

RaspberryPI Runtime

straton user guide – Rev. 7

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straton



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1. Prerequisites

This user guide has been developed using a Raspberry Pi 4 device and a PiFace 2 IO board.

2. Installation and configuration of the Raspberry PI

2.1. Download and installation of Raspberry PI OS

Download the latest Raspberry PI OS from: <https://www.raspberrypi.org/software/>

Install Raspberry Pi OS using Raspberry Pi Imager

Raspberry Pi Imager is the quick and easy way to install Raspberry Pi OS and other operating systems to a microSD card, ready to use with your Raspberry Pi. [Watch our 40-second video](#) to learn how to install an operating system using Raspberry Pi Imager.

Download and install Raspberry Pi Imager to a computer with an SD card reader. Put the SD card you'll use with your Raspberry Pi into the reader and run Raspberry Pi Imager.

[Download for Windows](#)

[Download for macOS](#)

[Download for Ubuntu for x86](#)

To install on **Raspberry Pi OS**, type `sudo apt install rpi-imager` in a Terminal window.

Format your SD card with default settings:

Formatage de Disque amovible (E:) X

Capacité : 7,14 Go

Système de fichiers : FAT32 (par défaut)

Taille d'unité d'allocation : 4096 octets

Restaurer les paramètres par défaut

Nom de volume : Raspberry15

Options de formatage

☒ Formatage rapide

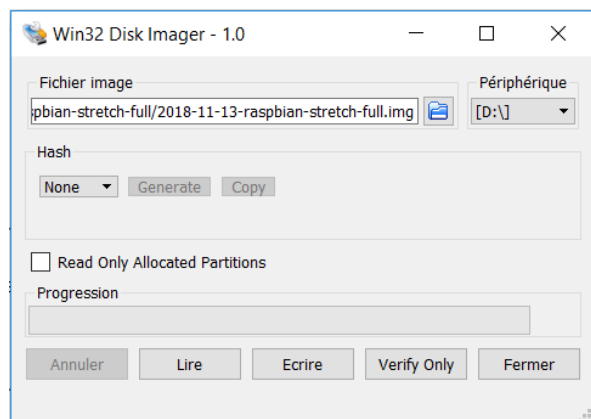
Démarrer Annuler

Formatage de Disque amovible (E:) X

Formatage terminé.

OK

Extract and write the image of the Raspberry PI OS on your SD card.



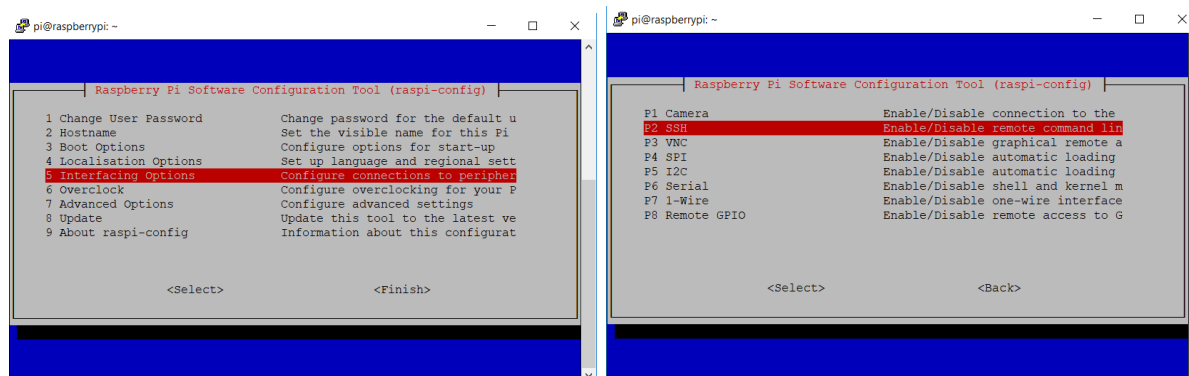
Plug the SD card in your Raspberry, also connect a screen, a mouse and a keyboard.
Start the Raspberry and follow the installation steps.

2.2. Configuration of Raspberry PI OS

Once the installation is finished, access the terminal.

