and confirm it with the → key.
6) Next, using the ↑ and ↓ keys, modify the date display time „**dd"** and confirm it with the → key.
7) To activate the display of the thermometer **(t)** set **Y** using the ↑ and ↓ keys and confirm it with the → key.
8) Using the ↑ and ↓ keys modify the temperature display time „**td"** and confirm it with the → key.
9) The clock will return to the main menu, to exit the main menu, press the ← key.

NOTE! If the respective parameter of the presentation (the clock, the date or the thermometer) is deactivated by setting **N**, the parameter presentation time step will be skipped.

To **change the displayed date format**, you should:
1) Call the configuration menu by pressing the **MENU** key.
2) Select the „**F3"** function using the ↑ and ↓ keys and confirm it with the → key.
3) Using the ↑ and ↓ keys, select your preferred format of displaying the date and confirm it with the → key.

	ZA/ZAH	ZB/ZBH
dny	DD-MM YYYY	DD-MM-YY
ndy	MM-DD YYYY	MM-DD-YY
ynd	YYYY MM-DD	YY-MM-DD
ydn	YYYY DD-MM	YY-DD-MM

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[1] Option available in the variant equipped with the network synchronizations module or the GPS module.

| **dn** | DD-MM | DD-MM |
| **nd** | MM-DD | MM-DD |

4) Using the ↑ and ↓ keys , select your preferred format of displaying the time and confirm it with the → key.
   tf 12   12-hour format
   tf 24   24-hour format

5) Using the ↑ and ↓ keys , select your preferred leading zeros format of displaying the time and confirm it with the → key.
   tLZ Y   time leading zeros format on
   tLZ n   timeleading zeros format off

6) Using the ↑ and ↓ keys, select the time colon blinking option (applies to the ZA series clocks only) and confirm with the → key.
   bLC Y   time colon blinking option on,
   bLC n   time colon blinking option off;

7) Using the ↑ and ↓ keys, activate the time synchronization indicator (applies to the NTP synchronization) and confirm with the → key.
   SIn Y   time synchronization indicator on,
   SIn n   time synchronization indicator off;

   NOTE! The synchronization indicator is displayed only while the time is displayed. While the temperature and date are displayed, the indicator is disabled. The synchronization indicator is displayed by the lower dot between the digits representing hours and minutes. It indicates a synchronization problem or no NTP synchronization.

8) The clock will return to the main menu, to exit the main menu, press the ← key.

To **configure time synchronization or to activate the Master Mode**[2]**,** you should:
   1) Call the configuration menu by pressing the **MENU** key.
   2) Select the **F4** function using the ↑ and ↓ keys and confirm it with the **→ key.**
   3) Using the ↑ and ↓ keys, select your preferred synchronization mode and confirm it with the → key.
      S no   synchronization inactive (**inactive Master Mode)**
      S GP   GPS satellite synchronization
      S nt   NTP network synchronization
      S nb   NTP Multicast/Broadcast network synchronization,
      S rS   content synchronization using the RS-485 interface;
   4) Using the ↑ and ↓ keys, activate/deactivate the Master Mode and confirm it with the → key.
      tb y   Master Mode active
      tb n   Master Mode inactive
   5) The clock will return to the main menu, to exit the main menu press the ← key.
      NOTE! Before setting time from the website, the menu or automatically, configure regional settings.
      NOTE! The satellite synchronization requires the GPS module. The network synchronization requires the Internet access.
      NOTE! The Master Mode cannot be activated when the synchronization mode is disabled.

To **activate the automatic display brightness control**, you should:
   1) Call the configuration menu by pressing the **MENU** key.
   2) Select the **„F5"** function using the ↑ and ↓ keys and confirm it with the → key.
   3) Using the ↑ and ↓ keys, activate the automatic brightness control „**br A**" and confirm it with the → key.
      br 1   Minimum brightness
      …   …
      br 10   Maximum brightness
      br A   Automatic brightness
   4) Using the ↑ and ↓ keys, select your preferred automatic brightness control profile and confirm it with the → key.
      Pr 1   Profile 1: Internal standard
      Pr 2   Profile 2: Internal dynamic
      Pr 3   Profile 3: External standard
      Pr 4   Profile 4: External dynamic

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[2] Option available in the variant equipped with the network synchronizations module or the GPS module.

To **set the display brightness manually**, you should:
1) Call the configuration menu by pressing the **MENU** key.
2) Select the „**F5**" function using the ↑ and ↓ keys and confirm it with the → key.
3) Using the ↑ and ↓ keys, activate your preferred brightness and confirm it with the → key.
   br 1   Minimum brightness
   …   …
   br 9   Maximum brightness
4) The clock will return to the main menu, to exit the main menu, press the ← key.

