Inveo Sp. z o.o.

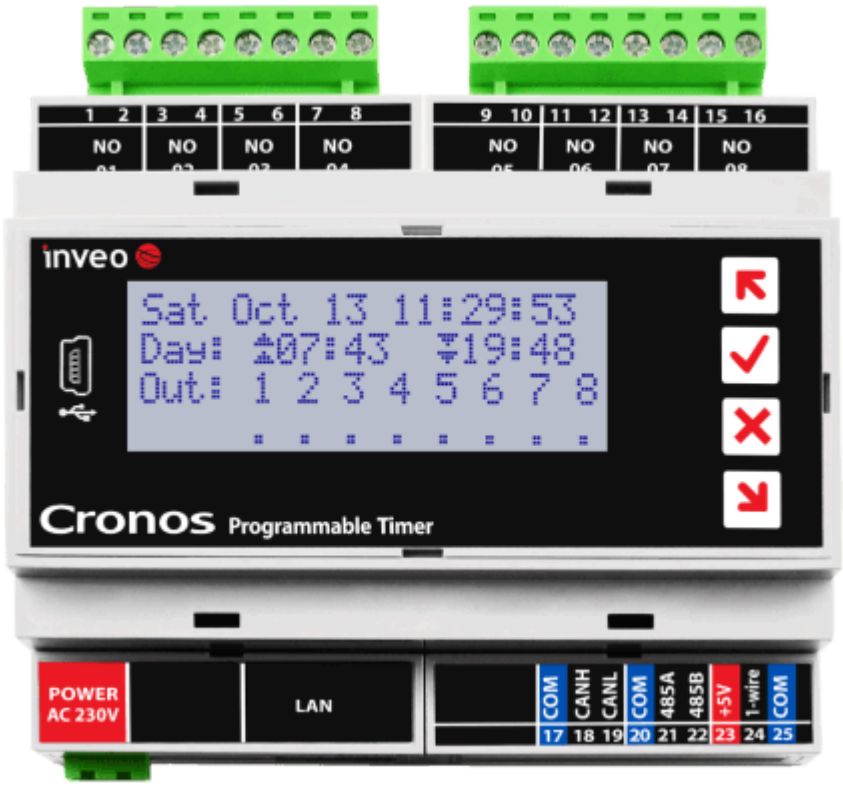
Cronos

Instruction Manual

Overview

Warning

This manual applies only to the firmware version v1.08 onwards. Inveo does not guarantee that the information contained in this document applies to previous firmware revisions.



Purpose of the device

The Cronos is a digital timer designed to implement timing functions in control applications.

Its main purpose is time control of electrical circuits, as per user's program, where activation and deactivation can be correlated to sunrises and sunsets. The built-in astronomical clock calculates the current sunrise and sunset times based on the geographical coordinates entered. Cronos enables programming of channel activation and deactivation times in the crontab table format, providing nearly unlimited freedom to define time intervals. Moreover, the controller can operate independently from the defined program, allowing for output control over LAN.

Cronos supports protocols such as TCP, UDP, UDP Multicast, HTTP GET, and KNX-IP in routing mode, allowing the user to define and send data frames over various protocols. Additionally, the device is equipped with a readable LCD display, presenting eg. the current date and time, sunrise and sunset times and relay output status.

Cronos can be powered with 230V AC and its enclosure is designed to attach to a DIN rail.

Changelog

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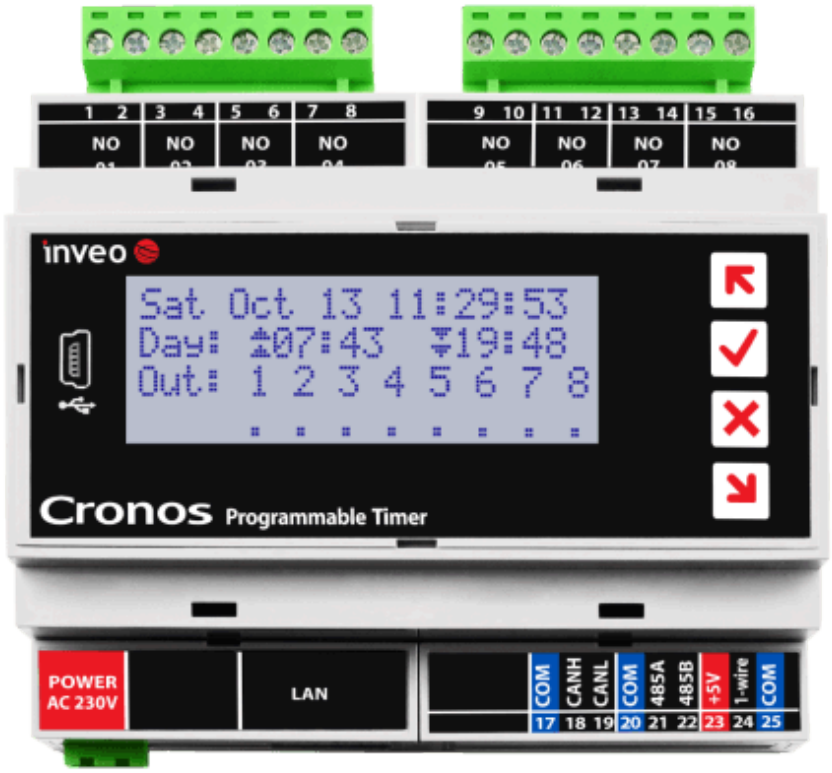
Device construction

Technical characteristics

Parameter	Description
Power supply	230V AC
Power consumption	5W (depending on the amount of activated outputs)
Outputs	**Output type:** NO, relay **Maximum voltage:** 250V AC **Maximum relay load:** 8A **Activation time:** 1ms **Deactivation time:** 5ms **Operating mode:** bistable, astable, monostable
Communication	Ethernet 10/100Mbps, RJ45 port

General characteristics:



- 8 250V relay outputs (maximum relay load 2A),
- Ethernet network connector,

- Readable LCD display,
- Astronomical clock,
- Programming via a WEB interface or integrated buttons and LCD display,
- Output control via LAN support,
- Precise Real Time Clock with battery backup and SNTP synchronization,
- Enclosure intended to mount on a DIN rail.

The device supports the following network protocols:

- SNMP,
- HTTP/HTTPS,
- KNX IP in routing mode.

Network configuration

> **Warning**
>
> **After the initial power-up, it's needed to configure the device.**

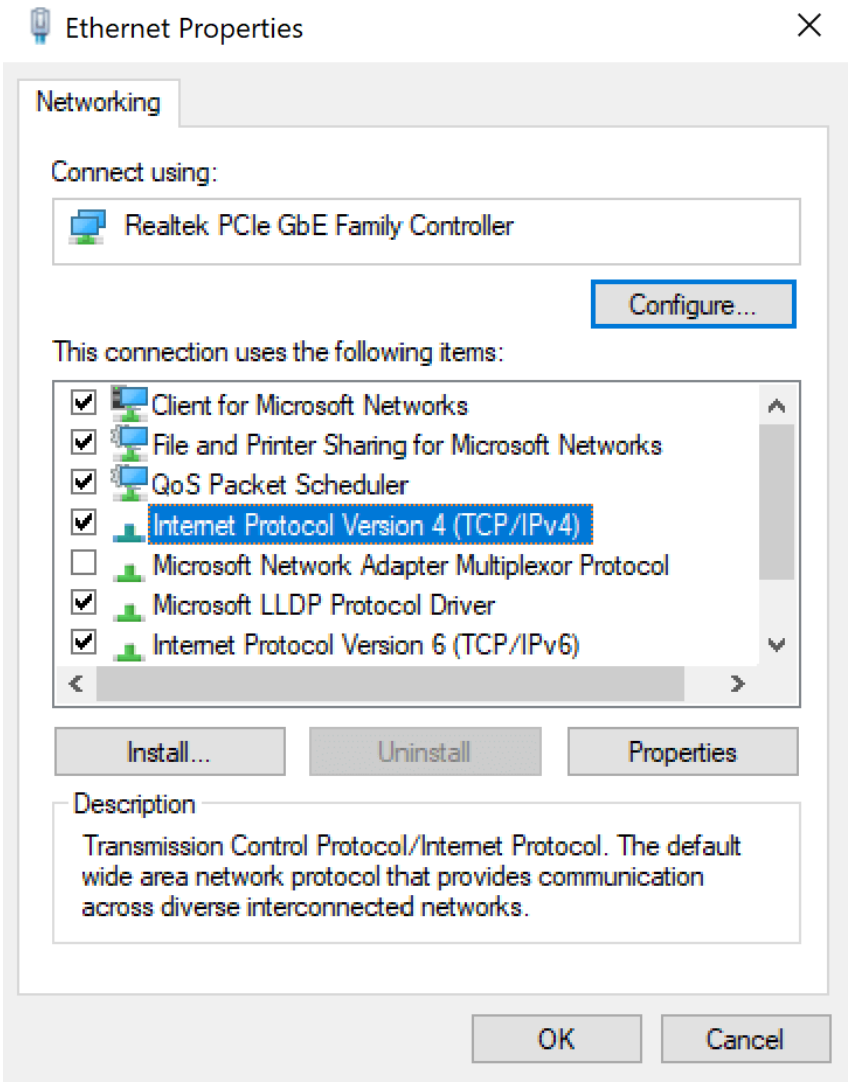
Changing the device's IP address

During configuration, it's needed to change the subnet address of the computer on the same network.