Use the following command to access the configuration page:

- ▶ Access the configuration menu:
 - `sudo raspi-config`
- ▶ Enable SSH connections



The Raspberry is now ready to be used from your own computer using SSH connexions.

Reboot the Raspberry:

- `sudo reboot`

Connect it to the network using its Ethernet port.

- ▶ To obtain the IP and MAC addresses, enter this command line in the terminal:
 - Ifconfig

```
pi@raspberrypi:~ $ ifconfig
eth0      Link encap:Ethernet  HWaddr b8:27:eb:82:d2:4c
          inet addr:192.168.33.158  Bcast:192.168.33.255  Mask:255.255.255.0
          inet6 addr: fe80::ddf2:321f:296d:9d5f/64 Scope:Link
          UP BROADCAST RUNNING MULTICAST  MTU:1500  Metric:1
          RX packets:122165 errors:0 dropped:117 overruns:0 frame:0
          TX packets:2521 errors:0 dropped:0 overruns:0 carrier:0
          collisions:0 txqueuelen:1000
          RX bytes:11166827 (10.6 MiB)  TX bytes:481061 (469.7 KiB)

lo        Link encap:Local Loopback
          inet addr:127.0.0.1  Mask:255.0.0.0
          inet6 addr: ::1/128 Scope:Host
          UP LOOPBACK RUNNING  MTU:65536  Metric:1
          RX packets:268 errors:0 dropped:0 overruns:0 frame:0
          TX packets:268 errors:0 dropped:0 overruns:0 carrier:0
          collisions:0 txqueuelen:1
          RX bytes:22392 (21.8 KiB)  TX bytes:22392 (21.8 KiB)

pi@raspberrypi:~ $
```

3. Installation and configuration of the straton Runtime

3.1. Download the straton Runtime

Download the straton Runtime for the Raspberry from <https://straton-plc.com/en/downloads/>

SEARCH
Type a keyword and hit Enter

SEARCH
Select the required category

☐ Docs 99
☒ Product 4

3.2. Installation of the T5 runtime

Unzip the file downloaded from the COPA-DATA website in the previous step.

Using an FTP client (FileZilla in this case):

- ▶ Connect to the Raspberry (IP address, port 22, name and password)
(By default the user name and password is `pi / raspberry`)
- ▶ Drag and drop the Runtime file ("t5pi11" in our case) in `/home/pi` folder

Using an SSH Client (PuTTY in our case), connect to the Raspberry (IP address + port 22)

- ▶ Configure the runtime file to be executable
 - **`chmod +x Runtime_file`** (t5pi11 in our case)
- ▶ Start the runtime with admin rights
 - **`sudo ./Runtime_file`**
- ▶ If you plan to use IEC61850, create a Custom folder: "`sudo mkdir Custom`" in the same directory as the runtime, then start the runtime with
 - **`sudo ./Runtime_file /path850=Custom/`**
- ▶ By default, communications with the workbench is on port 1100.

After version 11, an additional bash file named `run.sh` is provided. This helper can assist the user to select the appropriate command line arguments.

Grant rights to the file using "`chmod +x run.sh`"

