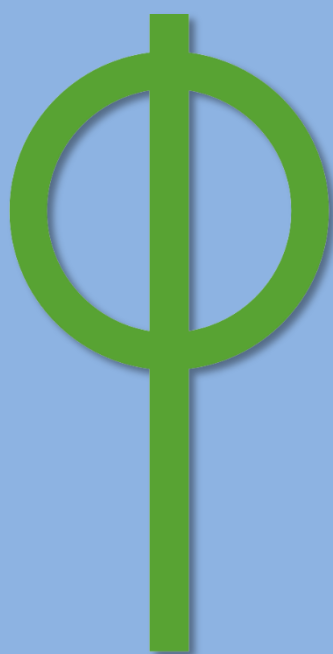


# FYTOSCOPE

Walk-in growth chamber

## Software Instructions Manual

Please read this manual before operating this product



Photon  
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and Agriculture

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*The contents of this manual have been verified to correspond to the specifications of the device. However, deviations cannot be ruled out. Therefore, a complete correspondence between the manual and the real device cannot be guaranteed. The information in this manual is regularly checked, and corrections may be made in subsequent versions.*

*The visualizations shown in this manual are only illustrative.*

*PSI is never liable for damage caused to things that were present in the growth chamber. This manual is an integral part of the purchase and delivery of equipment and its accessories and both Parties must abide by it.*

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## 1 SAFETY INSTRUCTION

Before using the growth chamber, read this manual carefully and follow the instructions. If you are not sure about anything in the manual, contact the manufacturer for clarification.






By taking device, the customer agrees to follow the instructions in this guide.

It is forbidden to relocate the growth chamber and its accessories. Handling may only be performed by PSI service personnel.



Copying or other interference in the device software without PSI permission is considered copyright infringement and is sanctioned in accordance with the relevant legislation. These activities can also lead to loss of warranty on the device and its accessories and/or may also cause damage to health and property.

The following table presents basic highlight symbols used in this manual.

Symbol	Description
	This symbol alerts the user, inter alia complementary and additional information
	General risk of injury. It is necessary to follow safety precautions to avoid risk of injury or damage to the operator, third parties or surroundings of the device.
	Danger of electric shock

Tab. 1 Used warning symbols

## **2 SOFTWARE CONTROL**

This section describes how to control the growth chamber using the appropriate software.

### **2.1 INTRODUCTION**

Part of the growth chamber is a computer with a touch screen display, usually located on the front side of the electrical cabinet. The computer comes with a pre-installed operating system and growth chamber control software, which is run automatically after the computer starts.

Fytotron software package is designed to control the growth chamber. Cultivation conditions can be controlled manually or automatically at a given time, which gives possibility to create variety of protocols to simulate diurnal changes in intensity and spectral composition of light, temperature and humidity. All controlled variables are continuously recorded and displayed in a graph.

Software is divided into two parts - Server and Client.

## 2.2 SERVER APPLICATION

Server application allows users to access basic device services, such as managing and modifying user accounts, setting up operator contact e-mails and phone numbers for sending information and warning messages about the device status, etc.

Server application has three bookmarks

- Users
- SMTP + GSM
- Rules + Alerts

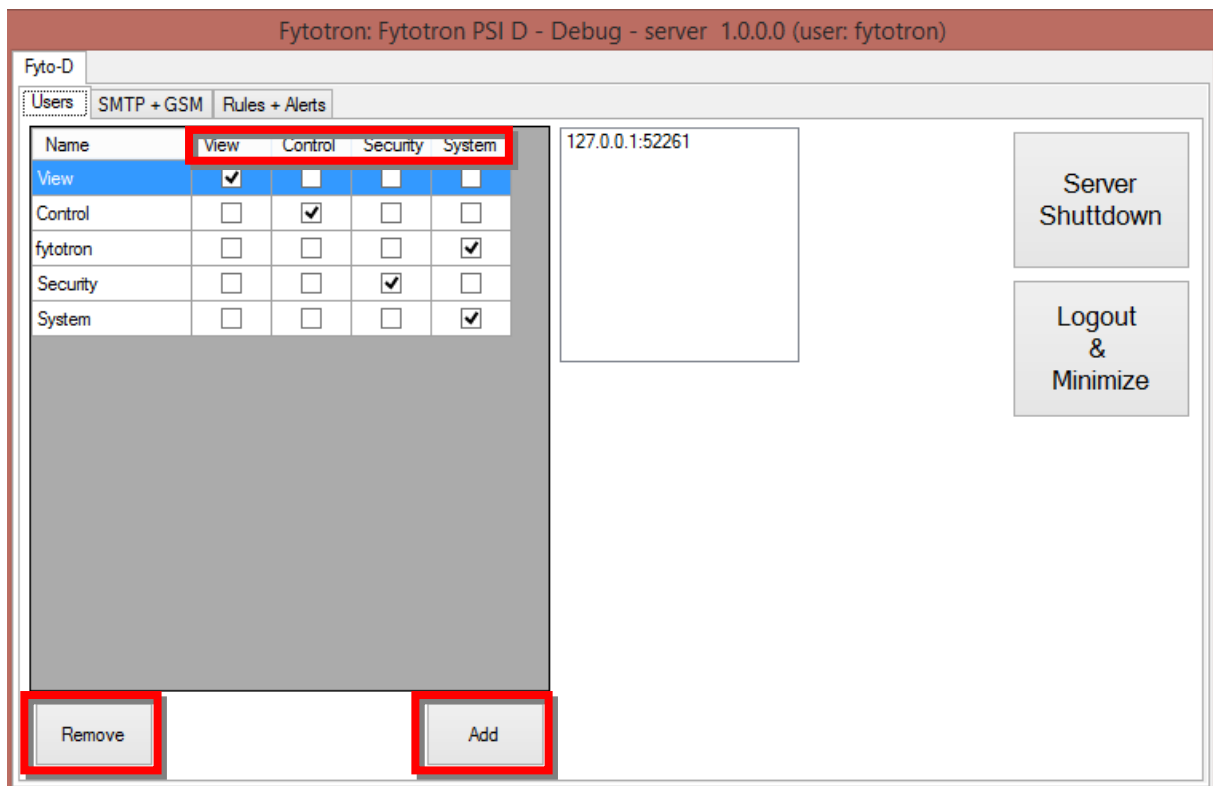
### 2.2.1 USERS

The "Users" bookmark contains data about operator user accounts - account names and their permissions (see Pict. 1).



Permissions implementation is under development and its setup does not have any impact on the user actual permissions.

New users are added by clicking the *Add* button. *Add User* window with username and password fields is displayed (Pict. 2).



Pict. 1 Users

Few general recommendations for setting up the password:

- Length at least 6 characters.
- Password should contain both large and small letters, numbers, punctuation and symbols (e.g. %, #,!).
- Keep the password in a safe place and don't disclose it to anyone.



It is recommended to make an official record that the user has an account with the given privileges and have set a unique password known only to him. It is then possible to link particular users with corresponding actions in case of violation of operational guidelines of the device and its accessories.

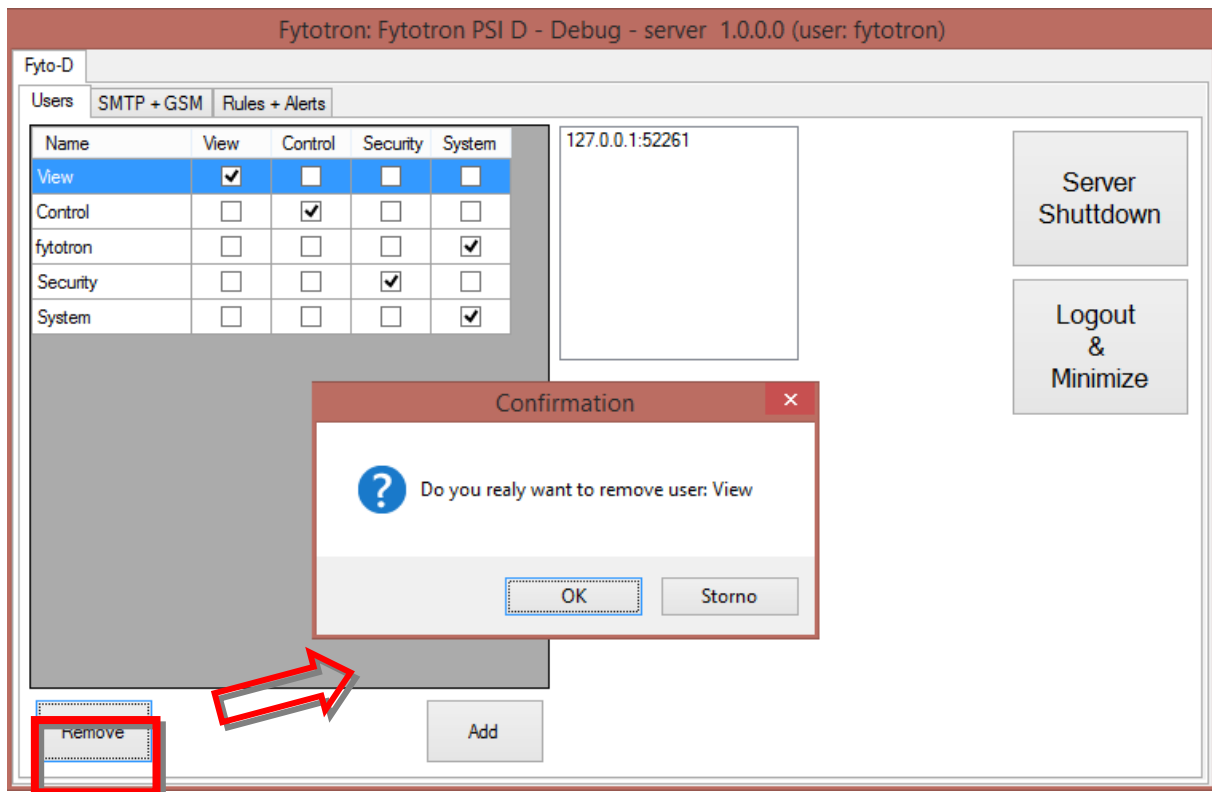
A screenshot of a software dialog box titled "Add User". The dialog has a red title bar with a close button (X) in the top right corner. It contains three input fields: "Name", "Password", and "Password". The "Name" and the first "Password" field are highlighted with a red rectangular border. Below the input fields are two buttons: "Ok" and "Cancel".

Pict. 2 Adding users

To remove user account, select the user to remove and click the *Remove* button (Pict. 3). The confirmation dialog is displayed, if accepted, user account is deleted.



ATTENTION! Do not remove all accounts. If all accounts are removed, PSI support needs to be contacted to restore at least one valid user.



Pict. 3 Removing User

*Users* bookmark also contains *Server Shutdown* and *Logout & Minimize* buttons. *Server Shutdown* shuts down the application server, and it is impossible to log into a *Client* application. *Logout & Minimize* button logs out current user and minimizes the application to the background. This is the default state. To edit *Server* setup again, click the server icon in the taskbar and login.