To **enter or modify the alarm**, you should:
1) Call the configuration menu by pressing the **MENU** key.
2) Select the „**F6**" function using the ↑ and ↓ keys and confirm it with the → key.
3) Using the ↑ and ↓ keys, select one of the available alarms **(from A1 to A30)** and confirm it with the → key.
   A 1   alarm 1
   …
   A 30   alarm 30
4) Using the ↑ and ↓ keys, activate an alarm (**On Y**) and confirm it with the → key.
5) Using the ↑ and ↓ keys, modify the time of activating the alarm. Successively enter: first the hour, next the minute, and confirm the parameters with the → key.
6) Using the ↑ and ↓ keys, enter the alarm duration period in seconds **(t)** and confirm it with the → key.
7) Using the ↑ and ↓ keys, select your preferred alarm mode: **ALLd** (ever day) **SELd** (selected days) and confirm it with the → key.
8) If you choose the **SELd** mode (selected days), you should subsequently select the days in which the alarm is to be active (e.g. active on Monday **d1 Y**, inactive on Monday **d1 n**), every time proceeding by using the → key.
   d1   Monday
   d2   Tuesday
   …
   d7   Sunday

To **activate the ECO mode of the display,** you should:
1) Call the configuration menu by pressing the **MENU** key.
2) Select the „**F7**" function using the ↑ and ↓ keys and confirm it with the → key.
3) Using the ↑ and ↓ keys, activate the ECO mode „**ECO Y**" and confirm it with the → key.
   ECO Y   yes
   ECO n   no
4) Using the ↑ and ↓ keys, modify the value of the entered time of **activating the clock display**, next confirm it with the → key.
5) Using the ↑ and ↓ keys, modify the value of the entered time of **deactivating the clock display**, next confirm it with the → key.
6) The clock will return to the main menu, to exit the main menu, press the ← key.
   NOTE! When the ECO mode is active (**ECO Y**) and the time of activating and deactivating the clock is the same, the clock will be **on** for 24 hours.

To **change the display font shape,** you should:
1) Call the configuration menu by pressing the **MENU** key.
2) Select the „**F8**" function using the ↑ and ↓ keys and confirm it with the → key.
3) Using the ↑ and ↓ keys, select your preferred font shape and confirm it with the → key.
   Fnt1   rounded font
   Fnt2   seven-segment font

To **restore factory settings of the clock by using the remote control,** you should:
1) Call the configuration menu by pressing the **MENU** key.
2) Select the „**F9**" function using the ↑ and ↓ keys and confirm it with the → key.
3) Using the ↑ and ↓ keys, select **res Y** and confirm it with the → key.
   NOTE! This function is used to fully restore factory settings, including resetting the alarm and making the default network configuration. This function doesn't reset a remote control codes. When the device is equipped with LAN module the network settings will be reset as well.

To **set a unit of measurement for the displayed temperature and its offset** using a remote control, you should:
1) Call the configuration menu pressing the **MENU** key.
2) Select the **F10** function using the keys ↑ and ↓ and confirm it with the key →.
3) Using the ↑ and ↓ keys, select a unit of measurement for the temperature and confirm it with the → key.
   tU °C   Celsius degrees
   tU °F   Fahrenheit degrees
4) Using the keys ↑ and ↓ select „**Of Y**" and confirm it with the key →.
5) Using the keys ↑ and ↓ set the appropriate temperature offset value within the range of ±9.9°C and confirm it with the key →.
   Of Y   yes
   Of N   no

To **configure the display (content) synchronization** using a remote control, you should:
1) Call the configuration menu pressing the **MENU** key.
2) Select the **F11** function using the keys ↑ and ↓ and confirm it with the key →.
3) Using the keys ↑ and ↓ select „**SC Y**" and confirm it with the key →.
4) Using the keys ↑ and ↓ set the appropriate synchronization mode „**SC Cb**" (Slave - Content Basic)**,** „**SC Cf**" (Slave - Content Full)**,** „**SC Sr**" (Master – Server Content) and confirm it with the key →.

   NOTE! The **only** result of the above configuration is setting/switching over to the selected operation mode. Full configuration of display synchronization requires configuring through the webpage. For a Slave device (basic or full), you should configure the IP address of the Master being the synchronization source.

To **view information about the signal strength or disconnection of the GPS module** using the remote control as follows:
1) Call the configuration menu pressing the **MENU** key.
2) Select the „**F12**" function using the ↑ and ↓ keys and confirm it with the → key.
   GP Un   GPS unconnected
   GP NO   GPS no signal
   GP PS   GPS poor signal
   GP GS   GPS good signal

To **configure the clock location, the time zone, taking into account the daylight saving** time, you should:
1) Call the configuration menu by pressing the **MENU** key.
2) Select the **F13** function using the ↑ and↓ keys and confirm it with the → key**.**
3) Using the ↑ and ↓ keys, select the clock location and confirm it with the → key.
   LO EU   location Europe
   LO AU   location Australia
   LO US   location the United States
   LO CA   location Canada
   LO IL   location Israel
4) Using the ↑ and ↓ keys, activate/deactivate taking into account the daylight saving time and confirm it with the → key.
   dst y   yes
   dst n   no
5) Using the ↑ and↓ keys, activate/deactivate the time zone and confirm it with the → key.
   G y   yes
   G n   no
6) Using the ↑ and ↓ keys, select a time zone and confirm it with the → key.
   -12   UTC zone -12:00
   …   …
   14   UTC zone +14:00
7) The clock will return to the main menu, to exit the main menu, press the ← key.
   NOTE! While configuring regional settings, the user must be aware of the time zones in the available locations.
   NOTE! For the Polish official time, you should enter the UTC+1 (G 01) time zone and activate taking into account the daylight saving time „**dst y**"
   NOTE! When you are setting the time zone, remember to maintain the conformity with the preset location. The illustration below will help you to choose the appropriate time zone.

