

# User Manual for the GSM StreetLight Software



## Rajtek Technical Support

This reference manual describes the capabilities of the software and the range implemented commands needed for remote control of street lighting over the GSM.

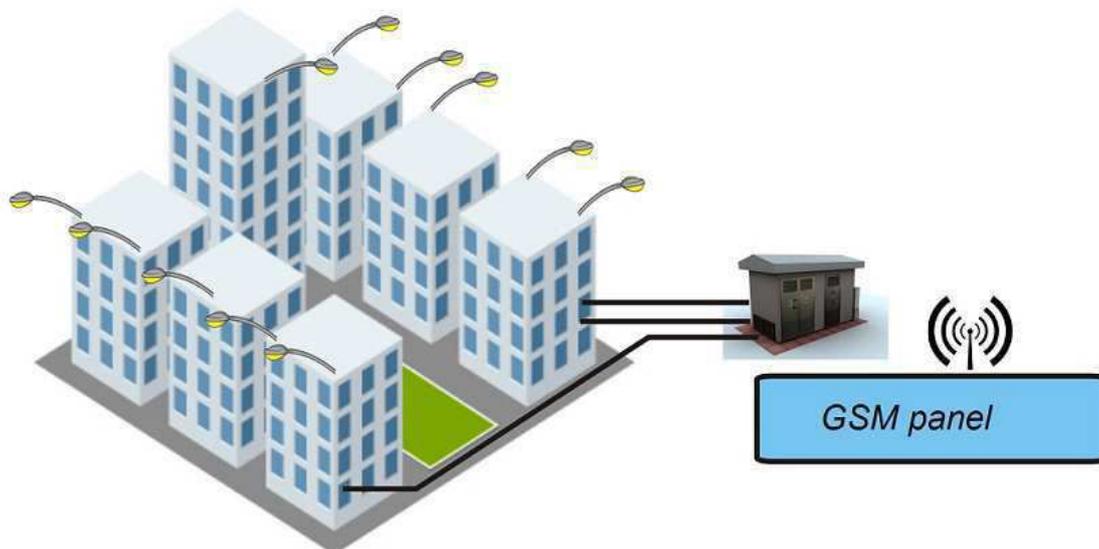
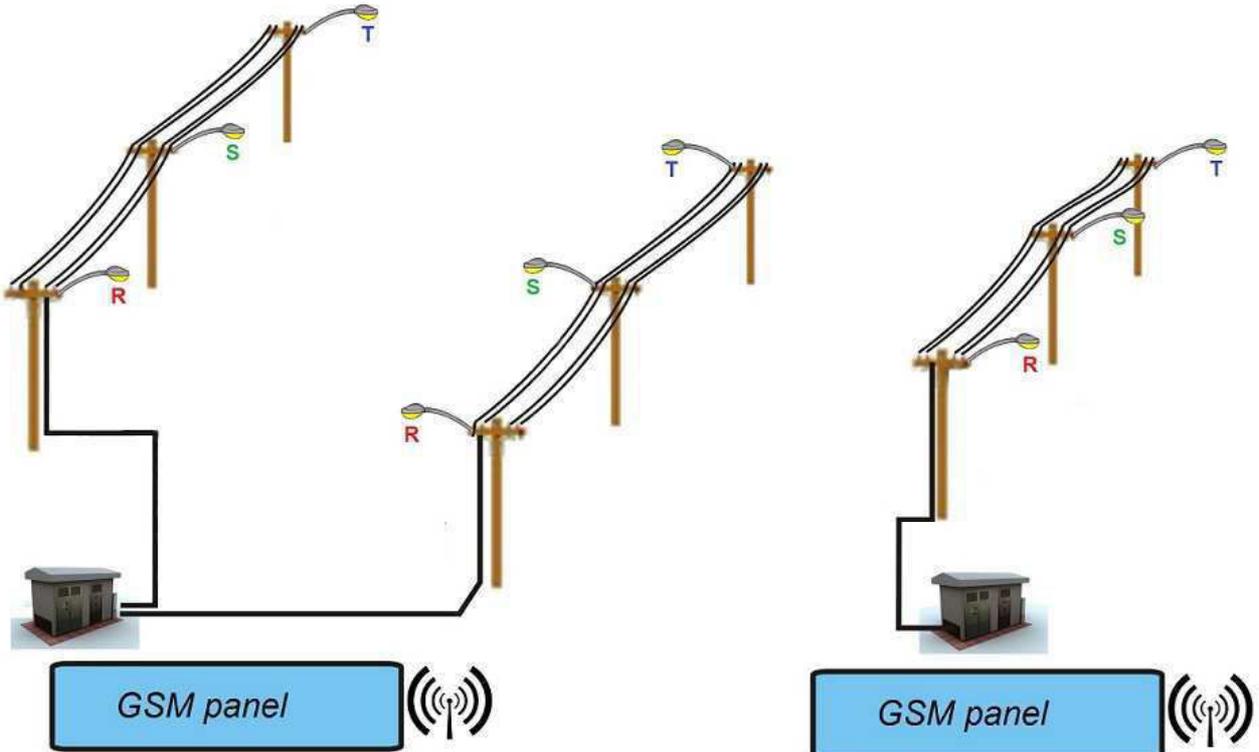
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Revision: 1.0