### 2.2.2 SMTP + GSM

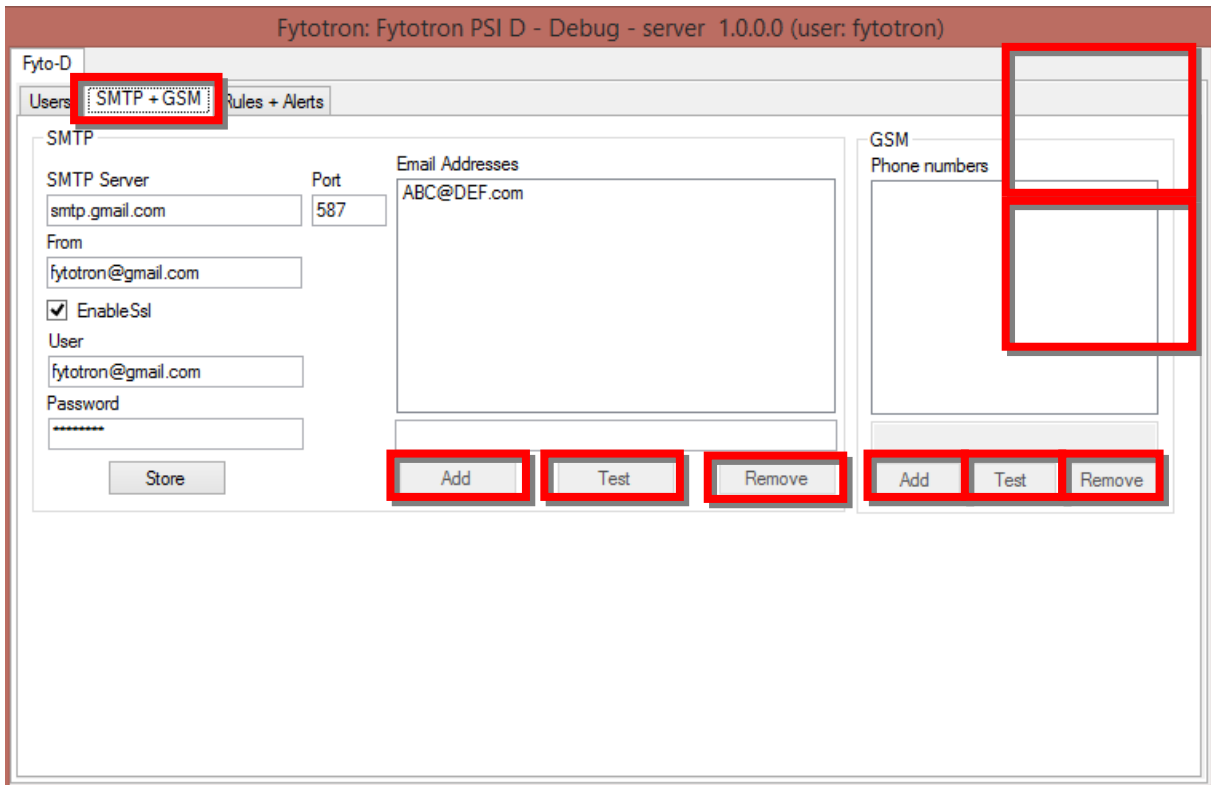
SMTP + GSM Bookmark (Pict. 4) contain management tools for email and SMS (text) notifications.



To add or delete email address or phone number, use corresponding buttons. Delete operation does not ask for confirmation, item is deleted immediately after pressing the button.

Email or phone contacts are added using the *Add* button and removed using *Remove* button. *Test* buttons sends email/SMS to test functionality of the selected item.

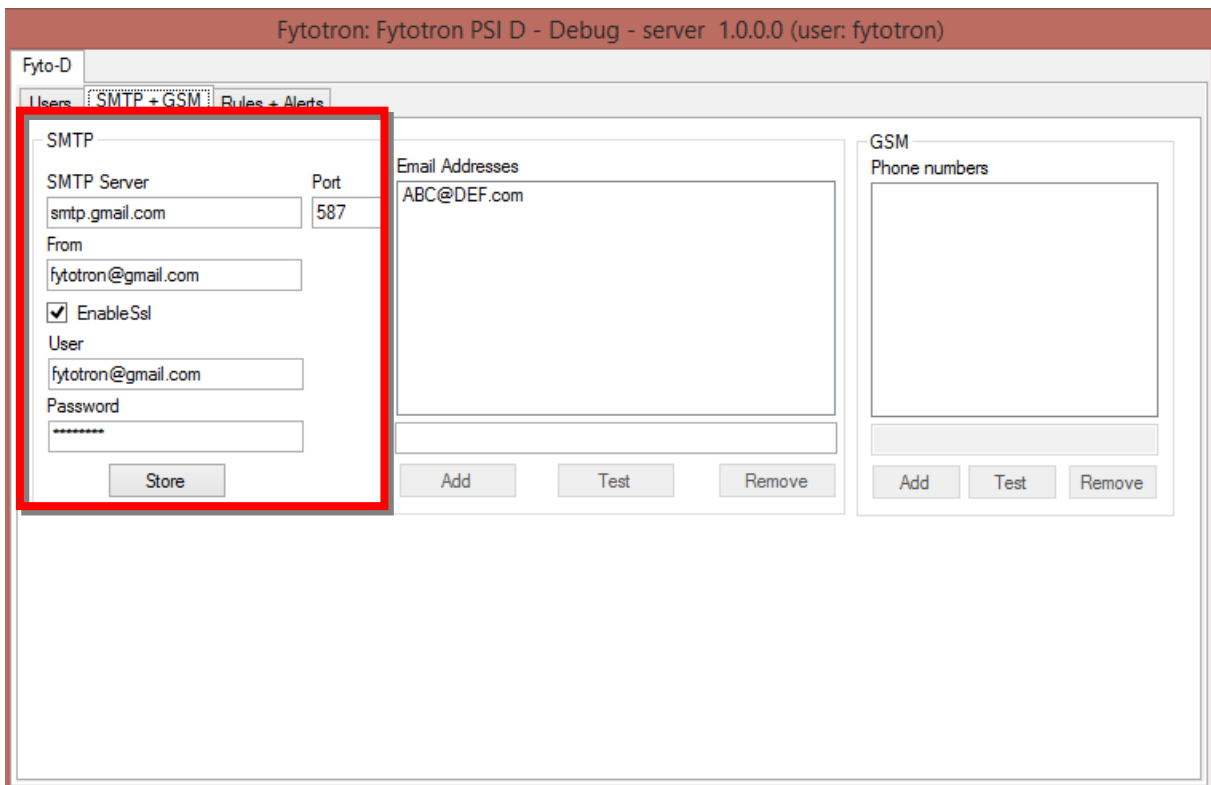




Pict. 4 SMTP + GSM



SMTP + GSM Bookmark contains also information about the SMTP Server (Pict. 5). It is not recommended to change this setup unless you know what you are doing or instructed by PSI staff.



Pict. 5 SMTP

### 2.2.3 RULES AND ALERTS

The bookmark *Rules + Alerts* (**Error! Reference source not found.**) contains setup of notifications and alerts.

Column *Caption* contains list of services, equipment and accessories of growth chamber. Next two columns control which event is sent using corresponding channel (email, SMS). None, one or both channels can be ticked. Column *State* represents current state of the item. *Date* column shows date when the item was last changed.



It is recommended to have all email notifications ticked (default state). SMS option is possible to tick selectively. If there are any doubts about meaning of the items, contact the PSI support.

Fytotron: Fytotron PSI D - Debug - server 1.0.0.0 (user: fytotron)

Fyto-D

Users SMTP + GSM **Rules + Alerts**

Caption	Email	Sms	State	Date
PLC Communication	<input checked="" type="checkbox"/>	<input type="checkbox"/>	■	
Fan 1	<input checked="" type="checkbox"/>	<input type="checkbox"/>	■	
Fan 2	<input checked="" type="checkbox"/>	<input type="checkbox"/>	■	
Filter 1	<input checked="" type="checkbox"/>	<input type="checkbox"/>	■	
Filter 2	<input checked="" type="checkbox"/>	<input type="checkbox"/>	■	
Filter 3	<input checked="" type="checkbox"/>	<input type="checkbox"/>	■	
Filter 4	<input checked="" type="checkbox"/>	<input type="checkbox"/>	■	
Filter 5	<input checked="" type="checkbox"/>	<input type="checkbox"/>	■	
Filter 6	<input checked="" type="checkbox"/>	<input type="checkbox"/>	■	
Filter 7	<input checked="" type="checkbox"/>	<input type="checkbox"/>	■	
Cooler Pressure	<input checked="" type="checkbox"/>	<input type="checkbox"/>	■	
Cooler Pressure	<input checked="" type="checkbox"/>	<input type="checkbox"/>	■	
Cooler Manual	<input checked="" type="checkbox"/>	<input type="checkbox"/>	■	
Cooler Device	<input checked="" type="checkbox"/>	<input type="checkbox"/>	■	

Pict. 6 Rules and Alerts

## 2.3 CLIENT APPLICATION

*Client* application provides control over cultivation conditions inside the growth chamber.

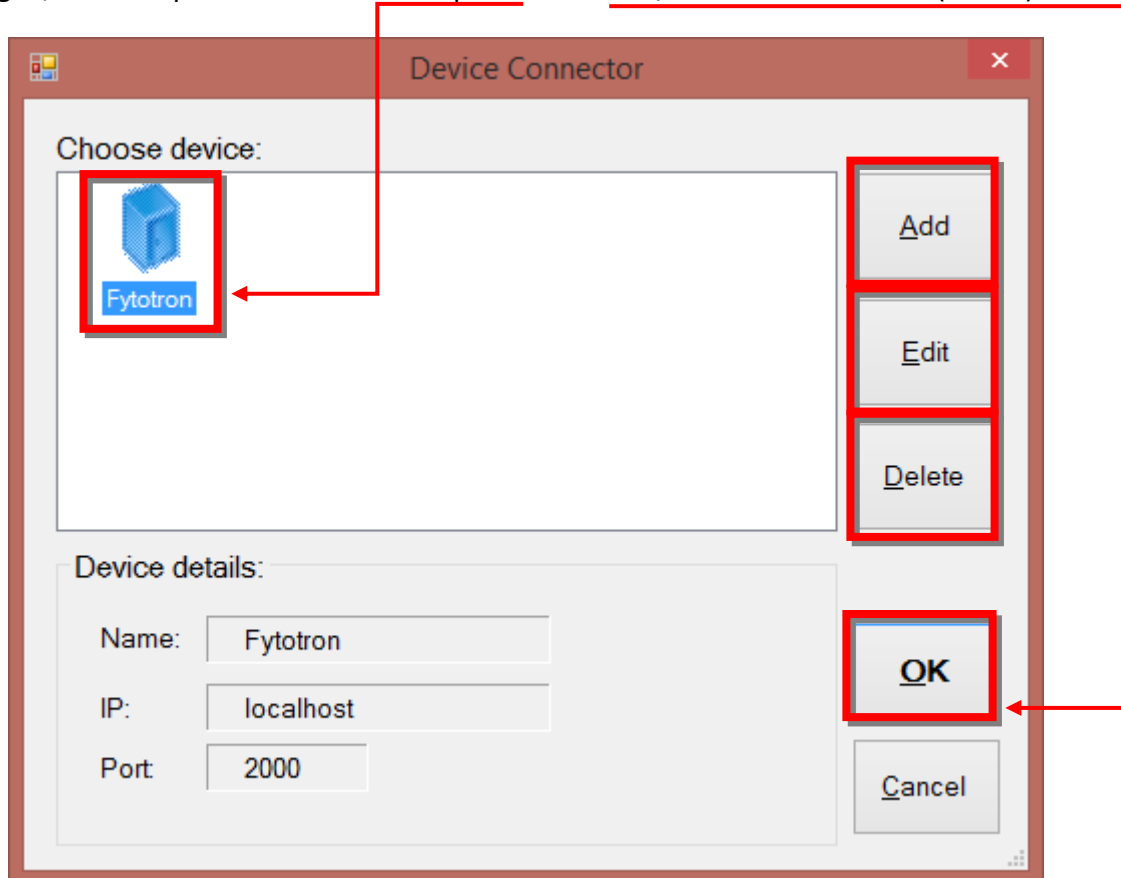
### 2.3.1 LOGIN

When you run the *Client* application, the initial device selection dialog<sup>1</sup> is displayed (Pict. 7).



Functions *Add*, *Edit* and *Delete* should be only used by trained personnel with the approval of PSI. Self made changes in the setup may corrupt the communication and disable device control.

To log in, click the particular device and press the Enter / Click the *OK* button (Pict. 7).



Pict. 7 Login

---

<sup>1</sup> Logon window appears only at the moment when there is more than one Fytotron growth chambers installed. Otherwise the automatic selection is made and this dialog is skipped.



Pict. 8 Authentication

After selecting the device, *AUTHENTICATION* screen is displayed (Pict. 8). This screen contains three areas:

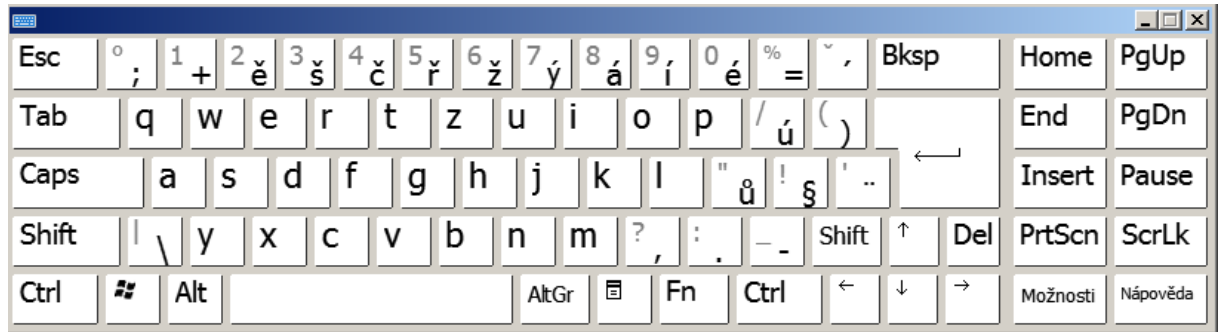
- Server
- Authentication
- Close Client

IP address, server port and current server state are shown in the *Server* area.