To **configure and activate the stopwatch/timer function,** you should:
1) Call the configuration menu, by pressing the **MENU** key.
2) Select the **F14** function using the ↑ and ↓ keys and confirm it with the → key.
3) Using the ↑ and ↓ keys, select a particular special function of the clock and confirm it with the → key.

      STO   **Stopwatch**,
      tiUP   (**Timer Up**) timer counting up from 0 to the preset value,
      tiDO   (**Timer Down**)   timer counting down from the preset value to 0
      LtUP   **(Long Range Timer Up)** long-range timer counting up from 0 to the preset value,
      LtdO   **(Long Range Timer Down)** long-range timer counting down from the preset value to 0,
      brEA   **Breaks**.

  NOTE! In the long-range timer, values over 24 hours are presented by alternating the display of time in days, e.g. "4 days" and the display of time in hours and minutes (HH:MM format for the ZA series and HH:MM:SS format for the ZB series). Values below 24 hours are presented by displaying time in the HH:MM format for the ZA series and in the HH:MM:SS format for the ZB series.

  NOTE! For the ZA series, when the long-range timer value is less than an hour, the time display format will change from hours and minutes to minutes and seconds (HH:MM -> MM:SS).

  NOTE! The breaks mode is configured only through the "Website" (Web-panel).

4) After selecting the **STO** (stopwatch) function, press the **A** key to start counting.
5) After selecting the **tiUP** or **tiDO** function (timers), you should set the value to/from which the timer is supposed to count.
    Setting the particular value on the hour/minute/second position is done using the ↑ , ↓ and → keys.
6) After selecting the **LtUP** or **LtDo** function (long-range timers), set the preset value of days to count down, confirm the selection with the → key, and then set the value of hours and minutes.
7) After configuring the selected timer mode, press the **A** key to start counting.
8) Functions of the keys:
   - **A** – stop the counter/restart counting,
   - **B** – restore initial counter value (active only when counting is stopped),
   - ← – return to the F14 menu.
9) Range/resolution dependent on the clock type:
   - **ZAXX**: maximum value 99:59   (Minutes:Seconds)
   - **ZBXX**: maximum value 99:59:59   (Hours:Minutes:Seconds)

NOTE! Timer settings begin from hours for the clocks of the ZBXX type and from minutes for the clocks of the ZAXX type.

NOTE! After exiting the F14 menu, counting is active in the background – after re-entering the previously selected function, the current counter value will be displayed regardless of the state (counting, stop).

NOTE! Activating any function such as counting, exiting the F14 menu and re-entering the F14 menu and selecting another function will stop counting and cause erasing the counter.

NOTE! Setting the timer counting values is possible only when the timers are stopped. In addition, setting the counting value to 00:00 or 00:00:00 (depending on the clock type) causes looping and resetting the counting value – protection against the 0 setting.

NOTE! Resetting the counter is possible only after having it stopped, otherwise pressing the **B** key will cause no action.

NOTE! When the selected timer finishes counting, the relay will be activated for 2 seconds (or other time configured via the Web-panel). After deactivating the relay, recounting with the same settings starts after pressing the **A** key. The relay can be deactivated manually using the B key.

NOTE! After pressing the → key in the F14 menu, the name of the latest set function will be displayed, and, if no function has been set/activated before, the selection will begin from the stopwatch function **"STO"** by default.

To **configure the network settings** using the remote control, you should:
1) Call the configuration menu by pressing the **MENU** key.
2) Select the **F15** function using the ↑ and ↓ keys and confirm it with the → key.
3) Select the given function using the ↑ and ↓ keys and confirm it with the → key:
      StAt   static addressing (default: 192.168.0.11),
      dHCP   dynamic addressing - DHCP (requires an active DHCP server in the network).
4) Exit the configuration menu using the ← key.

NOTE! Changing the operation mode will restart the device when exiting the menu. This will be signalled by the message: "rebo(ot)".

To **configure the content display synchronization** with the remote control, **using the RS-485 protocol**, you should:
1) Call the configuration menu by pressing the **MENU** key.
2) Select the **F16** function using the ↑ and ↓ keys and confirm it with the → key.
3) Select the appropriate synchronization mode using the ↑ and ↓ keys and confirm it with the → key:
   - **rS0F**   **no synchronization of the content display,**
   - **rSnA**   **master clock – master,**
   - **rSSL**   **slave clock - slave.**
4) Exit the configuration menu using the ← key.

NOTE! The default value for each device is "rSSL".

NOTE! The content display synchronization using RS-485 is independent of NTP or GPS time synchronization.