Street light control center





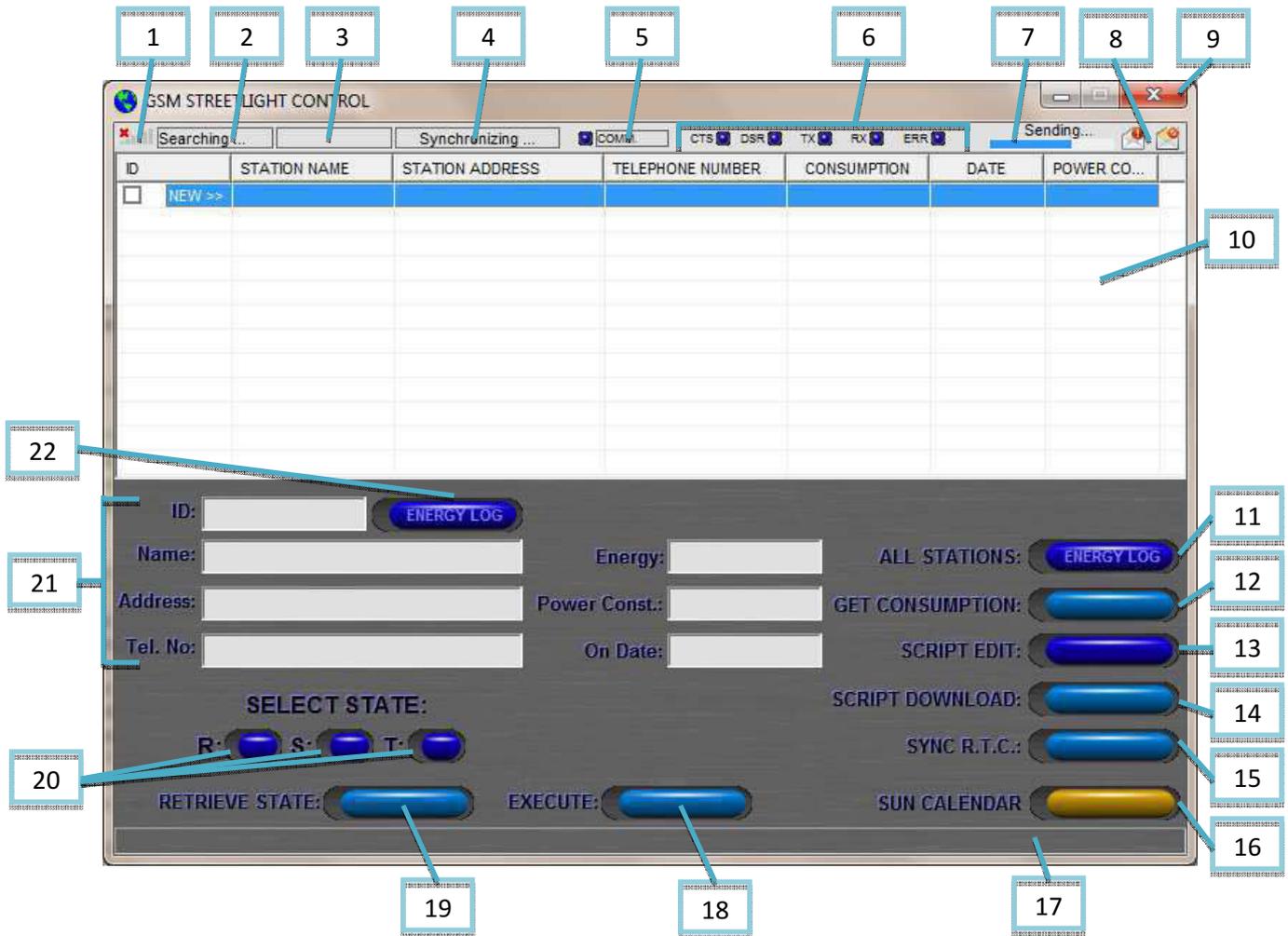
**GSM Panel**

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# 1. Main user interface description



**Picture 1.** Main user interface appearance

The above picture shows the appearance of the main user interface with its commands and different information areas. In the following paragraphs each of the command buttons and information areas will be described and explained.

