

# domat

control system

## RcWare SoftPLC

## MiniPLC configuration

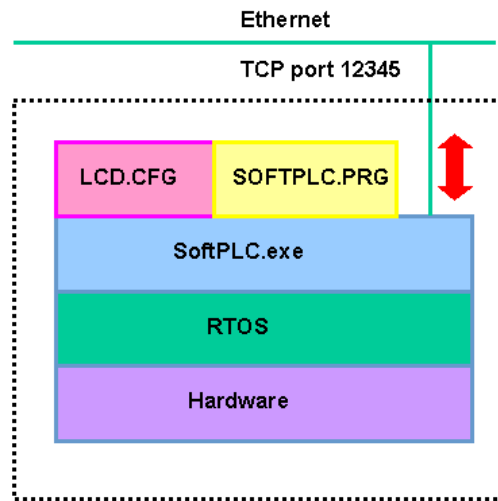


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# 1 MiniPLC Basics

MiniPLC is a freely programmable PLC controller with integrated web access, using PowerPC-based processor. This is how the layers are organized:



## 1.1 RTOS

At the lowest level, a Real Time Operating System is running, which takes care of following services:

- control of access to hardware resources
- Flash memory file management system
- ftp service access
- telnet service access
- launching of runtime which processes the application.

RTOS must be V 1.06B and above. The version number is displayed in the Platform Config dialogue – see below, or can be retrieved with a Chiptool software, which also can download latest RTOS version.

## 1.2 SoftPLC.exe

The runtime file is launched after MiniPLC boot and its correct start is indicated by a double short beep. If the application is not found or can not be read properly, the program gives two short and one long beeps and the display reads

```
CANNOT LOAD  
THE PROGRAM
```

In this case it is necessary to upload the application again.

The runtime also communicates over a TCP port (12345 by default), to which the IDE connects. This is how a new application, web pages, LCD definition, and MiniPLC configuration are uploaded.

If the program is damaged so that the runtime stops responding, it is not possible to connect to the controller even through IDE. Therefore a DIP switch close to the Ethernet socket is installed with following functionality: if ON, the SoftPLC.exe is run after reboot but does not process the application. Then it is possible to connect from IDE, load a correct application, put the switch back to OFF and reboot the controller.

## 1.3 Application

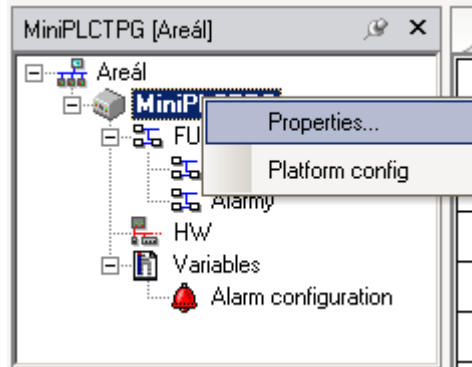
It consists of several files which specify the functionality of the control program and variable values, alarm definitions, LCD menu description etc.

The files are uploaded in the *Platform config* dialogue – see below.

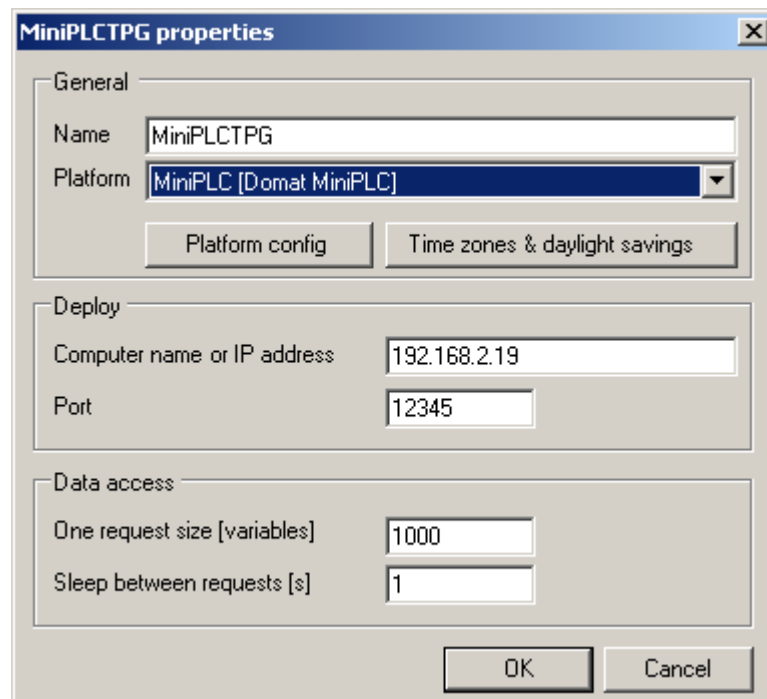
## 2 Application development in the IDE

The proceedings are the same as for the XP/XPem platforms, with following differences:

Right click on the project icon opens the context menu *Project Properties*:



In the Properties choose the *MiniPLC* platform:



Then, set the IP address of the MiniPLC. Default address is 192.168.1.37, mask 255.255.255.0. The IP address and other parameters can be changed in the *Platform Config* menu.

Usually it is not necessary to change the port number from its default (12345). Change it only if necessary for remote control or network security reasons – consult your network administrator.

One request size – number of variables to read at one request. Decrease if the network has high latency or dropouts. It is not necessary to change under normal conditions.

Sleep between requests – time span between the requests for variables update, not necessary to change under normal conditions.

## 2.1.1 Time zones

For safe daylight saving time change it is possible to define individual table as far as to 2024.

The table is set in the *Time zones and daylight savings* menu.

Year	Daylight start time [UTC]	Standard time start [UTC]
2005	27.3.2005 1:00:00	30.10.2005 2:00:00
2006	26.3.2006 1:00:00	29.10.2006 2:00:00
2007	25.3.2007 1:00:00	28.10.2007 2:00:00
2008	30.3.2008 1:00:00	26.10.2008 2:00:00
2009	29.3.2009 1:00:00	25.10.2009 2:00:00
2010	28.3.2010 1:00:00	31.10.2010 2:00:00
2011	27.3.2011 1:00:00	30.10.2011 2:00:00
2012	25.3.2012 1:00:00	28.10.2012 2:00:00
2013	31.3.2013 1:00:00	27.10.2013 2:00:00
2014	30.3.2014 1:00:00	26.10.2014 2:00:00
2015	29.3.2015 1:00:00	25.10.2015 2:00:00

Choose appropriate time zone above.