To **configure the quick-access timer** using the remote control, you should:
1) Call the configuration menu by pressing the **MENU** key.
2) Select the **F17** function using the ↑ and ↓ keys and confirm it with the → key.
3) Using the ↑ and ↓ keys, select the appropriate timer/stopwatch mode and confirm with the → key:
   - **StO**   **Stopwatch,**
   - **tIUP**   (**Timer Up**) timer counting up from 0 to the preset value,
   - **tIdO**   (**Timer Down**) timer counting down from the preset value to 0,
   - **LtUP**   **(Long Range Timer Up)** long-range timer counting up from 0 to the preset value,
   - **LtdO**   **(Long Range Timer Down)** long-range timer counting down from the preset value to 0,
   - **BrEA**   **Breaks**.
4) Using the ← key, exit the configuration menu.

NOTE! The default value for each device is "StO".

NOTE! The process of changing the operating mode between the clock and the quick-access timer can be activated using the red POWER button on the IR remote control or the "MODE" button on the wired remote control/panel communicating via RS485.

NOTE! When the quick-access timer is called, the countdown of other active timers is interrupted and there is an immediate switch to the quick-access timer.

To **do a hardware restore of the clock factory settings,** you should:
1) Disconnect the device from the power supply.
2) Make sure that the GPS connector cable is not connected (disconnect if there is).
3) Connect the GPS pin to GND pin inside the connector.
4) Switch on the power.
5) Wait (about 3 seconds) until the clock signals reset by flashing of middle-segment digits.
6) Disconnect the GPS pin and GND pin inside the connector

NOTE! This function is used to fully restore factory settings, including resetting the alarm and making the default network configuration. This function doesn't reset a remote control codes. When the device is equipped with LAN module the network settings will be reset as well.

To **disable restoring the factory settings** using the above-mentioned method, you should:
1) Call the configuration menu by pressing the **MENU** key.
2) Select the **F18** function using the ↑ and ↓ keys and confirm it with the → key.
3) Use the ↑ and ↓ keys to select the appropriate mode and confirm it with the → key:
   - **Hrdn**   (**Hard reset disable – no**) – factory reset unblocked,
   - **HrdY**   **(Hard reset disable – yes)** – factory reset blocked;
4) Use the ← key to exit the configuration menu.

4.   Daylight Saving Time

a)   Europe

In accordance with EU Directive 2000/84/EC:

- the standard time is changed to the daylight saving time on the last Sunday in March (by adding one hour),
- the daylight saving time is changed to the standard time on the last Sunday in October (by taking away one hour).

Considering the above, in the countries following EU Directive 2000/84/EC, when the option of taking into account the daylight saving time is activated in the clock:

a) **On the last Sunday in March** there is no time interval between 01:00UTC + TimeZone and 01:59UTC + TimeZone. If you try to set the clock to the time within this interval, one hour earlier value is adopted, and it is assumed that the time has not yet been changed to the daylight saving time. As a result, within the nearest 60 minutes, the clock will take into account the change to the daylight saving time and will add one hour automatically.

b) **On the last Sunday in October,** the time interval between 01:00UTC + TimeZone and 01:59UTC + TimeZone appears twice. If you set the clock to the time within this interval, the clock will be set to the time indicated by the user, and it is assumed that the time has already been changed to the standard time.

b)   Australia

- the standard time is changed to the daylight saving time on the first Sunday in October at 2:00 AM of the local time (adding one hour),
- the daylight saving time is changed to the standard time on the first Sunday in April at 3:00 AM of the local time, taking into account DST, (taking away one hour).

The daylight saving time is not applied in North Australia, Queensland and West Australia. Setting time change, the user must consider the fact if the particular Australian territory (time zone) uses DST.

c)   United States and Canada

- the standard time is changed to the daylight saving time on the second Sunday in March at 2:00 AM of the local time (adding one hour),
- the daylight saving time is changed to the standard time on the first Sunday in November at 3:00 AM of the local time, taking into account DST, (taking away one hour).

The states of Arizona, Puerto Rico, Hawaii, Virgin Islands and Samoa do not change time. Setting time change, the user must consider the fact if the particular state, situated in the respective time zone, uses DST.

a)   Israel

- the standard time is changed to the daylight saving time on Friday before the last Sunday in March at 2:00 AM of the local time to 3:00 AM (adding one hour),
- the daylight saving time is changed to the standard time on the last Sunday in October at 2:00 AM of the local time to 1:00 AM (taking away one hour).

9

Appendix A: Supporting the "Website"

The ZA MATRIX and ZB MATRIX series clocks allow intuitive configuration through the built-in "Website".

To configure the network connection, follow the document **Network Card Configuration Manual**, to be downloaded from the following website:

http://rgbtechnology.pl/soft/

1. Connection with the device

The connection with the device is made through the Ethernet interface, while supporting the integrated „Website" is done via the Internet browser (recommended browser: Mozilla Firefox, version 16.0.2 or later).

To connect with the device, enter the IP address assigned to the device into the browser (default: **192.168.0.11**). In case of any problems with determining the IP address of the device, use the **RGB Devicer** or RGB ClockSet software.

Then, the device will ask you to enter: username and password (default User: **admin**, Password: **dbps**).

The device start-up - initial animation:

- **DHCP addressing** - the clock displays the word "DHCP", "IP" and the device address. If only the word "DHCP" is displayed, it means that there has been no active DHCP server in the network.
- **static addressing** - the clock displays the word "IP" and the device address.