Before we start, it is very important that the user is introduced to the color coding schema of the user interface. Namely, it is evident that there are three types of buttons:

- Dark Blue Wide 
- Dark Blue Short 
- Light Blue 
- Yellow 

The Dark Blue Wide buttons are for functionalities of the software where the GSM is not used, i.e. where SMS messages are not being sent.

The Dark Blue Short buttons present the user with selection of an option or display an existing option on the client's side. When an option is activated by clicking on the button or when these buttons present the user with an active existing option on the client's side, they will change to green, as shown .

The Light Blue buttons are used for direct commands. When any of these buttons is clicked it will immediately trigger an SMS message to the client, either directing it to execute a command or requiring a response.

The Yellow buttons are for information purposes, only. When clicked, it will display auxiliary information, not of operational importance to the software but important from a point of view of the user.

Let us now describe the different areas of the user interface, as enumerated on Picture 1.

## 1.1. Information bar and database record area

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1. This icon displays the state of registration of the SIM card and the signal strength. In case the SIM card is not registered on the GSM network even if the signal strength is good enough, the software will not be capable of sending text messages.
2. This part of the information bar displays network operator information. The software will continuously search for network operator until one is identified. In case network operator is not identified no text messages can be sent.
3. This area displays the network provider.
4. The current time and date are displayed in this label. The software constantly compares the time and date of the GSM modem with the time and date of the working station PC on which the software has been installed. In case there is a difference of more the one second the software will automatically change the time and date of the GSM modem, in which case the label will write "Synchronizing...".

**NOTE:** THE REFERENCE TIME AND DATE IS THE COMPUTER'S TIME AND DATE ON WHICH THE SOFTWARE IS RUNNING. IT IS USER'S RESPONSIBILITY TO SUPPLY THE CORRECT TIME AND DATE OF HIS WORKING STATION.

5. This label indicates the communication port number as well as its state. In case communication with the GSM modem is functioning properly, the blue light indication will flash every ten seconds. By clicking on this label, the user can change the port number through which the PC communicates with the GSM modem.
6. The light indicators in this area of the information bar are connected to the hardware states of RS232 communication lines: Clear to send line, Data ready line, Receive and Transmit lines. When the hardware communication lines function properly, the CTS and the DSR line

will constantly flash. The TX and the RX lines will flash only when the software is transmitting or receiving, accordingly. In case there is a hardware communication then the ERR indication will continuously flash until a correct communication is established. The user should note that the ERR indication will not flash if there is total malfunction with the communication port and the port ceases to exist (for example, if the communication cable gets plugged off). In this situation, the user will see that there will be no network.

7. This area shows a progress bar indicating the progress of the SMS currently being sent. It appears only while an SMS is being sent.
8. The icons in this area indicate the state of the sent and received SMS. When an SMS is received the information bar will briefly display the letter  icon. If the required format of the received SMS is not recognized the software will automatically discard this SMS and briefly display the "Not Recognized Format"  icon. In case the format of the SMS is recognized but there is a consistency error, then the "Wrong Format" icon  will be displayed. When sending an SMS, if the sending process fails for any reason, the "Failed SMS"  icon is displayed. When visible, this icon has an additional functionality. If the mouse is positioned over this icon a text informing the user of the total number of failed SMS's will be displayed. If this icon is clicked, the application will open a window indicating the failed SMS list. The functionality of this part of the user interface is described in Chapter 6.
9. This area is not part of the information bar but of the operating system's window DC. It is used to minimize the window or terminate the program.
10. This is the area of the user interface that displays the existing database. Besides the self-explanatory column captions, the first column caption is labeled "ID". This is an internal record identification number, not volatile by the user and unique for each record in the database. The fields in the column ID contain additional information, important to the user. First of all there is the check box field. When checked, it indicates that this item should also be taken in consideration when executing a command. If multiple items are checked, the selected command will be executed on all of the selected (checked) items. The user should note that clicking any row on this list (except the first row) makes the client active. This means even if no client is checked, a command will be executed upon this client. The user can see his selection verification in the fields marked by the item number 20. Additional information contained in the field ID is the status of the script uploaded to the client. If the  icon is displayed it means that the client has an active script and the last known information is that the script is running. If the icon  is displayed, it means that the client has an uploaded script, but last known information is that the script is not running. If the icon  is displayed, it means that the client has no uploaded user defined script and hence script is not running.