Launch "`sudo ./run.sh --help`" to display information about the arguments

Launch "`sudo ./run.sh`" to start t5runtime with the optimal command line arguments.

```
pi@raspberrypi: ~  
pi@raspberrypi:~$ sudo ./tSpill  
TS Service for Linux - Linux Multithreaded - Dec 20 2021  
Version 1100 Changeset 11217  
Devkit V11.0.211103 - 2019 - (c) COPA-DATA  
  
Registry  
Driver TSBUSExGPIO: GPIO driver V11.0.0  
IEC60870 Slave (1100)V11217  
IEC60870 Master (1100)V11217  
IEC61850 Slave (1100)V11217  
IEC61850 Master (1100)V11217  
Profinet IO Device (1100)V11217  
Profinet IO Controller (1100)V11217  
Driver TSBUSShm2: Shared memory V11.0.0  
Driver TSBUSMailbox: Mailbox V11.0.0  
Driver TSEIPC: Ethernet/IP Scanner V11.0.0  
Driver TSEIPS: Ethernet/IP Adapter V11.0.0  
Driver TSEIPTAG: Ethernet/IP Tag Client V11.0.0  
Driver TSEIPFIO: Ethernet/IP PointIO / FlexIO V11.0.0  
Driver TSBUSExCANOpen: CANOpen master V11.0.0  
Driver TSBUSExMQTT: MQTT Client V11.0.0  
Driver TSBUSExEPL V11.0 - Stack OPLK V2.2.1  
SQLITE  
Driver TSBUSExopcua_s62541 V11.0 - OPC UA Stack open62541-undefined  
ENF3 Master from CD (1100)V11217  
ENF3 Outstation from CD (1100)V11217  
Driver TSBUSExOLS: On Line programming with scripts V11.0.0  
OpenSSL 1.1.1 11 Sep 2018  
Driver TSBUSExopcua_c V11.0 - OPC UA Stack open62541-undefined  
TBSYST  
Driver TSBUSExI2C: I2C driver V11.0.0  
Size of info queue (evInfo) = 16000  
Size of event queue (evEvent) = 8000  
Maximum logged events (maxpub) = 1024  
  
Ready - Press CTRL+C to exit.  
  
LICENSE : Key file found <K5License.ini>  
LICENSE : Key number <DC-A6-32-02-3A-71.0100.0.0.1602.520E>  
LICENSE : Adapter found <DC-A6-32-02-3A-71>
```

If not activated straton Runtime runs for 2 hours.

The license needs to be in a K5License.ini file in the same folder as the runtime.

In order to get a straton runtime license, you need to send the Raspberry physical/MAC address of one of the device's Ethernet card to STRATON AUTOMATION.

You will shortly receive your license number.

In order to activate the license, type in a console, in the same directory as the Runtime:

- **echo *Your_license_number* > K5License.ini**

Or create the K5License.ini file manually and put the license number inside it. Be careful with the file name, this is case sensitive!

NOTES: the license number follows this syntax: MacAddress.0.0.abcd.efgh

If the license number is not OK, a message will warn you when starting the start of the straton runtime.

4. Download an application

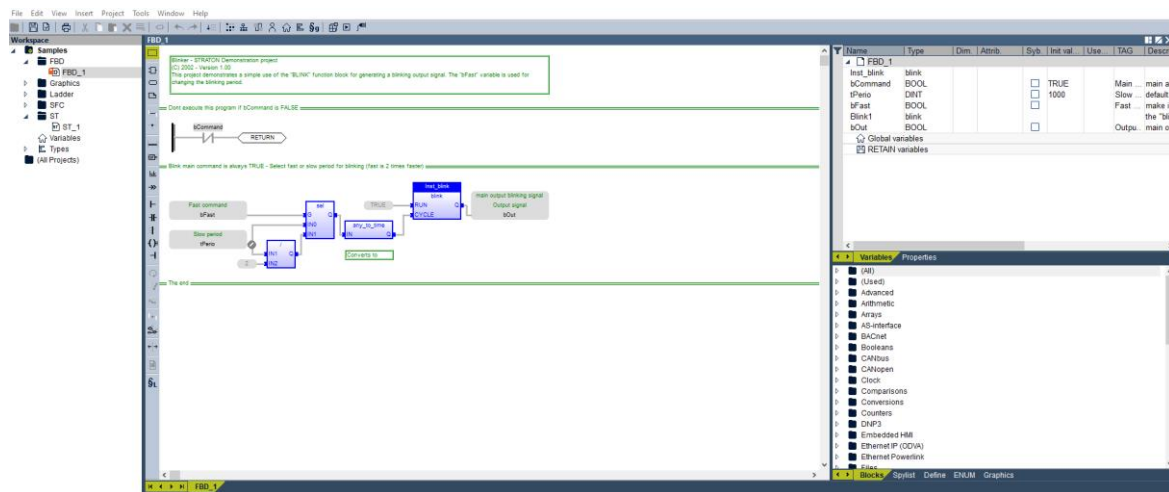
First of all, start a straton Runtime on the platform.

Open the straton IDE and select the “Samples” project in the start page.


