USER MANUAL

Z-TWS4

Z-PASS2-S

S6001-RTU

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Date	Revision	Notes
06/09/2016	07	- Chapter "Features": new features forZ-PASS2-S-R01 - Chapter "LEDs signalling": new par. " Z-PASS2-S-R01" - New chapter "Ethernet Mode (Z-PASS2-S-R01)" - Chapter: "Discovering the IP address": network parameters setting - Chapter "Upgrading the firmware by a USB pen": revision - Par. "Web Configuration Pages/Administrator pages": changed paragraphs: - "Main View" - "Network and Services" - "Router Configuration" - "FW Upgrade" new paragraphs: - "VPN Configuration/OpenVPN Client/LED signalling (Z-PASS2-S-R01)" - "VPN Configuration/VPN Box/LED signalling (Z-PASS2-S-R01)" - Par. "Web Configuration Pages/User pages" changed paragraphs: - "Main View" - "Network and Services"
11/01/2017	08	- Renamed “Z-PASS2-S-1” → ”, “Z-PASS2-S-R01” - Chapter “Discovering the IP address”: discovery working on both LAN and WAN interfaces - New chapter “Network Redundancy” - Paragraph “Main View” revision (also for “User Pages”) - Paragraph “Network and Services”: added “DNS Mode” parameter and Network Redundancy parameters; changed some default values (also for “User Pages”) - Paragraph “Real Time Clock Setup”: added “Central Europe” time zone value - Paragraph "VPN Configuration/OpenVPN Client": revision into "VPN Configuration/OpenVPN”; added packet/byte counters description - Paragraph "VPN Configuration/VPN Box”: added packet/byte counters description - Paragraph “Mobile Network”: added packet/byte counters description - Paragraph “Router Configuration”: Port Mapping parameters no more disabled when “Use Local Addresses” is ON - Paragraph “Users Configuration”: added “guest” user credentials - New paragraph “Ethernet Interfaces” - New paragraph “Modbus Modules” - New paragraph “Data Logs” - New paragraph “Guest Pages” - StratON FBs and Functions, new paragraphs: GET_ALARMS, PUT_ALARM, SET_ALARMS_STAT, FM_WRITE_NCRLF, TXBAPPENDFILE, GET_MIN_SINCE2K - Chapter Z-NET4: added note to “Remote Control Functions”
01/03/2017	09	- New paragraph “Configuration Management” - PLC application name shown in the web pages header - “Use Local Address through VPN” parameter: “ON” option always available - Paragraph “Network and Services” (Admin and User): changed default value for “Default Gateway” and “DNS Server” parameters; “Default Gateway” always in the WAN subnet, in LAN/WAN mode; “DHCP on LAN” disabled, in LAN/WAN mode

		- OpenVPN, Configuration File: added rules on “dev” and “log” options - StratON FBs and Functions, new paragraphs: S7_DB_READ, S7_DB_WRITE
23/05/2017	10	- Chapter "Features": new features for Z-PASS2-S-IO - New “LEDs signaling” sub-paragraph for IO HW revision - New chapter “Remote Access Disable” - New chapter “Auto-APN” - Paragraph “Network and Services”: added screen-shots for “IO” version; added “COM1/Mode” parameter - Paragraph “VPN Box”: added “License Limit Reached” error reason - Paragraph “FW Upgrade”: changed “Stop TWS Services” pop-up - Paragraph “Configuration Management”: added “Save Debug Logs” feature - Paragraph “Mobile Network”: added “APN Mode” parameter - New paragraph “Digital I/O Configuration” - Paragraph “PPP_CONNECT”: changes for “Auto-APN” - StratON FBs and Functions, new paragraphs: PPP_CONNECT_R2, VPNBOX_STATUS, WDOG_KEEP_ALIVE, WDOG_SET_TMO
02/08/2017	11	- Chapter “Technical Specifications”: added features for Z-PASS2-S-IO modem - Paragraph “LEDs signaling”/IO: added info about modem “STAT “ LED - Chapter “VPN”: added description of Layer 2 and Layer 3 VPN - Paragraph “VPN Configuration/VPN Box”: changes related to L2 VPN and info about connected user; added L2 VPN figure - Deleted paragraph “Updating the StratON application by a USB pen” - Chapter “Upgrading the firmware…”: added notes about LEDs blinking - Paragraph “Main View” (admin): updated figure - Paragraph “Network and Services”: added info about new Web Server and File Transfer parameters; updated figures - Paragraph “Real Time Clock Setup”: updated figure - Paragraph “Router Configuration”: changed default value for “Allow Access through Mobile Public IP Address” parameter - Paragraph “Configuration Management”: added info about zip archive; updated figures - Paragraph “Mobile Network”: updated figures - “Remote Access Disable” → “Remote Connection Disable”
06/10/2017	12	- Changed “-R02” → “-IO” - Chapters “Features”, “Technical Specifications”: note about GPS module and antenna - Chapter “Electrical Connections”: added sub-paragraph for Z-PASS2-S-IO Digital I/Os - New sub-paragraph “Z-PASS2-S-IO profiles” - Paragraphs “Main View”, “Network and Services”: updated figures - Paragraph “Real Time Clock Setup”: added figure with new time zones - Paragraph “VPN Box”: updated first figure - Paragraph “Router Configuration”: updated figures - Paragraph “Users Configuration”: updated figure - Paragraph “FW Upgrade”: updated figures - Paragraph “Configuration Management”: added table about save option and archive contents; updated figure - New sub-paragraph “Factory reset by USB pen” - Paragraph “Mobile Network”: added info and figure about “GPS Location”; updated some figures - Paragraph “Digital I/O Configuration”: added info and figure about “Local Alarm”

		- New paragraph “FW Versions” - Deleted “DHCP on LAN” parameter - Paragraph “Network and Services” (user): updated figures
30/11/2017	13	- Paragraph “Router Configuration”: parameter “Access through Mobile Public IP Address” changed to “Mobile Network Firewall” - Paragraph “Mobile Network”: changes related to “Operator Selection” and PIN handling - New paragraph “DDNS Configuration” - Paragraphs “Main View” and “Guest pages”: “RESET” button renamed to “RESTART”; updated figures - Chapter “Remote Connection Disable”: added “Security Level 4 (SMS Service)” - Paragraph “Digital I/O Configuration”: added “Security Level 4 (SMS Service)” ; updated figures - Paragraph “FW Versions”: updated figure - StratON FBs, new paragraph: SERVICE_CTRL - Deleted references to Z-MODEM-3G
18/01/2018	14	- Chapter “Features”: added Z-PASS2-S-IO-4G product - Chapter “Technical specifications”: updated info about modem - Removed “None” value of “Security Level / Service Disable” parameter.
15/03/2018	15	- Removed CTS signal from COM1 port (Z-TWS4, Z-PASS2-S) - Added parts related to Z-TWS4-IO
30/07/2018	16 (FW rel. SW002940_336)	- Paragraph “Router Configuration”: new “Ethernet Bandwidth Limitation” parameter; updated figures
28/09/2018	17 (FW rel. SW002940_340)	- New chapter “M-Bus” - New web page paragraph “Modbus TCP Client Configuration” - New web page paragraph “M-Bus Diagnostics” - New FB paragraphs MBUS_GET_DATA, MBUS_GET_INFO, MBUS_READ_DATA, MBUS_WRITE_RAW
10/10/2018	18 (FW rel. SW002940_341)	- Paragraph “M-Bus Diagnostics” reviewed
23/10/2018	19 (FW rel. SW002940_342)	- Paragraph “M-Bus Diagnostics” reviewed
20/03/2019	20 (FW rel. SW002940_344)	-Modified chapter “M-Bus Diagnostics” in “M-Bus Scan” -Added Chapter “M-Bus Configuration” - new function MBUS_READ_CTL - Deleted FB: MBUS_READ_DATA, MBUS_GET_DATA, MBUS_GET_INFO
05/04/2019	21 (FW rel. SW00290_350)	-Added Chapter “OPC-UA” -new FB UAC_CONNECT UAC_DISCONNECT UAC_READ UAC_WRITE
25/10/2019	22 (FW rel. SW00290_360)	-Added MQTT Client Protocol - OPC-UA Server: - added new "Security Policies":

		- Basic128Rsa15 / Sign - Basic128Rsa15 / Sign & Encrypt - Basic256Sha256 / Sign - Basic256Sha256 / Sign & Encrypt - Added certificate management in "OPC-UA Server Configuration" - OPC-UA Client: - added new "Security Policies": - Basic128Rsa15 / Sign - Basic128Rsa15 / Sign & Encrypt - Basic256 / Sign - Basic256 / Sign & Encrypt - Basic256Sha256 / Sign - Basic256Sha256 / Sign & Encrypt - Added new page “OPC-UA Client Configuration" - FB UAC_CONNECT: added new input parameters SEC_POLICY, SEC_MODE -Added new FB DSN_RESOLVE -Changed the “Modbus TCP-IP Client configuration” chapter with “Modbus Configuration” -Added The new Modbus Pass-Through mode
20/12/2019	23	-Added MQTT SSL/TLS connection retry file info -Fixed Chapter “Importing the M-BUS Configuration in Straton”
31/03/2020	24	-Added MQTT configuration from files (from firmware SW00294_362)

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1 Preliminary information / Informazioni preliminari

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SENECA SRL PUO' MODIFICARE IL CONTENUTO DI QUESTO MANUALE IN QUALUNQUE MOMENTO E SENZA PREAVVISO AL FINE DI CORREGGERE, ESTENDERE O INTEGRARE FUNZIONALITA' E CARATTERISTICHE DEL PRODOTTO.

2 Features

Z-TWS4, Z-PASS2-S and S6001-RTU are programmable, communication oriented PLCs.

The Z-TWS4/Z-PASS2-S/S6001-RTU StratON™ PLC is programmable according to the IEC 61131-3 standard, by means of the StratON development environment.

All three devices provide the following features:

- OpenVPN connectivity
- full configuration by means of an integrated web site
- FW upgrade, that can be performed locally, by means of a USB pen, or remotely, through the web site

Z-PASS2-S and S6001-RTU integrate a 3G HSPA modem.

S6001-RTU is equipped with a rich set of analog and digital inputs/outputs.

Z-PASS2-S, S6001-RTU and Z-TWS4 (when connected to an external modem) can be used as a Router, routing packets between the WAN (Mobile Network) and the LAN (Ethernet).

All three devices are based on a 32bits ARM9 processor, equipped with the Linux operating system (Linux kernel 2.6.28).

Z-PASS2-S-R01 is a new version of the Z-PASS2-S product, providing the following new features:

- the two available Ethernet ports can be configured as two fully separated network interfaces (“LAN” and “WAN”), whereas in the older versions they could only work as ports of an Ethernet switch; the user can choose if the two ports shall work in “LAN/WAN” mode or “Switch” mode, by means of a new configuration parameter (“Ethernet Mode”);
- there are 4 more LEDs, providing information about the “Ethernet Mode” and the VPN functionalities.

Z-TWS4-IO is a new version of the Z-TWS4 product, providing the following new features:

- one digital input which can be used to disable remote connection to the device
- one digital output which goes HIGH when the device is remotely accessed
- one digital output which can also be used as a remote command
- one configurable digital input/output, which can also be used as a local alarm
- a new set of LEDs
- COM1 RS232/RS485 mode set by software (configuration parameter), instead of HW DIP switch

Z-PASS2-S-IO is a new version of the Z-PASS2-S product, providing the following new features:

- one digital input which can be used to disable remote connection to the device
- one digital output which goes HIGH when the device is remotely accessed
- one digital input which can also be used as a local alarm
- one digital output which can also be used as a remote command
- two configurable digital inputs/outputs
- a new set of LEDs
- COM1 RS232/RS485 mode set by software (configuration parameter), instead of HW DIP switch
- a new penta-band 3G+ modem, which also features a GPS module

Z-PASS2-S-IO-4G is a new version of the Z-PASS2-S-IO product, providing a new 4G LTE Cat.1 modem, instead of the 3G+ modem.

NOTE 1:
in the following chapters, the term “Device” will be used when describing features or characteristics that are available in all three products.

NOTE 2:
in the following chapters, any reference to 3G modem/connection applies also to 4G modem/connection.

3 Technical specifications

COMMUNICATION PORTS (Z-TWS4/Z-PASS2-S)	
RS 485	Baud rate: maximum 115 Kbps, minimum 110 bps COM 4 (screw terminals 4-5-6) COM 2 (screw terminals 1-2-3 or IDC10 connector) COM 1 (removable 4 pin connector, as an alternative to RS232)
RS 232	Baud rate: maximum 115 Kbps, minimum 110 bps COM 1 (removable 4 pin connector, as an alternative to RS485)
CAN	CAN bus port 2.0A and 2.0B Baud rate: maximum 500 Kbps, minimum 20 Kbps (screw terminals 10-11-12 or IDC10 connector) available only in Z-TWS4
Ethernet 1 and Ethernet 2	Ethernet 10/100 Mbps Two RJ45 connectors on front-panel Maximum connection length 100 m In Z-PASS2-S-R01/Z-PASS2-S-IO/Z-TWS4-IO, the two ports can work either as LAN/WAN ports (**ETH1=LAN, ETH2=WAN**) or ports of an Ethernet switch. In Z-TWS4/Z-PASS2-S, the two ports can work only as ports of an Ethernet switch.
USB #1 HOST	Plug-in: USB type A
USB #2 HOST	Plug-in: micro USB (available only in Z-TWS4)
COMMUNICATION PORTS (S6001-RTU)	
RS 485	Baud rate: maximum 115 Kbps, minimum 110 bps COM 4 (screw terminals 54-55-56) COM 2 (screw terminals 57-58-59)

RS 232	Baud rate: maximum 115 Kbps, minimum 110 bps COM 1 (DB9 male connector)
Optional Bus for future extensions	screw terminals 60-61-62
Ethernet	Ethernet 10/100 Mbps RJ45 connector Maximum connection length 100 m
USB #1 HOST	Plug-in: USB type A
CPU AND MEMORY	
Microprocessor	ARM 9, 32 bits, 400 MHz
Memories	64 Mbytes of RAM 1 Gbyte of FLASH 8 Kbytes of FeRAM, split in 2 partitions (4 Kbytes each) for redundancy
Slot for external memory	Micro SD card: max 32 Gbytes
I/O CPU (S6001-RTU)	
Microprocessor	8 bits, 24 MHz
3G+ MODEM (Z-PASS2-S/S6001-RTU)	
HSPA Modem	14.4 Mbps in downlink, 5.76 Mbps in uplink
Slot for SIM card	Mini SIM with push-push connector
3G+ MODEM (Z-PASS2-S-IO)	
Speed	HSPA+: max 14.4 Mbps DL, max 5.76 Mbps UL UMTS: max 384 Kbps (DL), max 384 Kbps (UL) EDGE: max 236.8 Kbps (DL), max 236.8 Kbps (UL) GPRS: max 85.6 Kbps (DL), max 85.6 Kbps (UL)
GNSS	GPS/GLONASS 16 GPS channels 14 GLONASS channels Accuracy <1.5m CEP-50 @ Open Sky
Approvals	RoHS Compliant, CE/GCF/Vodafone (Europe), DoC (Russia), FCC/PTCRB/AT&T (North America), RCM (Australia), ICASA (South Africa), SRRC/NAL/OFCA (China), JATE & TELEC (Japan), NCC (Taiwan), KC/SKT (Korea), IC/Rogers (Canada), Anatel (Brazil), NBTC (Thailand)
Slot for mini SIM	Mini SIM with push-push connector

4G (LTE Cat. 1) MODEM (Z-PASS2-S-IO-4G)	
Speed	LTE FDD: max 10 Mbps (DL), max 5Mbps (UL) LTE TDD: max 8.96 Mbps (DL), max 3.1 Mbps (UL) DC-HSPA+: max 42Mbps (DL), max 5.76 Mbps (UL) UMTS: max 384 Kbps (DL), max 384 Kbps (UL) EDGE: max 296 Kbps (DL), max 236.8 Kbps (UL) GPRS: max 107 Kbps (DL), max 85.6 Kbps (UL)
GNSS	GPS/GLONASS/BeiDou/Galileo/QZSS
Approvals	RoHS Compliant, CE/GCF/Vodafone (Europe), FCC/PTCRB/AT&T/Verizon* (North America), RCM/Telstra (Australia), JATE/TELEC/DOCOMO* (Japan), NCC (Taiwan), KC/SKT/KT*/LGU+* (Korea), IC/Rogers (Canada), Anatel (Brazil), CCC/SRRC/NAL (China) *= Under Development
Slot for mini SIM	Mini SIM with push-push connector
POWER SUPPLY (Z-TWS4/Z-PASS2-S)	
Power supply	11..40 Vdc or 19..28 Vac @ 50..60 Hz
Consumption	Typical 4 W @ 24 Vdc; Max 6 W
POWER SUPPLY (S6001-RTU)	
Power supply	24 Vac/dc ± 15% @ 50/60Hz
Consumption	10 VA max , 6 VA typical
ENVIRONMENTAL CONDITIONS (Z-TWS4/Z-PASS2-S)	
Temperature	-20..+55 °C
Humidity	30..90 % @ 40 °C not condensing
Storage temperature	-20..+85 °C
Protection degree	IP20
ENVIRONMENTAL CONDITIONS (S6001-RTU)	
Temperature	-10..+65 °C
Humidity	10..90 % not condensing
Storage temperature	-40..+85 °C
Protection degree	IP20
CONNECTIONS (Z-TWS4/Z-PASS2-S)	
Connections	Removable 3 way screw terminals, 5.08 pitch

	Rear IDC10 connector for DIN 46277 rail Removable 4 pin connector Two RJ45 connectors Type A USB connector and micro USB connector (only in Z-TWS4) Plug in: micro SD card Two SMA antenna connectors: - for Main and Diversity antennas (only in Z-PASS2-S, Z-PASS2-S-R01) - for 3G and GPS antennas (only in Z-PASS2-S-IO)
CONNECTIONS (S6001-RTU)	
Connections	Removable screw terminals DB9 male connector RJ45 connector Type A USB connector Plug in: micro SD card Two SMA antenna connectors, for Main and Diversity antennas
BOX / DIMENSIONS (Z-TWS4/Z-PASS2-S)	
Dimensions	Z-TWS4: L: 100 mm; H: 112 mm; W: 35 mm Z-PASS2-S: L: 100 mm; H: 112 mm; W: 53 mm
Case	Nylon 6 with 30% fiberglass field, self-extinguishing class V0, black color
WEIGHT / DIMENSIONS (S6001-RTU)	
Dimensions	190 mm x 160 mm x 105 mm
Weight	600 g
INPUTS / OUTPUTS (Z-TWS4-IO)	
Digital Inputs	Max. number of channels: 2 Voltage: OFF<4V ON>8V; Max. Current (Vout+): 20mA Current absorbed: 3mA at 12VC; 6mA at 24VC
Digital Outputs	Max. number of channels: 3 Voltage (+Vext): 10 – 24VC Max. current delivered: 400mA
INPUTS / OUTPUTS (Z-PASS2-S-IO)	
Digital Inputs	Max. number of channels: 4 Voltage: OFF<4V ON>8V; Max. Current (Vout+): 20mA Current absorbed: 3mA at 12VC; 6mA at 24VC

Digital Outputs	Max. number of channels: 4 Voltage (+Vext): 10 – 24VC Max. current delivered: 400mA
INPUTS / OUTPUTS (S6001-RTU)[1]	
Analog inputs	4, current, 0..20 mA resolution: 12 bit accuracy: += 0.3% of full scale input impedance: 50 Ω
Analog outputs	1, current, 0..20 mA 1, voltage, 0..10 Vdc resolution: 12 bit accuracy: += 0.3% of full scale output load: current: <= 500 Ω, voltage: >= 1 kΩ
Digital inputs	15, PNP, with optoisolation ON current > 4 mA, OFF current < 3 mA
Digital outputs	8, SPDT relays max peak current: 3 A operating current: 2 A operating voltage: 250 Vac minimum load: 0.5 W isolation: 3 kV
Liquid level control inputs	conductive liquid level switch, 2 channels adjustable sensitivity

The following table shows which frequency bands are supported by the modem available in Z-PASS2-S, Z-PASS2-S-R01, S6001-RTU, Z-PASS2-S-IO and Z-PASS2-S-IO-4G products.

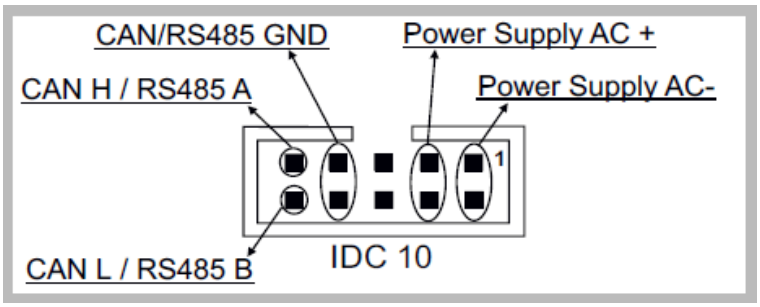
Standard	Frequency/Feature	Z-PASS2-S, Z-PASS2-S-R01, S001-RTU	Z-PASS2-S-IO	Z-PASS2-S-IO-4G
GSM	GSM 850 MHz	OK	OK	
	EGSM 900 MHz	OK	OK	OK
	DCS 1800 MHz	OK	OK	OK
	PCS 1900 MHz	OK	OK	
WCDMA	WCDMA 800 MHz		OK	
	WCDMA 850 MHz		OK	OK
	WCDMA 900 MHz	OK	OK	OK
	WCDMA 1900 MHz		OK	
	WCDMA 2100 MHz	OK	OK	OK
LTE	LTE 800 DD			OK
	LTE 850			OK
	LTE 900			OK
	LTE 1800			OK
	LTE 2100			OK
	LTE 2600			OK
HSPA	HSDPA	OK	OK	
	HSUPA	OK	OK	
	HSPA+		OK	
	DC-HSPA+			OK
DRX	Receiver Diversity	OK		

[1] For more detailed information about S6001-RTU I/Os, see S6001-RTU Installation Manual.

4 Electrical Connections

4.1 Z-TWS4, Z-TWS4-IO, Z-PASS2-S, Z-PASS2-S-R01, Z-PASS2-S-IO

Power Supply and Modbus interface are available by using the bus for the Seneca DIN rail, by the rear IDC10 connector or by Z-PC-DINAL1-35 accessory for Z-TWS4, Z-PC-DINAL2-52.5-17 for Z-PASS2-S. The following picture shows the meaning of the IDC10 connector pins.

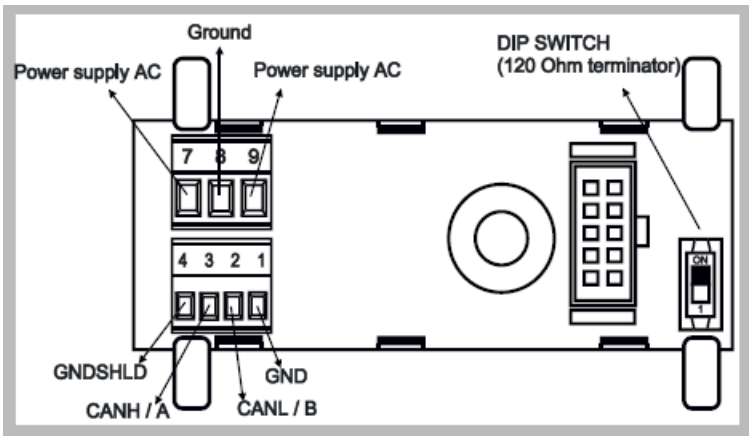


Power supply is available only from the rear connector for Z-TWS4, while:

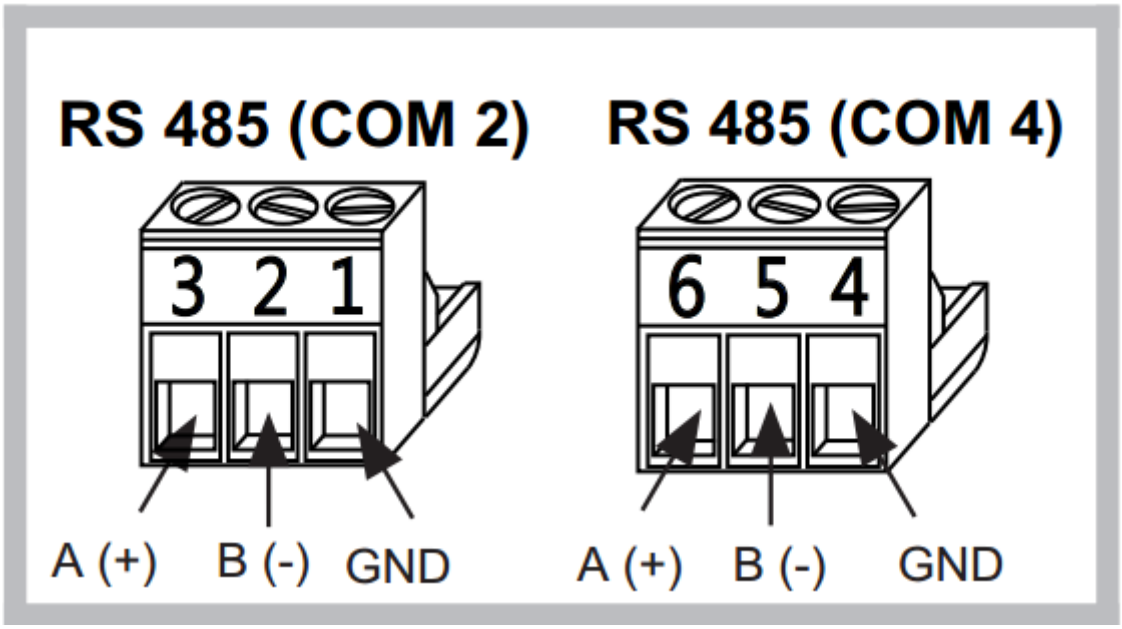
Z-TWS4-IO can be powered also through 17-18 screw terminals;

Z-PASS2-S/ZPASS2-S-R01/ZPASS2-S-IO can be powered also through 14-15 screw terminals.

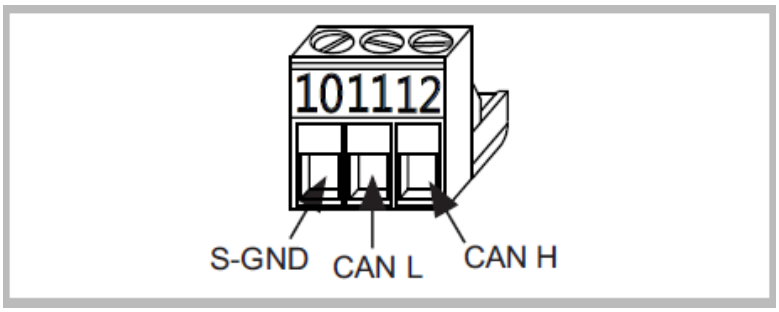
If ***Z-PC-DINAL1-35*** or ***Z-PC-DINAL2-52.5-17*** accessory is used, the power supply signals and communication signals may be provided by the terminals block into the DIN rail support. In the following figure the meaning and the position of the terminal blocks are shown. The DIP-switch that sets the 120 Ω terminator is used only for CAN communication (Z-TWS4 only).
GNDSHLD: shield to protect the connection cables against interference (recommended).



The Device has two RS 485 serial ports for Modbus communication: COM 4 and COM 2. The RS485 connection for COM 2 can be set up by means of the corresponding screw terminals or by the IDC10 connector. On Z-TWS4, to select RS 485 on IDC10 connector, put the SW1 DIP-switch on OFF position; on Z-PASS2-S, no operation is needed.



The Z-TWS4 has a CAN port available on screw terminals 10-11-12. As an alternative, the connection can be set up on the IDC10 connector. To select CAN port on IDC10 connector, put the SW1 DIP-switch on ON position.

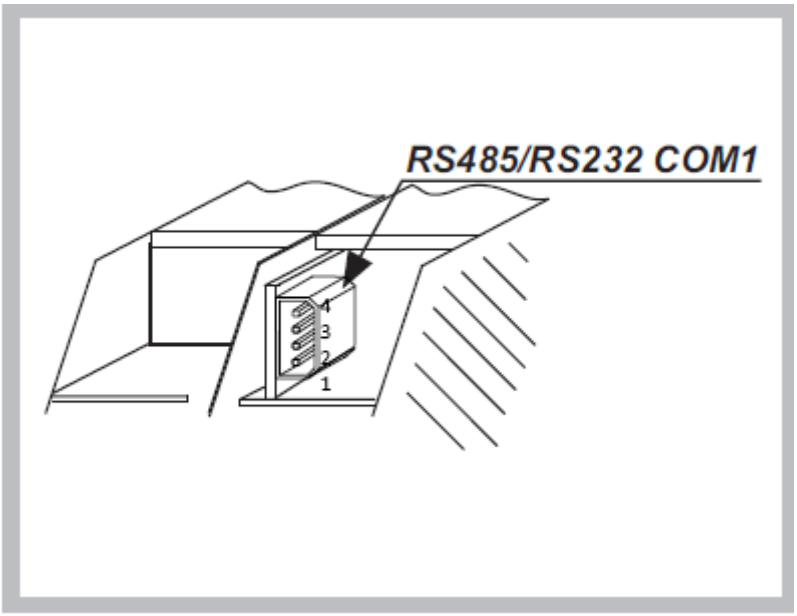


Through a removable 4 pin connector, the Device provides a serial RS232 port or, as an alternative, a third RS485 port. In order to select the RS232 port on the removable 4 pin connector, put the SW2 DIP-switch on ON position; to select the RS485 port on the removable 4 pin connector, put the SW2 DIP-switch on OFF position[2].

In Z-TWS4-IO/Z-PASS2-S-IO, the mode (RS485/RS232) of this port is set as a parameter in software configuration.

The cable length for the RS232 interface must be less than 3 meters.

[2] While in Z-TWS4 the SW2 DIP-switch position can be changed by the user, in Z-PASS2-S the DIP-switch is internal and its position is permanently set in the factory.

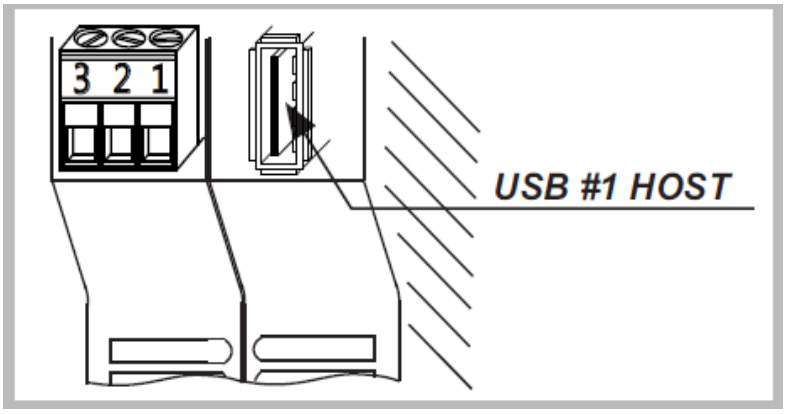


The connector pin-out is given in the following table:

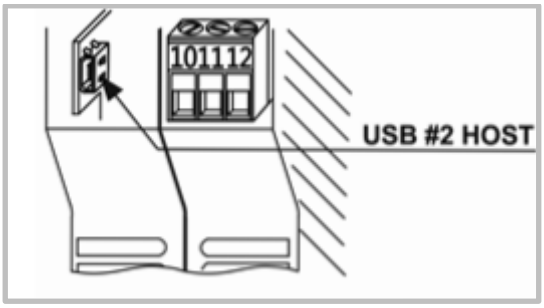
Pin	RS232	RS485
1 (bottom)	-	-
2	Tx	B
3	Rx	A
4 (top)	GND	GND

The Device has a USB HOST type A connector, that can be used as an additional serial port (using a Seneca S117P1, for example) or to connect an external USB memory; this is used for FW upgrade (see chapter 18).

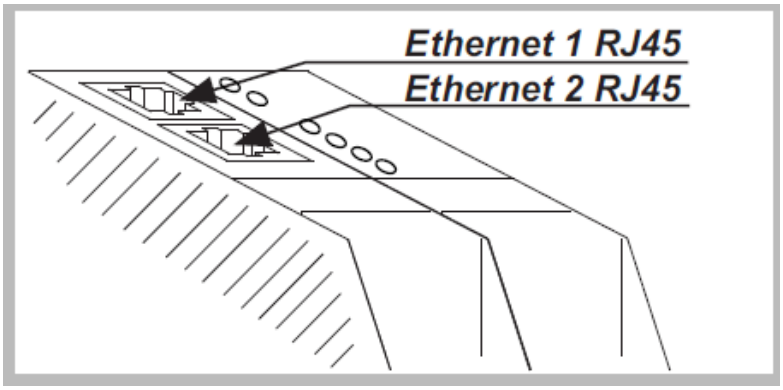
Please note that, on this USB port, the "hotplug" feature is not available; so, after plugging the USB device, it is necessary to power off/on the Z-TWS4/Z-PASS2-S to let it detect the USB device.



The Z-TWS4 also has a second USB HOST connector, with micro-USB plug-in, that can be used to connect a USB device by means of a "Micro USB to USB" adapter; this port is no more available in Z-TWS4-IO.

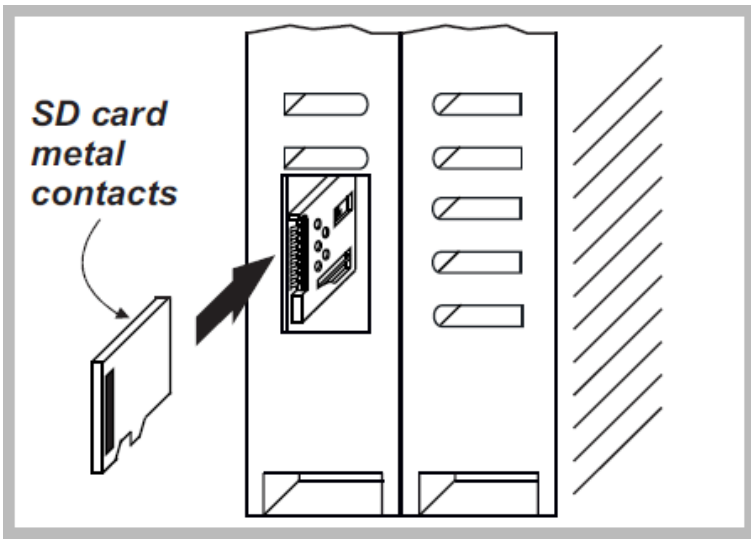


The Device has two Ethernet ports with RJ45 connectors on the front panel. The two ports are internally connected in HUB/SWITCH mode. The two ports have the same MAC Address.

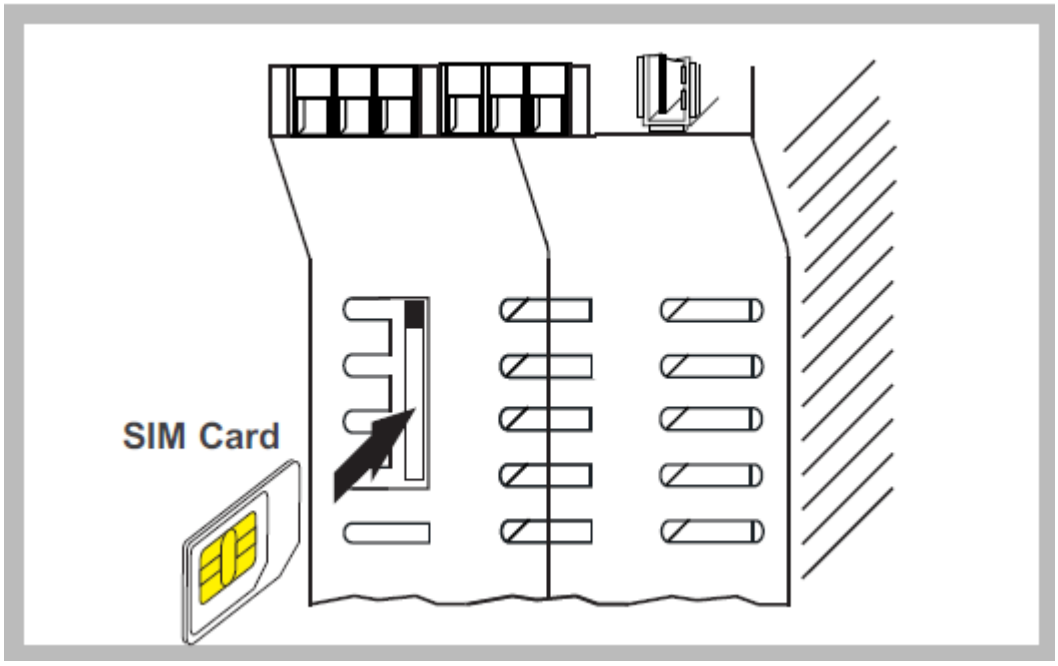


The Device has a plug-in connector for micro SD card placed in the side part of the case.
To insert the SD card into the connector, be sure that the SD card is oriented with metal contacts facing towards left (with reference to the figure).

The SD card can be of any class.

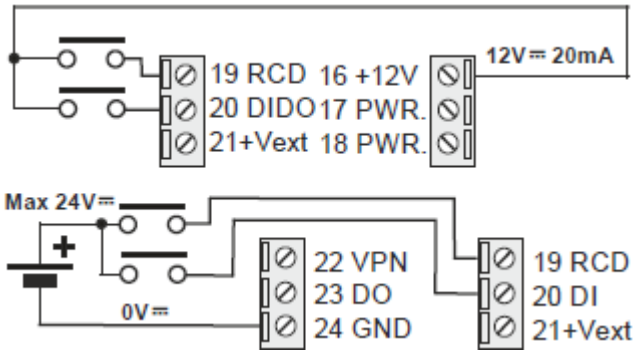


The Z-PASS2-S has a slot for SIM card, placed on the side of the case. Before pushing the SIM card into this slot, please be sure that the SIM card golden contacts are facing towards right (please see the figure below).

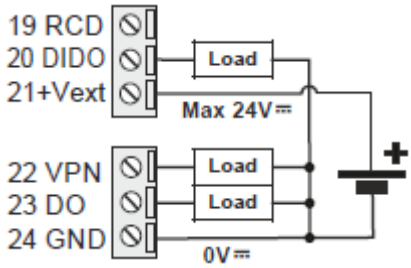


4.1.1 Z-TWS4-IO Digital I/Os

In Z-TWS4-IO, the electrical connections for the Digital Inputs shall be arranged as in the following figures.

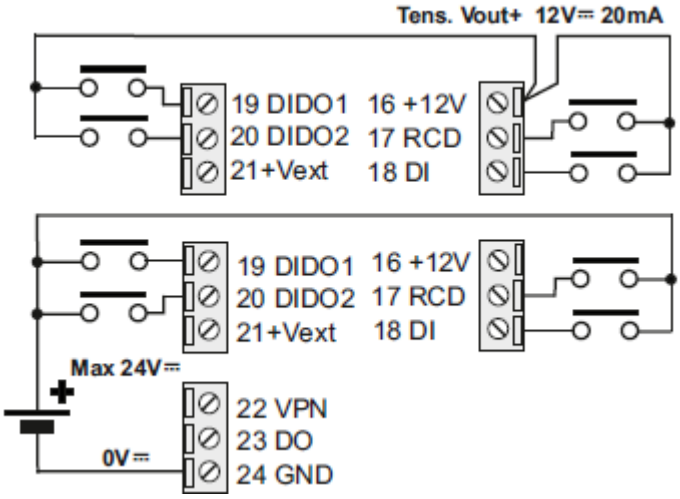


The electrical connections for the Digital Outputs shall be arranged as in the following figure.

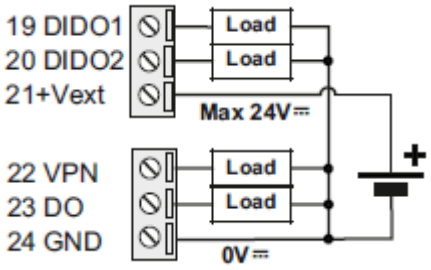


4.1.2 Z-PASS2-S-IO Digital I/Os

In Z-PASS2-S-IO, the electrical connections for the Digital Inputs shall be arranged as in the following figures.

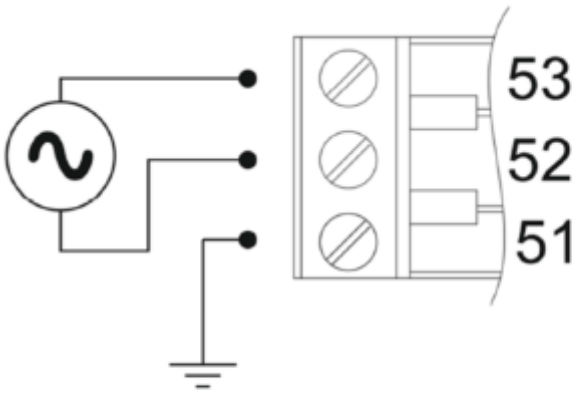


The electrical connections for the Digital Outputs shall be arranged as in the following figure.



4.2 S6001-RTU

Power supply must be connected to screw terminals 52 and 53. The supply voltage must be 24 ± 15 % Vac/dc (any polarity).



Upper limits must not be exceeded to avoid serious damage to the device. It is necessary to protect the power supply source against any failure of the device by means of an appropriately sized fuse.

S6001-RTU has two RS485 serial ports (COM2 and COM4) available on removable screw terminals, as specified in the following table.

Signal	COM2	COM4
GND	57	54
B	58	55
A	59	56

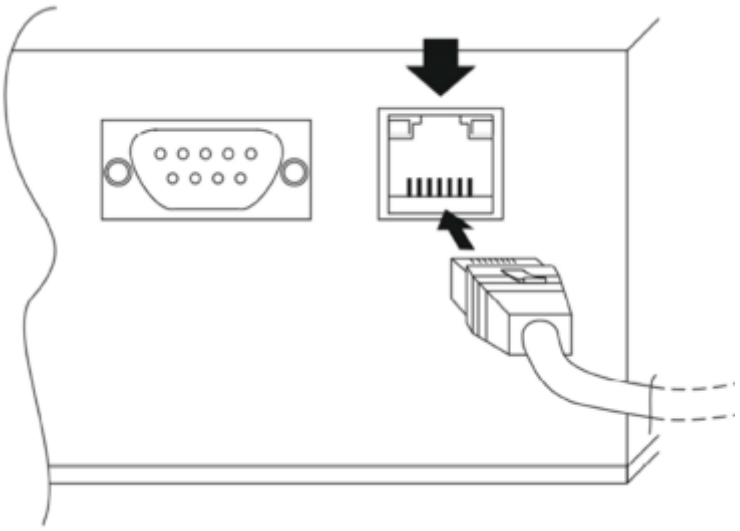
An RS232 serial port with full handshaking signals is available on DB9 male connector on the left side of S6001-RTU. Use the CS-DB9F-DB9F cable[3] to connect RS232 devices.
Signals on DB9 connector are listed in the table below.

Pin	Name	Description	IN/OUT
1	DCD	Data carrier detect	In
2	RXD	Receive data	In
3	TXD	Transmit data	Out
4	DTR	Data terminal ready	Out
5	SG	Signal ground	
6	DSR	Data set ready	In
7	RTS	Request to send	Out
8	CTS	Clear to send	In
9	RI	Ring indicator	In

An optional communication bus is available on removable screw terminals 60,61,62, for future extensions.

S6001-RTU has 1 USB port which is an USB HOST with connector type “A”, suitable to connect, for example, a mass storage (e.g.: a USB pen) with maximum consumption of 300 mA @ 5 Vdc.

An Ethernet port is available on the left side of S6001-RTU on an RJ45 connector.



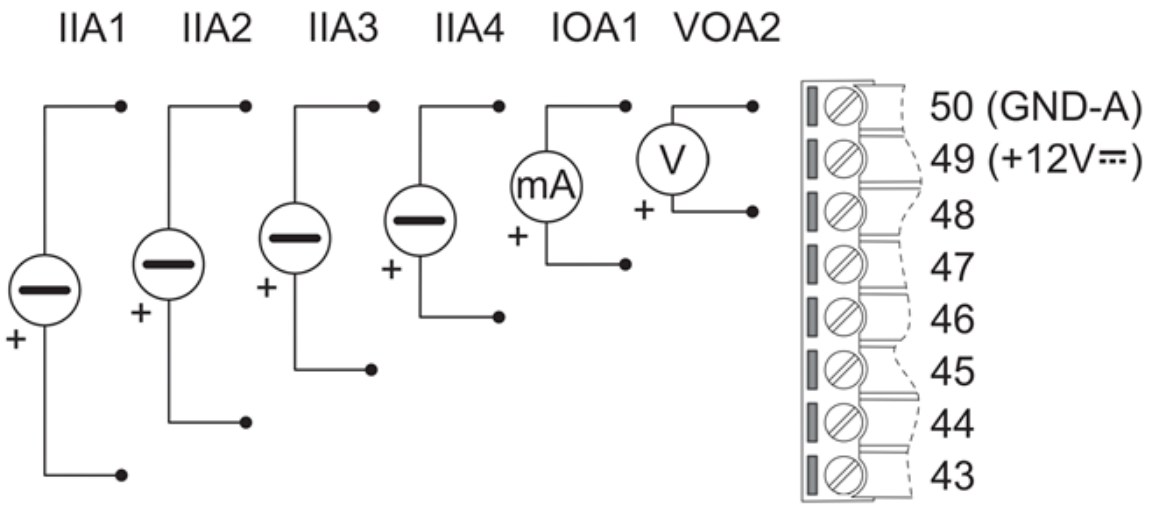
An SD card slot is available, near the optional bus screw terminals; SD cards with storage capacity up to 32 GB can be used.

A SIM card slot, with a push-push connector, is available; 3V mini SIM cards can be used.

Two SMA antenna connectors are available, for Main and Diversity antennas.

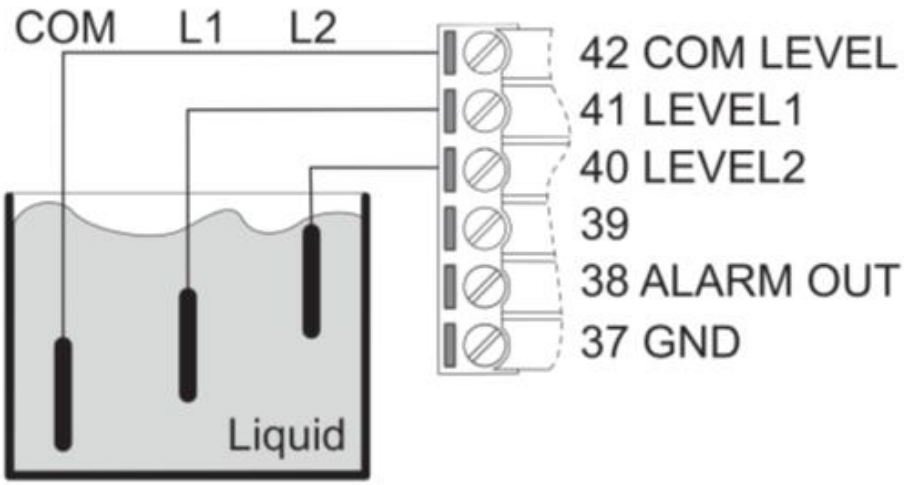
[3] The CS-DB9F-DB9F cable is supplied on request.

Analog inputs and outputs are available on screw terminals 43-50, as shown in the following figure and table.



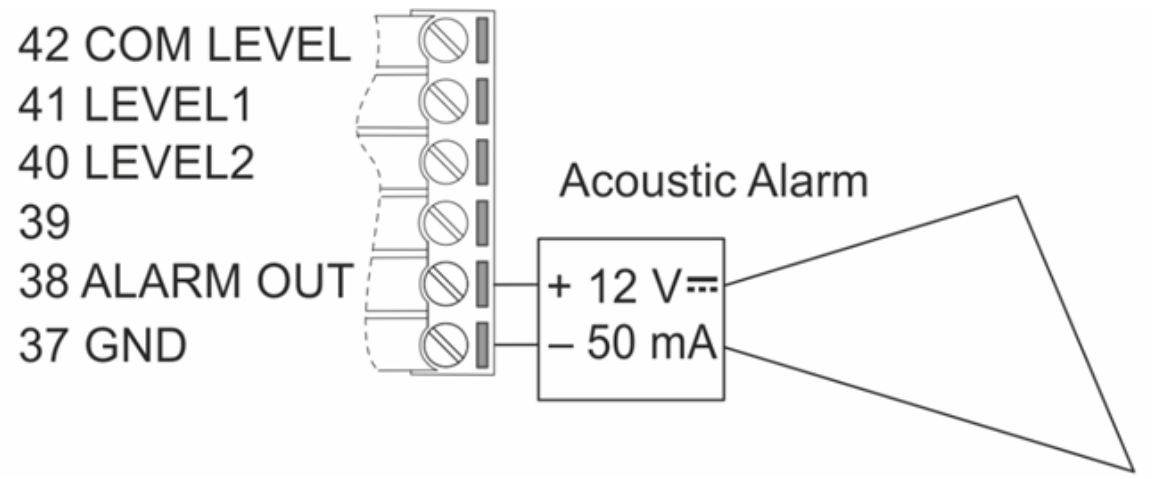
4 analog current inputs (0-20 mA)	Four active sensors are available from 43 to 46 screw terminals. Screw terminal 49 is a supply voltage (+12 Vdc) for passive current sensor.
1 analog current output (0-20 mA)	Available between 47 and 50 screw terminals.
1 analog voltage output (0-10 Vdc)	Available between 48 and 50 screw terminals.

The Liquid Level Inputs are available on screw terminals 40-42, as shown in the following figure.

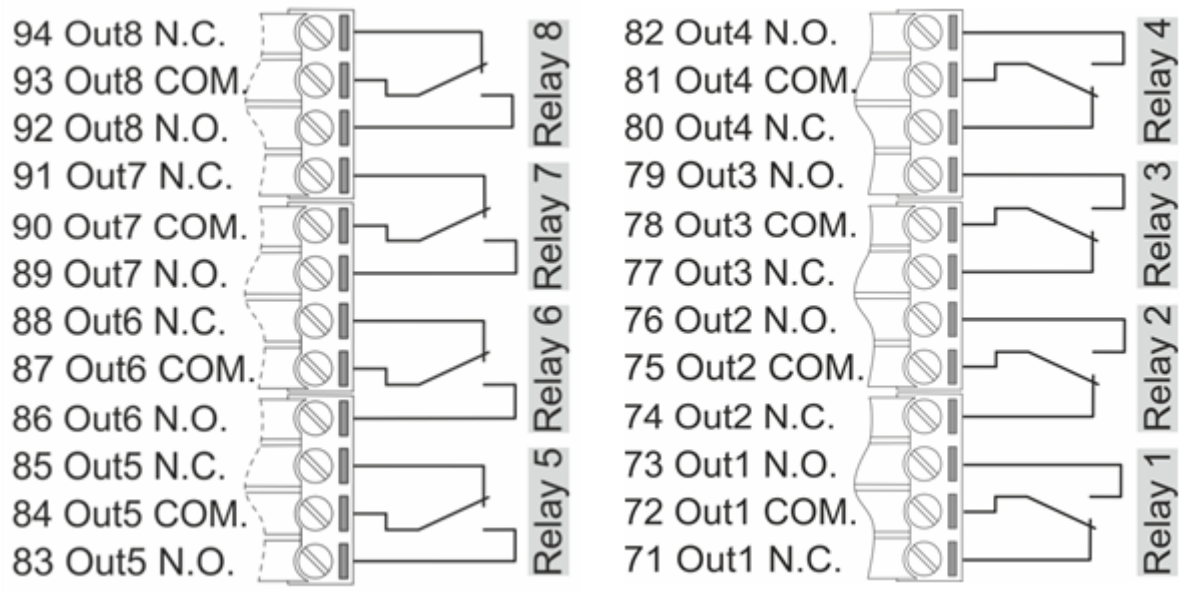


The analog level signals from screw terminals 40, 41, 42 can be used to control the level of liquid in a tank.

The supply voltage (12 Vdc @ 50mA) from screw terminals 38 and 37 can be used to connect, for example, an acoustic alarm. Screw terminal 39 must not be connected.

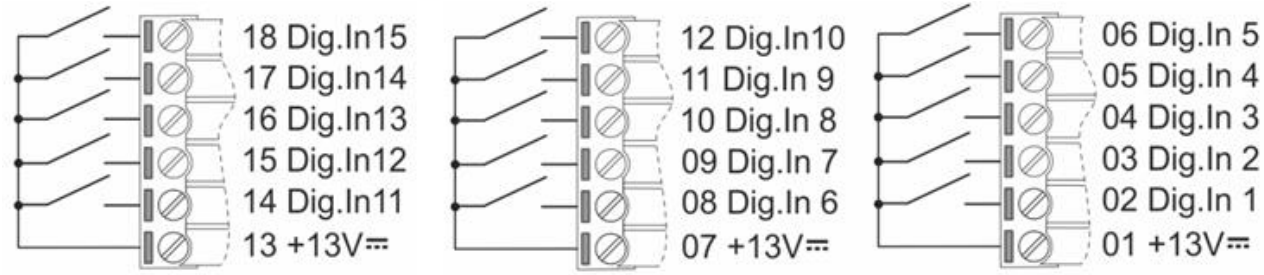


The 8 digital outputs (relays) are available on screw terminals 71-94, as shown in the following figure.



Eight SPDT relays are available to control, for example, external pumps. The operating voltage is 250 Vdc @ 2 A.

The 15 digital inputs are available on screw terminals 1-18, as shown in the following figure.



All digital inputs are PNP type with optoisolation.

5 LEDs signaling

5.1 Z-TWS4, Z-PASS2-S

LED	Status	Meaning
PWR Green	ON	The module is powered on
RUN Red	Blinking	The module is ready for use
LINK1 Yellow	ON OFF	Ethernet 1 connection detected Ethernet 1 connection absent
ACT1 Green	Blinking OFF	There is data activity (Ethernet 1) There is no data activity (Ethernet 1)
LINK2 Yellow	ON OFF	Ethernet 2 connection detected Ethernet 2 connection absent
ACT2 Green	Blinking OFF	There is data activity (Ethernet 2) There is no data activity (Ethernet 2)
RX1-2-4 Red	Blinking ON OFF	Data reception (COM 1-2-4) Check the connection (COM 1-2-4) No data reception (COM 1-2-4)
TX1-2-4 Red	Blinking ON OFF	Data transmission (COM 1-2-4) Check the connection (COM 1-2-4) No data transmission (COM 1-2-4)
3G PWR Green (Z-PASS2-S only)	ON	The 3G Modem is powered on
STAT Yellow (Z-PASS2-S only)	ON Slow Blinking Fast Blinking	Not registered on GSM network Registered on GSM network Mobile Network connection active

5.2 Z-PASS2-S-R01

LED	Status	Meaning
PWR Green	ON	The module is powered on
RUN Red	Blinking	The module is ready for use
LAN/WAN	ON	The Ethernet ports are working in “LAN/WAN” mode

Yellow	OFF	-
SWITCH Green	ON OFF	The Ethernet ports are working in “Switch” mode -
VPN Yellow	ON Blinking OFF	VPN connection is working properly VPN connection is not working properly VPN functionality is disabled or VPN Box/Point-to-Point functionality is enabled but no client is connected or VPN Box/Single LAN functionality is enabled but the Device is not configured yet
SERV Green	ON Blinking OFF	VPN Box “SERVICE” connection is working properly VPN Box “SERVICE” connection is not working properly VPN Box functionality is disabled
RX1-2-4 Red	Blinking ON OFF	Data reception (COM 1-2-4) Check the connection (COM 1-2-4) No data reception (COM 1-2-4)
TX1-2-4 Red	Blinking ON OFF	Data transmission (COM 1-2-4) Check the connection (COM 1-2-4) No data transmission (COM 1-2-4)
3G PWR Green	ON	The 3G Modem is powered on
STAT Yellow	ON Slow Blinking Fast Blinking	Not registered on GSM network Registered on GSM network Mobile Network connection active

Ethernet Connector LEDS

LED	Status	Meaning
ETH1-2 Green	ON OFF	Ethernet 1-2 connection detected Ethernet 1-2 connection absent
ETH1-2 Yellow	Blinking OFF	There is data activity (Ethernet 1-2) There is no data activity (Ethernet 1-2)

5.3 Z-PASS2-S-IO

LED	Status	Meaning
PWR Green	ON	The module is powered on
RUN Green	Blinking	The module is ready for use
DIDO1 Green	ON OFF	Configurable Digital Input/Output 1 state is HIGH Configurable Digital Input/Output 1 state is LOW
DIDO2 Green	ON OFF	Configurable Digital Input/Output 2 state is HIGH Configurable Digital Input/Output 2 state is LOW
DI Green	ON OFF	Digital Input state is HIGH Digital Input state is LOW
DO Green	ON OFF	Digital Output state is HIGH Digital Output state is LOW
RCD Green	ON OFF	Remote Connection is disabled Remote Connection is enabled
VPN Green	ON Blinking OFF	VPN connection is working properly VPN connection is not working properly VPN functionality is disabled or VPN Box/Point-to-Point functionality is enabled but no client is connected or VPN Box/Single LAN functionality is enabled but the Device is not configured yet
LAN/WAN Green	ON OFF	The Ethernet ports are working in “LAN/WAN” mode The Ethernet ports are working in “Switch” mode
SERV Green	ON Blinking OFF	VPN Box “SERVICE” connection is working properly VPN Box “SERVICE” connection is not working properly VPN Box functionality is disabled
RX2-4 Green	Blinking ON OFF	Data reception (COM 2-4) Check the connection (COM 2-4) No data reception (COM 2-4)
TX2-4 Green	Blinking ON	Data transmission (COM 2-4) Check the connection (COM 2-4)

	OFF	No data transmission (COM 2-4)
3G PWR Green	ON	The 3G Modem is powered on
STAT Yellow	Slow blinking (200 ms OFF, 1800 ms ON) Slow blinking (1800 ms OFF, 200 ms ON) Fast blinking (125 ms OFF, 125 ms ON)	Searching for GSM network Registered on GSM network Data transfer is ongoing

Ethernet Connector LEDS

LED	Status	Meaning
ETH1-2 Green	ON OFF	Ethernet 1-2 connection detected Ethernet 1-2 connection absent
ETH1-2 Yellow	Blinking OFF	There is data activity (Ethernet 1-2) There is no data activity (Ethernet 1-2)

5.4 Z-TWS4-IO

LED	Status	Meaning
PWR Green	ON	The module is powered on
RUN Green	Blinking	The module is ready for use
DIDO Green	ON OFF	Configurable Digital Input/Output state is HIGH Configurable Digital Input/Output state is LOW
DO Green	ON OFF	Digital Output state is HIGH Digital Output state is LOW
RCD Green	ON OFF	Remote Connection is disabled Remote Connection is enabled
VPN Green	ON Blinking OFF	VPN connection is working properly VPN connection is not working properly VPN functionality is disabled or VPN Box/Point-to-Point functionality is enabled but no client is connected or

		VPN Box/Single LAN functionality is enabled but the Device is not configured yet
LAN/WAN Green	ON OFF	The Ethernet ports are working in “LAN/WAN” mode The Ethernet ports are working in “Switch” mode
SERV Green	ON Blinking OFF	VPN Box “SERVICE” connection is working properly VPN Box “SERVICE” connection is not working properly VPN Box functionality is disabled
RX2-4 Green	Blinking ON OFF	Data reception (COM 2-4) Check the connection (COM 2-4) No data reception (COM 2-4)
TX2-4 Green	Blinking ON OFF	Data transmission (COM 2-4) Check the connection (COM 2-4) No data transmission (COM 2-4)

Ethernet Connector LEDS

LED	Status	Meaning
ETH1-2 Green	ON OFF	Ethernet 1-2 connection detected Ethernet 1-2 connection absent
ETH1-2 Yellow	Blinking OFF	There is data activity (Ethernet 1-2) There is no data activity (Ethernet 1-2)

5.5 S6001-RTU

Frontal LEDS

Group	Number	Colour	Status		Meaning
Digital Inputs	1,2,3,4,5,6,7,8 9,10,11,12,13,14,15	Green	ON OFF	High Low	
Digital Outputs	1,2,3,4,5,6,7,8	Red	ON OFF	Closed Open	
3G Power Signal	2,3,4,5,6	Yellow	OFF	ON	6 ON = Max
	1		Blinking	ON	1 Blinking = Min
Comm. Port COM2	RX, TX	Red	Blinking		RS485 activity
		Red	Fixed ON		Verify connection
Comm. Port COM4	RX, TX	Red	Blinking		RS485 activity
		Red	Fixed ON		Verify connection

Run	1	Red	Blinking	Run	
Level switch	L1, L2	Green	OFF, OFF (value 0) ON, OFF (value 1) ON, ON (value 2)		Under min level Between min and max levels Over max level

Following are some further notes about LED behavior:

- at power on, during the bootstrap phase, all LEDS, except for the COM PORT LEDs, are ON; when the system is fully operational, RUN LED is blinking
- when Straton application is not running, all LEDS, except for the COM PORT LEDs, are blinking
- 3G PWR SIG LED 1 is blinking, synchronously with RUN LED, in the following situations:
  - GSM/3G network is not available (or signal level is too low)
  - SIM is not inserted

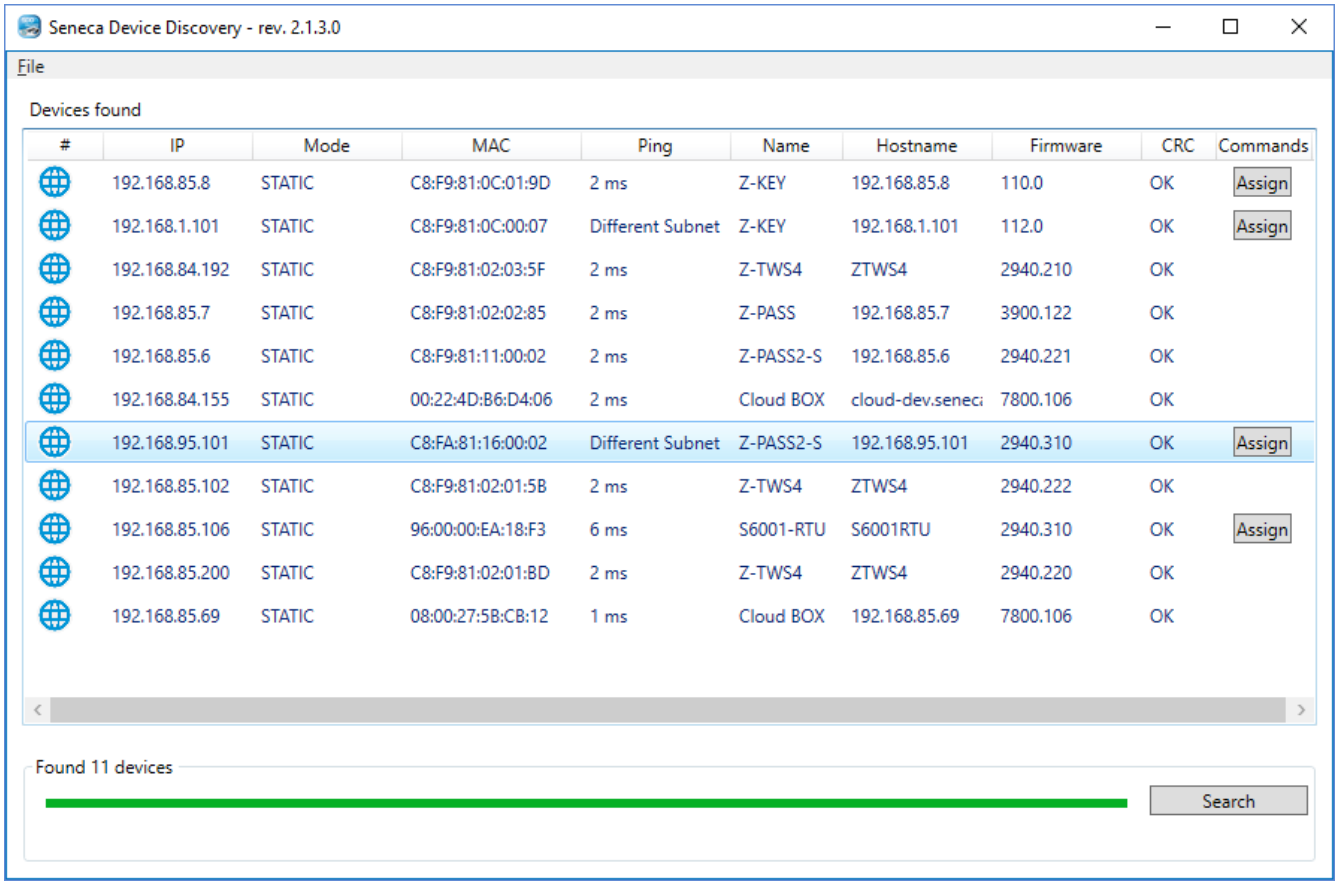
Modem LEDS

LED	Status	Meaning
3G PWR Green	ON	The 3G Modem is powered on
STAT Yellow	ON	Not registered on GSM network
	Slow Blinking	Registered on GSM network
	Fast Blinking	Mobile Network connection active

6 Discovering the IP address

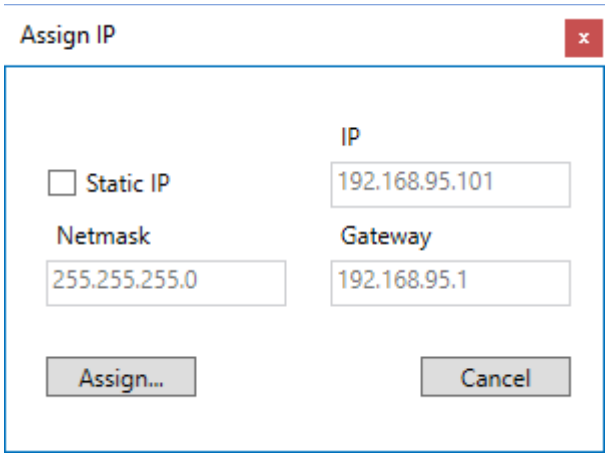
Z-TWS4/Z-PASS2-S/S6001-RTU devices come out of the factory with the default 192.168.90.101 IP address on the Ethernet network interface.