**Name** – name of the time zone

**Zone offset** – deviation between local time and UTC

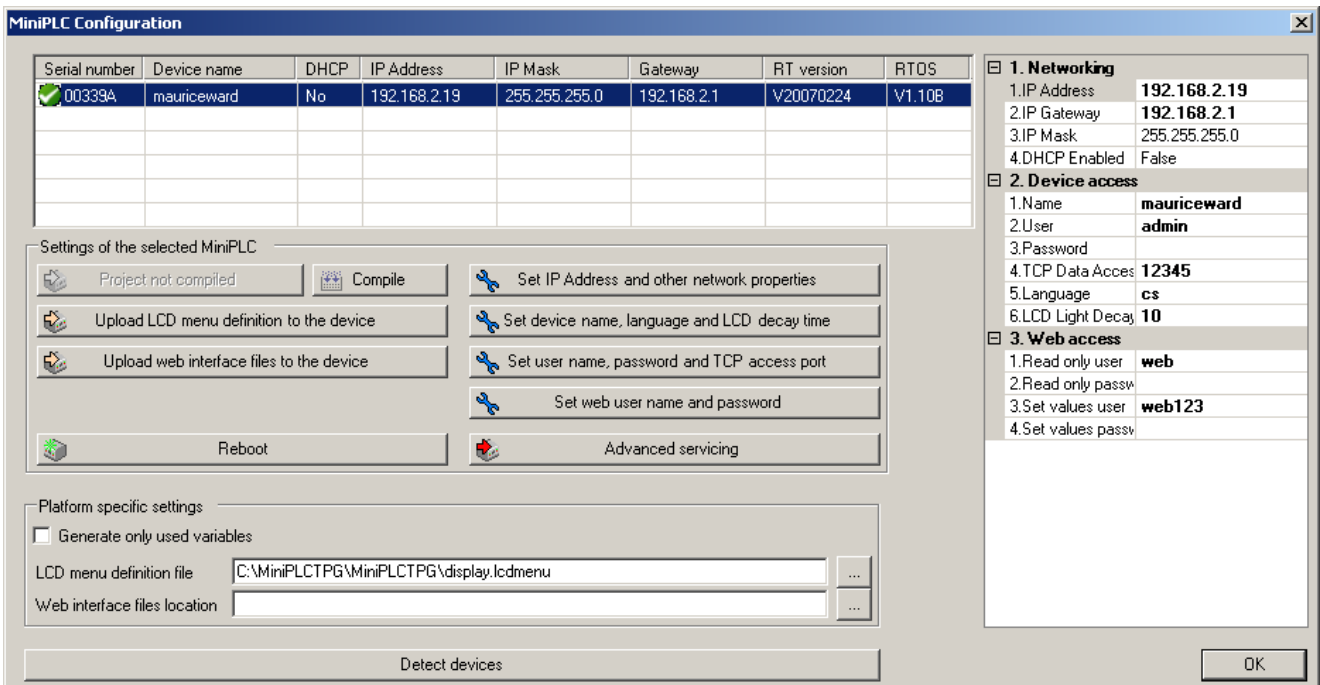
**Daylight shift** – difference between normal and daylight saving time (some countries use different value than 60 minutes, therefore any value can be set here)

In the table it is possible to set exact dates and times of the daylight saving time change and back. Finally confirm with the OK button.

Generally, there is no reason for changing the time zone settings unless the MiniPLC is deployed in another region than Western, Central and Eastern Europe, where standard predefined rules apply.

## 2.2 The Platform config menu

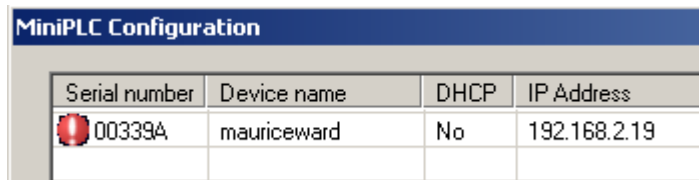
This menu is the basic means for MiniPLC controller configuration.



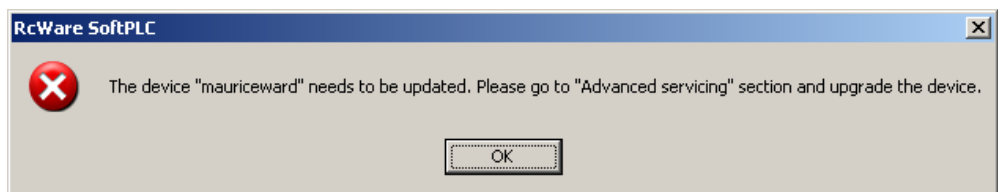
In the upper part of the window there is a table with all the MiniPLC controllers which have been detected in the network. The controller is detected even if its IP address is out of the current subnet (defined by IP address and subnet mask at the PC where IDE is running).

## 2.2.1 Firmware update

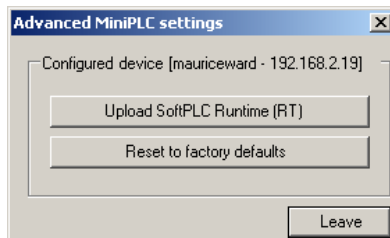
If MiniPLC and IDE contain identical firmware version there is a green tick symbol in the table. If it is not the case, which might result in misinterpretation of some function blocks, it is necessary to update the firmware. This is indicated by a red exclamation mark:



and if the MiniPLC is selected by clicking in the corresponding line, a window appears:



There are two buttons in the *Advanced servicing* section:



**Upload SoftPLC Runtime** – this is where the most recent firmware version is uploaded to the controller. The process contains several steps and is lead by a dialogue.

**Reset to factory defaults** – all the SoftPLC-related data is deleted from the MiniPLC flash memory and the controller is ready to receive new SoftPLC components. This is only necessary if the installation is damaged badly and the controller behaves oddly.