(NOTE: clicking on the “Demo projects” title opens the demo projects’ folder)

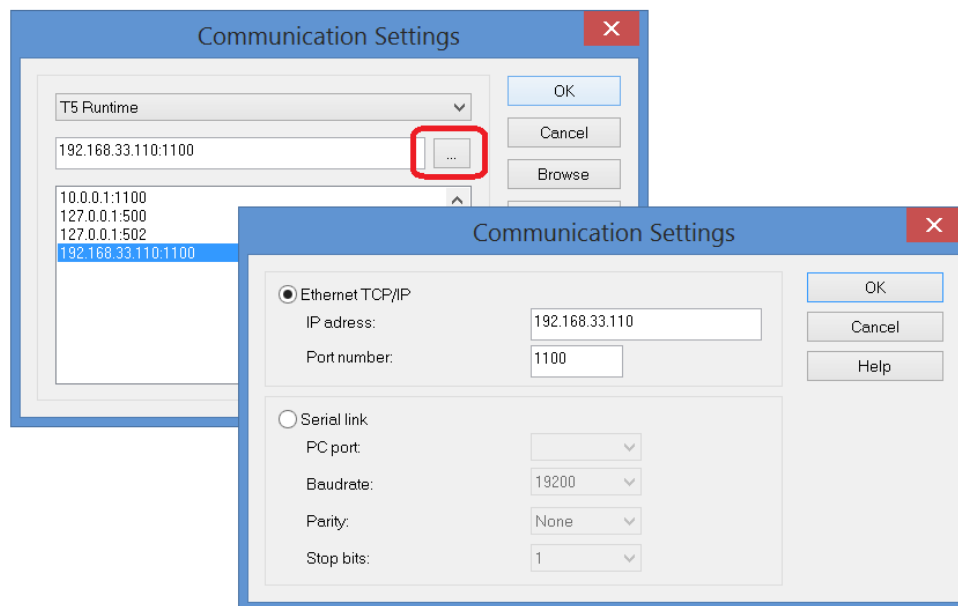
Demo projects

CoffeeMachine
Energy_61850
Samples



Download the application to the straton runtime:

- ▶ Select the communication parameters in menu Tools/Communication Parameters
- ▶ Establish the connection through menu Project/Online ()



RESULT IS:



The download is successful and application starts correctly.



The runtime is not started or communication parameters are wrong.



The application is not yet downloaded or an error occurs during startup. More detail can be found in the output view.

5. Install I2C Driver on Raspberry

There are some command lines to execute for enabling the i2c feature on the Raspberry.

Open a terminal on the raspberry then type:

- ▶ **sudo su** in order to switch as the root (administrator) user
- ▶ **nano /etc/modprobe.d/raspi-blacklist.conf**

In the opened file, add a # before the **blacklist i2c-bcm2708**. This will ensure the SPI interface driver to be loaded each time the Raspberry will be started.

```
blacklist spi-bcm2708
#blacklist i2c-bcm2708
```

Press Ctrl +X to exit, type Y to confirm saving changes, then press enter.

- ▶ **nano /etc/modules**

In the opened file, add a new line with i2c-bcm2708 and another one with i2c-dev :

```
snd-bcm2835
i2c-bcm2708
i2c-dev
```

Press Ctrl +X to exit, type Y to confirm saving changes, then press enter.

- ▶ **apt-get update** in order to update the list of available packages on repository
- ▶ **apt-get install i2c-tools** in order to install i2c driver
- ▶ **modprobe i2c-dev** in order to activate the i2c
- ▶ **reboot** and wait until the system has rebooted

Then, wire your i2c slaves to GPIO 2 (SDA) and GPIO 3 (SCL) (refer to the map in section [Erreur ! Source du renvoi introuvable.](#)).

In a terminal, type **sudo i2cdetect -y 1**

It should discover the wired i2c slaves.


Addresses are shown in hexadecimal. Convert them to decimal to configure straton.

6. Configure I2C Port

First of all, make sure that the configuration of the GPIO does not map pins that are dedicated to the I2C port. These pins are GPIO 2 and 3 for Raspberry V2, and GPIO 0 and 1 for Raspberry V1.