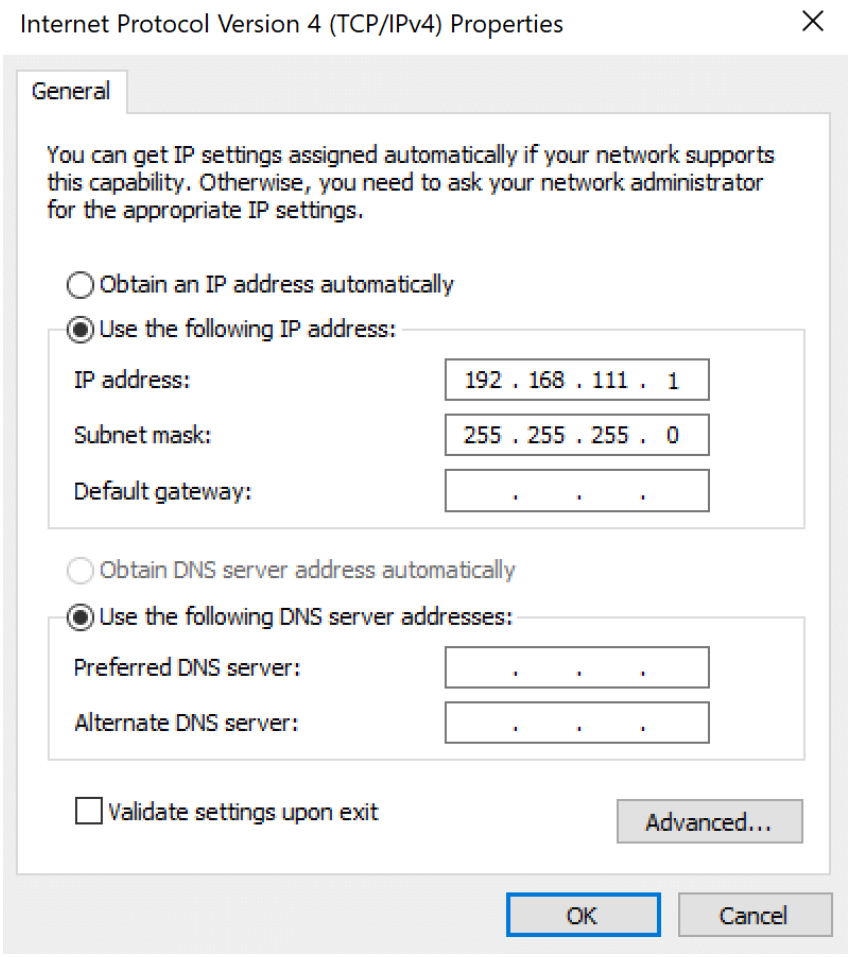
To access the computer's network configuration, do one of the following:

- Press **Win + R**, type in `ncpa.cpl`, and then press **Enter**.
- Alternatively, go to:
  Start → Control Panel → Network and Internet → Network and sharing center → Change adapter settings.

Then:
1. Select the network connection, 1. Right-click it and select **Properties**, 1. After selecting this option, network connection configuration screen will appear.



Select **Internet protocol version 4 (TCP/IPv4)** and type in the following parameters:

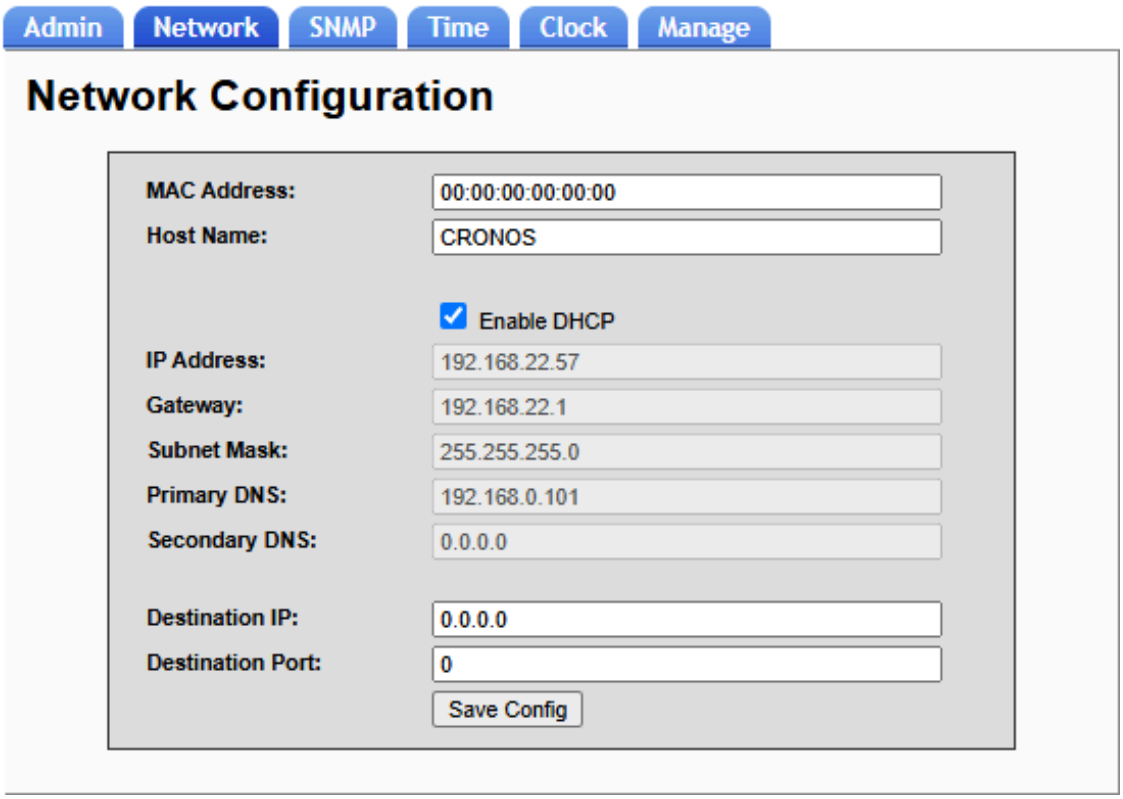


Note

After applying the configuration with OK, start a web browser and type in the following address: 192.168.111.15. (Default user and password: admin/admin00)

Network settings configuration

In the **Network** tab, it's possible to change LAN settings.



If the **Enable DHCP** option is selected, the module will try to download the IP address, subnet mask, network gateway and DNS addresses from the DHCP server automatically.

The following fields are used for network configuration:

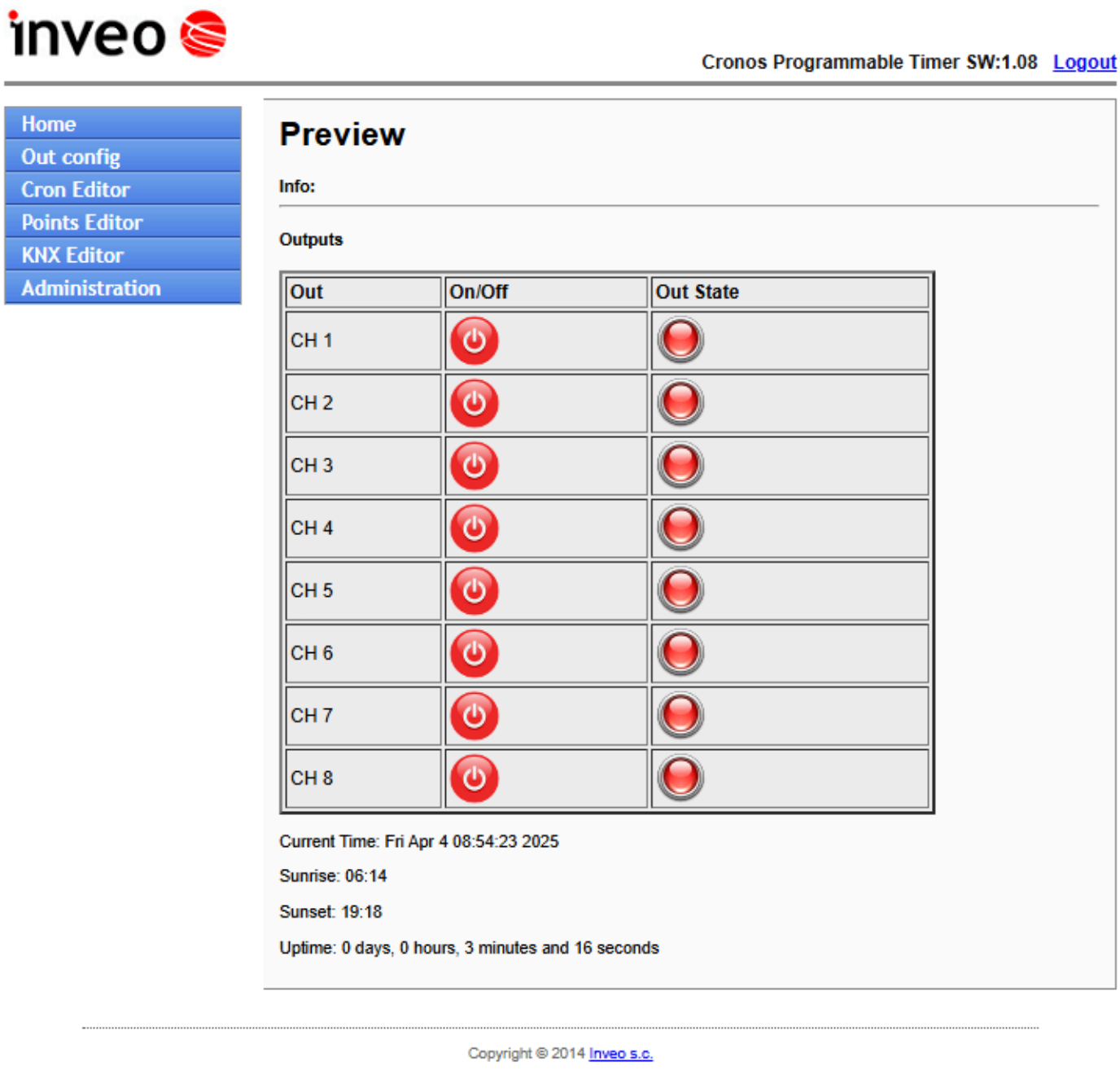
- **MAC Address** – Module MAC address,
- **Host Name** – NETBIOS name,
- **Enable DHCP** – Selection of this field forces the use of DHCP-assigned address,
- **IP Address** – Module IP address (the module will be visible in the network under this address),
- **Gateway** – Network gateway,
- **Subnet Mask** – IP subnet mask,
- **Primary DNS, Secondary DNS** – DNS server addresses.