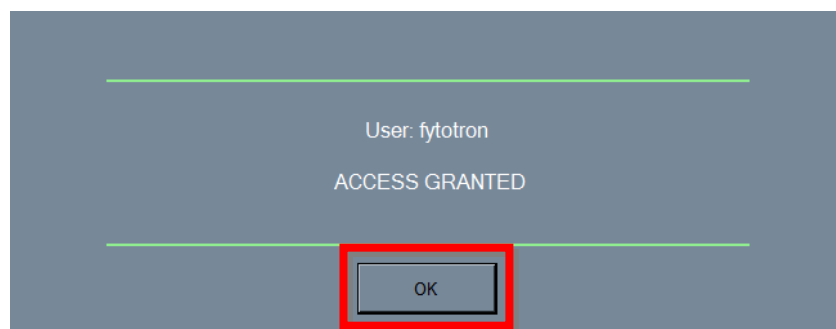
If the *State* box shows *Disconnected* message, the server is not running and must be started before logging in.

*Authentication* area contains fields for user credentials and *Login* button. On the left side, on screen keyboard toggle button is located. (Pict. 9).



Pict. 9 On Screen Keyboard

After filling in the required information, click *Login* button. Credentials are checked and if valid, confirmation message is displayed (Pict. 10).



Pict. 10 Successful Login into the Client Application

The last option is the *Close Client* button. Clicking this button closes the login window.

### 2.3.2 FYTOTRON CLIENT – SCREENS DESCRIPTION

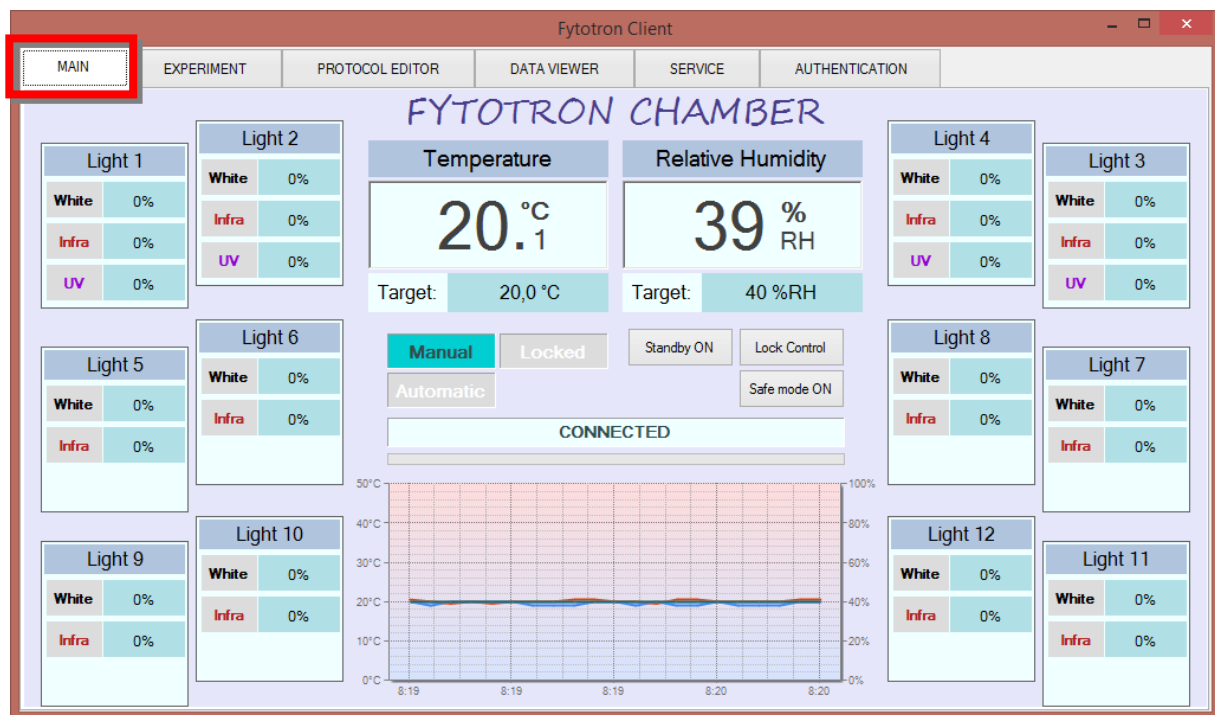
Client program is functionally divided into several tabs:

- **Main tab** – allows manual adjustment of lights, temperature and relative humidity (only constant values, not the day / night cycle) and provides simple recorded values graph
- **Experiment tab** – provides tools for protocol state monitoring and control
- **Protocol Editor tab** – provides tools for generating protocols, i.e. instructions for simulating complicated growth conditions from simple day / night cycle with constant temperature and humidity to complicated diurnal waveforms of all parameters
- **Data Viewer tab** – displays complex graph and provides tools for recorded data export

- **Service** – displays information about the connection to the server and allows control of the client window
- **Authentication** – manages user sessions

### 2.3.2.1 MAIN

The **Main** tab displays current and target values for the following parameters (Pict. 11): temperature, relative humidity and individual lights. The graph (Pict. 15) displays the temperature and humidity.



Pict. 11 Main Tab

#### 2.3.2.1.1 MODE OF OPERATION

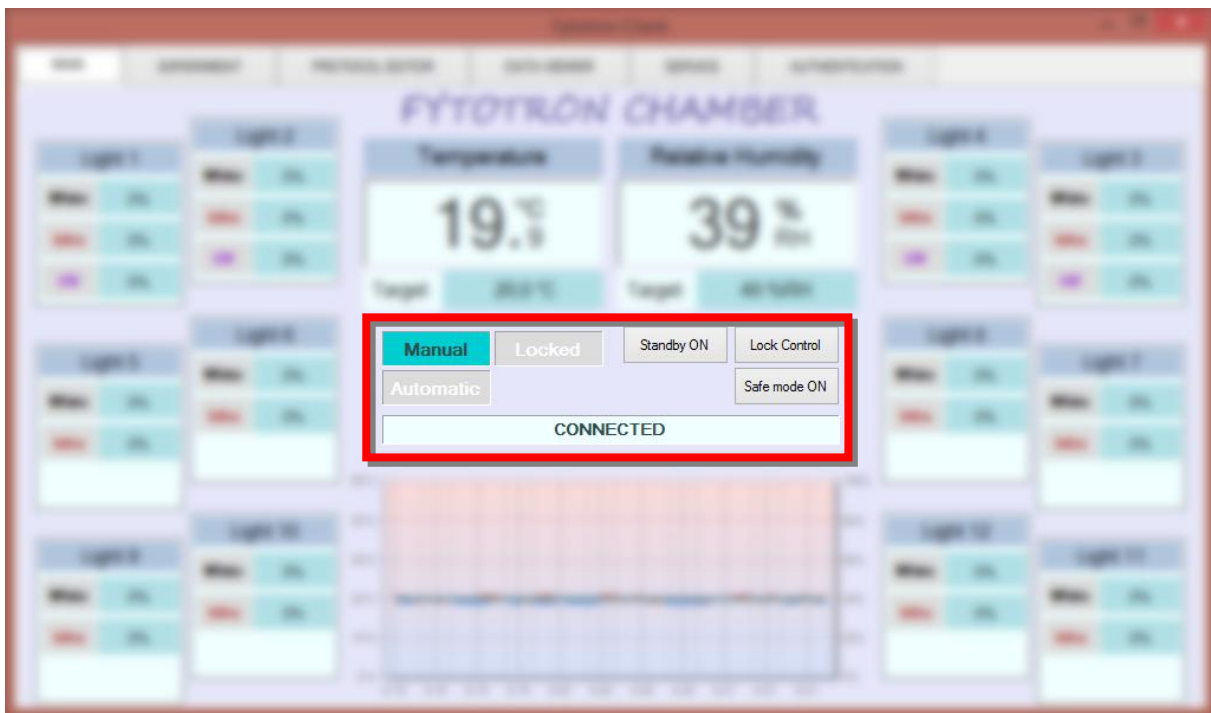
Application can operate in *manual* or *automatic* mode. Manual mode allows to directly change the target temperature and humidity and light control. Automatic mode uses controls the above using predefined protocols.

Current mode of operation is shown on the left side (Pict. 12), control buttons are on the right side.

*Standby* button turns chamber into the standby mode, where the lights and humidity control are turned off. Ambient temperature is maintained and overheating protection is activated.

*Safe mode* is used to dim the lights when operator needs to enter into the chamber.

*Lock Control* button locks application controls to avoid unwanted operation. To unlock the controls, press the *Lock Button* repeatedly and re-enter the credentials.

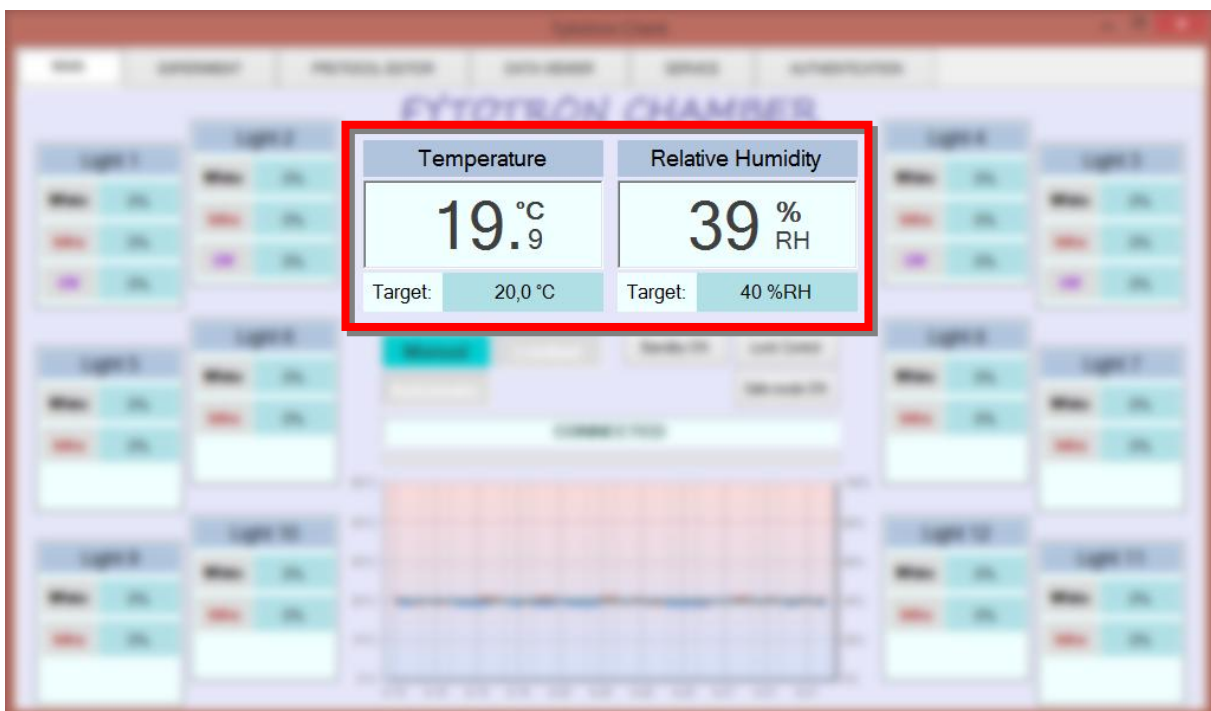


Pict. 12 Status Indication and Change of Operating Modes

At the bottom of this section, there is a window informing on the progress of the running experiment, where current repeat and status of the current cycle is shown.

#### 2.3.2.1.2 TEMPERATURE AND HUMIDITY

*Actual temperature and humidity* is displayed in the upper part of the window (Pict. 13), along with target values. These values can be changed by clicking on the corresponding target value label. Values cannot be changed if the protocol is running or if the screen is locked.