Then, in the fieldbus configuration tab, click on "Insert Configuration" button ():

Choose I2C, and validate.

Then click on the "Insert Mater / Port" button:  and "OK". Configure the port number to "1" (default on the raspberry).

Click on the "Insert Slave / Data block" button: 

Configure the address of the slave. Pay attention that the address should be a decimal number (not hexadecimal). Refer to previous chapter to find what the address of your i2c slave is.

Then map variables. Depending on the Format, the expected type of the variable is different.

Format	Variable Type
Byte.bit (1 bit)	BOOL
Byte (1 bytes)	SINT, USINT
Word (2 bytes)	INT, UINT
Dword (4 bytes)	DINT, UDINT
Real (4 bytes)	REAL

You have to take care of the offset. The offset of a value should be the offset of previous value plus the size of previous value.

7. Use the dataserver on the Raspberry

Refer to the Dataserver user guide for a full description!

7.1. Prerequisites

In this case, we will use CGI request with the pre-compiled **t5web.cgi** file as well as pre-coded javascript files, both available in the 'cgi-bin' and 'www' folder present in the Runtime delivery (Refer to the section **Erreur ! Source du renvoi introuvable.** of this document). The webserver will be apache2.

Install apache2:

- ▶ `sudo apt-get install apache2`

Using Filezilla, put the 't5web.cgi' file in /home/pi. Then move it to the right place, make it executable and configure apache 2 to use cgi

- ▶ `sudo mv /home/pi/t5web.cgi /usr/lib/cgi-bin/`
- ▶ `chmod +x /usr/lib/cgi-bin/t5web.cgi`
- ▶ `sudo a2enmod cgi`
- ▶ `sudo systemctl restart apache2`

Using Filezilla, put the 'js' folder in /home/pi. Then move it to the right place:

- ▶ `sudo mv /home/pi/js /var/www/html`

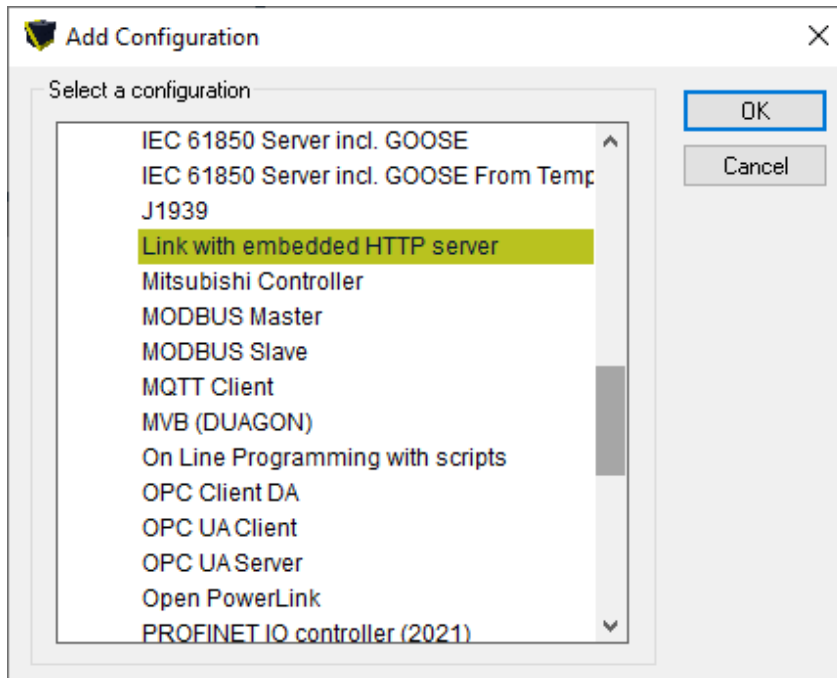
For certain graphics, images like *.bmp ones will be downloaded in an 't5html5' folder. This must exist on the target. In order to create it, if this does not exist:

- ▶ `sudo mkdir /var/www/html/t5html5`

In a web browser, type the IP address of the Raspberry to check that the webserver runs well (apache2 default page must appear)