> **Tip**
>
> **After making changes, apply them using the Save button**

Device configuration

Home tab

After correct login credentials are provided, the user can preview the current state of outputs and the device

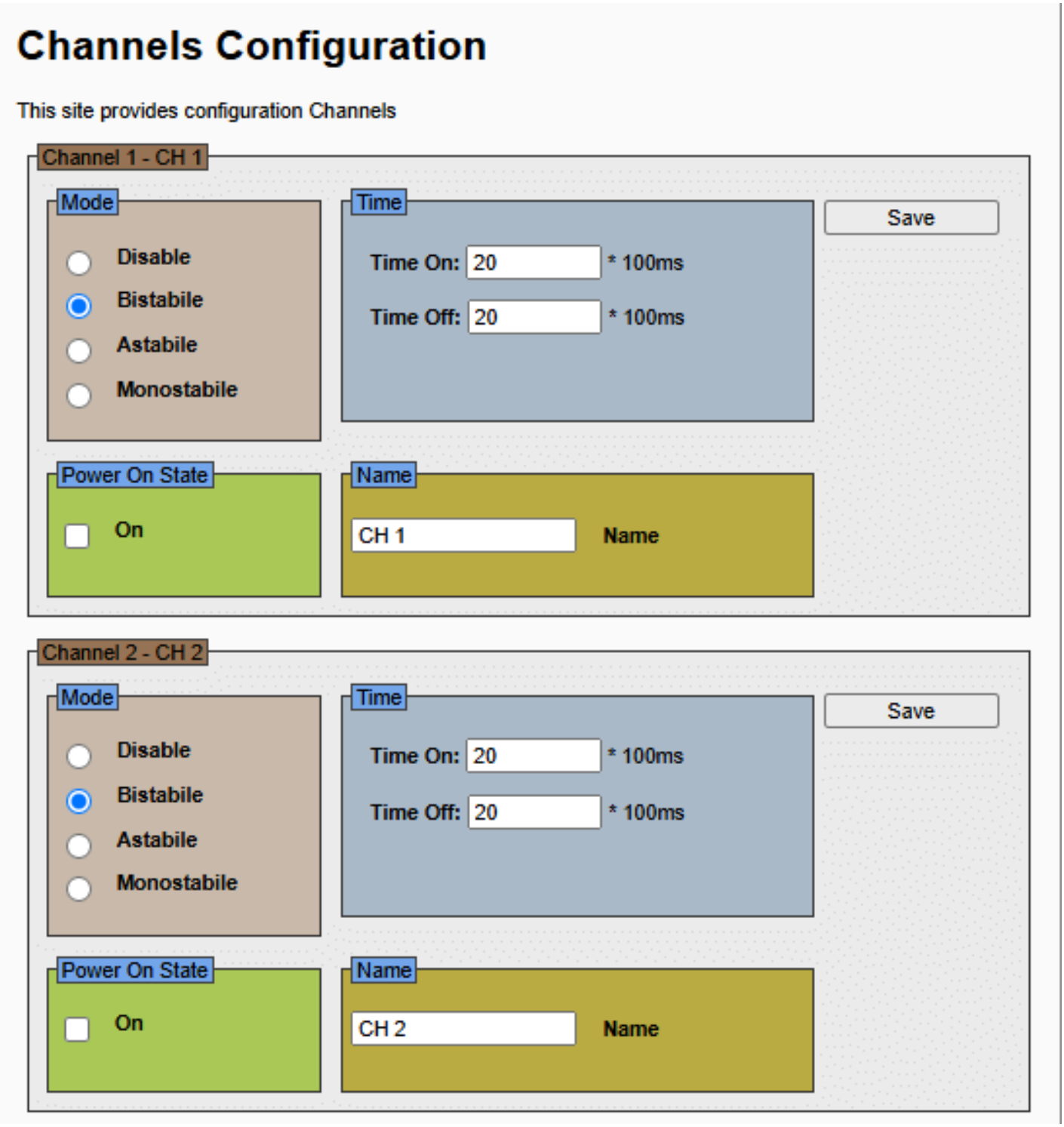


In the **Outputs** table, the **Out** column contains the names of output channels, that the user can change in **Out config**. The **On/Off** table displays the current state of the outputs (activated/deactivated)

- Output active – Green,
- Output inactive – Red,
- Curent time,
- Sunrise – Sunrise time calculated for the geographical position set,

- Sunset – Sunset time calculated for the geographical position set,
- Uptime – Time since last controller restart.

Output channel configuration

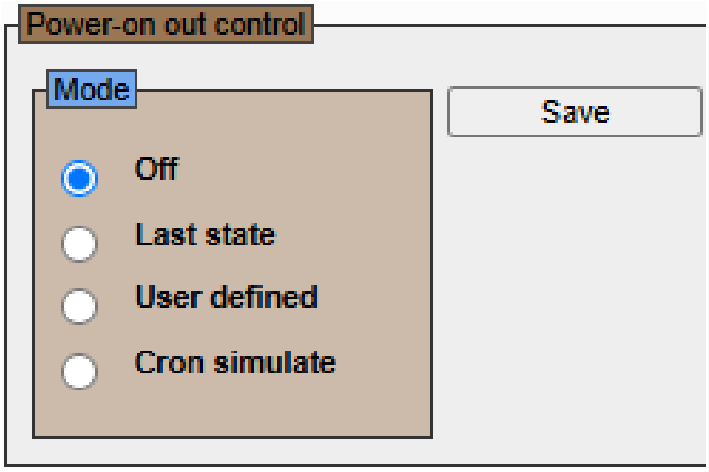


After selecting **Out config**, the output conifguration page will be displayed.
Each output can operate in the following modes:

- **Disable** – Output disabled,
- **Bistabile** – Bistable mode,
- **Astabile** – Astable mode (Activation and deactivation times are defined by **Time On** and **Time Off** parameters),

- **Monostabile** – Monostable mode (Activation time defined by **Time On**).

Selecting **On** in the **Power On State** tab forces output activation after a controller restart.



In the **Power-on out control** window, output state after power loss and return can be defined:

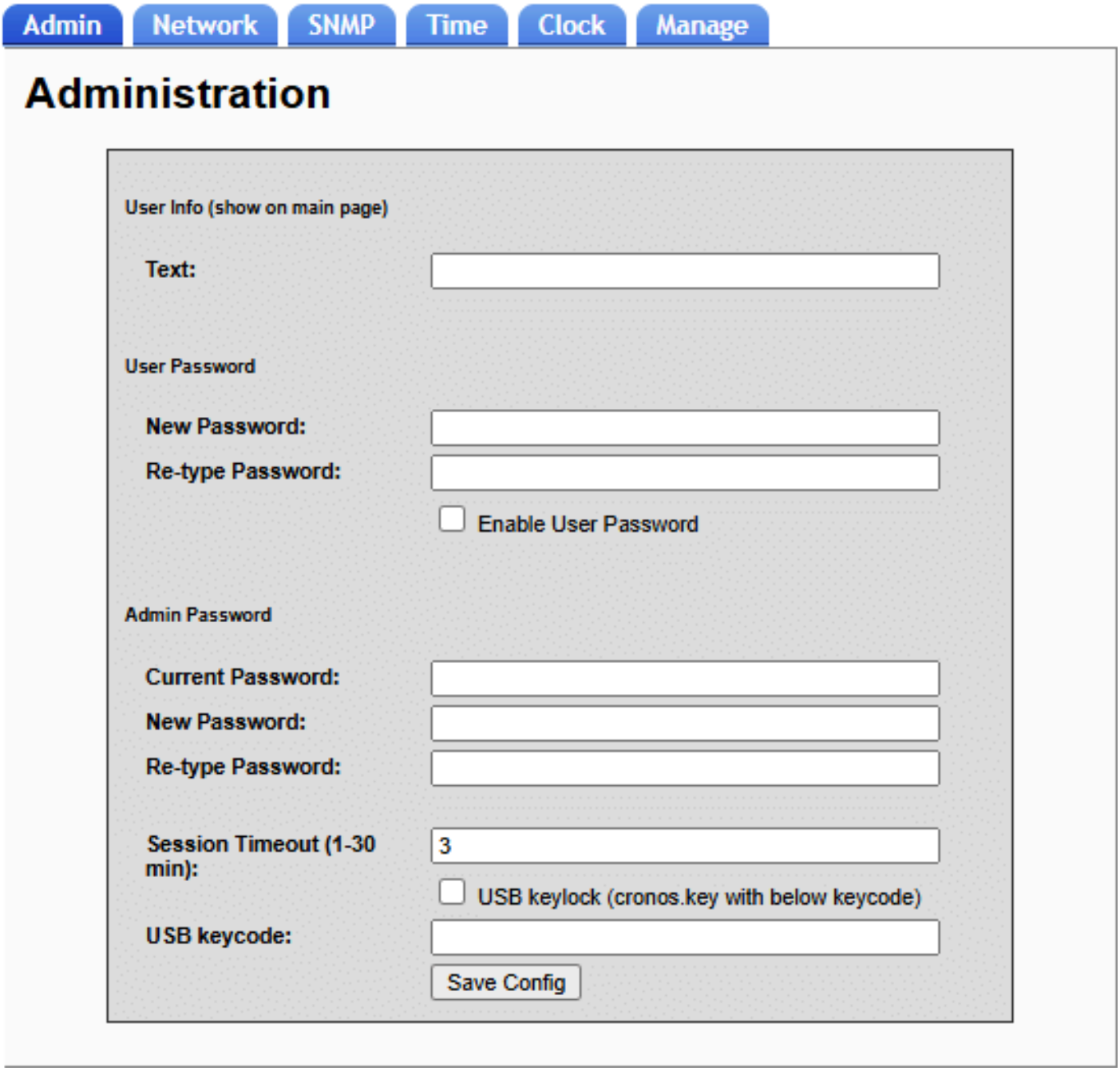
- **Off** – All outputs are off when the power is restored,
- **Last state** – All outputs assume the state they had before the power loss occured,
- **User defined** – Output has the state that is specified in **Power On State**,
- **Cron simulate** – After power is restored, the outputs are set to a state they would have if the reader kept operating.

Administration menu

After selecting the **Administration** menu, the following settings can be modified:

- **Admin** – Administrator/user password settings,
- **Network** – Network settings,
- **SNMP** – Simple Network Management Protocol settings,
- **Time** – Real Time Clock and time zone settings,
- **Clock** – Geographical coordinates and astronomical clock mode settings,
- **Manage** – Firmware update and device reset.