Pict. 13 Temperature and Humidity Settings

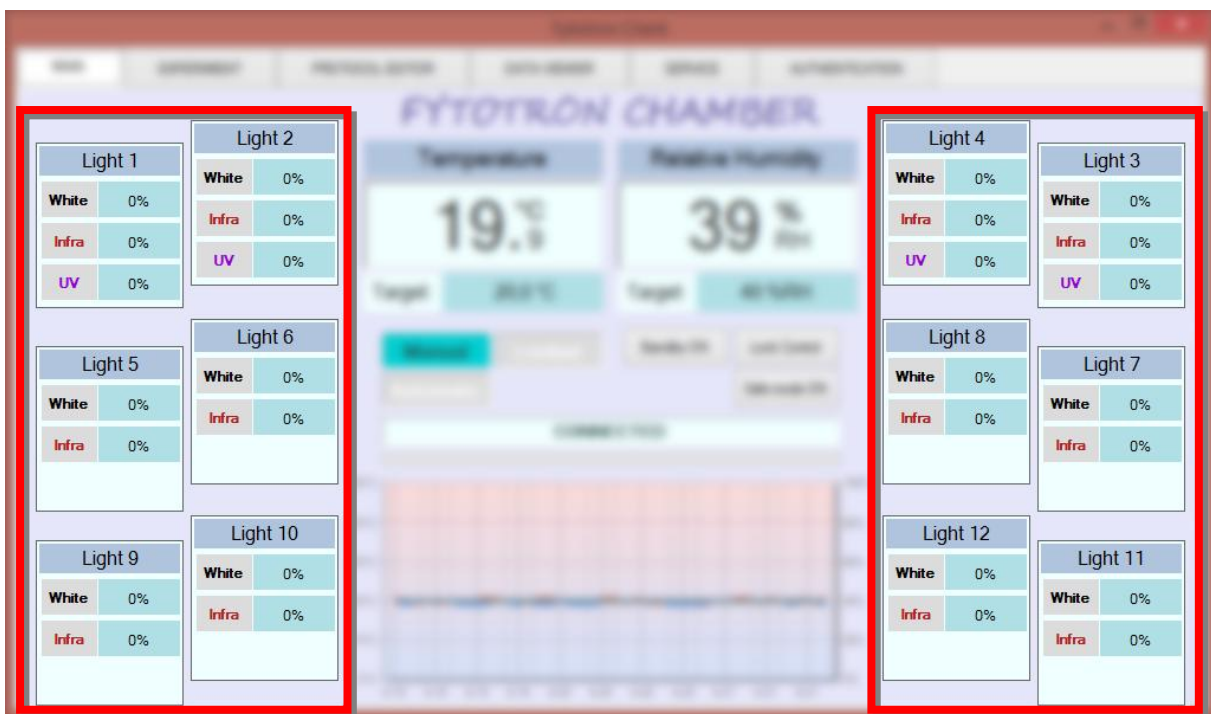
### 2.3.2.1.3 LIGHTS

On the sides of the main window, there are controls for individual lights (Pict. 14). The number, placement and light components of light controls reflect actual chamber dispositions. If the shelf light is divided into two sections, the section closer to the door is odd numbered, the farther one even numbered.



For example, section labeled *Light 1* controls the front left half of the upper shelf light.

Light intensity is displayed in the percents of maximal intensity and can be changed by clicking on the intensity value label. Light is turned on and off by clicking the light name label.

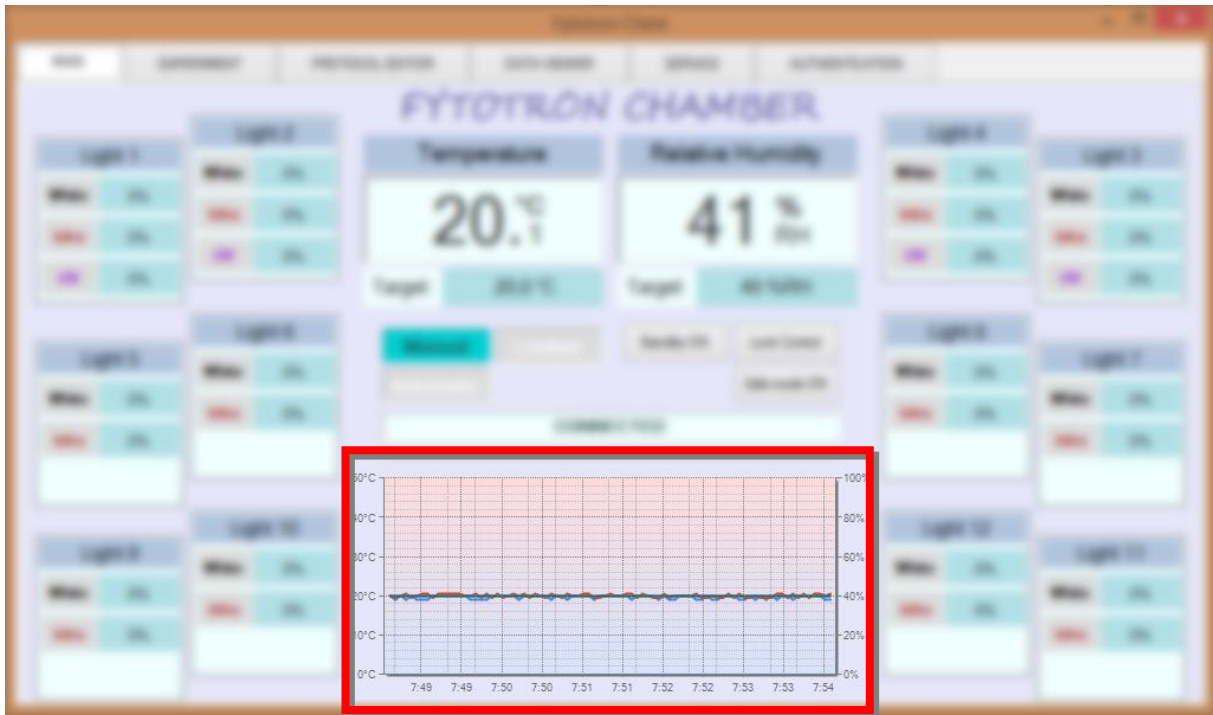


Pict. 14 Light Control

### 2.3.2.1.4 GRAPH

The graph at the bottom of the window (Pict. 15) shows waveforms of target and actual temperature and humidity. *Primary Y axis* holds temperature, *secondary Y axis* humidity. *The X axis* contains timestamps of the measured values. Chart element settings are accessed by clicking on the graph area.

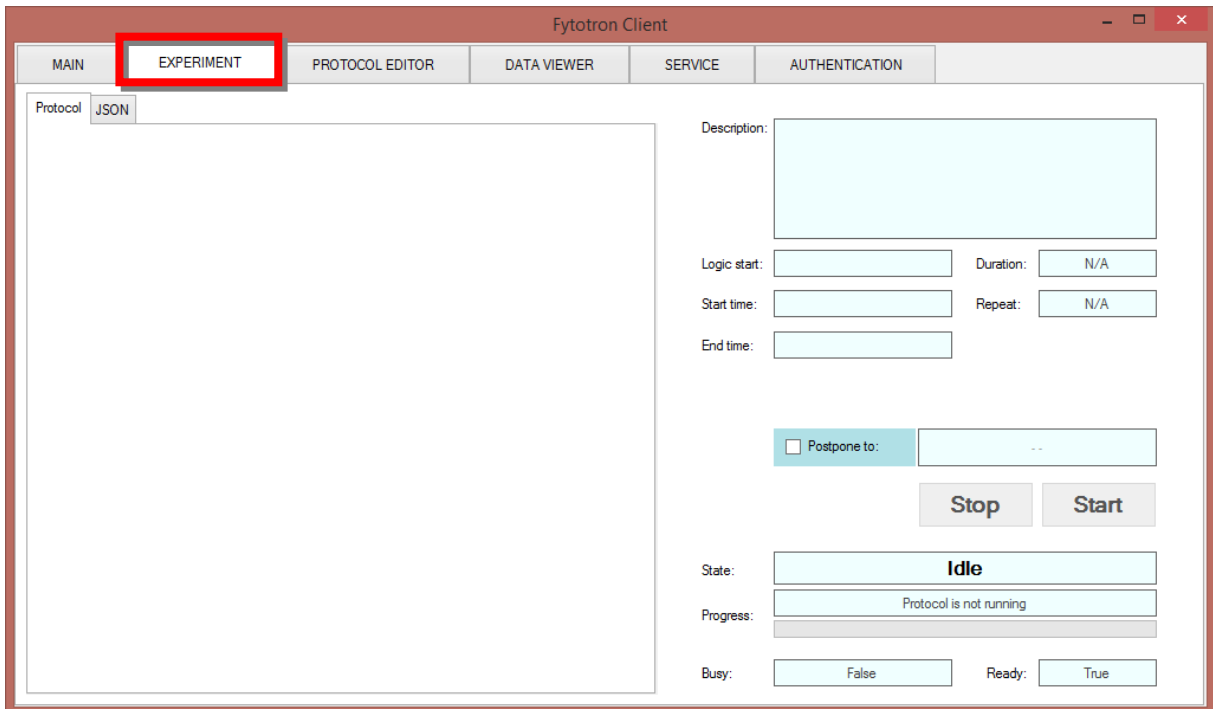




Pict. 15 Graph of Temperature and Humidity

### 2.3.2.2 EXPERIMENT

**Experiment tab** is used to control the state of current experiment and detailed view of the actual position in the protocol.



Pict. 16 Experiment (blank)

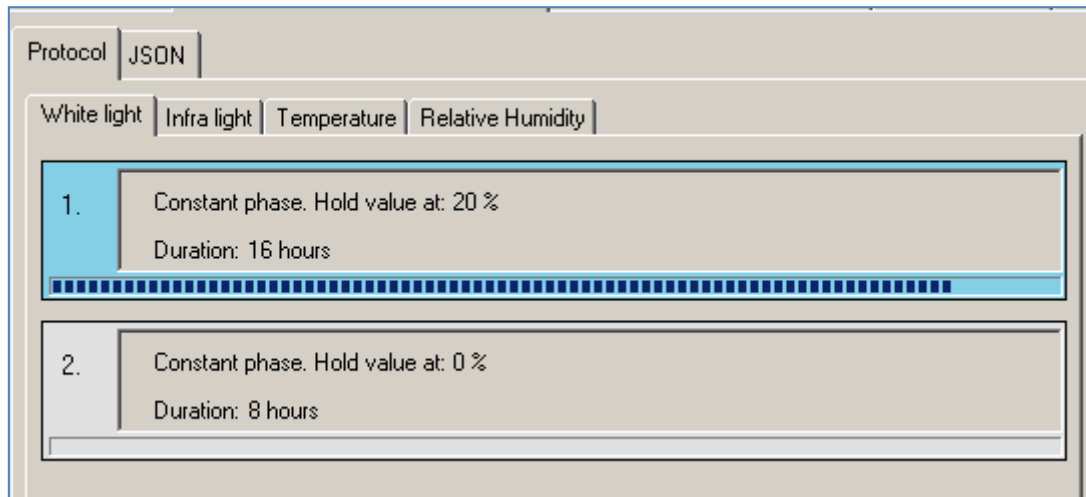
### 2.3.2.2.1 INFORMATION ABOUT THE EXPERIMENT

The left side of window (Pict. 17) contains information about the currently loaded protocol and its progress. It is divided into the sub-tabs with partial protocols for individual lights, temperature and humidity.



The blue color indicates which phase of the protocol is currently active.

The bookmark *JSON* shows text version of the protocol in the JSON language.



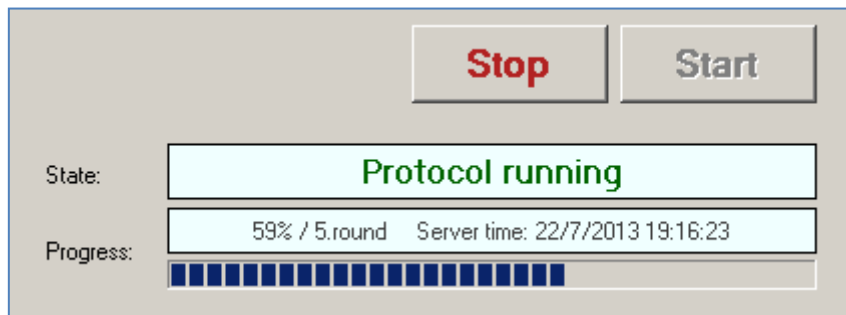
Pict. 17 Phase Progress

Information about the beginning, end duration and the number of repetitions of the protocol is displayed in the upper right part of the window (Pict. 18).



Pict. 18 Experiment Information

Current state and progress of the experiment and state control buttons are displayed in the bottom right part of the window (Pict. 19).