If this address is changed, *and forgotten*, it can be retrieved by running the "Seneca Device Discovery" (SDD) application, as shown in the following figure:

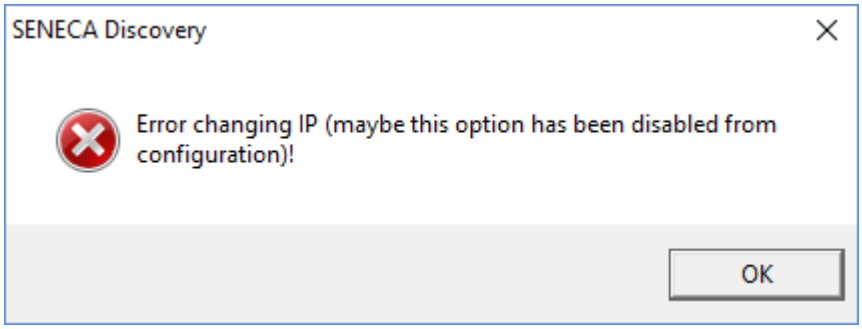


This application shows the IP address, MAC address, FW version and some other useful information, for every Z-TWS4/Z-PASS2-S/S6001-RTU device (and other Seneca products) found in the LAN.

Moreover, by clicking on the “Assign” button, it is possible to change the network configuration parameters of a device, as shown in the following figure:



For security reasons, this feature can be disabled on the Device (see paragraph 19.1.2); in this case, the following error message is shown, after clicking on the “Assign” button”.



The SDD can be easily installed by running the installer program available at the following link:

http://www.seneca.it/products/sdd

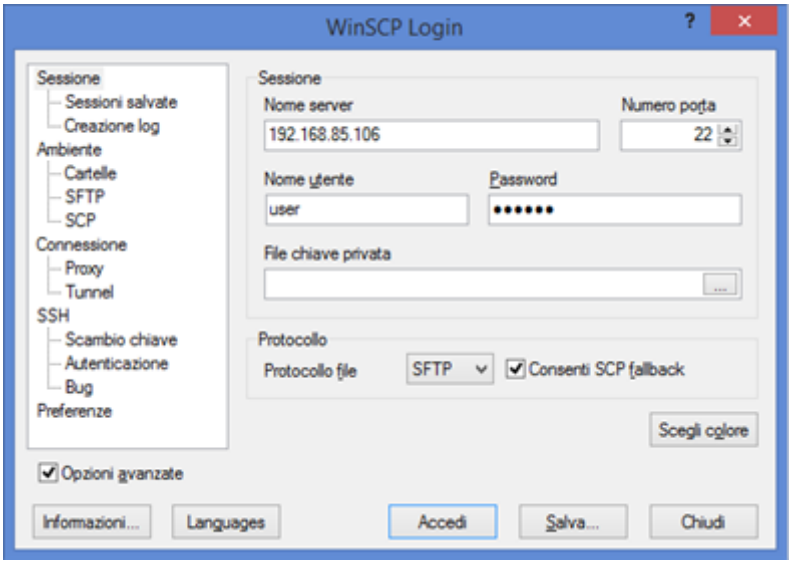
NOTE:
- when the Device is working in "Switch" mode, the IP Address shown by the SDD is the same regardless of the Ethernet port which the PC running the SDD is connected to;
- when the Device is working in "LAN/WAN" mode, the IP Address shown by the SDD is the LAN IP Address when the PC is connected to the LAN port, the WAN IP Address when the PC is connected to the WAN port; moreover, the network configuration parameter changes apply to the relevant port.

7 FTP/SFTP access

To easily access the Device by means of FTP/SFTP, you can use the WINSCP™ program; you can free download WINSCP™ from:

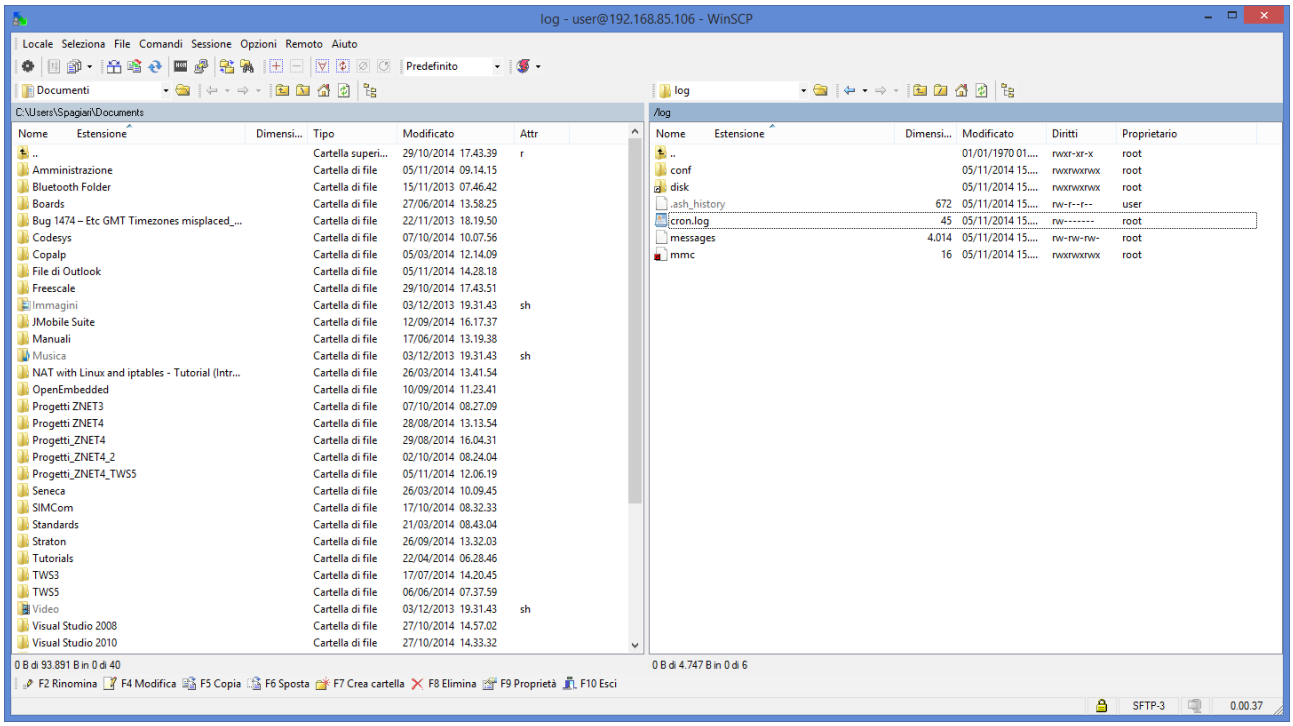
http://winscp.net/eng/download.php

You must set the connection as in the following figure (the screenshot shows a connection to the 192.168.85.106 IP address):



The credentials (username and password) are those ("user", "123456") set for the "FTP USER" (see "Users Configuration" web page in paragraph 19.1.7).

After clicking the “Access” button, you will get a new window, as in the following screenshot; on the right, you can copy and delete files directly to/from the Device.



The WinSCP program can be used both as an FTP or SFTP client to transfer files to/from the Device; just select “FTP” or “SFTP” protocol in the “WinSCP Login” window; normally, it’s better to use SFTP, since it provides a secure (i.e. encrypted) service.

8 StratON PLC

Z-TWS4/Z-PASS2-S/S6001-RTU StratON PLC provides the full support for IEC 61131-3 PLC Standard; an Integrated Development Environment (IDE) is available for Windows™ PCs.

The StratON IDE includes several tools such as: a fieldbus configuration tool, an analog signal editor and program editors compliant with the five languages of the IEC 61131-3 Standard: Sequential Function Chart (SFC), Function Block Diagram (FBD), Ladder Diagram (LD), Structured Text (ST), Instruction List (IL).

With StratON IDE, it’s simple to write, download and debug IEC 61131-3 code.

8.1 Writing, downloading and running the first program

To let the PLC developer easily create StratON applications for Seneca CPUs, the following libraries are available:

- a Function Block (FB) and Functions library, which provides some frequently used functionalities, particularly related to communication and data transfer tasks, compiled in the CPU firmware; the direct use of these FBs and functions is targeted at skilled PLC developers (a detailed description of the FBs and Functions is given in chapter 20);
- a “Profiles” library, which provides access to the CPU I/Os by means of “profiled” variables; this is needed for S6001-RTU and Z-PASS2-S-IO CPUs;

- a “User Defined Function Block” (UDFB) library, in ST language, which simplifies the use of the above FBs, providing a simpler and “higher level” access to their functionalities.

Furthermore, two project templates are available for Z-PASS2-S and S6001-RTU CPUs, respectively.

An installer program, called *“Seneca StratON Package setup”*, is available which automatically installs the above Seneca libraries and templates. The installer can also be used to install the StratON IDE and Z-NET4 SW (see chapter 21).

The installer is available at the following link:

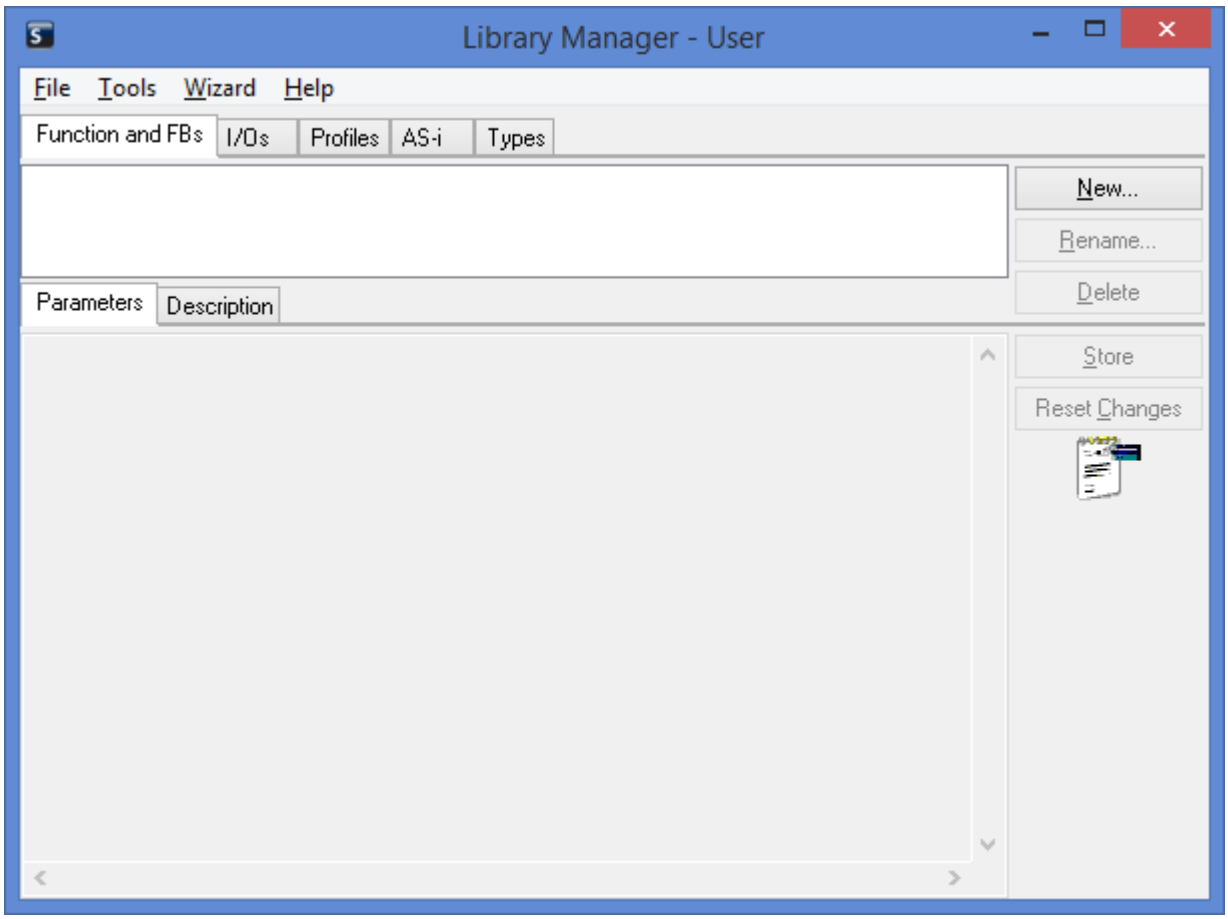
http://www.seneca.it/products/seneca-straton-package

If, for some reasons, the installer can’t be run, the above libraries and templates can be installed manually as described in the following sub-paragraph.

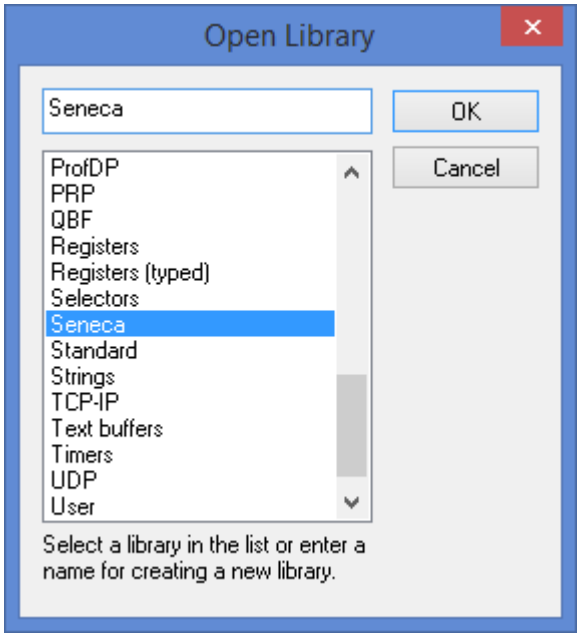
8.1.1 Seneca libraries and templates installation

The following steps are needed to integrate the Seneca libraries and templates in the StratON IDE.

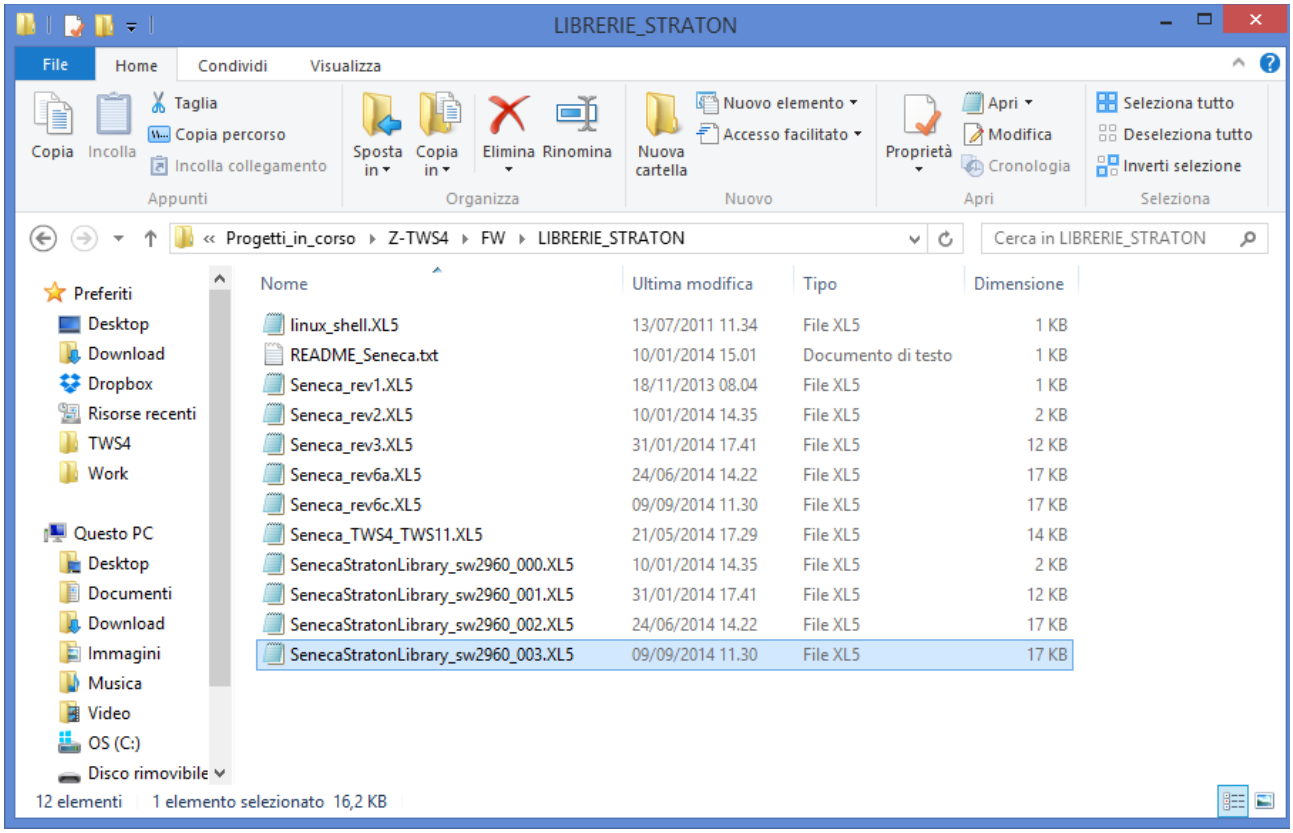
First, we must add the Seneca FB Library (file *SenecaStratonLibrary.XL5*) to the IDE, using the “Library Manager” tool:

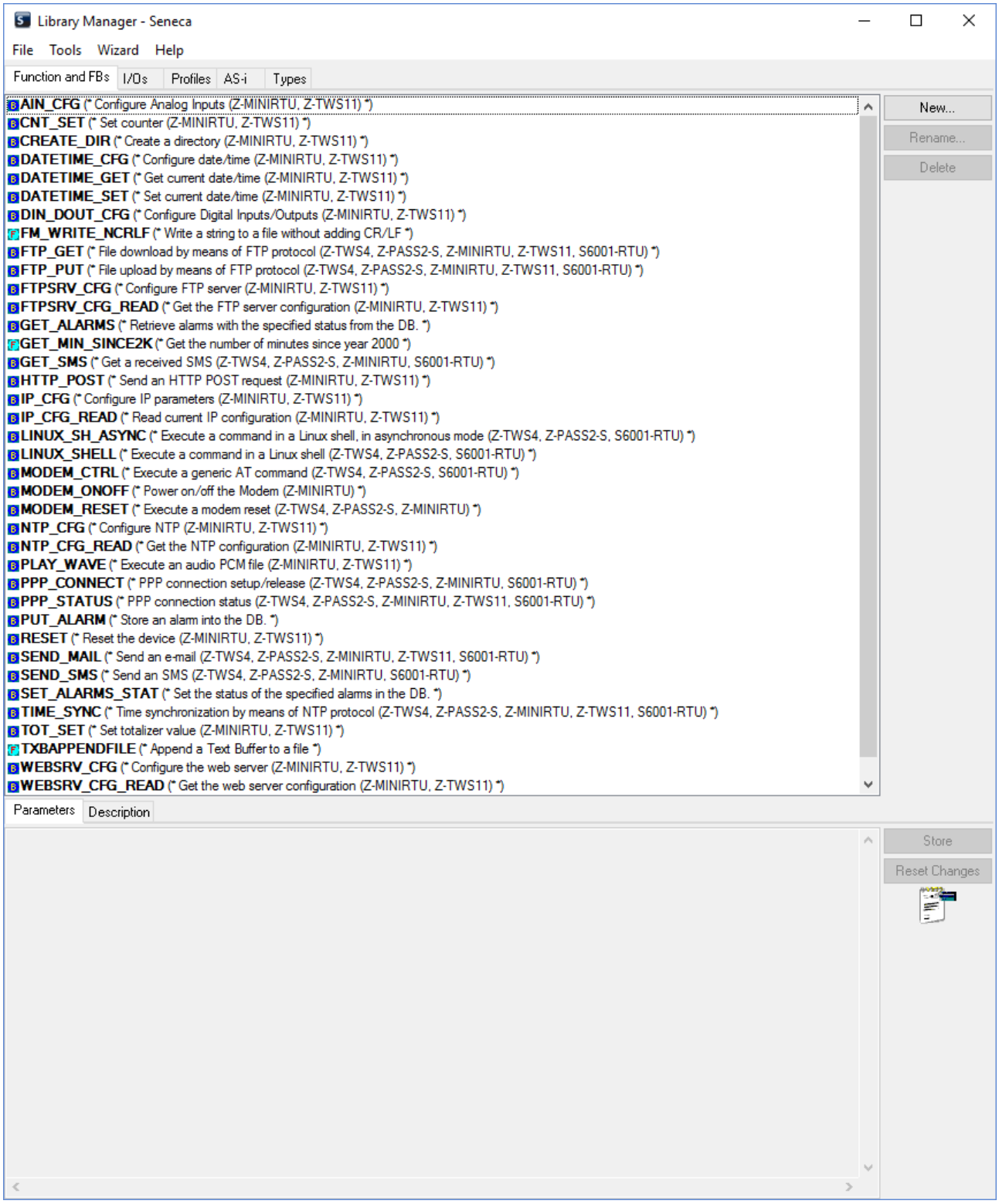


Select the “File / Open Library” option and enter the “Seneca” name to create the new Seneca library.



Then, import the Library (menu “Tools / Import”):





Save the library (menu “File / Save Library”).

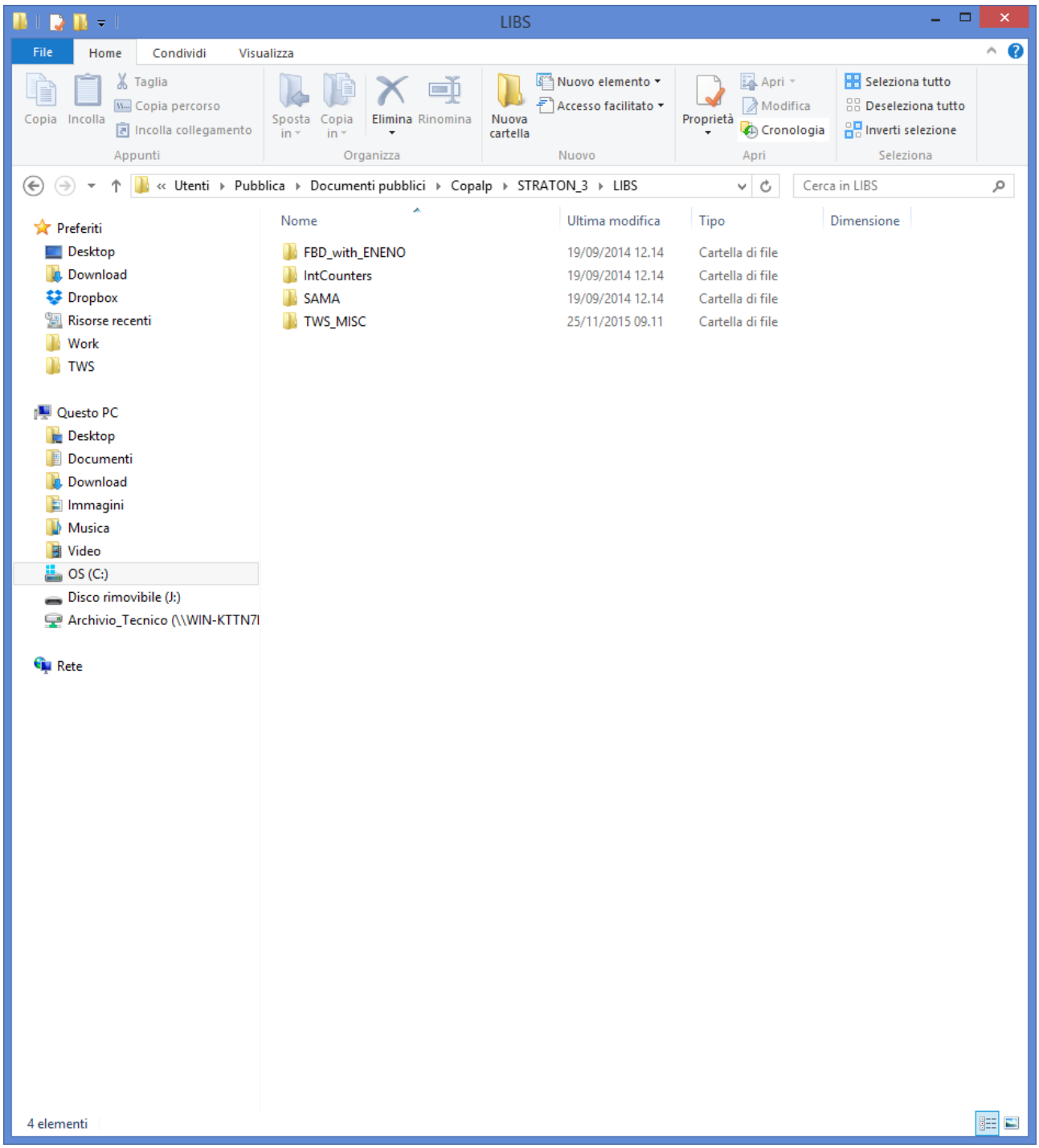
The procedure to add the “Profiles library” to the IDE is identical to the one just explained; the only difference is that the *SenecaStratonProfiles.XL5* file shall be selected (instead of the *SenecaStratonLibrary.XL5* file).

Now that the “low-level” FBs are available, we have to install the UDFB library.

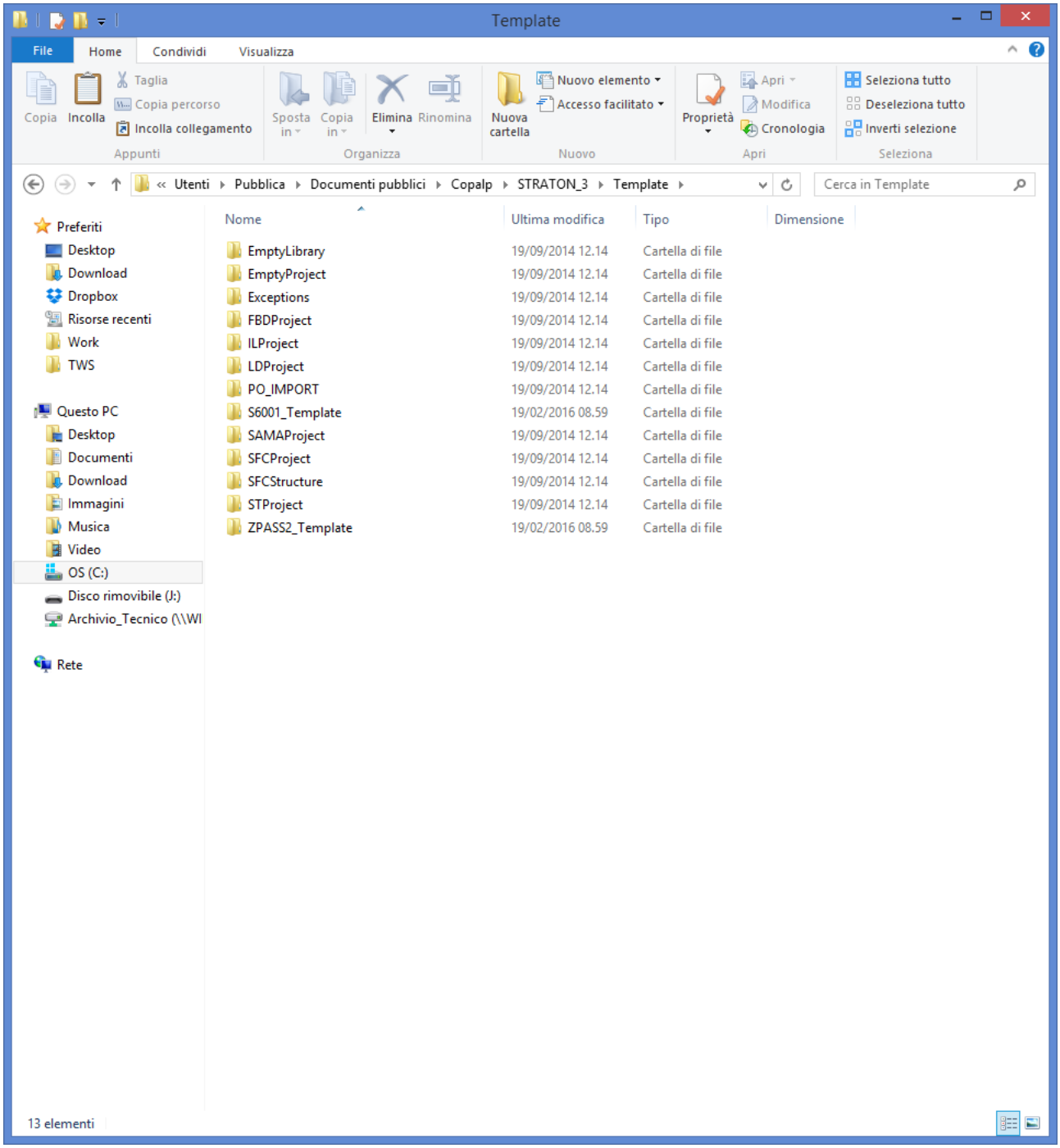
The UDFB library is provided as a zip file, containing the following folders:

- *TWS_MISC*
- *ZPASS2_Template*
- *S6001_Template*

The *TWS_MISC* folder shall be copied into the following directory:
C:\Users\Public\Documents\Copalp\STRATON\LIBS

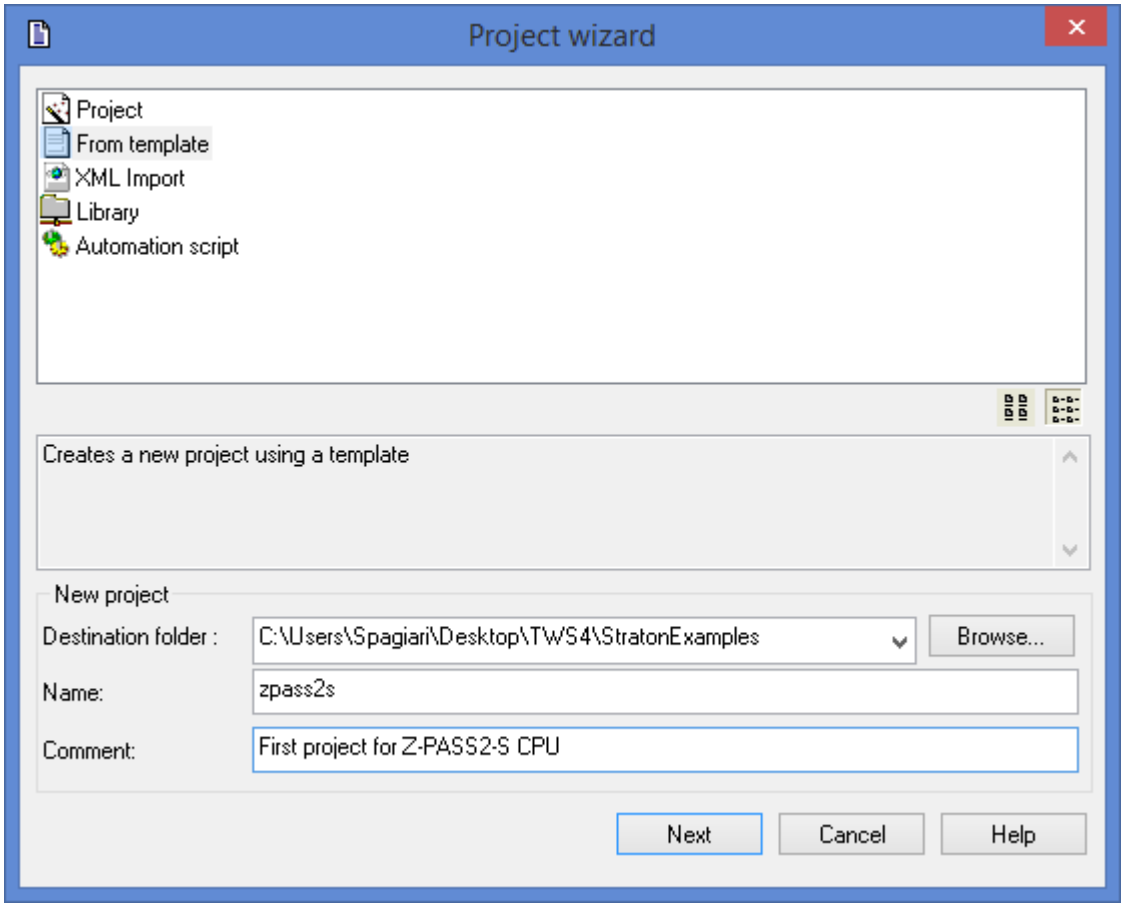


The *ZPASS2_Template* and *S6001_Template* folders shall be copied into the following directory:
C:\Users\Public\Documents\Copalp\STRATON\Template

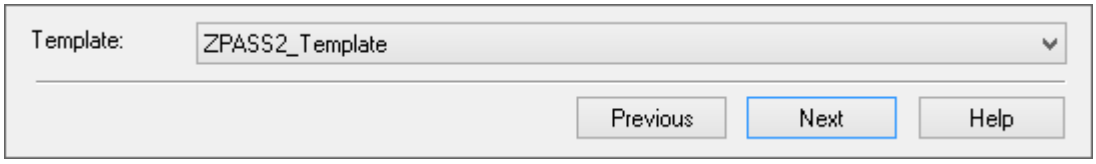


8.1.2 *Creating a project for Seneca CPUs*

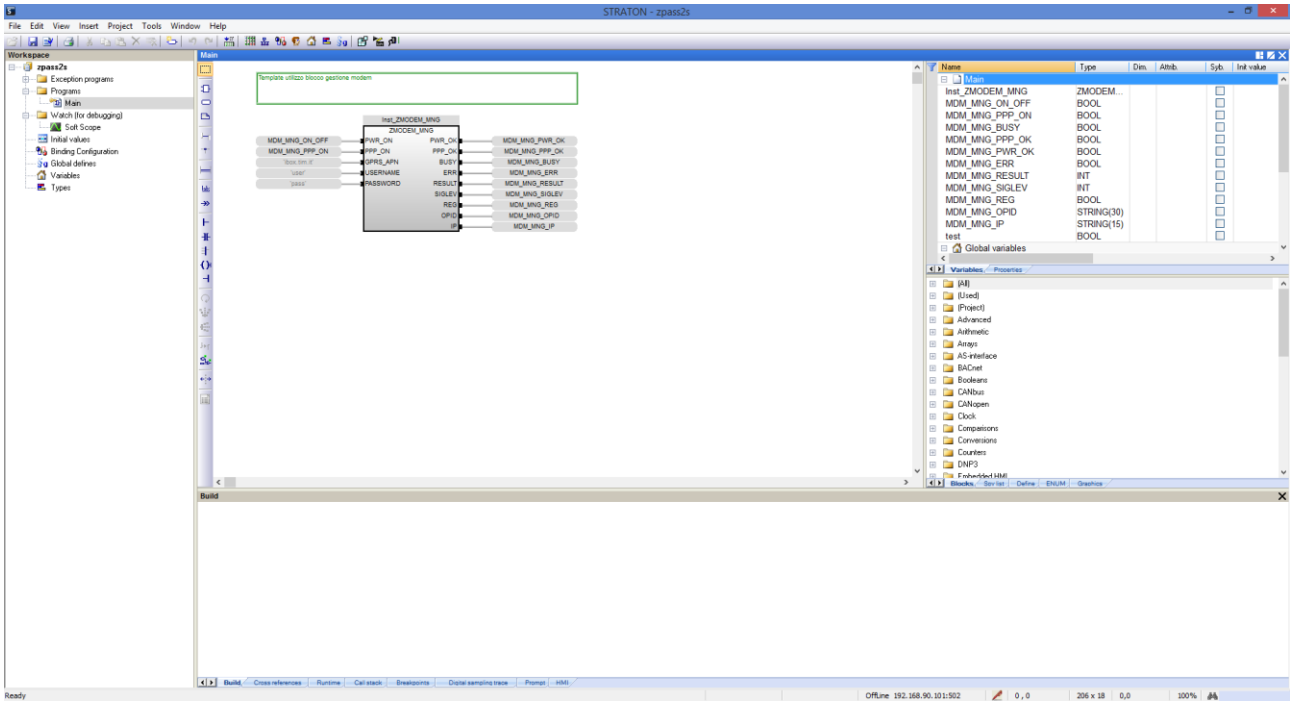
Run the StratON IDE and create a new project based on a template, as in the following figure:



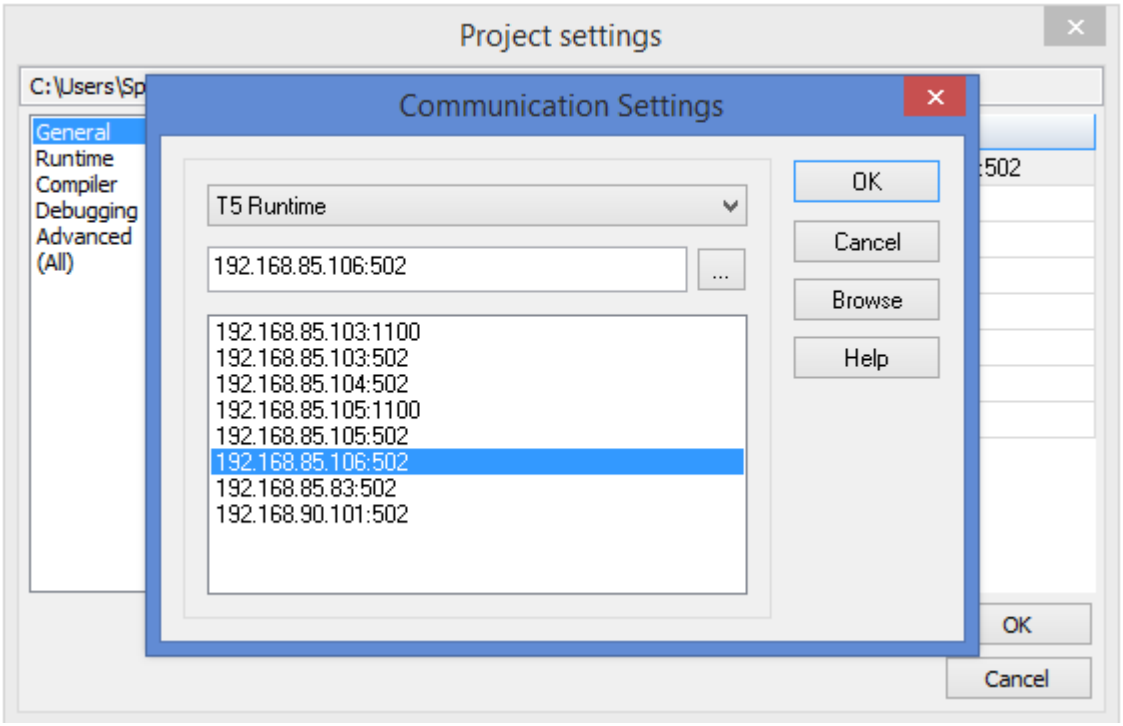
Select the "ZPASS2_Template" (or "S6001_Template") in the template list.



Now, as you can see in the following figure, in the *Main* program a *ZMODEM_MNG* UDFB instance is already available, which lets you easily control the Z-PASS2-S/S6001-RTU modem.



Set the correct target IP address (for example 192.168.85.106); normally, the port shall be set to 502:



Then press the icon:

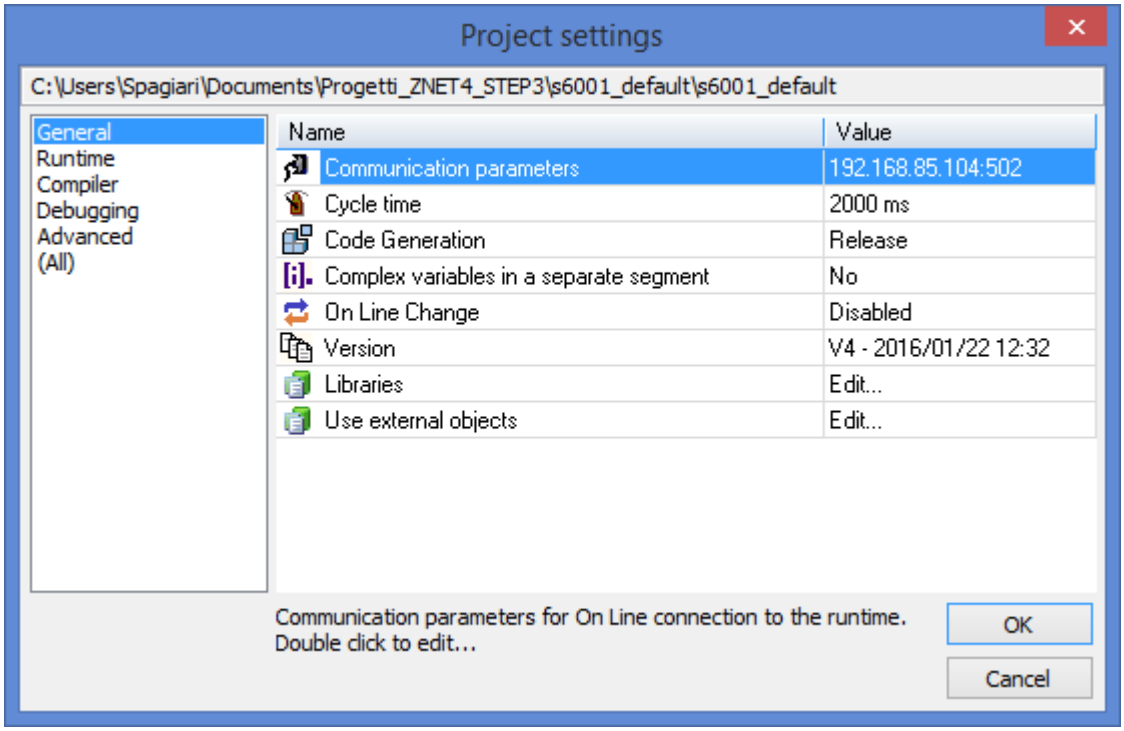
to compile the project.

Download the code by pressing the icon:

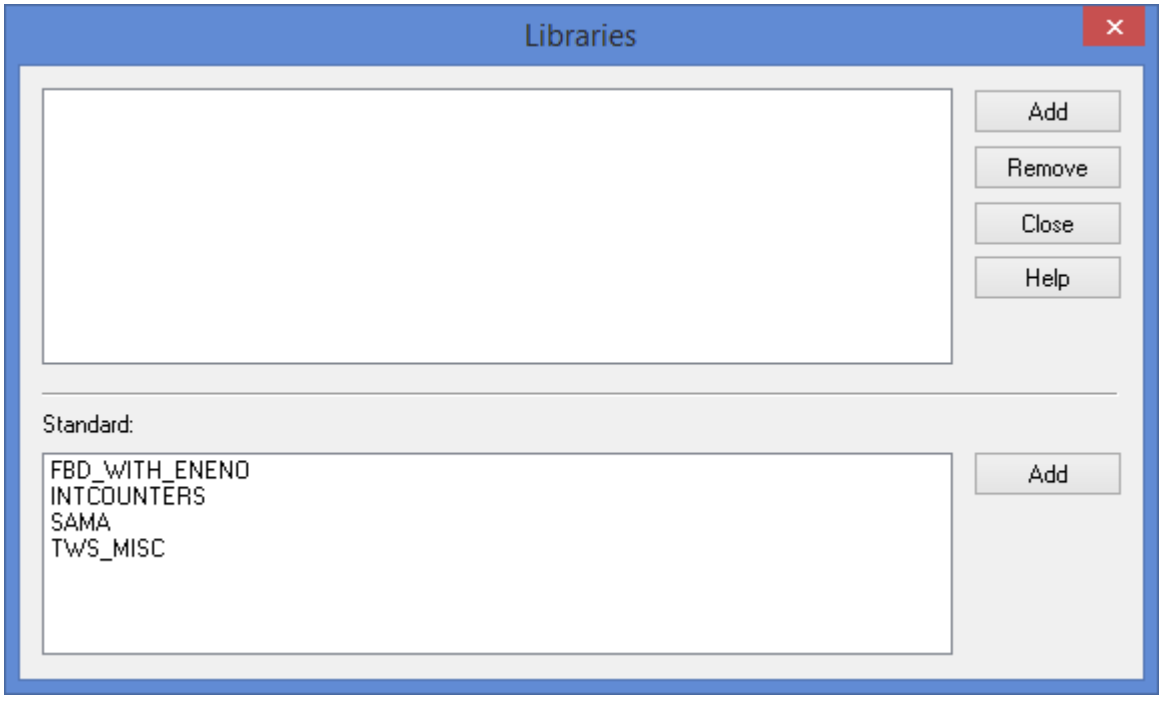
The project file will be placed into the */disk* directory of the Device.

If the Straton project is not based on "ZPASS2_Template"/"S6001_Template", the Seneca UDFB library can still be used, as described in the following.

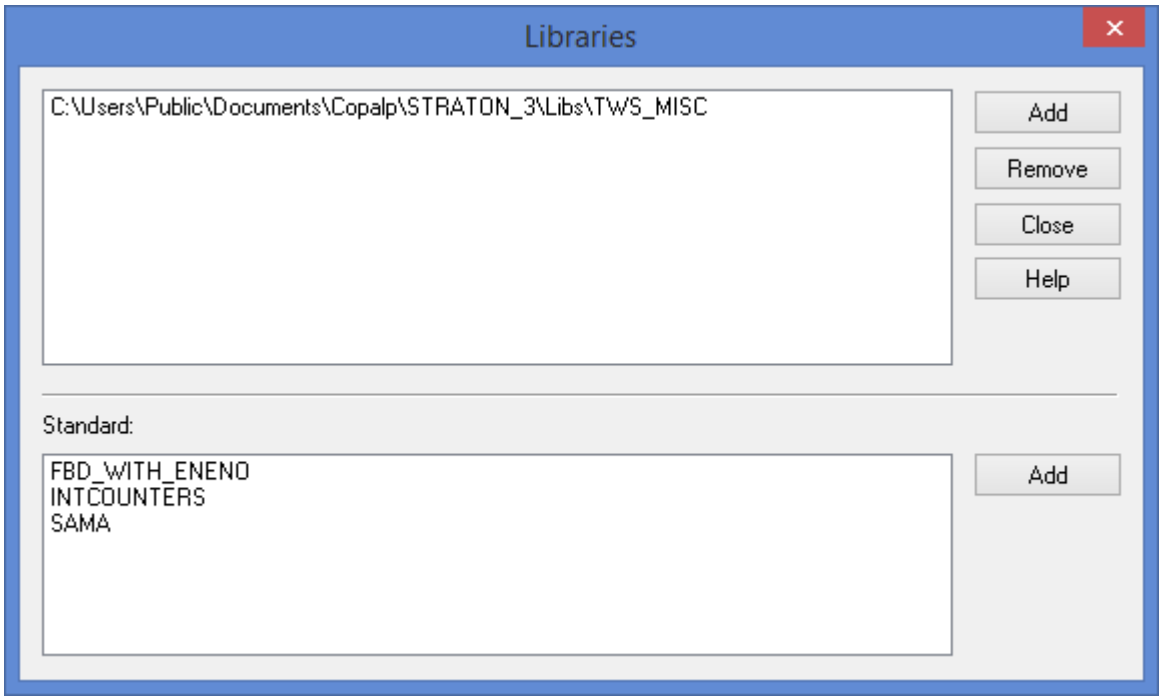
In the Straton IDE, go to the "Project Settings" window, shown below (menu "Project/Settings"):



Click on "Libraries / Edit…"; the following window is shown:

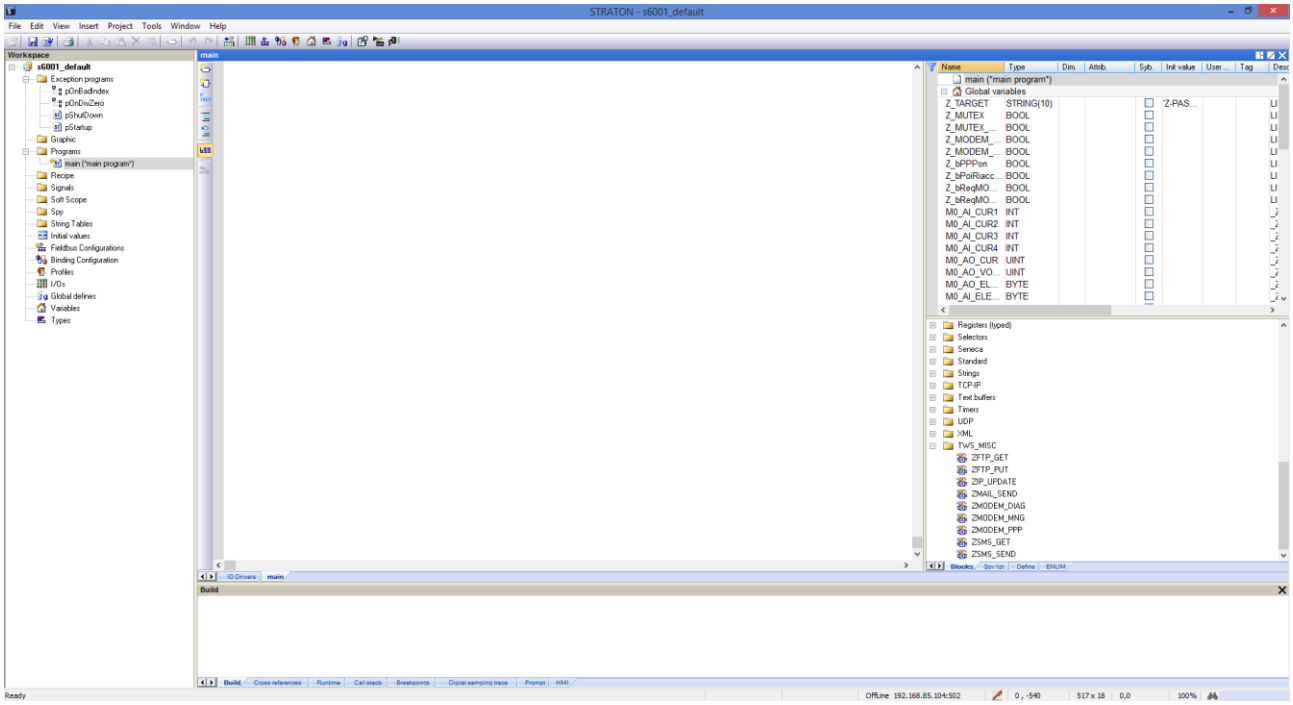


Select the “TWS_MISC” library and click on “Add”.



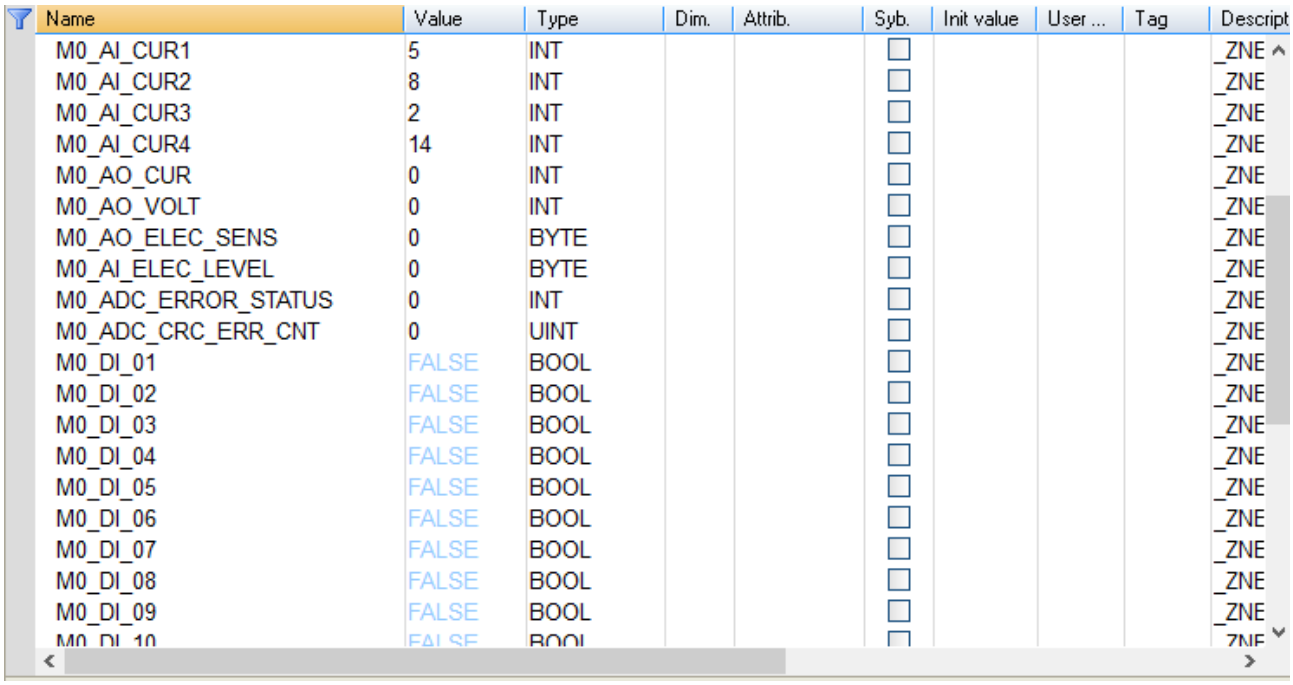
Finally, click on “Close”.

Now, the UDFB library is available in the project, as shown in the following figure:



If the Straton project has been built using the Seneca Z-NET4 SW (see chapter 21), the *TWS_MISC* is already included, so the above procedure is not needed.

In particular, when using S6001-RTU CPU, Z-NET4 SW provides a simple way to create the base Straton project; in fact, all the variables corresponding to the CPU I/Os will be inserted in the project, as shown in the following figure.



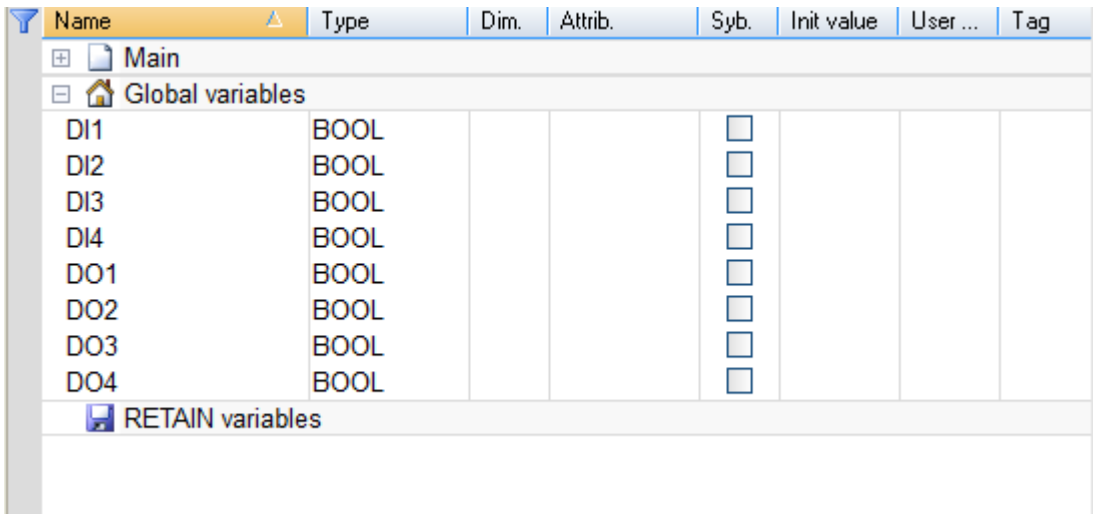
Name	Value	Type	Dim.	Attrib.	Syb.	Init value	User ...	Tag	Descript
M0_AI_CUR1	5	INT			☐				_ZNE
M0_AI_CUR2	8	INT			☐				_ZNE
M0_AI_CUR3	2	INT			☐				_ZNE
M0_AI_CUR4	14	INT			☐				_ZNE
M0_AO_CUR	0	INT			☐				_ZNE
M0_AO_VOLT	0	INT			☐				_ZNE
M0_AO_ELEC_SENS	0	BYTE			☐				_ZNE
M0_AI_ELEC_LEVEL	0	BYTE			☐				_ZNE
M0_ADC_ERROR_STATUS	0	INT			☐				_ZNE
M0_ADC_CRC_ERR_CNT	0	UINT			☐				_ZNE
M0_DI_01	FALSE	BOOL			☐				_ZNE
M0_DI_02	FALSE	BOOL			☐				_ZNE
M0_DI_03	FALSE	BOOL			☐				_ZNE
M0_DI_04	FALSE	BOOL			☐				_ZNE
M0_DI_05	FALSE	BOOL			☐				_ZNE
M0_DI_06	FALSE	BOOL			☐				_ZNE
M0_DI_07	FALSE	BOOL			☐				_ZNE
M0_DI_08	FALSE	BOOL			☐				_ZNE
M0_DI_09	FALSE	BOOL			☐				_ZNE
M0_DI_10	FALSE	BOOL			☐				ZNE

For more information about Straton IDE and related tools, please refer to StratON tutorials and on-line help.

8.1.3 Z-PASS2-S-IO profiles

Two Straton I/O profiles are available for Z-PASS2-S-IO CPU.

The first profile, named “ZPASS_DIO”, provides variables corresponding to the available Digital I/Os, as shown in the following figure.



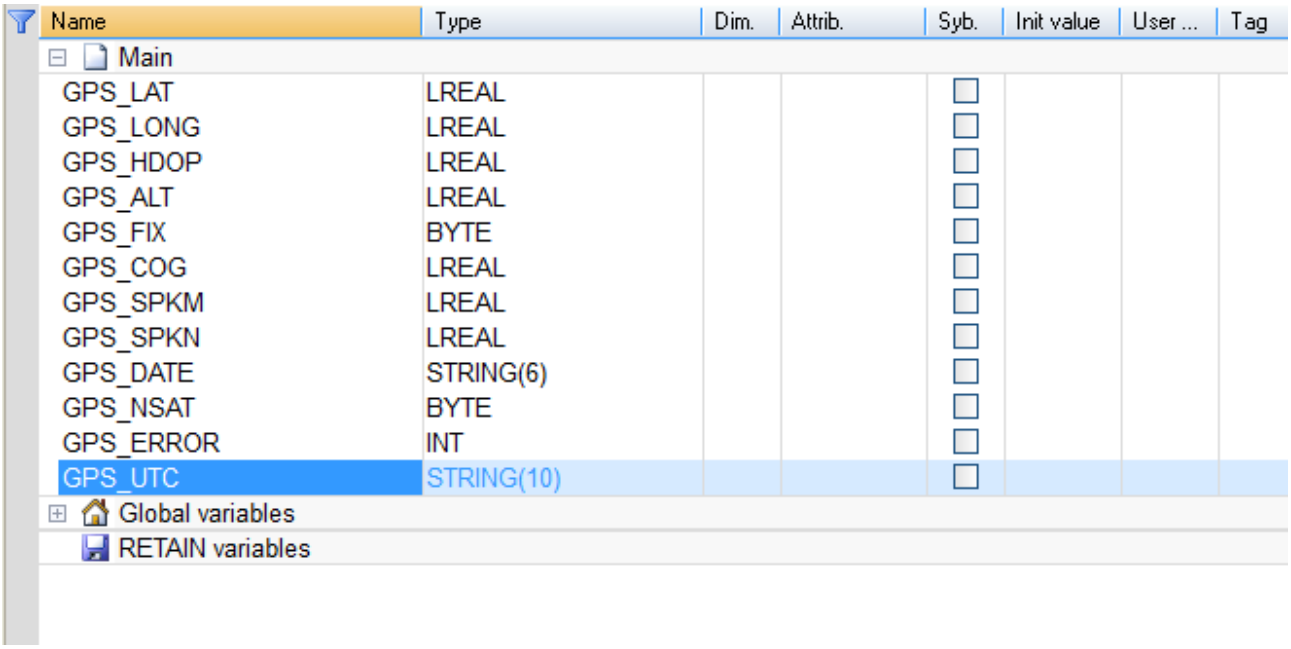
Name	Type	Dim.	Attrib.	Syb.	Init value	User ...	Tag
Main							
Global variables							
DI1	BOOL			☐			
DI2	BOOL			☐			
DI3	BOOL			☐			
DI4	BOOL			☐			
DO1	BOOL			☐			
DO2	BOOL			☐			
DO3	BOOL			☐			
DO4	BOOL			☐			
RETAIN variables							

It should be noted that four “DIx” variables and four “DOx” variables are declared, corresponding to the maximum number of inputs and outputs possibly available; the Digital I/O configuration (see paragraph

19.1.13) determines which of these variables are actually handled by the PLC; for example, if DIDO1 is set as an input and DIDO2 as an output, DI3 and DO4 will be handled while DI4 and DO3 will not be used.