Admin

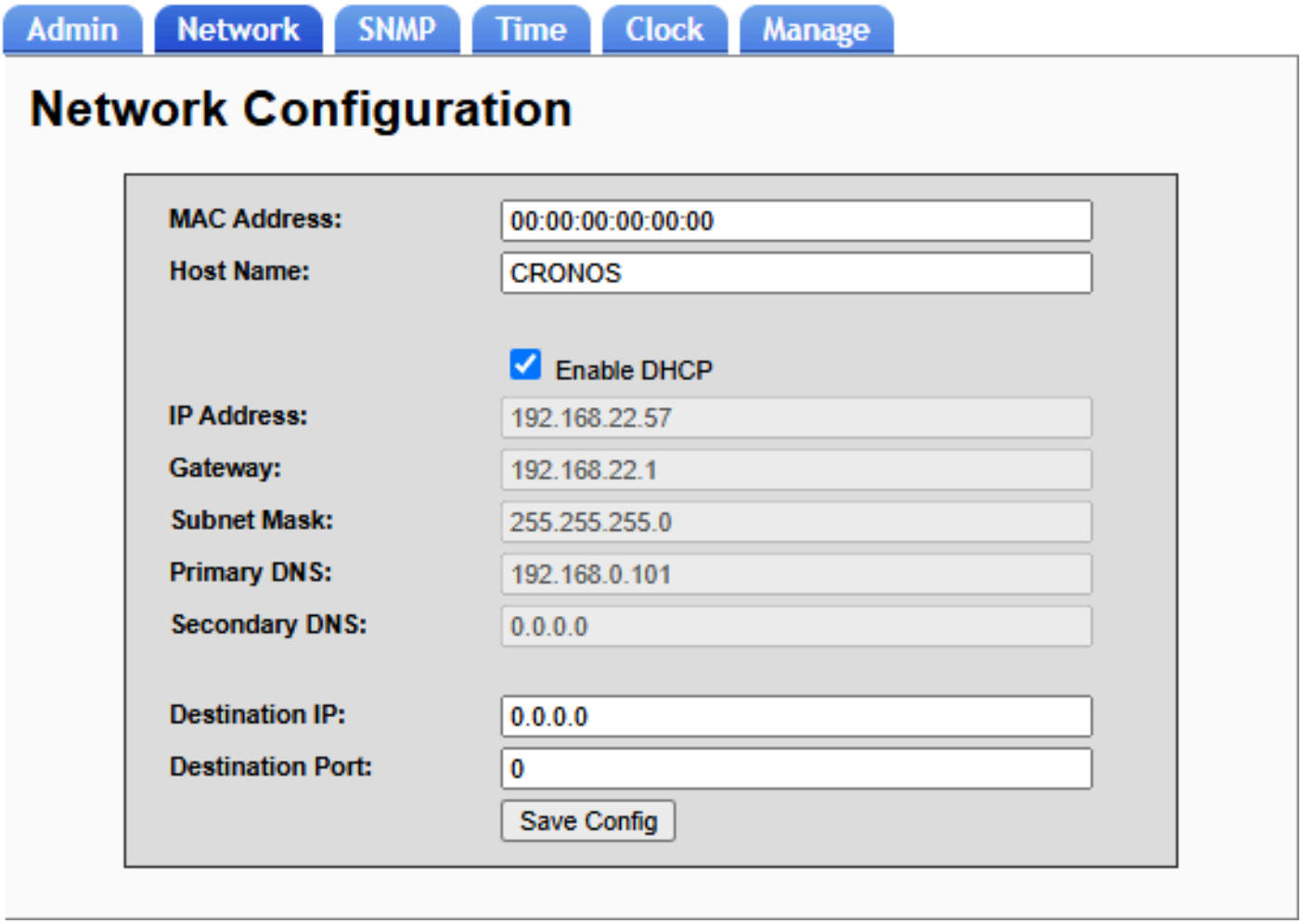


- **User Info** – Message defined by the user to be displayed on the home page,
- **User Password** – Limited access to settings password,
- **Admin Password** – Full access password,
- **Session Timeout (1-30min)** – Automatic user log-off after a period of inactivity.

If **USB keylock** is selected and **USB keycode** is set, the controller's keypad will be locked (unauthorized users can't make changes). **LCK** will be displayed on the screen. To unlock the keypad, write a file `cronos.key` to a pendrive, containing the same value as the **USB keycode** field, and connect it to the device's USB port.

After making changes, apply them using **Save Config**.

Network



The following fields are used to configure the device's network interface:

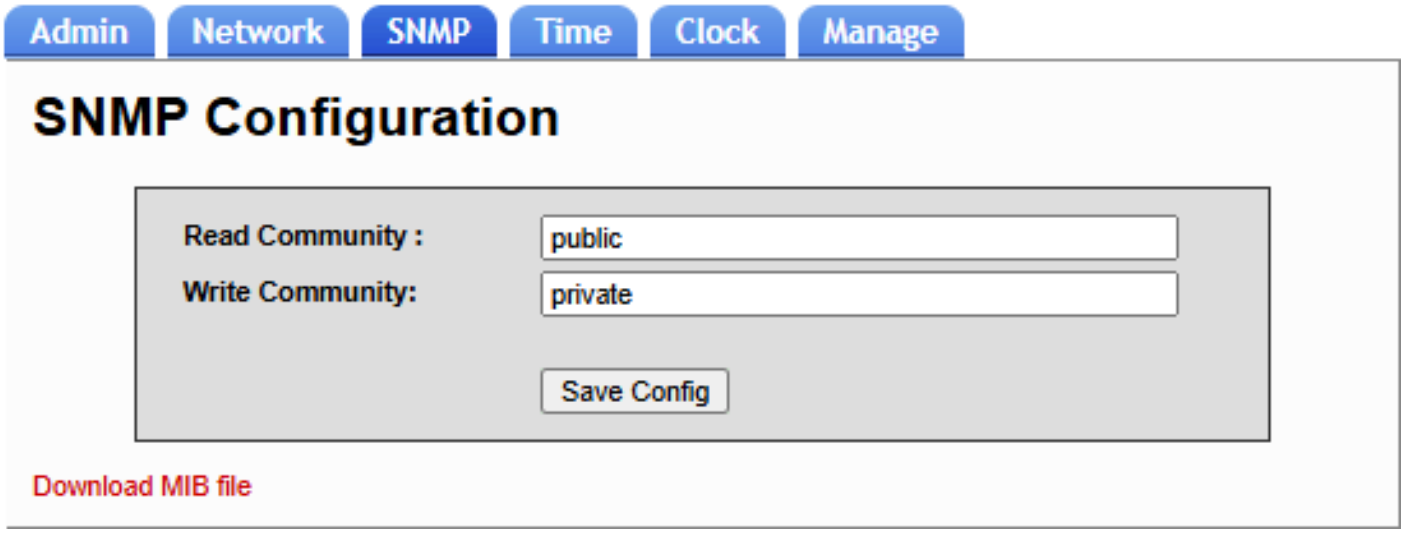
- **MAC Address** – Module MAC address,
- **Host Name** – NETBIOS name,
- **Enable DHCP** – Selection of this field forces the use of DHCP-assigned address,
- **IP Address** – Module IP address (the module will be visible in the network under this address),
- **Gateway** – Network gateway,
- **Subnet Mask** – IP subnet mask,
- **Primary DNS, Secondary DNS** – DNS server addresses.

After making changes, apply them using **Save Config**.

SNMP

The module is equipped with an SNMP v2c agent. The SNMP protocol allows download and setting of output state.

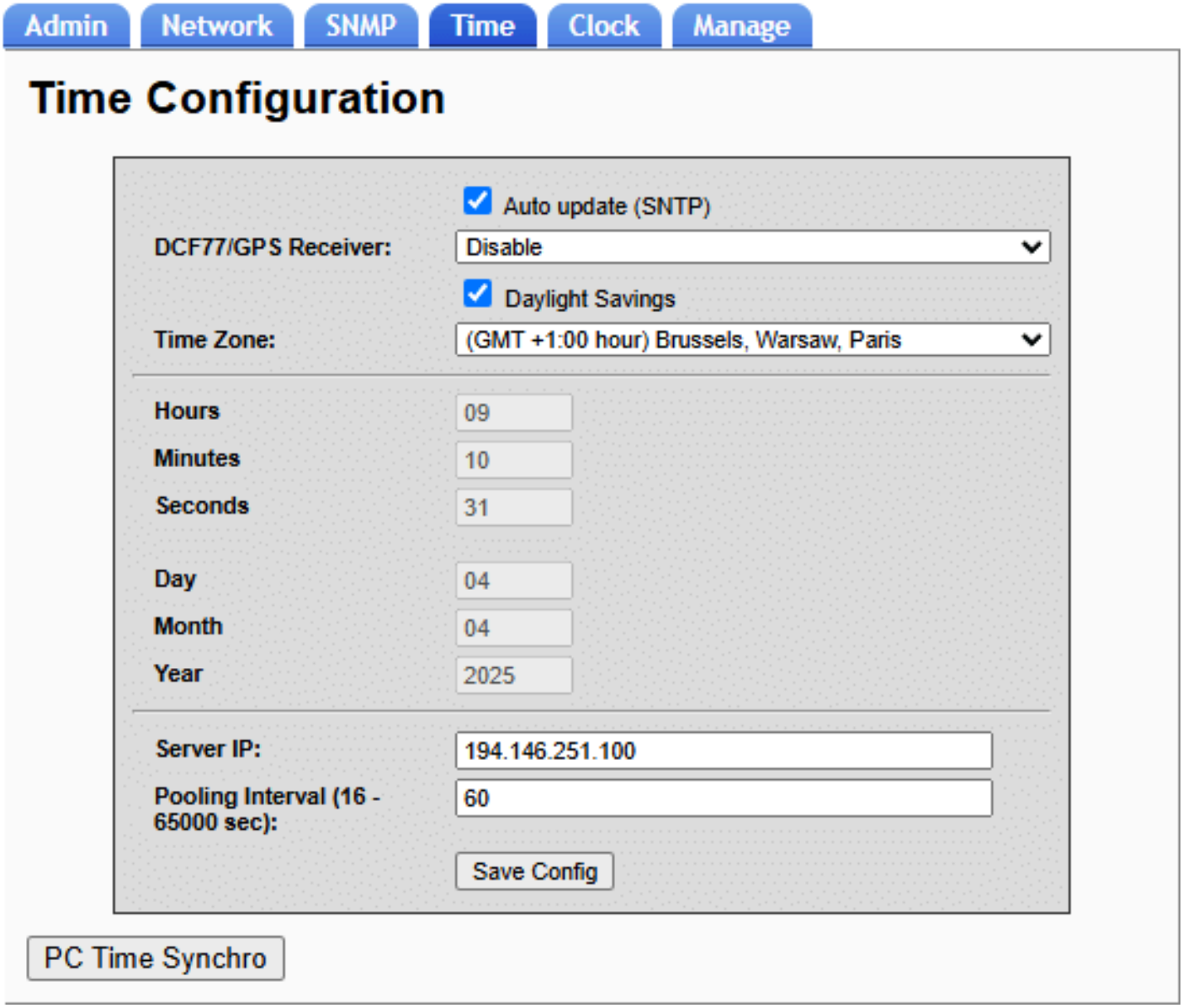
- **Read Community** – Data read password,
- **Write Community** – Data write password.