NOTE! If you include a few clocks to the same network, the devices must be connected in succession and given a unique IP address, which will avoid an address conflict (initially all of them have the same default IP address).

2. Supporting the "Website"

The integrated "Website" consists of five webpages which allows you to configure various functions of the device.

NOTE! Always confirm the changes of the settings of the device parameters with the "Save" button.

2.1. Time tab

This tab allows you to configure the parameters connected with time.

- **Local date & time** – manual setting of the local time and date.
- **Regional settings** - manual setting of the device location, of the time zone and of allowing for the daylight saving time.
- **Time source for the clock**- configuration of the device synchronization mode (time sources for the clock). The available modes:
  - ✓ No synchronization,
  - ✓ GPS – time synchronization using the connected GPS receiver,
  - ✓ NTP – time synchronization using the NTP server,
  - ✓ RS485 – RGB Protocol – time and content synchronization using the RS-485 protocol,
  - ✓ NTP Multicast/Broadcast – time synchronization by listening to synchronization packets broadcast from the server (the clock does not poll the server).
- **Time source for other devices**– configuring time synchronization (the time source, the time zone, the daylight saving time, the IP addresses of time servers, the Master Mode).

Note! To make the time synchronization using the NTP servers work, you need the proper (taking into account local network addresses) configuration of the following parameters: "IP Address", " Subnet mask", " Gateway" in the **Advanced** tab and the connection of the device to the Internet.

2.2. Display tab

This tab allows you to configure the parameters connected with the device display.

- **Format** – configuring the displayed functions and their duration (the clock, the date, and the thermometer) and the date format. Ability to enable or disable leading zeros, time colon blinking (ZA series devices only), and time synchronization indicator.
- **Brightness** – configuring the display brightness and activating the automatic brightness control.
- **Thermometer settings** - configuration of the temperature unit and of the ambient temperature offset.
- **Display synchronization over Ethernet** – configuration of the display (content) synchronization, of selecting the operation modes, and of the field of the master clock IP address (required for the Slave operation modes).
- **Eco** – setting the energy saving mode (the time of activating the device, the time of deactivating the device).
- **Fonts** – selecting the display font.
- **Configuration import/export** - ability to import or export the configuration of the tab content from or to a file.

2.3. Alarms tab

This tab allows you to configure the parameters connected with the alarms.
- **Set alarm** – configuring a single alarm (activating, the operating time, the duration, the mode, the days of the week).
- **Alarms** – status of all available alarms.

The meanings of the alarm status symbols are described in Tab. 4

Tab. 4 *Alarm status symbols*

Symbol	Colour	Meaning
⊘	red	not set, inactive
✔	yellow	set, inactive
✔	green	set, active

2.4. Advanced tab

This tab allows you to configure the advanced parameters of the device.
- **Clock name** – an individual clock name.
- **Network** - network settings - ability to enable and configure the DHCP option, set the IP address, the subnet mask, the default gateway, the DNS addresses, and the ability to disable remote access to the device. When the DHCP function is active, the clock allows you to use the DHCP 42 option and the DHCP private option (default no. 230) - (Appendix C).
- **RS485** – setting the interface mode and the content display synchronization using RS-485. The modes to choose from: slave, master, off.
- **Password** – setting the user password.
- **Restart schedule** - allows you to program the device to restart at a specified time.
- **Default settings** – restores the factory settings.
- **Import/Export the whole configuration -** ability to import or export the whole device configuration from or to the file.

NOTE! The **"Default settings"** function fully restores the factory settings, including resetting the alarm and making the default network configuration.

NOTE! The "Disable remote access" function disables the access to the Web-panel through the website and the Clockset software. The access can only be restored by restoring the default settings.

2.5. Status tab

This tab allows you to read the device status.
- **Date & time** – reading the time and the date.
- **Sensors** – reading the sensors: the temperatures and the environment brightness.
- **GPS status** – reading information about the signal strength or disconnection of the GPS module.
- **NTP client status** - when the NTP configuration enabled, it displays the address of the remote time server and the time of the last synchronization.
- **Network** – reading the network interface configuration.
- **Device** – reading the software version, hardware version, an individual clock name and product name.
- **Advanced DHCP** – reading the status of the DHCP 42 option and the DHCP private option (default no. 230).

2.6. Firmware tab

The tab that allows you to read the software version, the device type and the software update.

2.7. Timers tab

The tab that allows you to change the device operation mode from the clock to the stopwatch or the timer.
- **Direct actions** - setting the device operation mode:
  - ✓ time - time display,
  - ✓ stopwatch - counting time - operated by means of the "Start|Stop" and "Reset" buttons of the Web-panel, or by means of the "A" and "B" buttons on the remote control. The reset option is available when the stopwatch has been stopped.
  - ✓ timer up - counts the time from zero to the preset end value,
  - ✓ timer down - counts the time from the preset start value to zero,
  - ✓ long-range timer up - counts the days and time from zero to the final value,
  - ✓ long-range timer down - counts the days and time from the preset initial value to zero,
  - ✓ breaks - shows the time left to the end of the current break. In the absence of an active break, the device will show the value "00:00".
- **Settings** – setting the start and end values for the "timer up/down" operation mode and setting the countdown end signal duration. The audible signalling device (buzzer) - before the end of the preset time - can be turned off using the "Reset" button or the "B" button on the device remote control. Possibility to set the quick-access timer (activated by the POWER button on the IR remote control or wired RS485 remote control).