**NOTE:** ON THE CLIENT SIDE, EVEN THOUGH THERE MAY BE NO SCRIPT UPLOADED BY THE USER OR AN UPLOADED SCRIPT HAS BEEN DELETED, THE CLIENT HAS

A HARD-WIRE IMPLEMENTED FAIL-SAFE SCRIPT WHICH ALLOWS IT A BASIC AND FAIL-SAFE FUNCTIONALITY.

The columns "Consumption" and "Date" change its value every time the user requires new status. In other words, these fields display the last know consumption status of the client.

**NOTE:** THE SHOWN CONSUMPTION STATUS OF THE CLIENT AND THE VALUE WRITTEN IN THE DATABASE WILL NOT BE CHANGED UNLESS MANUALLY REQUIRED BY THE USER. ONLY THE LAST VALUES WILL BE DISPLAYED HERE. FOR HISTORICAL CONSUMPTION REQUIREMENTS SEE CHAPTER 4.

## 1.2. Command buttons, option buttons and active selection area

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11. This push button opens a window with a list of all required consumption states, of all the clients, in a chronological order. For details see Chapter 4.
12. As previously described, this push button according to the applied color schema belongs to direct commands. When pressed, it immediately sends an SMS or multiple SMS's to the selected client or clients requiring of them to inform the base of their current consumption state. The selection can be done in two ways. If there are checked items in the clients' database, then the software scrolls through all of the checked items and sends the command to each of them. Otherwise, it will send the command only to the currently selected client. Information about currently selected client is placed in the fields of item 21. In case nothing is checked and there is not a current client selection, a message box will inform the user that this command will not be executed.
13. When pressed, this button opens the script editor. For details on creating a script see Chapter 3.
14. When pressed this button immediately sends an SMS to the client requiring of it to send the script saved in its memory. The script may exist, not exist, be active or not be active. No matter, the client will respond with an SMS. For details on creating or modifying a script see Chapter 3. This command does not support multiple client executions, meaning it will execute only on the currently selected client.
15. The " Sync R.T.C." (Synchronize Real-Time Clock) button sends a synchronization SMS to the client. The contents of this SMS are the current time and date of the base station (the PC on which this software is installed), directing the client to change its time and date to the ones indicated. This command supports single client as well as multiple client execution.

16. The “Sun Calendar” button belongs to the group of auxiliary information buttons. When pressed, it will open a window showing the calendar of sunrise and sunset on different locations. For details see Chapter 5.
17. Even though this task bar does not belong to this logical group (it is not a button, but an information bar) for enumeration consistency, it is described here. This area is a task bar area that shows the last executed action by the GSM modem.
18. The “Execute” command button is directly connected to the “Select State” option buttons. It directs the client to immediately turn on or off each of its phases. This command supports single client as well as multiple client execution.

**NOTE:** WHEN A MANUAL ON/OFF EXECUTION IS CARRIED OUT THE CLIENT RESPONDS IMMEDIATELY, SUSPENDING ALL INTERNAL ACTIVE SCRIPTS! WHEN USING MANUAL EXECUTION THE USER IS URGED TO CONSIDER THE EXISTING ENVIRONMENT AND JUSTIFICATION OF MANUAL EXECUTION. IN ORDER TO ACHIEVE FAIL-SAFE OPERATION THE CLIENT HAS A BUILT-IN SAFETY MECHANISAM. NAMELY, EVERY MANUAL EXECUTION IS ACTIVE UNTIL 06:00 IN THE MORNING. WHEN THE R.T.C. REACHES THIS TIME, THE MANUAL COMMAND IS IMMEDIATELY SUSPENDED AND CONTROL OF OPERATION IS RETURNED TO THE ACTIVE SCRIPT.

19. This command requires of the client to inform of its current phase state. The new received phase state will be immediately indicated on the “Select State” option buttons and this information will be saved in the database. In case of multiple client execution, the new phase state will be indicated after making client selection from the clients’ list. This command supports single client as well as multiple client execution.
20. These option buttons R, S and T represent the phases of the client. They have double functionality. The R, S and T option buttons show the last known phase state of the client, but also enable the user to indicate a new state and activate this state by manual execution.
21. This is the area where information of currently selected client is shown. A record from the database (the clients’ list) is made a current selection by clicking on the desired row from the clients’ list. This area consists of the following self-explanatory fields: “ID”, “Name”, “Address”, “Tel. No.”, “Energy”, “Power Const.” and “On Date”.
22. When there is an active client selection, pressing this button will display a window with a list of all ever required energy states of this single, currently selected, client. Compared to the button from point 11, this one has essentially the same functionality but showing information for a single client, only.



user. Even though they do not influence software operation, they never the less contain information very important to the user.