7.2. Create the configuration in straton Editor

In the Fieldbus Configuration () , insert the "Link with embedded HTTP Server" driver:



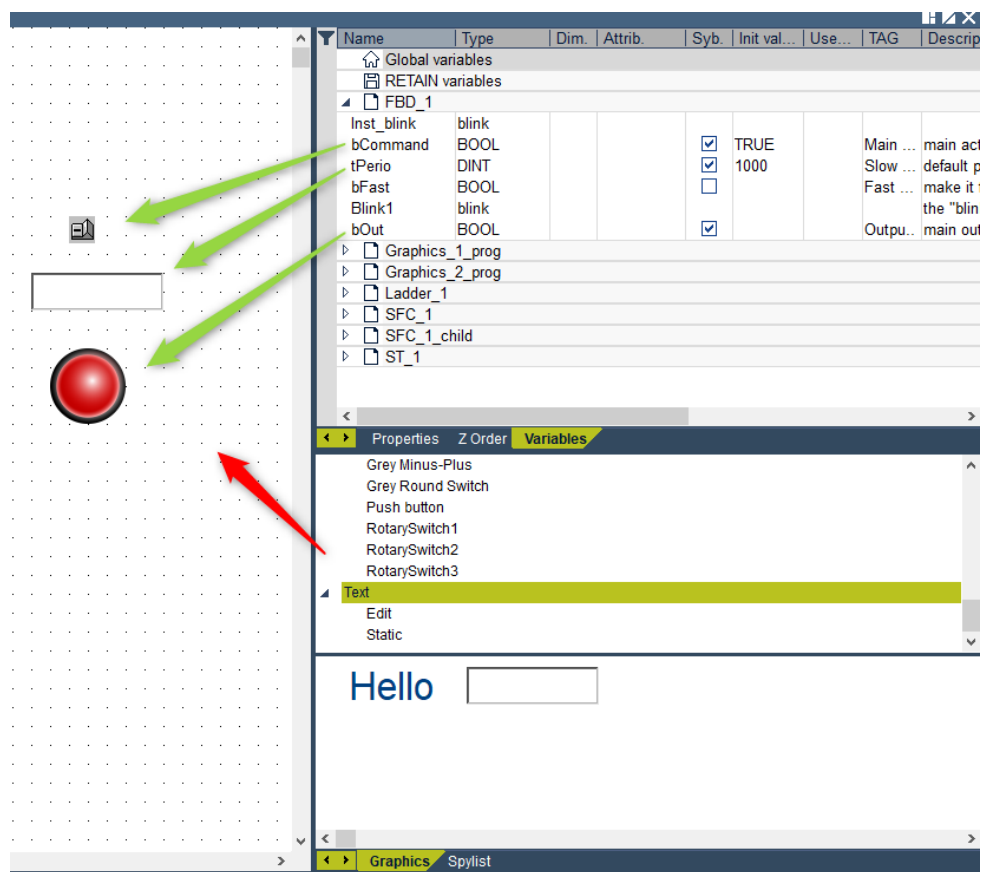
Select the variables to be visible by the Data Server by checking the Embedded Symbol flag in the straton variables list (dictionary on the right):

Name	Type	Dim.	Attrib.	Syb.	Init val...	Use...	TAG	Descrip
FBD_1								
Inst_blink	blink							
bCommand	BOOL			<input checked="" type="checkbox"/>	TRUE		Main ...	main act
tPerio	DINT			<input checked="" type="checkbox"/>	1000		Slow ...	default p
bFast	BOOL			<input type="checkbox"/>			Fast ...	make it
Blink1	blink							the "blin
bOut	BOOL			<input checked="" type="checkbox"/>			Outpu..	main out
Global variables								
RETAIN variables								

Note: you can also enable embedding all of the symbols in the straton project's Settings.