## 2.2.2 Network properties setup

The *Set IP address and other network properties* button sets those parameters:

**IP Address** – IP address of the MiniPLC

**IP Gateway** – default network gateway

**IP Mask** – subnet mask

**DHCP Enabled** – if True, the controller reads automatically its IP address from a DHCP server, the IP address is not assigned by the **IP Address** parameter. This is not the usual setting, consult your network administrator.

Enter new values to the first part of the table at right and then write them clicking the *Set IP address and other network properties* button.

## 2.2.3 Controller name, language, and backlight setting

This is what the *Set device name, language and LCD decay time* button is for.

In the *Device access* section writes those parameters:

**Name** – a string with controller name (location) for easier identification of the MiniPLC in the table

**Language** – language of the LCD display. Now, those languages are available:

en	English
de	German
cs	Czech
hu	Hungarian
si	Slovenian

Other languages will be added on demand.

**LCD Light Decay (min)** – user inactivity time after which the display backlight goes off.

## 2.2.4 Runtime access settings

The button *Set user name, password and TCP access port* sets the parameters for client connections – for IDE, OPC server, Touchscreen etc.

**User** – user name, default value is *admin*

**Password** – password, default value is *rw*

**TCP Data access port** – default value is 12345, must be the same as that in the *Project properties* in the IDE.

## 2.2.5 Web access settings

The button *Set web user and password*. If the controller works as a web server for values monitoring and control over a web browser, here are user names and passwords for read-only and read/write levels set.

The *Web access* section contains those parameters:

**Read only user** – user name for read-only access

**Read only password** – password for read-only access

**Set values user** – user name for read / write access

**Set values password** – password for read / write access

Default name is *softplc*, default password is *web* for both access levels.

The actual passwords are not read from the MiniPLC, however it is possible to define new passwords and write them to the MiniPLC.

If the controller is set up accordingly, go on in the left column and upload the application data:

### 2.2.6 Program upload

The button *Upload compiled program*. If the program is not compiled, the button is disabled and reads *Program not compiled*. The program can be compiled directly from the *Platform config* window clicking the *Compile* button.

### 2.2.7 LCD display menu upload

The button *Upload LCD menu definition to the device*. The menu is created in the HMI editor, see **RcWare SoftPLC HMI Editor**. The path to the *.lcdmenu* file must be set in the *LCD menu definition file* window in the lower part of the dialogue. The *.lcdmenu* file is compiled automatically and results in *LCD.CFG* which is uploaded to the device.

In case the LCD menu definition contains variables which do not exist in the MiniPLC, the display reads

??? – for analog values

**UNKNOWN STATE** – for binary and multistate values.

Then it is necessary to correct the variables assignments to the menu items in the HMI editor, or re-read the variables from the IDE project to the HMI project (menu *File – Variables Manager* – choose connection name – *Edit connection*, and reselect and reread the project file *.splcproj*).

### 2.2.8 Web pages upload

The web pages are edited in the HMI editor, see **RcWare SoftPLC HMI Editor**. There must be file path to the files correctly set in the *Web interface files location* box in the lower part of the dialogue.

The contents is copied by clicking the *Upload web interface files to the device* button.

### 2.2.9 Restart

After new data is uploaded to the controller, the MiniPLC must be rebooted. In case of remote access when the power off / power on procedure is difficult to exercise it is possible to restart the MiniPLC by clicking the *Reboot* button.

Click *OK* to close the *Platform Config* dialogue.

## 2.3 Connection with a running MiniPLC

Connect to MiniPLC to watch process values online, change them, and plot the trend values when commissioning and tuning the plant.

Select *Remote connection* at the toolbar and click *Connect*.

A dialogue with connection parameters opens:





Check and set here:

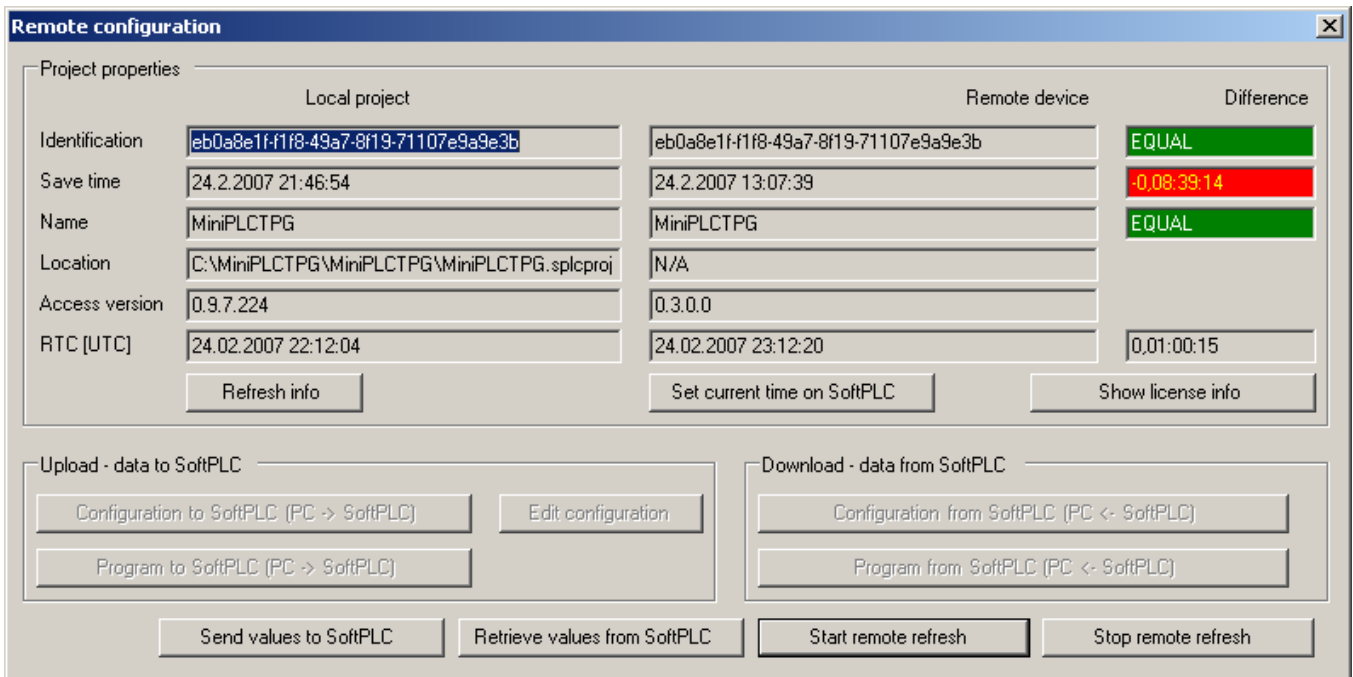
**Computer name or IP address** – IP address of the target MiniPLC controller, predefined value is that which has been set in the Project Properties, the drop-down menu contains previously entered values.