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2.8. Breaks tab

The tab allows you to set parameters related to breaks. The device enables configuration of up to 30 breaks. The user defines the beginning of a break at a given time, its duration and the days on which the break is to be active. Additionally, the beginning and end of the break is signaled with an acoustic signal (in the case of a device equipped with an acoustic signaling device). During the break, the clock can work in three modes:

- **Clock**,
- **Timer down** (default setting),
- **Timer up**.

2.9. SNMP tab

The clock supports the SNMP protocol (agent mode) which enables managing the clock (reading parameters) and sending messages (traps) about events.

3. Default network settings

Tab. 5 shows the network settings of the Prestige Line clock with DHCP option disabled. Restoring the factory settings is possible using the respective function in the user menu or in the "Website".

Tab. 5 *Default network settings*

Parameter	Default value
User	admin
Password	dbps
IP address	192.168.0.11
Subnet mask	255.255.255.0
Default gateway	192.168.0.1

4. Configuring the Master NTP Mode (NTP server)

The ZA and ZB Matrix series clocks enable local synchronization of the Slave Clocks with the Master Clock. Table 6 shows an example of the clocks configuration. NOTE! The IP addresses of the NTP servers can be entered by the user only through the "Website".

Tab. 6 *Master Mode Configuration*

	Master Clock	Slave Clock
Local time synchronization - Master Mode [NTP server mode] ("Time" tab)	**Active**	**Inactive**
Remote time synchronization [time source for the clock] - Mode ("Time" tab)	**GPS or NTP**	**NTP**
Comments	**When NTP is selected as the synchronization source,** the Remote Time Server **fields**, from 1 to 5, **should contain server addresses compliant with NTP.**	**In the Remote Time Server field 1, enter the IP address of the Master Clock. The Remote Time Server fields, from 2 to 5, should be completed with addresses 0.0.0.0**
Synchronization ("Display" tab)[3]	**Master Mode**	**Slave Full Mode**
Static IP address ("Advanced" tab)	**192.168.0.11 (default)**	**192.168.0.12 and subsequent in the case of more devices**

5. Configuring the Master Mode – RS485

The ZA and ZB Matrix series clocks enable local synchronization of the Slave Clocks with the Master Clock using the RS-485 protocol. Table 7 shows an example of the clocks configuration. NOTE! The IP addresses of the NTP servers can be entered by the user only through the "Website".

Tab. 7 *Master Mode configuration– RS-485*

	Master Clock	Slave Clock
Remote time synchronization - Mode ("Time" tab)	**GPS or NTP**	**RS485 – RGB Protocol**
Comments	**When NTP is selected as the synchronization source,** the Remote Time Server **fields**, from 1 to 5, **should contain server addresses compliant with NTP.**	**–**
RS485 - Mode ("Advanced" tab)	**Master**	**Slave**

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[3] Relates to the content synchronization (e.g. temperature).

6. Changing the language of web page

To change the language, click at the bottom right corner on a flag symbolising the language. Available languages are Polish and English (default). After clicking on the desired flag, next to it should be displayed an information "Ustawiono język polski" or "Set English language", which means the correct language setting in the memory clock (feedback from the device).
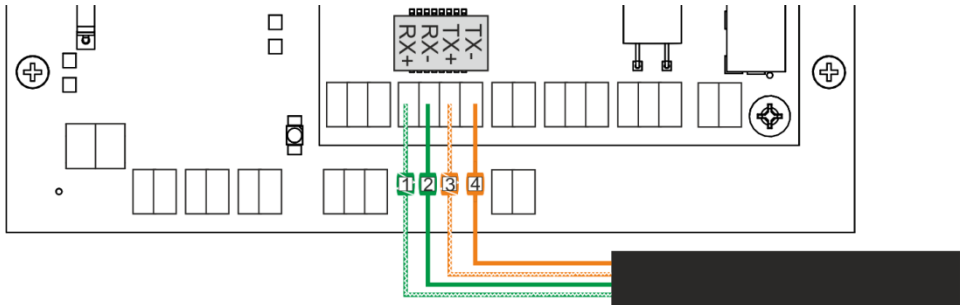
7. Connecting LAN to the clock

Fig. 3 LAN and clock wiring diagram

Legend:
Green-White -1-   - RX+ wire   Orange-White -3-   - TX+ wire
Green -2-   - RX- wire   Orange -4-   - TX- wire

Appendix B: Selected accessories (sold separately)

1. GPS GM-2 Receiver

The GPS GM-2 receiver (fig. 4) is used to synchronize the real time in the RGB Technology products. The synchronization signal is sent from the satellite transmitters located on the circumterrestrial orbits. This kind of solution guarantees the synchronization of time in every place in the world. The device works properly on condition that the receiver module can "see" the sky.
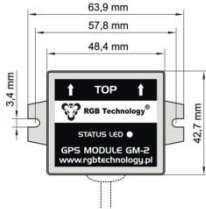

fig. 4 Receiver module GPS GM-2 – overall view

fig. 5 Receiver dimensions

The receiver is resistant to adverse atmospheric conditions – IP67 rating. To fasten the receiver, you can use the pressure-sensitive adhesive tape placed on the bottom of the receiver, use the band clips or screw it down with rawlbolts – as required. It is essential to orientate the receiver properly – the arrows near the inscription "TOP" must be directed upwards. The receiver should be located in the open air to ensure the stable signal reception from the satellites. While searching for the correct location of the antenna, make sure that the receiver has enough time for reaction – after selecting the convenient location, place the antenna there and wait for a dozen or so minutes. It is a standard procedure during the „cold boot" of the GPS receiver.