Moreover, while the variables corresponding to the inputs are updated by the PLC regardless of their function modes, only the variables corresponding to the outputs set as "General Output" will actually affect the digital outputs.

The second profile, named "ZPASS_GPS", provides variables corresponding to the information given by the GPS module, as shown in the following figure.

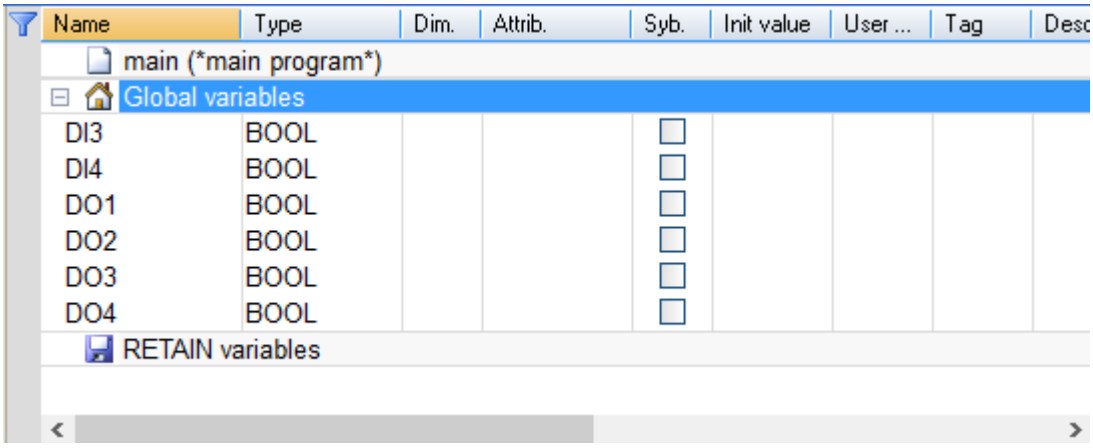


In particular, the *GPS_ERROR* variable tells if the other variables contain valid and updated values or not, in the following way:

- GPS_ERROR = 0 GPS fixed; variables contain updated values
- GPS_ERROR = -1 GPS not fixed; variables contain not updated, possibly invalid, values
- GPS_ERROR = -2 some error has occurred; variables contain invalid values

8.1.4 Z-TWS4-IO profile

The "ZPASS_DIO" profile is available also for Z-TWS4-IO, providing variables corresponding to the available Digital I/Os, as shown in the following figure.



It should be noted that two "DIx" variables and four "DOx" variables are declared, corresponding to the maximum number of inputs and outputs possibly available; the Digital I/O configuration (see paragraph 19.1.13) determines which of these variables are actually handled by the PLC; for example, if DIDO1 is set as an input and DIDO2 as an output, DI3 and DO4 will be handled while DI4 and DO3 will not be used.

Moreover, while the variables corresponding to the inputs are updated by the PLC regardless of their function modes, only the variables corresponding to the outputs set as "General Output" will actually affect the digital outputs.

8.2 Energy Management Protocols

The StratON soft-PLC installed on Z-TWS4/Z-PASS2-S/S6001-RTU supports the following "Energy Management" protocols:

- IEC 60870-5-101 (Master/Slave)
- IEC 60870-5-104 (Master/Slave)
- IEC 61850 (Master/Slave)

The activation of these protocols is license-based.

Please contact Seneca to get more information about getting the license for Energy Management protocols.

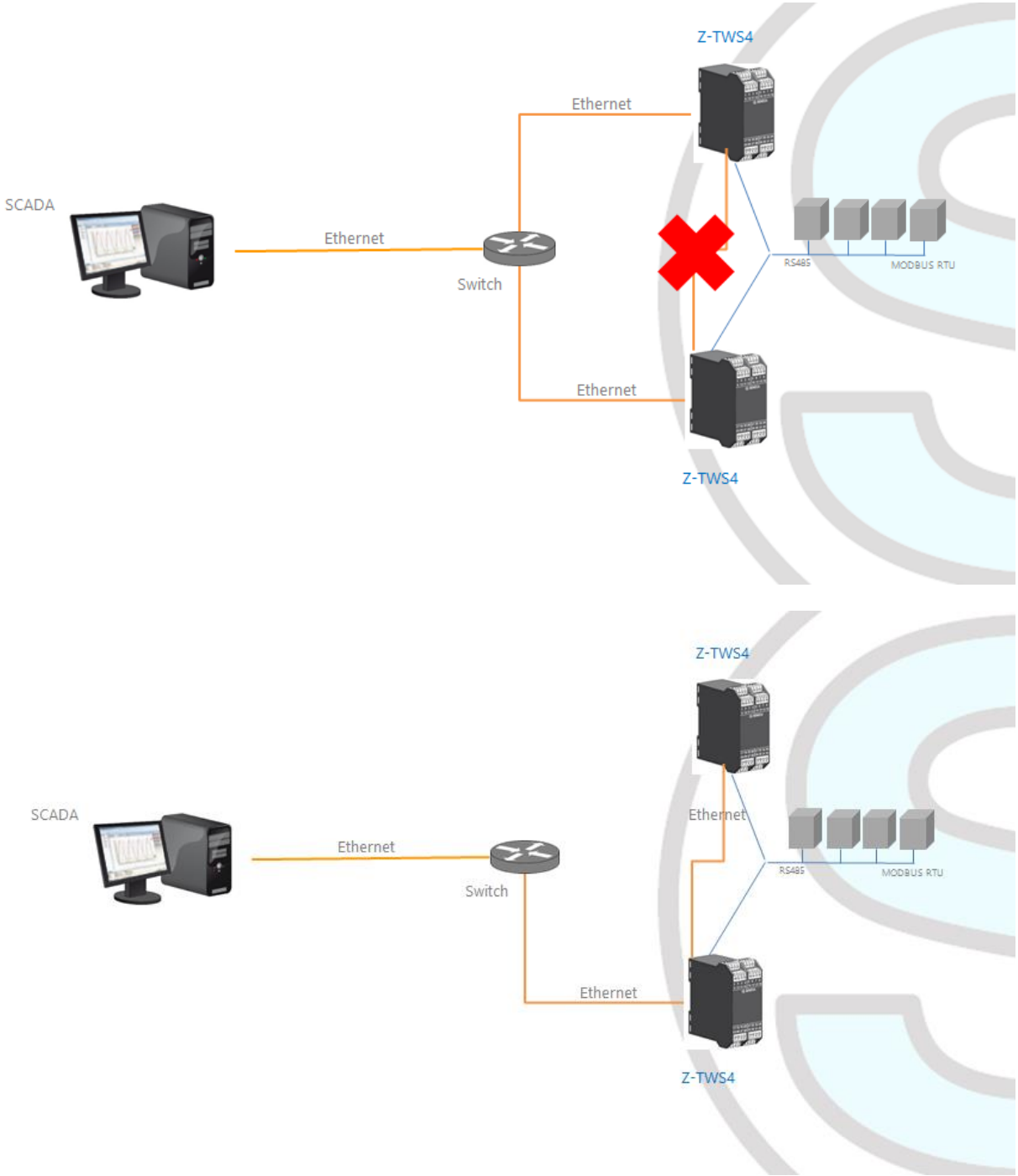
8.3 StratON Redundancy

WARNING!

At the date of this manual, the "StratON Redundancy" functionality is still in a "Beta version"; this means that the proper operation of this functionality is not guaranteed for every kind of application; please contact Seneca for further information.

The StratON PLC provides a "Redundancy" functionality:
when this feature is enabled, two CPUs (Z-TWS4 or Z-PASS2-S or S6001-RTU) run the same StratON application; the two CPUs connect each other via the Ethernet, in order to keep variables, state-machines etc. synchronized between them; in each moment, only one of the two CPUs actually runs the application and drives the fieldbus; if, for any reason, that CPU stops running, the application execution is handed over to the second CPU.

When the redundancy is used, some care must be taken when connecting the devices, in order to avoid Ethernet loops; the Ethernet connections shall be set up as shown in the following figures.



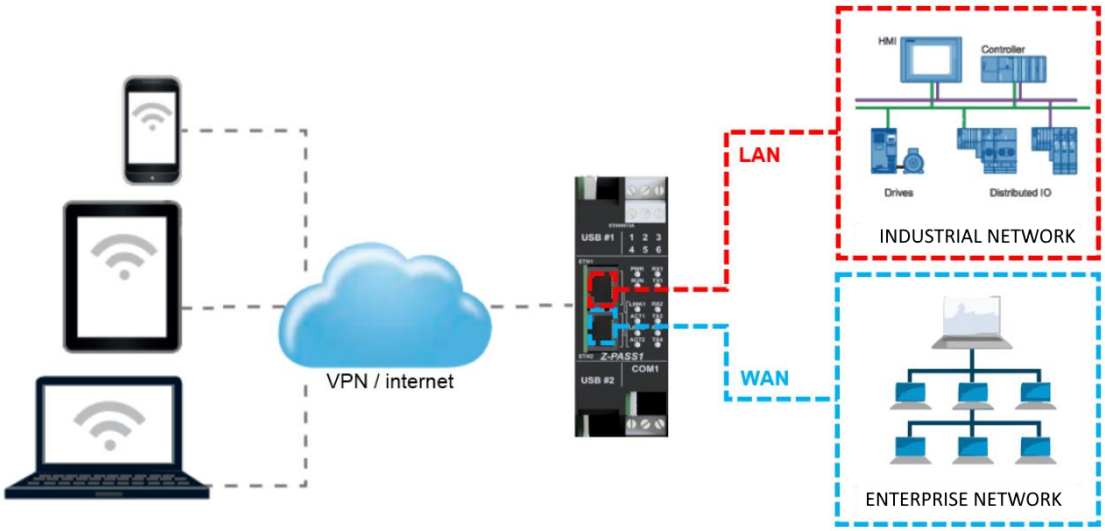
Please see paragraph 19.1.2 for a description of the configuration parameters related to StratON Redundancy.

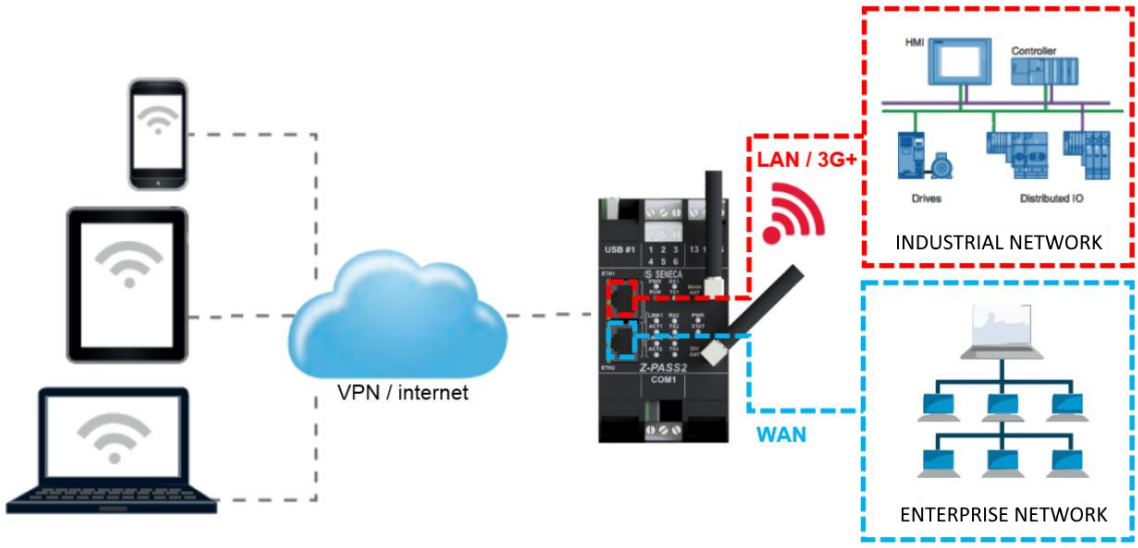
9 Ethernet Mode (Z-PASS2-S-R01/Z-PASS2-S-IO/Z-TWS4-IO)

In Z-PASS2-S-R01/Z-PASS2-S-IO/Z-TWS4-IO products, the two available Ethernet ports can be configured as two fully separated network interfaces (“LAN” and “WAN”) or, as in the older versions, they can work as

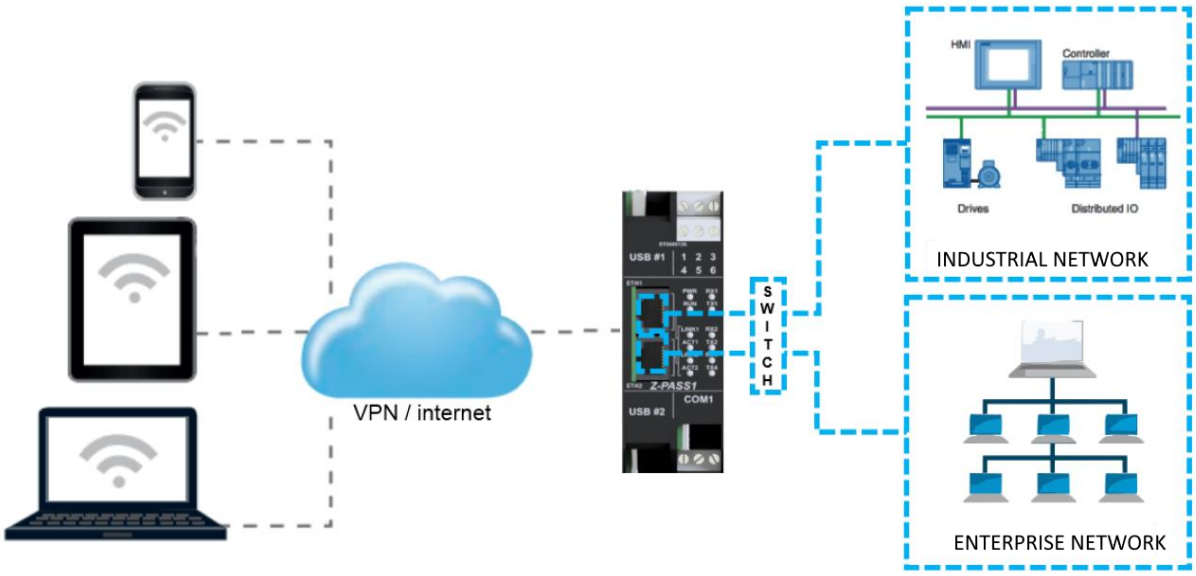
ports of an Ethernet switch; the user can choose between the “LAN/WAN” mode and the “Switch” mode, by means of a configuration parameter (“Ethernet Mode”) (see paragraph 19.1.2).

The “LAN/WAN” mode is needed when the “industrial” network connected to the LAN interface (comprising e.g. HMI and PLC devices) shall be separated from the “enterprise” network connected to the WAN interface (comprising enterprise PCs and servers); when the Device is remotely accessed through the WAN interface, only devices connected to the LAN interface can be reached, while access to machines lying in the enterprise network is forbidden; this is depicted in the following two figures.

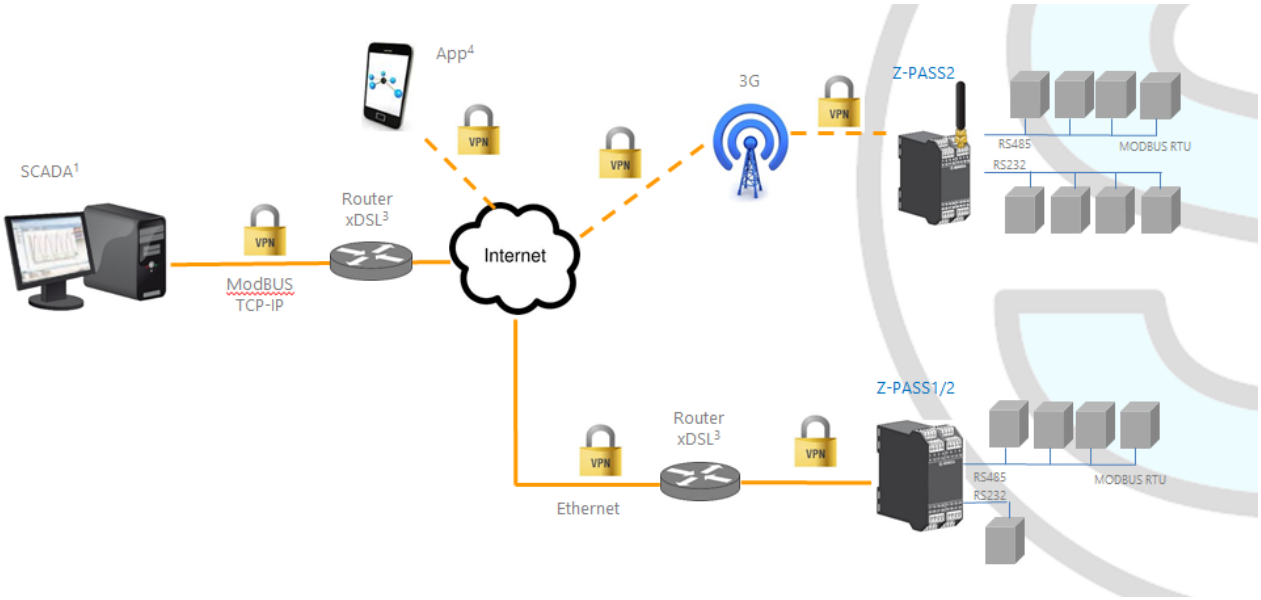




When this separation is not needed or when the Internet access is achieved only through the mobile (3G+) interface, the “Switch” mode still lets the Device be used as an Ethernet switch, as shown in the following figure.



10 VPN



Z-TWS4/Z-PASS2-S/S6001-RTU support the standard OpenVPN protocol.

The main advantages that come from using a VPN are:

- secure connections, since transported data are encrypted;
- the ability to establish connections without interfering with the corporate LAN;
- no need to have a static/public IP address on the WAN side;
- remote configurability by a built-in Web Server.

Two “VPN modes“ are available, named “OpenVPN” and “VPN Box”, respectively.

The “OpenVPN” mode can be used when the Device shall be installed in an already existing VPN. In this case, an OpenVPN server shall be available and the certificate and key files for the Device client shall be provided by the VPN administrator; the files can be uploaded to the Device using the “VPN configuration” page of Device Web Server.

If the VPN infrastructure does not exist yet, the advisable choice is to adopt the “VPN Box” solution, developed by Seneca. The “VPN Box” is an hardware appliance (or a virtual machine) which lets the user easily setup two alternative kinds of VPN:

- “Single LAN” VPN
- “Point-to-Point” VPN

In the “Single LAN” VPN, all devices and PCs (and associated local subnets) configured into VPN are always connected in the same network. In this scenario any PC Client can connect to any Device and to other machines which lie in the Device LAN, but also any device/machine can connect to any other remote device/machine which belongs to the same VPN network. This VPN architecture puts some constraints on the device sub-networks definition, in fact all VPN clients must have a different IP address and different local LAN, to avoid conflicts. The software named “VPN BOX Manager” configures VPN BOX and will help you to avoid errors defining local subnets.

In the “Point-to-Point” VPN, a client PC, in a given moment, can perform a single connection, on demand, to only one Device (and to machines which lie in the Device LAN) at time. Furthermore, devices can’t communicate each other. The advantage of this architecture is that the same sub-network can be used in all sites. Point to point mode makes it possible to define user groups and manage them. This VPN modality must be configured on “VPN Box”.

There are two kinds of “Point-to-Point” VPN:

- routing Layer 3 VPN
- bridging Layer 2 VPN

In “Routing Layer 3 VPN”, only IP (Layer 3) packets are transported over the VPN tunnel and a new virtual LAN is created with a network subnet which must be different from the LAN subnets of the server and clients.

Conversely, in “Bridging Layer 2 VPN”, all Ethernet frames are transported over the VPN tunnel and the clients are inserted in the server LAN.

Each of the two kinds has benefits and drawbacks:

Layer 2 benefits/drawbacks:

- can transport any network protocol
- broadcast traffic (e.g.: DHCP) is transported
- causes much more traffic overhead on the VPN tunnel

Layer 3 benefits/drawbacks:

- can transport only IP traffic
- broadcast traffic (e.g.: DHCP) is not transported
- lower traffic overhead, transports only traffic which is destined for the VPN clients

The “VPN Box” is supplied with two Windows applications:

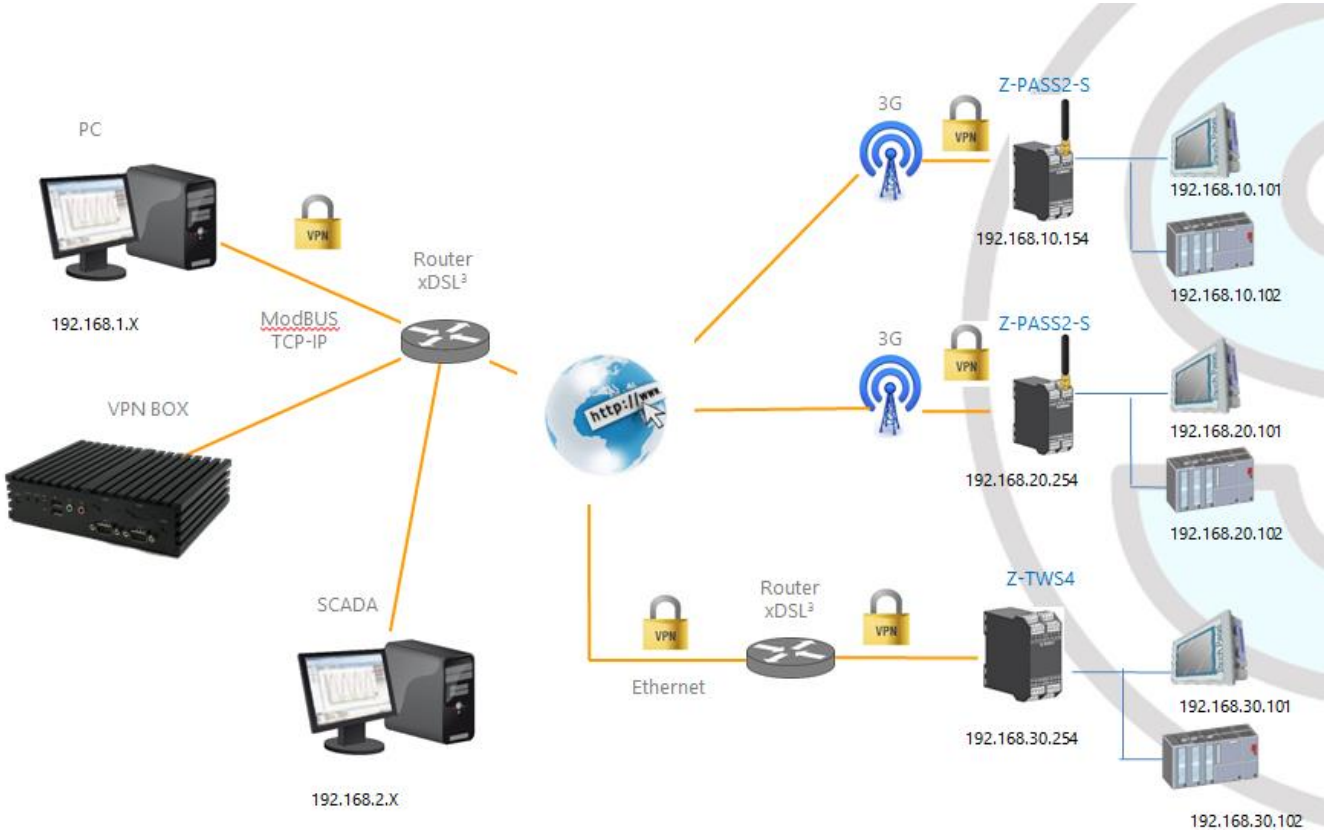
- the "VPN Box Manager", which allows to configure the VPN[4] mode on the VPN Box and manage the devices[5]
- the "VPN Client Communicator", which lets the user connect the PC to the network (in the "Single LAN" case) or to a specific device (in the "Point-to-Point" case)

A detailed description of "VPN Box" can be found in the "VPN Box User Manual".

A detailed description of Z-TWS4/Z-PASS2-S/S6001-RTU VPN configuration parameters is given in 19.1.4 paragraph.

The following two sub-paragraphs give some more info about the two kinds of VPN.

10.1 "Single LAN" VPN



The above figure gives an example of a "Single LAN" VPN.

The client PC (with IP address 192.168.1.X) can connect, just as an example, to the first Z-PASS2-S by using its 192.168.10.154 IP address and to the PLC in the Z-PASS2-S LAN by using its local IP address 192.168.10.102.

Also, two devices which lie in two different LANs of the same VPN network (e.g.: 192.168.10.101 and 192.168.20.102) can connect to each other, again using their local IP addresses.

[4] Only one of the two kinds of VPN can be configured on a given VPN Box.
[5] "VPN Box" functionality is available also on Seneca Z-PASS1 and Z-PASS2 products.

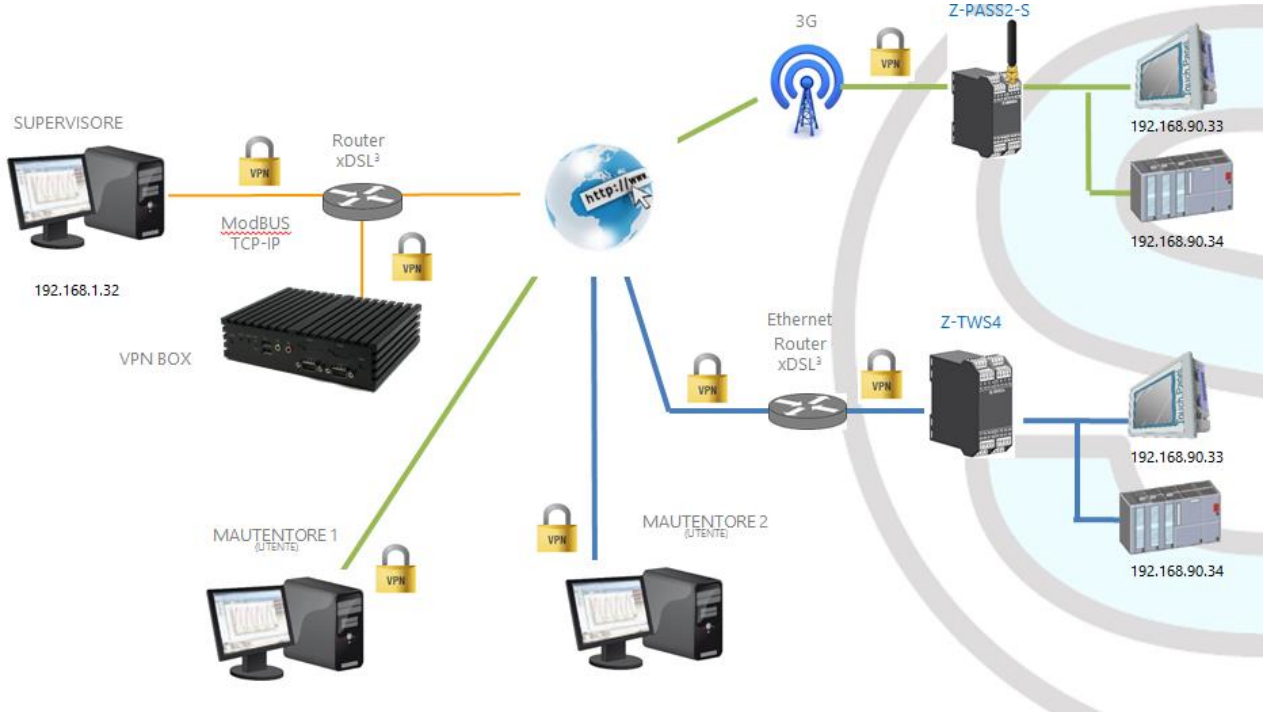
To let this scenario work correctly, an essential rule must always be followed: the Device LANs and the PC LAN shall have different and not colliding subnets; so, in the above figure, the following subnets allocation has been depicted:

PC LAN	192.168.1.0/24
SCADA LAN	192.168.2.0/24
Z-PASS2 LAN	192.168.10.0/24
Z-PASS2 LAN	192.168.20.0/24
Z-PASS1 LAN	192.168.30.0/24

The "VPN Box Manager" application guides you in the configuration task, checking that no subnet/IP address conflict is present in the network.

If subnet/conflicts cannot be avoided, using a "Single LAN" VPN is still possible if local IP addresses are not used; devices can be reached by means of their VPN IP addresses and machines beyond them can be reached by configuring some "port forwarding" rules on the Device Router (see 19.1.5 paragraph).

10.2 "Point-to-Point" VPN



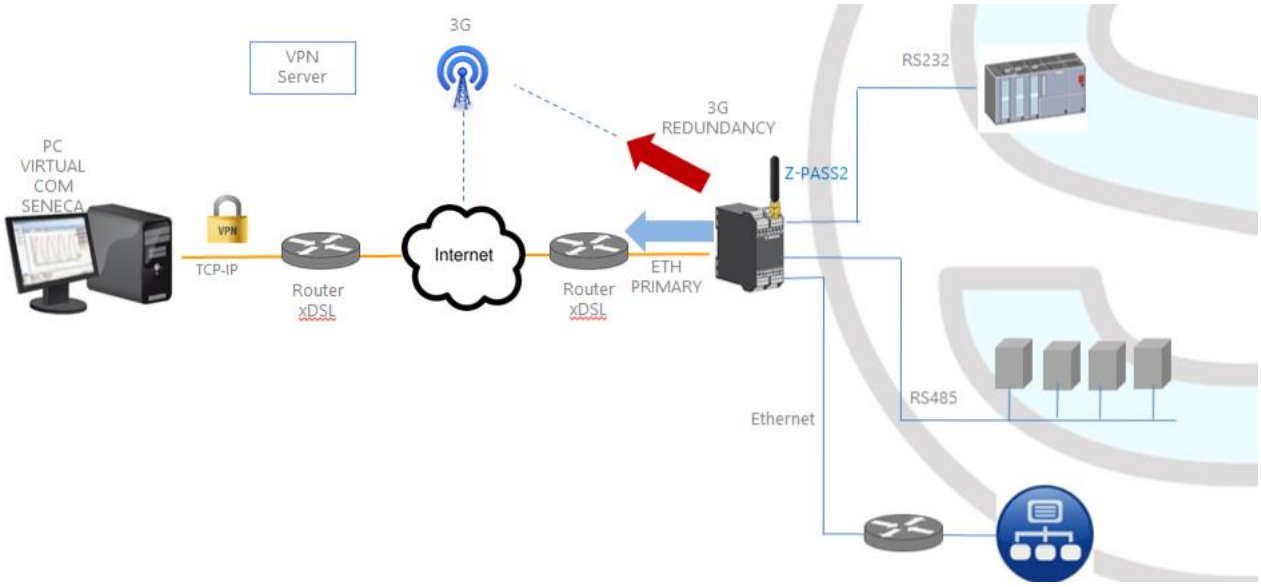
The above figure gives an example of a "Point-to-Point" VPN.

In this scenario a PC (acting as a VPN Client) can connect, on demand, to only one Device and its subnet, using local IP addresses. Since the client "sees" just one Z-TWS4/Z-PASS2-S/S6001-RTU (and attached devices) at time, the same subnet configuration can be assigned to different sites, without creating conflicts.

For this kind of VPN, the "VPN Box Manager" application lets define group of users that can connect only to assigned devices.

The “VPN Client Communicator” application retrieves the list of devices which are available for the logged user; then the user can select one device on the list and connect to it.

11 Network Redundancy

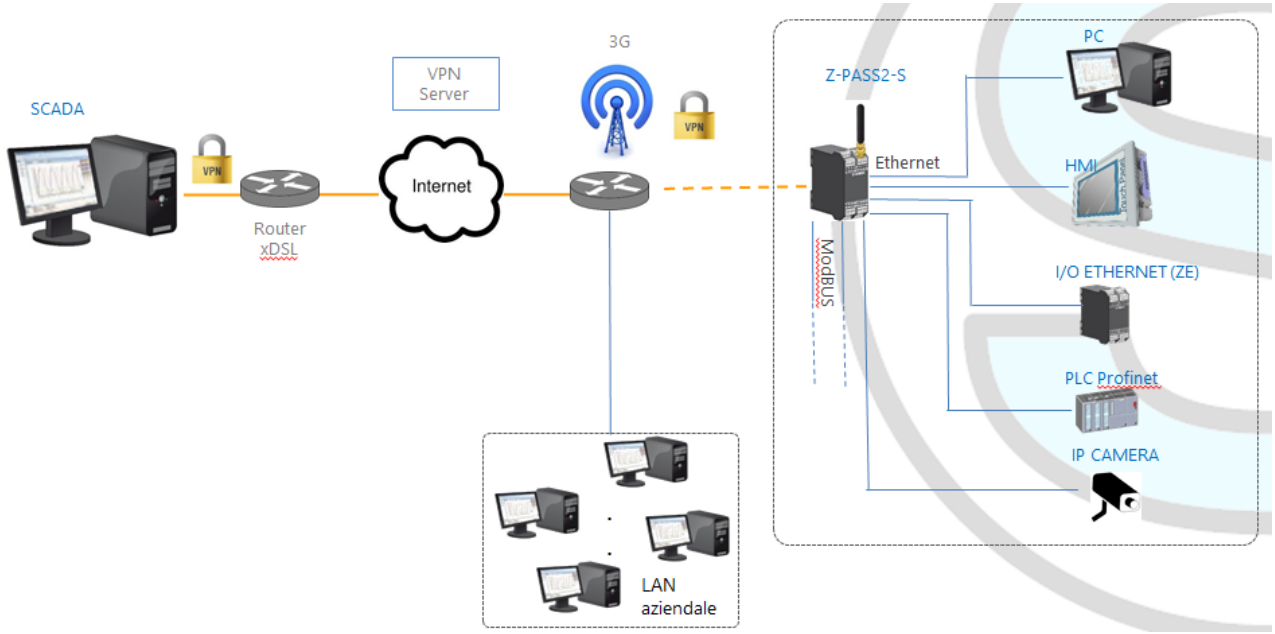


“Network Redundancy” is a functionality than can be enabled on the Device when a 3G modem is available (true for Z-PASS2-S and S6001-RTU).

This functionality switches the network interface used to access the Internet from the Ethernet (“primary” interface) to the Mobile/3G (“secondary” interface), when Internet access through the primary interface becomes unavailable; when access through the primary interface become available again, the network interface is switched back to Ethernet.

The parameters provided to configure Network Redundancy are explained in paragraph 19.1.2 “Network and Services”.

12 Router



As already told before, “Router” functionality routes packets between the WAN (Mobile Network) interface and the LAN (Ethernet) interface and vice versa; so, this functionality especially makes sense when a 3G connection is active, which needs the availability of a 3G modem (true for Z-PASS2-S and S6001-RTU).

More specifically, an important feature of the Router is what is known as “IP forwarding”; this means that when the Device receives a packet not targeted for it, it does not discard the packet but forwards it to its actual destination; when a packet is routed from the LAN to the WAN, the Device also performs what is known as “IP masquerading”, meaning that the original source IP address is replaced with the IP address of the WAN (Mobile Network) interface.

Another important feature is the availability of a DNS server/forwarder, which can resolve names either by itself or querying the external configured DNS server.

Also, a DHCP server is available which assigns IP addresses to clients connected on the Device LAN; here, you can configure the range of addresses used by the server and the lease time.

There is also the possibility to define up to five “Port Forwarding” rules or “Virtual Servers”; using these rules, you can, for example, redirect packets received on a TCP or UDP port to another Device port or to another machine, with a different IP address, on the same or another port.

As an alternative to using “Port Forwarding” rules, Router + VPN functionalities allow the use of local addresses, as shown in the previous chapter; in the router configuration, a flag is given to enable this feature.

A detailed description of the Router configuration can be found in paragraph 19.1.5.

13 Remote Connection Disable

Z-PASS2-S-IO and Z-TWS4-IO products provide a dedicated digital input and a dedicated digital output to control and monitor remote connection to the device.

In details:

- when “Remote Connection Disable” digital input is set to HIGH state, remote connection to the device is disabled; conversely, when “Remote Connection Disable” digital input is set to LOW state, remote connection to the device is enabled; “Remote Connection Disable” digital input state is reported by the “RCD” LED;
- “Remote Connection Active” digital output is set to HIGH state when the device is remotely accessed (VPN connection is active); it is set to LOW state when VPN connection is not active.

Four levels of security can be configured to disable remote connection:

- Level 1 (“VPN Connection”): VPN connections are disabled in any VPN mode (VPN Box Point-to-Point, VPN Box Single LAN, OpenVPN), but VPN Box Service is still running, so the device can still be monitored on VPN Box Manager;
- Level 2 (“VPN Service”): VPN Box Service is disabled, but the device can still access the Internet and send/receive SMSs;
- Level 3 (“Internet Connection”): any Internet access is disabled, but the device can still send/receive SMSs;
- Level 4 (“SMS Service”): modem is off, so SMSs can’t be sent/received.

See “Digital I/O Configuration” paragraph to learn how to set the desired security level.

14 Auto-APN

The Auto-APN feature lets the Device establish mobile data connections without requiring the user to configure APN data[6] for the SIM in use.

This is accomplished by using the SIM IMSI and, possibly, some other data available on the SIM, to select the proper APN record in an internal DB[7], containing APN records for all mobile operators in the world.

In some particular cases, however, when a “custom APN” shall be used, the Auto-APN feature can be disabled, setting the “APN Mode” parameter to “Manual”, in the “Mobile Network” page (see paragraph 19.1.10).

15 M-Bus (ONLY Z-TWS4-IO and Z-PASS2-S-IO)

Z-TWS4-IO and Z-PASS2-S-IO, can be connected to a M-Bus fieldbus in the following way:

- connecting the Seneca “Z-MBUS” RS232-MBUS adapter to the COM1 serial port;
- setting the COM1 mode to RS232 (see paragraph 19.1.2).

[6] APN data are: APN, Username, Password and Authentication Type.
[7] This DB is updated to the one used in the last Android O.S. version.

To handle M-Bus devices, the following resources are provided:

- the “M-Bus” section web pages
- the MBUS_READ_CTL function
- the MBUS_WRITE_RAW function block

The M-BUS web pages lets you scan the bus, searching for devices, detecting either their primary addresses or secondary addresses; it also lets you read the data records and slave information from a device and create the configuration files to be imported in Straton PLC.

The **MBUS_READ_CTL** FB lets you start/stop the M-BUS acquisition;

the MBUS_WRITE_RAW FB lets you build and send a generic M-Bus frame, thus providing a flexible way to send configuration commands to M-Bus devices.

16 OPC Unified Architecture (OPC UA) protocol

OPC Unified Architecture (OPC UA) is a standardized machine to machine communication protocol for industrial 4.0 automation developed by the OPC Foundation.

OPC UA is a vendor-independent communication protocol and it’s based on the client-server principle with a robust security.

The devices support both OPC-UA server and OPC-UA client protocols.

17 MQTT client protocol

The MQTT is the most used protocol for IOT applications:

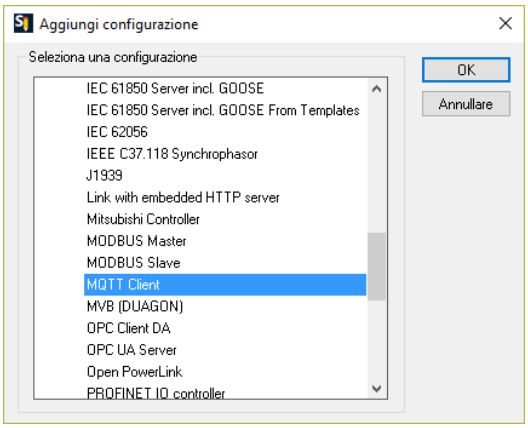
“MQTT stands for MQ Telemetry Transport. It is a publish/subscribe, extremely simple and lightweight messaging protocol, designed for constrained devices and low-bandwidth, high-latency or unreliable networks. The design principles are to minimise network bandwidth and device resource requirements whilst also attempting to ensure reliability and some degree of assurance of delivery. These principles also turn out to make the protocol ideal of the emerging “machine-to-machine” (M2M) or “Internet of Things” world of connected devices, and for mobile applications where bandwidth and battery power are at a premium”.

For more info on MQTT protocol see http://mqtt.org/

The MQTT version supported by the Z-PASS1/2 is the 3.1.1

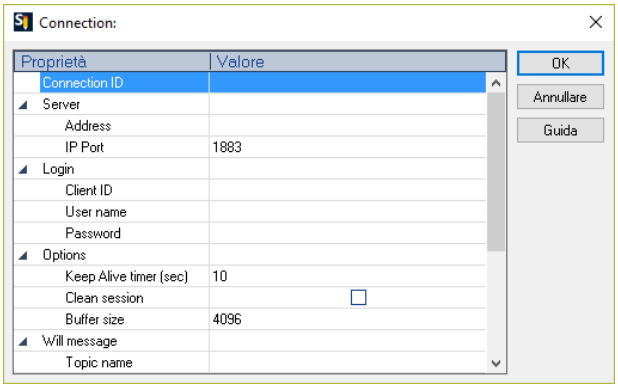
For using the MQTT protocol ***you must use Straton workbench 9.3 or later***.

For use the MQTT client select it from the Straton Workbench Fieldbus section :



17.1 MQTT protocol Parameters from PLC program

The MQTT setup can be made directly from the workbench:



But if you need to configure these parameters from the Straton PLC Program you can use a set of special words that will load the configuration from a file.

Special Words are:

In the filed “Address” type: mqtt_par_address so the filed “Address” is obtained from the file:

/var/run/mqtt_par_address

In the filed “Client ID” type: mqtt_par_clientid so the filed “Client ID” is obtained from the file:

/var/run/mqtt_par_clientid

In the filed “User Name” type: mqtt_par_username so the filed “User Name” is obtained from the file:

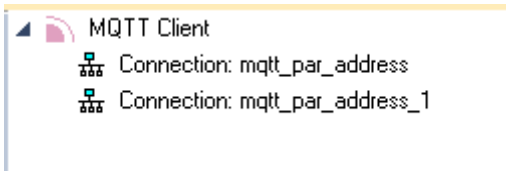
/var/run/mqtt_par_username

In the filed “Password” type: mqtt_par_password so the filed “Password” is obtained from the file:

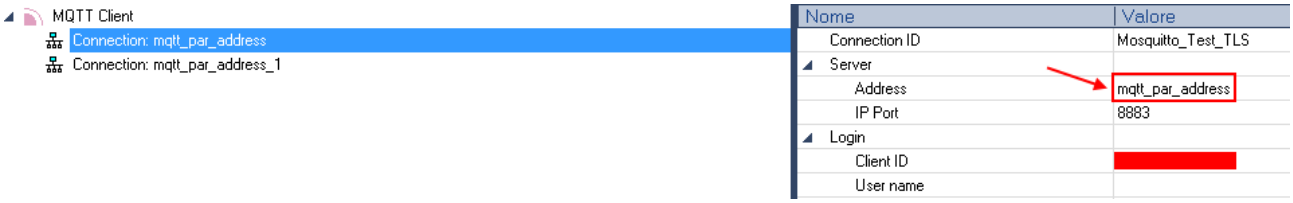
/var/run/mqtt_par_password

17.1.1 Manage Multiple MQTT connections

You can manage multiple MQTT connections using parameters *that starts with the special words (mqtt_par_address123, mqtt_par_address_aaa, …)*, for example create 2 mqtt connections:



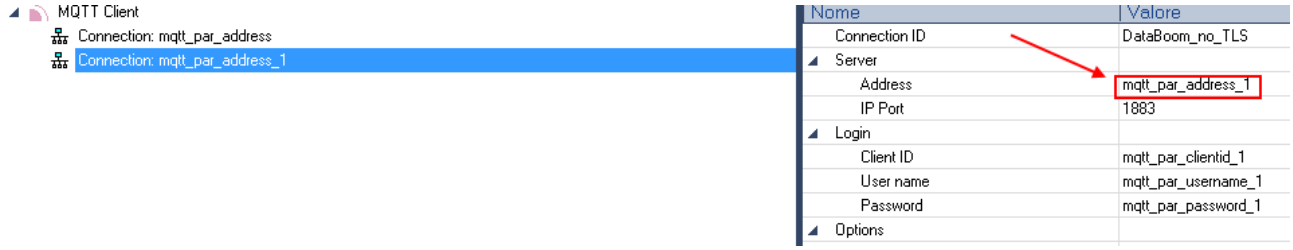
The first connection use the Field address “mqtt_par_address”



So will load the Address from the file:

/var/run/mqtt_par_address

The second connection use the Filed address “mqtt_par_address_1”



this will load the Address from the file:

/var/run/mqtt_par_address_1

(the technique can also be used for the others parameters client id, username and password).

17.2 MQTT with SSL/TLS Connection retry configuration

The default configuration for the MQTT SSL/TLS connection is:

CONN _TRY_MAX = 10

CONN_TRY_WAIT = 1000 ms

Where:

CONN _TRY_MAX is the number of retry for the connection.

CONN_TRY_WAIT is the timeout of each connection attempt.

If you need to change this default configuration you need to create the file:

“ssl_con_try_params”

In this path:

“/var/run/”

Whith the values of parameters, for example:

root@Z-PASS2-S:~# cat /var/run/ssl_conn_try_params

50,200

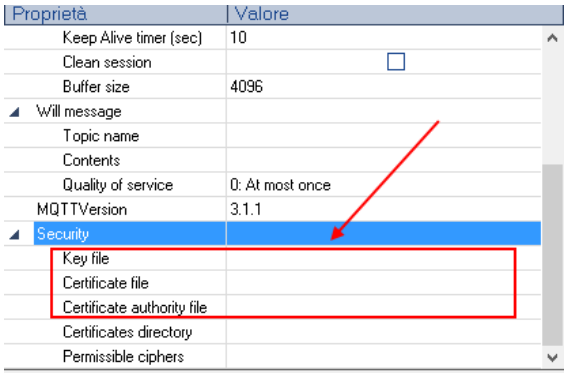
Means that CONN _TRY_MAX = 50 and CONN_TRY_WAIT = 200 ms.

NOTE1: At the end of the file you need to add a \n (newline character)

NOTE2: The file is loaded in a RAM filesystem so you need to create it at each boot.

17.3 MQTT static and dynamic Client Certificates

In the MQTT configuration Under Security section you can enter the path and the filename for the certificates:



Seneca suggests to use the /log directory for the certificates.

MQTT Client certificate can be upload only by the FTP server.

The Key file is the client private key file.

Certificate file is the client certificate.

Certificate Authority file is the Certification Athority certificate.

If you need to change dynamically these files and others parameters without recompiling the project you can load in /var/run directory a file with filename that must starts respectively with:

"mqtt_par_clientkey", "mqtt_par_clientcert", "mqtt_par_cacert"

The contents of the files must be a text with the file name without the path.

Note that in a program you can use more than one certificate file for example “mqtt_par_clientcert00”, “mqtt_par_clientcert01” etc…

17.4 Change MQTT parameters from a file

You can change the port and the keepalive configuration overwriting in runtime the actual configuration with the following files:

"mqtt_par_port" and "mqtt_par_keepalive".

The contents of the files must be a text with the new parameter value.

18 Upgrading the firmware by USB pen

The Device firmware can be upgraded by means of a USB pen; a pen drive formatted with FAT32 file-system is needed.

The procedure is the following:

1) download the FW file from one of the following links:

   http://www.seneca.it/products/z-tws4
   http://www.seneca.it/products/z-pass2-s
   http://www.seneca.it/products/s6001-rtu

   the downloaded file is a .zip file; extract the FW file from it;
   the FW file shall have a name like the following:

   SW002940_xxx.bin

2) copy the file into the root of the USB pen
3) switch off the Device
4) insert the USB pen into the USB#1 port
5) switch on the Device; the upgrade procedure will take some minutes to be completed; during this time, the Device MUST NOT be switched off; during the procedure, the Device will be rebooted several times; also, during the procedure, several LEDS will blink simultaneously[8]
6) the upgrade procedure is ended when only the LED “RUN” is blinking[9]
7) remove the USB pen

19 Web Configuration Pages

NOTE: in this chapter, the web pages screen-shots are shown for only one of the products (Z-TWS4, Z-PASS2-S, Z-PASS2-S-R01, Z-PASS2-S-IO, S6001-RTU); the pages for the other products are identical, except

[8] This applies only to products with HW revisions IO and R01; in details: for IO HW revision, all LEDs will blink simultaneously, except for Power, LAN/WAN, COM and modem LEDs; for R01 HW revision, RUN, VPN and SERV LEDs will blink.
[9] Also SERV and VPN LEDs might blink, depending on the Device configuration and status.

for the product name shown in the top of the pages and for some details explained in the following paragraphs.

Furthermore, for S6001-RTU one more page ("I/O View") is available.

19.1 Administrator pages

The Device can be fully configured by means of a set of web configuration pages.

To access the Device configuration site, you have to connect the browser to the Device IP address on port 8080, e.g.:

http://192.168.90.101:8080[10]

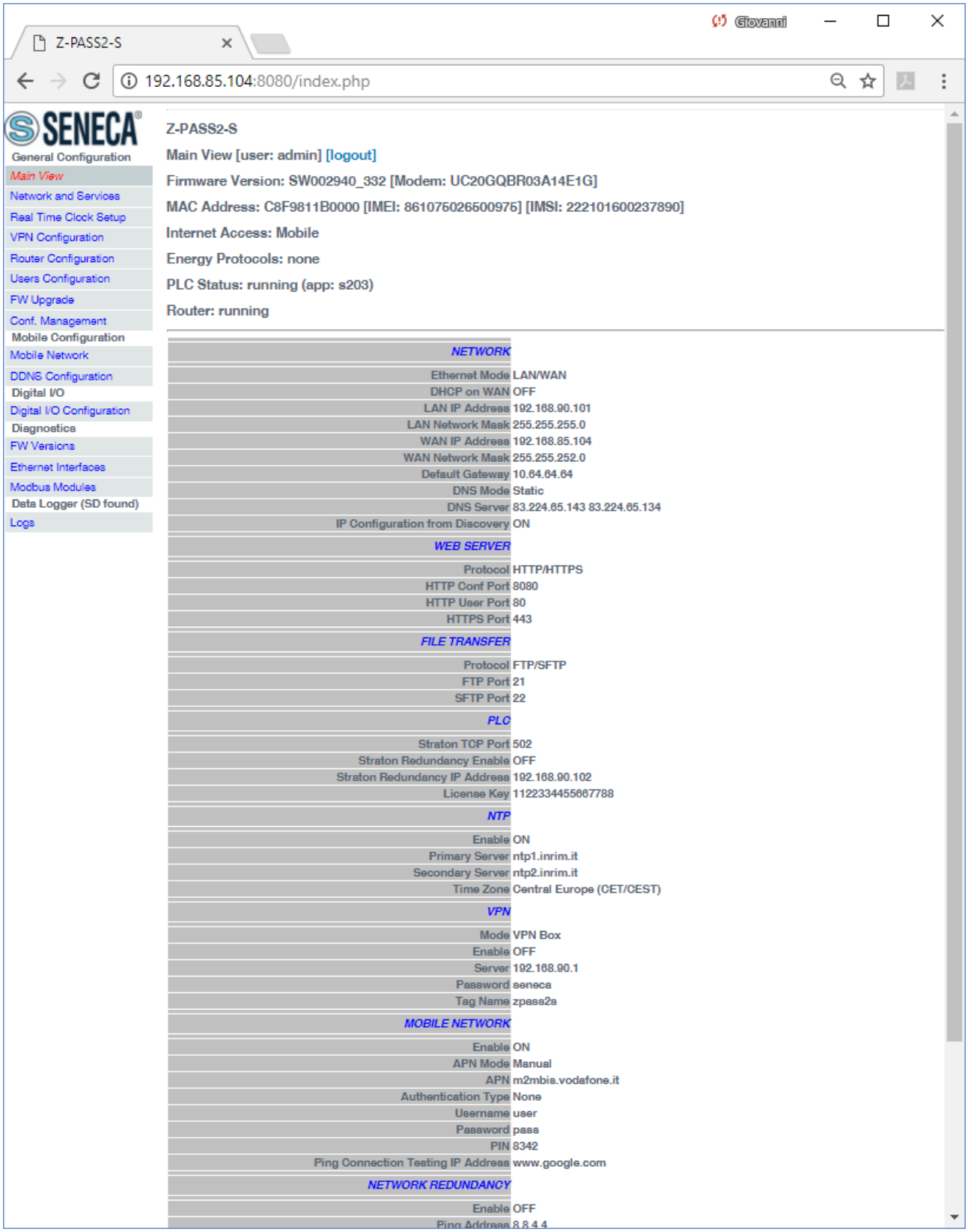
and, when asked, provide the following credentials (default values):

Username: admin
Password: admin

You come to the "Main View" page, described in the following paragraph.

[10] The default 80 HTTP port has been left available for customer pages.

19.1.1 Main View



In this page, main Device configuration parameters are shown, with their current values.

On the left side of the page, like in all the other pages, a menu is shown which lets you access all the configuration pages; the menu is divided in several sections:

- General Configuration
- Mobile Configuration (not available on Z-TWS4 and Z-TWS4-IO)
- Digital I/O (on Z-PASS2-S-IO, Z-TWS4-IO products)
- Diagnostics
- Data Logger

In S6001-RTU, a "S6001-RTU" section is also present.

On top of the page, like in all the other pages, the following information are shown:

- the page name
- the FW version, along with the modem FW revision, for Z-PASS2-S/S6001-RTU; for S6001-RTU, the FW version of the I/O board is also shown
- the MAC address; the modem IMEI, for Z-PASS2-S/S6001-RTU; the SIM IMSI, for Z-PASS2-S/S6001-RTU, when a SIM is present
- the network interface used for Internet Access (i.e.: "Ethernet" or "Mobile")
- which energy protocols are enabled (on a license base)
- the Soft PLC status (i.e.: "running" or "stopped"); if the PLC application execution is stopped or no application is loaded on the Device, the status "app not running" is also shown; if the PLC application is running, the name of the application is also shown
- the Router status (i.e.: "running" or "disabled")

The currently logged user (e.g.: "admin") and the "Logout" link are also present, near the page name.

In this page, the following buttons are available:

- "RESTART", to perform the Device reboot
- "FACTORY DEFAULT", to reset the Device to its factory state
- "CLEAN INTERNAL DATA LOGS", to delete internal data log files (this does not affect the data log files stored on the SD card, see paragraph 19.1.18)

Probably, the first parameters you need to change when setting up a new Device are those related to its network configuration.

You can accomplish this in the "Network and Services" page, described in the following paragraph.

19.1.2 Network and Services

The parameters shown in this page slightly change, depending on the HW version of the product (Z-TWS4/Z-PASS2-S or Z-PASS2-S-R01 or Z-TWS4-IO/Z-PASS2-S-IO) and, for new HW versions, on the selected "Ethernet Mode"; this is shown in the following figures.

The previous figure shows the “Network and Services” page for a Z-PASS2-S-IO, when the “Ethernet Mode” parameter is set to “Switch” ; it also applies to a Z-TWS4-IO in “Switch” mode.

The previous figure shows the “Network and Services” page for a Z-PASS2-S-IO, when the “Ethernet Mode” parameter is set to “LAN/WAN” it also applies to a Z-TWS4-IO in “LAN/WAN” mode.

The previous figure shows the “Network and Services” page for a Z-PASS2-S-R01, when the “Ethernet Mode” parameter is set to “Switch”.

The previous figure shows the “Network and Services” page for a Z-PASS2-S-R01, when the “Ethernet Mode” parameter is set to “LAN/WAN”.

The previous figure shows the “Network and Services” page for a S6001-RTU; it also applies to a Z-TWS4 and Z-PASS2-S (old version).

There is an important difference between the parameter values shown in this page and those shown in the “Main View” page: the former are configured values, whereas the latter are actual values.

To better explain this difference, let's consider the case when the DHCP parameter is set to ON; in the "Network and Services" page, you may see the 192.168.90.101 default value for the "IP Address" parameter, whereas the "Main View" page shows the actual IP Address, assigned by the DHCP server.

In the following table, all configuration parameters available in the page are listed, with a short explanation and the parameter default value for each of them.