The next field is the telephone number. This field most directly influences the operation of the software and the grid itself. This is the telephone number used when sending an SMS to the client (the station) and as such should represent unique client identifier. The telephone number should be entered together with the country code and the area code (operator code).

**NOTE:** IT IS ON THE RESPONSIBILITY OF THE USER TO USE UNIQUE TELEPHONE NUMBERS FOR EACH STATION. IF THIS IS NOT THE CASE IT MAY LEAD TO AMBUGUITIES.

The next section has three logically separated entities. These are marked with large R, S and T letters. This is the area where the working client script should be entered. These fields are not obligatory to be specified at this point.

Each of the three entities has ten fields. These represent the ten memory locations allocated for the script of the according phase. This means that to each phase, within twenty four hours, total of five on/off actions can be defined. Hence, these fields should contain the times when each phase should be turned on (fields in the “On Time” column) and turned off (fields in the “Off Time” column). The hour format that should be used is “hh:mm” – two digits for the hour and two digits for the minutes separated by a colon. The software has an implemented routine to check for correct syntax. Nevertheless, the user is also urged to use the correct syntax.

When the user is satisfied with the entered information, the “Add Record” button should be pressed. By doing so, the software make a logical information check and enters the date in the database.

**NOTE:** IT SHOULD BE EMPHASIZED THAT THE INFORMATION IN THE FIRST FOUR FIELDS (“NAME”, “ADDRESS”, “POWER CONSTANT” AND “TEL. NUMBER”) CAN NOT BE CHANGED LATTER ON. THE ONLY WAY IS TO DELETE THE RECORD FROM THE DATABASE AND MAKE A NEW RECORD. THE USER SHOULD TAKE GREAT CARE WHEN ENTERING CLIENT INFORMATION. THE RESPONSIBILITY FOR THE INFORMATION ENTERED AND HOW THIS INFORMATION IS USED HAS THE USER, SOLELY! MOREOVER, IF THERE HAVE BEEN ACTIONS EXECUTED UPON A CERTAIN CLIENT AND LATTER ON THE CLIENT IS ERASED, ALL OF THE HISTORY FOR THAT CLIENT WILL BE ERASED ALONG WITH IT.

After the data is added to the database, the software will wait for a new input. In case new input is not required, the “Close” button should be pressed. The same is achieved by simply closing the active window.

### 3. Editing or creating a script

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In this section it will be explained how the user can attach (create) or edit a script for a client.

When the “Script Edit” button on the main user interface is pressed (point 13, Picture 1) the following form is displayed.

	ON TIME:		OFF TIME:	
R		- 1 -		<input type="checkbox"/>
		- 2 -		<input type="checkbox"/>
		- 3 -		<input type="checkbox"/>
		- 4 -		<input type="checkbox"/>
		- 5 -		<input type="checkbox"/>
S		- 1 -		<input type="checkbox"/>
		- 2 -		<input type="checkbox"/>
		- 3 -		<input type="checkbox"/>
		- 4 -		<input type="checkbox"/>
		- 5 -		<input type="checkbox"/>
T		- 1 -		<input type="checkbox"/>
		- 2 -		<input type="checkbox"/>
		- 3 -		<input type="checkbox"/>
		- 4 -		<input type="checkbox"/>
		- 5 -		<input type="checkbox"/>

Picture 3. Script Editor form

Similarly to the previous chapter, the first section of this form has three logically separated entities. These are marked with large R, S and T letters. This is the area where the working client script should be entered.

Each of the three entities has ten fields. These represent the ten memory locations allocated for the script of the according phase. This means that to each phase, within twenty four hours, total of five on/off actions can be defined. Hence, these fields should contain the times when each phase should be turned on (fields in the “On Time” column) and turned off (fields in the “Off

Time” column). The hour format that should be used is “hh:mm” – two digits for the hour and two digits for the minutes separated by a colon. The software has an implemented routine to check for correct syntax. Nevertheless, the user is also urged to use the correct syntax.