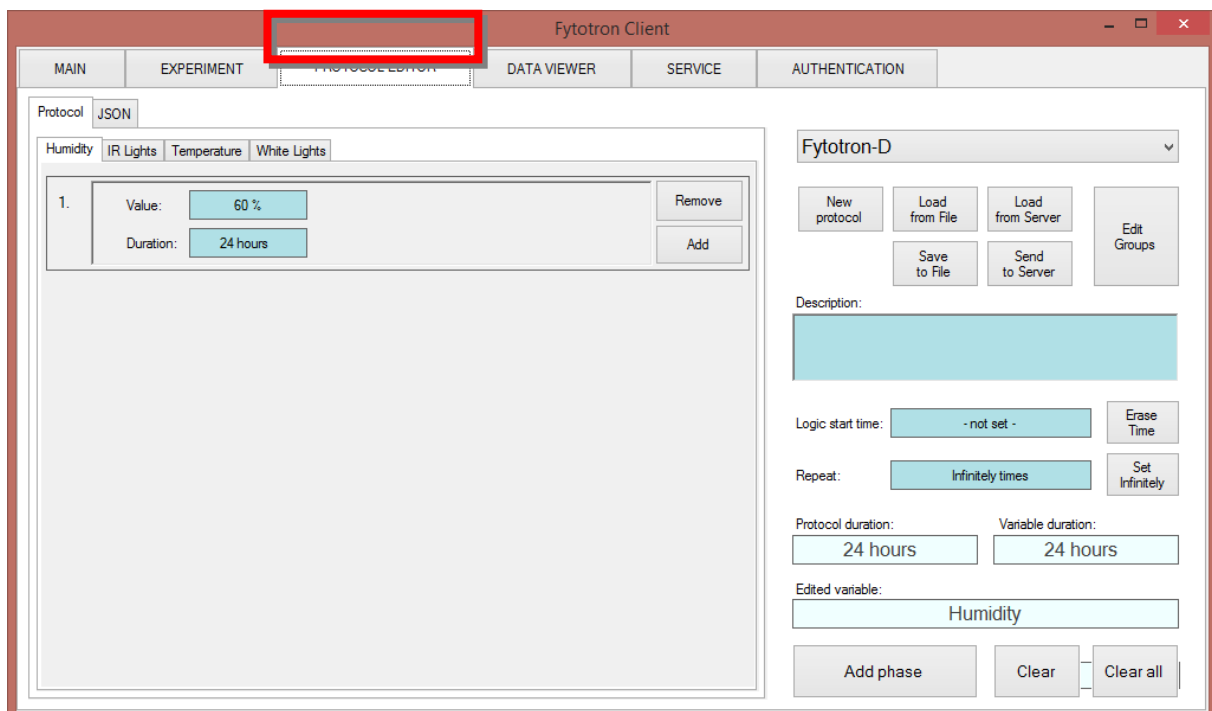
Pict. 19 Experiment Controls

### 2.3.2.3 PROTOCOL EDITOR

**Protocol Editor** tab (**Error! Reference source not found.**) contains controls allowing creating new or editing existing protocols. These protocols can simulate regularly recurring natural events.



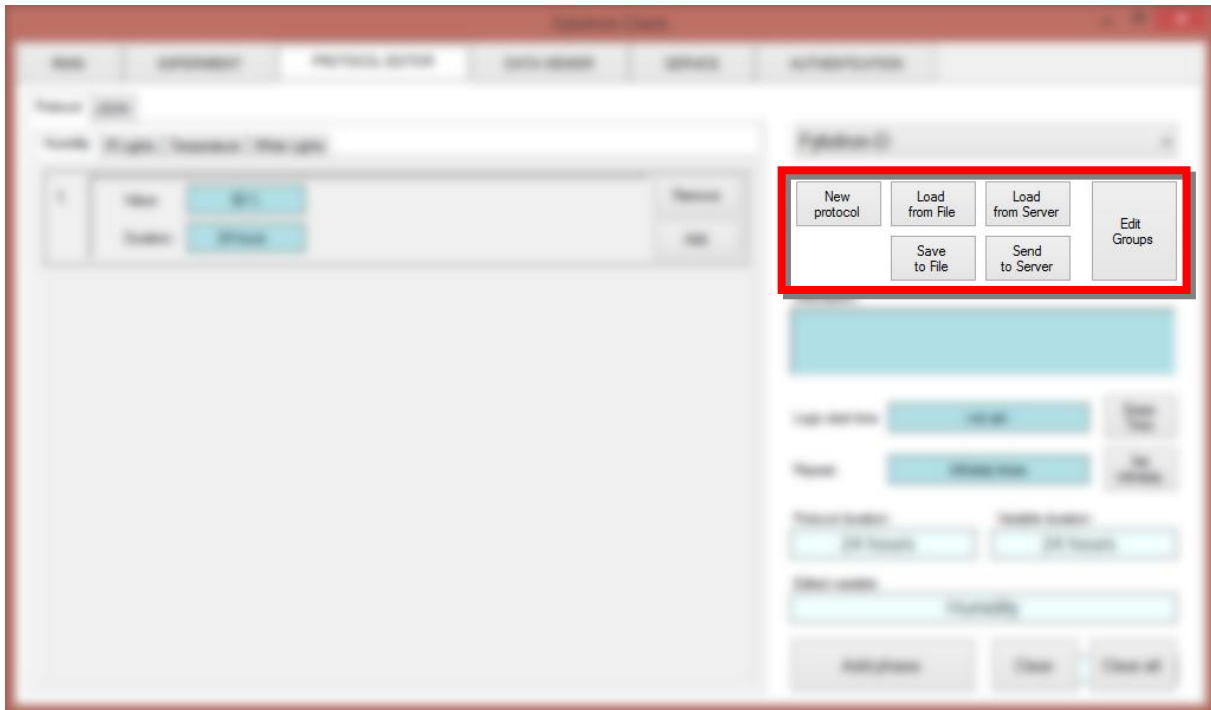
An example might be the alternation of day and night, created from light, temperature and humidity curves.



Pict. 20 Protocol Editor (blank)

#### 2.3.2.3.1 CREATING, SAVING AND LOADING THE PROTOCOLS

In the upper right part of the window (Pict. 21), there are buttons for protocol creating, saving and loading. After pressing the *New protocol* button, dialog window with selection of controlled parameters for the new protocol appears (Pict. 22). The *Edit Groups* button can be used later on to recall this window. *Load from File* and *Save to File* buttons are used for handling the protocols on the local disk. *Load from Server* and *Send to Server* buttons work with the protocol currently stored in the server.



Pict. 21 Loading and Saving of Protocols

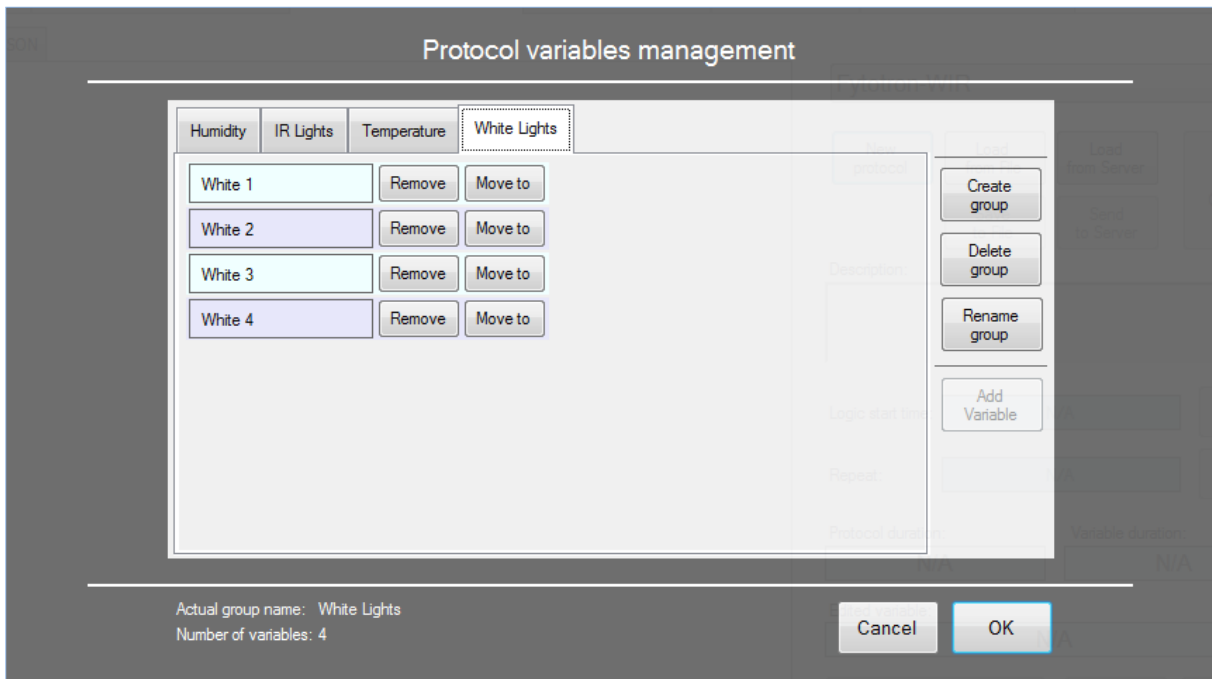


Before the protocol can be run, it has to be uploaded to the server first.

#### 2.3.2.3.2 PROTOCOL VARIABLES MANAGEMENT

By default, variables of the same type are merged into a single group. Each group is represented by one tab, which displays all variables that it contains. Groups are the base units in the protocols; each group can have different sequence of phases in protocol and thus can be controlled separately.

Turned around, each variable, which should be controlled in the protocol, must be contained in a group.

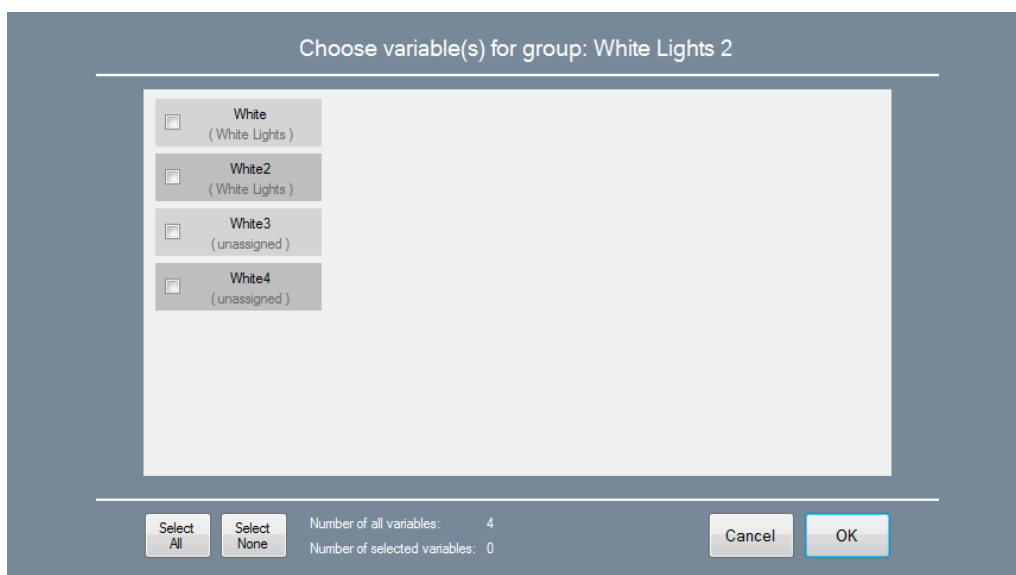


Pict. 22 Group variables

In the right part of the window, there are buttons for the whole group operations - *Create Group* for new group, *Delete group* for removing the group and *Rename group* for changing group name.