The MIB file describing the SNMP structure can be downloaded from the SNMP tab by clicking Download MIB file.

Time

Cronos is equipped with an internal Real Time Clock (RTC). Additionally, the module can synchronize its internal clock with a time server via SNTP. Configuration can be done in **Administration > Time**.



- **Auto update (SNTP)** – Enable time synchronization with a time server via SNTP,
- **DCF77/GPS Receiver** – External time synchronization source selection (option),
- **Daylight Savings**,
- **Time Zone**,
- **Hours, Minutes, Seconds, Day, Month, Year** – Date an time fields,
- **Server IP** – IP address of a server the device will synchronize with,
- **Pooling Interval (16-65000 sec)** – Specifies how often synchronization will be carried out.

If not using the time server, the user can manually set the clock by inputting the time and date to appropriate fields.

PC Time Synchro button – Programs the controller's RTC with the time and date taken from the PC.

After making changes, apply them using **Save Config**.

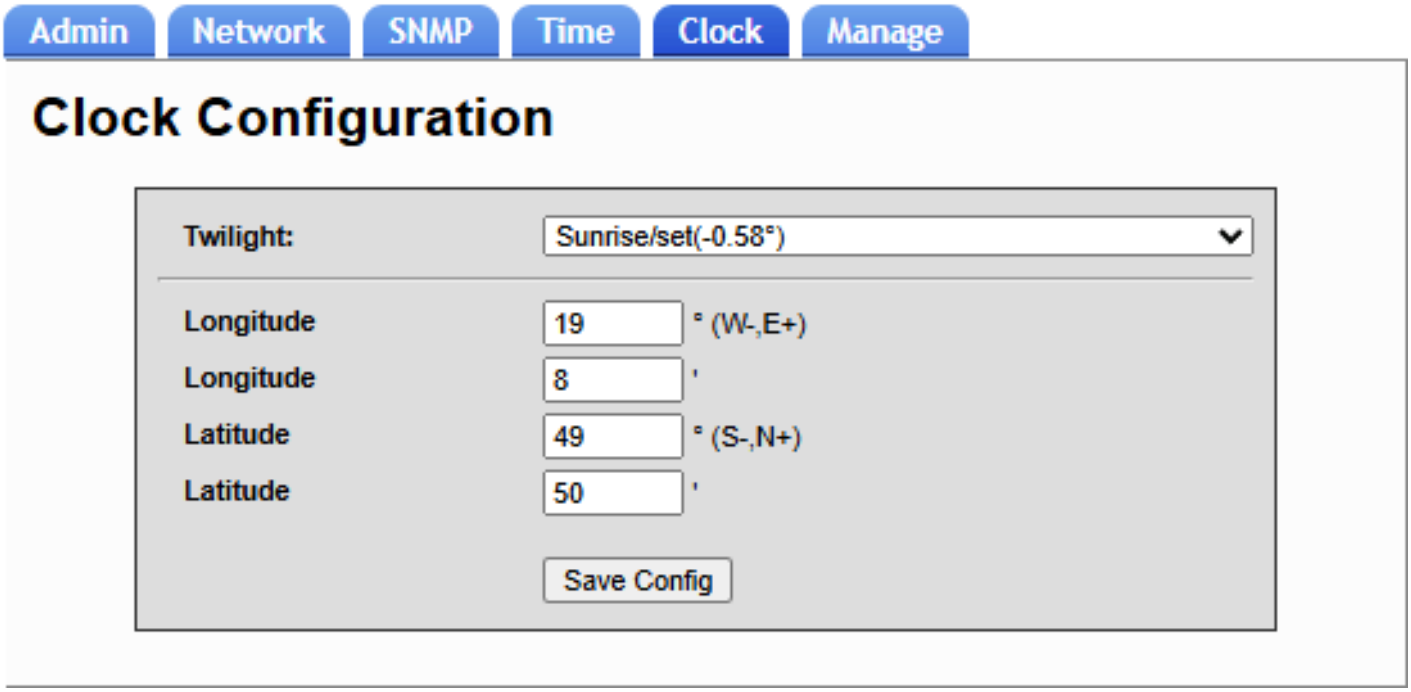
Clock

- **Civil (-6º)** – Civil twilight - the phase of sunset when the centre of the solar disc is no more than 6 angular degrees below the horizon. During this period, the brightest stars and planets appear in the sky, retaining enough natural light for normal outdoor activities.
- **Nautical (-12º)** – Nautical twilight (also known as dusk) - the time after sunset when the centre of the solar disc is less than 6 angular degrees below the horizon, but still above 12°. This phase allows the horizon line to be clearly observed, which is important in astronavigation, enabling simultaneous navigation based on terrestrial and celestial objects.
- **Astromical (-18º)** – Astronomical twilight - the period when the centre of the solar disc is between 12 and 18 angular degrees below the horizon. It ends with the beginning of astronomical night. Astronomical dawn - the time before sunrise when the sun's rays light up the sky, making the faintest stars no longer visible. Astronomical dawn lasts from the time the centre of the Sun's disc is more than 18° below the horizon line until it is more than 12° below the horizon line. The astronomical dawn ends the astronomical night and then the nautical dawn begins.
- **Nautical dawn** – The time before sunrise when the horizon and landscape become visible, allowing navigation based on illuminated objects on land or sea. During this time, the brightest stars are still visible in the sky. Nautical dawn lasts from the moment when the centre of the Sun's disc is more than 12° below the horizon line, but still less than 6° below the horizon line.
- **Civil dawn** – The time before sunrise when the centre of the sun's disc is already more than 6° below the horizon line.

Cronos calculates the hour of the sunrise and sunset - to do that, input of geographical coordinates is needed (longitude and latitude in the degrees/minutes format).

- **Twilight** – Select the astronomical clock mode
  - Sunrise/set (-0,58°),
  - Civil (-6°),
  - Nautical (-12°),
  - Astronomical (-18°).
  - Longitude,
  - Latitude.

Example settings for civil twilight (-6°) for the location:
Kozy – Longitude 19°09'E, latitude 49°51'N

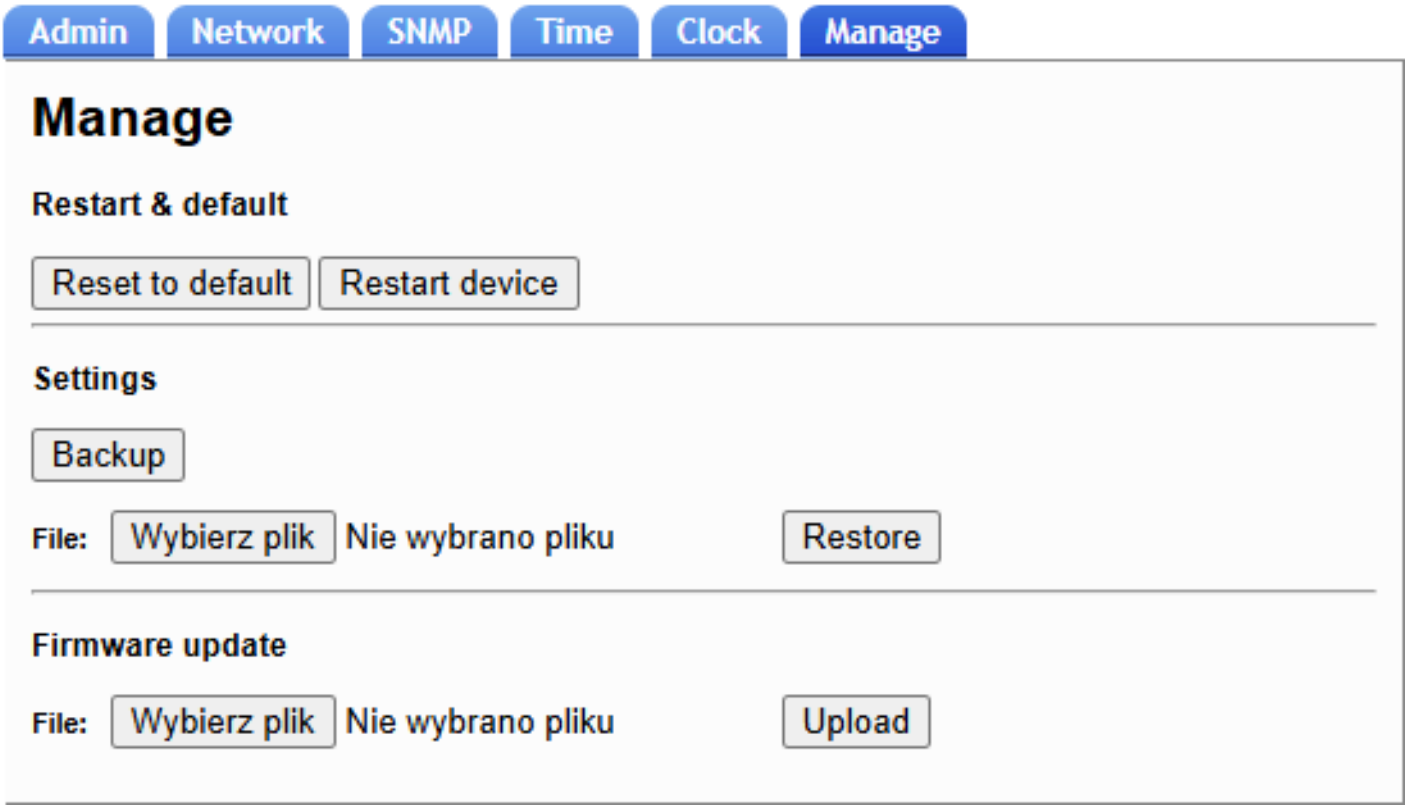


After the longitude and latitude values are entered and configuration is saved, the controller's display will show the calculated sunrise and sunset hours.



In this case the sun will rise at 06:01 and set at 18:06.