**Port** – TCP port for connection with the runtime, default value is 12345.

**User name** – user name, default value is *admin*

**Password** – user password, default value is *rw*

After the connection has been established successfully, a window opens:



### 2.3.1 Connection error

If the connection can not be established and a message window appears, check those items:

- is the MiniPLC connected to the network?
- is the IP address of the MiniPLC properly set and the controller is in the same subnet as the PC where IDE runs?
- is user name, password and port number set correctly?

- does the runtime at the MiniPLC run properly? (Green LED close to the buzzer must flash in the program processing cycle.)
- is the PC not protected by a firewall which blocks the connection?

### 2.3.2 Remote Configuration window

This window contains useful information about the program status in IDE as well as in MiniPLC:

**Identification** – unique GUID of the program. In order to upload a new version of the program here, GUID must be identical in IDE as well as in MiniPLC. If it is not the case, the complete project must be uploaded in the *Platform Config - Upload compiled program* menu and MiniPLC must be rebooted.

**Save time** – date of the last program save. May be useful at version checks and may prevent accidental deletion of a newer version in the MiniPLC by an older version in IDE.

**Name** – Application name, this is defined in the *Project Properties*.

**Location** – where the project resides (on a disk, CF card etc.). Not applicable for MiniPLC as there is only one possible location here given by internal settings.

**Access version** – runtime or IDE version, just for information. Have those values ready when contacting technical support.

**RTC/UTC** – system times in IDE as well as in MiniPLC.

Buttons:

**Refresh info** – refreshes values from IDE as well as from MiniPLC

**Set current time on SoftPLC** – takes the PC (IDE) time and sets it in the MiniPLC.

**Show licence info** – displays runtime licence number, not applicable for MiniPLC.

The buttons for program upload and download are not relevant for the MiniPLC platform, they only work for SoftPLC (*Full featured SoftPLC*, i.e. runtime working on OS Windows XP/XPem and Linux).

**Send values to SoftPLC** – write values from IDE to MiniPLC once only. Used e.g.:

- if the time programs have been set offline in the IDE and we want to transfer them to MiniPLC while we do not wish to stop the program and upload it as a whole
- if the user set some values or time programs by mistake and we want to upload a previously created backup from IDE to MiniPLC.

**Retrieve values from SoftPLC** – unrepeated transfer of the values the other way round, i.e. from MiniPLC to IDE. It is used

- to backup current values incl. time programs
- if we want to change the program structure with our program backup and do not want to discard user settings which have been made in the meantime

**Start remote refresh** – starts periodic update of the values from MiniPLC to IDE, used for commissioning, when there are live process values displayed in the FUPLA schemas and all the changes and settings made in the IDE are written to MiniPLC.

**Stop remote refresh** – stops periodic update of the values from MiniPLC to IDE which is useful e.g. before the web pages are uploaded (the refresh takes up a substantial processing capacity of the MiniPLC and may slow down the file transfer).

### 2.3.3 Disconnect

Click the *Disconnect* button at the toolbar to disconnect. The disconnecting may take some time as there are values read and written into files.

## 3 IPLC500 family

### 3.1 Introduction

The IPLC500 family are Linux-based PLCs with Power PC processor.

Details see data sheet IPLC5xx. There are four types available:

IPLC500	1 x RS485
IPLC510	2 x RS485, 2 x RS232
IPLC500B	1 x RS485, no display, no buttons
IPLC510B	2 x RS485, 2 x RS232, no display, no buttons

Because of using the Linux operating system, the process of uploading the SoftPLC project and configuring the process station is slightly different from the IPLC2... and IPLC3... types.

### 3.2 Software tools

For communicating with the MiniPLC, we need those tools:

- FTP client supporting SCP protocol (e.g. WinSCP)
- terminal program (e.g. PuTTY)

### 3.3 Setting the IP address of the MiniPLC

The default IPLC500 network settings are:

IP address	192.168.1.10
Network mask	255.255.255.0
Gateway	192.168.1.1

To change the address:

1. Configure your computer so as to be in the same network, having e.g. IP address 192.168.1.2, network mask and gateway same as those of the MiniPLC
2. Install WinSCP and connect over the SSL protocol (port 22) to the MiniPLC default address with following credentials:

User: **root**

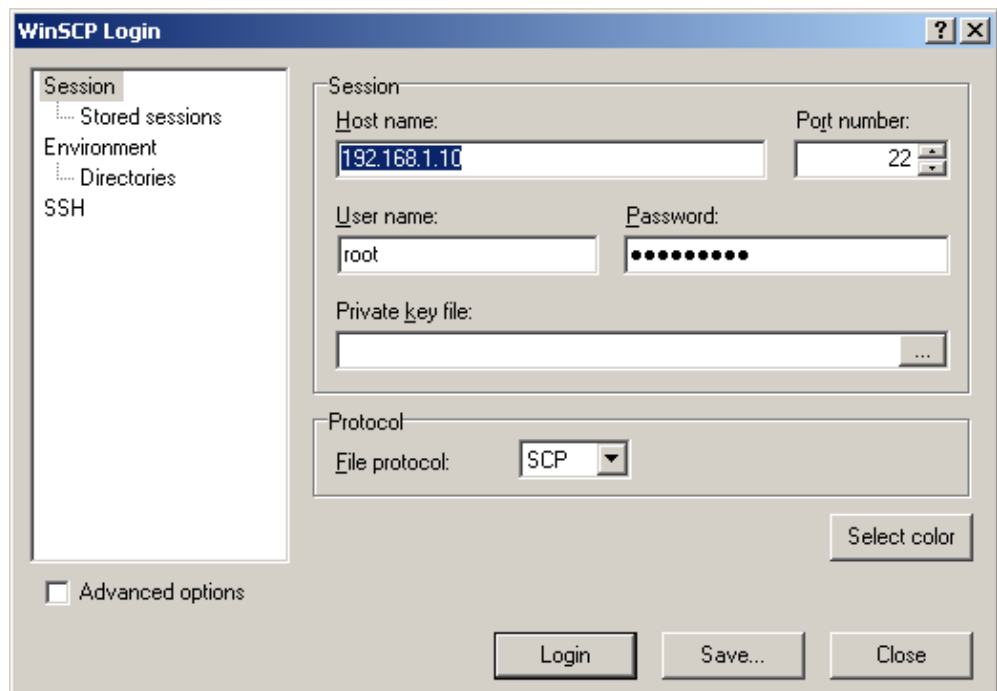
Password: **sharkXXXX**, where XXXX are the last four digits of the MiniPLC serial number.