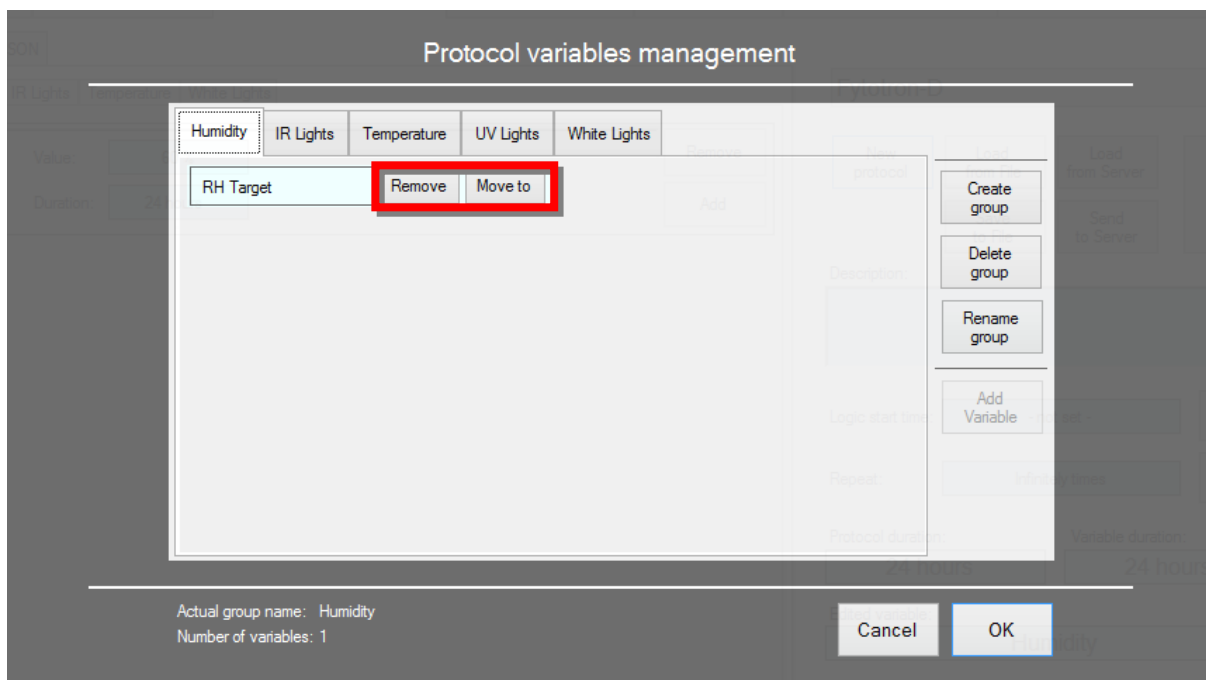
*Add Variable* button is used to add variables to the current group. If the group already contains all variables of the same type as current group, button is disabled. When pressed, list of available variables is displayed (**Error! Reference source not found.**).

Variables are assigned to current group if their checkbox is ticked. Both free and already assigned variables can be selected, if a variable is already assigned to some group, it is moved to the current one. Selection is confirmed by the *OK* button.



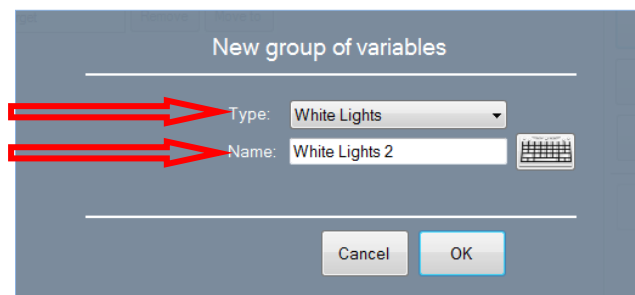
Pict. 23 Variables Assignment

Each variable in a group is carrying two buttons (Pict. 24 **Group Variables Management** [Error! Reference source not found.](#) [Error! Reference source not found.](#)). *Remove* button removes the variable from the group, thus it becomes unassigned. It is either available for assignment to another group, or if it remains unassigned, it will not be available for the protocol. *Move* button is used to directly assign a variable to another group of the same type.



Pict. 24 Group Variables Management

To create a new group, press the *Create group* button. In the dialog box (Pict. 25) select the type of the group (this determines which parameters can be assigned to a group) and enter a name for the group.

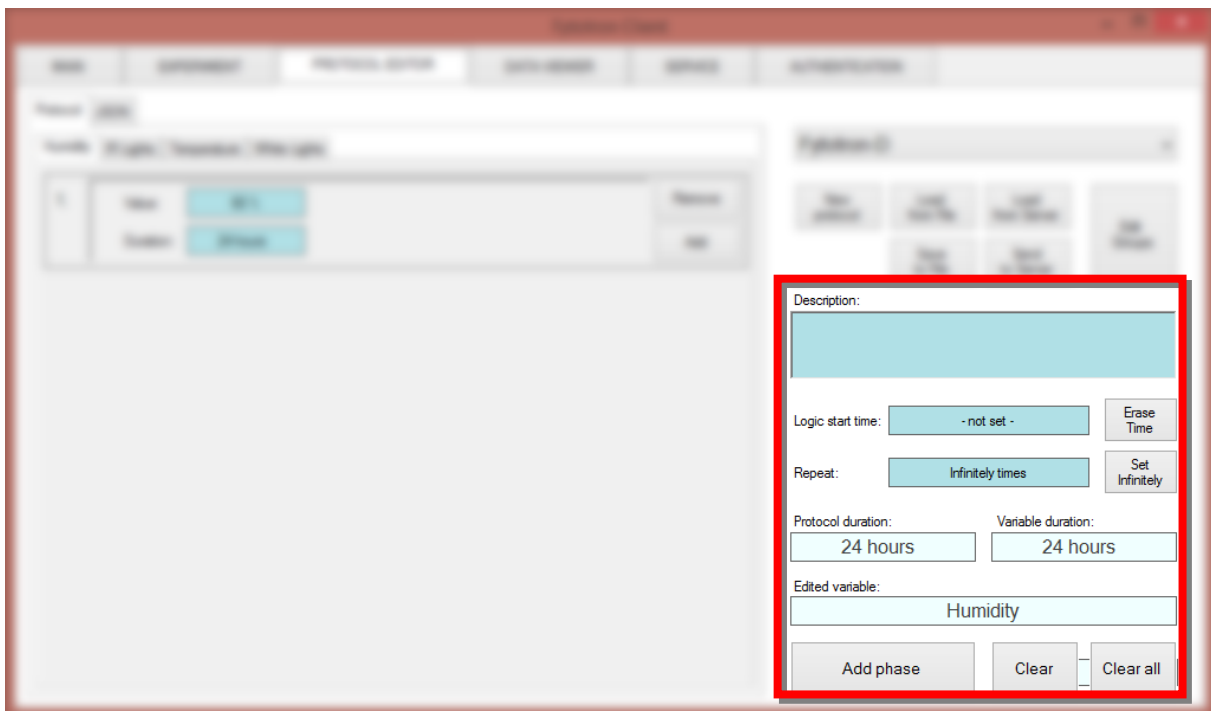


Pict. 25 New Group

Newly created group has no assigned parameters use the *Add Variable* button to add some.

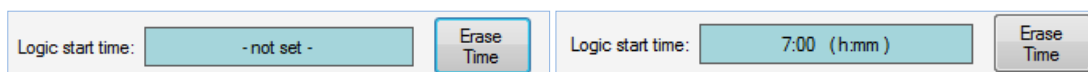
### 2.3.2.3.3 EDITING THE PROTOCOL

Controls for editing the protocol are located in the bottom right part of the window (Pict. 26). Here you can set the *Protocol description*, a *Logic start time* and the number of repetitions of all phases of the protocol.



Pict. 26 Editing the protocol

*Logic start time* specifies the start time of the protocol in range from 0:00 to 23:59. If the value is set by clicking the value blue field, the position in the protocol is immediately recalculated at the protocol start, so it seems it was started at the *Logical start time*. *Erase Time* button unset the value.

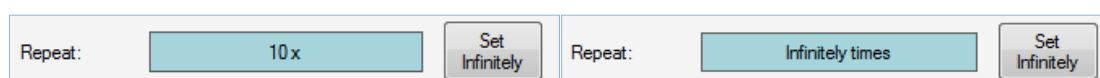


Pict. 27 Logic Start Time



*Logic start time* is useful for editing the protocol parameters during the protocol execution. If the time is set, stop the protocol, edit parameters and run it again. Protocol resumes the execution in the correct position.

*Repeat* sets the number of repetitions of protocol (Pict. 28). The minimum value is one repetition maximum value is infinite. It is set by clicking on the value blue field.

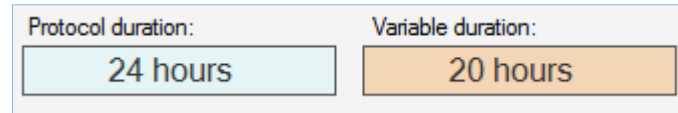


Pict. 28 Repeat

*Set Infinitely* button sets the number of repeats to infinity, protocol is then repeated in a never-ending loop.

*Protocol duration* shows duration of the entire protocol. *Variable duration* is used to check the duration of the protocol components. The duration of all components should be the same in the correctly defined protocol, and therefore equal to the *Protocol duration*. Length

may however differ during the protocol building process and this is visualized in the *Variable duration* value and field color (Pict. 29).



Pict. 29 Image of Protocol duration and Variable duration

Protocol component for each of the defined groups is build from the phases with defined duration. The sum of phase durations makes *Variable duration*.

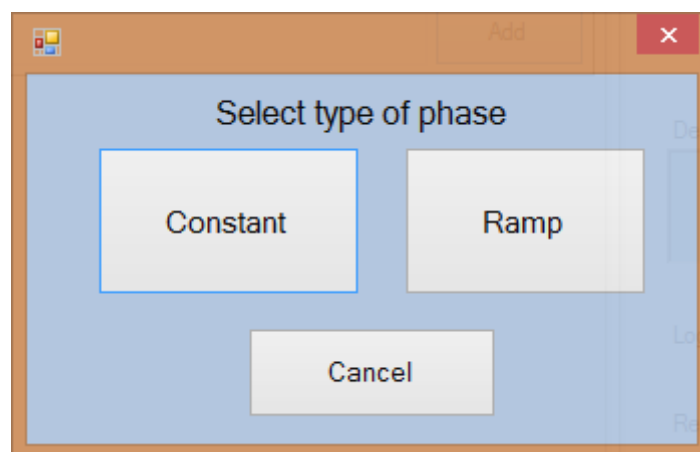
If the protocol contains only one component (e.g. temperature), *Protocol duration* is always equal to the *Variable duration*. If it contains more components, *Protocol duration* shows the longest of component durations and *Variable durations* shows value for currently edited component.

*Clear* and *Clear all* buttons are used for removing currently selected or all phases of the current protocol component. Single phases can be also removed using *Remove* button on the phase visualization box.

*Add phase* button is used for adding phase at the beginning of the protocol. To add phase after an existing phase, Add button on the phase visualization box is used.

After pressing one of the add buttons, Add Phase dialog box appears (Pict. 30). Constant option creates phase that maintains constant value of the variable (Pict. 31 Constant Phase

), while the Ramp option creates a phase with linear variable transition from Start to End value (Pict. 32 Ramp Phase ).



Pict. 30 New phase of protocol



Both phases have *Duration* parameter, specifying duration time of the phase. Parameters are changed by clicking on the blue field.

4.	Value:	<input type="text" value="30 °C"/>		<input type="button" value="Remove"/>
	Duration:	<input type="text" value="1h 30min"/>		<input type="button" value="Add"/>

Pict. 31 Constant Phase

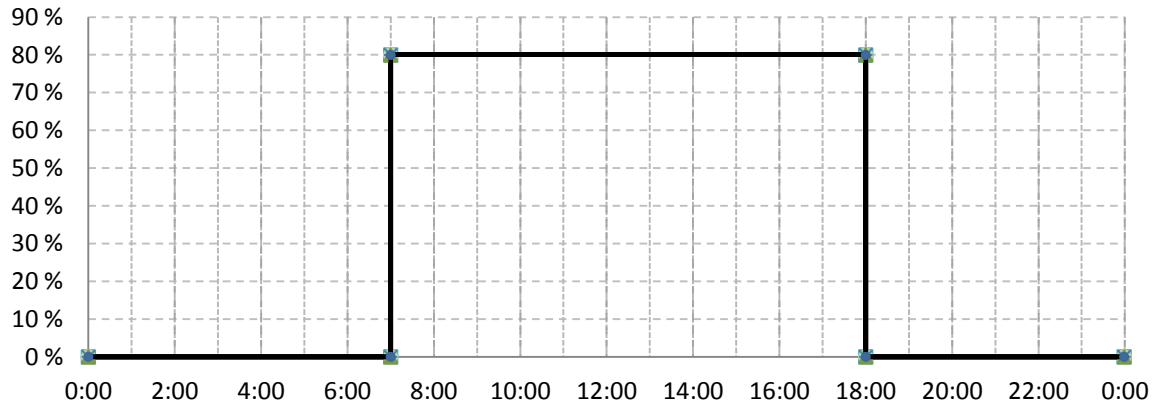
1.	Start:	<input type="text" value="18 °C"/>	End:	<input type="text" value="20 °C"/>		<input type="button" value="Remove"/>
	Duration:	<input type="text" value="1 hour"/>				<input type="button" value="Add"/>

Pict. 32 Ramp Phase

### 2.3.2.3.4 PROTOCOL EXAMPLES

#### Example #1 - Simple day-night cycle

The first example shows how to set simple day-night cycle, with protocol only for white lights. The light intensity is 80% from 7:00 to 6:00 p.m. and darkness for the rest of the day (Pict. 33).