Manage



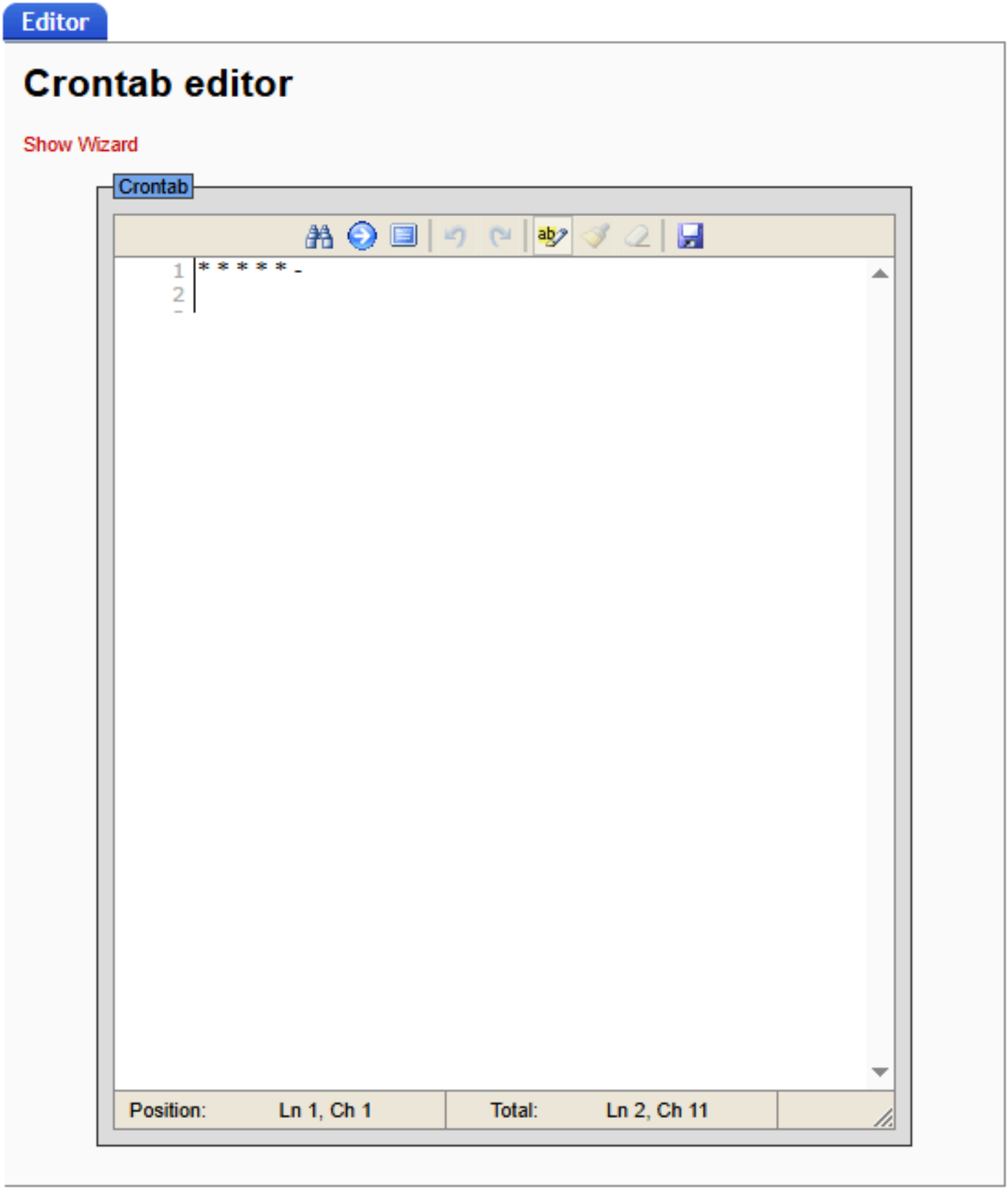
- **Reset to default**,
- **Restart device**,
- **Backup** – Save all settings to the PC's hard drive,
- **Restore** – Restore all settings to the controller,
- **Upload** – Upload the new firmware version to the module.

Upload the firmware in **Administration > Manage > Firmware update**.

After uploading, a MD5 checksum will be displayed on the webpage along with the uploaded file length.
The checksum must be the same as the sum in the sum.md5 file provided with the firmware file.
If the checksum is correct, click **Upload**.

CRONTAB Editor

Selecting **Cron Editor** will display the crontab entry editor. After inputting all data into the editor field, write it using the floppy disc icon.



Settings configuration involves filling 6 columns.

The drawing describes the meaning of columns:

```
* * * * * Control command
| | | | |
| | | | ---------- Day of the week (0-7) (0 and 7 sunday)
| | | -------------- Month (1-12)
| | ----------------- Day of the month (1-31)
| --------------------- Hour (0-23)
------------------------ Minute (0-59)
```

The control command consists of 8 fields representing the state of outputs.

Each field can assume the values:

- **1** – Output activation,
- **0** – Output deactivation,
- **n** – Negation (state inversion),
- **-** – Leave the output with no changes.

Example

Output	1	2	3	4	5	6	7	8
State	1	1	0	1	n	1	-	0

- Activate outputs 1, 2, 4, 6,
- Deactivate outputs 3, 8,
- Invert output 5,
- Output 7 - no changes.

The controller recognizes the following entries:

- Sunday can be represented by 0 or 7
- The day of command execution can be inputted in two ways: day of the month or day of the week. If two fields are filled, the command will be executed both on the day of the month and day of the week!
- Numerical values can be saved in various formats:
- 1-3 – Values 1, 2, 3,
- 0-10/2 – Values 0, 2, 4, 6, 8 i 10 (every 2nd value in the range from 0 to 10),
- 1,2,5 – Values 1, 2, 5,
- */2 – Every 2nd allowed value (np. in the first collumn it will be 0, 2, 4, 6...56, 58),
- 1-3,5,6 – 1, 2, 3 and 5, 6,
- SR – time of the sunrise,
- SS – time of the sunset.

Tip

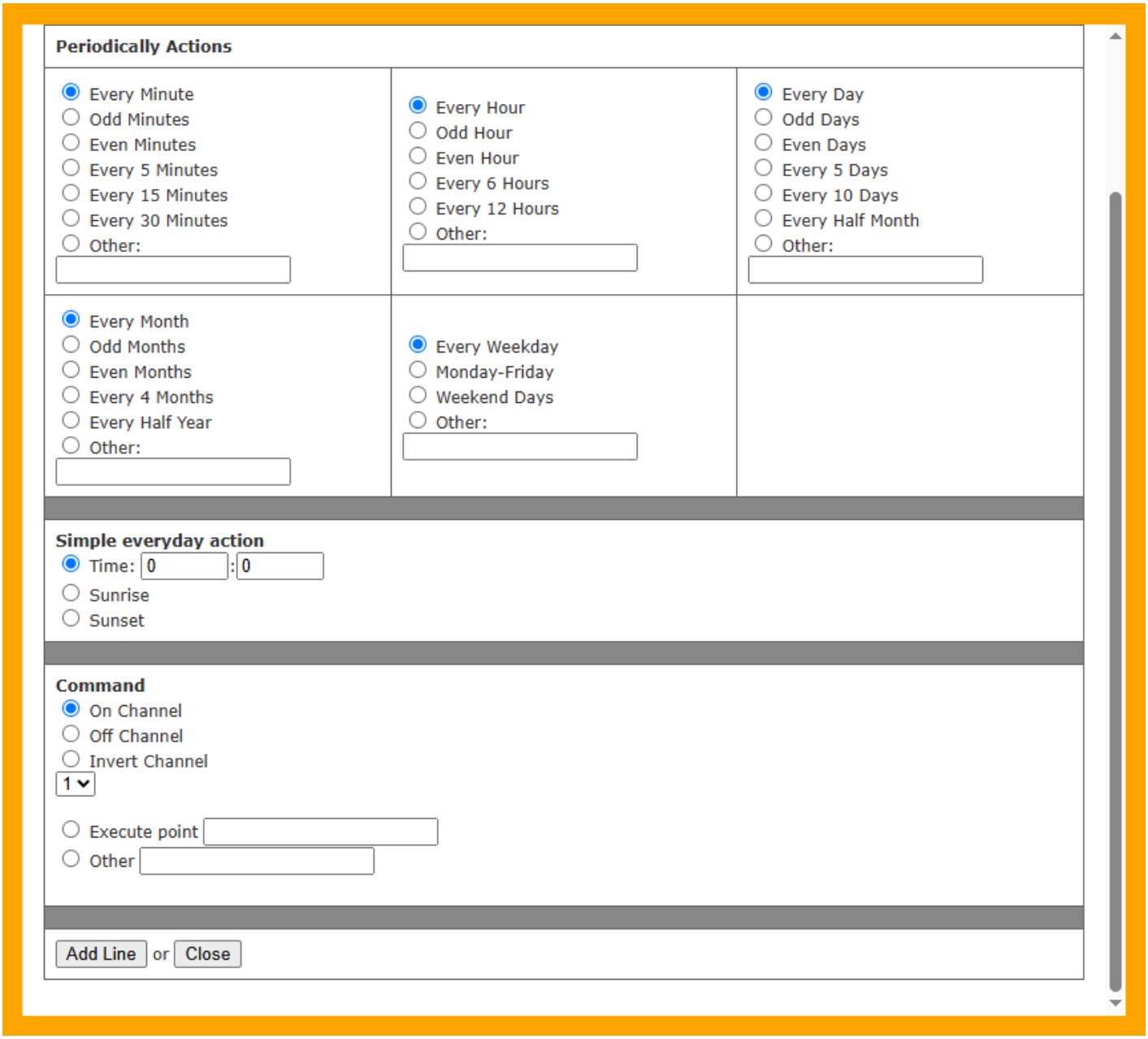
Because of Daylight Savings Time, avoid tasks that should happen between 2:00 and 3:00 on a Sunday. During automatic change from winter to summer time, the action will not complete, while during change from summer to winter time, it will be completed twice.