Field	Meaning	Default value
NETWORK/Ethernet Mode	This parameter determines if the two Ethernet ports work as two fully separated network interfaces ("LAN/WAN") or as the ports of an Ethernet switch ("Switch"); depending on the value of this parameter, some other network parameters are hidden/shown or renamed as described below. This parameter is available only for Z-PASS2-S-R01, Z-PASS2-S-IO and Z-TWS4-IO products. For all other products, only "Switch" mode is available, hence the parameter is not shown.	LAN/WAN
Ethernet Mode = "Switch"		
NETWORK/DHCP	Flag to enable/disable the DHCP functionality on the Ethernet interface.	OFF
NETWORK/IP Address	IP address of the Ethernet interface (disabled when "DHCP" is set to "ON")	192.168.90.101
NETWORK/Network Mask	Network mask of the Ethernet interface (disabled when "DHCP" is set to "ON")	255.255.255.0
NETWORK/IP Address 2 Enable	Flag to enable/disable the second IP address on the Ethernet interface. Note that the second IP address can be enabled also when the DHCP functionality is active.	OFF
NETWORK/IP Address 2	Second IP address of the Ethernet interface	192.168.100.101
NETWORK/Network Mask 2	Second network mask of the Ethernet interface	255.255.255.0
Ethernet Mode = "LAN/WAN"		
NETWORK/DHCP on WAN	Flag to enable/disable the DHCP	ON

	functionality on the WAN Ethernet interface	
NETWORK/LAN IP Address	IP address of the LAN Ethernet interface	192.168.90.101
NETWORK/LAN Network Mask	Network mask of the LAN Ethernet interface	255.255.255.0
NETWORK/WAN IP Address	IP address of the WAN Ethernet interface (disabled when "DHCP on WAN" is set to "ON")	192.168.100.101
NETWORK/WAN Network Mask	Network mask of the WAN Ethernet interface (disabled when "DHCP on WAN" is set to "ON")	255.255.255.0
NETWORK/Default Gateway	Default Gateway IP address (disabled when DHCP functionality is enabled on any interface). When "Ethernet Mode" is set to "LAN/WAN", the Default Gateway shall be in the WAN subnet.	192.168.100.1 , for Z-TWS4-R0x and Z-PASS2-S-R0x (x=1,2) 192.168.90.1, for all other products
NETWORK/DNS Mode	Tells if the DNS Server shall be set statically (value: "Static") or dinamically assigned by the DHCP Server (value: "DHCP")	DHCP, for Z-TWS4-R0x and Z-PASS2-S-R0x (x=1,2) Static, for all other products
NETWORK/DNS Server	DNS server IP address (disabled when DHCP functionality is enabled on any interface and DNS Mode = DHCP)	192.168.100.1 , for Z-TWS4-R0x and Z-PASS2-S-R0x (x=1,2) 192.168.90.1, for all other products
NETWORK/IP Configuration from Discovery	Flag to enable/disable the possibility of changing some of the network configuration parameters by means of the SDD application (see chapter 6)	ON
WEB SERVER/Protocol	Protocol used to access the web pages: HTTP/HTTPS, HTTPS, HTTP	HTTP/HTTPS
WEB SERVER/HTTP Conf Port	TCP port to access the configuration pages, using HTTP protocol. Please note that if this parameter is set to 80 (standard HTTP port), the web user site won't be available anymore.	8080 Default URL for conf pages: **Errore. Riferimento a collegamento ipertestuale non valido.**
WEB SERVER/HTTP User Port	TCP port to access the user pages, using HTTP protocol.	80 Default URL for user pages: **Errore. Riferimento a**

		collegamento ipertestuale non valido.>
WEB SERVER/HTTPS Port	TCP port to access the configuration and user pages, using HTTPS protocol.	443 Default URL for conf pages: **Errore. Riferimento a collegamento ipertestuale non valido.** Default URL for user pages: **Errore. Riferimento a collegamento ipertestuale non valido.**
FILE TRANSFER/Protocol	Protocol used for File Transfer: FTP/SFTP, SFTP, FTP	FTP/SFTP
FTP Port	TCP Port for FTP protocol	21
SFTP Port	TCP Port for SFTP protocol	22
LOG FOLDER SHARING/Enable	Flag to enable/disable the sharing of the "/log" directory (by means of "Samba" service)	ON
PLC/Straton TCP Port	TCP port to connect to the Straton server	502
PLC/Straton Redundancy Enable	Flag to enable/disable the Straton Redundancy functionality	OFF
PLC/Straton Redundancy IP Address	IP address of the second Device used for Straton Redundancy	192.168.90.102
PLC/License Key	Key to enable/disable Energy Protocol functionalities in Straton (see paragraph 8.2)	1122334455667788 (dummy value)[11]
NETWORK REDUNDANCY/Enable	Flag to enable/disable the "Network Redundancy" functionality, that is using the Ethernet interface as the primary interface to access the Internet and the Mobile interface as the secondary interface, if the access through the primary interface becomes unavailable	OFF
NETWORK REDUNDANCY/Ping Address	IP Address used as ping destination to check if access to the Internet through the primary interface (Ethernet) is available. This address shall be different from the one set for "DNS Server"	8.8.4.4

[11] The correct License Key string is provided by Seneca.

	parameter, otherwise an error is shown.	
WATCHDOG/Enable	Flag to enable/disable the watchdog functionality	ON
WATCHDOG/Timeout (s)	Watchdog timeout, in seconds; when watchdog is enabled, if it's not refreshed for this amount of seconds, the system will be rebooted. Possible values are in the range [30..3600].	60
DEBUG LOGS/Enable	Flag to enable/disable the debug logs	OFF
COM1/Mode	Operating mode of the COM1 serial port; possible values: RS485, RS232, Z-MBUS (Meter Bus extension) RS232 and Z-MBUS parameters are available only for Z-TWS4-IO and Z-PASS2-S-IO products.	RS485

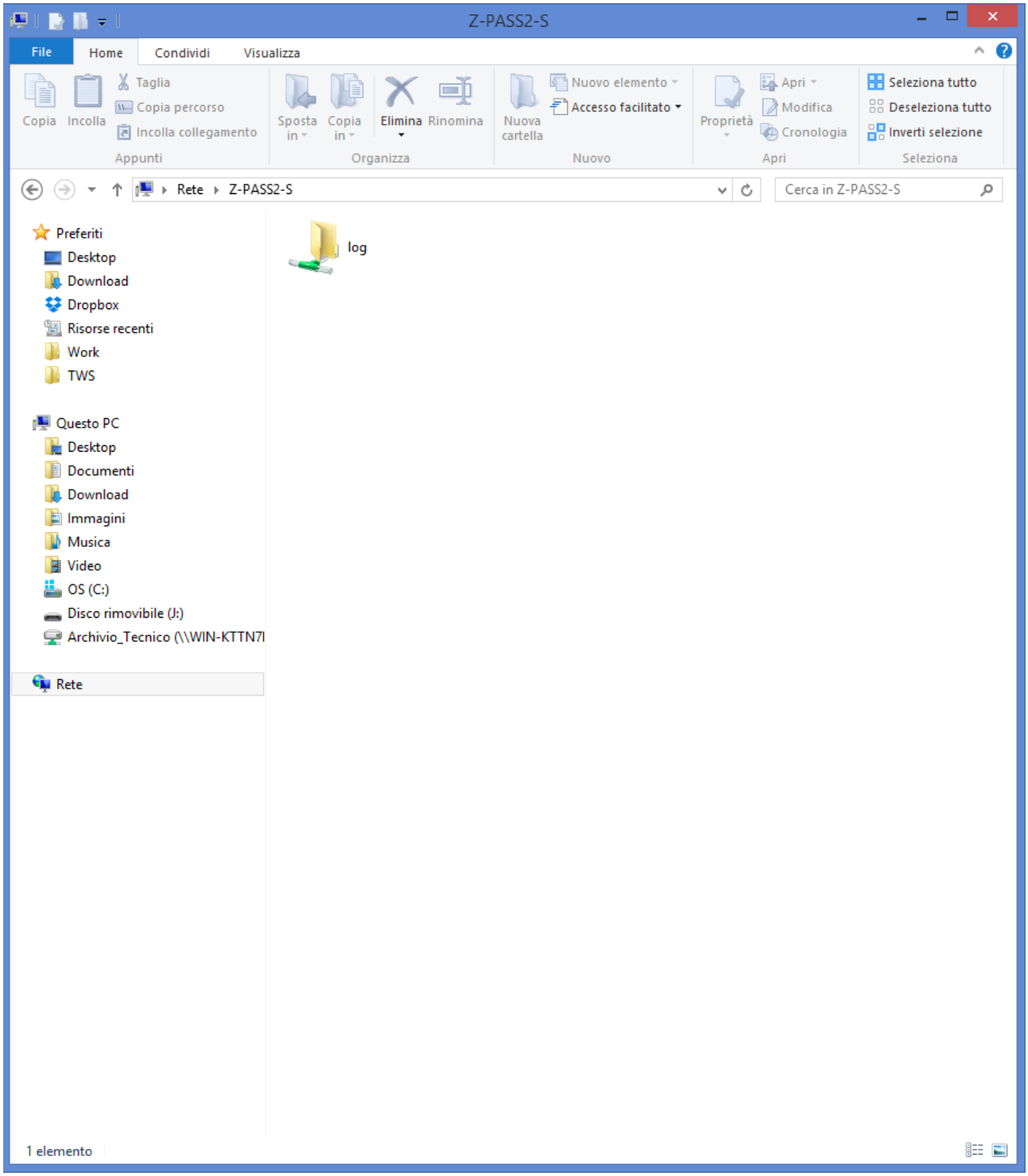
Some notes about the "DHCP" parameters:

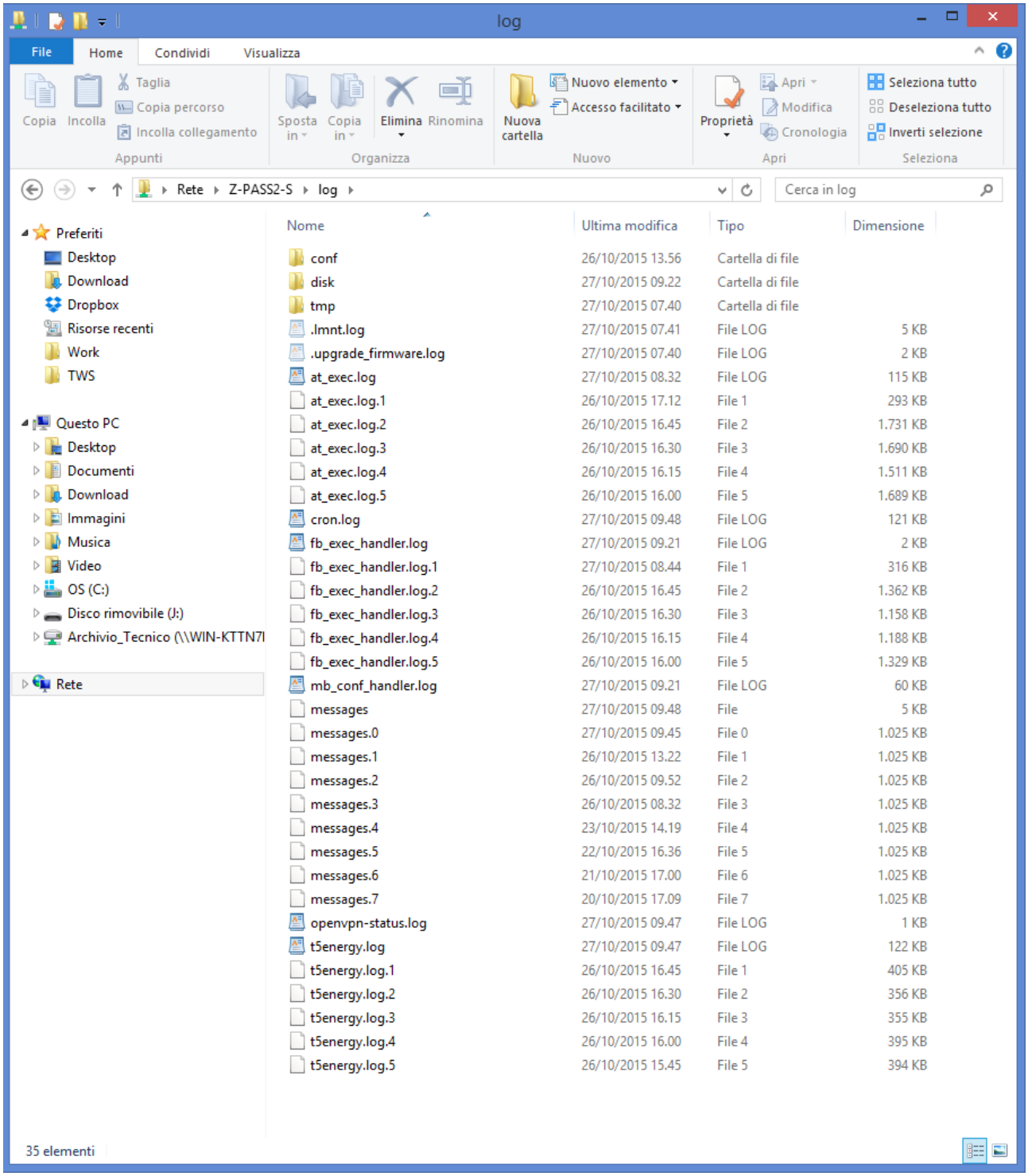
- the "DHCP" parameter can be set to "ON" only if the "DHCP Server" parameter of the "Router Configuration" page is set to "OFF" (see paragraph 19.1.5);
- only the "DHCP on WAN" parameter can be set to "ON".

You can change any of the above parameters; to apply the changes, press the "APPLY" button; as warned by the note on the page, only for some parameters, the parameter change requires rebooting the Device; these parameters are:

- NETWORK/Ethernet Mode
- WEB SERVER/Port
- WATCHDOG/Enable, only when changing ON -> OFF
- DEBUG LOGS/Enable, only when changing ON -> OFF

If the "LOG FOLDER SHARING/Enable" parameter is ON, on a Windows PC, you can directly access the "/log" directory, as shown in the following pictures (the sharing name is equal to the product name, without '-' character, that is "ZPASS2S", "ZTWS4" or "S6001RTU"):

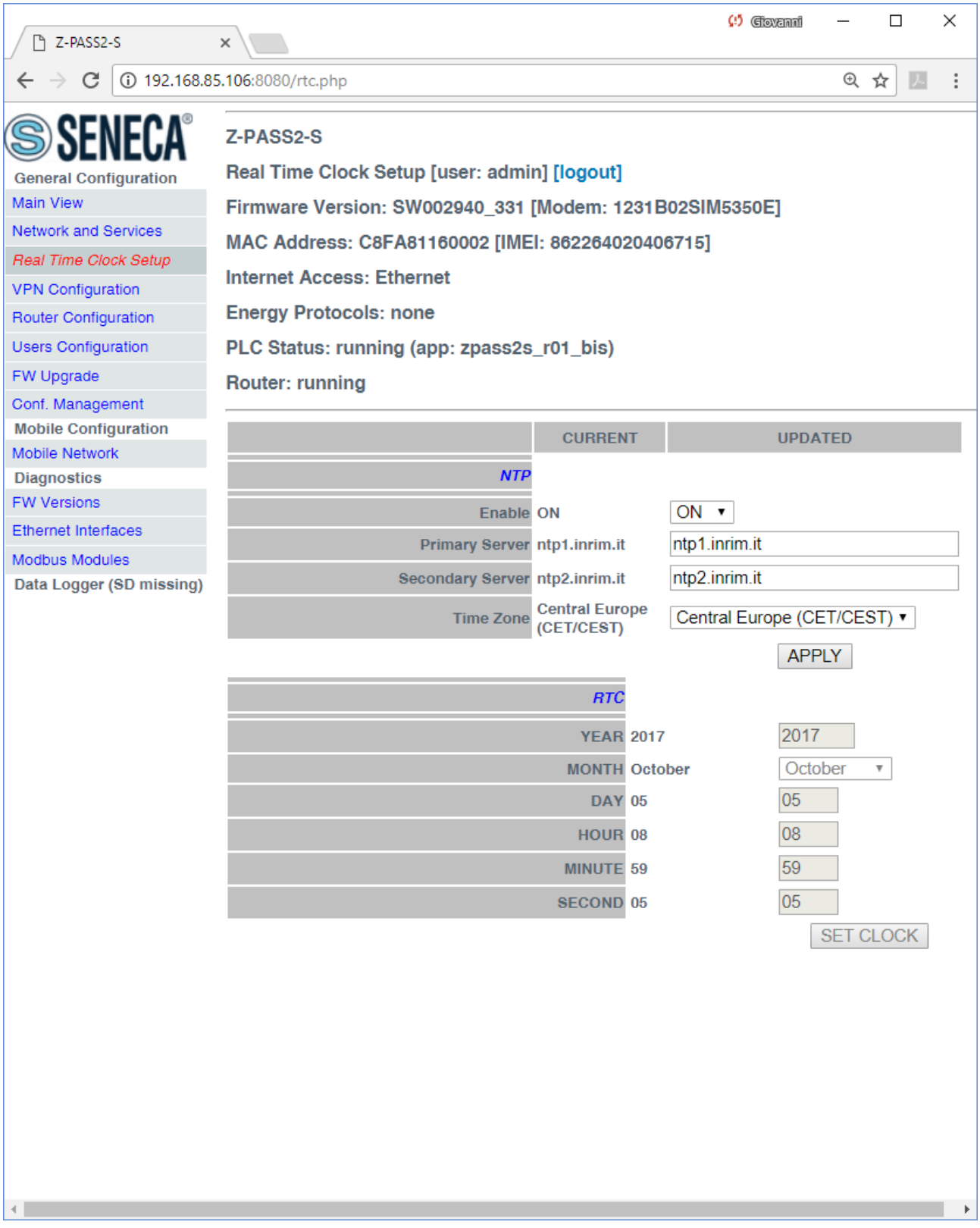

Z-PASS2-S
File
Home
Condividi
Visualizza
Copia
Incolla
Taglia
Copia percorso
Incolla collegamento
Appunti
Sposta in
Copia in
Elimina
Rinomina
Organizza
Nuova cartella
Nuovo elemento
Accesso facilitato
Nuovo
Proprietà
Apri
Modifica
Cronologia
Apri
Seleziona tutto
Deseleziona tutto
Inverti selezione
Seleziona
Rete
Z-PASS2-S
Cerca in Z-PASS2-S
Preferiti
Desktop
Download
Dropbox
Risorse recenti
Work
TWS
Questo PC
Desktop
Documenti
Download
Immagini
Musica
Video
OS (C:)
Disco rimovibile (J:)
Archivio_Tecnico (\\WIN-KTTN7
Rete
log
1 elemento



Depending on the LAN configuration, a login may be needed to access the shared folder; if so, use the credentials shown in the following figure (username: "\guest", password: "" [empty]).

19.1.3 Real Time Clock Setup

By clicking on the "Real Time Clock Setup" link, in the "General Configuration" menu, you come to the following page:



This page is made up of two sections: “NTP” and “RTC”.

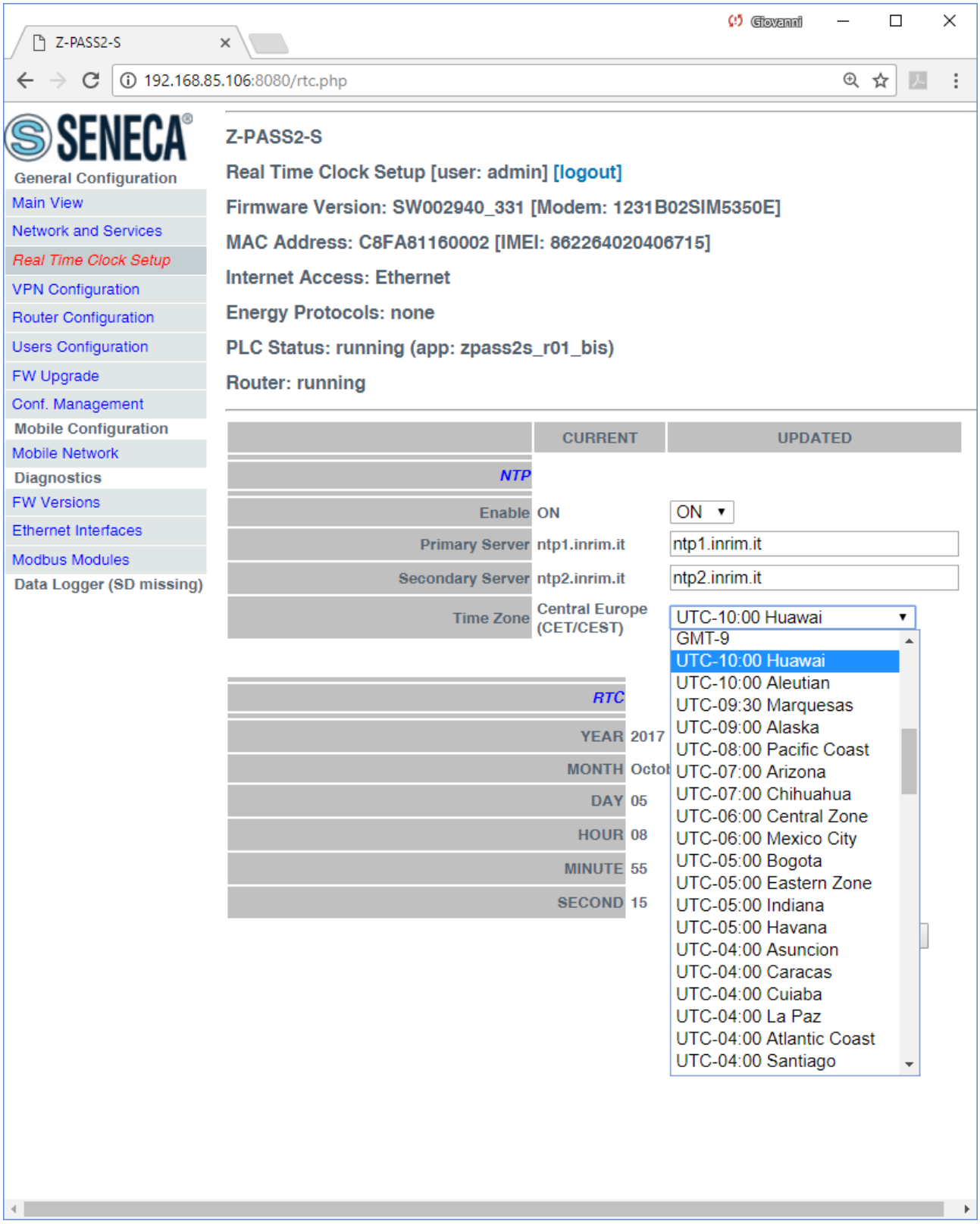
In the “NTP” section, you can change the parameters related to the Network Time Protocol and to the Time Zone, as listed in the following table:

Field	Meaning	Default value
NTP/Enable	Flag to enable/disable time synchronization by means of NTP protocol	ON
NTP/Primary Server	IP address or FQDN[12] of the Primary NTP Server	ntp1.inrim.it
NTP/Secondary Server	IP address or FQDN of the Secondary NTP Server	ntp2.inrim.it
NTP/Time Zone	Time Zone	Central Europe (CET/CEST)

When the "Time Zone" parameter is set to "Central Europe (CET/CEST)" value, the Device automatically enables (CEST) / disables (CET) the "Daylight Saving Time" setting.

A large number of Time Zones are available, as partially shown in the following figure:

[12] FQDN: Fully Qualified Domain Name, e.g.: "pool.ntp.org".



The “RTC” section of the page lets you manually change the Device date/time settings; since this makes sense only if NTP time synchronization is not enabled, when “NTP/Enable” parameter is “ON” the input fields and the “SET CLOCK” button are disabled and the parameters are only for viewing.

Instead, when “NTP/Enable” parameter is “OFF”, the input fields in the “NTP” section are still enabled; this lets you change and save the parameter values, even if they are not actually used.

19.1.4 VPN Configuration

By clicking on the “VPN Configuration” link, in the “General Configuration” menu, you come to the following page:

The page has a different layout depending on the value of the “VPN Mode” parameter, which can be “OpenVPN” or “VPN Box” (for an explanation of these values, see chapter 10).

19.1.4.1 OpenVPN

The page is made up of two sections: “VPN Files” and “VPN Configuration”.

The “VPN Files” section lets you load the files needed to configure Open VPN and establish a secure VPN connection; these files are described in the following.

19.1.4.1.1 Configuration File

This file shall contain all the information needed to configure the Open VPN behaviour; the main configuration options are[13]:

- if the Device shall act as a client or a server (typically, it will be a client)

[13] For more information about Open VPN configuration options, please refer to the OpenVPN web page (“openvpn.net”).

- the transport protocol (UDP or TCP)
- the server IP address/host name and port
- the files needed to perform authentication procedures
- etc.

This file has the *.ovpn* extension (in Windows systems) or *.conf* extension (in Linux systems); regardless of the original name, it will be renamed as *ovpn.conf* on the Device.

This is the only mandatory file, that is if this file has not been loaded on the Device, VPN can't be enabled.

As reminded in the web page, in options requiring a file argument, only the file name shall be given, with no path, as in the following example:

`ca ca.crt` **OK**

`ca /home/config/vpn/ca.crt` **KO !**

Other two important rules that shall be followed are:

- the "dev" option shall be: "`dev tun0`" or "`dev tap0`"
- the "log" option shall be omitted (so that, logs are written to syslog)

An example of a client configuration file is given in paragraph 19.1.4.1.7.

19.1.4.1.2 CA certificate

This file shall contain the Certification Authority (CA) certificate and has the *.crt* extension.

It is needed when the configuration file contains the *"ca"* option.

19.1.4.1.3 Client certificate

This file shall contain the client certificate and has the *.crt* extension.

It is needed when the configuration file contains the *"cert"* option.

19.1.4.1.4 Client key

This file shall contain the client key and has the *.key* extension.

It is needed when the configuration file contains the *"key"* option.

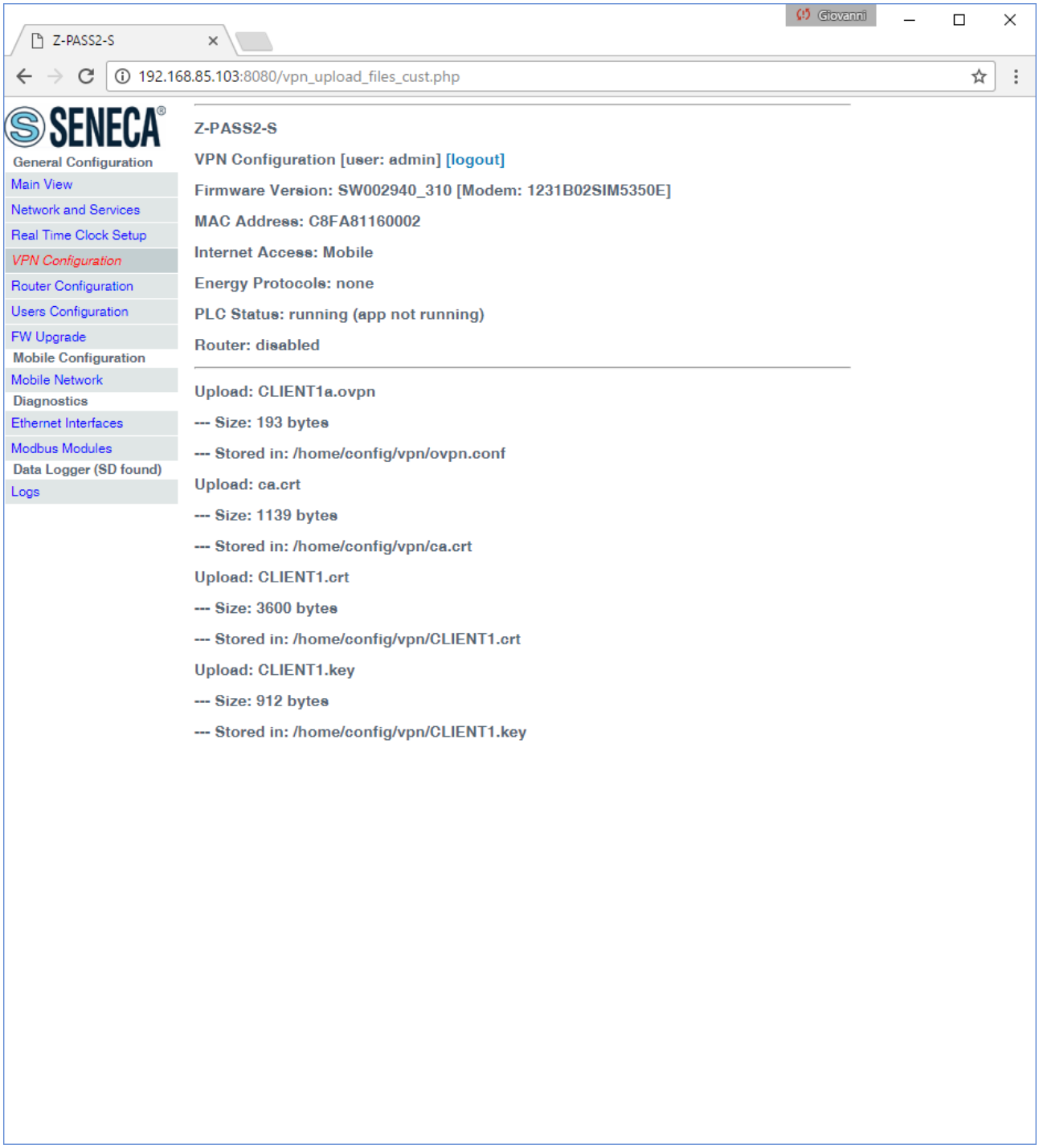
19.1.4.1.5 Additional file

This file can be of any type and may be needed for configuration options other than *"ca"*, *"cert"* and *"key"*.

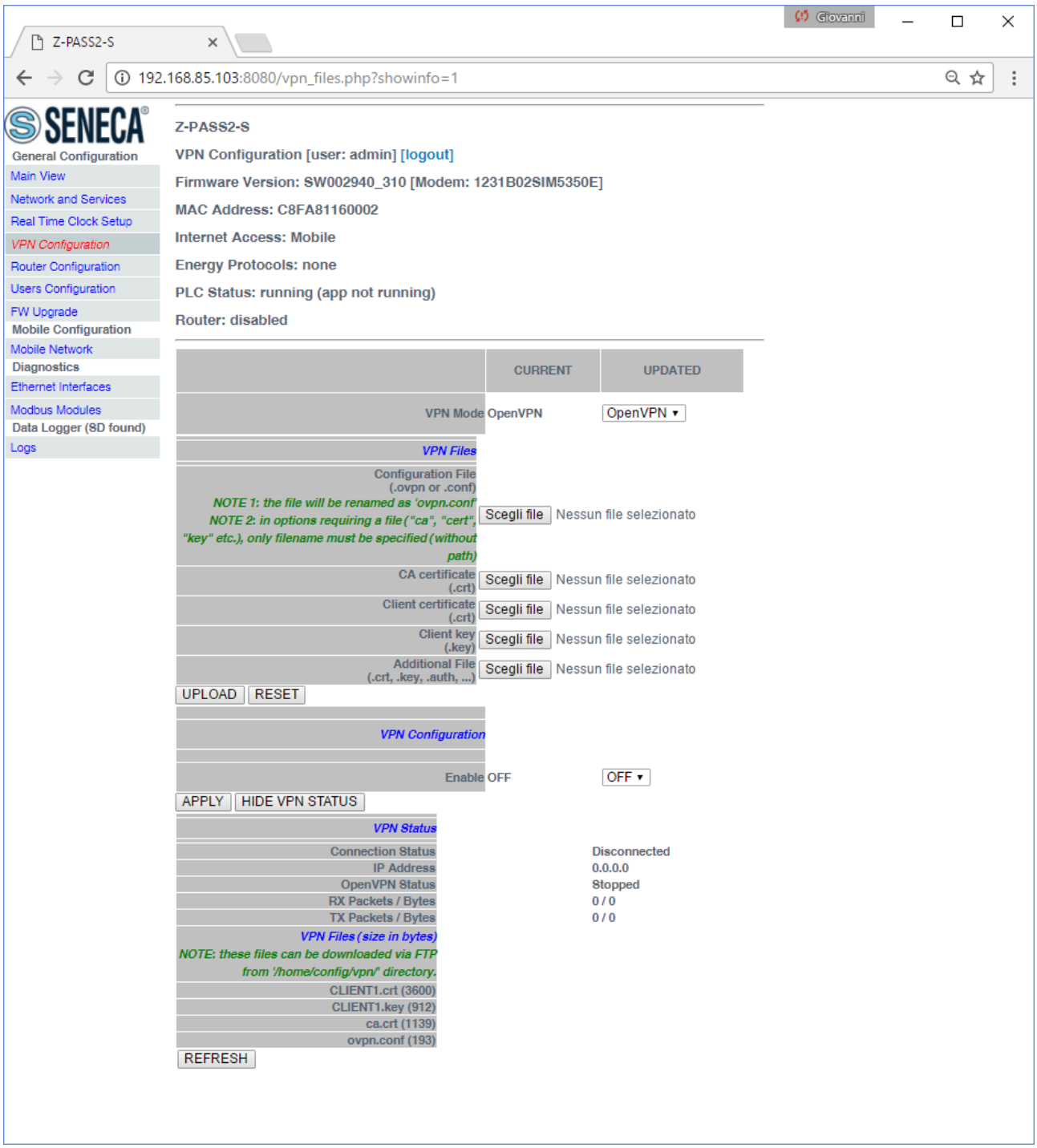
More than one additional file can be loaded.

You can browse your PC to select the above files and send them to the Device by pressing the "UPLOAD" button.

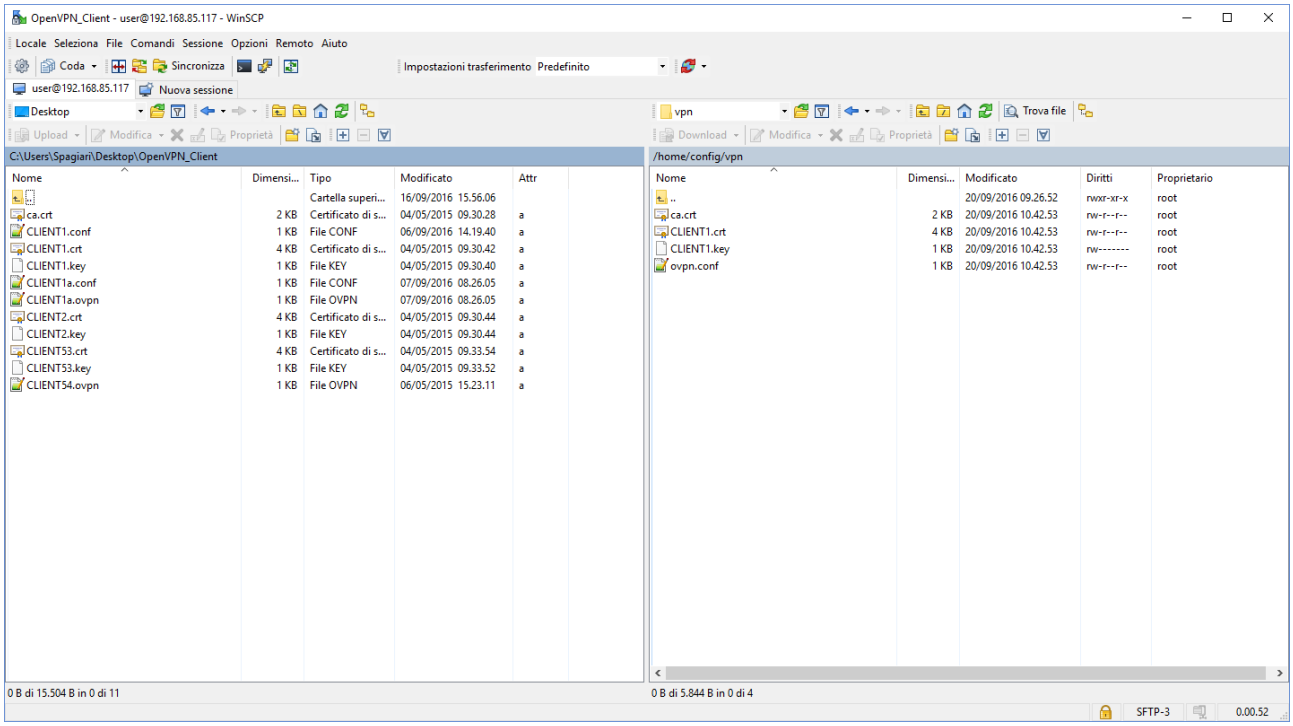
Once the upload is done, a result page is shown like in the following figure.


Giovanni
Z-PASS2-S
192.168.85.103:8080/vpn_upload_files_cust.php
SENECA
General Configuration
Main View
Network and Services
Real Time Clock Setup
VPN Configuration
Router Configuration
Users Configuration
FW Upgrade
Mobile Configuration
Mobile Network
Diagnostics
Ethernet Interfaces
Modbus Modules
Data Logger (SD found)
Logs
Z-PASS2-S
VPN Configuration [user: admin] [logout]
Firmware Version: SW002940_310 [Modem: 1231B02SIM5350E]
MAC Address: C8FA81160002
Internet Access: Mobile
Energy Protocols: none
PLC Status: running (app not running)
Router: disabled
Upload: CLIENT1a.ovpn
--- Size: 193 bytes
--- Stored in: /home/config/vpn/ovpn.conf
Upload: ca.crt
--- Size: 1139 bytes
--- Stored in: /home/config/vpn/ca.crt
Upload: CLIENT1.crt
--- Size: 3600 bytes
--- Stored in: /home/config/vpn/CLIENT1.crt
Upload: CLIENT1.key
--- Size: 912 bytes
--- Stored in: /home/config/vpn/CLIENT1.key

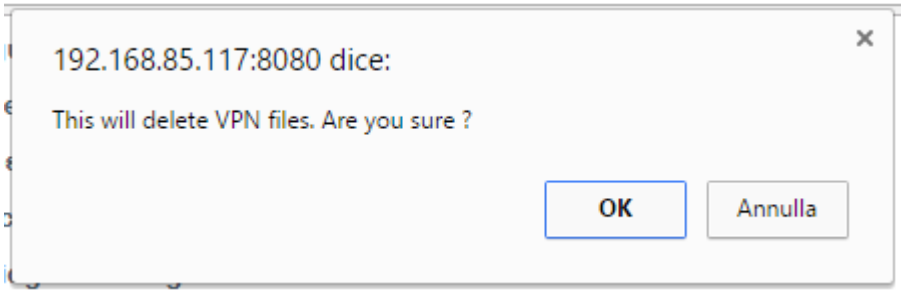
You can check which VPN files are stored on the Device by clicking on the “SHOW VPN STATUS” button, as shown in the following figure (remember that the configuration file is renamed as “ovpn.conf”):



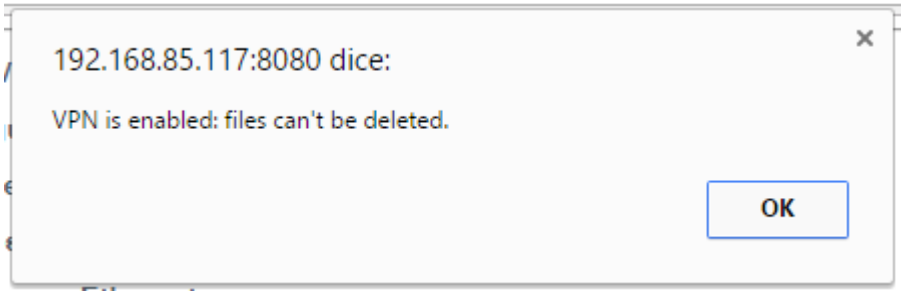
As reminded by the web page, the VPN files can be downloaded from the Device, if needed, via FTP/SFTP; they can be found in the */home/config/vpn* directory, as shown in the following figure.



Is is possible to clear all the VPN files, by clicking on the “RESET” button; a pop-up will appear, requiring a confirmation:



If VPN is enabled, the user is not allowed to delete VPN files, as warned by the following pop-up:

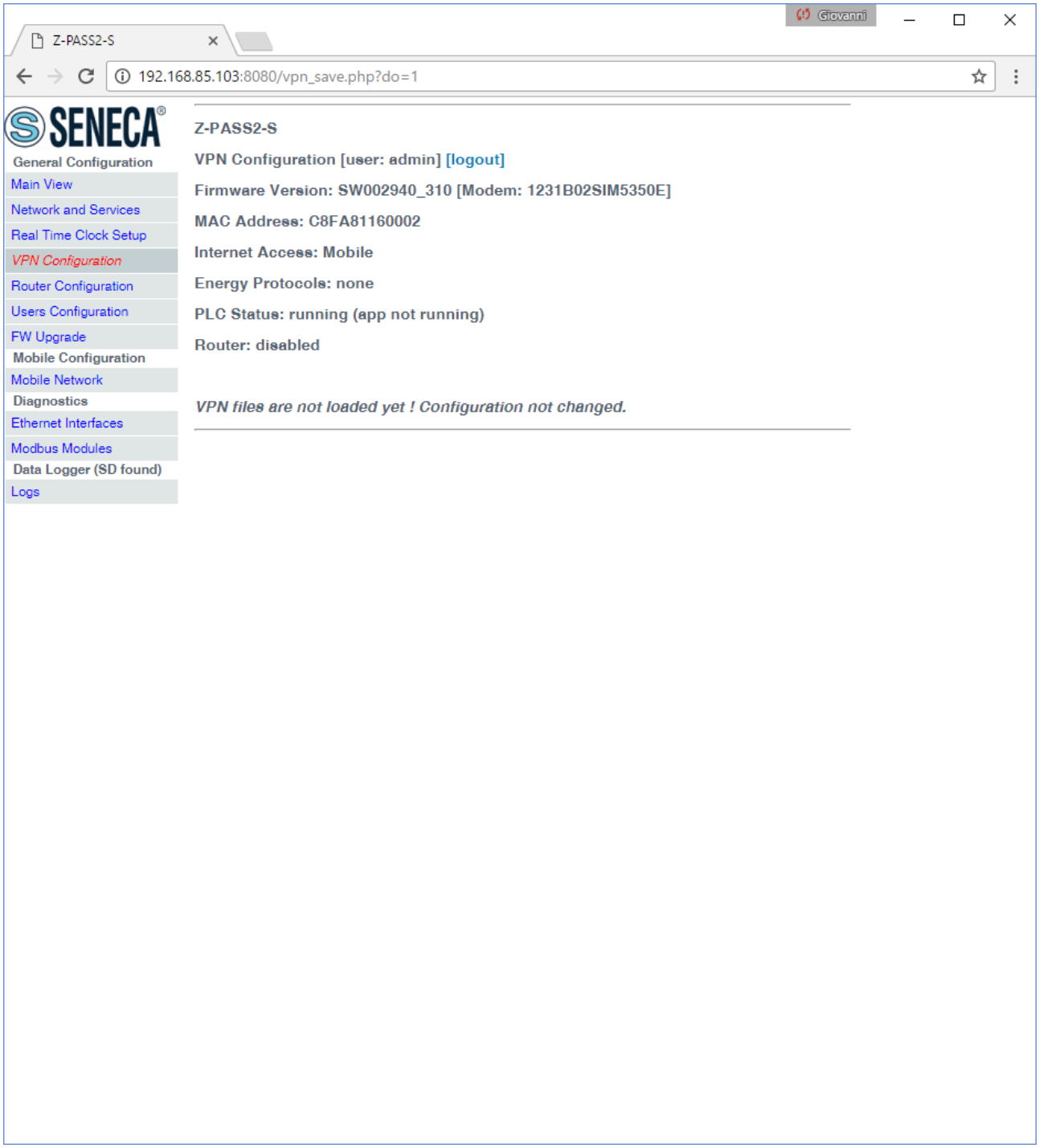


In the “VPN Configuration” section, there is only one parameter, as described in the following table:

Field	Meaning	Default value
VPN Configuration/Enable	Flag to enable/disable the VPN connectivity; when enabled, the	OFF

	Device will run the Open VPN process with the loaded configuration	

As already told above, if you try to enable the VPN connectivity, but no configuration file has been uploaded to the Device yet, an error is given as shown in the following figure:

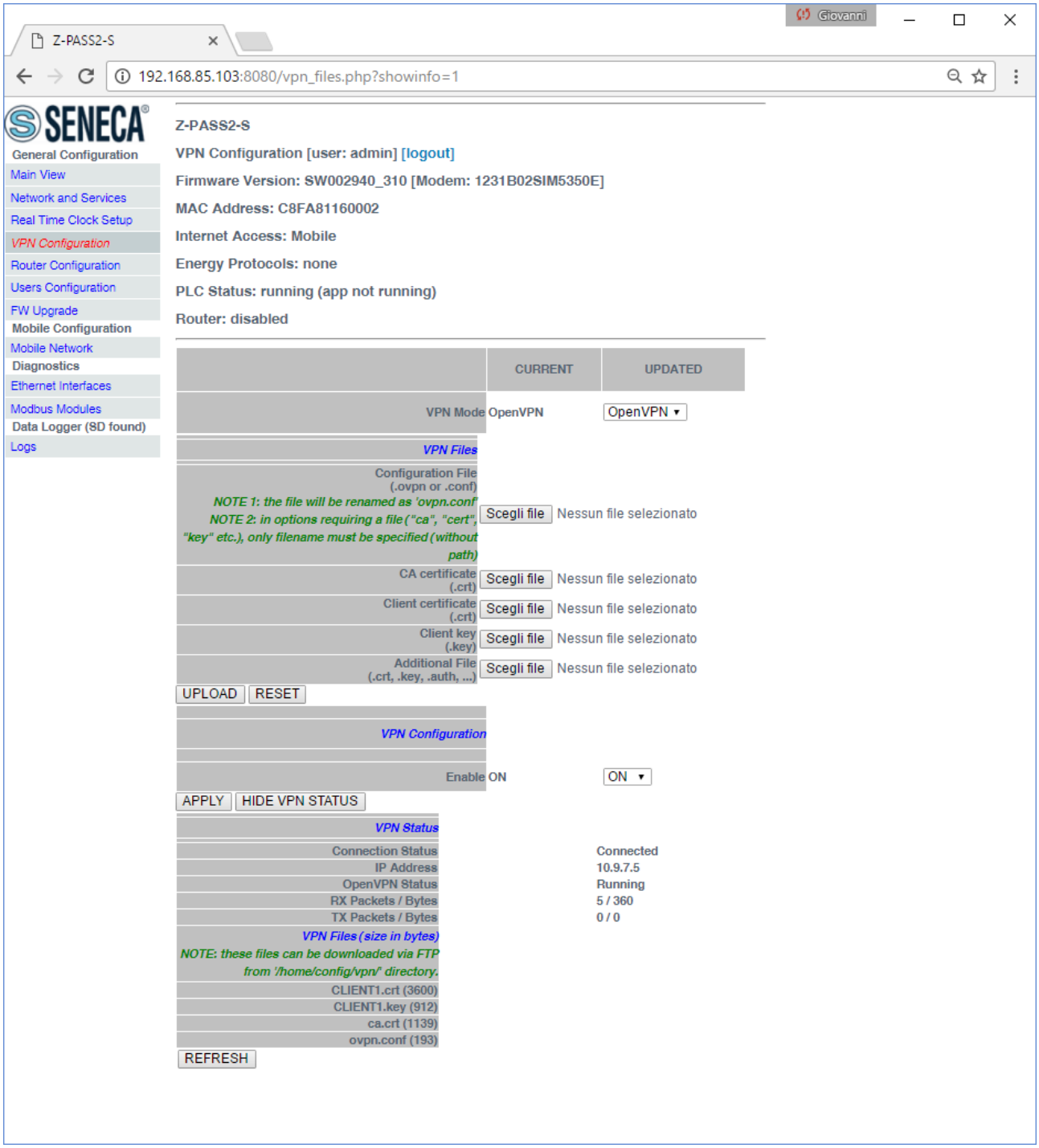


When you click on the “SHOW VPN STATUS” button, a third section appears, named “VPN Status”, showing:

- the VPN “Connection Status” (i.e.: “Disconnected” or “Connected”)

- the IP address assigned to the VPN interface when “Connected”, the “dummy” IP address “0.0.0.0” when “Disconnected”
- the “OpenVPN Status” (i.e.: “Stopped” or “Running”)
- the number of packets/bytes received from the VPN interface, when connected; “0/0” when disconnected
- the number of packets/bytes sent to the VPN interface, when connected; “0/0” when disconnected
- the VPN files stored on the Device (see above)

as shown in the following couple of figures:



An important status information is given by the “OpenVPN Status” field; if VPN is enabled (“ON”), but this status is “Stopped”, Open VPN process could not be correctly started: probably, the configuration file contains some errors or, maybe, some options not supported by the Device Open VPN implementation.

You can refresh the VPN status, by clicking on the “REFRESH” button.

Finally, you can hide the “VPN Status” section, by clicking on the “HIDE VPN STATUS” button.

19.1.4.1.6 OpenVPN Server configuration file

This paragraph gives an example of OpenVPN server configuration; this is the server configuration typically used with Z-TWS4/Z-PASS2-S/S6001-RTU devices.

```
port 1194
proto udp
dev tun
ca ca.crt
cert server.crt
key server.key
dh dh1024.pem
server 10.9.7.0 255.255.255.0
ifconfig-pool-persist ipp.txt
client-config-dir ccd
client-to-client
keepalive 10 120
comp-lzo
persist-key
persist-tun
status openvpn-status.log
verb 3
```

19.1.4.1.7 OpenVPN Client configuration file

This paragraph gives an example of OpenVPN client configuration; this is the client configuration typically loaded on Z-TWS4/Z-PASS2-S/S6001-RTU devices.

```
client
dev tun
port 1194
proto udp
remote 2.192.5.105 1194
nobind
ca ca.crt
cert tws4.crt
key tws4.key
comp-lzo
persist-key
persist-tun
script-security 3 system
verb 3
```

19.1.4.1.8 LED signalling (Z-PASS2-S-R01/Z-PASS2-S-IO/Z-TWS4-IO)

In Z-PASS2-S-R01/Z-PASS2-S-IO/Z-TWS4-IO products, when VPN functionality is enabled in “OpenVPN” mode, the “SERV” and “VPN“ LEDs give the following status information (see chapter 5):

LED	Status	Meaning
VPN Yellow	ON	VPN connection is working properly
	Blinking	VPN connection is not working properly

	OFF	VPN functionality is disabled
SERV Green	-	Not used

19.1.4.2 VPN Box

The page contains only ony section: “VPN Box”, as shown in the following figure.

The “VPN Box” section contains the following parameters:

Field	Meaning	Default value
VPN BOX/Enable	Flag to enable/disable the “VPN Box” functionality, that is the procedure/protocol that lets the	OFF

	Device setup the VPN, by interacting with the “VPN Box” server (see “VPN Box User Manual”)	
VPN BOX/Server	IP address or FQDN of the “VPN Box” server	192.168.90.1
VPN BOX/Password	Password to access the “VPN Box” server	seneca
VPN BOX/Tag Name	Mnemonic name used to uniquely identify the Device; if the default (“zpass2s”) value is left, the Device will register as “zpass2s_<MACAddress>” or “ztws4_<MACAddress>” on the VPN Box	zpass2s

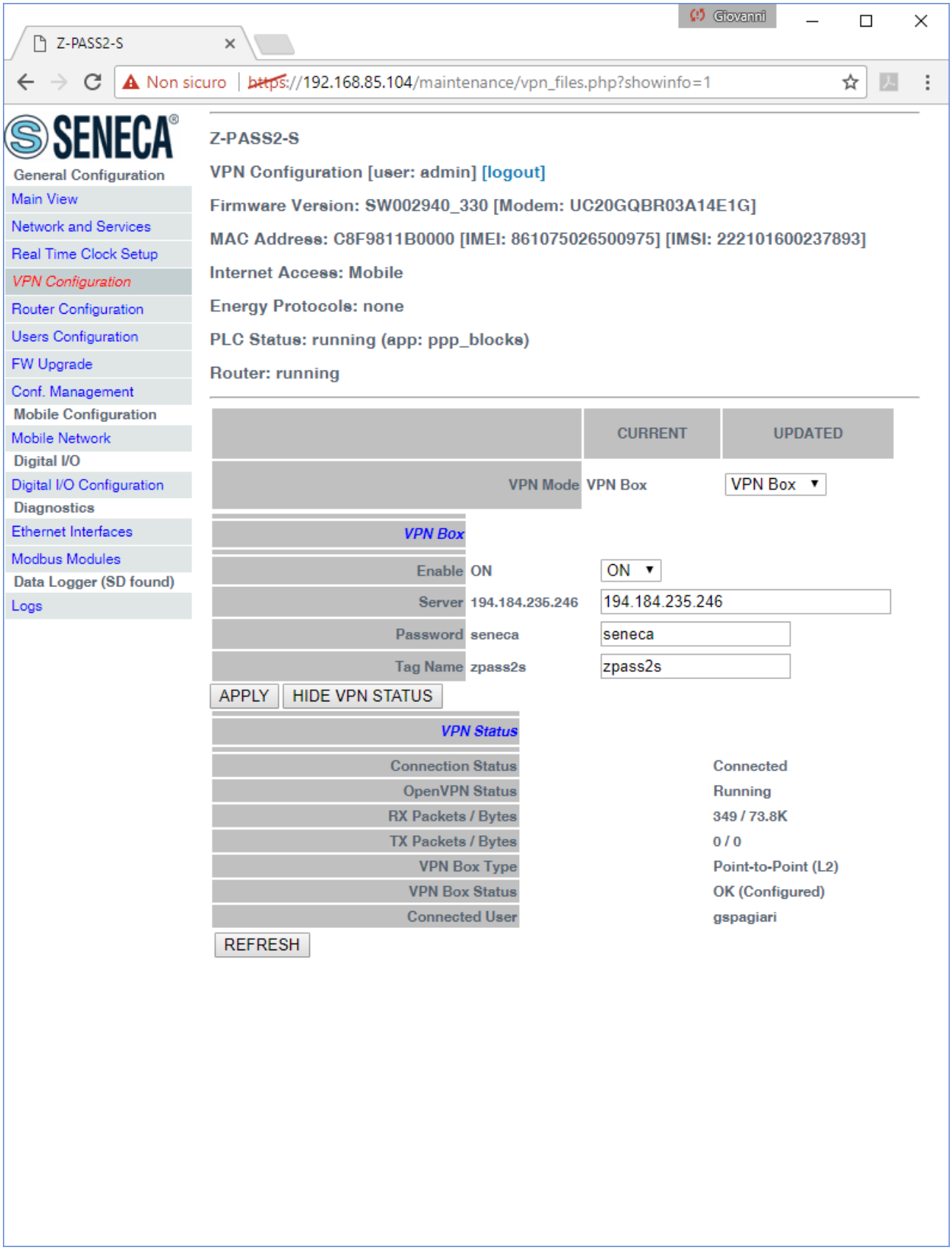
When you click on the “SHOW VPN STATUS” button, a new section appears, named “VPN Status”, showing:

- the VPN “Connection Status” (i.e.: “Disconnected” or “Connected”)
- the IP address assigned to the VPN interface when “Connected”, the “dummy” IP address “0.0.0.0” when “Disconnected”; this row is not shown for “Point-to-Point (L2)” VPN Box, since no IP address is assigned to the VPN interface
- the “OpenVPN Status” (i.e.: “Stopped” or “Running”)
- the number of packets/bytes received by the VPN interface, when connected; “0/0” when disconnected
- the number of packets/bytes sent by the VPN interface, when connected; “0/0” when disconnected
- the “VPN Box Type”, which can be “Point-to-Point”, “Point-to-Point (L2)” or “Single LAN”, if VPN Box is enabled
- the “VPN Box Status”, if VPN Box is enabled
- the username of the connected user, if any

as shown in the following three figures:


Giovanni
Z-PASS2-S
192.168.85.103:8080/vpn_files.php?showinfo=1
SENECA
General Configuration
Main View
Network and Services
Real Time Clock Setup
VPN Configuration
Router Configuration
Users Configuration
FW Upgrade
Mobile Configuration
Mobile Network
Diagnostics
Ethernet Interfaces
Modbus Modules
Data Logger (SD found)
Logs
Z-PASS2-S
VPN Configuration [user: admin] [logout]
Firmware Version: SW002940_310 [Modem: 1231B02SIM5350E]
MAC Address: C8FA81160002
Internet Access: Ethernet
Energy Protocols: none
PLC Status: running (app not running)
Router: disabled
CURRENT
UPDATED
VPN Mode
VPN Box
VPN Box
VPN Box
Enable
OFF
OFF
Server
192.168.90.1
192.168.90.1
Password
seneca
seneca
Tag Name
zpass2s
zpass2s
APPLY
HIDE VPN STATUS
VPN Status
Connection Status
Disconnected
IP Address
0.0.0.0
OpenVPN Status
Stopped
RX Packets / Bytes
0 / 0
TX Packets / Bytes
0 / 0
REFRESH


Giovanni
Z-PASS2-S
192.168.85.103:8080/vpn_files.php?showinfo=1
SENECA
General Configuration
Main View
Network and Services
Real Time Clock Setup
VPN Configuration
Router Configuration
Users Configuration
FW Upgrade
Mobile Configuration
Mobile Network
Diagnostics
Ethernet Interfaces
Modbus Modules
Data Logger (SD found)
Logs
Z-PASS2-S
VPN Configuration [user: admin] [logout]
Firmware Version: SW002940_310 [Modem: 1231B02SIM5350E]
MAC Address: C8FA81160002
Internet Access: Ethernet
Energy Protocols: none
PLC Status: running (app not running)
Router: running
CURRENT
UPDATED
VPN Mode
VPN Box
VPN Box
VPN Box
VPN Box
Enable
ON
ON
Server
194.184.235.246
194.184.235.246
Password
laboratorio
laboratorio
Tag Name
zpass2sr01
zpass2sr01
APPLY
HIDE VPN STATUS
VPN Status
Connection Status
Connected
IP Address
10.9.0.1
OpenVPN Status
Running
RX Packets / Bytes
26 / 3.3K
TX Packets / Bytes
31 / 26.1K
VPN Box Type
Point-to-Point
VPN Box Status
OK (Configured)
REFRESH



For an explanation of the differences between a “Single LAN” VPN and a “Point-to-Point” VPN, see chapter 10.

The “VPN Box Status” string has the following format:

Result (Status)

The following table gives a short explanation of the possible “Result” and “Status” strings:

Result	Status	Meaning
Error (Unexpected response)		A response code has been received that is not handled by the Device (it should never occur)
Error (No response from VPN Box)		No response has been received from the VPN Box (response timeout); this is normally due to connectivity problems
Error (Invalid response from VPN Box)		A response has been received whose content is not valid for the Device (it should never occur)
Error (Wrong password)		The password set on the Device is wrong
Error (License Limit Reached)		The maximum number of devices allowed by the license are already registered on VPN Box
Error (VPN Box not configured)		The VPN Box has not been configured yet
Error (Generic error)		A generic error has occurred on the VPN Box
OK		The Device has just been registered on the VPN Box
OK	New	The Device is registered on the VPN Box, but it is not configured yet (“Single LAN” only)
OK	Configuration updated	The Device configuration has just been updated
OK	Configured	The Device is properly configured and available for VPN connection
OK	Ban	The Device has been banned
OK	Not found	The Device is unknown for the VPN Box; this happens when Device registration is deleted on the VPN Box
OK	Unknown	The Device has an “unknown” status in the VPN Box (it should never occur)
OK	Not bound	The “tunnel” between the Device and the VPN Box is not up; this may occur when the tunnel port is blocked (“not open”) in the ADSL router on the VPN Box side (“Point-to-Point” only)
OK	Unexpected status	A status code has been received that is not handled by the Device (it should never occur)

You can refresh the VPN status, by clicking on the “REFRESH” button.

Finally, you can hide the “VPN Status” section, by clicking on the “HIDE VPN STATUS” button.

19.1.4.2.1 LED signalling (Z-PASS2-S-R01/Z-PASS2-S-IO/Z-TWS4-IO)

In Z-PASS2-S-R01/Z-PASS2-S-IO/Z-TWS4-IO products, when VPN functionality is enabled in “VPN Box/Single LAN” mode, the “SERV” and “VPN“ LEDs give the following status information (see chapter 5):

LED	Status	Meaning
VPN Yellow	ON	VPN connection is working properly

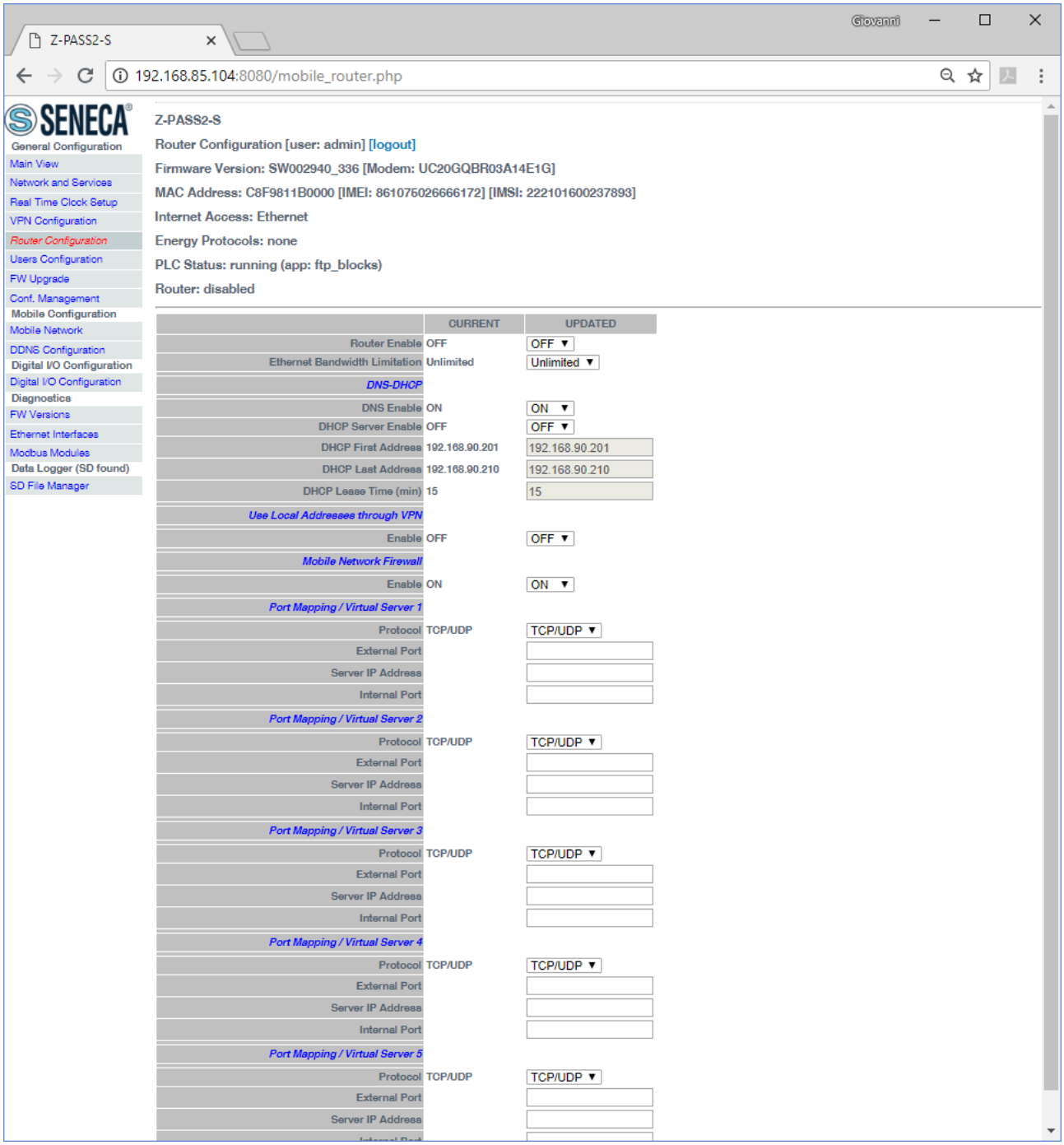
	Blinking OFF	VPN connection is not working properly The Device has not been configured by the VPN Box yet or VPN Box functionality is disabled
SERV Green	ON Blinking OFF	VPN Box “SERVICE” connection is working properly VPN Box “SERVICE” connection is not working properly VPN Box functionality is disabled

Similarly, when VPN functionality is enabled in “VPN Box/Point-to-Point” mode, the “SERV” and “VPN“ LEDs give the following status information (see chapter 5):

LED	Status	Meaning
VPN Yellow	ON OFF	A VPN client is connected to the Device No VPN client is connected to the Device or VPN Box functionality is disabled
SERV Green	ON Blinking OFF	VPN Box “SERVICE” connection is working properly VPN Box “SERVICE” connection is not working properly VPN Box functionality is disabled

19.1.5 Router Configuration

By clicking on the “Router Configuration” link, in the “General Configuration” menu, you come to the following page:



In this page, you can change the parameters related to the Router functionality.

First, you have a set of general parameters, as listed in the following table:

Field	Meaning	Default value
Router Enable	Flag to enable/disable the Router functionality	OFF
Ethernet Bandwidth Limitation	This parameter can be used to limit the bandwidth on the ethernet interfaces; this may be needed to avoid overloading the CPU, when a	Unlimited

	large amount of data is forwarded from one interface to the other (LAN ↔ WAN). Since this does not occur when the two ethernet interfaces work in "switch" mode, the parameter is not shown when "Ethernet Mode" parameter is set to "Switch" (see paragraph 19.1.2). Possible values are: Unlimited 20 Mbit/s 10 Mbit/s 1 Mbit/s	
DNS Enable	Flag to enable/disable the DNS forwarding service	ON
DHCP Server Enable	Flag to enable/disable the DHCP service (DHCP server) NOTE: this parameter can be set to "ON" only if the "DHCP" parameter of the "Network and Services" page is set to "OFF".	OFF
DHCP First Address DHCP Last Address	These parameters define the range of IP addresses assigned by the DHCP server to requesting clients	192.168.90.201 192.168.90.210
DHCP Lease Time (min)	Validity period for the IP address assignment, in minutes. Possible values are in the range [1..60].	15

Then, you have the parameter shown in the following table.

Field	Meaning	Default value
Use Local Addresses Through VPN	Flag to enable/disable the access to the Device and other devices which are in the Device LAN by using their local (LAN) IP addresses	OFF

Then, you have another important parameter, which is shown in the following table.