Pict. 33 Simple Day-Night Protocol

Create a new protocol by pressing the *New Protocol* button. A dialog box for selecting the regulated variables appears. Select only the White Lights group, remove others if present, and click on OK. The White Light group tab is created. The easiest way how to create light curve on the picture is to use three constant phases. The first phase is from midnight to 7:00. The duration is therefore 7h, lights intensity 0%. The second phase has intensity 80%, starts at 7:00 and ends at 18:00, the duration is thus 11h. The last phase duration is 6h and intensity 0%

	Phase type	Settings	Time	Duration
1.	Constant	0 %	0:00 - 07:00	7 h
2.	Constant	80 %	07:00 - 18:00	11 h
3.	Constant	0 %	18:00 - 00:00	6 h

Tab. 2 List of Phases for Example #1

Insert the first phase by clicking *Add Phase* button, and select the *Constant* type. New phase with default values is inserted into the *White Lights* tab. Set the *Value* and *Duration* fields to values listed in the Tab. 2 List of by clicking corresponding blue fields. Add second and third phase by clicking previous phase *Add* button, and fill in the values from the Tab. 2 List of .

Next, set *Logic start time* to midnight (0:00) and *Repeat* to infinity. Now the protocol is set. To run it, first upload it to the server by clicking the *Send to Server* button, and then start it using *Start* button from the *EXPERIMENT CONTROL* tab. The system starts execution of the protocol in time corresponding to the current real world time.

TIP: If the protocol duration is 24h, the first and last phase are the same type with the same values (except duration), one phase can be saved by using the *Logic Start* feature. The procedure is demonstrated using the Example #1 above. Protocol is not built from scratch, just modified. First, remove either first or last phase (the first in this example) by clicking its *Remove* button. The remaining phases of the protocol are automatically renumbered. Extend the originally third, now second phase *Duration* by the length corresponding to the deleted phase. In our case, the second phase has length of 13 hours (**Error! Reference source not found.**).

	Phase type	Settings	Time	Duration
1.	Constant	80 %	07:00 - 18:00	11 h
2.	Constant	0 %	18:00 -07:00	13 h

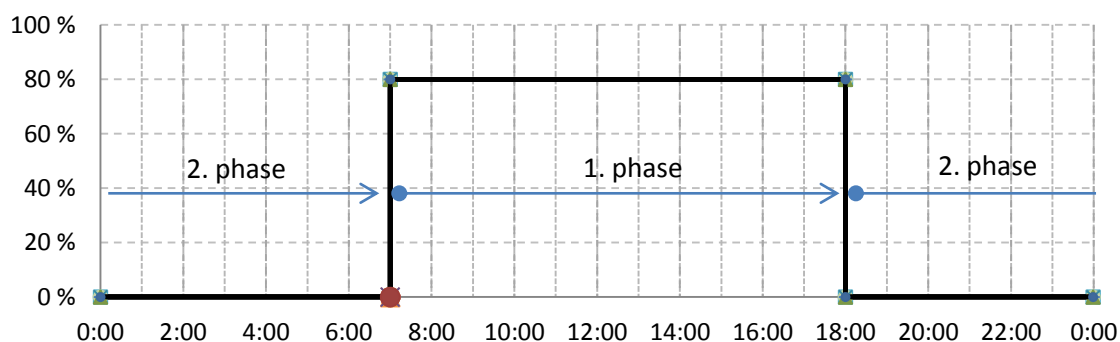
Tab. 3 List of Phases for Modified Example #1

To finish the setup, modify *Logic start time* to 7:00. This causes the protocol to start at 7:00 real world time with 11h of light, followed by 13h of dark.

The screenshot shows a software interface for configuring light phases. It is titled 'White Lights'. There are two phase configuration blocks. The first block is labeled '1.' and contains a 'Value' field set to '80 %' and a 'Duration' field set to '11 hours'. To the right of this block are 'Remove' and 'Add' buttons. The second block is labeled '2.' and contains a 'Value' field set to '0 %' and a 'Duration' field set to '13 hours'. It also has 'Remove' and 'Add' buttons.

Pict. 34 Phases for Modified Example #1

Output light curve is therefore identical with the curve from the Example #1 programmed using 3 phases (**Error! Reference source not found.**).



Pict. 35 Phases for Modified Example #1 with Red Marked *Logic start time*

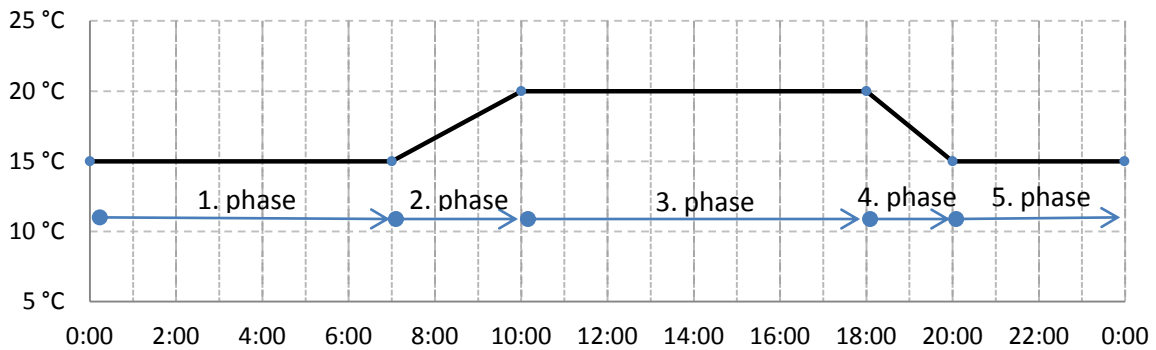
## Example #2 - Temperature regulation with ramps

The second example shows how to program temperature day-night cycle with dusk/dawn like temperature transitions (**Error! Reference source not found.**).

Create the protocol the same way as for Example #1, but select *Temperature* this time.

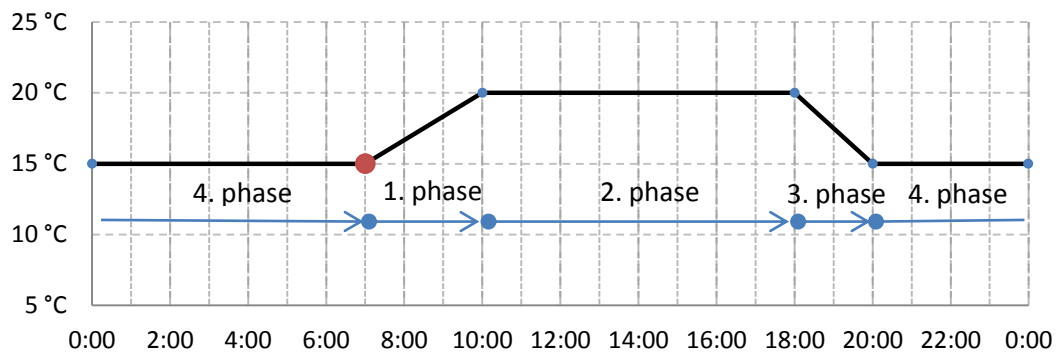


Name *Temperature* may differ depending on the device type.



Pict. 36 Temperature Regulation with Ramps

The waveform can be divided into five phases - constant phase 15 °C, rising phase 15 to 20 °C, constant phase 20 °C, descending phase 20 to 15 °C and constant phase 15 °C. The first and last phase is the same, therefore the first phase can be omitted while extending the duration of the last phase. *Logic start time* is set to 7:00.



Pict. 37 Phases for Example #2

	Phase type	Settings	Time	Duration
1.	Ramp	15 - 20 °C	7:00 - 10:00	3 h
2.	Constant	20 °C	10:00 - 18:00	8 h
3.	Ramp	20 - 15 °C	18:00 - 20:00	2 h
4.	Constant	15 °C	20:00 - 07:00	11 h

Tab. 4 List of Phases for Example #2

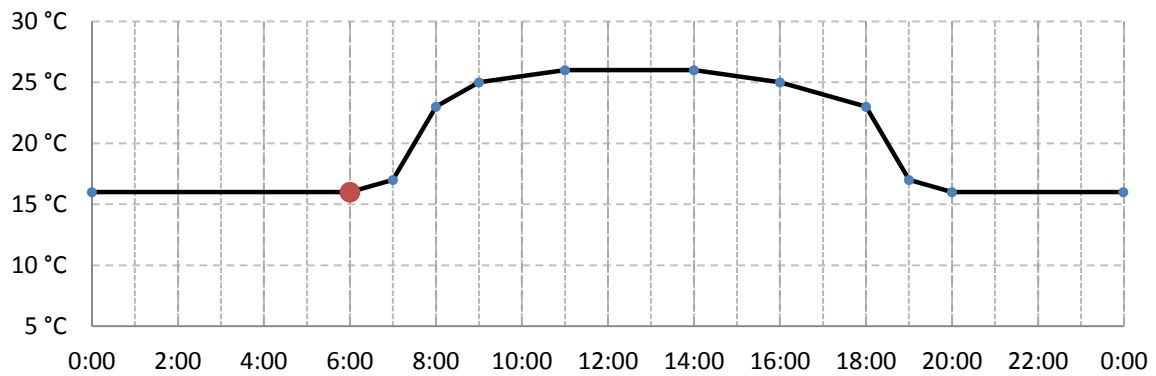
Temperature	
1.	Start: <input type="text" value="15 °C"/> End: <input type="text" value="20 °C"/> Duration: <input type="text" value="3 hours"/>
	<input type="button" value="Remove"/> <input type="button" value="Add"/>
2.	Value: <input type="text" value="20 °C"/> Duration: <input type="text" value="8 hours"/>
	<input type="button" value="Remove"/> <input type="button" value="Add"/>
3.	Start: <input type="text" value="20 °C"/> End: <input type="text" value="15 °C"/> Duration: <input type="text" value="2 hours"/>
	<input type="button" value="Remove"/> <input type="button" value="Add"/>
4.	Value: <input type="text" value="15 °C"/> Duration: <input type="text" value="11 hours"/>
	<input type="button" value="Remove"/> <input type="button" value="Add"/>

Pict. 38 Graphical View of Phases for Example #2

### Example #3 - Complex Waveforms

The system allows entering almost any combination of constant and ramp stages. Few more waveforms with a description of phases follow.