The serial number can be read at the sticker at the side of the controller, e.g.

```
IPLC510B
S/N: 014487 MAC 000A14BE0181
.....
```

The password in this example is **shark4487**.

1. Use SCP protocol and define the connection to the IPLC5... process station – user name **root** / password **sharkXXXX** (see above). Do not forget to change the protocol type to SCP.



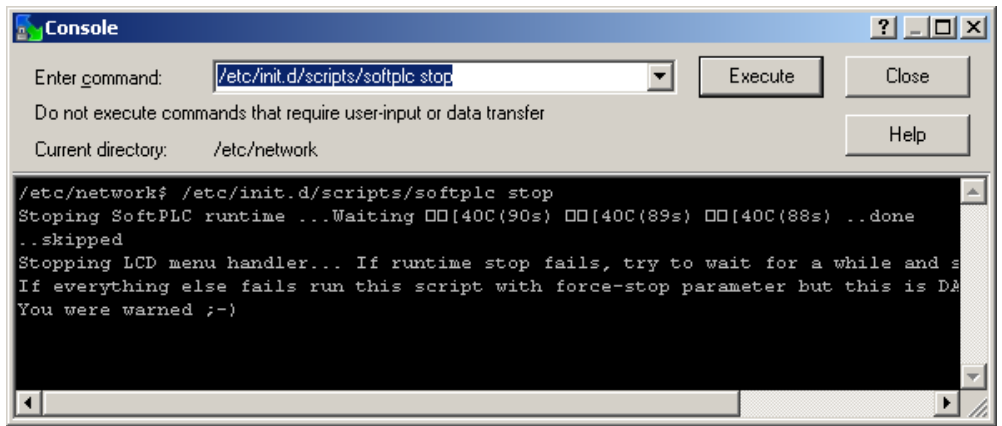
2. Save the connection for future access clicking the *Save* button.
  3. Log in to the controller by clicking the *Login* button.
  4. Locate the `/etc/network/interfaces` file and open it (the F4 key).
  5. Edit the new IP address, mask, gateway, and DNS server if necessary.
  6. Save the file (Ctrl + S or the Save icon). **Make sure the file has been saved properly!** The file is edited in the local temporary folder and then copied back to the MiniPLC. It may be necessary to enter the password again. Watch the process in the WinSCP program window at its lower part. Make sure that the stored file has new time and date of last saving.
  7. Reboot the MiniPLC (power off – power on, or type „reboot“ in the console) to apply new settings.
- Important note:**
8. Record the new IP address and other network properties for future reference!

## 3.4 Uploading the new project

### 3.4.1 Stop the SoftPLC runtime

Before uploading the SoftPLC program, it is necessary to stop the SoftPLC runtime. Proceed as follows:

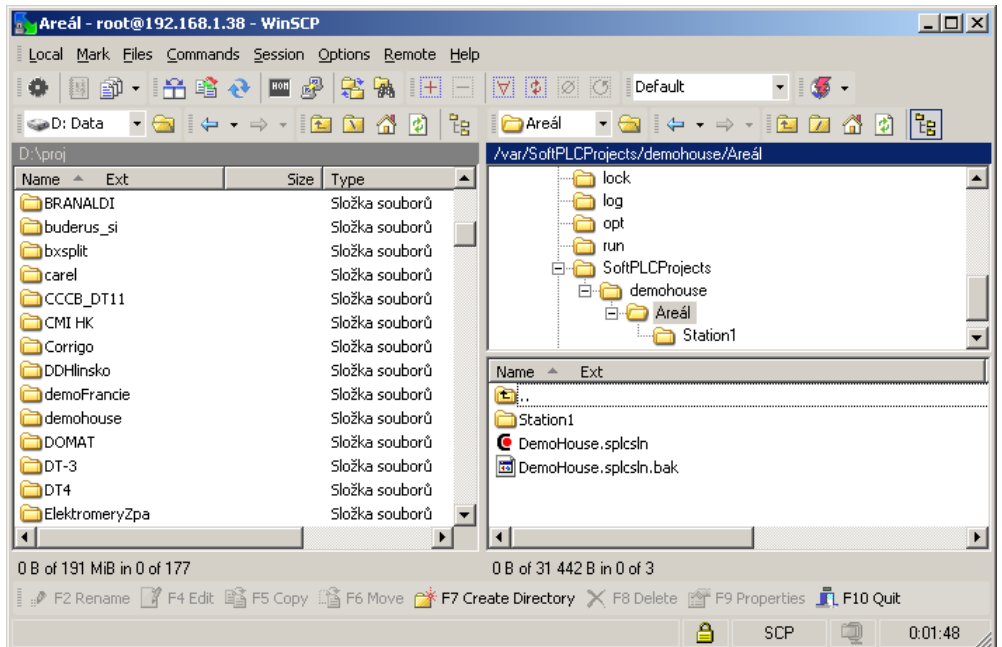
9. Run the WinSCP terminal (Ctrl + T, Commands – Terminal in the menu, or taskbar icon), PuTTY or another terminal program and log in to the MiniPLC as described above
10. In the command prompt, type `/etc/init.d/scripts/softplc stop` and click Execute.
11. The runtime is stopped and in the terminal window there is a message:



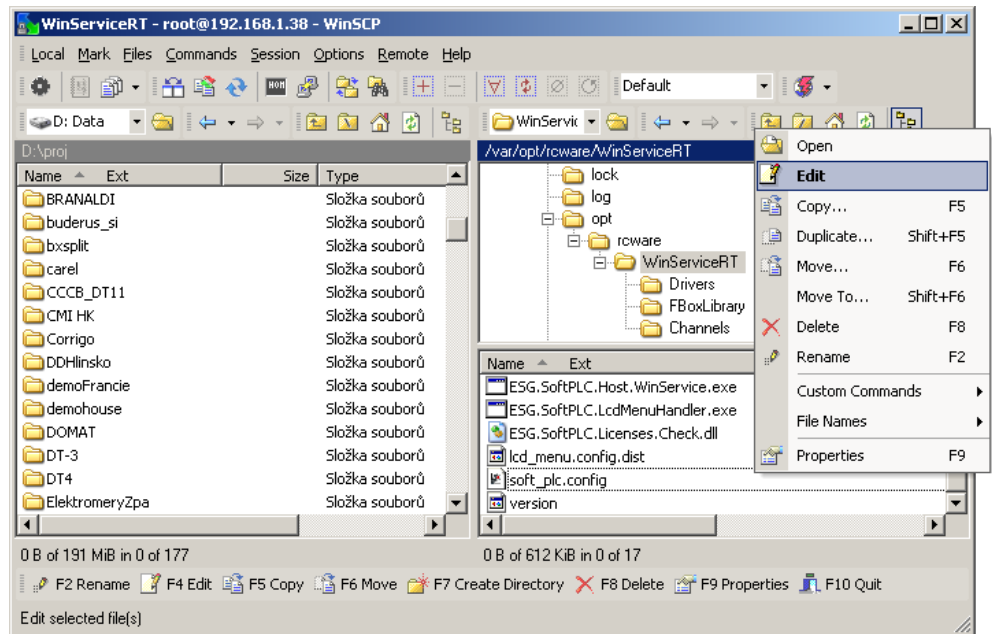
Go back to the WinSCP panels.

### 3.4.2 Copying the project to the project folder and editing the config file

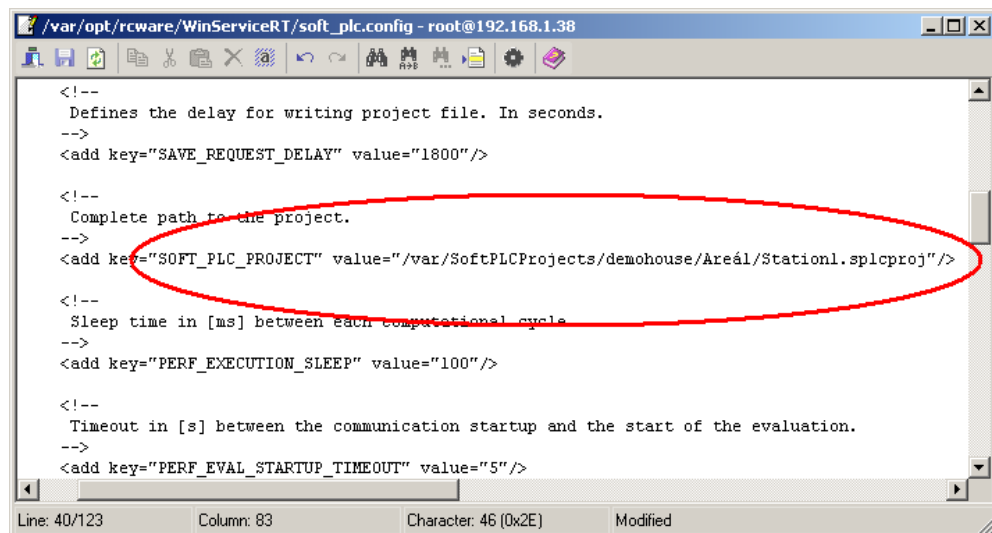
1. Locate the `/var/SoftPLCProject` folder in the IPLC and copy the project into the folder maintaining the project folder structure. The example shows copying of the **demohouse** project.



2. Locate the `/var/opt/rcware/WinServiceRT` folder and the **soft\_plc.config** file in this folder.
3. Right click the file name and select Edit.



4. The editor window opens.



5. Locate the **SOFT\_PLC\_PROJECT** parameter and edit the path and filename to the *.splcproj* file.
6. If necessary, edit other runtime configuration parameters, such as login user name and password for the clients (such as for IDE, Touchscreen, OPC server, SCADA etc.), data access TCP port, and optionally the SoftPLC Proxy parameters.
7. Save the file into the IPLC clicking the Save icon (or Ctrl-S) and close the editor window.

### 3.4.3 Setting the LCD menu config file name

1. Locate the `/var/opt/rcware/WinServiceRT` folder and the `lcd_menu.config` file in this folder. In case the file name is `lcd_menu.config.dist`, go through the **Uploading new SoftPLC runtime** procedure as described below and enable the LCD menu.
2. Right click the file name and select Edit.

```
<?xml version="1.0" encoding="utf-8" ?>
<configuration>
  <appSettings>
    <add key="LCD_MENU_PATH" value="/var/SoftPLCProjects/MiniPLCTPG/MiniPLCTPG/lab08.lcdmenu"/>
    <add key="CONTRAST" value="10"/>
    <add key="SCROLL_SPEED" value="6"/>
    <add key="BACKLIGHT_TIMEOUT" value="600"/>
  </appSettings>
</configuration>
```

Edit the path and filename to the `.lcdmenu` file.

3. Save the file into the IPLC clicking the Save icon (or Ctrl-S) and close the editor window.

### 3.4.4 Starting the SoftPLC runtime

4. In the terminal window, start the SoftPLC runtime: in the command prompt, type `/etc/init.d/scripts/softplc start` and click Execute

```
Enter command: /etc/init.d/scripts/softplc start [Execute] [Close]
Do not execute commands that require user-input or data transfer
Current directory: /etc/network [Help]

/etc/network# /etc/init.d/scripts/softplc start
Starting SoftPLC runtime ... ..done
Starting LCD menu handler ... ..done
Loading required modules ...
..skipped
..skipped
LCD Driver I/O expander Starting application .....done
```

or

switch off and switch on power for the process station and let it boot.