The GPS receiver has a LED informing about the work of the receiver.

Tab. 8. Description of the LED function - GPS

| LED	Meaning	What to do
doesn't shine	no power supply or the initialization of the receiver	if the diode doesn't start shining in a minute, check the receiver power supply
doesn't shine for 1 second / shines for a fraction of a second	no time synchronization, searching for the signal	if it lasts for more than 15 minutes, change the antenna location
shines for a second / doesn't shine for a fraction of a second	time is synchronized, searching for a stronger signal	if the diode doesn't start shinning with continuous light in 15 minutes, change the antenna location
shines with continuous light	time is synchronized, very good signal	working correctly, no need for changes
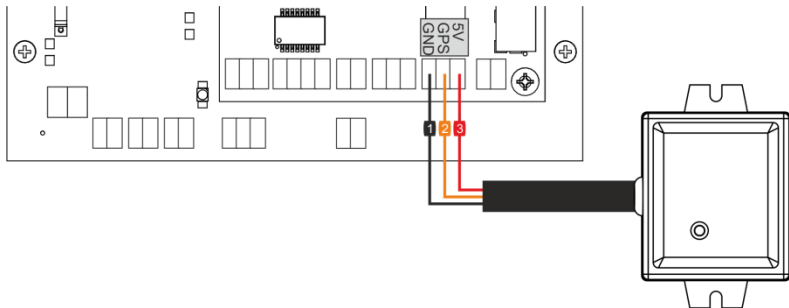
fig. 6 Connection the GPS module to the clock

Legend:
Black -1-   - 0.25 mm² - GND
Orange -2-   - 0.25 mm² - GPS signal cable
Red -3-   - 0.25 mm² - 5VDC

Alternative color scheme:
Green -1-   - 0.25 mm² - GND
White -2-   - 0.25 mm² - GPS signal cable
Brown -3-   - 0.25 mm² - 5VDC

NOTE! Remember to enable time synchronization via GPS! See page 4.

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2.   Temperature probe

Optionally, the device can be equipped with a temperature probe that allows you to measure and display the temperature in degrees Celsius (° C) or Fahrenheit (° F). The following signal cable length variants are available: 0.5m, 2m, 5m and 10m. The detailed description of the temperature probe is available in the DTR documentation according to the catalogue index number.
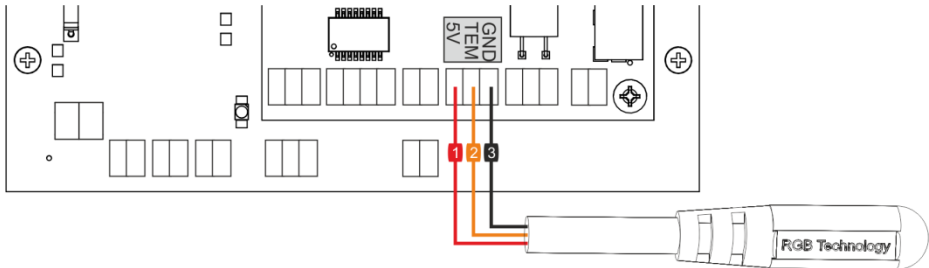

fig. 7 *Temperature probe and clock wiring diagram*

Legend:
Red -1-   - 0.25 mm² - 5VDC
Orange -2-   - 0.25 mm² - signal cable
Black -3-   - 0.25 mm² - GND

Alternative color scheme:
Brown -1-   - 0.25 mm² - 5VDC
White -2-   - 0.25 mm² - signal cable
Green -3-   - 0.25 mm² - GND

NOTE! Remember to enable temperature display!

3.   Buzzer

Optionally, the device can be equipped with an audible signalling device (buzzer). The user may choose one of two signalling device versions:
1)   volume of the audio signal at the level of 88dB;
2)   volume of the audio signal at the level of 108dB.

The standard cable length is 2m.
The detailed description of the signalling device is available in the DTR documentation according to the catalogue index number.
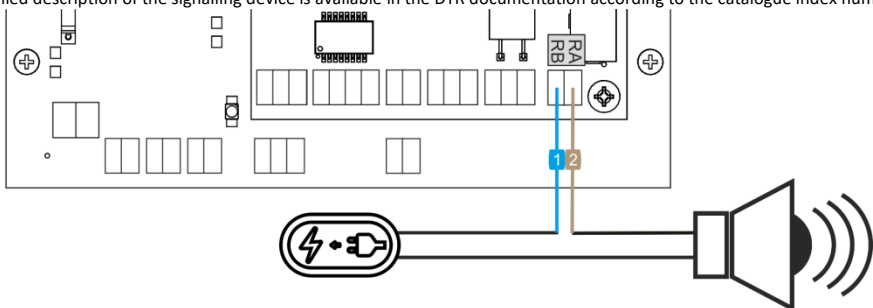

fig. 8 *Buzzer and clock wiring diagram*

Legend:
Blue -1-   - 0.5 mm² - contact "B" of the relay
Brown -2-   - 0.5 mm² - contact "A" of the relay

NOTE! Remember to configure alarms!