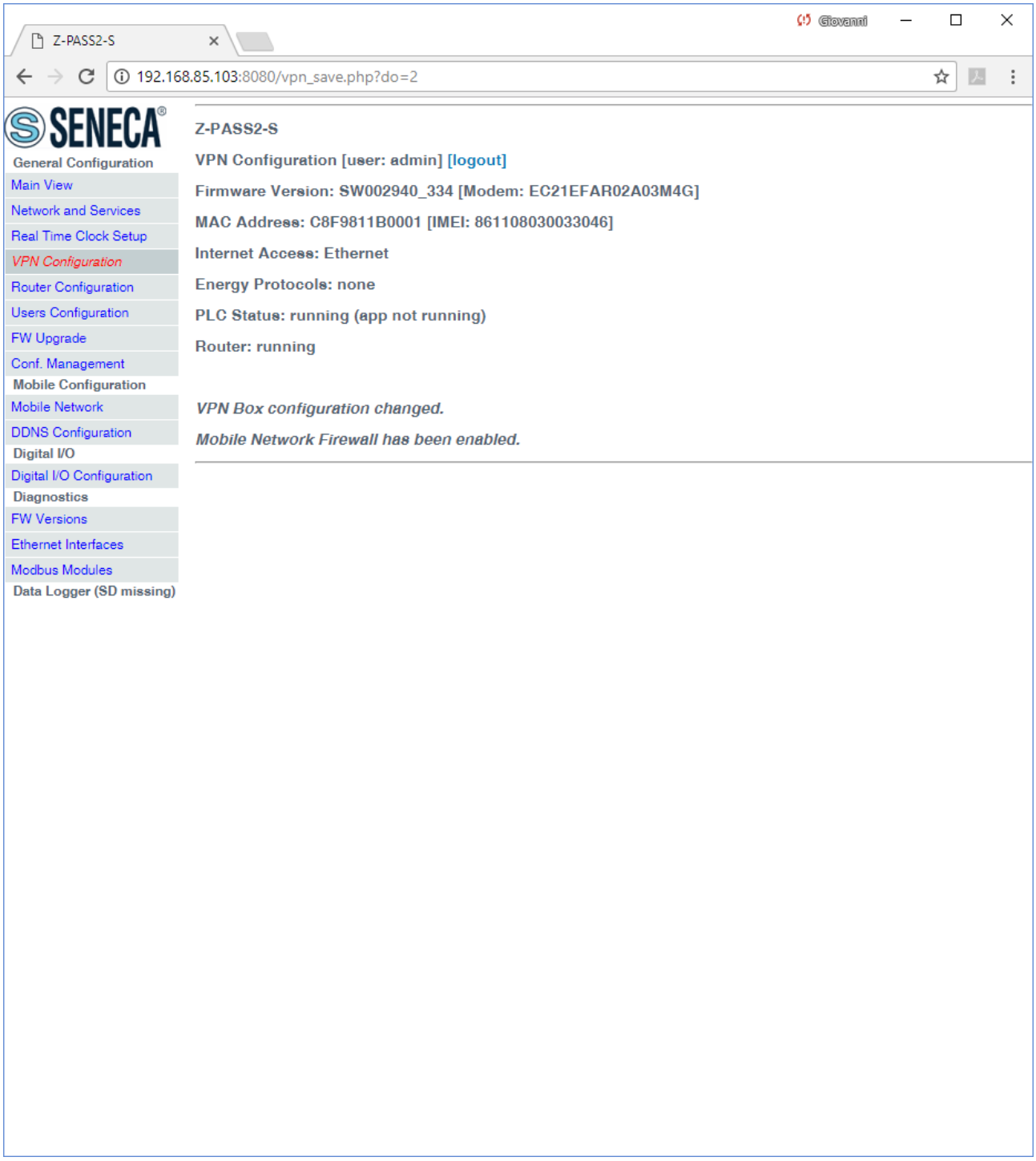
Field	Meaning	Default value
Mobile Network Firewall/Enable	Flag to enable/disable the "Mobile Network Firewall", that is disable/enable access to the Device and other devices which are in the Device LAN, by using the IP address	ON

	assigned to the Mobile Network (3G) interface. To open a port in the firewall, a "Port Mapping / Virtual Server" rule shall be defined.	

The above parameter shall be set to ON, to protect the Device against undesired (maybe malicious) accesses.

This is the only parameter in the "Router Configuration" page that is working also when the Router functionality is disabled (Router Enable = OFF).

It is important to note that, when the VPN is activated (see 19.1.4 paragraph), the parameter is automatically set to ON, as warned by the message shown in the following figure.



Finally, there are 5 sections which let you define up to 5 “Port Mapping” rules (also known as “Virtual Servers”); in each section, the available parameters are the following:

Field	Meaning	Default value
Protocol	This parameter defines the transport protocol (or kind of port) which is affected by the rule: TCP, UDP or both	TCP/UDP
External Port	TCP or UDP port which a packet was	*Empty*

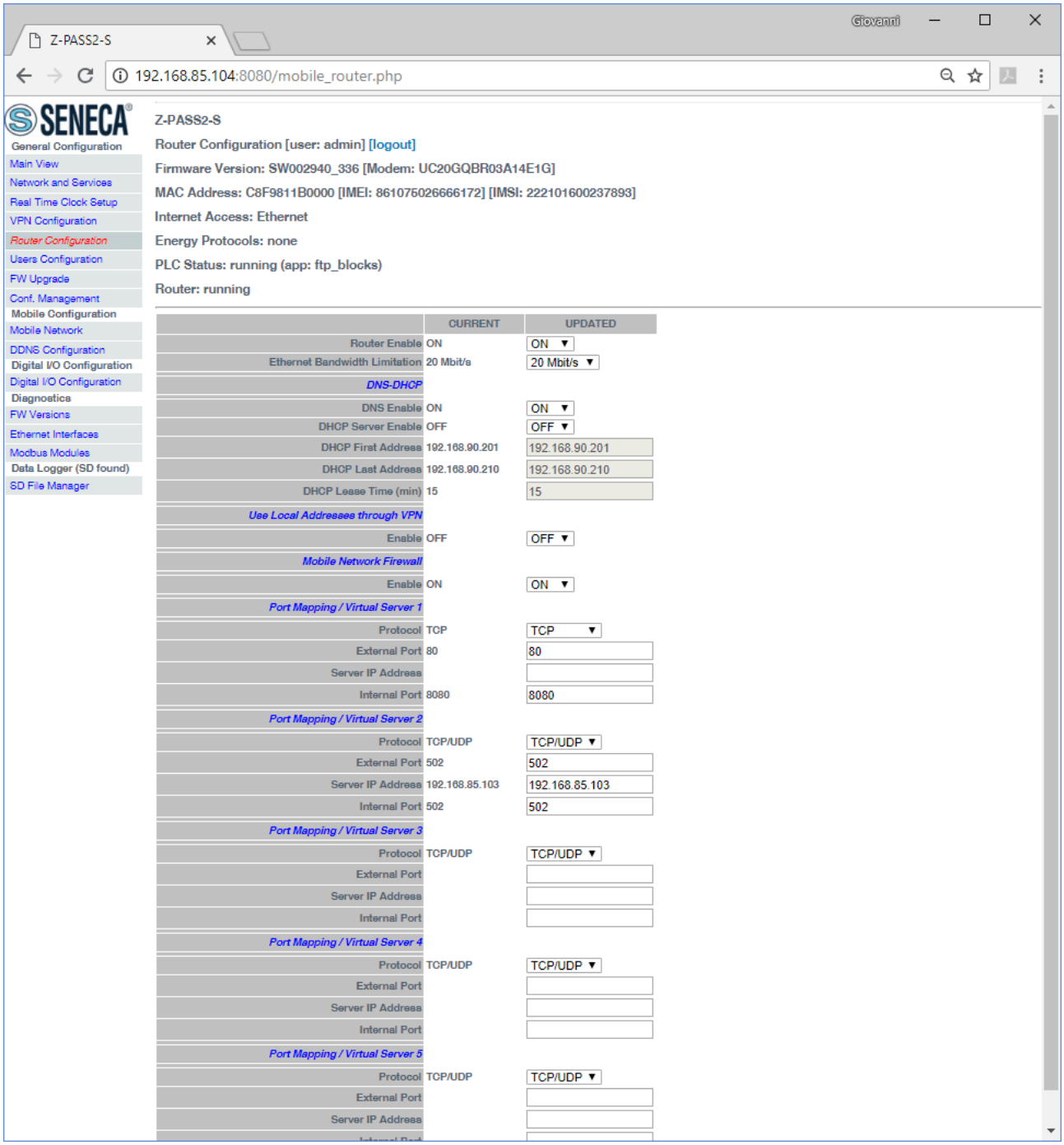
	originally sent to	
Server IP Address	IP address which the received packet is forwarded to	*Empty*
Internal Port	TCP or UDP port which the received packet is forwarded to	*Empty*

If Router is left disabled (Router Enabled = OFF), you can still change parameters; changes will be saved without actually applying them (except for the “Mobile Network Firewall” parameter, as told before); the following message will be given, after clicking the “APPLY” button:

If you try to enable the DHCP server functionality (DHCP Server Enable = ON), but the “DHCP First Address” and “DHCP Last Address” parameters define an address range that is not congruent with the Ethernet configuration (IP address and network mask), an error is given, as shown in the following figure:

As already told before, the Router configuration page lets you define up to 5 “Port Forwarding” rules or “Virtual Servers”.

An example is given in the following figure:



In this example, 2 rules have been set:

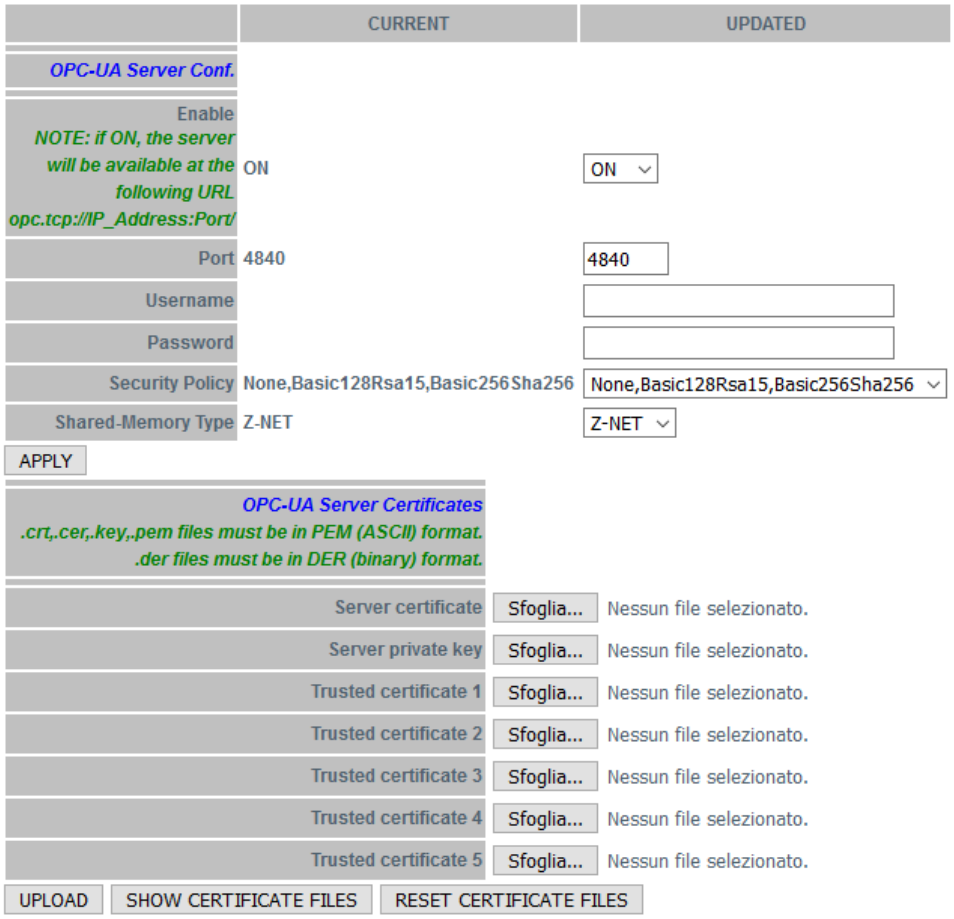
- the first rule tells the Device that any TCP packet received on the 80 (HTTP) port has to be forwarded to the 8080 port, leaving the original destination IP address unchanged; so, this rule lets you access the Device configuration web site on the standard HTTP port; however, by doing this, the access to the custom user's pages won't be possible anymore !
- the second rule tells the Device that any TCP or UDP packet received on the 502 port (which is often used for Modbus TCP protocol) shall be forwarded to the 192.168.85.103 IP address (which corresponds to another device) on the same (502) destination port.

Another important aspect of "Port Mapping / Virtual Server" rules is that they let define which ports are open in the "Mobile Network Firewall"; for example, if you want to connect to the web configuration site

and to the SSH console, through the public IP address assigned to the 3G interface, the 8080 and 22 TCP ports shall be open; this can be done as shown in the following figure.

19.1.6 OPC UA Server Configuration

By clicking on the “OPC UA Server Conf” link, in the “General Configuration” menu, you come to the following page:



In this page, you can set the parameters related to the OPC Unified Architecture (OPC UA), as listed in the following table:

Field	Meaning	Default value
Enable	Enable or not	OFF
Port	The server port to use	4840
Username	The username provided with the service subscription	empty
Password	The password provided with the service subscription	empty
Security Policy	Select the security policy to use (support policies are: None Basic128Rsa15 / Sign Basic128Rsa15 / Sign & Encrypt Basic256Sha256 / Sign Basic256Sha256 / Sign & Encrypt	None
Shared Memory	Select which shared memory must access with the OPC-UA protocol.	Z-NET
OPC-UA Server Certificates	Upload to the device the certificates for: Server, Private key and Trusted certifiactes (up to 5). Press “Upload” to send the certificate to	

	the device Press Show Certificate Files for show the actual loaded files Press Reset Certificate File for delete the actual loaded files	

Note that for access the server with a OPC UA client you must use the following url:

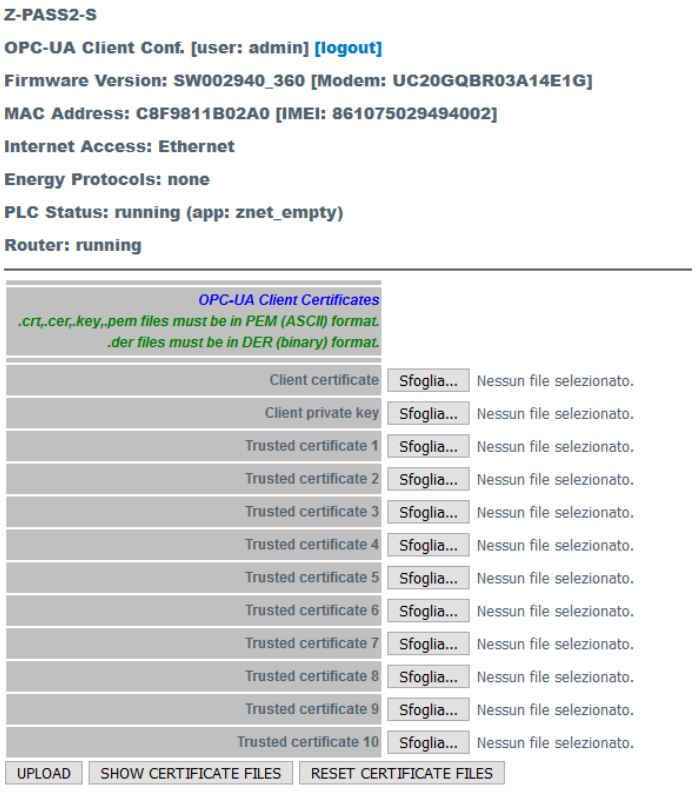
opc.tcp://IP_ADDR:PORT/

where:

IP_ADDR is the actual IP address

PORT is the configured port for the OPC UA serverOPC UA Client Configuration

By clicking on the “OPC UA Client Conf” link, in the “General Configuration” menu, you come to the following page:

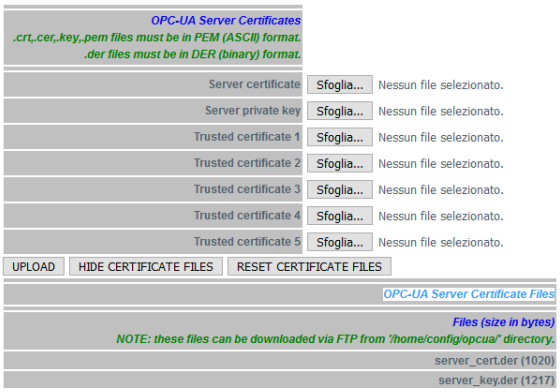


In this page, you can set the parameters related to the Certificates for the Client OPC Unified Architecture (Client OPC UA).

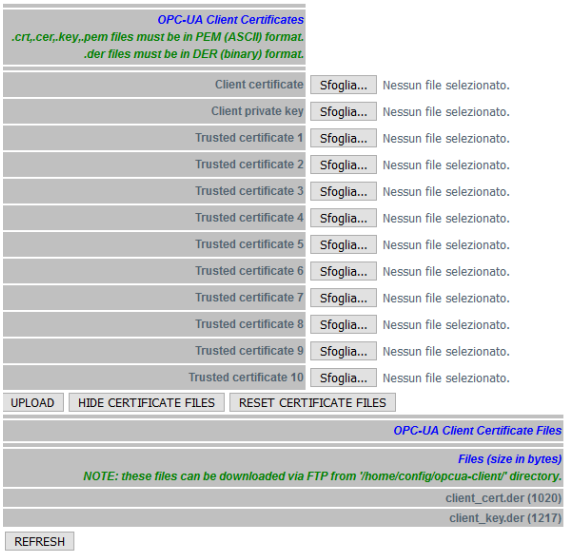
19.1.6.1 Using OPC-UA Client / Server Certificates

The Seneca devices are prepared with a couple of default certificates:

“server_cert.der” and “server_key.der” are provided in the default OPC-UA server configuration:



And “client_cert.der” and “client_key.der” are provided in the default OPC-UA client configuration:



These files can be downloaded from the device using the ftp connection to /home/config/opcua-client.

If you want to allow only some clients to connect you must use the “OPC-UA Server/Client Trusted List”.

For upload the Client/Server certificate to the trusted list use the “Trusted Certificate n” button, (max 5 Client certificates are allowed for the server and max 10 for the client).

Otherwise, if the trusted certificate lists are empty all clients are allowed to access to all the OPC-UA Servers.

Example 1 “Sign & Encrypt and allow all clients”

We need to connect 2 Seneca OPC-UA Client devices to one Seneca OPC-UA Server device with Sign&Encrypt but we don't need to restrict the access to only the 2 Clients.

In this case we must only connect the clients to the server without copy certificates.

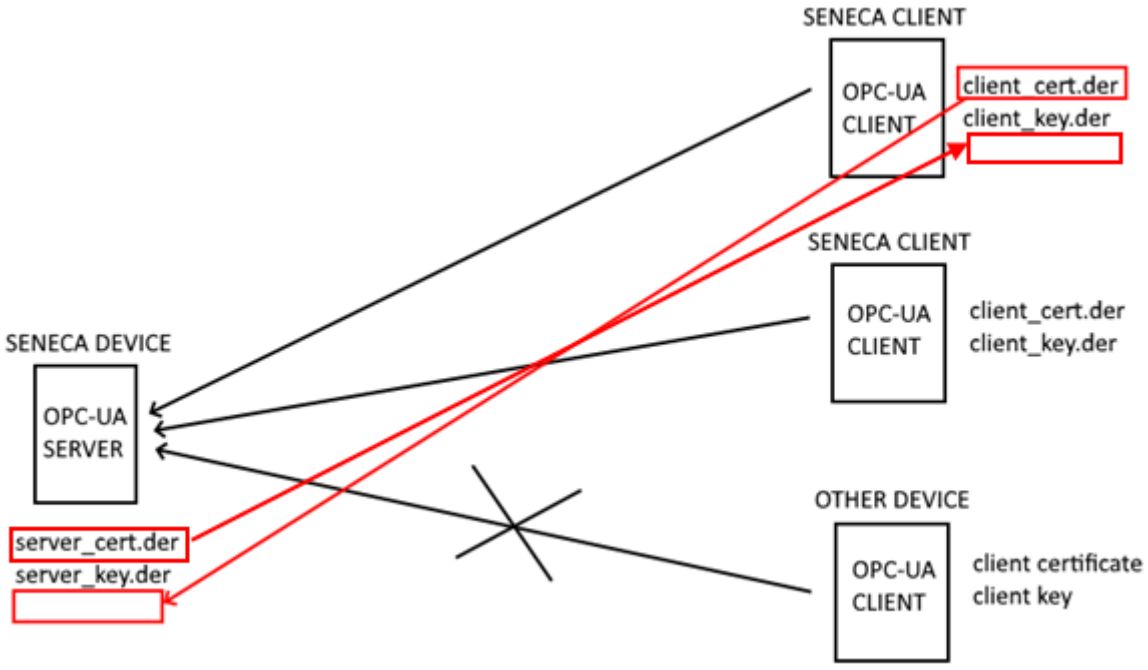
Example 2 "Sign & Encrypt and allow anly the 2 clients"

We need to connect 2 Seneca OPC-UA Client devices to one Seneca OPC-UA Server device with Sign&Encrypt but we need to restrict the access to only these 2 Clients.

In this case we must upload the "client_cert.der" to the Server Trusted certificate.

If you are using the default file you can upload only one file (because the 2 Seneca devices have the same certificates).

Also we must upload the "server_cert.der" to the Client Trusted certificate:



In this way the "Other device" is not allowed to connect to the OPC-UA server.

19.1.7 Users Configuration

By clicking on the "Users Configuration" link, in the "General Configuration" menu, you come to the following page:

In this page, you can change the "Web Administrator", "Web User", "Web Guest" and "FTP User" credentials, as explained in the following table:

Field	Meaning	Default value

WEB ADMINISTRATOR/Username	Username to access the web configuration site (full access)	admin
WEB ADMINISTRATOR/Password	Password to access the web configuration site (full access)	admin
WEB USER/Username	Username to access the web configuration site (limited access) (see paragraph 19.2)	user
WEB USER/Password	Password to access the web configuration site (limited access) (see paragraph 19.2)	user
WEB GUEST/Username	Username to access the web configuration site, in "view-only mode" (see paragraph 19.3)	guest
WEB GUEST/Password	Password to access the web configuration site, in "view-only mode" (see paragraph 19.3)	guest
FTP USER/Username	Username to access the Device FTP/SFTP site (see chapter 7)	user
FTP USER/Password	Password to access the Device FTP/SFTP site (see chapter 7)	123456

For all the fields in this page, the following characters are allowed:

`a-zA-Z0-9-_|!@$%^&*?+{}<>;,:.`

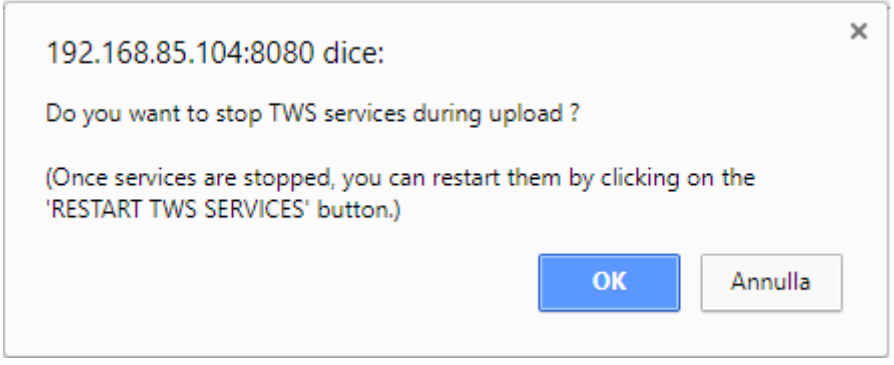
each field can contain up to 100 characters.

The same rules apply to the other "Username" and "Password" fields of the web pages and to the "Tag Name" field of the "VPN Configuration" page.

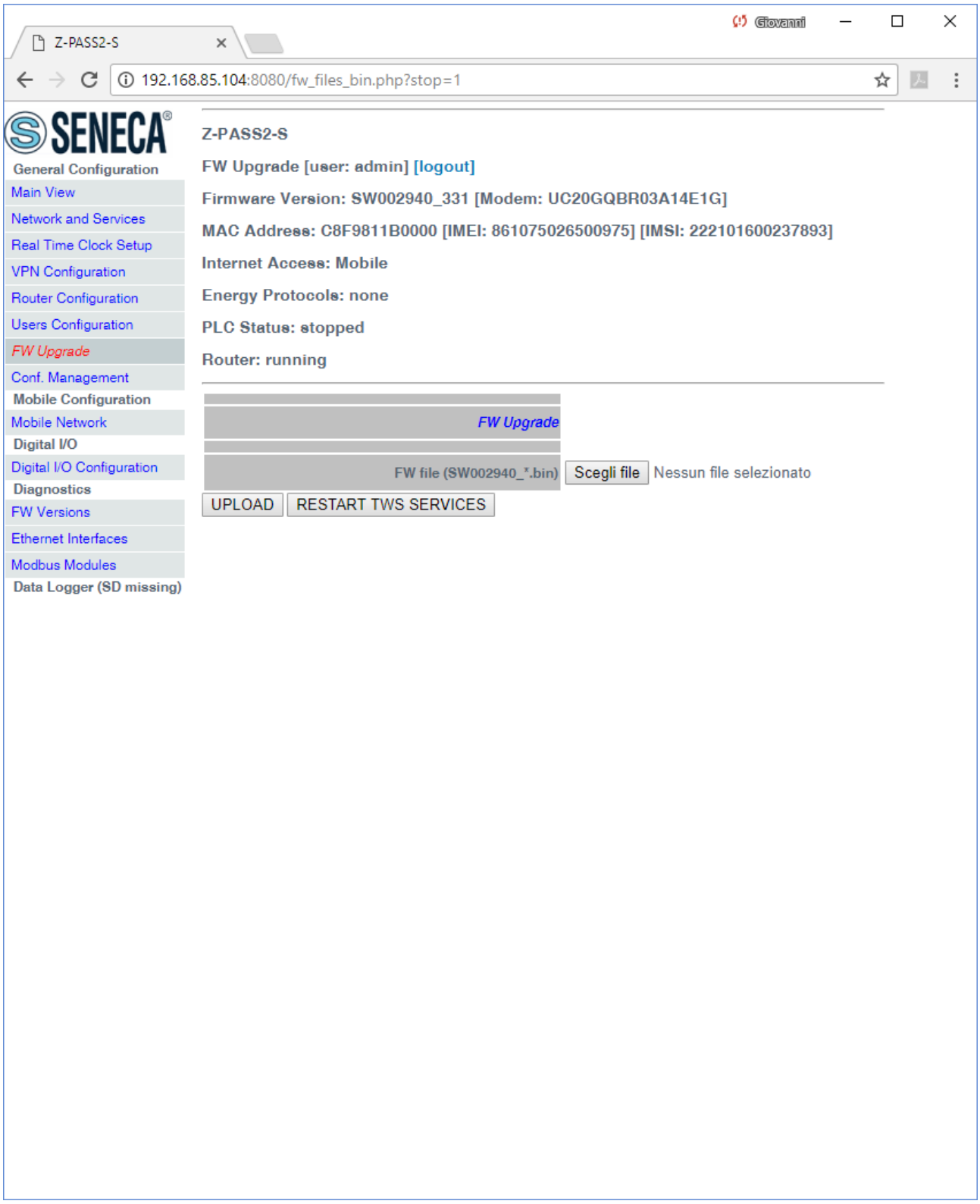
Please note that, after changing the Web Administrator credentials, a new login will be required to access any page.

19.1.8 FW Upgrade

When clicking on the "FW Upgrade" link, in the "General Configuration" menu, the following pop-up is shown:



If you click on the “OK” button, TWS Services (i.e. Soft-PLC) are stopped and you come to the “FW Upgrade” page, shown in the following figure.



Now, if you want to leave this page without performing the FW upgrade, the “RESTART TWS SERVICES” button lets you restart the TWS services which, otherwise, would remain in the “stopped” state.

Otherwise, if you click on the “Cancel” button of the pop-up, TWS Services are not stopped and you come to the same page where the “RESTART TWS SERVICES” button is disabled.

So, it is up to the user to choose if Soft PLC shall be stopped or not, during FW Upload; on one side, stopping it is more safe and let the upload be completed in a shorter time; on the other side, there are situations in which PLC stop time shall be as short as possible.

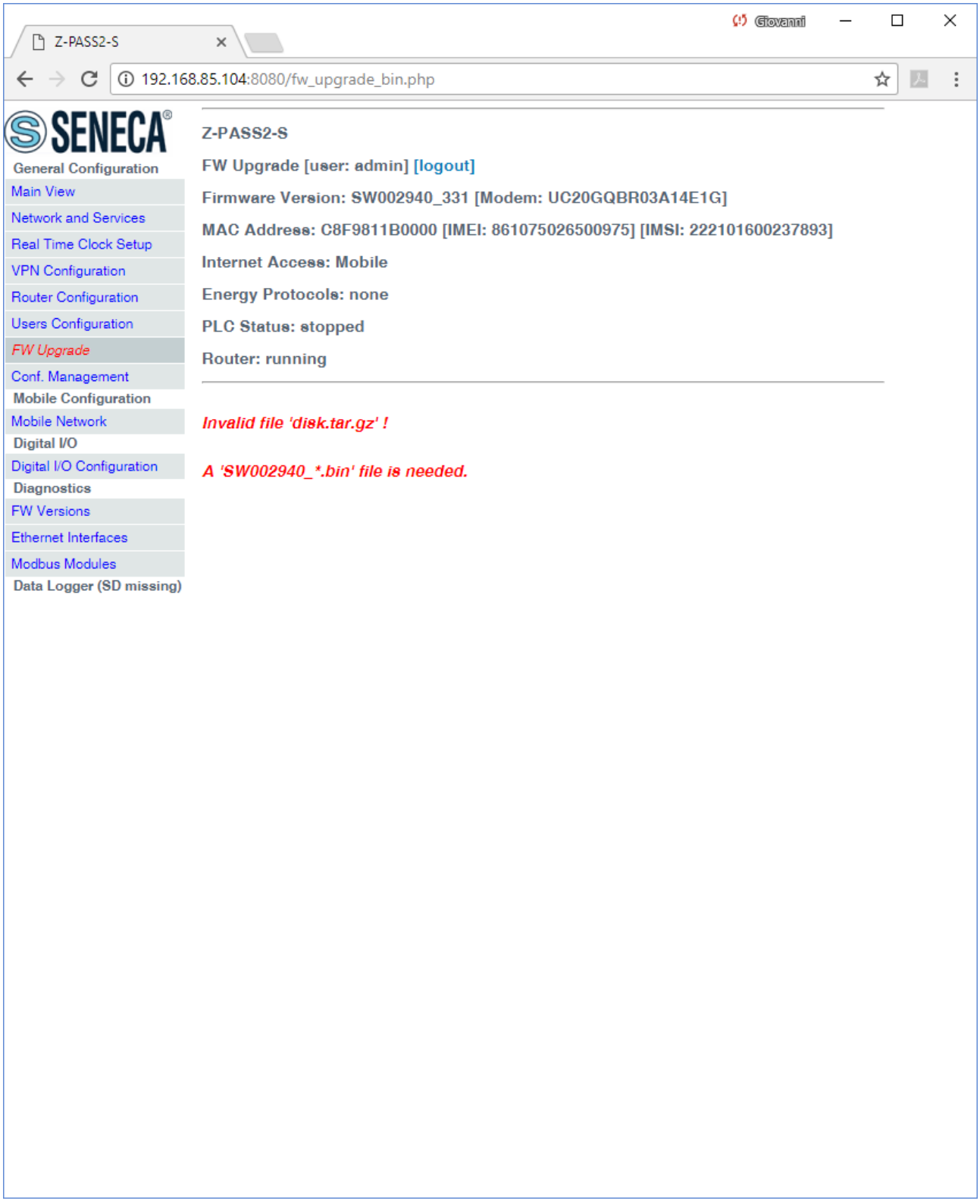
Since an erroneous use of the FW Upgrade functionality might compromise the proper Device operation, use this page only to apply upgrades provided by Seneca, with the support of Seneca personnel.

This page lets you browse your PC to select the file containing the FW, which shall have a name of the following type:

SW002940_xxx.bin[14]

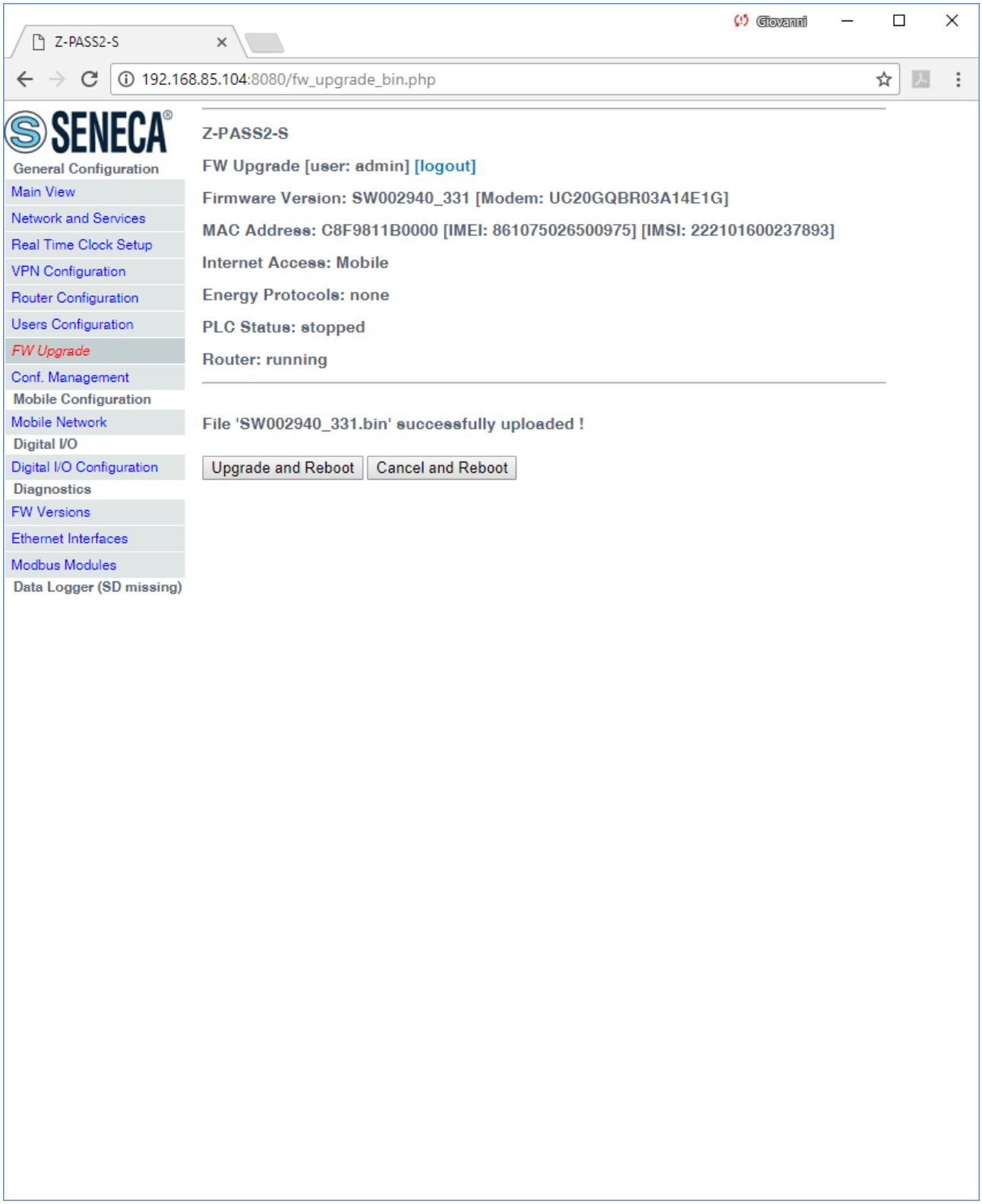
If you select a file with a different name, an error will be shown at the end of the upload, as in the following figure.

[14] The FW file can be downloaded from Seneca website (see chapter 18).



Once a file is selected, you can start the upload, by pressing the “UPLOAD” button.

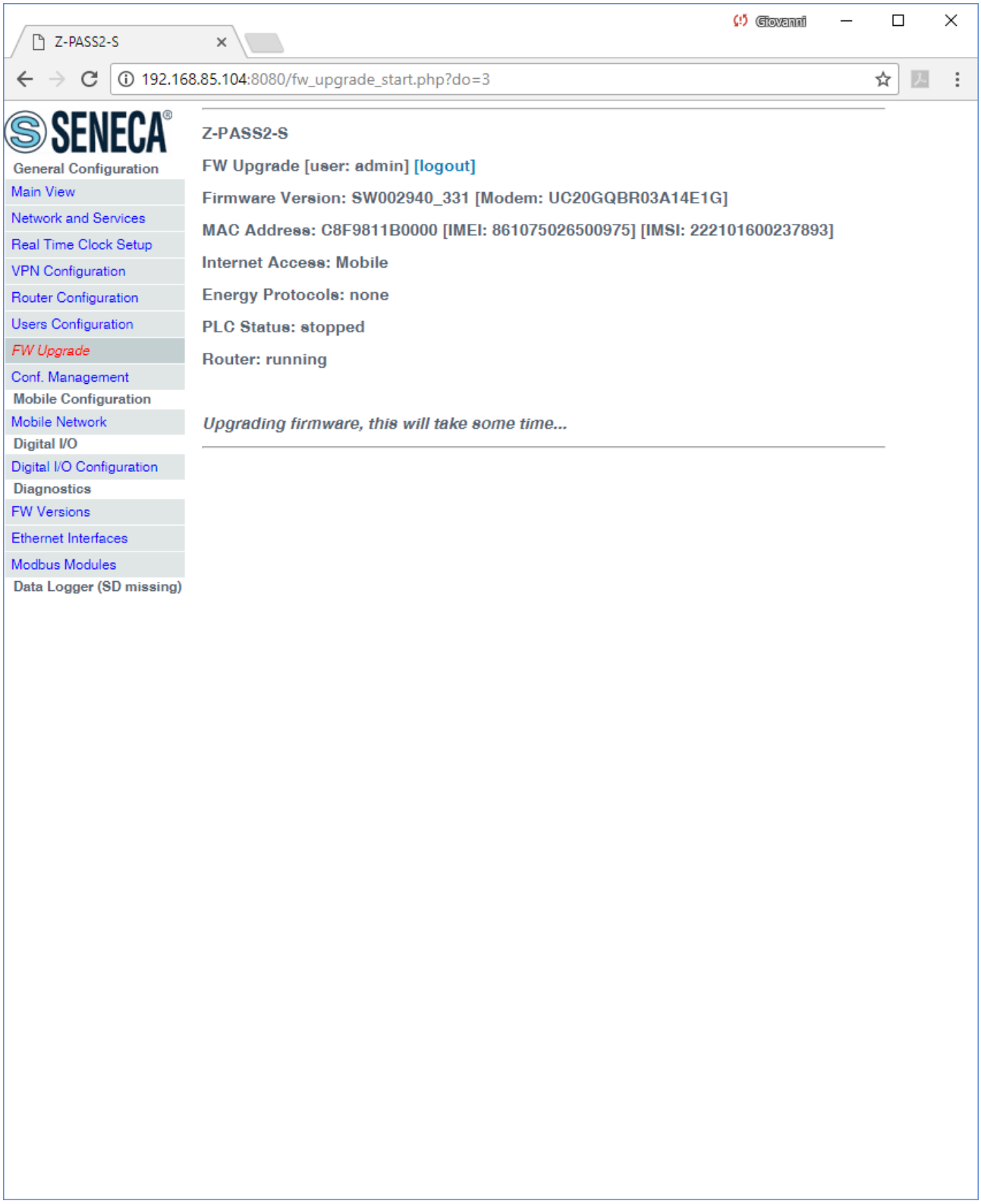
Once the upload is successfully completed, the following page is shown:



In this page, you can:

- press the “Upgrade and Reboot” button: this will start the upgrade procedure, which takes some minutes to be completed; during this time, the Device MUST NOT be switched off; during the

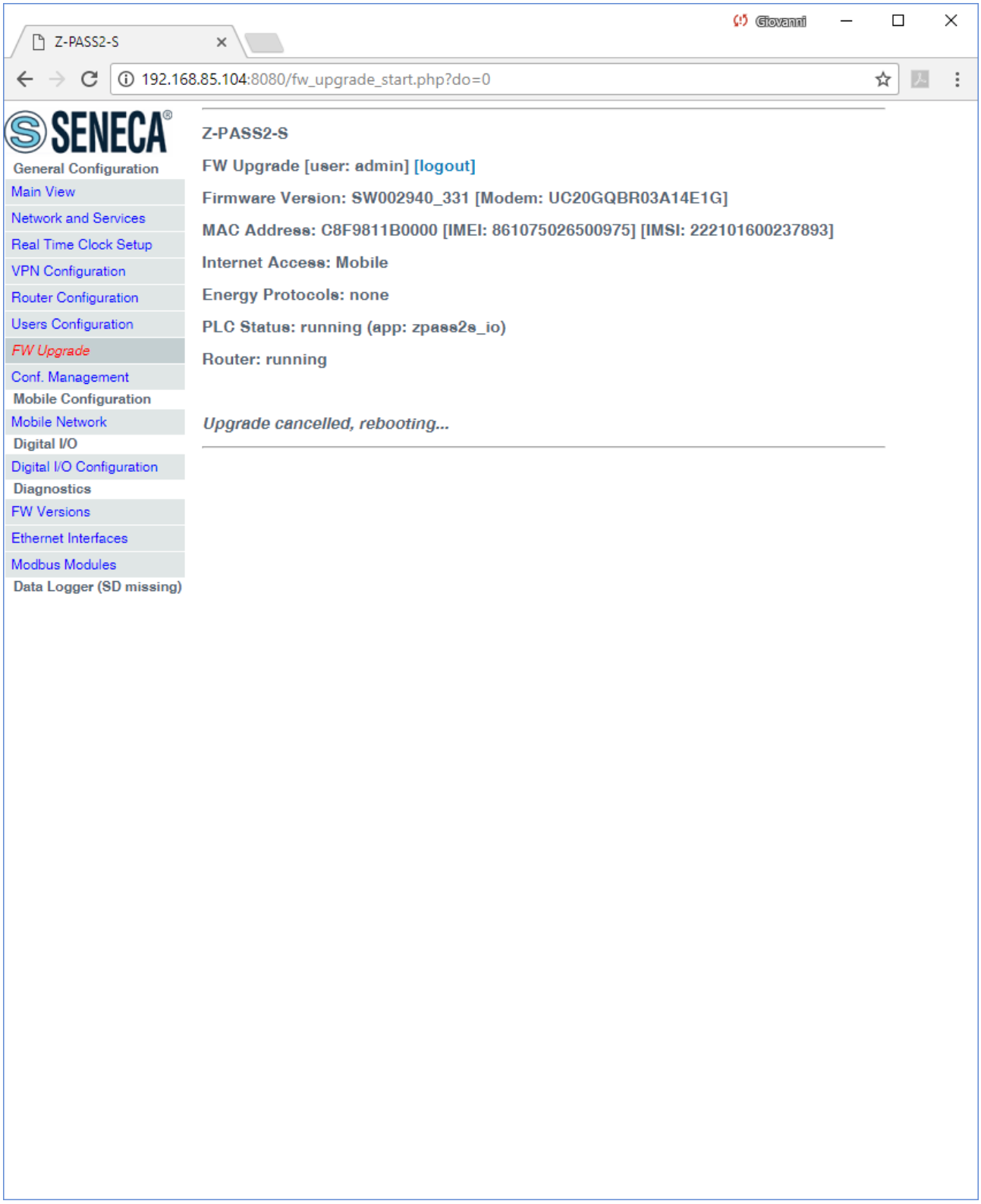
procedure, the Device will be rebooted several times; also, during the procedure, several LEDS will blink simultaneously[15]; the upgrade procedure is ended when only the LED "RUN" is blinking[16];



[15] This applies only to products with HW revisions IO and R01; in details: for IO HW revision, all LEDs will blink simultaneously, except for Power, LAN/WAN, COM and modem LEDs; for R01 HW revision, RUN, VPN and SERV LEDs will blink.

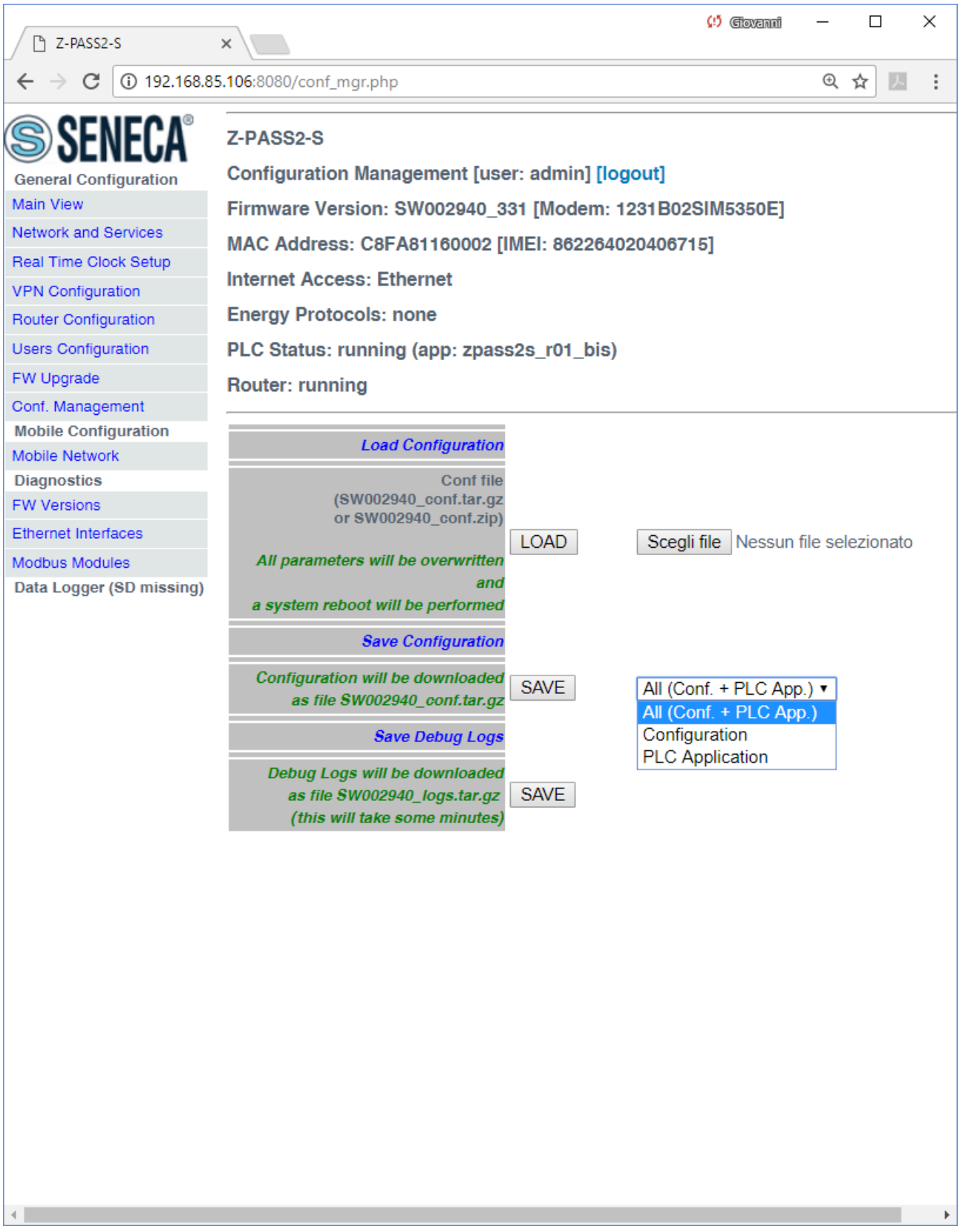
[16] Also SERV and VPN LEDs might blink, depending on the Device configuration and status.

- press the “Cancel and Reboot” button: this will delete the uploaded file on the Device and perform the reboot.



19.1.9 Configuration Management

By clicking on the “Conf. Management” link, in the “General Configuration” menu, you come to the following page:



This page lets you save and load the whole Device configuration; this is very useful, for example, when you have to apply the same configuration to many devices.

The configuration archive file is named *SW002940_conf.tar.gz*; its contents depend on the selected option, as shown in the following table:

Option	**Files**
All (Conf. + PLC App.)	- configuration parameters - OpenVPN configuration (if present) - PLC (Straton) application (if present) - web user pages (if present)
Configuration	- configuration parameters - OpenVPN configuration (if present)
PLC Application	- PLC (Straton) application (if present) - web user pages (if present)

The configuration archive, once created and downloaded by means of the "SAVE" button can be uploaded to the same or another device, in two ways:

- by means of the "LOAD" button, in this page
- by means of a USB pen

The procedure to load the configuration into the Device by means of a USB pen is the following:

- copy the *SW002940_conf.tar.gz* (or *SW002940_conf.zip*, see below) file into the root folder of the USB pen;
- switch off the Device;
- insert the USB pen into the USB#1 port of the Device;
- switch on the Device; the procedure will take some minutes to be completed; during this time, the Device MUST NOT be switched off; during the procedure, the Device will be rebooted;
- after the reboot, wait until you see the "RUN" LED blinking;
- remove the USB pen;
- the configuration has been applied to the Device.

The only care when you carry the configuration archive from a device to another one is that the two devices should be the same product model; for example, it's not safe to load the configuration archive saved on a Z-PASS2-S-R01 into a Z-PASS2-S.

This page lets you load also the configuration archive created by Z-NET4 SW (see chapter 21) as a zip file (*SW002940_conf.zip*).

Another useful feature available in this page is the one provided by the "Save Debug Logs / SAVE" button: when you click on it, a file named *SW002940_logs.tar.gz* is downloaded, which contains the debug logs stored by the CPU during its operation.

Please note that, to get detailed debug logs, the “DEBUG LOGS / Enable” parameter, in “Network and Services” page, shall be set to ON.

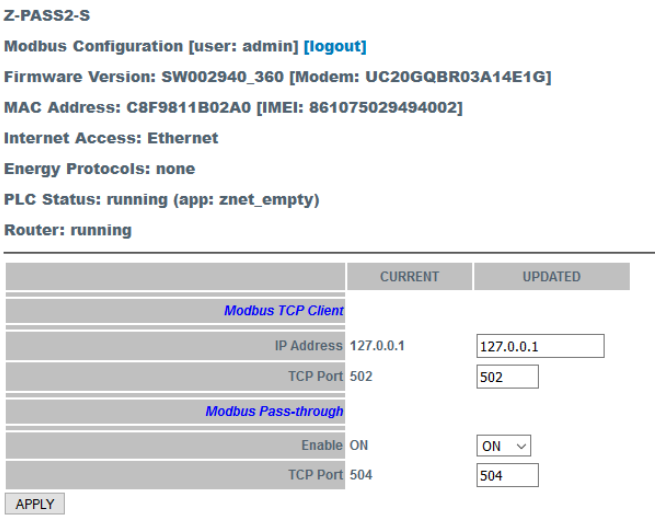
19.1.9.1 Factory reset by USB pen

A USB pen can be used also to reset the Device to its factory state; the procedure is the following:

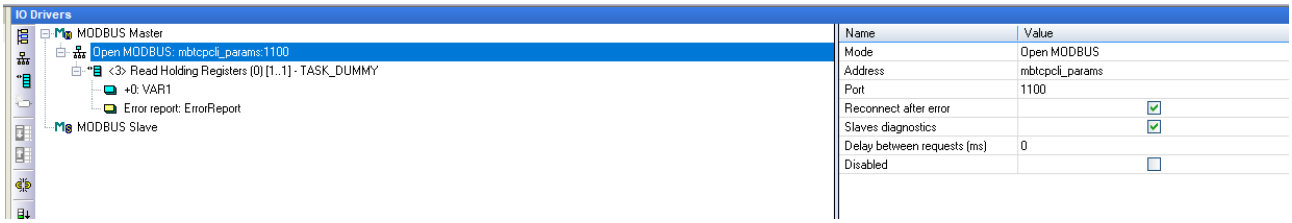
- create an empty file named *SW002940_reset_cmd* into the root of the USB pen;
- switch off the Device;
- insert the USB pen into the USB#1 port of the Device;
- switch on the Device; the procedure will take some minutes to be completed; during this time, the Device MUST NOT be switched off; during the procedure, the Device will be rebooted;
- after the reboot, wait until you see the "RUN" LED blinking;
- remove the USB pen;
- the factory reset has been performed.

19.1.10 Modbus Configuration

By clicking on the "Modbus Configuration" link, in the "General Configuration" menu, you come to the following page:



This page lets you change the IP Address and TCP Port of the Modbus TCP Client ("Open MODBUS") in the "Fieldbus Configurations" of the Straton project; the Modbus TCP Client change can be done without the need of recompiling the Straton project.



To apply the parameters set in this page to the "Open MODBUS" configuration, the string *"mbtcpcli_params"* shall be written in the "Address" field.

It should be noted that the value of the "Port" field is overwritten with the one set in the "Modbus TCP Client Configuration" web page.

In the following table, all configuration parameters available in the page are listed, with a short explanation and the parameter default value for each of them.

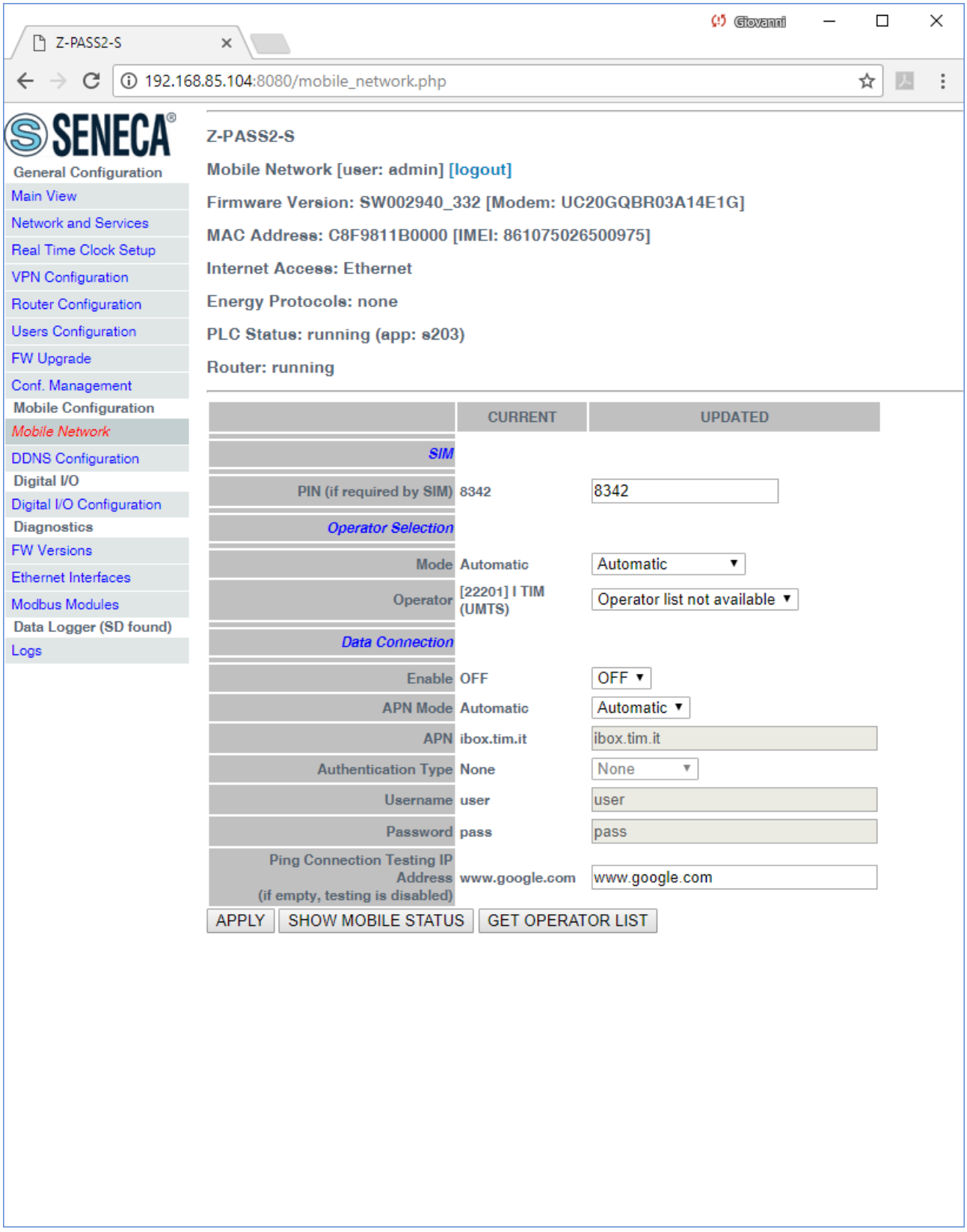
Field	Meaning	Default value
IP Address	IP Address of the Modbus TCP Server the client shall connect to	127.0.0.1
TCP Port	TCP Port of the Modbus TCP Server the client shall connect to	502

The Modbus Pass-through mode allows to change on the fly the Modbus TCP-IP to Modbus RTU protocol for access to the RS485 or RS232 devices using the Ethernet ports.

Field	Meaning	Default value
Enable	Enable or not the Modbus Pass-through	OFF
TCP Port	TCP Port of the Modbus TCP for the Pass-through	504

19.1.11 Mobile Network

By clicking on the “Mobile Network” link, in the “Mobile Configuration” menu, you come to the following page:



The above figure shows the “Mobile Network” page for Z-PASS2-S-IO.

For Z-PASS2-S-R01, Z-PASS2-S and S6001-RTU, the “Operator Selection” section and the “GET OPERATOR LIST” button are not available, so the page is as shown in the following figure.

In this page, you can change the parameters related to the Mobile Network, as listed in the following table:

Field	Meaning	Default value
SIM/PIN (if required by SIM)	PIN needed to unlock the SIM card, if PIN locking functionality is enabled	1234

	on it[17]	
Operator Selection/Mode (only on Z-PASS2-S-IO)	This parameter tells if the modem shall select the Mobile Network Operator: - automatically (Mode=Automatic) - as selected by the user (Mode=Manual) - reverting to "automatic" mode, if "manual" selection fails (Mode = Manual/ Automatic)	Automatic
Operator Selection/Operator (only on Z-PASS2-S-IO)	This parameter contains the list of the Mobile Network Operators currently available, that is detected by the modem. The list items are strings with the following format: - the MCC+MNC[18] code in square brackets (e.g.: "[22201]") - the string identifying the operator (e.g.: "I TIM") - the access technology, that is "GSM" or "UMTS", in brackets This list is initially empty: it shall be filled by clicking on the "GET OPERATOR LIST" button.	"[22201] I TIM (UMTS)"
Data Connection/Enable	Flag to enable/disable the Mobile Network connectivity	OFF
Data Connection/APN Mode	This parameter tells if the APN and related parameters are automatically retrieved (based on SIM IMSI) (Mode=Automatic) or the values given in this page are used. When APN Mode = Automatic, APN, Authentication Type, Username and Password parameters are disabled.	Automatic
Data Connection/APN	Access Point Name, as given by the Mobile Network Operator	ibox.tim.it
Data Connection/Authentication Type	Type of authentication required; possible values are: "None", "CHAP/PAP", "CHAP only", "PAP only"	None
Data Connection/Username	Username needed for UMTS/GPRS connectivity, as given by the Mobile Network Operator; it may be empty, if "Authentication Type" parameter	user

[17] Please note that the procedure to enable/disable the PIN locking functionality on the SIM is not performed by the Device.