**NOTE:** THE VALUE “00:00” IS RESERVED FOR “EMPTY FIELD”. THE USER SHOULD NOT USE THIS VALUE SINCE IT WILL HAVE THE SAME EFFECT AS AN EMPTY FIELD.

In addition to every memory set of on/off values, there is an option button where the user can specify if the uploaded script should be activated immediately after the upload has finished or not. The memory set of the script cannot be activated unless both on and off times are correctly specified.

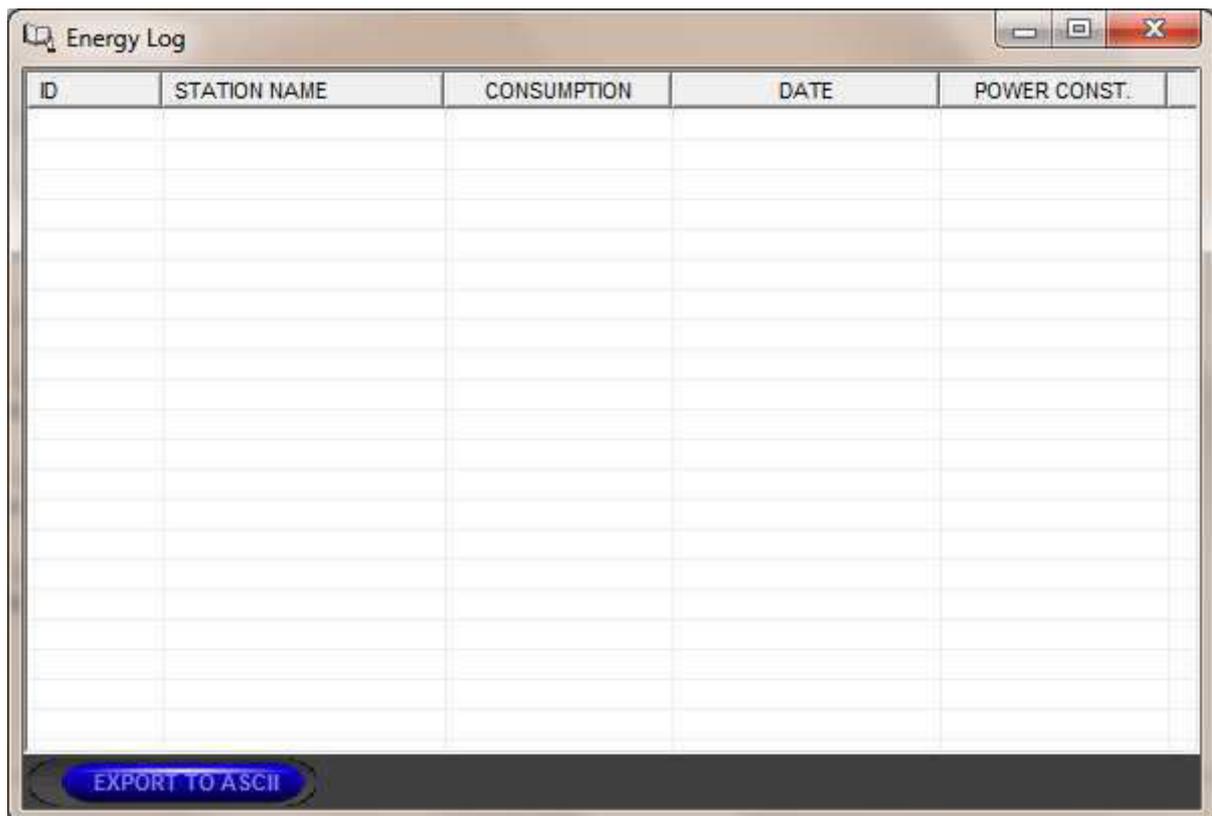
The user is also provided with an option to save the currently written script or even pick up one that has previously been saved. By pressing the “Save” button the user will be asked for a location and name by which the script will be saved. Even though there is a default directory for saving the scripts, the user can save them anywhere. If latter on the script needs to be recalled, the “Browse” button should be pressed. The path and name of the selected script will be shown on the label above the “Save” and “Browse” buttons.

When the script has been created and needs to be transferred to the client the user should press the “Update” button. By pressing this button, the script is saved in the database, immediately an SMS with the script is sent to the client and the script status icon in the “ID” column of the clients’ list is updated.

Pressing the “Cancel” button closes the script editor. This can also be achieved by simply closing the script editor window.