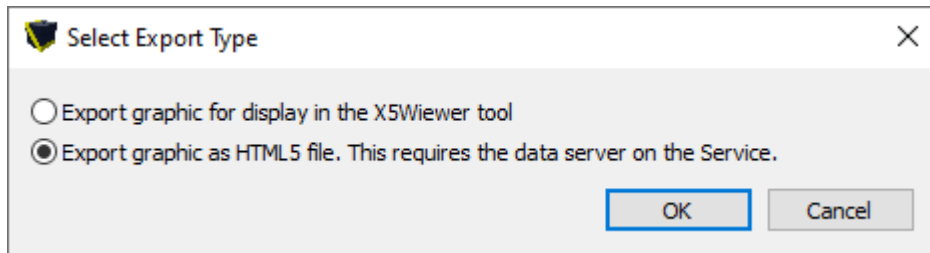
Right-click in the straton project list > Insert New Item > Graphics.

In the graphics, create graphical elements doing a drag and drop from the list, then link the embedded variables to it also doing a drag and drop from the variables list on the desired elements.



7.3. Put the HTML5 page on the Raspberry

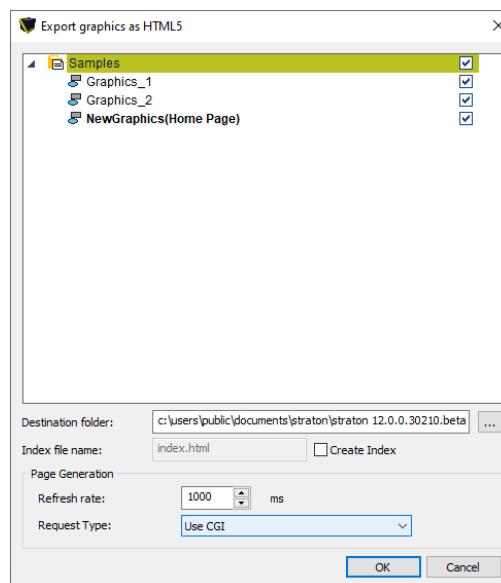
In the graphics, click on the Export Graphics button () then choose to export the graphic as HTML5 page.



Click on Ok, choose a folder to save the file locally, then:

- ▶ Choose the page of that you want export.
- ▶ Select the Refresh rate.
- ▶ Select the Request Type

Click on ok.

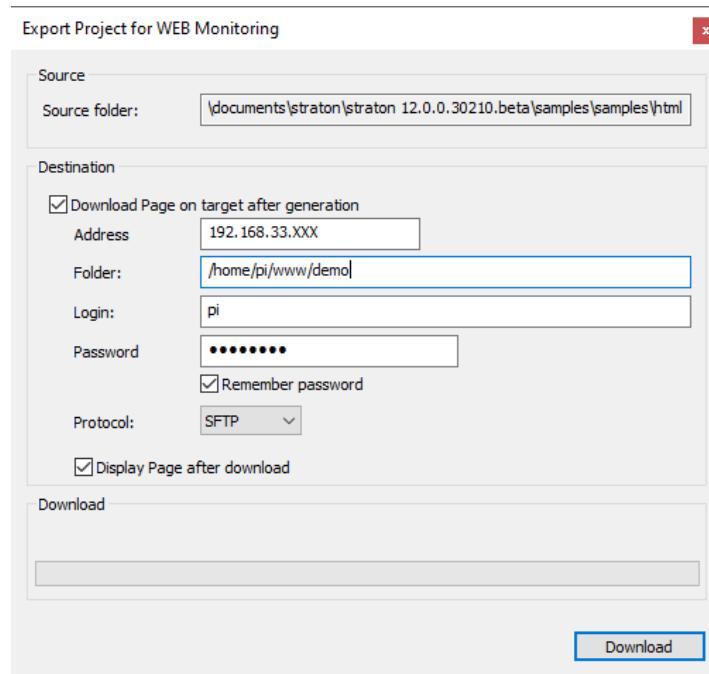


After you can download the folder directly on the target:

- ▶ Enter the Ip address of the target.
- ▶ The path where you want download the folder
- ▶ Enter the login and the password of the target.