[18] MCC = Mobile Country Code, MNC = Mobile Network Code

	is “None”	
Data Connection/Password	Password needed for UMTS/GPRS connectivity, as given by the Mobile Network Operator; it may be empty, if “Authentication Type” parameter is “None”	pass
Data Connection/Ping Connection Testing IP Address (if empty, testing is disabled)	FQDN or IP address used to periodically check, by means of “ping” packets, if the mobile connection is actually working; if the field is lefty empty, the check is not performed. It is important to note that the FQDN or IP address specified must be reachable from the Device mobile network, otherwise the Device will detect that the mobile connection is not working and will drop it.	www.google.com

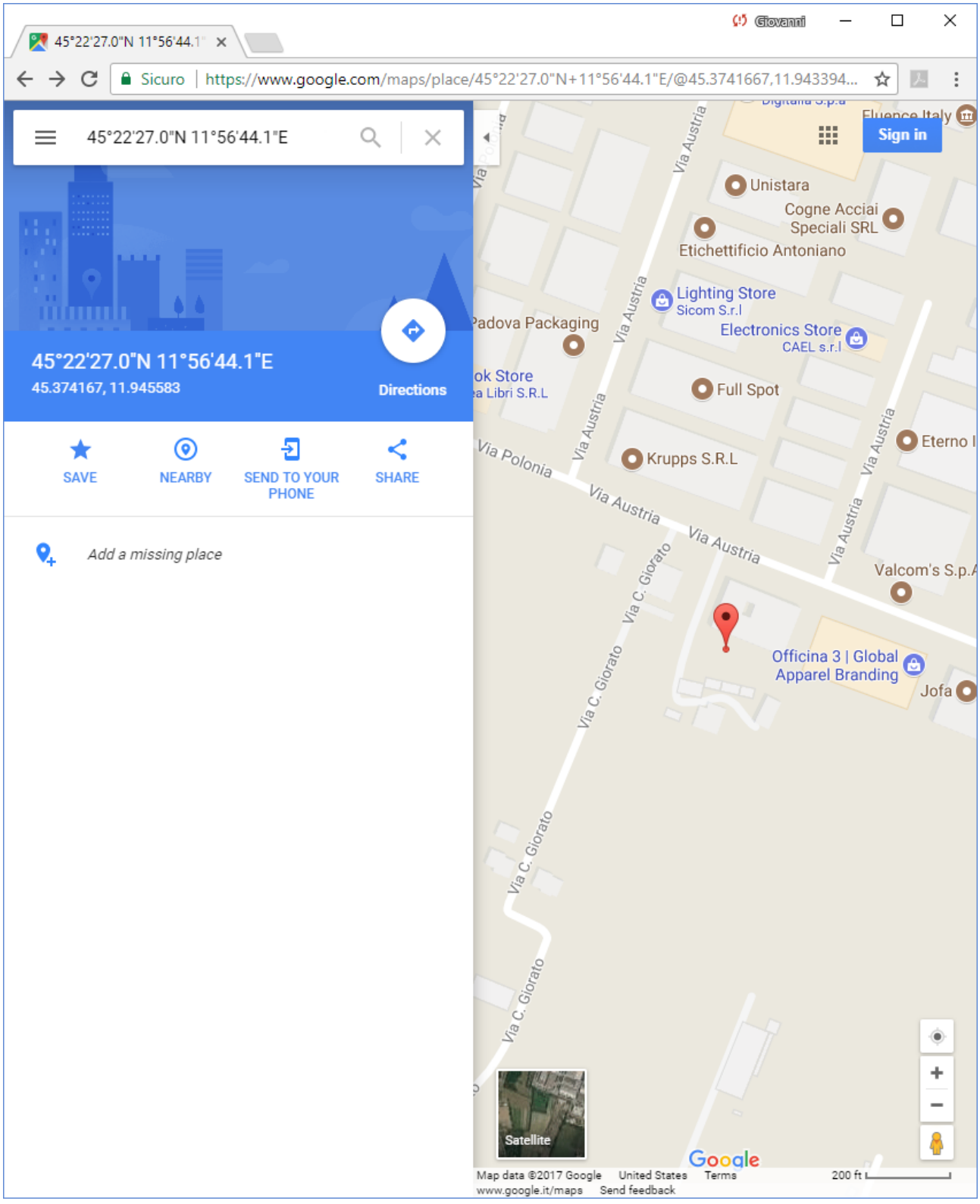
In the “Mobile Network” page, when you click on the “SHOW MOBILE STATUS” button, a new section appears, named “Mobile Status”, showing:

- the SIM/PIN Status; if an error in PIN setting has occurred or PUK/PUK2 setting is needed, this status is shown in red color
- the number of remaining attempts for PIN setting; when this value is less than 3 (shown in red color), it means that PIN setting has failed, that is the configured PIN value is wrong
- the radio “Signal Level”, in the range [0..7]
- the selected operator (only for Z-PASS2-S-IO)
- the GSM “Registration Status”
- the Mobile Network “Connection Status” (i.e.: “Disconnected” or “Connected”)
- the IP address assigned to the Mobile Network interface when connected, the “dummy” IP address “0.0.0.0” when disconnected
- the number of packets/bytes received from the Mobile Network interface, when connected; “0/0” when disconnected
- the number of packets/bytes sent to the Mobile Network interface, when connected; “0/0” when disconnected

as shown in the following couple of figures:

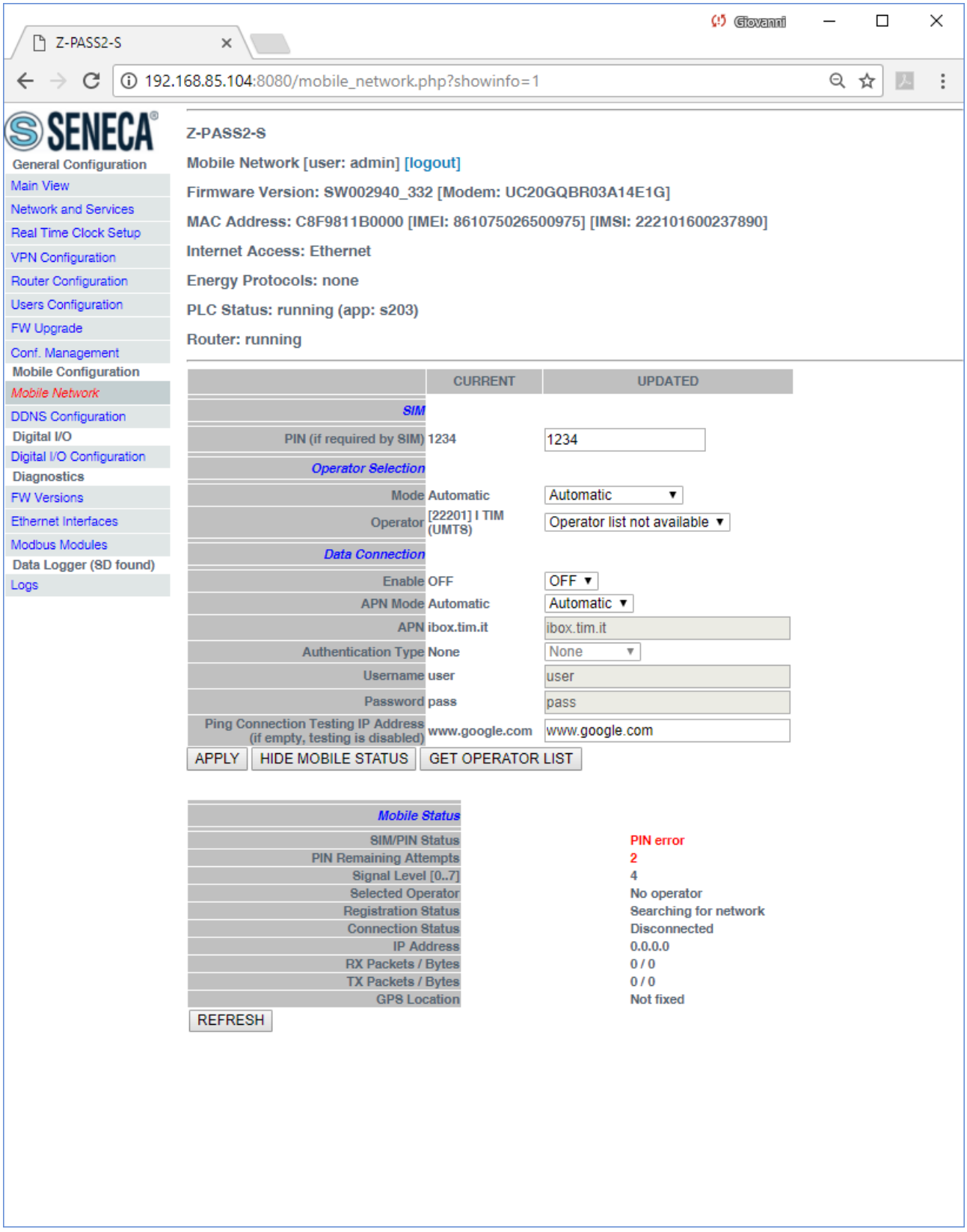

Z-PASS2-S
192.168.85.104:8080/mobile_network.php?showinfo=1
SENECA
General Configuration
Main View
Network and Services
Real Time Clock Setup
VPN Configuration
Router Configuration
Users Configuration
FW Upgrade
Conf. Management
Mobile Configuration
Mobile Network
DDNS Configuration
Digital I/O
Digital I/O Configuration
Diagnostics
FW Versions
Ethernet Interfaces
Modbus Modules
Data Logger (SD found)
Logs
Z-PASS2-S
Mobile Network [user: admin] [logout]
Firmware Version: SW002940_332 [Modem: UC20GQBR03A14E1G]
MAC Address: C8F9811B0000 [IMEI: 861075026500975] [IMSI: 222101600237890]
Internet Access: Ethernet
Energy Protocols: none
PLC Status: running (app: s203)
Router: running
CURRENT
UPDATED
SIM
PIN (if required by SIM) 8342
8342
Operator Selection
Mode Automatic
Automatic
Operator [22201] I TIM (UMTS)
Operator list not available
Data Connection
Enable OFF
OFF
APN Mode Automatic
Automatic
APN ibox.tim.it
ibox.tim.it
Authentication Type None
None
Username user
user
Password pass
pass
Ping Connection Testing IP Address (if empty, testing is disabled) www.google.com
www.google.com
APPLY
HIDE MOBILE STATUS
GET OPERATOR LIST
Mobile Status
SIM/PIN Status PIN required
PIN Remaining Attempts 3
Signal Level [0..7] 6
Selected Operator "vodafone IT" (UMTS)
Registration Status Registered (home network)
Connection Status Disconnected
IP Address 0.0.0.0
RX Packets / Bytes 0 / 0
TX Packets / Bytes 0 / 0
GPS Location 45.37445,11.94516 [Map]
REFRESH

As shown in the above figures, only for Z-PASS2-S-IO, the last row of the "Mobile Status" gives the "GPS Location" as `Latitude,Longitude` values; clicking on the Map link, the Google Maps on the current position are shown.



If the GPS signal is not available, the “GPS Location” row contains the string “Not fixed” and the Map link is not shown.

The following figure shows the situation when an error in PIN setting has occurred, due to a wrong value of the PIN parameter.



It should be noted that, when the PIN is set during procedures automatically performed by the Device firmware, if the number of remaining attempts is 1, no more attempt is done to avoid blocking the SIM.

You can refresh the Mobile Network status, by clicking on the “REFRESH” button.

You can hide the “Mobile Status” section, by clicking on the “HIDE MOBILE STATUS” button.

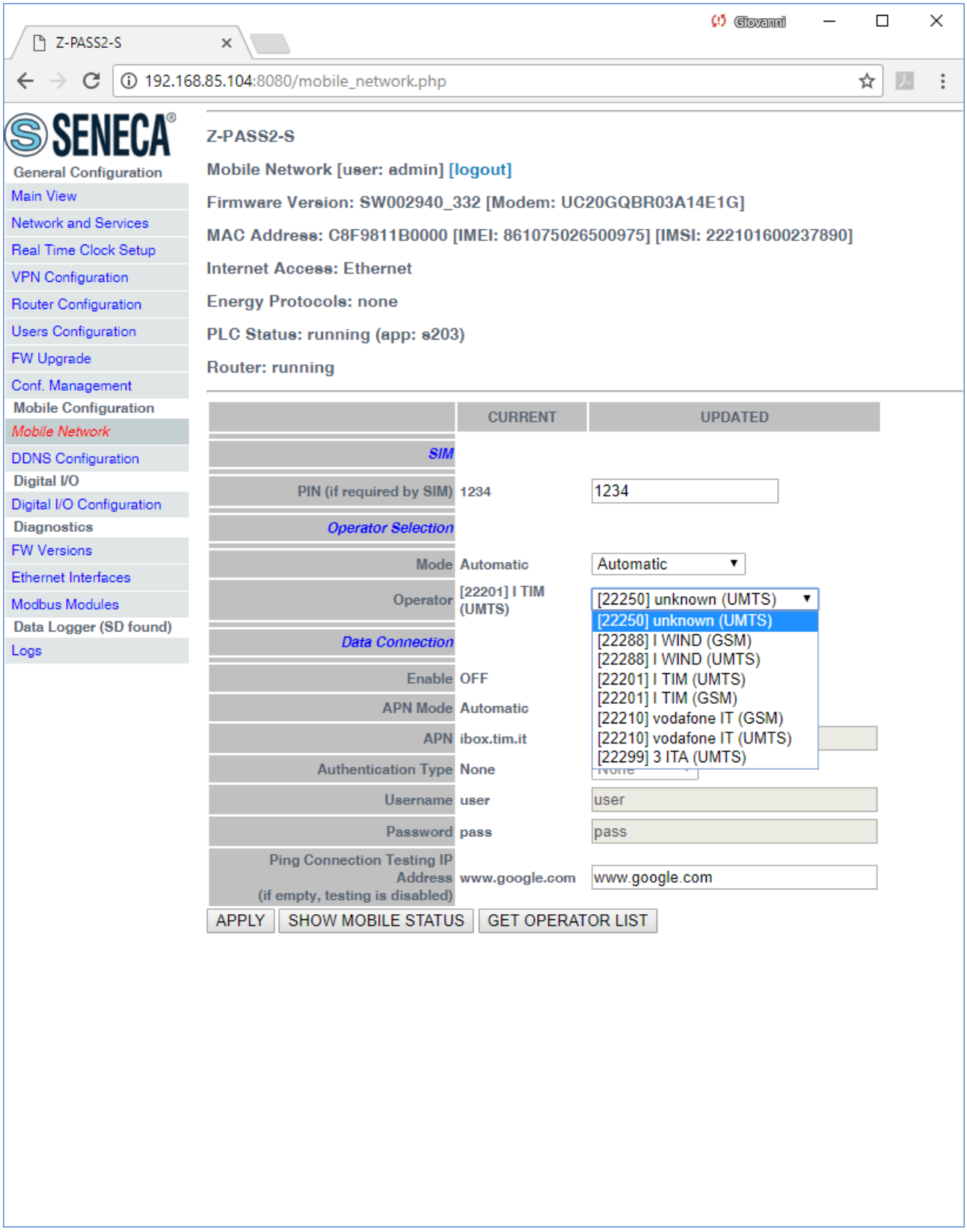
As already told above, the “GET OPERATOR LIST” button lets you retrieve the list of the operators currently available, that is detected by the modem (only on Z-PASS2-S-IO).

When you click on the button, the following page is shown.

Tipically, it takes about 1 minute to get the list, so the page shows the number of seconds elapsed.

When the procedure is completed, the following page is shown.

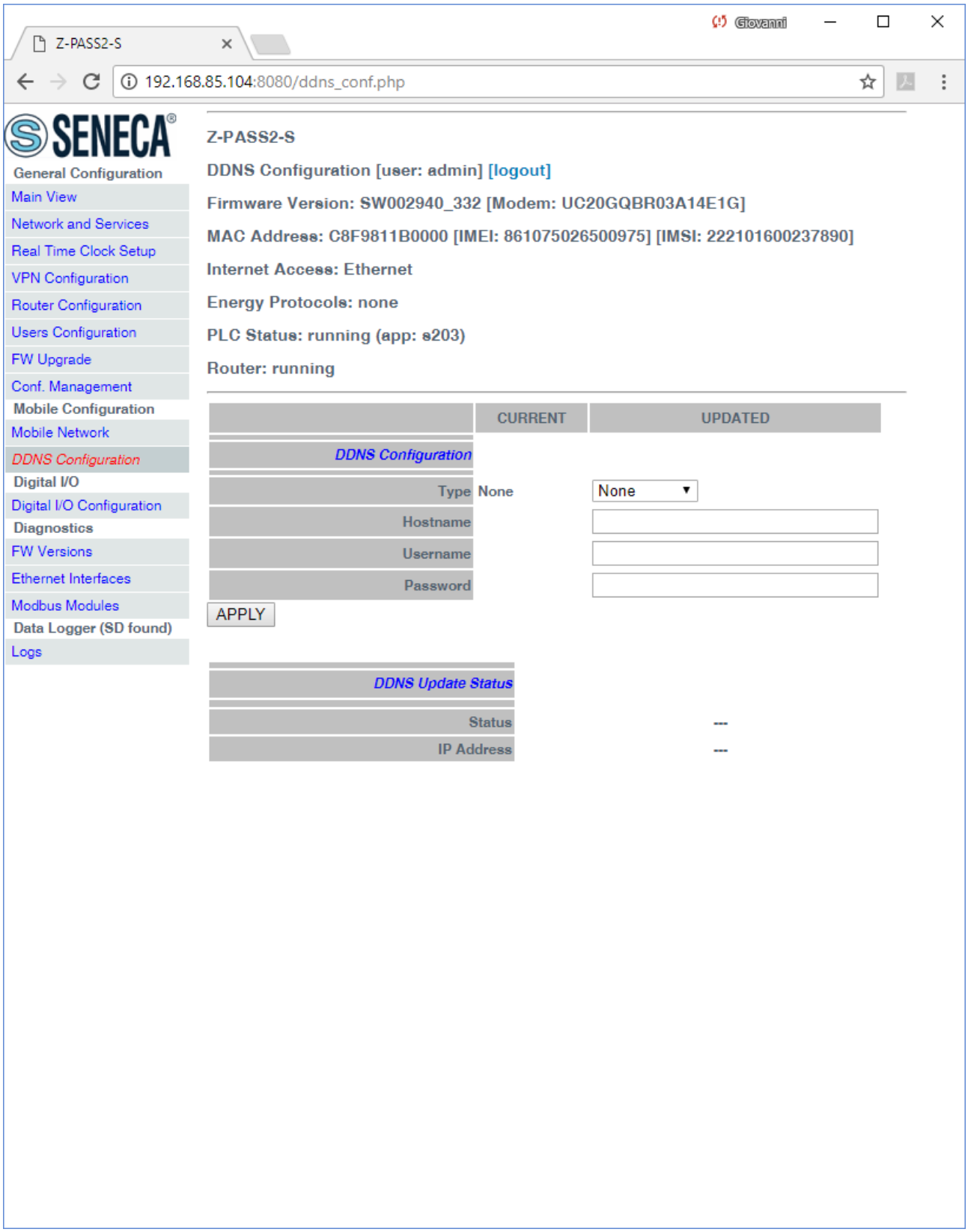
After some seconds, the page automatically evolves to the “Mobile Network” page, with the operator list filled, as shown in the following figure.



You can choose an operator from the list, to perform “Manual” or “Manual/Automatic” selection.

19.1.12 DDNS Configuration

By clicking on the “DDNS Configuration” link, in the “Mobile Configuration” menu, you come to the following page:



In this page, you can set the parameters related to the Dynamic DNS service, as listed in the following table:

Field	Meaning	Default value
Type	Type of Dynamic DNS service; possible values are: - None - dyndns.it - dyndns.org - no-ip.com	None
Hostname	The hostname provided with the service subscription	empty
Username	The username provided with the service subscription	empty
Password	The password provided with the service subscription	empty

The parameters shall be set according to the DDNS service subscription; an example is given in the following figure.

When an IP address assigned to the Mobile Network Interface has been bound with the hostname, the "DDNS Update Status" section appears like in the following figure.

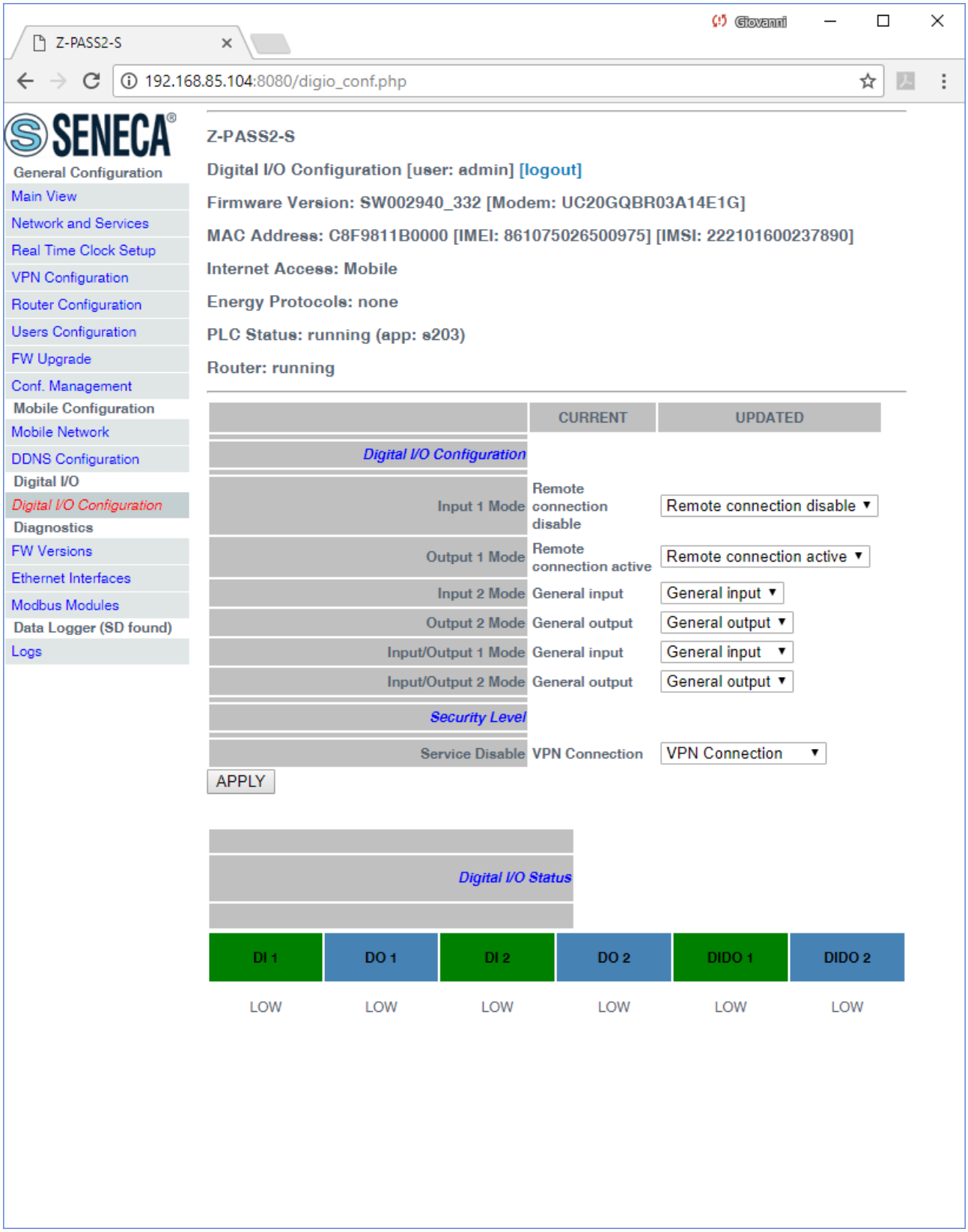

Giovanni
Z-PASS2-S
192.168.85.104:8080/ddns_conf.php
SENECA
General Configuration
Main View
Network and Services
Real Time Clock Setup
VPN Configuration
Router Configuration
Users Configuration
FW Upgrade
Conf. Management
Mobile Configuration
Mobile Network
DDNS Configuration
Digital I/O
Digital I/O Configuration
Diagnostics
FW Versions
Ethernet Interfaces
Modbus Modules
Data Logger (SD found)
Logs
Z-PASS2-S
DDNS Configuration [user: admin] [logout]
Firmware Version: SW002940_332 [Modem: UC20GQBR03A14E1G]
MAC Address: C8F9811B0000 [IMEI: 861075026500975] [IMSI: 222101600237890]
Internet Access: Mobile
Energy Protocols: none
PLC Status: running (app: s203)
Router: running
CURRENT
UPDATED
DDNS Configuration
Type dyndns.it dyndns.it
Hostname zpasstest1.ns0.it zpasstest1.ns0.it
Username gsp-seneca gsp-seneca
Password egdirba! egdirba!
APPLY
DDNS Update Status
Status good
IP Address 2.45.73.76

19.1.13 Digital I/O Configuration

By clicking on the “Digital I/O Configuration” link, in the “Digital I/O” menu, you come to the page described in the following sub-paragraphs[19]; the page differs between Z-TWS4-IO and Z-PASS2-S-IO:

19.1.13.1 Z-PASS2-S-IO

[19] This page is available only for Z-TWS4-IO and Z-PASS2-S-IO products.



In this page, you can configure the operating modes of the Digital I/Os and the security level applied by the "Remote Connection Disable" feature (see chapter 13).

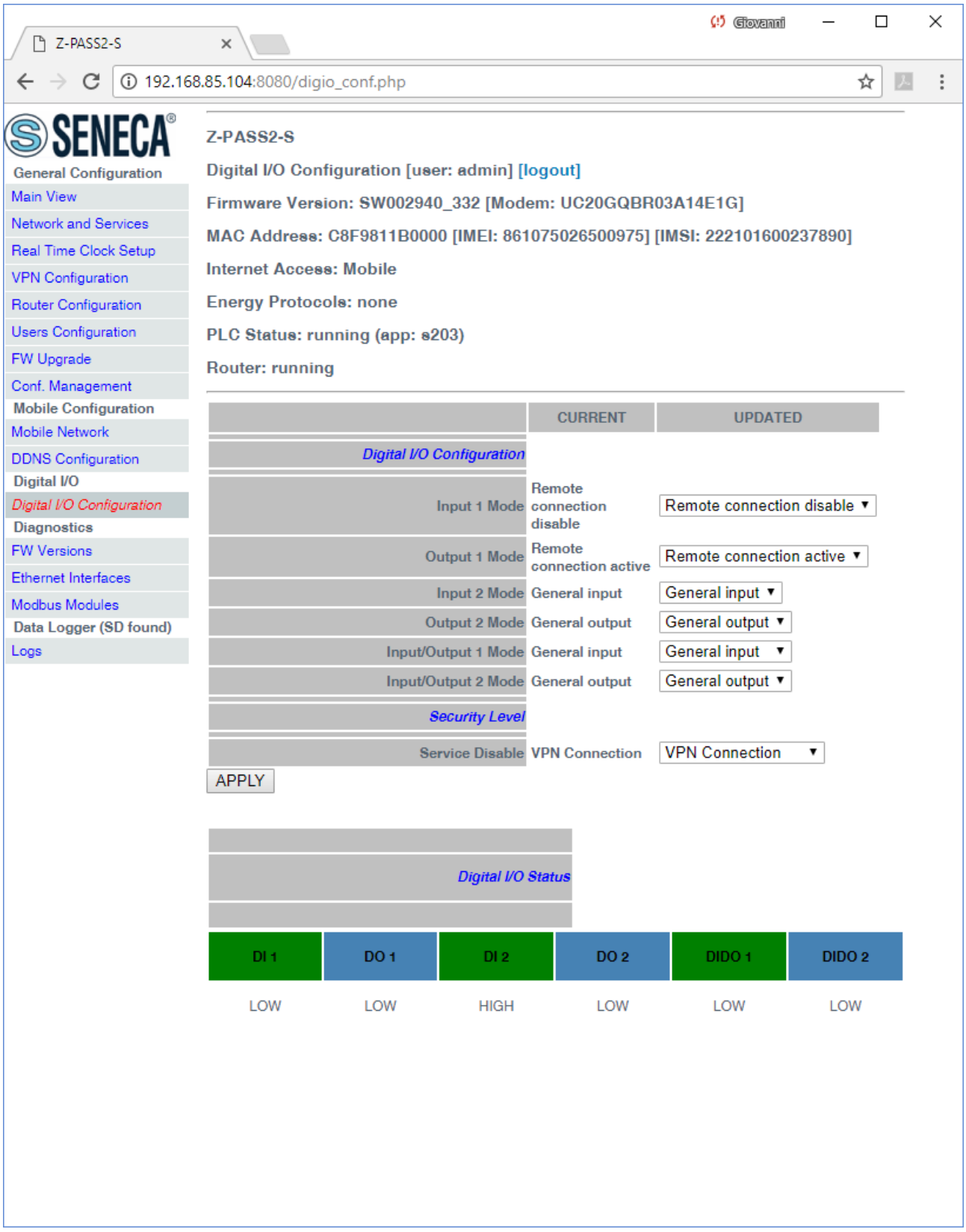
Field	Meaning	Default value
Input 1 Mode	This parameter represents the	Remote connection disable

	operating mode of the Digital Input 1 (DI 1). Since this is the digital input used for "Remote Connection Disable" feature, its value ("Remote connection disable") cannot be changed.	
Output 1 Mode	This parameter represents the operating mode of the Digital Output 1 (DO 1). Since this is the digital output used to monitor remote connection, its value ("Remote connection active") cannot be changed.	Remote connection active
Input 2 Mode	This parameter represents the operating mode of the Digital Input 2 (DI 2). Possible modes are: "General input" | "Local alarm".	General input
Output 2 Mode	This parameter represents the operating mode of the Digital Output 2 (DO 2). Possible modes are: "General output" | "Remote toggle"[20].	General output
Input/Output 1 Mode	This parameter represents the operating mode of the Digital Input/Output 1 (first configurable digital I/O) (DIDO 1). Possible modes are: "General input" | "General output".	General input
Input/Output 2 Mode	This parameter represents the operating mode of the Digital Input/Output 2 (second configurable digital I/O) (DIDO 2). Possible modes are: "General input" | "General output".	General output
Service Disable	This parameter determines which access services are disabled when "Remote Connection Disable" digital input is HIGH. Possible values are: "VPN Connection" | "VPN Service" | "Internet Connection" | "SMS Service". See chapter 13, for a detailed	VPN Connection

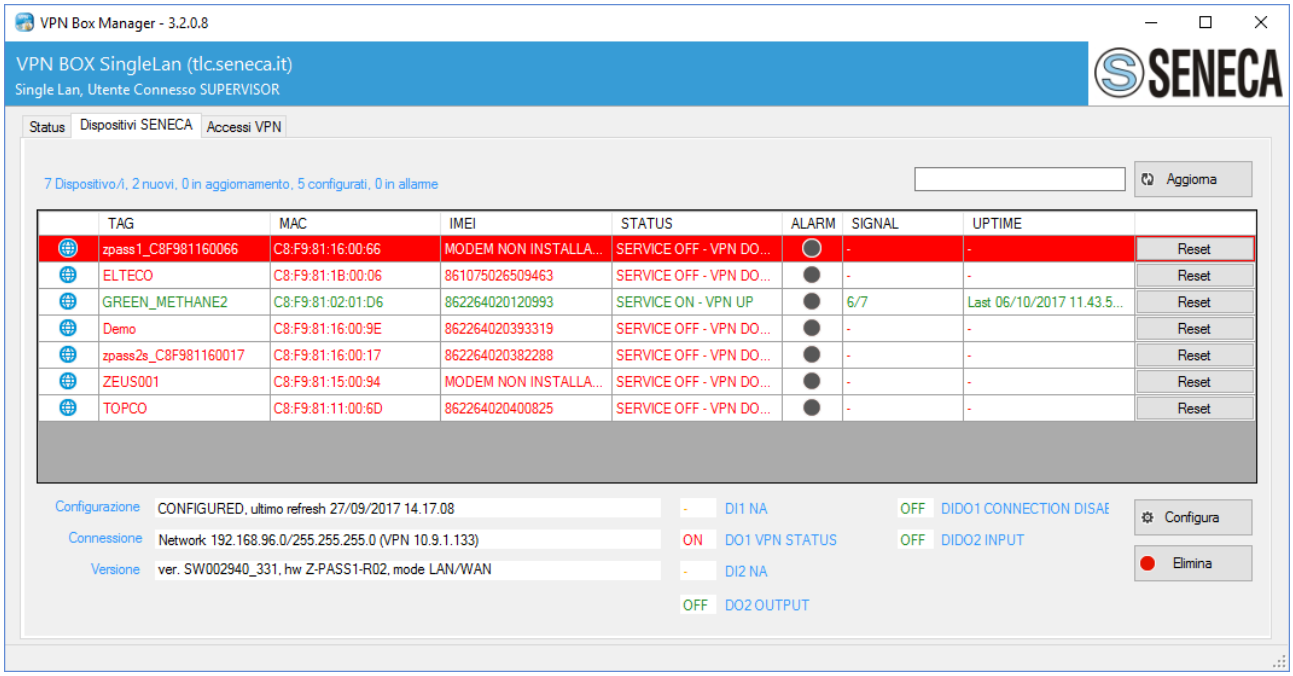
[20] "Remote toggle" function is still to be defined.

	description of these values.	

The “Digital I/O Status” section of the page gives the current status values (“LOW”/”HIGH”) for each of the six available digital I/Os.



The status of the digital input configured as “Local Alarm” is reported in the “ALARM” column in the “Devices” tab of the “Seneca VPN Box Manager” and “Seneca VPN Client Communicator” applications.



19.1.13.2 Z-TWS4-IO

In this page, you can configure the operating modes of the Digital I/Os and the security level applied by the "Remote Connection Disable" feature (see chapter 13).

Field	Meaning	Default value
Output 1 Mode	This parameter represents the operating mode of the Digital Output 1 (DO 1).	Remote connection active

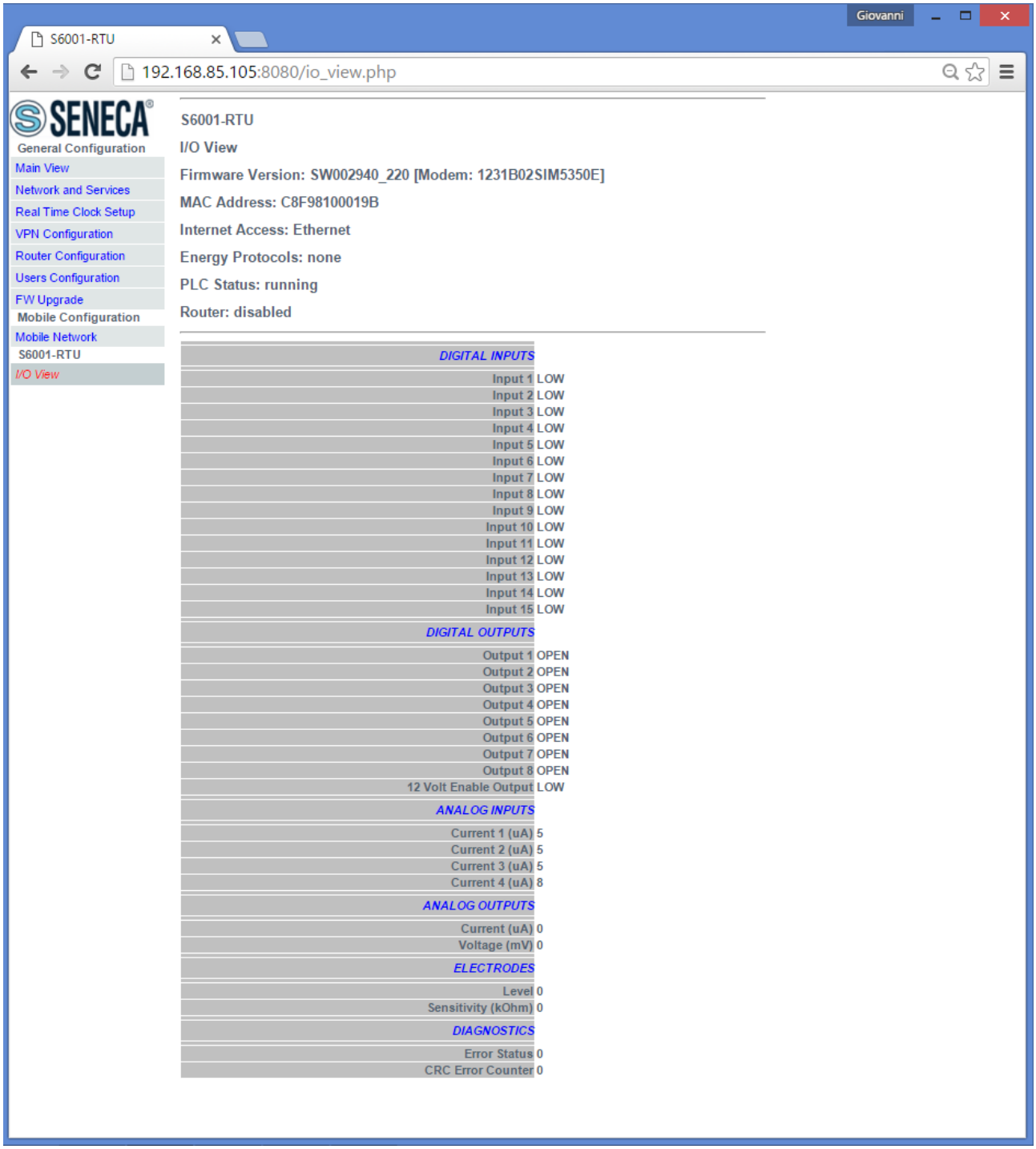
	Since this is the digital output used to monitor remote connection, its value ("Remote connection active") cannot be changed.	
Output 2 Mode	This parameter represents the operating mode of the Digital Output 2 (DO 2). Possible modes are: "General output" | "Remote toggle"[21].	General output
Input/Output 1 Mode	This parameter represents the operating mode of the Digital Input/Output 1 (first configurable digital I/O) (DIDO 1). Since this is used as an input for "Remote Connection Disable" feature, its value ("Remote connection disable") cannot be changed.	Remote connection disable
Input/Output 2 Mode	This parameter represents the operating mode of the Digital Input/Output 2 (second configurable digital I/O) (DIDO 2). Possible modes are: "General input" | "General output" | "Local alarm".	General output
Service Disable	This parameter determines which access services are disabled when "Remote Connection Disable" digital input is HIGH. Possible values are: "VPN Connection" | "VPN Service" | "Internet Connection" | "SMS Service". See chapter 13, for a detailed description of these values.	VPN Connection

The "Digital I/O Status" section of the page gives the current status values ("LOW"/"HIGH") for each of the four available digital I/Os.

19.1.14 I/O View (S6001-RTU)

In S6001-RTU CPU, one more page is available called "I/O View"; in this page, the current status of all the inputs/outputs is shown, along with some diagnostic information.

[21] "Remote toggle" function is still to be defined.

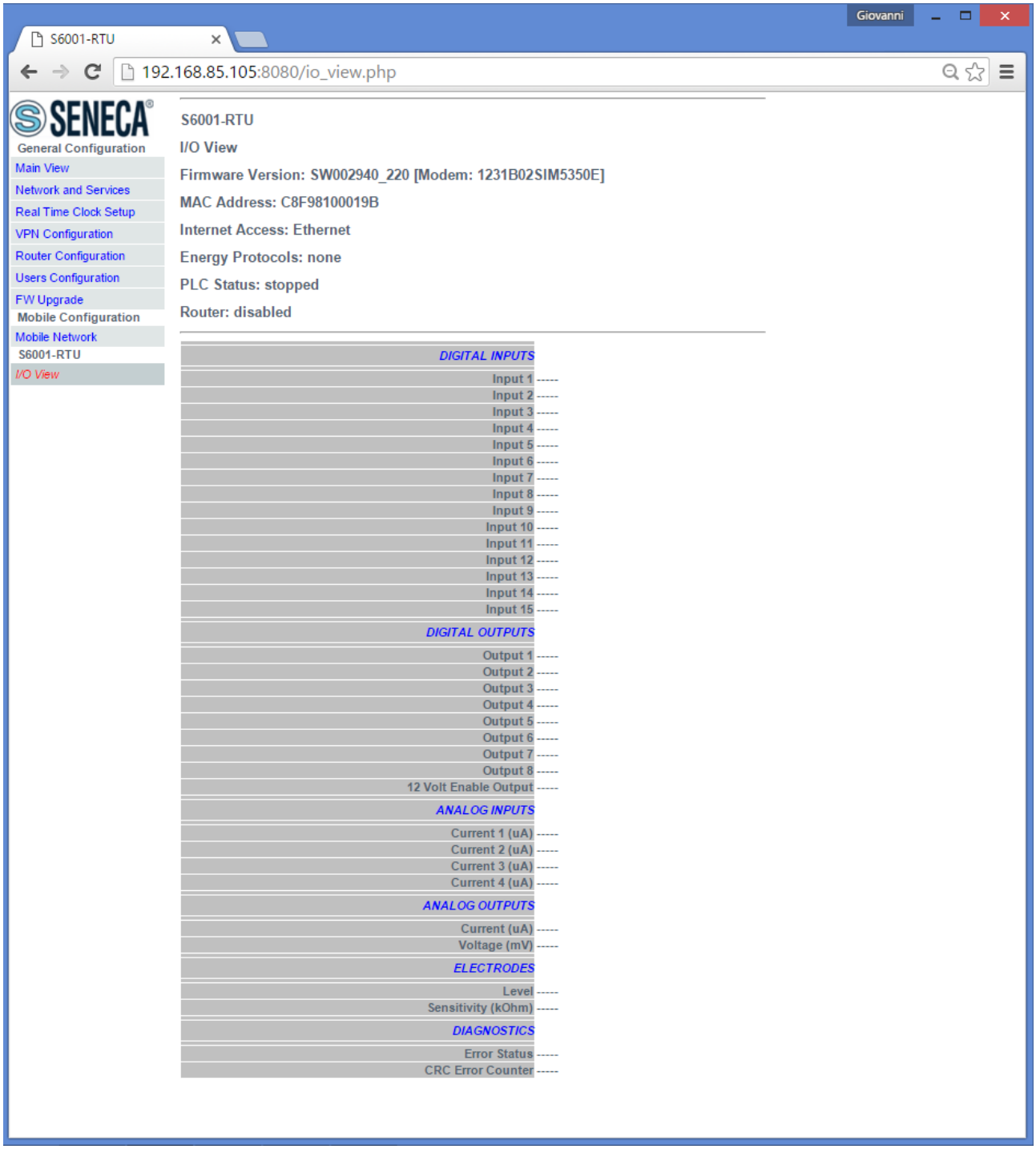


The following parameters are shown:

Field	Meaning	Values
DIGITAL INPUTS/Input 1..Input 15	Status of Digital Input	LOW/HIGH
DIGITAL OUTPUTS/Output 1..Output 8	Status of Digital Output (relay)	OPEN/CLOSED
DIGITAL OUTPUTS/12 Volt Enable Output	Status of Digital Output enabling 12 Vdc voltage on screw terminals 37 and 38	LOW/HIGH
ANALOG INPUTS/Current 1..	Value of analog current input (in uA)	0..20000

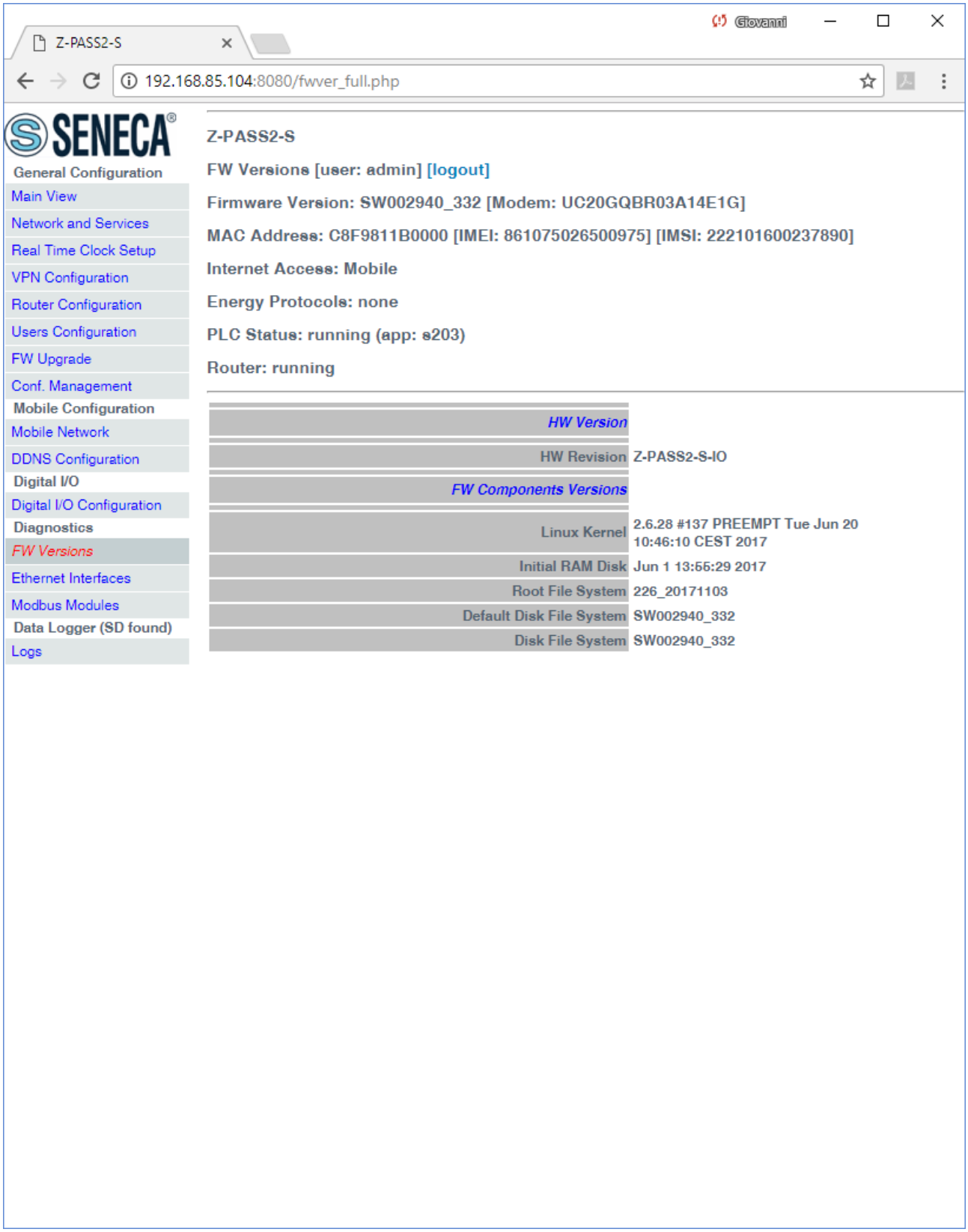
Current 4		
ANALOG OUTPUT/Current	Value of analog current output (in uA)	0..20000
ANALOG OUTPUT/Voltage	Value of analog voltage output (in mV)	0..10000
ELECTRODES/Level	Liquid level value	0,1,2
ELECTRODES/Sensitivity	Sensitivity value applied in liquid level measurement (in kΩ)	0..255
DIAGNOSTICS/Error Status	This parameter gives an information about errors that might occur in the I/O board. The value is a bitmask, as specified in the column “Values”.	0: no error Bit 9: flash memory error
DIAGNOSTICS/CRC Error Counter	This parameter counts the CRC errors occurring in the communication between the CPU board and the I/O board; if the value continuously increases, it means that there is some HW problem	>= 0 0 means “no CRC error”

If the Soft PLC application is not running, inputs/outputs values are not available, so the page appears like in the following figure:



19.1.15 FW Versions

By clicking on the “FW Versions” link, in the “Diagnostics” menu, you come to the following page:



In this page, the following information are shown:

- the product name along with its HW revision (in the above figure: “Z-PASS2-S-R01”)
- the version strings of all the FW components, which are:
    - Linux Kernel (*kernel*)

- Initial RAM Disk (*initrd*)
- Root File System (*rootfs*)
- Default Disk File System (*diskdfl*)
- Disk File System (*disk*)

19.1.16 Ethernet Interfaces

By clicking on the “Ethernet Interfaces” link, in the “Diagnostics” menu, you come to the following page:

The above figure applies to a Z-PASS2-S-R01/Z-PASS2-S-IO/Z-TWS4-IO CPU, when the “Ethernet Mode” is “LAN/WAN”.

In this page, for each of the two available Ethernet interfaces (LAN and WAN), the following information is shown:

- the Ethernet link status (i.e. “Down” or “Up”)
- the number of packets/bytes received from the Ethernet interface, when the link is up; “0/0” when the link is down
- the number of packets/bytes sent to the Ethernet interface, when the link is up; “0/0” when the link is down

For Z-TWS4, Z-PASS2-S, S6001-RTU and for Z-PASS2-S-R01/Z-PASS2-S-IO/Z-TWS4-IO when the “Ethernet Mode” is “Switch”, the “Ethernet Interfaces” page is similar to the one shown in the following figure.

In this page, for the one available Ethernet interface, the following information is shown:

- the number of packets/bytes received from the Ethernet interface
- the number of packets/bytes sent to the Ethernet interface

You can refresh the Ethernet status, by clicking on the “REFRESH” button.

19.1.17 Modbus Modules

By clicking on the “Modbus Modules” link, in the “Diagnostics” menu, you come to a page similar to the one in the following figure:

This page shows a table containing a row for each Modbus RTU Slave modules configured in the Z-NET4[22]/Straton project; each row contains the following information:

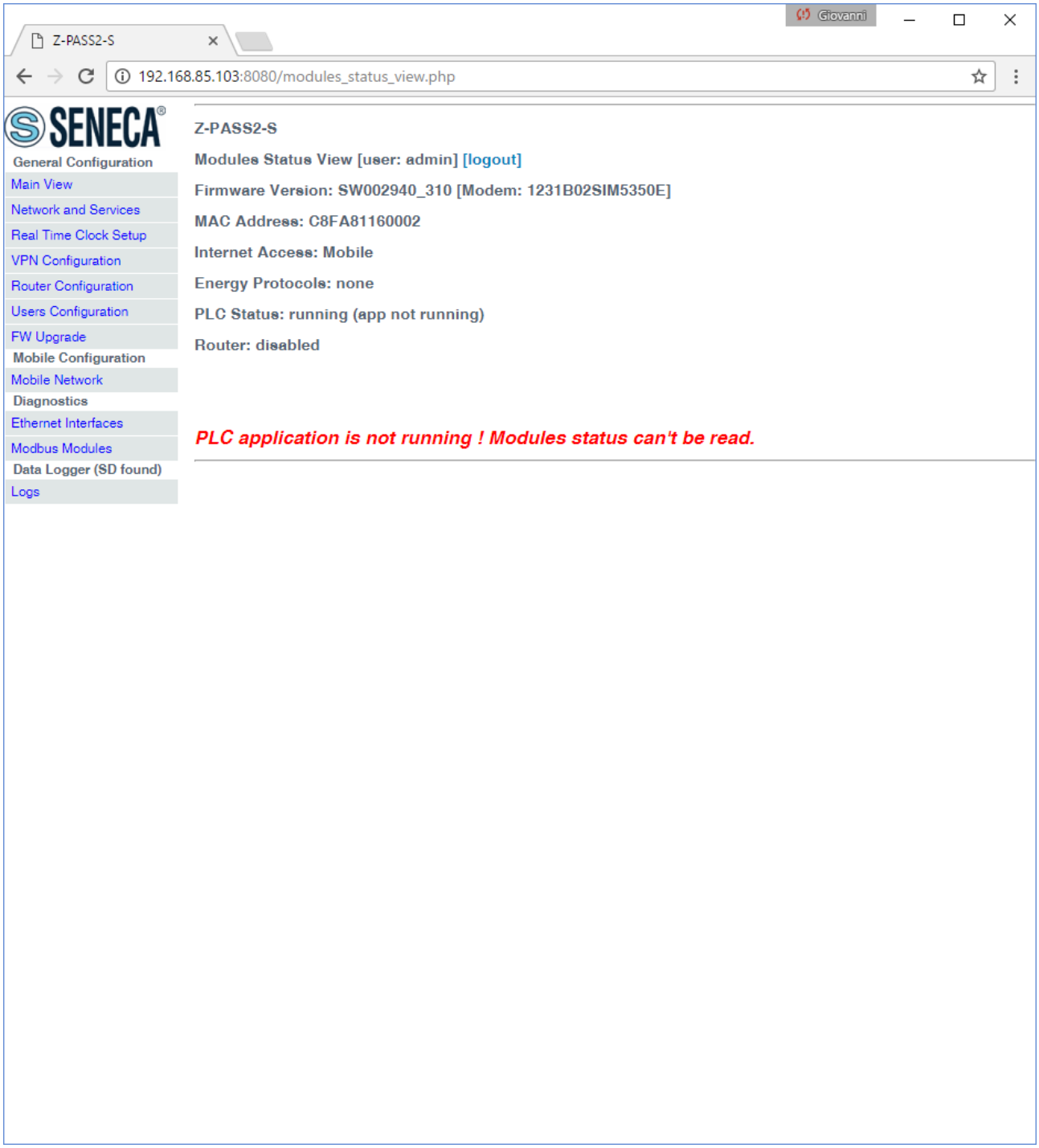
- a progressive index
- the Modbus Slave Address
- the name of the serial port (i.e. COM1/COM2/COM4) which the module is connected to
- the type of module
- the module status, which can be:
    - "OK", if the module is correctly responding to Modbus requests
    - "TIMEOUT", if the module is not responding to Modbus requests
    - "ERROR", if any other error occurs

The Modbus Modules page can't be shown in the following situations:

- if a Z-NET4 project is not loaded on the Device
- if TWS/PLC services are not running
- if a PLC application is not running, i.e. not present or stopped

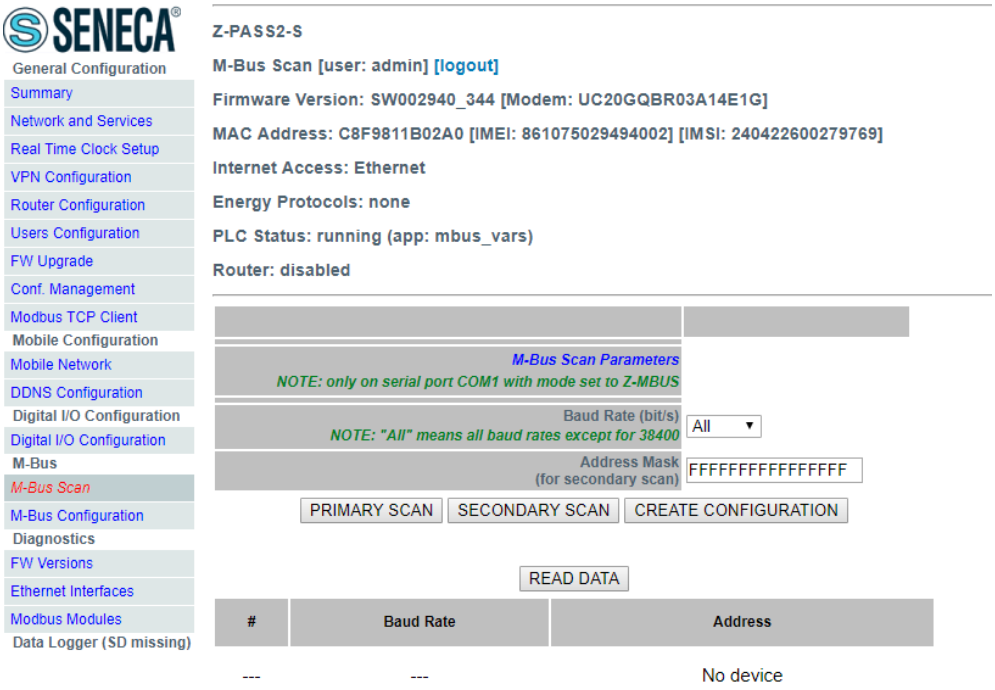
As an example, for the third of the above cases, the following message is shown:

[22] For information on Z-NET4 SW, please see chapter 21.



19.1.18 M-Bus Scan

By clicking on the “M-Bus Scan” link, in the “M-Bus” menu, you come to the following page.

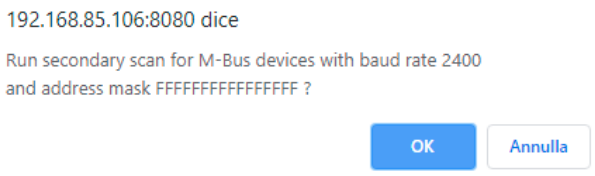


This page lets you run scan procedures to search for M-Bus devices and read data from the detected devices.

To let these procedures properly work, you have to:

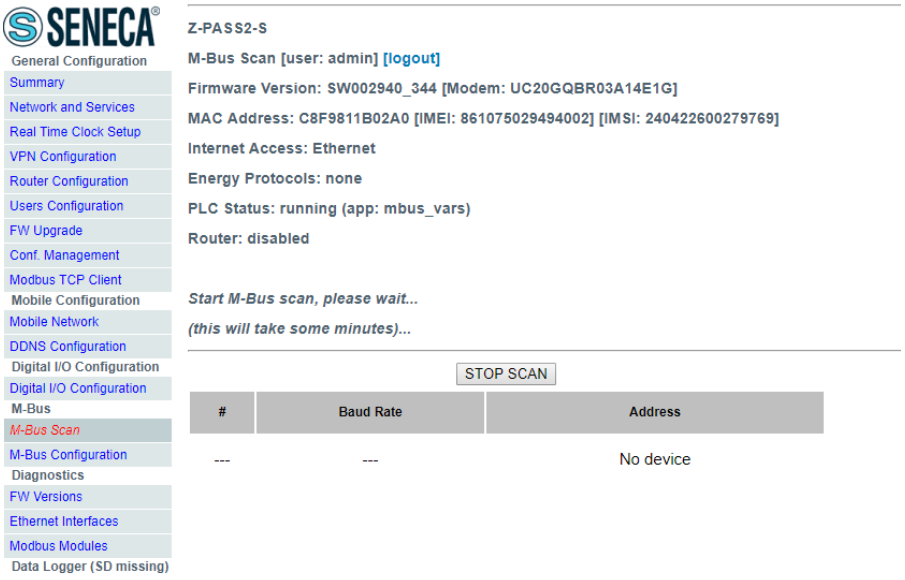
- connect the Seneca “Z-MBUS” RS232-MBUS adapter to the COM1 serial port;
- set the COM1 mode to Z-MBUS (see paragraph 19.1.2).

The “SECONDARY SCAN” button lets you scan the bus, detecting M-Bus secondary addresses; select the correct baud-rate for the COM1 serial port or select “All” to repeat the scan for any possible baud-rate[23]; then click on the button; a confirmation pop-up will be shown.

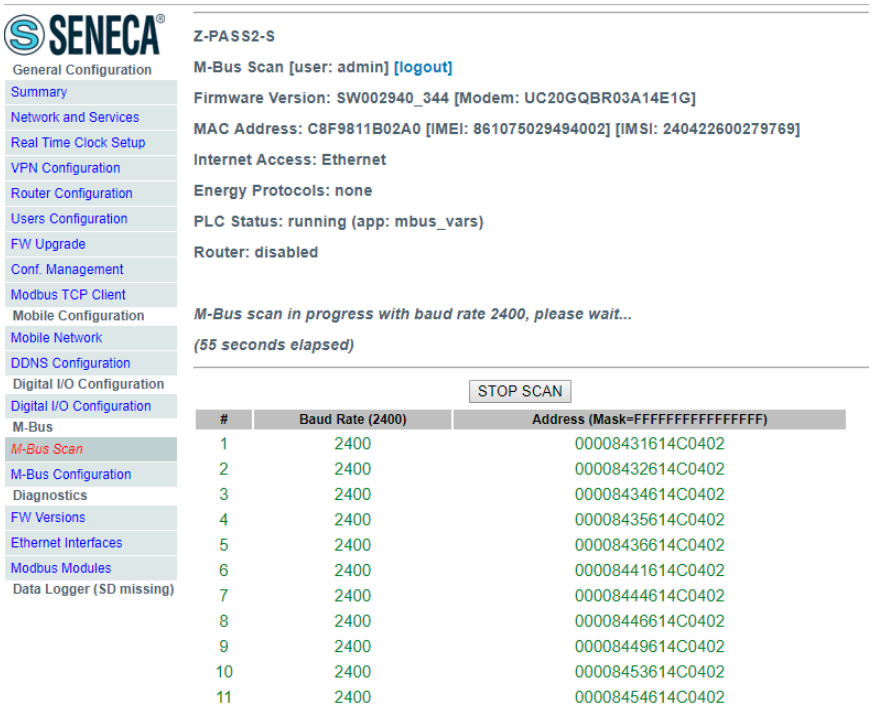


After confirming, the following page will be shown.

[23] Actually, the “All” option executes the scan for all possible baud-rates, except for 38400, that is: 300, 600, 1200, 4800, 9600, 19200; 38400 value can be selected separately.

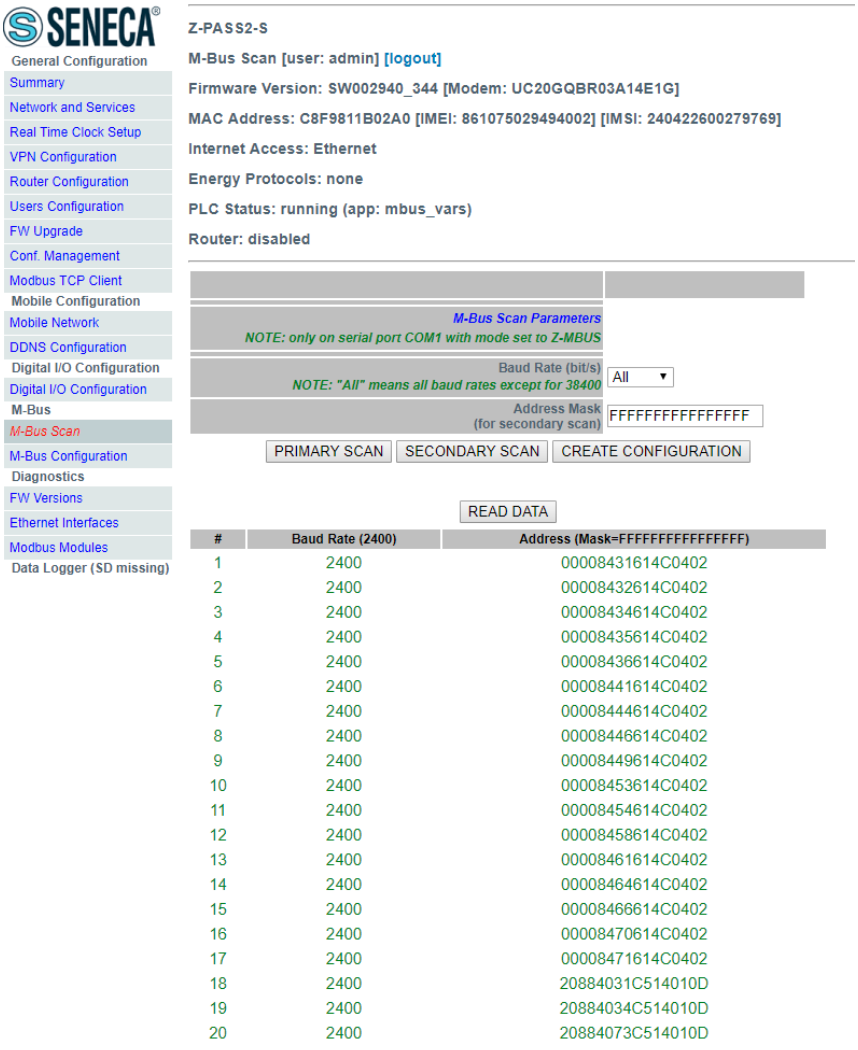


The scan procedure may take several minutes to be completed, so the page shows the number of seconds elapsed; the devices are shown in term of their secondary address and baud rate as soon as they are detected.



The “STOP SCAN” button lets you abort the procedure; anyway, the partial results are kept.

At the end of the procedure the webserver indicate the end of the scan and then the following page is displayed:



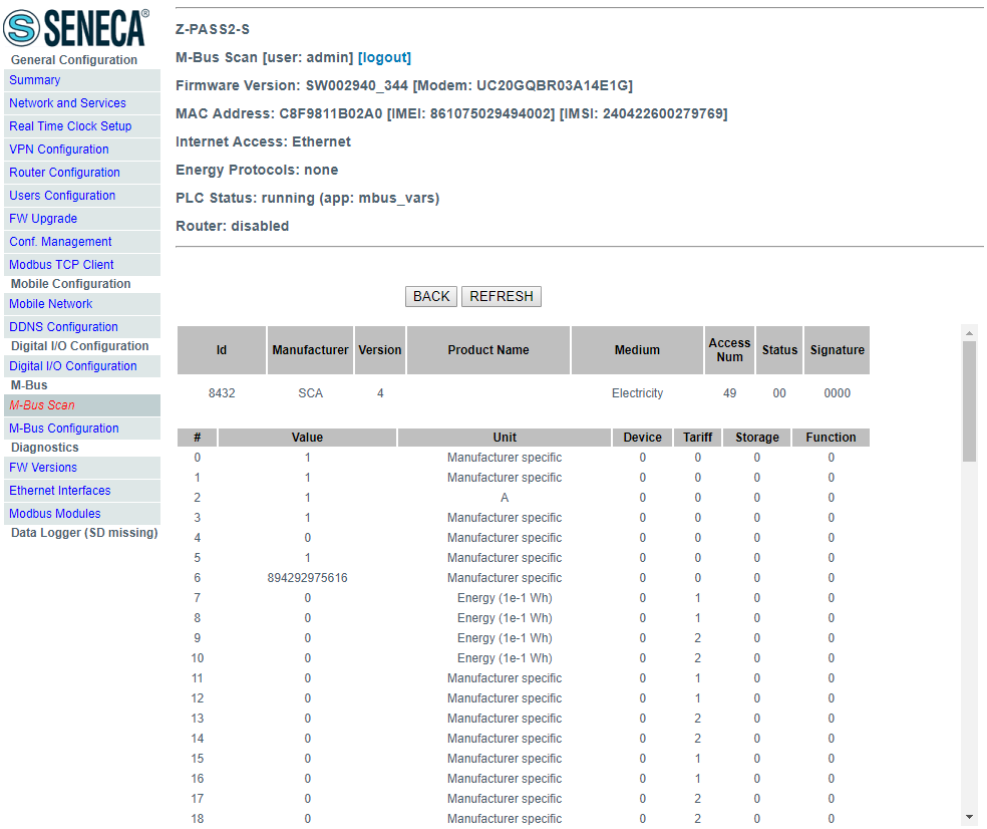
The baud rate value shown in the table header remembers the parameter choice for the last scan procedure.