## 4. Working with the energy log

Each time the user presses the “Get Consumption” button (point 12, Picture 1) the received date is saved in the database. This way, the user can have a history of energy consumptions of every client. The energy log can be brought up by pressing any of the two “Energy Log” buttons on the main user interface form (point 11, point 22, Picture 1). The difference between the two has been explained in Chapter 1.2. The displayed data is in chronological order.



The screenshot shows a window titled "Energy Log" with a table containing five columns: ID, STATION NAME, CONSUMPTION, DATE, and POWER CONST. The table is currently empty. At the bottom of the window, there is a blue button labeled "EXPORT TO ASCII".

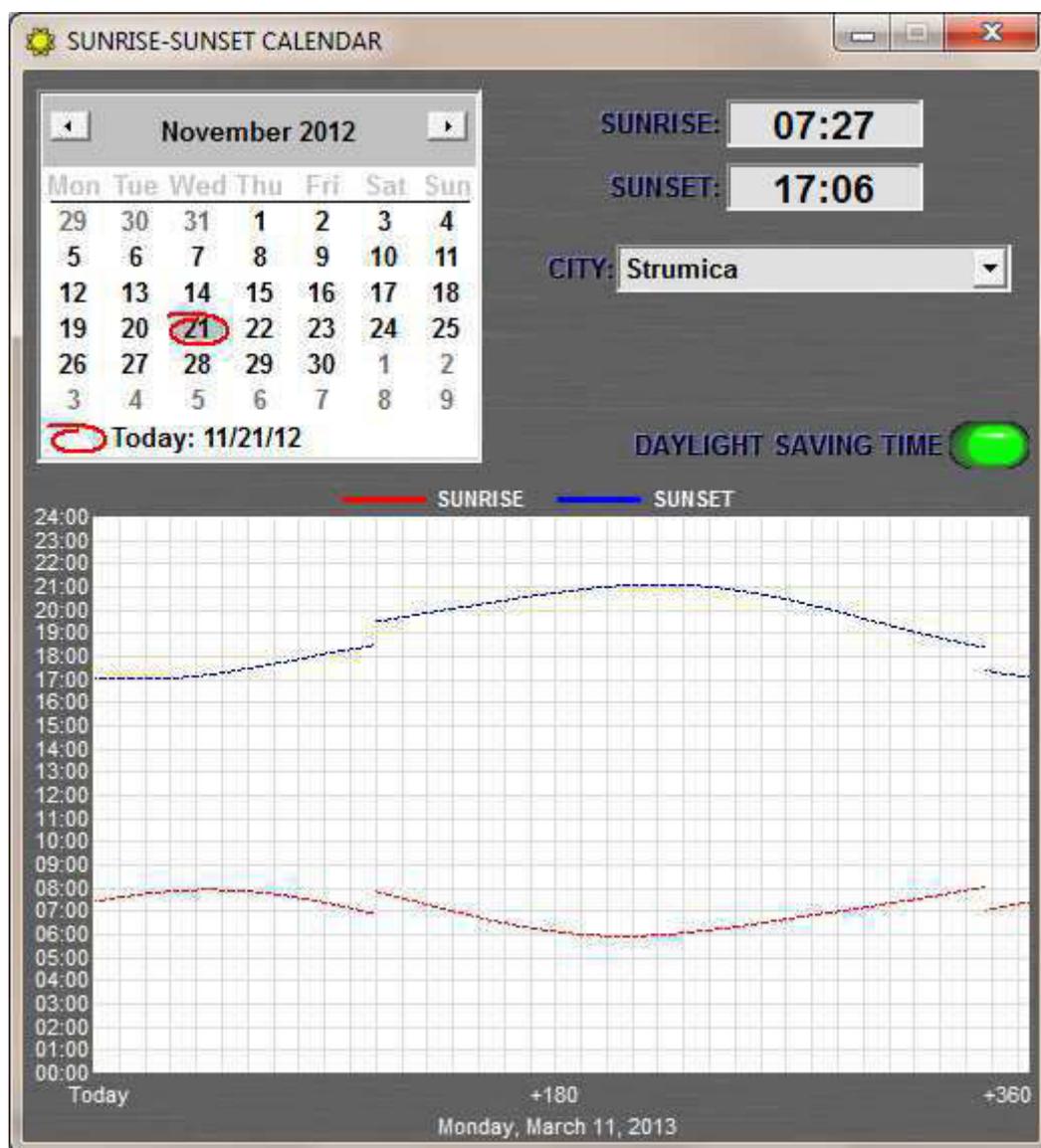
Picture 4. Energy Log form

This form has just one additional option. This is exporting the listed information to an ASCII file for further processing. This data is exported in such a way that can be easily imported in any data processing or office application, such as Excel. When this button is pressed the application will ask the user for the path and name under which the exported data will be saved.