- And the type of transfer (SFTP, FTP, T5)

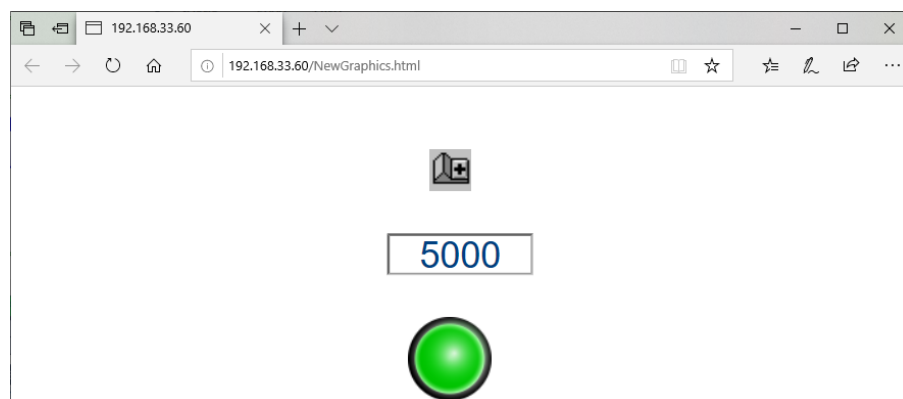
Click on Download and you can Display the page after the download.



The dialog box is titled "Export Project for WEB Monitoring". It contains the following fields and options:

- Source:**
 - Source folder: `\documents\straton\straton 12.0.0.30210.beta\samples\samples\html`
- Destination:**
 - ☒ Download Page on target after generation
 - Address: `192.168.33.XXX`
 - Folder: `/home/pi/www/demo`
 - Login: `pi`
 - Password: `••••••••`
 - ☒ Remember password
 - Protocol: `SFTP` (dropdown menu)
 - ☒ Display Page after download
- Download:**
 - A progress bar.
 - A `Download` button.

After pressing 'OK' the page will be downloaded to the target and a web browser will open, displaying the HTML5 page. From here you can interact with the straton variables.



8. Frequently Asked Questions

How to get the MAC address of the Ethernet card(s)?

To get the MAC address use the following command: **ifconfig**

How to display the content of a file?

The following command can be used: **cat <filename>**

How to edit the K5License.ini?

File can be edited using **sudo nano <filename>**

Use CTRL+X to close the file.

How to change the execution mode of a file?

By default a file copied to Linux do not get the execution privilege.

To set this privilege use the command **chmod +x filename**

How to get processes status?

Two commands are available:

- ▶ `ps -A`
- ▶ `top`

How to list network connection?

Use:

- ▶ `netstat`

How to start straton runtime on boot?

Use the following command to access the booting file

► `sudo nano /etc/rc.local`

Then add the command lines you are using to access the straton runtime and launch it:

```
#
# By default this script does nothing.

# Print the IP address
_IP=$(hostname -I) || true
if [ "$_IP" ]; then
    printf "My IP address is %s\n" "$_IP"
fi

cd /home/pi/StratonFolder
sudo ./t5pi92energy

exit 0
```

How to know the version of your Raspberry PI?

Open an SSH connection with your Raspberry (with PuTTY for example) and enter the following command:

► `cat /proc/cpuinfo`. Look at the "Revision" line and refer to the following tab:

Revision	Model
0002	Model B Revision 1.0
0003	Model B Revision 1.0 + Fuses mod and D14 removed
0004	Model B Revision 2.0 256MB, (Sony)
0005	Model B Revision 2.0 256MB, (Qisda)
0006	Model B Revision 2.0 256MB, (Egoman)
0007	Model A Revision 2.0 256MB, (Egoman)
0008	Model A Revision 2.0 256MB, (Sony)
0009	Model A Revision 2.0 256MB, (Qisda)
000d	Model B Revision 2.0 512MB, (Egoman)
000e	Model B Revision 2.0 512MB, (Sony)
000f	Model B Revision 2.0 512MB, (Qisda)
0010	Model B+ Revision 1.0 512MB, (Sony)
0011	Model Compute Module Revision 1.0 512MB, (Sony)
0012	Model A+ Revision 1.0 256MB, (Sony)
0013	Model B+ Revision 1.2 512MB
a01041	Model 2 B Revision 1.1 1GB, (Sony)
a21041	Model 2 B Revision 1.1 1GB, (Embest)