The table with the detected M-Bus devices is stored in a permanent way, so after switching off and on the CPU, the results of the last scan are still available; they will be overwritten by the next scan or deleted by a factory reset ("FACTORY DEFAULT" button in "Main View" page).

In the same way the "PRIMARY SCAN" button lets you scan the bus, detecting M-Bus primary addresses; select the correct baud-rate for the COM1 serial port or select "All" to repeat the scan for any possible baud-rate[24].

You can read data from one of the devices, by selecting the corresponding row and clicking on the "READ DATA" button; you come to a page like the following.

[24]Actually, the "All" option executes the scan for all possible baud-rates, except for 38400, that is: 300, 600, 1200, 4800, 9600, 19200; 38400 value can be selected separately.



In this page:

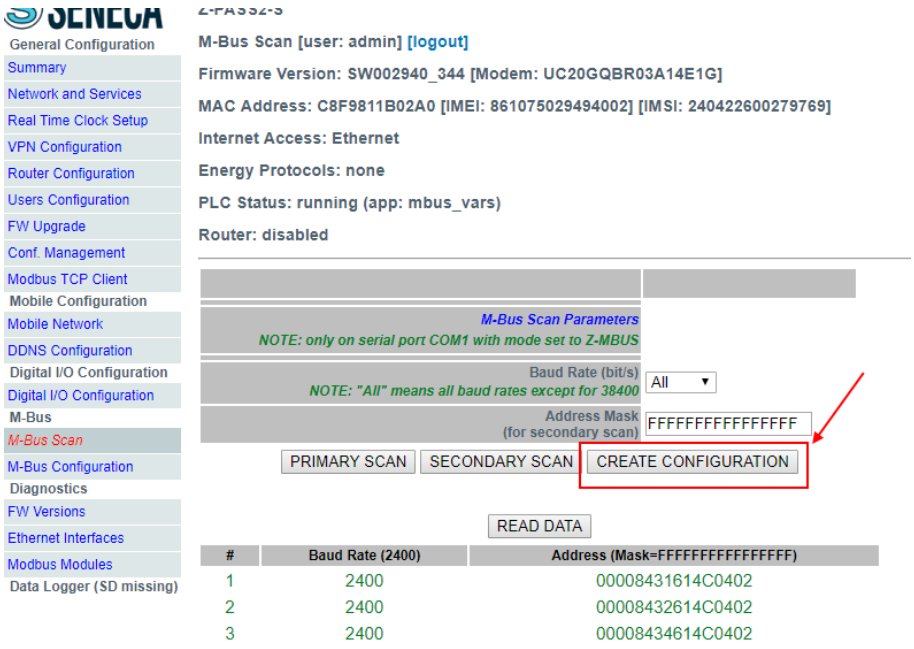
- the first table contains only one row, providing the “slave information”;

- the second table contains a variable number of rows, each providing a “data record”.

By clicking on the “REFRESH” button, you can refresh the data; by clicking on the “BACK” button, you come back to the page with the devices table.

19.1.18.1 CREATE CONFIGURATION BUTTON

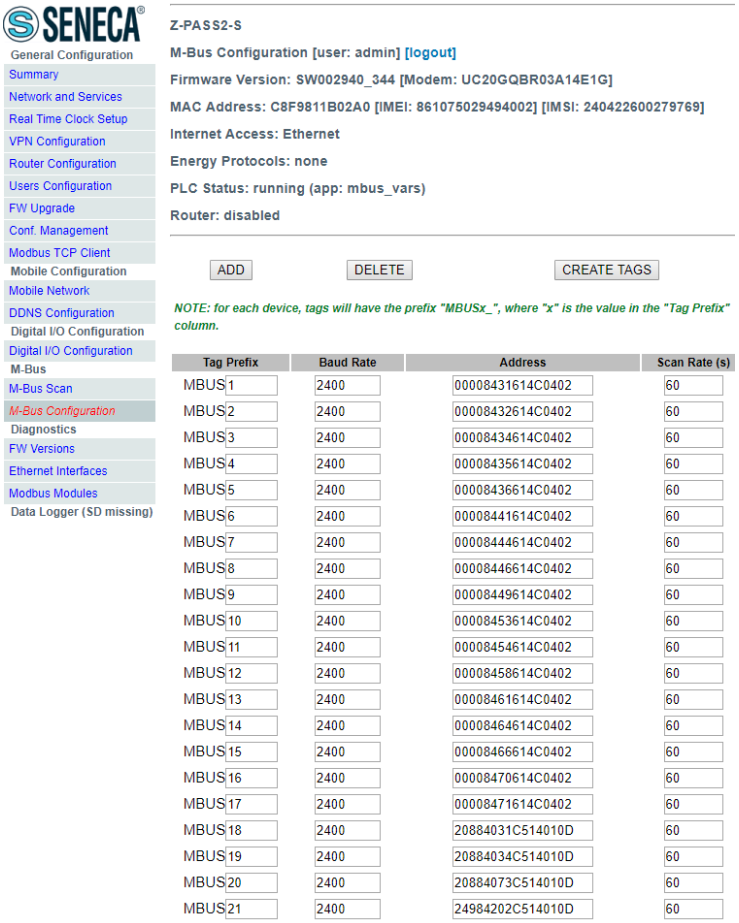
Now you can return to the previous pages and press the “CREATE CONFIGURATION” button.



In this way you have stored the actual M-BUS configuration. The webserver than move automatically to the next “M-Bus Configuration” page.

19.1.19 M-Bus Configuration

When you have pressed the “Create Configuration” in the M-Bus Scan page you will obtain the following page in the M-Bus Configuration:



The scan result can now be edited.

The 1st column represent the Straton Tag Prefix name for the device.

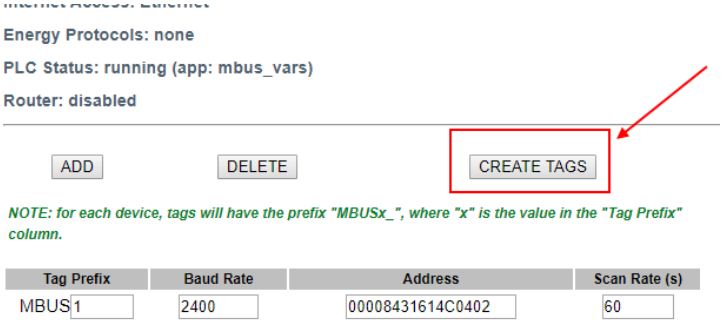
The 2nd column represent the Baud Rate to use.

The 3rd column represent the Device Address.

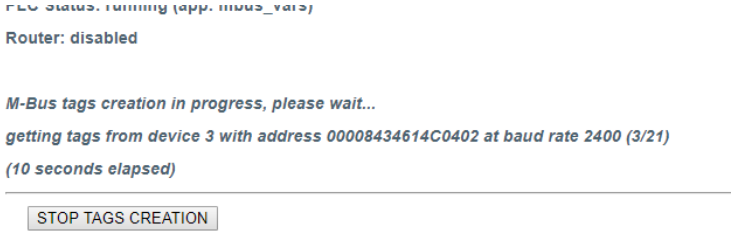
The 4th column represent the Scan Rate in seconds for this device.

19.1.19.1 Importing the M-BUS Configuration in Straton

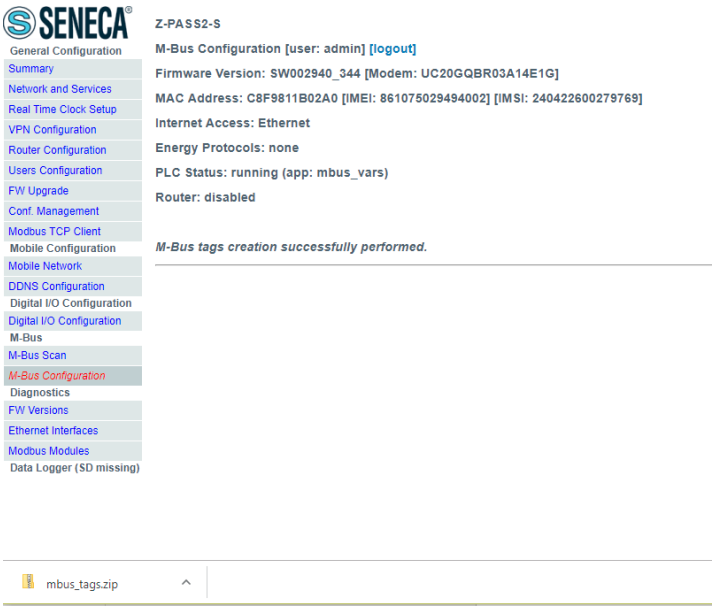
First of all we must export the actual configuration:



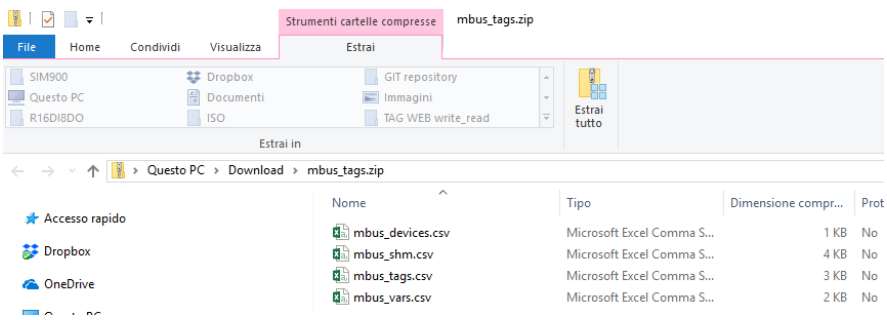
Now the tags automatic acquisition process will start:



At the end of the process a zip file (mbus_tags.zip) will be downloaded:



The zip contain 4 files:



Two of these files must be used in Straton:

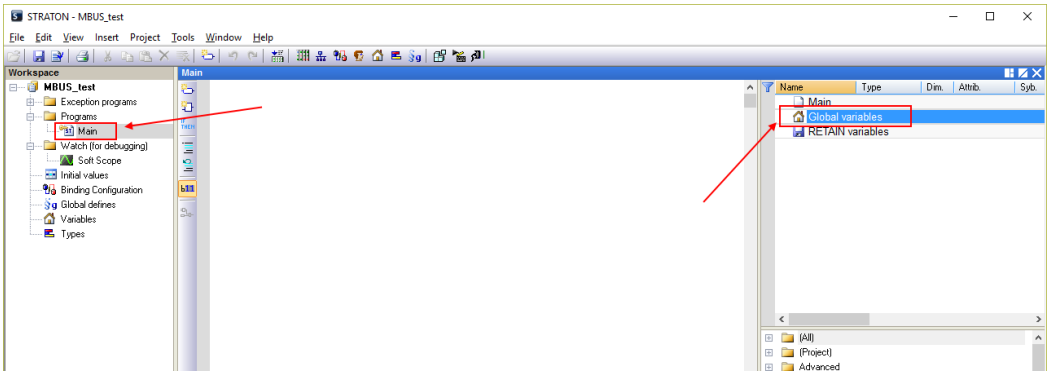
mbus_shm.csv (the shared memory configuration)

mbus_vars.csv (the M-Bus vars)

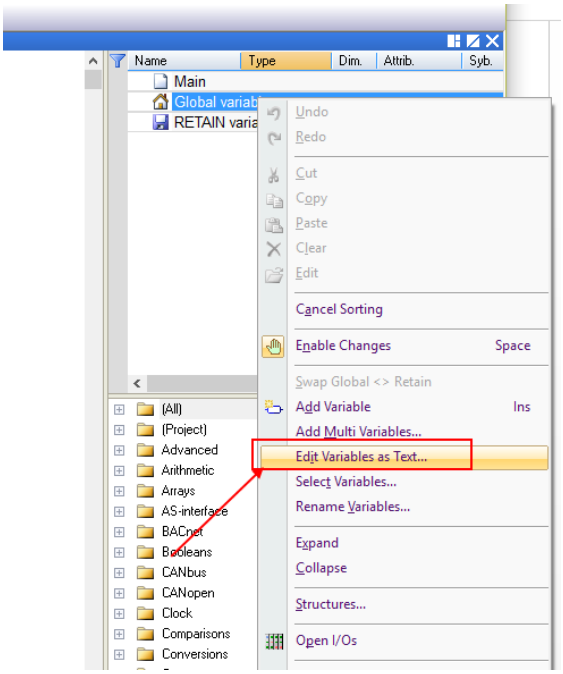
Extract the zip file in a directory.

Now launch Straton PLC:

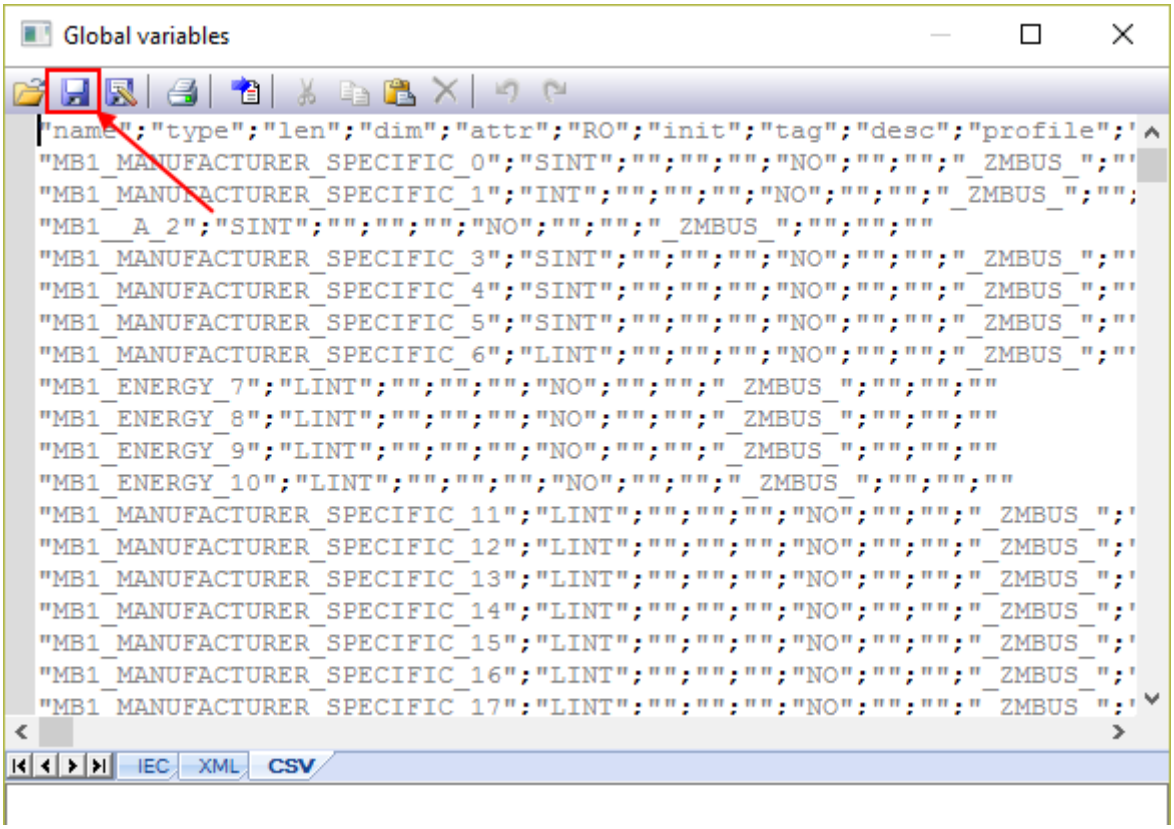
Select Main then Global Variables:



Now click the right mouse button and select “Edit Variables as Text”:



Open the “mbus_vars.csv” file with a text editor, copy and paste the list of variables into the “Global Variable” form in Straton then save the configuration with the “disk” icon:

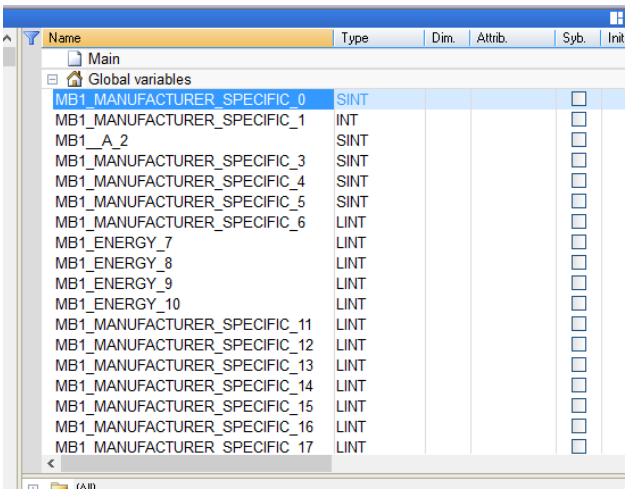


NOTE: The first Line

"name";"type";"len";…

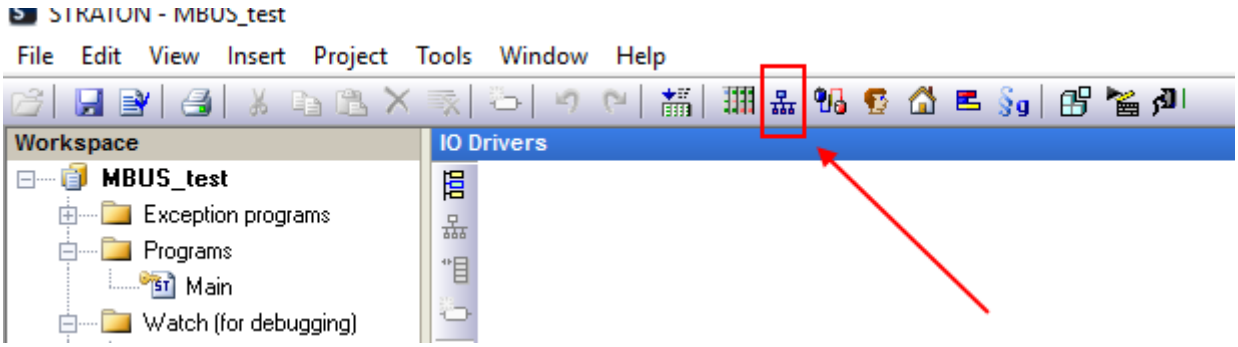
must be present only one time and only in the first row.

The variables are imported:

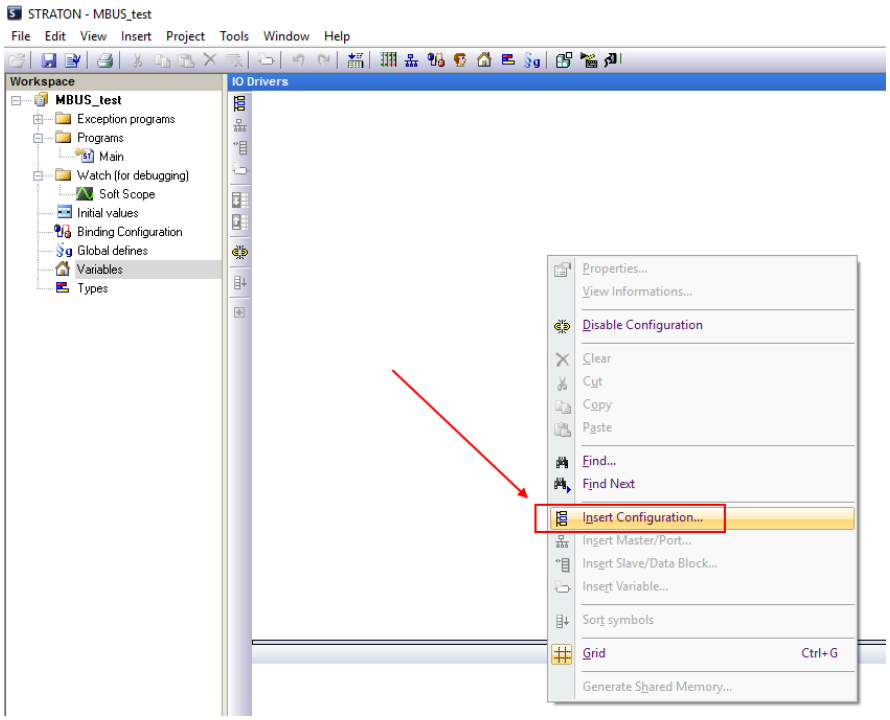


Now we must create the shared memory used for sharing the data from M-BUS:

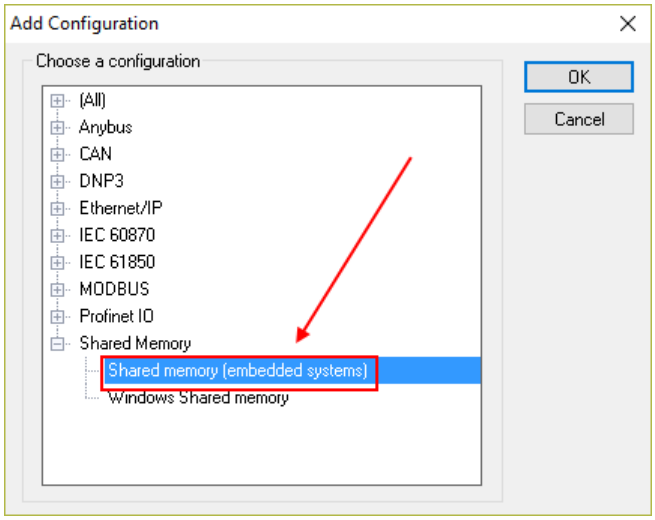
Click on fieldbus icon:



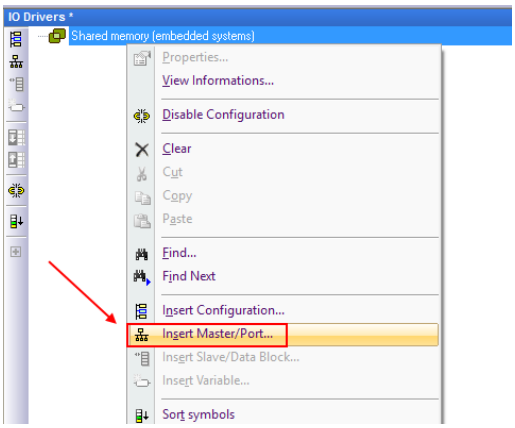
Click with the right mouse button and select “Insert Configuration”:



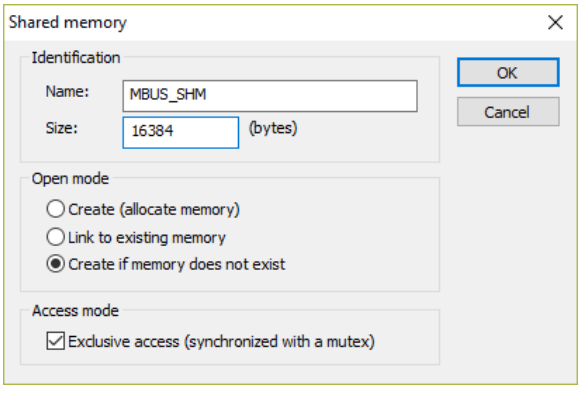
Now create the Embedded Shared Memory:



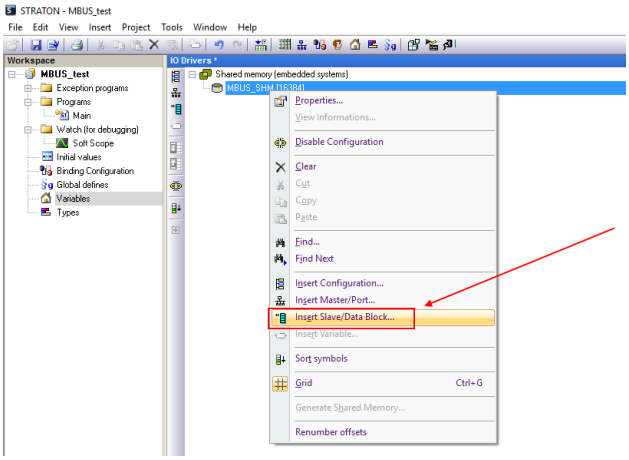
Insert a Master/Port:



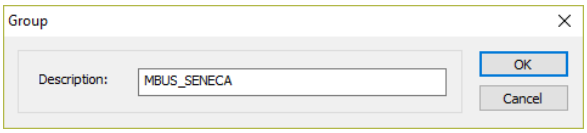
The Shared configuration MUST be (don't change any setting):



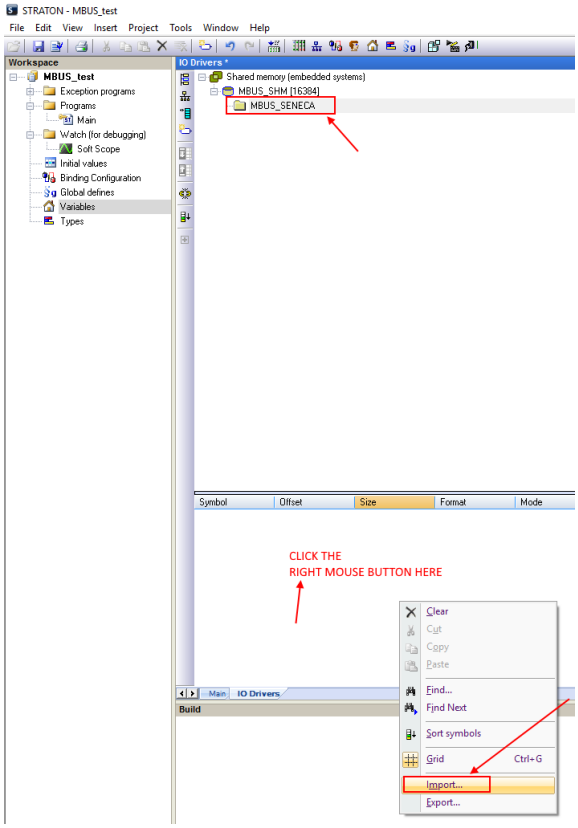
Now insert the data Block:



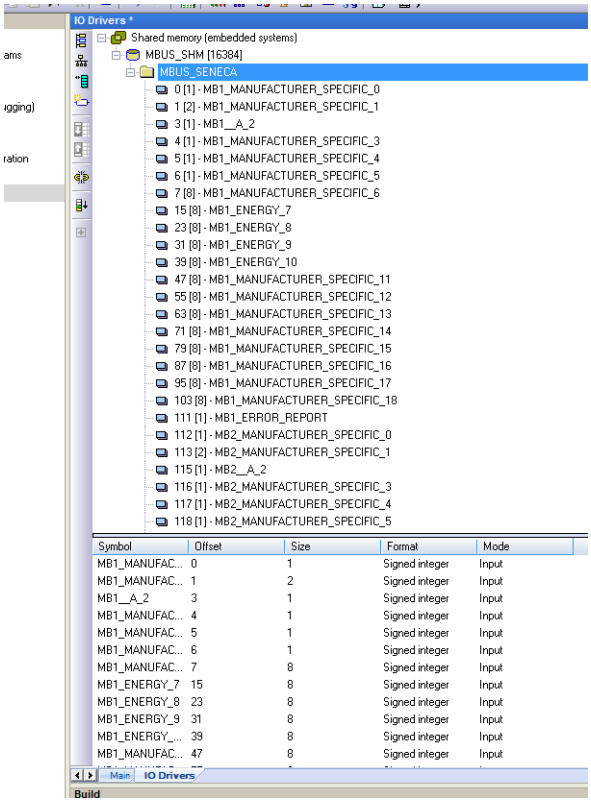
Create a name group (use the name that you want):



Then import the shared memory file:

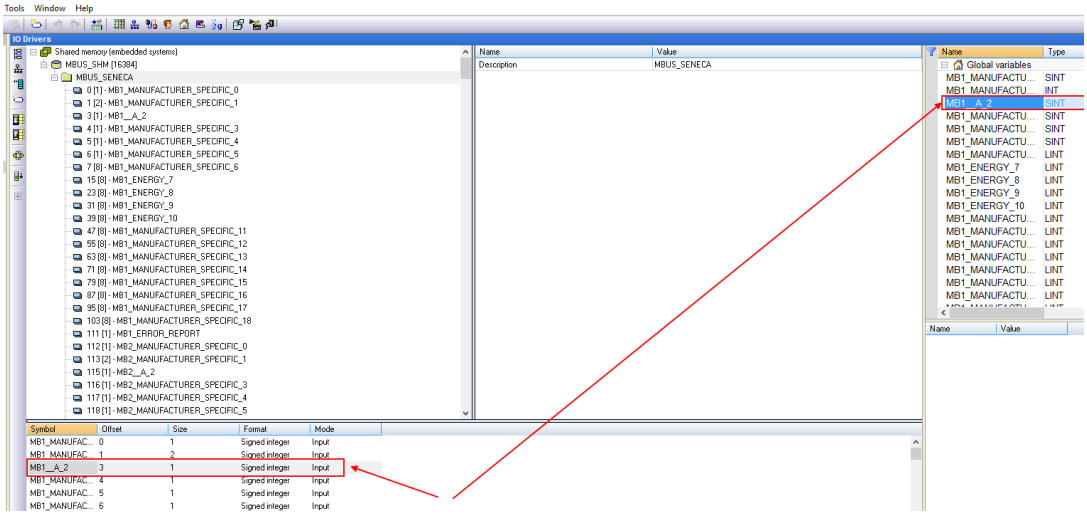


Select the “mbus_shm.csv” file:

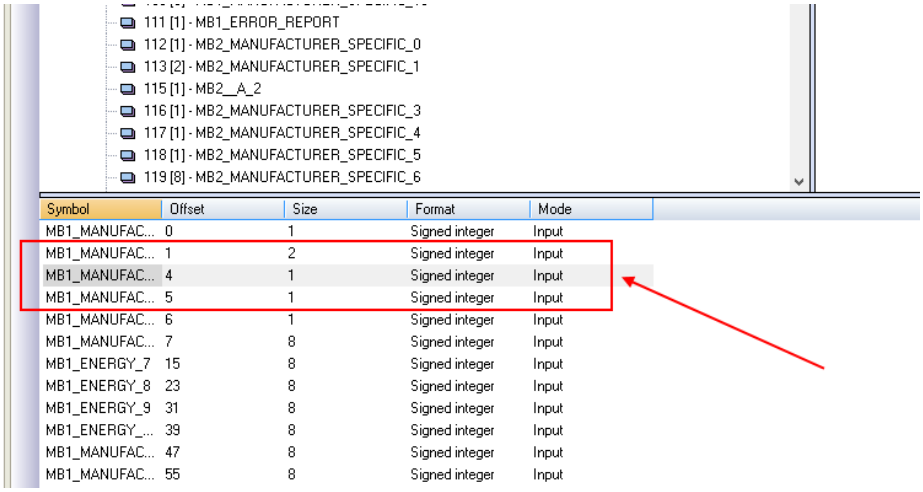


19.1.19.2 Delete unused M-BUS variables

For delete one or more variables clear the variables and the corresponding shared memory entry:



Note that in the shared memory the offsets of others variables are not changed:



19.1.19.3 Replace a M-BUS Device

For Replace an existing M-BUS device (for example in case of a replace for failure)

1. Go to M-BUS Scan and make a Secondary or Primary Scan
2. Take note of the new address
3. Go to M-BUS Configuration and manually change the address from the old to the new device
4. Push the “Create Tag” button
5. You don’t need to make any change in Straton

19.1.19.4 Adding a M-BUS Device

1. Go to M-BUS Scan and make a Secondary or Primary Scan
2. Take note of the new address and baudrate
3. Go to M-BUS Configuration and manually add the address and baudrate of the new device with the “ADD” button
4. Push the “Create Tag” button
5. Import the shared memory file (see chapter 19.1.19.1)
6. Import the variable file (see chapter 19.1.19.1) without delete your local variable (use copy-paste)

19.1.19.5 Delete a M-BUS Device

1. Go to M-BUS Scan and make a Secondary or Primary Scan
2. Take note of the Device address to delete
3. Go to M-BUS Configuration and manually delete the device with the “DELETE” button
4. Push the “Create Tag” button
5. Import the shared memory file (see chapter 19.1.19.1)

6. Delete the variables from the deleted device

19.1.19.6 Tag error report

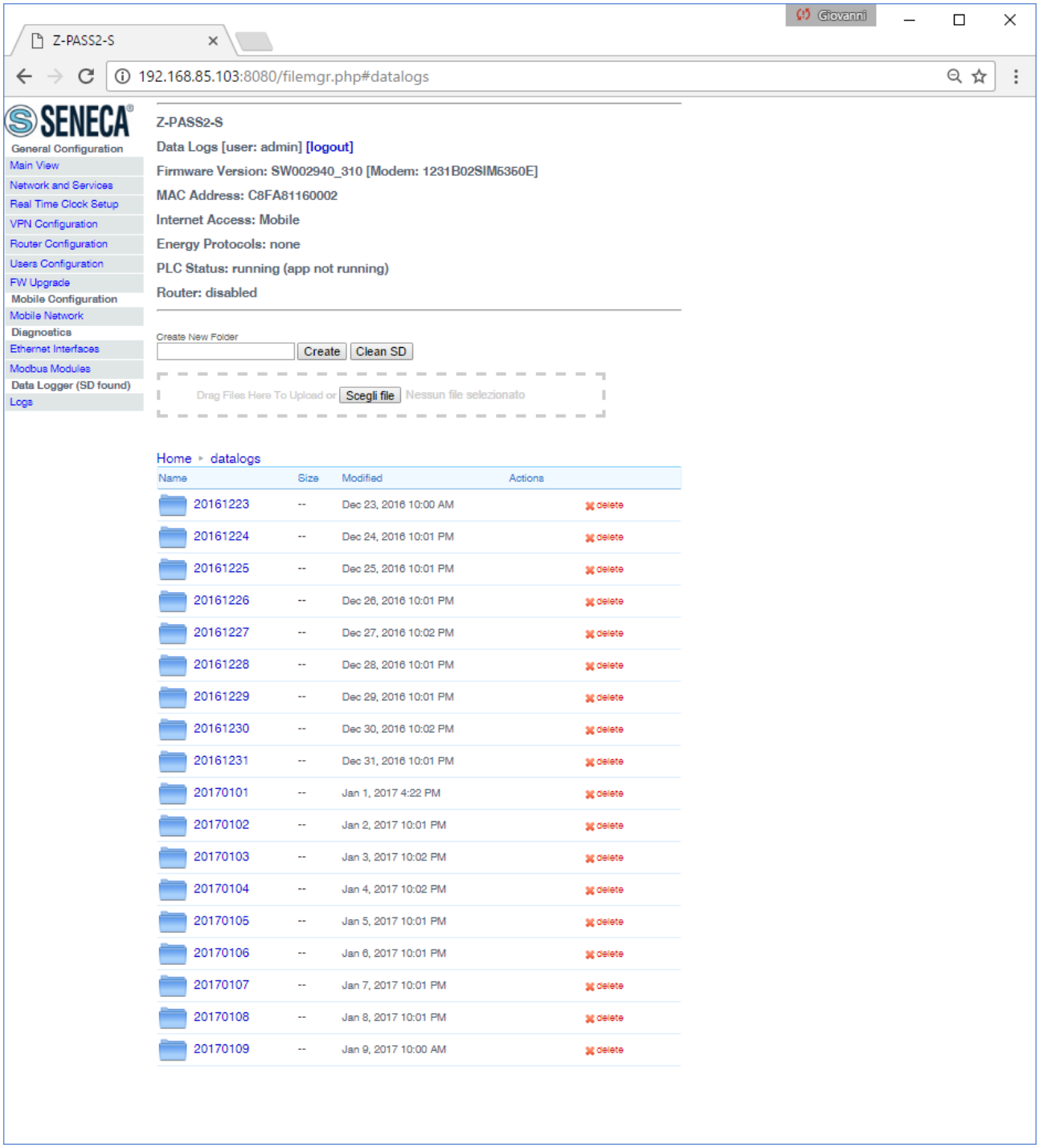
When variable tags are imported in Straton a special tag is creted “Tag error report”.

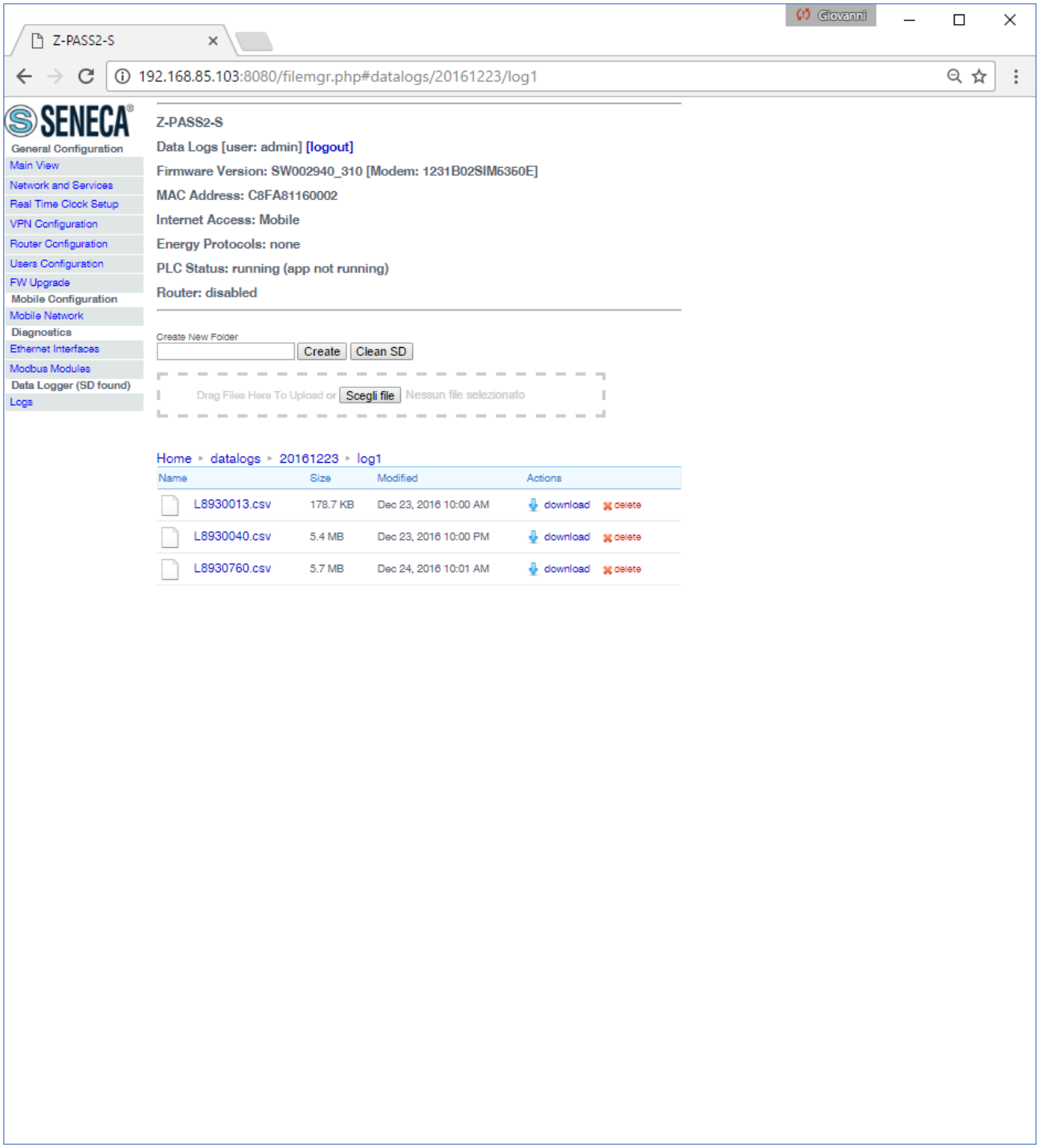
Use this tag for monitoring the device communication errors:

ERORR REPORT VALUE	***MEANING***
0	READ OK
-2	READ TIMEOUT, NO RESPONSE FROM DEVICE

19.1.20 Data Logs

By clicking on the “Logs” link, in the “Data Logger” menu, you come to a page similar to those in the following figures:


Giovanni
Z-PASS2-S
192.168.85.103:8080/filemgr.php#datalogs
SENECA
General Configuration
Main View
Network and Services
Real Time Clock Setup
VPN Configuration
Router Configuration
Users Configuration
FW Upgrade
Mobile Configuration
Mobile Network
Diagnostics
Ethernet Interfaces
Modbus Modules
Data Logger (SD found)
Logs
Z-PASS2-S
Data Logs [user: admin] [logout]
Firmware Version: SW002940_310 [Modem: 1231B02SIM6360E]
MAC Address: C8FA81160002
Internet Access: Mobile
Energy Protocols: none
PLC Status: running (app not running)
Router: disabled
Create New Folder
Create
Clean SD
Drag Files Here To Upload or
Scegli file
Nessun file selezionato
Home ▸ datalogs
Name
Size
Modified
Actions
20161223 -- Dec 23, 2016 10:00 AM delete
20161224 -- Dec 24, 2016 10:01 PM delete
20161225 -- Dec 25, 2016 10:01 PM delete
20161226 -- Dec 26, 2016 10:01 PM delete
20161227 -- Dec 27, 2016 10:02 PM delete
20161228 -- Dec 28, 2016 10:01 PM delete
20161229 -- Dec 29, 2016 10:01 PM delete
20161230 -- Dec 30, 2016 10:02 PM delete
20161231 -- Dec 31, 2016 10:01 PM delete
20170101 -- Jan 1, 2017 4:22 PM delete
20170102 -- Jan 2, 2017 10:01 PM delete
20170103 -- Jan 3, 2017 10:02 PM delete
20170104 -- Jan 4, 2017 10:02 PM delete
20170105 -- Jan 5, 2017 10:01 PM delete
20170106 -- Jan 6, 2017 10:01 PM delete
20170107 -- Jan 7, 2017 10:01 PM delete
20170108 -- Jan 8, 2017 10:01 PM delete
20170109 -- Jan 9, 2017 10:00 AM delete



This page shows the contents of the SD card which, typically, is used to store “Data Logs” files; these files are created by the “Data Logger” functionality available in Z-NET4 “Telecontrol Functions” (see chapter 21).

The page lets you perform the following operations:

- browse the SD folder tree, clicking on the folder name links
- delete a folder, clicking on the “delete” link
- create a new folder, by means of the “Create New Folder” text-box and “Create” button; the new folder is created in the folder currently shown
- download a file, clicking on the filename link or on the “download” link
- delete a file, clicking on the “delete” link

- uploading a file, selecting it by means of the “Choose file” button or dragging it into the dashed area; the file is created in the folder currently shown
- clean the SD, by means of the “Clean SD” button; please note that this is done by formatting the SD, so all SD contents will be lost

If an SD card is not available on the Device, the “Logs” link is not shown, as in the following figure.

19.2 User pages

It is also possible to access the Device configuration site as a “non-administrator” user; this user is allowed to access only the “Main View” and “Network and Services” pages, viewing and setting only a limited number of configuration parameters; in S6001-RTU, the “I/O View” page is also available.

Also the “FW Versions”, “Ethernet Interfaces” and “Modbus Modules” pages of the “Diagnostics” section are available for this kind of user; they will not be shown again here, as they are identical to those for administrator user.

To login as “non-administrator” user, connect the browser to the Device IP address on port 8080, e.g.:

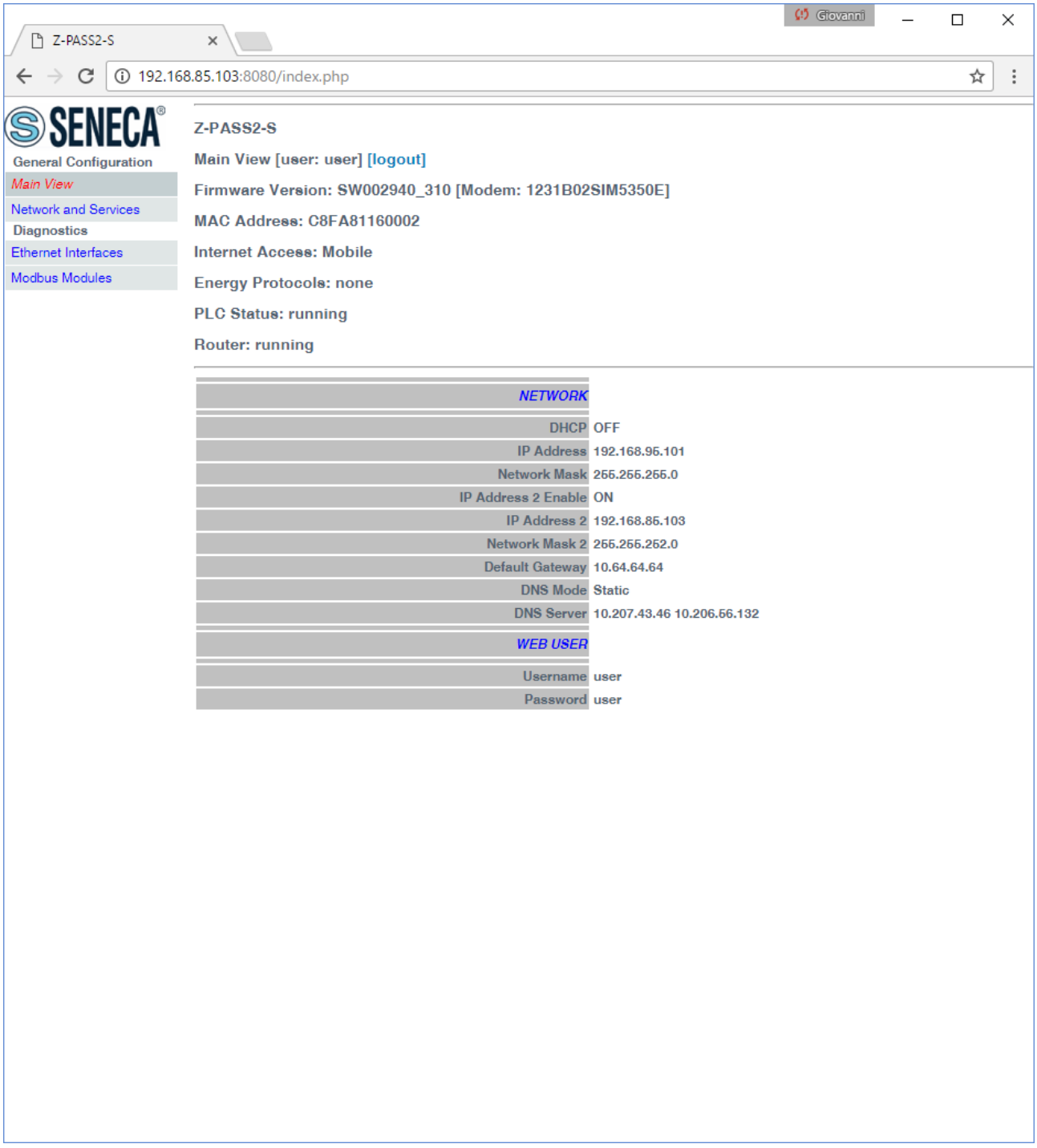
http://192.168.90.101:8080

and, when asked, provide the following credentials (default values):

Username: user
Password: user

You come to the “Main View” page, described in the following paragraph.

19.2.1 Main View



In this page, some Network parameters and the Web User credentials are shown, with their current values.

To change the parameter values, you have to go to the “Network and Services” page, described in the following paragraph.

19.2.2 Network and Services

The parameters shown in this page slightly change, depending on the HW version of the product (Z-TWS4/Z-PASS2-S or Z-PASS2-S-R01/Z-PASS2-S-IO/Z-TWS4-IO) and, for new HW versions, on the selected "Ethernet Mode"; this is shown in the following figures.

The previous figure shows the “Network and Services” page for a Z-PASS2-S-R01/Z-PASS2-S-IO/Z-TWS4-IO, when the “Ethernet Mode” parameter is set to “Switch”; it also applies to a Z-TWS4 and Z-PASS2-S (old versions) and to a S6001-RTU.

The previous figure shows the "Network and Services" page for a Z-PASS2-S-R01/Z-PASS2-S-IO/Z-TWS4-IO, when the "Ethernet Mode" parameter is set to "LAN/WAN".

There is an important difference between the parameter values shown in this page and those shown in the "Main View" page: the former are configured values, whereas the latter are actual values.

To better explain this difference, let's consider the case when the DHCP parameter is set to ON; in the "Network and Services" page, you may see the 192.168.90.101 default value for the "IP Address" parameter, whereas the "Main View" page shows the actual IP Address, assigned by the DHCP server.

In the following table, all configuration parameters available in this page are listed, with a short explanation and the parameter default value for each of them.

Note that "Ethernet Mode" parameter is not shown in user pages.

Field	Meaning	Default value
Ethernet Mode = "Switch"		
NETWORK/DHCP	Flag to enable/disable the DHCP functionality on the Ethernet interface.	OFF
NETWORK/IP Address	IP address of the Ethernet interface (disabled when "DHCP" is set to "ON")	192.168.90.101
NETWORK/Network Mask	Network mask of the Ethernet interface (disabled when "DHCP" is set to "ON")	255.255.255.0
NETWORK/IP Address 2 Enable	Flag to enable/disable the second IP address on the Ethernet interface. Note that the second IP address can be enabled also when the DHCP functionality is active.	OFF
NETWORK/IP Address 2	Second IP address of the Ethernet interface	192.168.100.101
NETWORK/Network Mask 2	Second network mask of the Ethernet interface	255.255.255.0
Ethernet Mode = "LAN/WAN"		
NETWORK/DHCP on WAN	Flag to enable/disable the DHCP functionality on the WAN Ethernet interface	ON
NETWORK/LAN IP Address	IP address of the LAN Ethernet interface	192.168.90.101
NETWORK/LAN Network Mask	Network mask of the LAN Ethernet interface	255.255.255.0
NETWORK/WAN IP Address	IP address of the WAN Ethernet	192.168.100.101

	interface (disabled when "DHCP on WAN" is set to "ON")	
NETWORK/WAN Network Mask	Network mask of the WAN Ethernet interface (disabled when "DHCP on WAN" is set to "ON")	255.255.255.0
NETWORK/Default Gateway	Default Gateway IP address (disabled when DHCP functionality is enabled on any interface). When "Ethernet Mode" is set to "LAN/WAN", the Default Gateway shall be in the WAN subnet.	192.168.100.1 , for Z-TWS4-R0x and Z-PASS2-S-R0x (x=1,2) 192.168.90.1, for all other products
NETWORK/DNS Mode	Tells if the DNS Server shall be set statically (value: "Static") or dinamically assigned by the DHCP Server (value: "DHCP")	DHCP, for Z-TWS4-R0x and Z-PASS2-S-R0x (x=1,2) Static, for all other products
NETWORK/DNS Server	DNS server IP address (disabled when DHCP functionality is enabled on any interface and DNS Mode = DHCP)	192.168.100.1 , for Z-TWS4-R0x and Z-PASS2-S-R0x (x=1,2) 192.168.90.1, for all other products
WEB USER/Username	Username to access the web configuration site (limited access)	User
WEB USER/Password	Password to access the web configuration site (limited access)	user

Some notes about the "DHCP" parameters:

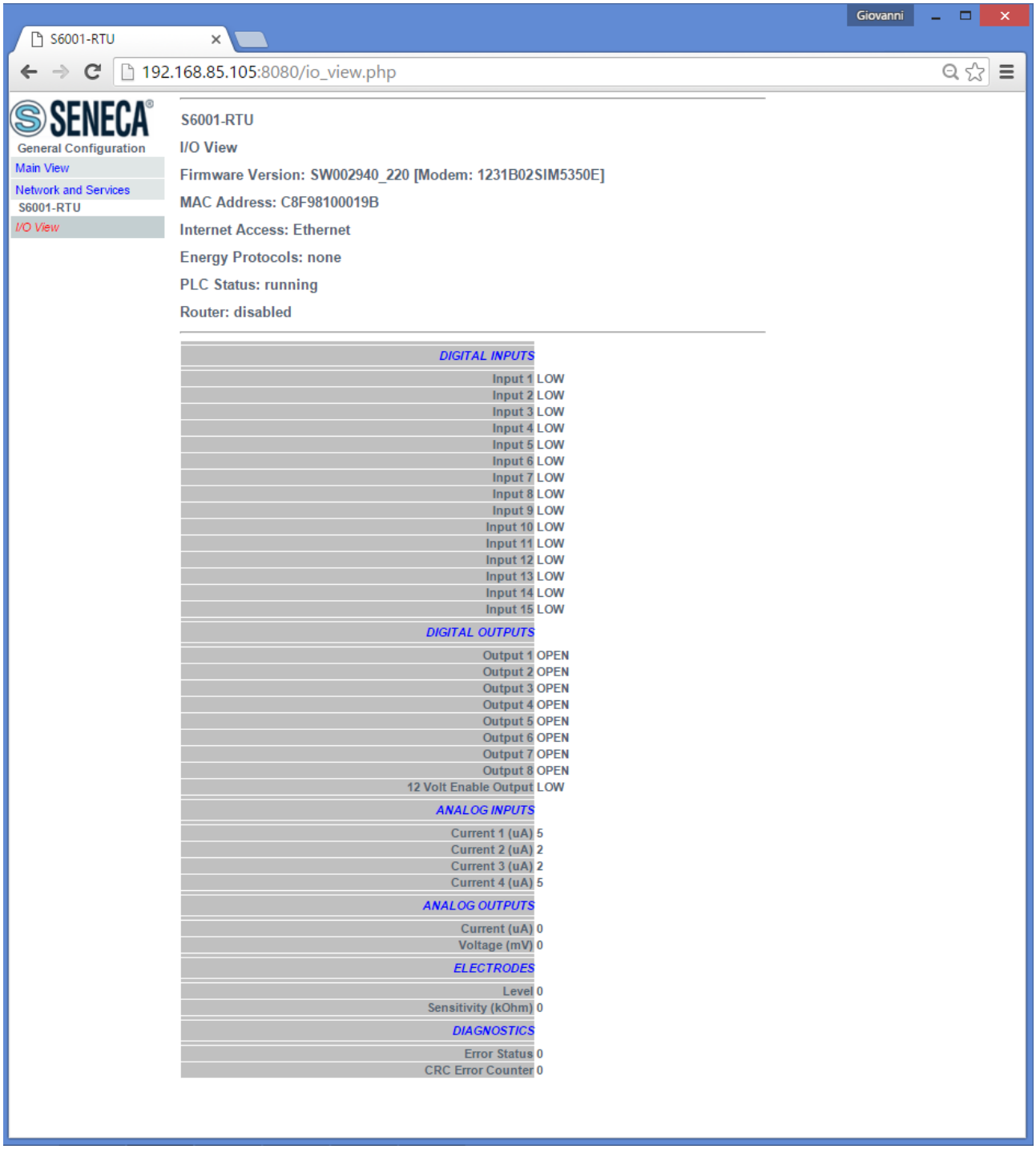
- the "DHCP" parameter can be set to "ON" only if the "DHCP Server" parameter of the "Router Configuration" page is set to "OFF";
- only the "DHCP on WAN" parameter can be set to "ON".

You can change any of the above parameters; to apply the changes, press the "APPLY" button.

Please note that, after changing the Web User credentials, a new login will be required to access any page.

19.2.3 I/O View (S6001-RTU)

This page is identical to that shown for "administrator user" (see 19.1.12).



19.3 Guest pages

It is also possible to access the Device configuration site as a “guest” user; this user is allowed to access all the pages except for “FW Upgrade”, “Configuration Management”” and “Data Logs” pages, viewing all configuration parameters and status information, without changing any parameter; so, in all the pages, the “APPLY” buttons (and any other button used to perform changes) are disabled.

To login as “guest” user, connect the browser to the Device IP address on port 8080, e.g.:

http://192.168.90.101:8080

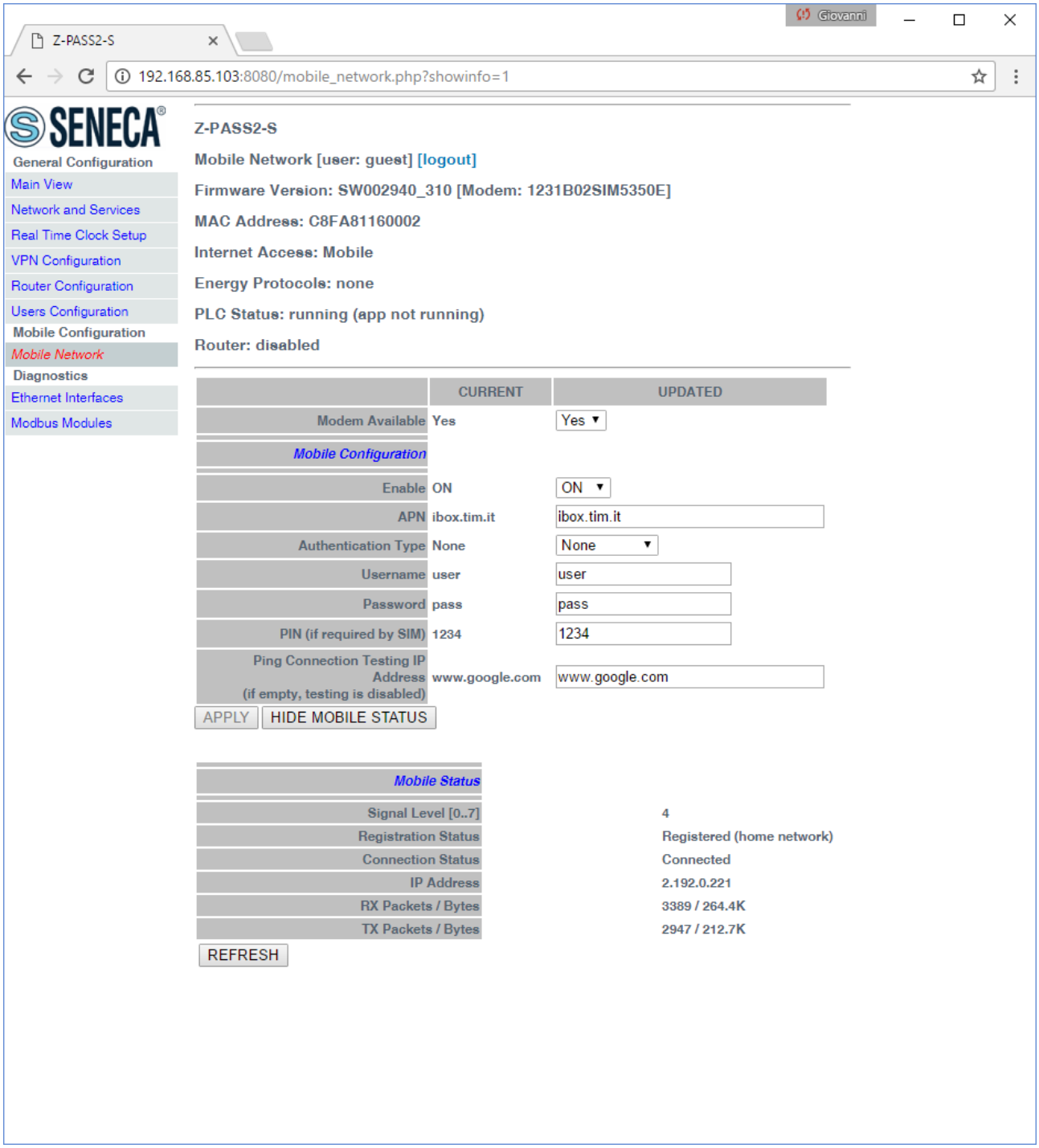
and, when asked, provide the following credentials (default values):

Username: guest
Password: guest

You come to the “Main View” page, shown in the following figure.

Note that, as told above, the “FACTORY DEFAULT”, “RESTART” and “CLEAN INTERNAL DATA LOGS” buttons are disabled.

Another example of a page accessed by the “guest” user is given in the following figure.



In the “Mobile Network” page, the “APPLY” button is disabled, whereas the “SHOW MOBILE STATUS”/”HIDE MOBILE STATUS” and “REFRESH” buttons are enabled, letting the “guest” user to view the Mobile Status.

20 Seneca StratON Library

To let the users exploit Z-TWS4/Z-PASS2-S/S6001-RTU features in their IEC 61131-3 programs, Seneca has developed a set of “Function Blocks” and Functions, supplied with the Seneca library for StratON.

In this chapter, all the FBs and functions available on Z-TWS4/Z-PASS2-S/S6001-RTU are listed, providing a description of input/output parameters and some notes for each of them.

20.1 Function Blocks

20.1.1 General FB behavior

The description given in this paragraph apply to all the FBs available on Z-TWS4/Z-PASS2-S/S6001-RTU, except for the LINUX_SHELL FB, which has a particular behavior (see related paragraph).

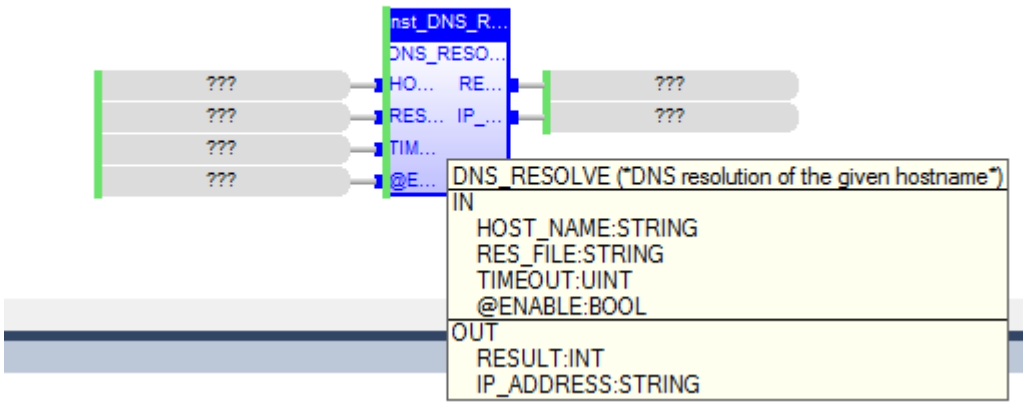
All the FBs require more than one PLC cycle to be completed (Asynchronous Function Block); so, the application shall run them for a number of cycles until it detects that the FB execution has ended.

Every FB has an "ENABLE" parameter, which is an input/output parameter: to let the FB actually run, the application shall put ENABLE=TRUE (input), not changing the parameter value during the FB execution; when the execution is completed, the FB code itself will put ENABLE=FALSE (output); when the FB is called with ENABLE=FALSE, it does nothing and returns the *NOT_DONE* (-2) result value.