The runtime is up and running. It should be possible to connect to the runtime through IDE or another client.

5. Disconnect the SCP client from the IPLC (Session – Disconnect or Shift-Ctrl-D) and close the SCP client.

## 3.5 Uploading new SoftPLC runtime

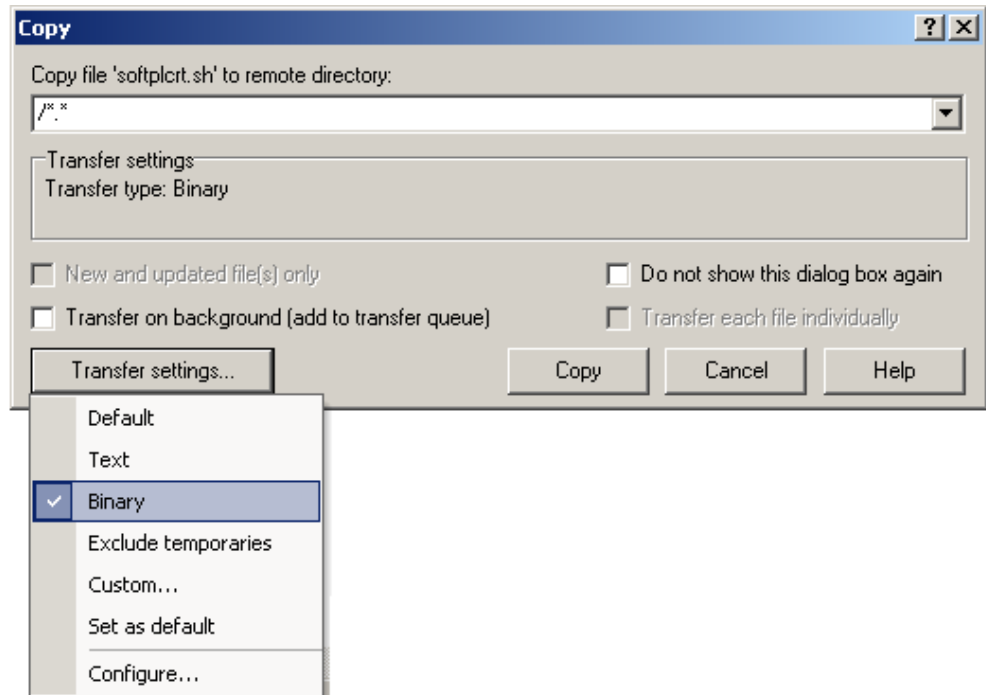
To update the IPLC5xx with new drivers, a new SoftPLC runtime must be loaded into the process station. The process follows over the SCP protocol, and terminal. It is **not** possible to use the WinSCP console only; a terminal program, e.g. PuTTY, must be used instead.

### 3.5.1 Prerequisites:

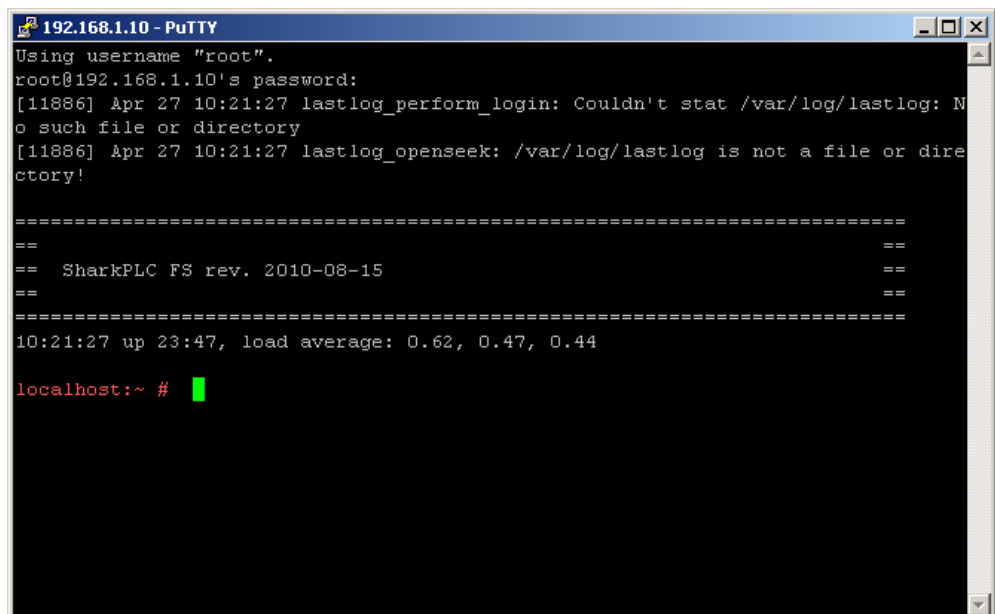
- Functional network connection with an IPLC5xx process station
- WinSCP installed
- PuTTY or another terminal program installed
- **softplcrt.sh** (the new SoftPLC runtime installer) available

### 3.5.2 Proceedings:

1. Prepare to copy the **softplcrt.sh** file to the process station. Any directory will do; in the example, the file is copied into the root directory.
2. Use **Files – Copy – Transfer settings – Binary** command to copy the file in binary form. Other forms of copying do not keep the structure of the file and the update process does not perform successfully.



3. After the file has been copied successfully, open the PuTTY window, wait several seconds until the login prompt appears, and log in using the *shark[last\_four\_digits\_of\_serial\_number]* password – see above.