Examples

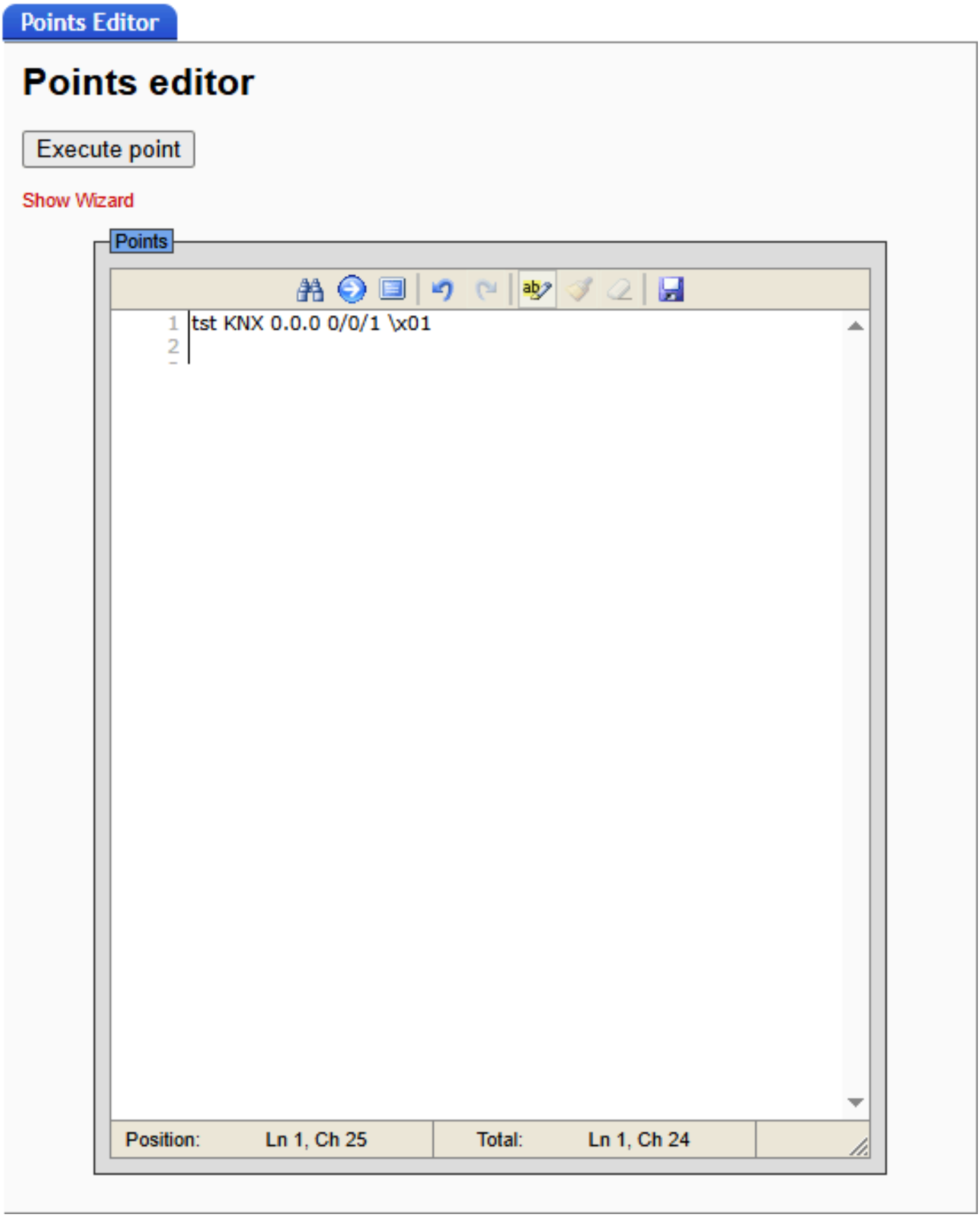
- Activate relay No. 3 at 12:45: `45 12 * * * --1------`
- Activate relay No. 5 at 17:30 on the 16th of October: `30 17 16 10 * ----1---`
- Activate relay No. 2 at 8:00 form Monday til Friday: `00 8 * * 1-5 -1--------`
- Activate relay No. 1 and 5 from Monday til Friday at sunrise: `SR SR * * 1-5 1---0---`
- Activate relay No. 1 at dusk and deactivate at dawn: `SS SS * * * 1--------- SR` `SR * * * 0---------`
- Activate relay No. 3 10 minutes after dawn: SR+10 SR `* * * --1-----`

Show wizard

In the Cron Editor tab, a wizard can be opened, making data input easier.



Points Editor



The Cronos controller has the ability to send control frames to other devices using TCP or UDP.

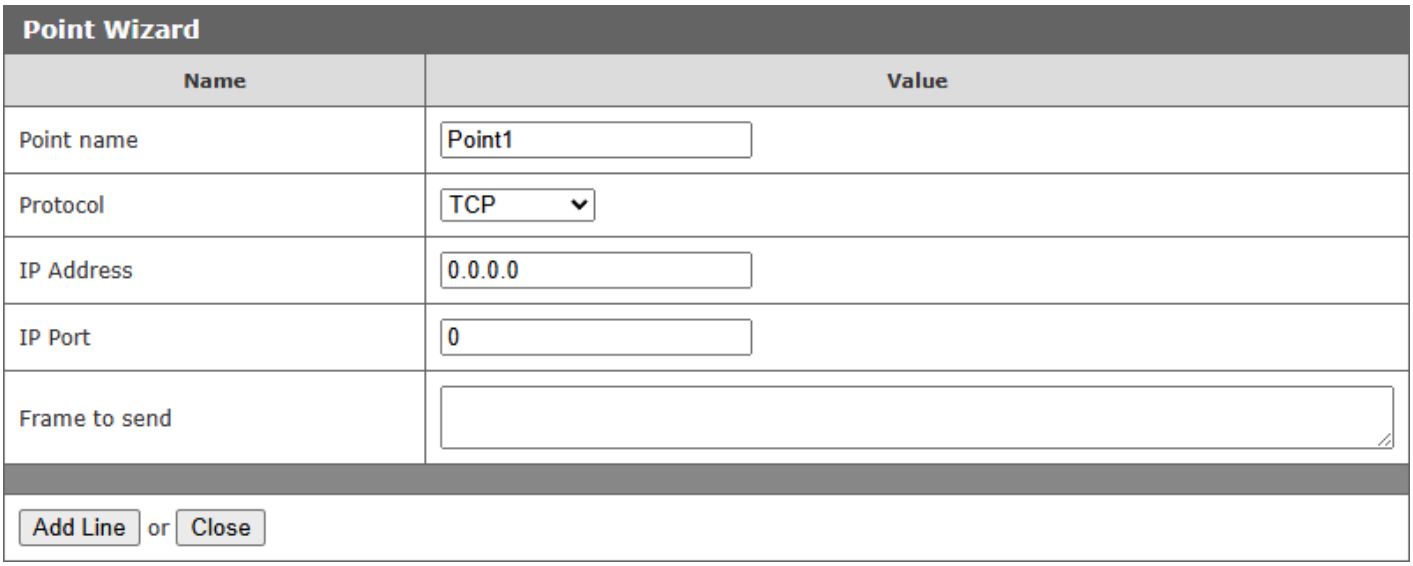
Example control frames:

Name	Protocol	Address	Port	Data
pwron	TCP	192.168.111.15	9761	`\x00\x01\x02\x03`
test1	UDP	192.168.111.23	1000	`\x12abcdefgh`
lock	GET	192.168.111.24	80	`/stat.php?inv=1 YWRtaW46YWRtaW4wMA==`
lamp	KNX	2/1/2		`\x81`

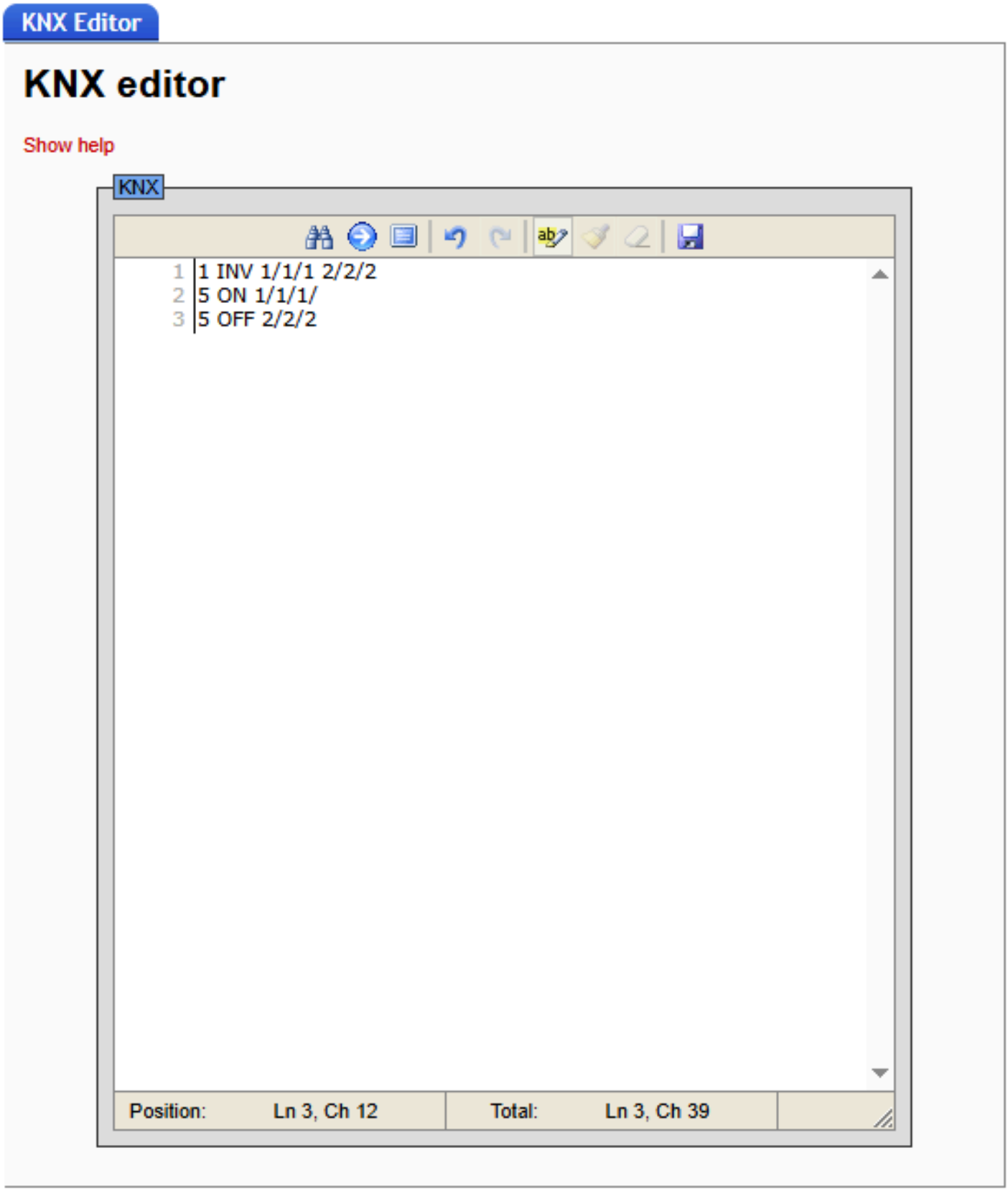
- **Name** – Any user-assigned name,
- **Protocol** – UDP, TCP, GET, KNX,
- **Address** – Target address,
- **Port** – Port, the frame will be sent to,
- **Data** – Data in HEX format - \x00, ascii -abcd.