Waveform #1, Logic start time 6:00

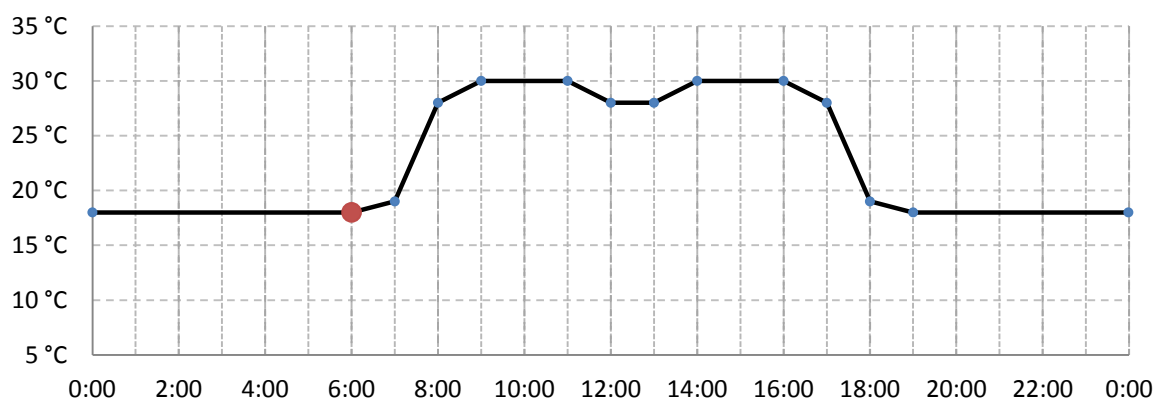


Pict. 39 Complex Waveforms #1

	Phase type	Settings	Time	Duration
1.	Ramp	16 - 17 °C	06:00 - 07:00	1 h
2.	Ramp	17 - 23 °C	07:00 - 08:00	1 h
3.	Ramp	23 - 25 °C	08:00 - 09:00	1 h
4.	Ramp	25 - 26 °C	09:00 - 11:00	2 h
5.	Constant	26 °C	11:00 - 14:00	3 h
6.	Ramp	26 - 25 °C	14:00 - 16:00	2 h
7.	Ramp	25 - 23 °C	16:00 - 18:00	2 h
8.	Ramp	23 - 17 °C	18:00 - 19:00	1 h
9.	Ramp	17 - 16 °C	19:00 - 20:00	1 h
10.	Constant	16 °C	20:00 - 06:00	10 h

Tab. 5 List of Phases for Waveform #1

Waveform #2, Logic start time 6:00

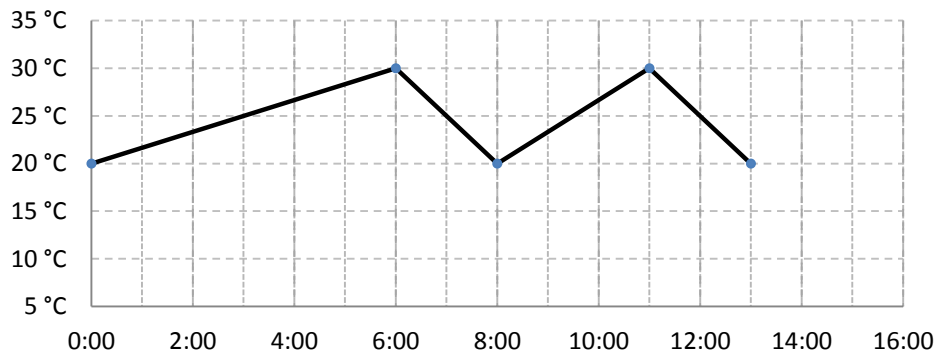


Pict. 40 Complex Waveforms #1

	Phase type	Settings	Time	Duration
1.	Ramp	18 - 19 °C	06:00 - 07:00	1 h
2.	Ramp	19 - 28 °C	07:00 - 08:00	1 h
3.	Ramp	28 - 30 °C	08:00 - 09:00	1 h
4.	Constant	30 °C	09:00 - 11:00	2 h
5.	Ramp	30 - 28 °C	11:00 - 12:00	1 h
6.	Constant	28 °C	12:00 - 13:00	1 h
7.	Ramp	28 - 30 °C	13:00 - 14:00	1 h
8.	Constant	30 °C	14:00 - 16:00	2 h
9.	Ramp	30 - 28 °C	16:00 - 17:00	1 h
10.	Ramp	28 - 19 °C	17:00 - 18:00	1 h
11.	Ramp	19 - 18 °C	18:00 - 19:00	1 h
12.	Constant	18 °C	19:00 - 06:00	11 h

Tab. 6 List of phases for waveform no. 2

Waveform #3 is independent of time of day - *Logic start* time unset. This type of protocol does not necessarily take 24 hours. Time on the X axis in this case does not represent time of the day but the duration of the protocol.



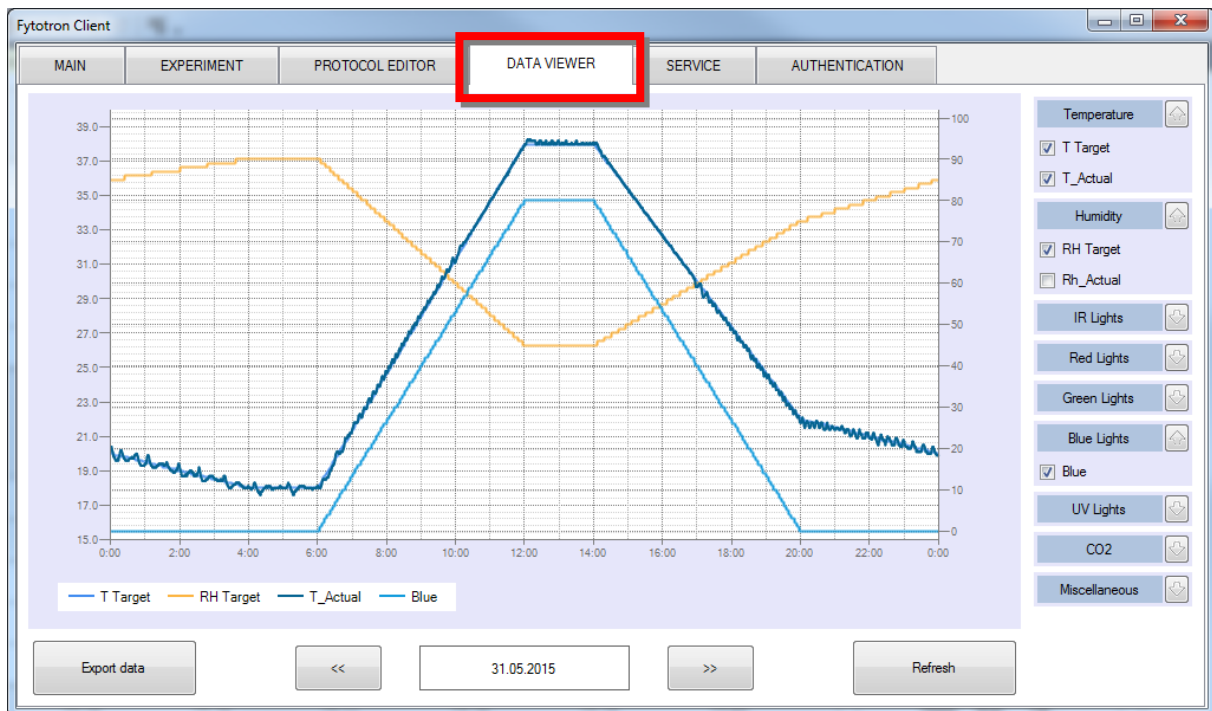
Pict. 41 Example of the process without Logic start setup

	Phase type	Settings	Duration
1.	Ramp	20 - 30 °C	6 h
2.	Ramp	30 - 20 °C	2 h
3.	Ramp	20 - 30 °C	3 h
4.	Ramp	30 - 20 °C	2 h

Tab. 7 List of phases for waveform no. 3

### 2.3.2.4 DATA VIEWER

The **Data Viewer** tab (Pict. 42) is used to display recorded data in graph. The graph shows one day at a time, day selection can be done by clicking in the box and selecting a date in the calendar view or by scroll the days using two buttons on the sides of the window with the date. Displayed parameters are selected in the menu right of the graph.



Pict. 42 Data viewer

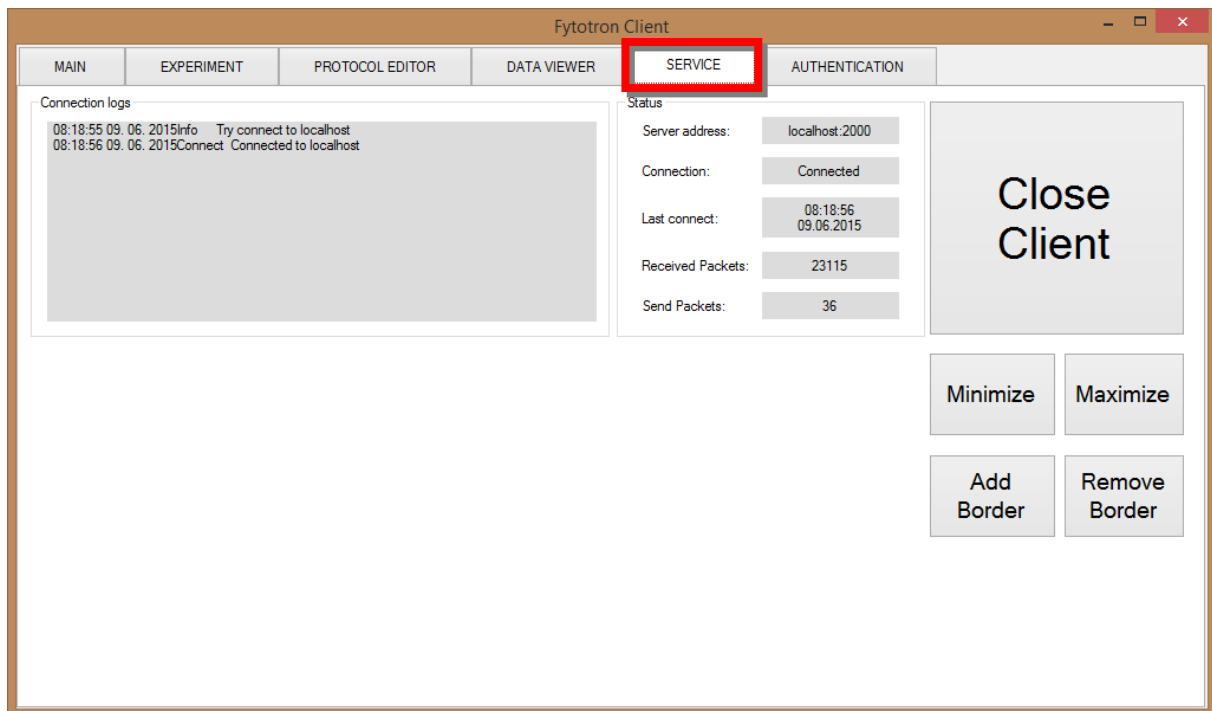
### 2.3.2.5 SERVICE

The **Service** tab (**Error! Reference source not found.**) displays basic status information about the server connection and controls for the application window. *Minimize* button hides the application window to the taskbar, *Maximize* expands the application window to full screen. *Add* and *Remove Border* buttons display and hide the border around the application window. *Close Client* button closes the *Client* application.



Closing application does not influence execution of the current protocol.

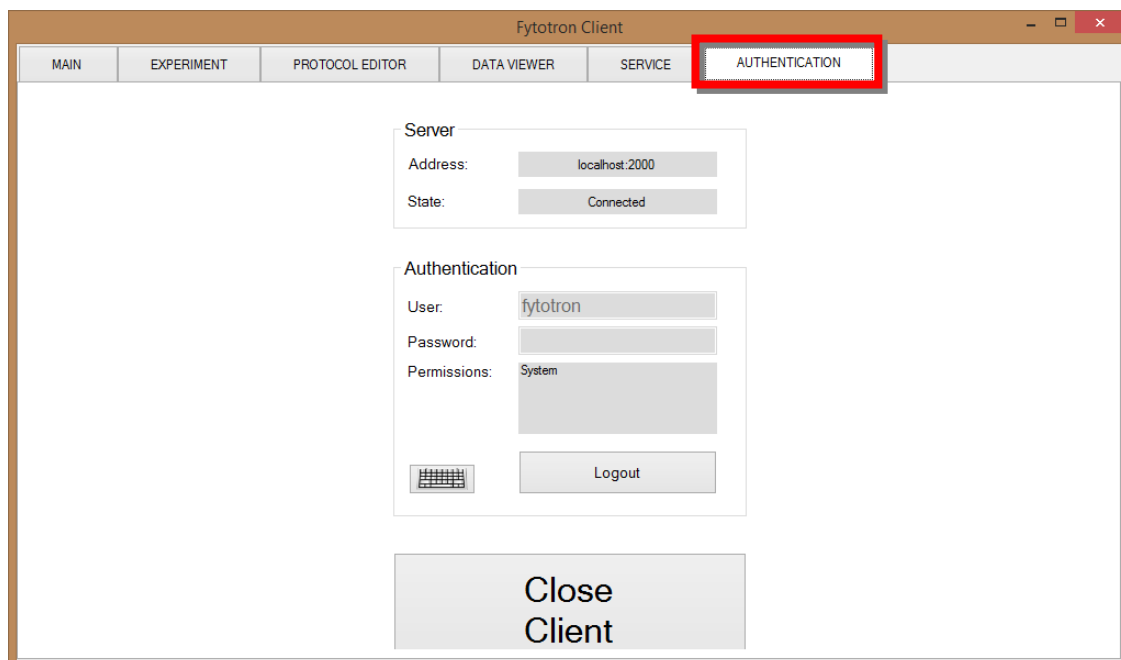




Pict. 43 Service

### 2.3.2.6 AUTENTHICATION

The **Authentication** tab (**Error! Reference source not found.**) is used to logon or log off users. User is asked to enter their username and password. If a user is logged on, the button caption shows *Logout* and it is used to log off. If the user is not logged on, the button caption shows *Login* it is used to logon.



Pict. 44 Authentication

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