4. Now you are logged in. The red *localhost:* prompt indicates that the process station is able to accept commands. Enter *sh softplcrt.sh* into the command line, and press Enter.



```

192.168.1.10 - PuTTY
Using username "root".
root@192.168.1.10's password:
[11935] Apr 27 10:24:06 lastlog_perform_login: Couldn't stat /var/log/lastlog: No such file or directory
[11935] Apr 27 10:24:06 lastlog_openseek: /var/log/lastlog is not a file or directory!

=====
==                               ==
== SharkPLC FS rev. 2010-08-15   ==
==                               ==
=====

10:24:06 up 23:50, load average: 0.64, 0.53, 0.46

localhost:~ # sh softplcrt.sh
-----
SoftPLC RT installer.
RT will be installed to '/var/opt/rcware/WinServiceRT'
-----
Version: 13.04.2011 / 16355 by Michal Hrouda

! WARNING ! This file overwrites existing files, continue (ay/N) ?

```

5. A warning appears; press „y“ or „a“ key to continue.
6. Be sure to keep a backup copy of the old **soft\_plc.config** file to save all settings, such as user / password / TCP port settings, RcWare DB settings, Proxy settings, etc. However, the installer copies the old config files to the **/tmp** directory.

```

192.168.1.10 - PuTTY
=====
==                               ==
== SharkPLC FS rev. 2010-08-15   ==
==                               ==
=====

10:24:06 up 23:50, load average: 0.64, 0.53, 0.46

localhost:~ # sh softplcrt.sh
-----
SoftPLC RT installer.
RT will be installed to '/var/opt/rcware/WinServiceRT'
-----
Version: 13.04.2011 / 16355 by Michal Hrouda

! WARNING ! This file overwrites existing files, continue (ay/N) ?
Verifying installer... Ok
Trying to stop RT ...
Stopping SoftPLC runtime ...Waiting          (80s)           done
Stopping LCD menu handler...                   skipped
If runtime stop fails, try to wait for a while and start this script again
If everything else fails run this script with force-stop parameter but this is D
ANGEROUS
You were warned ;-)
Backing up soft_plc.config to /tmp/ ...
Keep old config file (AY/n) ?

```

The installer will be verified. In case the verification fails, make sure it has been copied to the PLC in Binary mode as described above.

7. „**Keep old config file (AY/n) ?**“ The installer asks if the previous configuration file should be kept; answer „n“ to delete the file. (The new runtime may need more items in the config file, which were not included in the previous version. For small changes in the runtime, you can keep the previous file and your runtime settings will be kept. Please consult Domat Control System if you intend to keep the config file; it is always safe to delete the old file.)
8. The installer asks „**Old RT found. Delete (ay/N) ?**“ Press „a“ or „y“ to delete the old runtime files and install new runtime.
9. The installer asks „**Prerequisites complete. Ready to install. Continue (ay/N) ?**“ Press „a“ or „y“ to continue with copying the files.

After the files have been copied successfully, the installer asks „**Enable DIP switch 1 (AY/n) ?**“ The DIP switch 1 (located in the DIP block close to the Ethernet socket) is

the INIT switch. When active (ON) at power-up time, it sets the IP settings to default values:

IP address 192.168.1.10  
Subnet mask 255.255.255.0  
Default gateway 192.168.1.1

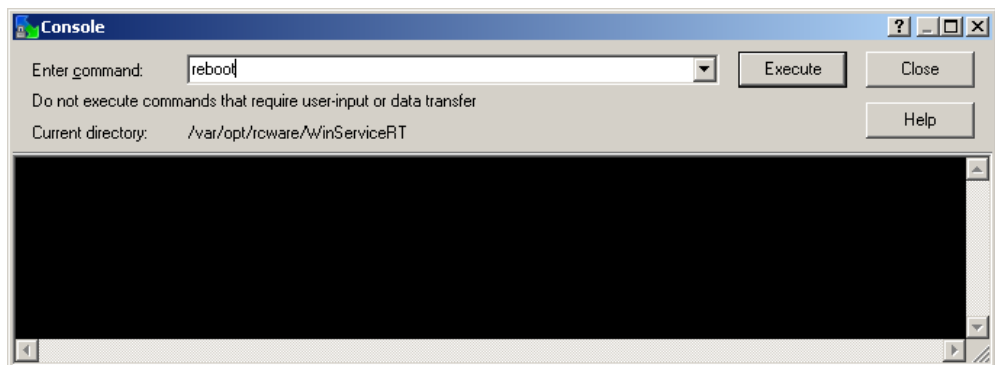
Press „a“ or „y“ to enable this function.

10. The installer asks „Run license HW info generator (ay/N) ?“ – Press „n“.
11. The installer asks „Run SoftPLC configurator (ay/N) ?“ – Press „a“ or „y“.
12. „Autostart SoftPLC RT (ano yes/no) ?“ – Press „a“ or „y“. This starts the SoftPLC runtime after reboot automatically. (Do not confuse with the automatic project execution which is configured in the SoftPLC config file:

```
<!--  
If "true", the SoftPLC will run the project  
immediately after start-up.  
-->  
  
<add key="RUN_AFTER_STARTUP" value="true"/>
```

This RUN\_AFTER\_STARTUP key defines if the SoftPLC project should be executed after start of SoftPLC runtime. If this value is **false**, the runtime may be started but the program stays in stop mode – it must be started on a remote basis over IDE.)

13. „Edit soft\_plc.config (ano yes/no) ?“ – Press „n“. It is more comfortable to edit the *soft\_plc.config* file later with the WinSCP editor.
14. „Configure LCD menu (ano yes/no) ?“ – Press „a“ or „y“. This is where the LCD menu is to be enabled – see below.
15. „Enable LCD menu (ano yes/no) ?“ – Press „a“ or „y“. This enables the LCD menu by renaming the *lcd\_menu.config.dist* to *lcd\_menu.config*. NB. The LCD menu definition file path and name must be defined in the */var/opt/rcware/WinServiceRT/lcd\_menu.config* file.
16. „Edit lcd\_menu.config (ano yes/no) ?“ – Press „n“. It is more comfortable to edit the *soft\_plc.config* file later with the WinSCP editor.
17. „Finished. Check everything and reboot.“ – The installation process has been completed. Now it is time to edit the *soft\_plc.config* and *lcd\_menu.config* files, see above. Close the PuTTY session and edit the files in WinSCP.
18. Restart the controller by typing **reboot** and click the Execute button in the WinSCP console.



19. The controller is now restarting with new SoftPLC runtime and new settings.