## 5. Working with the sun calendar

In order to provide the user with a tool to create more efficient scripts, this application has been provided with a sun calendar calculator. It has implemented locations for almost all the largest cities of the Republic Of Macedonia. At this moment this database of latitudes and longitudes is fixed, but in the further updates it will be an open database allowing the user to insert one's own locations.

The sun calendar calculator form is activated by pressing the "Sun Calendar" button (point 16, Picture 1).



Picture 6. Sun (sunset-sunrise) calendar form

The first thing the user needs to do is to select a location. This can be done by selecting one from the "City" drop down list. The application will automatically show the sunrise and sunset times

on the according labels for the desired location on the current date, which by default is the current date of the PC. From the calendar form, the user can select a different date. Changing the date will automatically update the sunrise and sunset times.

There is also an option button named “Daylight Saving Time”. The user can select if daylight saving time is applicable for the current location or not.

In order to further assist the user, the sun calendar form shows a graph of the sunrise and sunset times in a period of 365 days, starting from the current date. The red line marks the sunrise time and the blue the sunset times. Moving the mouse over this graph the user can see the date over which the mouse icon is. This date is shown on the label below the graph.

**NOTE:** THE SUNRISE AND SUNSET TIMES SHOWN ON THE CALENDAR FORM ARE CALCULATED TIMES ACCORDING TO INTERNATIONALLY RECOGNIZED ASTRONOMICAL CALCULATIONS. THESE CALCULATIONS TAKE CONSIDERATION ONLY OF THE LATITUDE AND LONGITUDE OF THE DESIRED LOCATION AND THE DATE. THE USER SHOULD CONSIDER THAT THE APPARENT SUNRISE AND SUNSET TIMES DEPEND TO A DIFFERENT EXTENT ON THE TOPOGRAPHY OF THE SURROUNDING, AND AS SUCH MAY DIFFER FROM THE ASTRONOMICAL SUNRISE AND SUNSET TIMES BY A FEW MINUTES.



need to be deleted, the user should check the option button “Mark All” and then press “Delete marked”.

**NOTE:** THE FAILED SMS STACK IS MAINTAINED ONLY AS LONG AS THE APPLICATION IS RUNNING. WHEN THE APPLICATION CLOSES THE FAILED SMS STACK IS RESET.

## 7. Starting the application

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When the application starts the first thing it does is to search for communication ports. It collects all the existing serial port numbers and asks the user to make a selection. In the situation where no serial ports are found the application will not start and inform the user that serial ports were not found. When communication ports exist, the following form will be shown.



Picture 8. Serial Communication port selection form

The user should select one of the serial communication port numbers and press the “Select” button. The user will be asked to select a communication port only if:

- It is the first time the application is running;
- There has been a change in the hardware configuration of the personal computer and the previously selected communication port does not exist anymore;
- The user has decided to change the communication port number by clicking the “Comm” label on the information bar of the main user interface (point 5, Picture 1).

After the serial communication port has been successfully selected, the application will ask for user name and password, as shown below.



Picture 9. Login window

Even though the application does not have user privileges administration implemented, it still requires from the user to register one self and enter a password that has to match the one that has been hard-coded in the software. This password will be given to the user by the software supplier. At this point, this data is for informative purposes, only. It is not used for any user administration. In the future updates of this software, user privileges administration will be implemented to the fullest extent.

Pressing the “Ok” button will continue with software start-up. Pressing the “Cancel” button will terminate the application.

After the correct password has be entered, the application will show the main user interface, as shown in Picture 1, and will try to establish a communication connection with the GSM

modem. At the same time, the application will check if it is registered with the software supplier. If the application has not been registered or the registration information is incorrect, the application will wait until connection with the GSM modem has been established and then a registration window will appear asking the user to register the software.



Picture 10. Product Registration window asking from the user to register the software

By pressing the register button the application sends an SMS to the Rajtek Technical Support center asking to be registered. This registration process may take up to ten minutes. While in progress, the following will be shown.



Picture 10. Product Registration window showing registration in progress

The progress bar lights with dark blue color will sequentially light up, indicating that registration is in progress. If in the meantime the user clicks the “Cancel” button, the application will be terminated. However, even if the application is not running, as long as the GSM modem is active, the registration process is still going to be finished. The next time the application starts, it will confirm the registration information and proceed to the main user interface.

When the registration has been finished previously, and the application is not run for the first time, the main user interface will show immediately after successful login.