A macro that sends several frames can be defined: `O1 CALL test1,pwron`

recall of frame O1 causes the test and pwron frames to be sent.



KNX Editor


KNX Editor
KNX editor
Show help
KNX
1 1 INV 1/1/1 2/2/2
2 5 ON 1/1/1/
3 5 OFF 2/2/2
Position: Ln 3, Ch 12
Total: Ln 3, Ch 39

Control buttons description

-  – Increase value or change position,
-  – Confirm changes or enter a submenu,
-  – Cancel changes or enter a higher menu,
-  – Decrease value or change position.

HTTP control

Cronos can be controlled via HTTP.

To read the current module state, recall `http://192.168.0.10/stat.php` in a web browser.

The module contains all important information in The module will display all important information in the form of an XML file:

```
<response>
    <prod_name>Cronos</prod_name>
    <out>00001000</out>
    <on>00001000</on>
</response>
```

Section	Description
`<prod_name>`	Module type
`<out>`	Output mode (activated/deactivated) In this case, OUT4 is active
`<on>`	Output state

The following table describes the available HTTP (GET) commands:

Command	Description
`http://<IP_address>/stat.php?on=x`	Output activation x=number of the relay output: Cronos x = 1 ÷ 8
`http://<IP_address>/stat.php?off=x`	Output deactivation x=number of the relay output: Cronos x = 1 ÷ 8

`http://<IP_address>/stat.php?inv=x`	Invert output state x=number of the relay output: Cronos x = 1 ÷ 8
`http://<IP_address>/stat.php?set=87654321`	Set all outputs Possible options: 1 – activation 0 – deactivation n – state inversion - – no state change
`http://<IP_address>/stat.php?exe=name`	Sends the pre-defined TCP or UDP frame

Module control examples using HTTP GET:

1. OUT2 activation:
   `http://192.168.0.10/stat.php?on=2`
2. OUT1 inversion:
   `http://192.168.0.10/stat.php?inv=1`
3. OUT2 deactivation:
   `http://192.168.0.10/stat.php?off=2`
4. Output 1 activation; output 2 inversion:
   `http://192.168.0.10/stat.php?set=000000n1`

Using a sunset sensor

In the latest version of the software, a modification has been introduced allowing to control the outputs depending on the light intensity by using a two-state external detector (e.g.: WZM-01/S1 from Zamel). The detector is connected to connectors 24 and 25 of the controller. The use of an external sensor allows, for example, to turn off the night light according to the astronomical clock and turn it on at low light intensity even during the day.

The signal from the detector is handled by the KNX protocol module. The event is directed to the EXT_OPEN and EXT_CLOSE commands.

Example

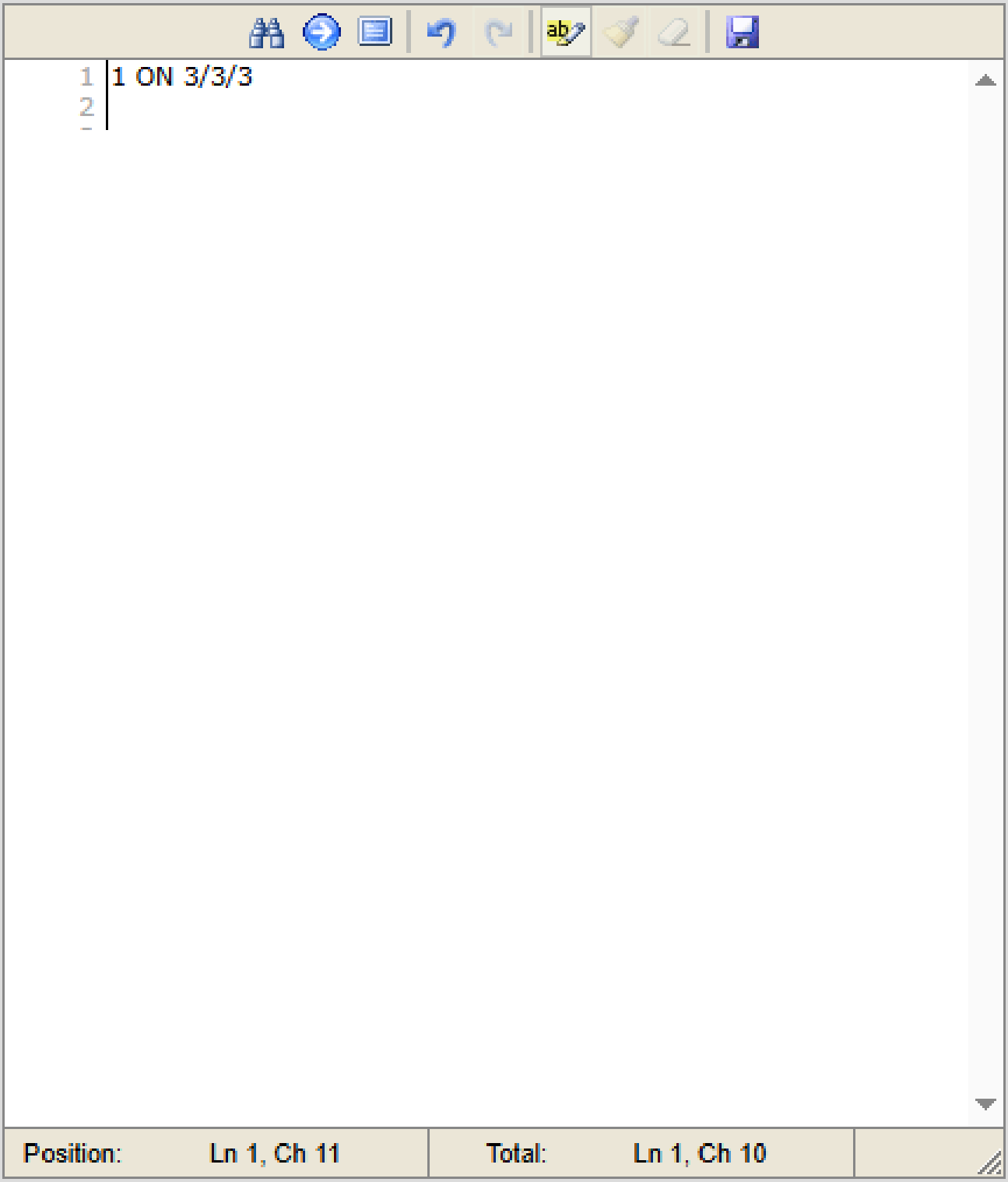
Assigning events (**Points Editor** tab) to KNX addresses – group 3/3/3 in this example.:
EXT_OPEN KNX 0.0.0 3/3/3 \x00
EXT_CLOSE KNX 0.0.0. 3/3/3 \x01
This means that the value of x01 will be sent to KNX group 3/3/3 after the sensor closes and the value of x00 when it opens.
Next, assign the module's reaction for the KNX command (**KNX Editor** tab)
1 ON 3/3/3
The line shown above controls output 1 and reacts to group 3/3/3. The user can assign several events to a single group and control two outputs, for example.

Points

```
1 EXT_OPEN KNX 0.0.0 3/3/3 \x00
2 EXT_CLOSE KNX 0.0.0 3/3/3 \x01
3
4
```

Position: Ln 4, Ch 1 | Total: Ln 4, Ch 59

KNX



Restoring factory settings

To restore the device to factory settings:

- Power up the device.
- Hold the **RESET** button for around 8 seconds.

> **Informacja**
>
> **Factory settings can be restored by using the built-in www server. The user should go to the Administration tab, then in Backup tab press the Reset to default button, which is located at the bottom of the page.**

Once the above steps have been completed, the device will be set to the following parameters:

- **IP address:** 192.168.0.10
- **IP mask:** 255.255.255.0
- **User:** admin
- **Password:** admin

Warranty and manufacturer's liability

> **Warning**
>
> **The manufacturer provides a two-year warranty for the device and post-warranty service for a period of 10 years from the date of introduction of the device to the market. The warranty covers all material and production defects.**

The manufacturer undertakes to respect the warranty agreement, if the following conditions are met:

- All repairs, changes, expansions and device calibrations are carried out by the manufacturer or an authorized service center,
- The power supply system meets the applicable standards,
- The device is operated in accordance with the suggestions presented in this manual,
- The device is operated in accordance with its intended purpose.

The manufacturer assumes no responsibility for consequences resulting from improper installation, improper use of the device, failure to comply with the instruction manual, and repairs made by unauthorized personnel.

> **Warning**
>
> **The device contains no user serviceable parts inside.**

Storage, operation and transport conditions

The device should be stored in enclosed rooms, where the atmosphere is free from vapours and corrosive substances:

- Environment temperature from -30°C to +60°C (-22°F - 140°F),
- Humidity from 25% to 90% (condensation unacceptable),
- Atmospheric pressure from 700 to 1060 hPa.

The device is intended to operate in the following conditions:

- Environment temperature from -10°C do +55°C (14°F - 131°F),
- Humidity from 30% to 75%,
- Atmospheric pressure from 700 to 1060 hPa.

Recommended transport conditions:

- Environment temperature from -40°C do +85°C (-40°F - 185°F),
- Humidity from 5% to 95%,
- Atmospheric pressure from 700 to 1060 hPa.

Installation and device operation:

- The module should be operated in accordance with recommendations provided later in this manual.

Disposal and decommissioning

In an event the device needs to be decommissioned (eg. after its intended life period is surpassed), it is recommended to contact the manufacturer or his representative, who are responsible to respond appropriately, i.e., to collect the device from the user. The user can alternatively contact companies specializing in electronic device or computer equipment disposal and/or decommissioning. Under no condition should the device be placed with other waste.