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Appendix C: Supporting Private DHCP Options (230) -„RGB Config String"

The clock, in addition to the standard DHCP client options (e.g. 1, 3, 6, 42), supports an additional private DHCP option by default no. 230 (vendor specific DHCP option), which allows advanced users and network administrators to perform group device configuration using the string of characters "RGB Config String". The configuration of the DHCP server is entered once and centrally, and the clocks, when obtaining an IP address lease, also download the configuration of: the time server (**tse** parameter), the time zone (**tzo** parameter), the daylight saving time rule (**dst** parameter), the 12-hour time format (**tf12** parameter). These parameters constitute the so-called "RGB Config String"; examples of the configuration strings are presented in Tab. 9.

NOTE! The clock, when obtaining the DHCP lease (device start-up) and when refreshing the DHCP lease, downloads the configuration data from the "RGB Config String". When the data is different from the currently present, it modifies its own settings and saves them in the non-volatile FLASH memory.

Tab. 9. Examples of the "RGB Config String" - additional option DHCP 230

Location	„RGB Config String" – additional option DHCP 230
Los Angeles	tse=pool.ntp.org;tzo=-08:00;dst=7 2 3 2 7 1 11 2;tf12=Y
Salt Lake City	tse=pool.ntp.org;tzo=-07:00;dst=7 2 3 2 7 1 11 2;tf12=Y
Chicago	tse=pool.ntp.org;tzo=-06:00;dst=7 2 3 2 7 1 11 2;tf12=Y
New York	tse=pool.ntp.org;tzo=-05:00;dst=7 2 3 2 7 1 11 2;tf12=Y
London	tse=pool.ntp.org;tzo=00:00;dst=7 -1 3 1 7 -1 10 2;tf12=N
Warsaw	tse=pool.ntp.org;tzo=01:00;dst=7 -1 3 2 7 -1 10 3;tf12=N
Tallinn	tse=pool.ntp.org;tzo=02:00;dst=7 -1 3 3 7 -1 10 4;tf12=N
Moscow	tse=pool.ntp.org;tzo=03:00;dst=N;tf12=N
Sydney	tse=pool.ntp.org;tzo=10:00;dst=7 1 10 2 7 1 4 3;tf12=N
Dubai	tse=pool.ntp.org;tzo=04:00;dst=N;tf12=N
Tel Aviv	tse=pool.ntp.org;tzo=02:00;dst=5 -1 3 2 7 -1 10 3;tf12=N
Ankara	tse=pool.ntp.org;tzo=03:00;dst=N;tf12=N
Kuala Lumpur	tse=pool.ntp.org;tzo=08:00;dst=N;tf12=N
Johannesburg	tse=pool.ntp.org;tzo=02:00;dst=N;tf12=N

Tab. 10. „RGB Config String" parameters – additional option DHCP 230

Parameter	Description	Examples
tse	Internet (domain) address or IP address of the time server	tse=pool.ntp.org tse=194.146.251.100
tzo	Time zone displayed in the format: HH:MM – zone with positive offset -HHMM – zone with negative offset	tzo=01:00 tzo=-05:00 tzo=00:00
dst	**Rule for time change in the "RGB Custom String" format. Details in Tab. 11.**	dst=7 -1 3 2 7 -1 10 3 dst=7 2 3 2 7 1 11 2 dst=N (disabling DST change)
tf12	Clock display mode in 12-hour format	tf12=N (24-hour format) tf12=Y (12-hour format)

NOTE! In the configuration of the "dst" parameter, individual number fields are separated with a "space". When "dst=N", time change is disabled.

Tab. 11. Description of the "dst" parameter value

DST start time				DST end time			
Day of a week	Number of the week in a month	Month	Hour	Day of a week	Number of the week in a month	Month	Hour
1 – Monday 2 – Tuesday 3 – Wednesday 4 – Thursday 5 – Friday 6 – Saturday 7 – Sunday	-1 – Last 1 – First 2 – Second 3 – Third 4 – Fourth	1 – January 2 – February 3 – March 4 – April 5 – May 6 – June 7 – July 8 – August 9 – September 10 – October 11 – November 12 – December	0 – 00:00 1 – 01:00 ... 23 – 23:00	1 – Monday 2 – Tuesday 3 – Wednesday 4 – Thursday 5 – Friday 6 – Saturday 7 – Sunday	-1 – Last 1 – First 2 – Second 3 – Third 4 – Fourth	1 – January 2 – February 3 – March 4 – April 5 – May 6 – June 7 – July 8 – August 9 – September 10 – October 11 – November 12 – December	0 – 00:00 1 – 01:00 ... 23 –23:00