All the FBs return the *FAILED* (-1) result value to signal that the FB execution has failed, for a generic reason; some FBs provide further failure result values, in particular the *TIMEOUT* (2) result value.

All the FBs return the *RUNNING* (0) result value to tell the application that the FB processing is still running and the *DONE* (1) result value when the FB processing has successfully ended.

20.1.2 DNS_RESOLVE



The DNS_RESOLVE FB resolves a hostname into the corresponding IP address.

When first called, the FB runs a process which starts the DNS resolution;
on subsequent calls, it only checks if the process has finished its job.

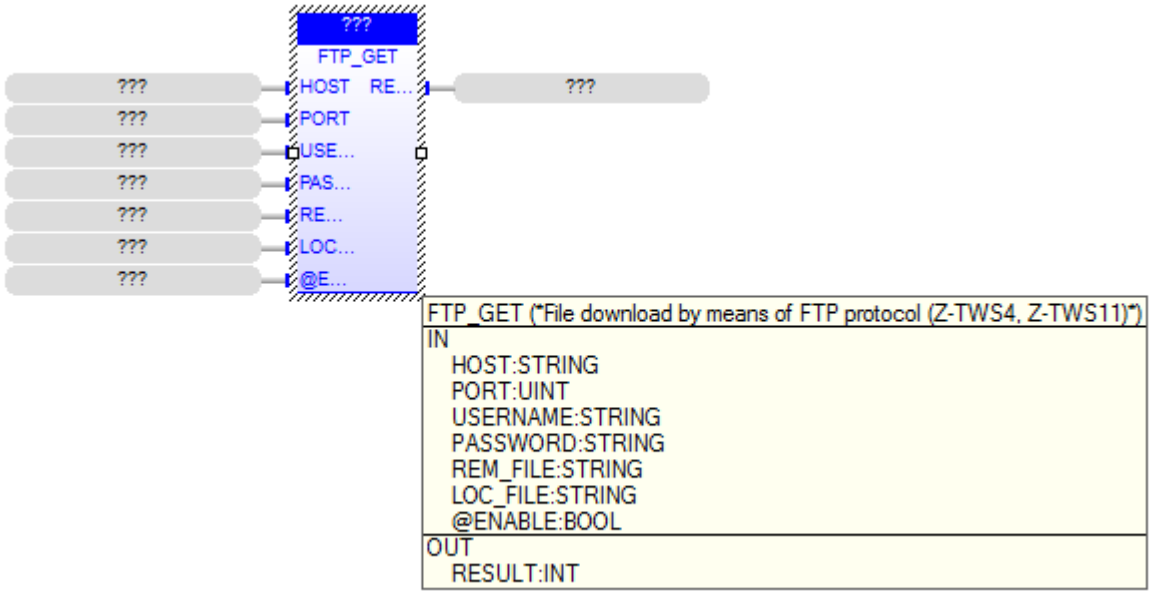
The FB has the following input parameters:

- HOST_NAME : the hostname to be resolved

- RES_FILE : if this parameter is not empty, the resulting IP address will be written into /var/run/ file; if this is not needed, the parameter can be left empty
- TIMEOUT : timeout, in seconds
- @ENABLE : TRUE -> FB is executed
FALSE -> FB is skipped

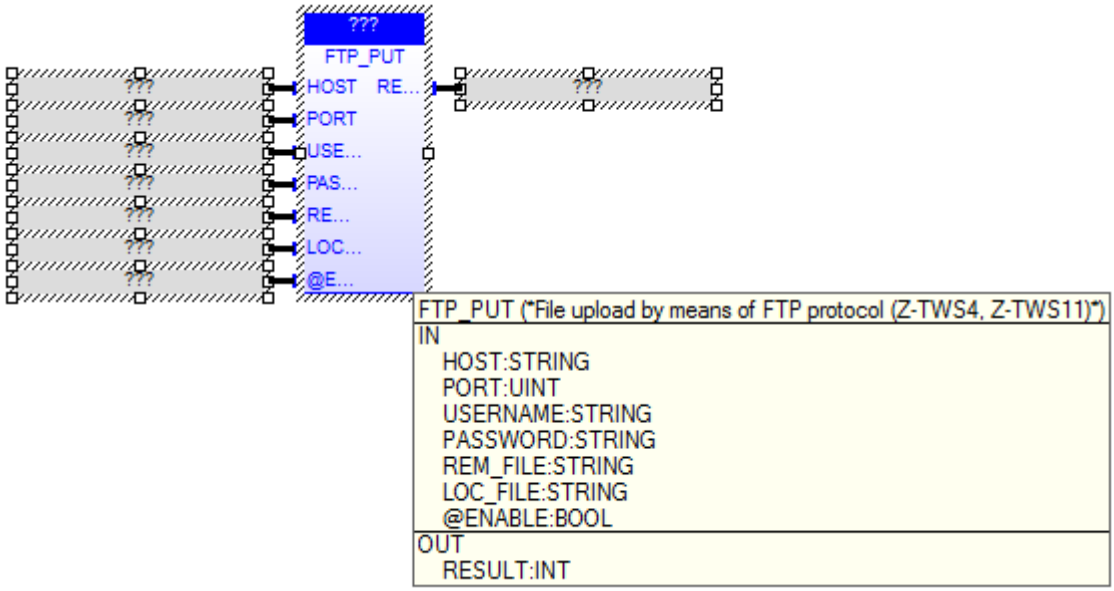
The FB has the following output parameters:
- RESULT : -2, when called with ENABLE=FALSE
-1, in case of any failure
0, if the process is still running
1, if the process has successfully finished
2, if timeout has expired
- IP_ADDRESS : the resulting IP address

20.1.3 FTP_GET



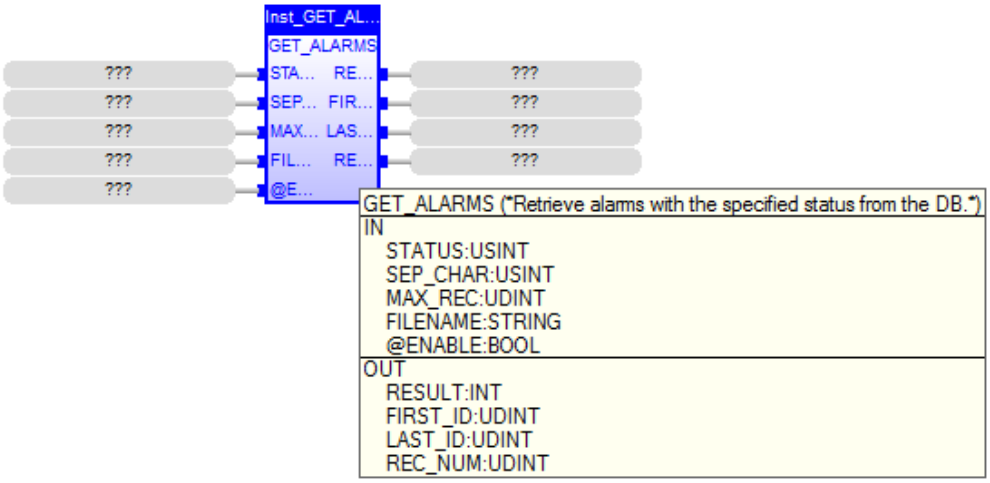

```
The FTP_GET FB downloads a file, by means of the FTP protocol.

When first called, the FB runs a process which starts performing the download;
on subsequent calls, it only checks if the process has finished its job.

The FB has the following input parameters:
- HOST     : IP address or host name of the FTP server
- PORT     : TCP port for the FTP protocol (normally: 21)
- USERNAME : username for authentication
- PASSWORD : password for authentication
- REM_FILE : name of the file (with path) on the remote server
- LOC_FILE : name of the file (with path) on the local device
- @ENABLE  : TRUE  -> FB is executed
             FALSE -> FB is skipped

The FB has the following output parameter:
- RESULT : -2, when called with ENABLE=FALSE
           -1, in case of any failure
            0, if the process is still running
            1, if the process has successfully finished.
```

20.1.4 FTP_PUT



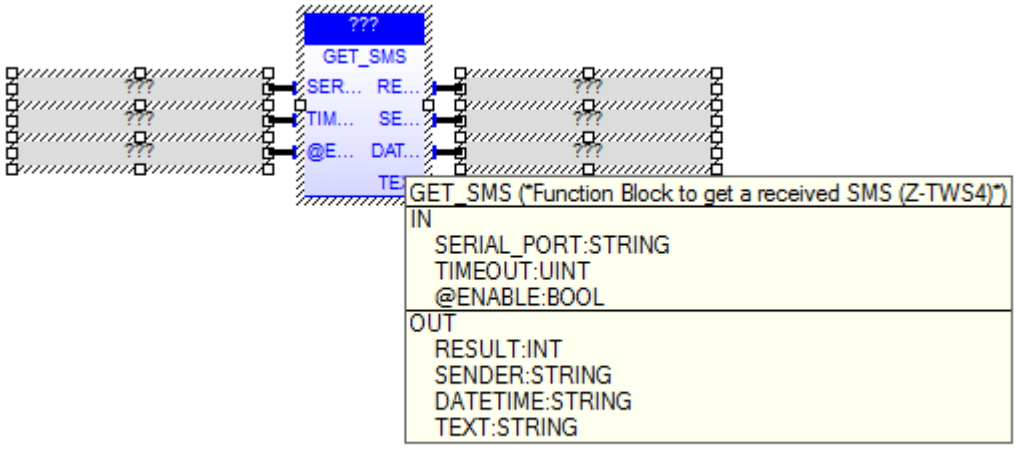

```
The FTP_PUT FB uploads a file, by means of the FTP protocol.

When first called, the FB runs a process which starts performing the upload;
on subsequent calls, it only checks if the process has finished its job.

The FB has the following input parameters:
- HOST     : IP address or host name of the FTP server
- PORT     : TCP port for the FTP protocol (normally: 21)
- USERNAME : username for authentication
- PASSWORD : password for authentication
- REM_FILE : name of the file (with path) on the remote server
- LOC_FILE : name of the file (with path) on the local device
- @ENABLE  : TRUE  -> FB is executed
             FALSE -> FB is skipped

The FB has the following output parameter:
- RESULT : -2, when called with ENABLE=FALSE
           -1, in case of any failure
            0, if the process is still running
            1, if the process has successfully finished.
```

20.1.5 GET_ALARMS




```
This FB retrieves all alarm records with the specified status from the DB;
the records are written as lines into the specified file.

INPUTS:
- STATUS : this parameter is handled as a "negative bitmask", meaning that this
FB will provide alarm records such that:
  (alarms.stat & STATUS) = 0, where:
  alarms.stat: DB field
  STATUS: this parameter
- SEP_CHAR : the field separator to be used in the file lines; possible values:
" "|","|";"
- MAX_REC : the maximum number of records (lines) to be retrieved
- FILENAME : the file name, with absolute path
- @ENABLE: TRUE  -> FB is executed
           FALSE -> FB is skipped
           the parameter is set to FALSE by the FB at the end of execution

OUTPUTS:
- RESULT: the FB result; possible values are:
   0: FB still running
   1: FB successfully executed
  -1: FB execution failed
  -2: FB execution timeout
- FIRST_ID : the id of the first record retrieved; this value shall be passed as
an argument to the SET_ALARMS_STAT FB
- LAST_ID : the id of the last record retrieved; this value shall be passed as
an argument to the SET_ALARMS_STAT FB
- REC_NUM : the number of records retrieved
```

20.1.6 GET_SMS



The GET_SMS FB gets an SMS, previously received, by means of a GSM modem; once read, the SMS is deleted.

When first called, the FB runs a process which starts getting the SMS; on subsequent calls, it only checks if the process has finished its job.

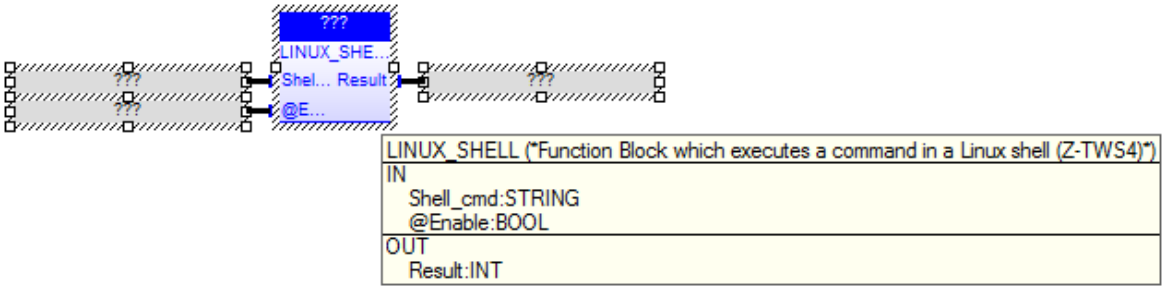
The FB has the following input parameters:

- SERIAL_PORT : this parameter is not used (it is still present only for compatibility reasons); it can be set to '' (empty string)
- TIMEOUT : timeout, in seconds
- @ENABLE : TRUE -> FB is executed
  FALSE -> FB is skipped

The FB has the following output parameters:
- RESULT : -2, when called with ENABLE=FALSE
  -1, in case of any failure
  0, if the process is still running
  1, if the process has successfully finished and an SMS has been found
  2, if timeout has expired
  3, if the process has successfully finished but no SMS has been found
  4, if PPP is active, on Z-MINIRTU
  5, if MODEM_RESET FB is running
- SENDER : SMS sender (only if RESULT=1)
- DATETIME : Date/time of SMS reception (only if RESULT=1)
- TEXT : SMS text (only if RESULT=1)

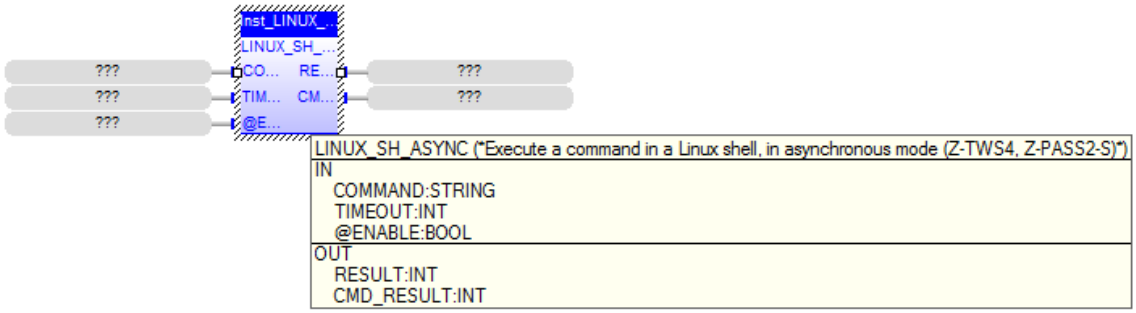
Please note that the GET_SMS FB can't be successfully executed while the PPP connection is active, on Z-MINIRTU.

20.1.7 LINUX_SHELL




```
Seneca FB for access to the Linux Shell.
Max 255 command line characters.
For access to the output use "> output.txt"

Shell_cmd : string command
@Enable   : if true execute the shell command
Result    : the return value of the "system" C function

Usage Example:

"ls > output1.txt"

create the directory list into output1.txt
```

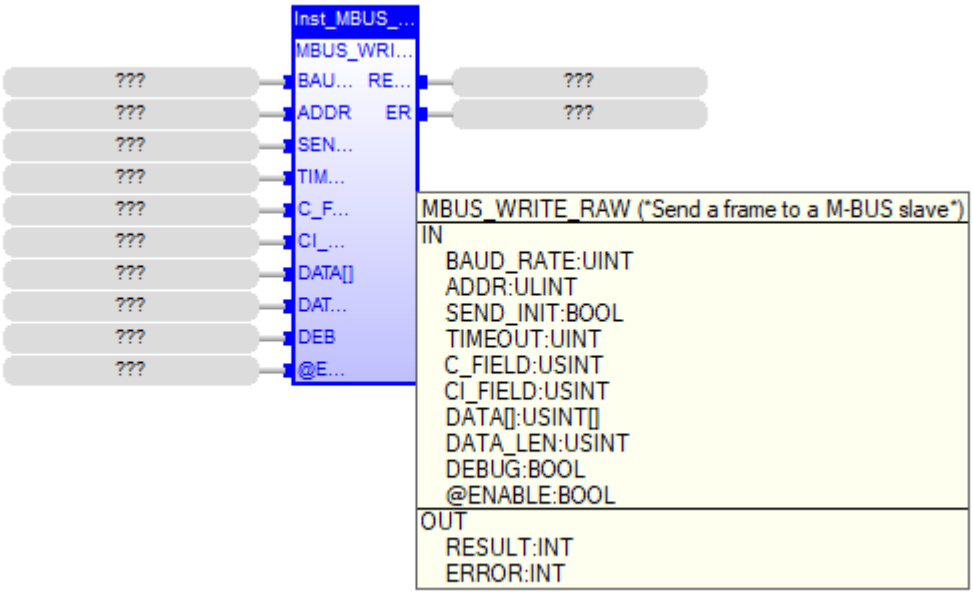
20.1.8 LINUX_SH_ASYNC




```
The LINUX_SH_ASYNC FB executes a command in a Linux shell, in asynchronous mode.

When first called, the FB runs a Linux shell process which starts performing the
command; on subsequent calls, it only checks if the process has finished the
command execution.

The FB has the following input parameters:
- COMMAND : the command to be executed
- TIMEOUT : timeout, in seconds
- @ENABLE : TRUE  -> FB is executed
            FALSE -> FB is skipped

The FB has the following output parameters:
```

```
- RESULT : -2, when called with ENABLE=FALSE
           -1, in case of any failure
            0, if the process is still running
            1, if the process has successfully finished
            2, if timeout has expired
- CMD_RESULT: command exit code
```

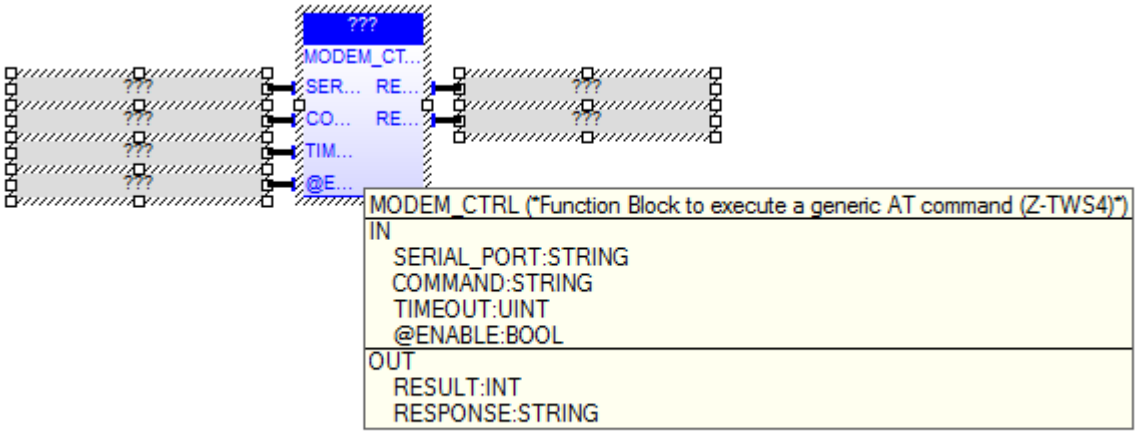
20.1.9 MBUS_WRITE_RAW




```
The MBUS_WRITE_RAW FB sends a frame to the specified M-Bus slave.
A Control Frame or Long Frame can be sent with this FB.

When first called, the FB runs a process which starts the procedure;
on subsequent calls, it only checks if the process has finished its job.

The FB has the following input parameters:
- BAUD_RATE : the baud-rate on the serial port; possible values are:
              300, 600, 1200, 2400, 4800, 9600, 19200, 38400
- ADDR : M-Bus primary (<=255) or secondary address
- SEND_INIT : flag to enable/disable the sending of the SND_NKE reset frame, at
the beginning of the procedure
- TIMEOUT : timeout, in seconds
- C_FIELD : the frame C Field value (see M-Bus protocol specification)
- CI_FIELD : the frame CI Field value (see M-Bus protocol specification)
- DATA[] : the frame User Data field (see M-Bus protocol specification)
- DATA_LEN : the length, i.e. the number of bytes, in the frame User Data field
- DEBUG : when this parameter is set to TRUE, the file /log/mbus_prot.log is
created, which contains the M-Bus protocol frames dump; this file can be
retrieved via FTP/SFTP protocol
- @ENABLE : TRUE  -> FB is executed
            FALSE -> FB is skipped

The FB has the following output parameters:
```

```
- RESULT : -2, when called with ENABLE=FALSE
           -1, in case of any failure
            0, if the process is still running
            1, if the process has successfully finished
            2, if timeout has expired
            5, if MBUS_READ_DATA or MBUS_WRITE_RAW FB is running
- ERROR : this parameter is meaningful when RESULT=-1; possible values are:
   0: none
  -1: invalid arguments (input parameters)
  -2: M-Bus protocol error

This FB can be used to send configuration commands to the slaves;
for example, to set the slave to primary address 8, the following values shall
be given:
  C_FIELD = 53 (hex)
  CI_FIELD = 51 (hex)
  DATA = 01 7A 08 (hex)
  DATA_LEN = 3
```

20.1.10 MODEM_CTRL



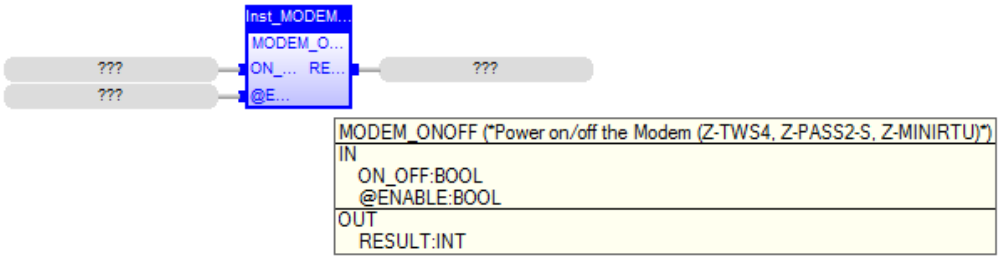

```
The MODEM_CTRL FB sends a generic AT command to the GSM modem and receives the
corresponding response.

When first called, the FB runs a process which starts sending the command;
on subsequent calls, it only checks if the process has finished its job.

The FB has the following input parameters:

- SERIAL_PORT : this parameter is not used (it is still present only for
compatibility reasons); it can be set to '' (empty string)
- COMMAND     : AT command to be executed
- TIMEOUT     : timeout, in seconds
- @ENABLE     : TRUE  -> FB is executed
                FALSE -> FB is skipped

The FB has the following output parameters:
- RESULT   : -2, when called with ENABLE=FALSE
             -1, in case of any failure
              0, if the process is still running
              1, if the process has successfully finished
```

(NOTE: this only means that the command was successfully sent and the response was successfully received;
it does not necessarily mean that the AT command was successfully executed;
in other words, it is up to the application to tell if the response means success or failure)
2, if timeout has expired
4, if PPP is active, on Z-MINIRTU
5, if MODEM_RESET FB is running
- RESPONSE : the response to the AT command, as sent by the modem; it can contain more lines, separated by a '\' character;
if the whole response is longer than 255 characters, it will be truncated.

Please note that the MODEM_CTRL FB can't be successfully executed while the PPP connection is active, on Z-MINIRTU.

This FB cannot be used (i.e.: it won't work) in the following situations:
- if modem is set to send numeric result codes (see "ATV" command)
- for commands using a prompt (e.g.: "AT+CMGS" command)
- for call-handling commands (e.g.: "ATD", "ATA", "ATH").

20.1.11 MODEM_ONOFF



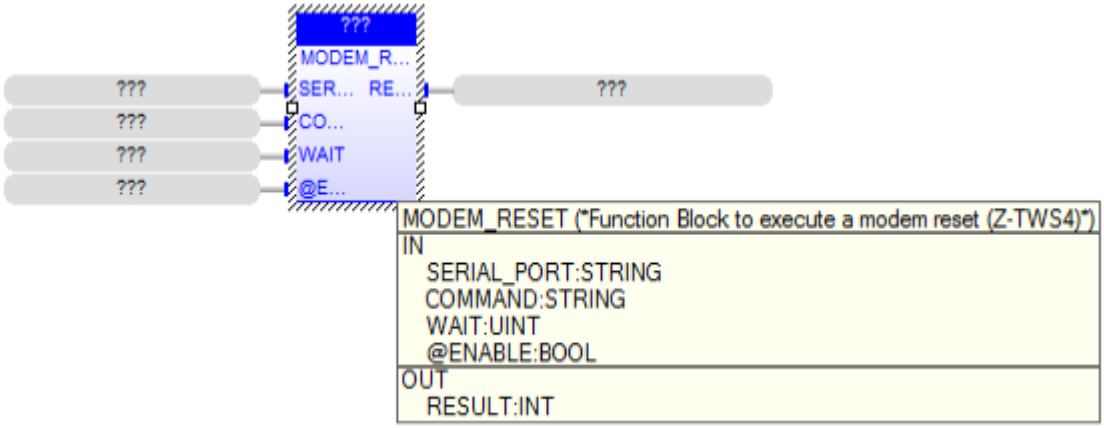
This FB permits to control the power ON/OFF digital input of the MODEM.

The params are :

ON_OFF : if True power-up the modem
@ENABLE : if True the FB is executed

RESULT : -2 FB executed with @ENABLE set to False
-1 Error
0 operation not completed
+1 OK
+2 modem is already ON/OFF

20.1.12 MODEM_RESET



The MODEM_RESET FB sends an AT reset command to the GSM modem and waits for a specified time.

When first called, the FB runs a process which starts sending the command; on subsequent calls, it only checks if the process has finished its job.

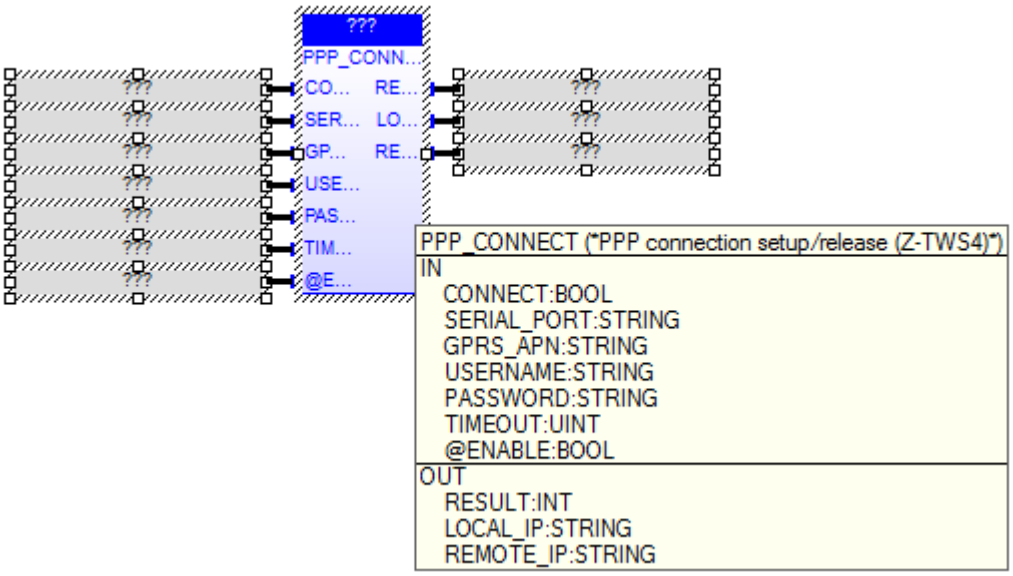
The FB has the following input parameters:

- SERIAL_PORT : this parameter is not used (it is still present only for compatibility reasons); it can be set to '' (empty string)
- COMMAND : reset AT command to be sent; if left empty, the "AT+CFUN=1,1" command will be sent
- WAIT : wait duration, in seconds, after sending the command; valid values are: [30..300]
- @ENABLE : TRUE -> FB is executed; FALSE -> FB is skipped

The FB has the following output parameter:
- RESULT : -2, when called with ENABLE=FALSE
-1, in case of any failure
0, if the process is still running
1, if the process has successfully finished
2, if timeout has expired (timeout = WAIT + 5 seconds)
4, if PPP is active, on Z-MINIRTU
5, if MODEM_RESET FB is already running

Please note that the MODEM_RESET FB can't be successfully executed while the PPP connection is active, on Z-MINIRTU.
Also note that, when MODEM_RESET FB is running, all other "modem related" FBs (PPP_CONNECT, SEND_SMS, GET_SMS, MODEM_CTRL and MODEM_RESET itself) are rejected.

20.1.13 PPP_CONNECT



The PPP_CONNECT FB performs PPP connection setup or release, by means of a GPRS/UMTS modem.

When first called, it runs a process which starts the connection setup or release; on subsequent calls, it only checks if the process has finished its job.

The FB has the following input parameters:

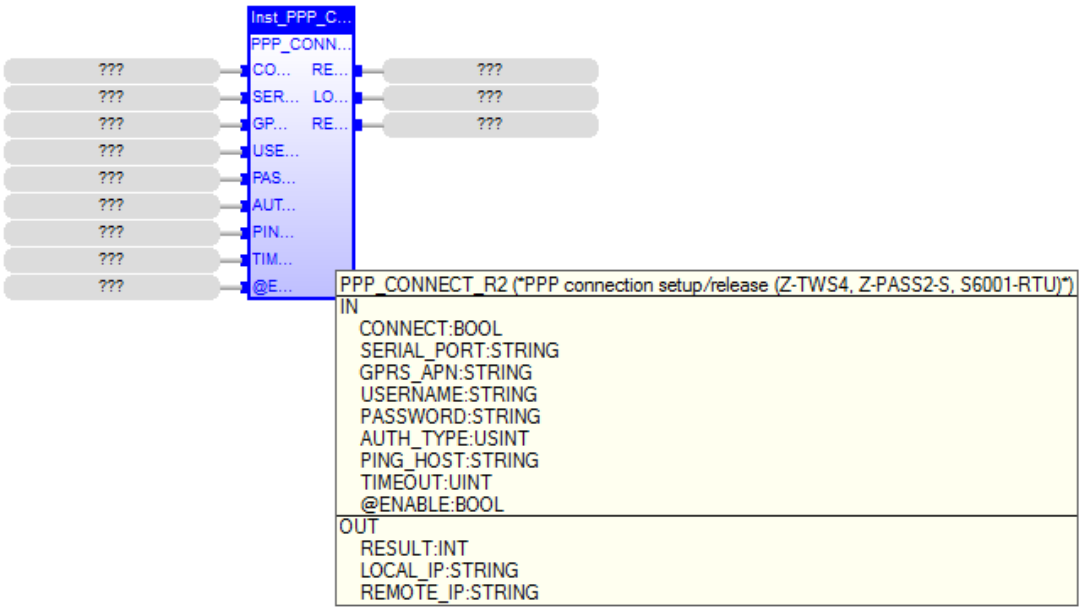
```
- CONNECT     : TRUE  -> connection setup
                FALSE -> connection release
- SERIAL_PORT : this parameter is not used (it is still present only for
compatibility reasons); it can be set to '' (empty string)
- GPRS_APN    : GPRS Access Point Name (as given by the mobile operator);
                if this parameter is left empty, "Automatic APN" functionality
is activated
- USERNAME    : username required for authentication
                (it can be empty, if authentication is not required);
                not used with "Automatic APN" functionality
- PASSWORD    : password required for authentication
                (it can be empty, if authentication is not required)
                not used with "Automatic APN" functionality
- TIMEOUT     : timeout, in seconds
- @ENABLE     : TRUE  -> FB is executed
                FALSE -> FB is skipped
```

When CONNECT=FALSE, GPRS_APN, USERNAME and PASSWORD parameters can be empty.

The FB has the following output parameters:

```
- RESULT    : -2, when called with ENABLE=FALSE
              -1, in case of any failure
               0, if the process is still running
               1, if the process has successfully finished
               2, if timeout has expired
               5, if MODEM_RESET FB is running
- LOCAL_IP  : IP address assigned to the PPP network interface (only if
RESULT=1, when CONNECT=TRUE)
- REMOTE_IP : IP address of the remote host (set as default gateway) (only if
RESULT=1, when CONNECT=TRUE)
```

20.1.14 PPP_CONNECT_R2



The PPP_CONNECT_R2 FB performs PPP connection setup or release, by means of a GPRS/UMTS modem.

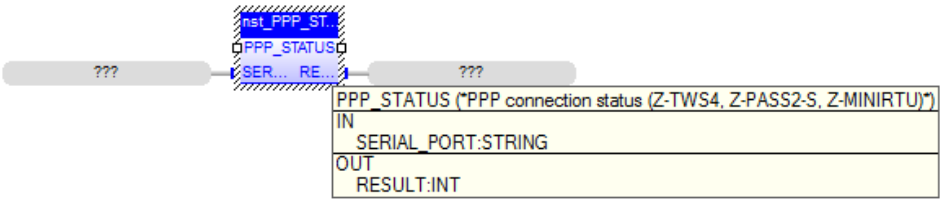
When first called, it runs a process which starts the connection setup or release; on subsequent calls, it only checks if the process has finished its job.

The FB has the following input parameters:

- CONNECT : TRUE -> connection setup
  FALSE -> connection release
- SERIAL_PORT : this parameter is not used (it is still present only for compatibility reasons); it can be set to '' (empty string)
- GPRS_APN : GPRS Access Point Name (as given by the mobile network operator); if this parameter is left empty, "Automatic APN" functionality is activated
- USERNAME : username required for authentication
  (it can be empty, if authentication is not required);
  not used with "Automatic APN" functionality
- PASSWORD : password required for authentication
  (it can be empty, if authentication is not required);
  not used with "Automatic APN" functionality
- AUTH_TYPE : authentication type:
  0 : None
  1 : CHAP/PAP
  2 : CHAP only
  3 : PAP only
  not used with "Automatic APN" functionality
- PING_HOST : IP address or Host Name used to check that PPP connectivity is available, running ping test;
  if this parameter is left empty, ping test is not performed

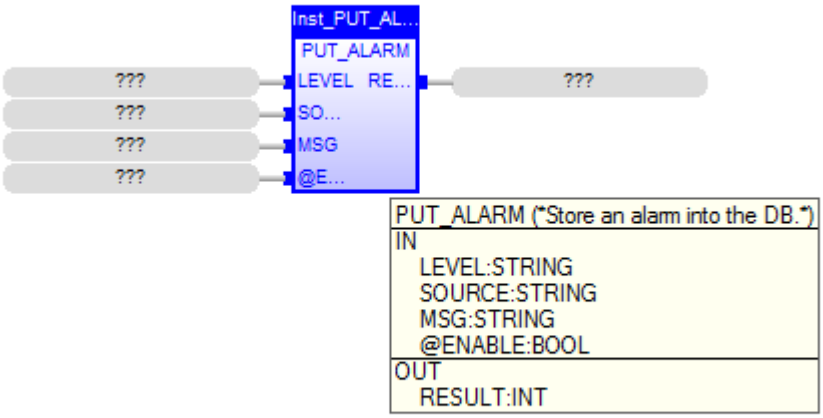
```
- TIMEOUT     : timeout, in seconds
- @ENABLE     : TRUE  -> FB is executed
                FALSE -> FB is skipped

When CONNECT=FALSE, GPRS_APN, USERNAME, PASSWORD and PING_HOST parameters can be
empty.

The FB has the following output parameters:
- RESULT    : -2, when called with ENABLE=FALSE
              -1, in case of any failure
               0, if the process is still running
               1, if the process has successfully finished
               2, if timeout has expired
               5, if MODEM_RESET FB is running
- LOCAL_IP  : IP address assigned to the PPP network interface (only if
RESULT=1, when CONNECT=TRUE)
- REMOTE_IP : IP address of the remote host (set as default gateway) (only if
RESULT=1, when CONNECT=TRUE)
```

20.1.15 PPP_STATUS



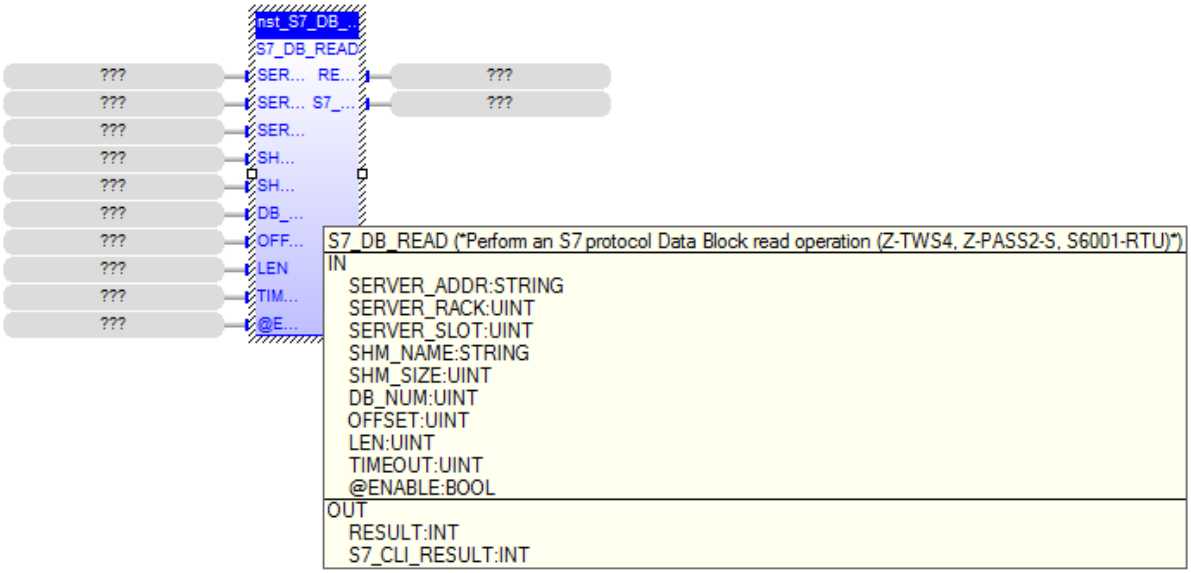

```
The PPP_STATUS FB returns PPP connection status.

The FB has the following input parameters:
- SERIAL_PORT : this parameter is not used (it is still present only for
compatibility reasons); it can be set to '' (empty string)

The FB has the following output parameters:
- RESULT    :  0, PPP DISCONNECTED
               1, PPP CONNECTED
               2, PPP CONNECTING
               3, PPP DISCONNECTING
```

20.1.16 PUT_ALARM



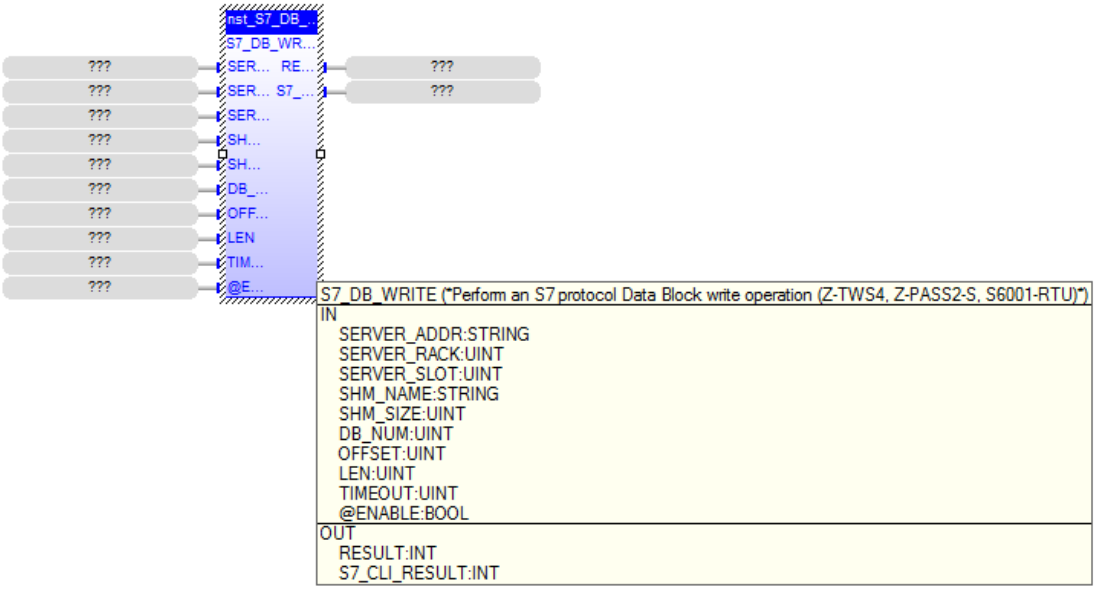

```
This FB stores an alarm record into the DB;
the "index" and "timestamp" fields are set by the FB;
the "status" field is set to 0 by the FB.
The FB is also responsible for keeping the DB size (number of records) under a
specified limit (e.g.: 1000).

INPUTS:
- LEVEL: a string representing the alarm/event level (e.g.: "INFO")
(max_len=10);
  possible values are defined by the application
- SOURCE: a string representing the alarm/event source (e.g.: "GRP1")
(max_len=10);
  possible values are defined by the application
- MSG: the text message of the alarm (max_len=255)
- @ENABLE: TRUE  -> FB is executed
           FALSE -> FB is skipped
           the parameter is set to FALSE by the FB at the end of execution

OUTPUTS:
- RESULT: the FB result; possible values are:
   0: FB still running
   1: FB successfully executed
  -1: FB execution failed
  -2: FB execution timeout
```

20.1.17 S7_DB_READ




```
This FB performs an S7 protocol Data Block read operation.
It connects to the specified S7 server IP address, rack and slot, performs the
operation and then disconnects.
The data read are written to the Straton shared-memory specified in the SHM_NAME
parameter.

INPUTS:
- SERVER_ADDR: the S7 server IP address
- SERVER_RACK: the S7 server rack number
- SERVER_SLOT: the S7 server slot number
- SHM_NAME: name of the Straton shared-memory which the data are written to
- SHM_SIZE: size of the Straton shared-memory which the data are written to
- DB_NUM: the number of the Data Block to be read
- OFFSET: start offset for the read operation in the Data Block
- LEN: number of bytes to be read
- TIMEOUT: timeout for the FB execution, in seconds
- @ENABLE: TRUE -> FB is executed
FALSE -> FB is skipped
the parameter is set to FALSE by the FB at the end of execution

OUTPUTS:
- RESULT: the FB result; possible values are:
    0: FB still running
    1: FB successfully executed
   -1: FB execution failed
   -2: FB execution timeout
- S7_CLI_RESULT: the S7 Client result; possible values are:
    0: no failure
   -1: invalid arguments failure
   -2: initialization failure (e.g.: error opening the shared-memory)
   -3: connection failure
   -4: read operation failure
```

20.1.18 S7_DB_WRITE

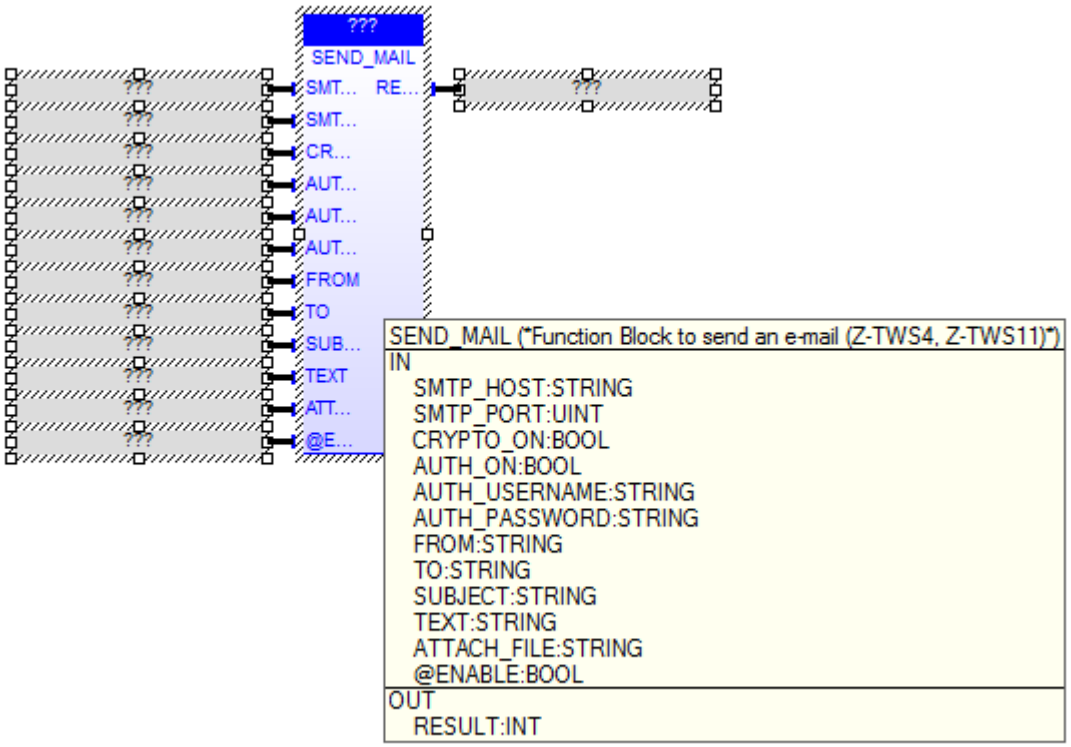


This FB performs an S7 protocol Data Block write operation.
It connects to the specified S7 server IP address, rack and slot, performs the operation and then disconnects.
The data to be written are read from the Straton shared-memory specified in the SHM_NAME parameter.

INPUTS:
- SERVER_ADDR: the S7 server IP address
- SERVER_RACK: the S7 server rack number
- SERVER_SLOT: the S7 server slot number
- SHM_NAME: name of the Straton shared-memory which the data are read from
- SHM_SIZE: size of the Straton shared-memory which the data are read from
- DB_NUM: the number of the Data Block to be written
- OFFSET: start offset for the write operation in the Data Block
- LEN: number of bytes to be written
- TIMEOUT: timeout for the FB execution, in seconds
- @ENABLE: TRUE -> FB is executed
FALSE -> FB is skipped
the parameter is set to FALSE by the FB at the end of execution

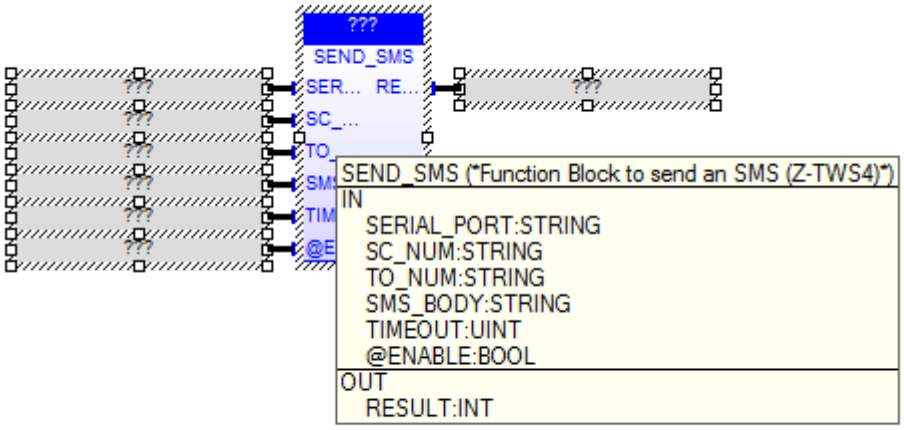
OUTPUTS:
- RESULT: the FB result; possible values are:
   0: FB still running
   1: FB successfully executed
  -1: FB execution failed
  -2: FB execution timeout
- S7_CLI_RESULT: the S7 Client result; possible values are:
   0: no failure
  -1: invalid arguments failure
  -2: initialization failure (e.g.: error opening the shared-memory)
  -3: connection failure
  -4: write operation failure

20.1.19 SEND_MAIL




```
The SEND_MAIL FB sends an e-mail, by means of the SMTP/SMTPS protocol.

When first called, the FB runs a process which starts sending the e-mail;
on subsequent calls, it only checks if the process has finished its job.

The FB has the following input parameters:
- SMTP_HOST     : IP address or host name of the SMTP/SMTPS server
- SMTP_PORT     : TCP port for the SMTP/SMTPS protocol (normally: 25, for SMTP;
465, for SMTPS)
- CRYPTO_ON     : if cryptography (SSL) shall be used (FALSE -> SMTP, TRUE ->
SMTPS)
                  (CRYPTO_ON=TRUE is available only for Z-TWS4/Z-PASS2-S)
- AUTH_ON       : if authentication shall be executed
- AUTH_USERNAME : username for authentication
- AUTH_PASSWORD : password for authentication
- FROM          : e-mail sender
- TO            : e-mail recipient
                  more than one recipient can be specified, using the ','
character as separator
- SUBJECT       : e-mail subject
- TEXT          : e-mail text
- ATTACH_FILE   : name of the file (with path) to be attached to the e-mail (it
can be empty)
- @ENABLE       : TRUE -> FB is executed
                  FALSE -> FB is skipped

The FB has the following output parameter:
- RESULT : -2, when called with ENABLE=FALSE
           -1, in case of any failure
            0, if the process is still running
            1, if the process has successfully finished.
```

20.1.20 SEND_SMS



The SEND_SMS FB sends an SMS, by means of a GSM modem.

When first called, it runs a process which starts sending the SMS;
on subsequent calls, it only checks if the process has finished its job.

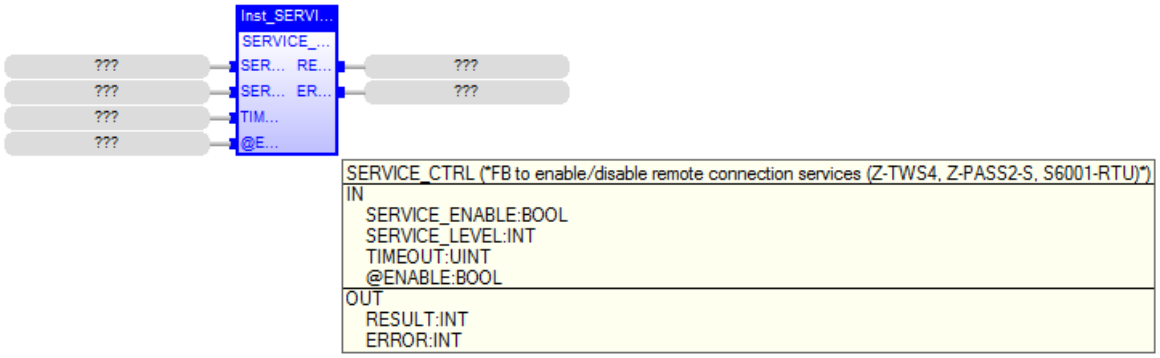
The FB has the following input parameters:

- SERIAL_PORT : this parameter is not used (it is still present only for compatibility reasons); it can be set to '' (empty string)
- SC_NUM : SMS Service Center (as given by the mobile operator) (it can be empty, if the SC number is already set on the modem/SIM)
- TO_NUM : recipient number
- SMS_BODY : SMS text
- TIMEOUT : timeout, in seconds
- @ENABLE : TRUE -> FB is executed
  FALSE -> FB is skipped

The FB has the following output parameter:
- RESULT : -2, when called with ENABLE=FALSE
  -1, in case of any failure
  0, if the process is still running
  1, if the process has successfully finished
  2, if timeout has expired
  4, if PPP is active, on Z-MINIRTU
  5, if MODEM_RESET FB is running

Please note that the SEND_SMS FB can't be successfully executed while the PPP connection is active, on Z-MINIRTU.

20.1.21 SERVICE_CTRL



The SERVICE_CTRL FB enables or disables connection services, based on the required service level.

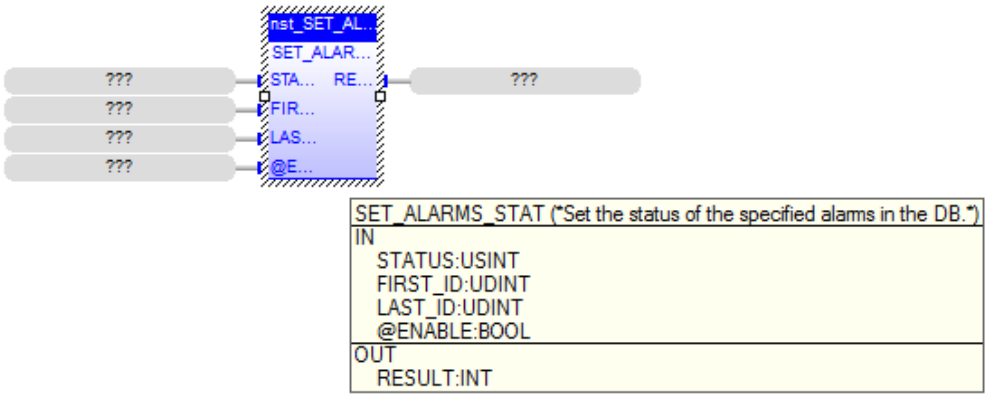
When first called, it runs a process which starts the procedure;
on subsequent calls, it only checks if the process has finished its job.

The FB has the following input parameters:

- SERVICE_ENABLE : TRUE -> enable connection services
  FALSE -> disable connection services
- SERVICE_LEVEL : this parameter defines the "Security Level", that is it tells which connection services shall be enabled/disabled;
possible values are:
 0: None
 1: VPN Connection
 2: VPN Service
 3: Internet Connection
 4: SMS Service
-1: the value of the "Security Level / Service Disable" configuration parameter will be used
- TIMEOUT : timeout, in seconds
- @ENABLE : TRUE -> FB is executed
  FALSE -> FB is skipped

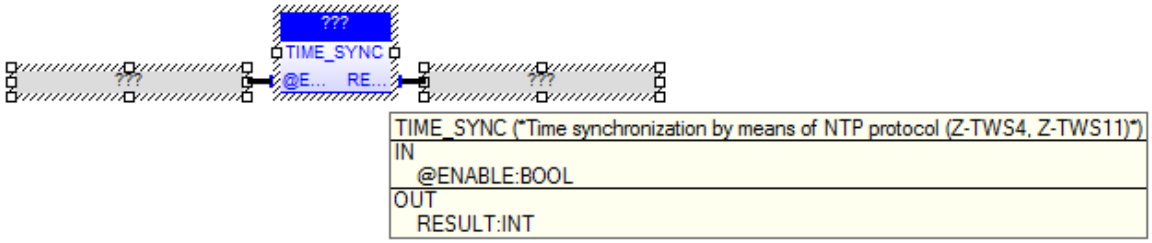
The FB has the following output parameters:
- RESULT : -2, when called with ENABLE=FALSE
  -1, in case of any failure
  0, if the process is still running
  1, if the process has successfully finished
  2, if timeout has expired
- ERROR : this parameter is meaningful only when RESULT=-1; in all other cases, it is set to 0;
possible values are:
1: the FB has been called with SERVICE_LEVEL=0
2: the procedure to enable/disable the connection services is already running
3: the CPU configuration procedure is running -> FB execution has been aborted
4: connection services are disabled since Remote Connection Disable (RCD) digital input is HIGH -> FB execution has been aborted

20.1.22 SET_ALARMS_STAT




```
This FB sets the value of the "status" field for the alarm records specified by
the passed arguments.

INPUTS:
- STATUS : this parameter is handled as a bitmask, meaning that the status of
the relevant alarm records will be set as:
  alarms.stat = (alarms.stat | STATUS), where:
  alarms.stat: DB field
  STATUS: this parameter
- FIRST_ID : the id of the first record retrieved by the GET_ALARMS FB
- LAST_ID : the id of the last record retrieved by the GET_ALARMS FB
- @ENABLE: TRUE  -> FB is executed
           FALSE -> FB is skipped
           the parameter is set to FALSE by the FB at the end of execution

OUTPUTS:
- RESULT: the FB result; possible values are:
   0: FB still running
   1: FB successfully executed
  -1: FB execution failed
  -2: FB execution timeout
```

20.1.23 TIME_SYNC



The TIME_SYNC FB performs time synchronization, by means of the NTP protocol.

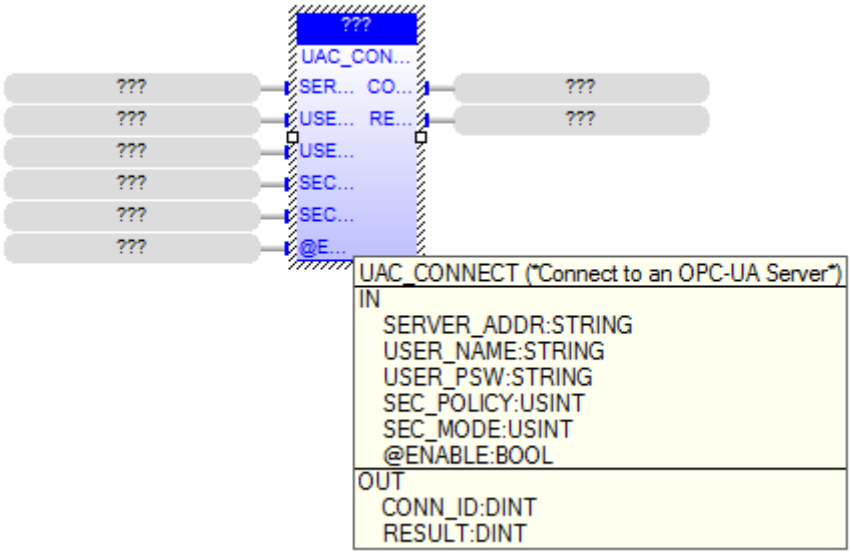
When first called, the FB runs a process which starts performing the synchronization;
on subsequent calls, it only checks if the process has finished its job.

The FB has the following input parameter:

- @ENABLE : TRUE -> FB is executed
  FALSE -> FB is skipped

The FB has the following output parameter:
- RESULT : -2, when called with ENABLE=FALSE
  -1, in case of any failure
  0, if the process is still running
  1, if the process has successfully finished.

20.1.24 UAC_CONNECT



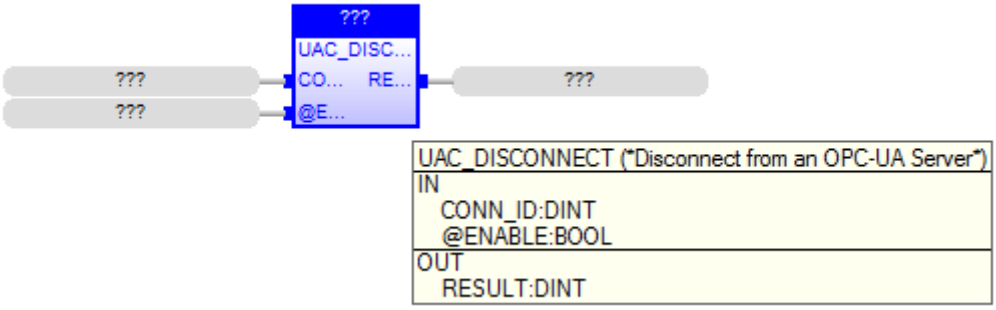
This Function Block can be used to connect to an OPC-UA Server.

When first called, it runs a process which starts the procedure;
on subsequent calls, it only checks if the process has finished its job.

The FB has the following input parameters:
- SERVER_ADDR : OPC UA Server URL (e.g.:
opc.tcp://192.168.90.2:53530/OPCUA/SimulationServer)
- USER_NAME : user name for authentication
- USER_PSW : password for authentication
- SEC_POLICY : numeric value for Security Policy:
1: None
2: Basic128Rsa15
3: Basic256
4: Basic256Sha256
all other values are invalid
- SEC_MODE : numeric value for Security Mode:
1: None
2: Sign
3: Sign and Encrypt
all other values are invalid
- @ENABLE : TRUE -> FB is executed
FALSE -> FB is skipped

The FB has the following output parameters:
- RESULT : -2, when called with ENABLE=FALSE
-1, in case of any failure
0, if the process is still running
1, if the process has successfully finished
- CONN_ID : connection identifier, to be used in UAC_READ, UAC_WRITE and
UAC_DISCONNECT FBs

20.1.25 UAC_DISCONNECT



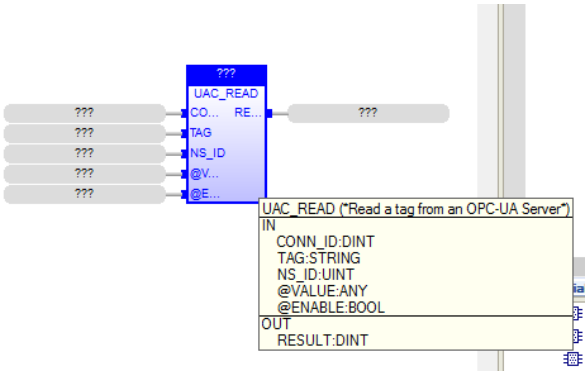
This Function Block can be used to disconnect from an OPC-UA Server.

When first called, it runs a process which starts the procedure;
on subsequent calls, it only checks if the process has finished its job.

The FB has the following input parameters:
- CONN_ID : connection identifier, given by the UAC_CONNECT FB
- @ENABLE : TRUE -> FB is executed
FALSE -> FB is skipped

The FB has the following output parameters:
- RESULT : -2, when called with ENABLE=FALSE
-1, in case of any failure
0, if the process is still running
1, if the process has successfully finished

20.1.26 UAC_READ



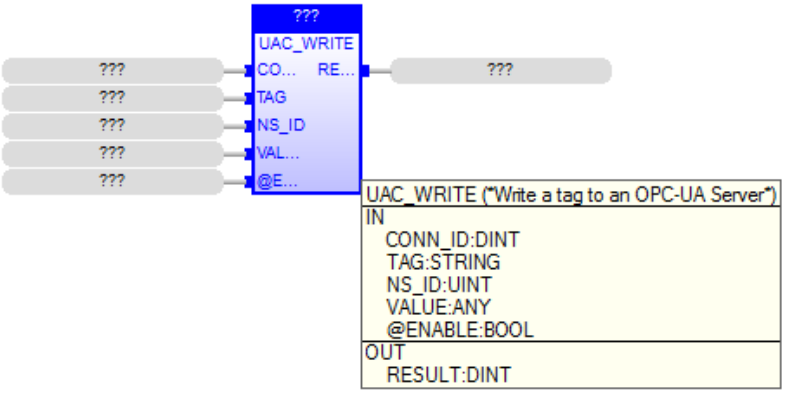
This Function Block can be used to read a tag from an OPC-UA Server.

When first called, it runs a process which starts the procedure;
on subsequent calls, it only checks if the process has finished its job.

The FB has the following input parameters:
- CONN_ID : connection identifier, given by the UAC_CONNECT FB
- TAG : name of the tag to be read
- NS_ID : tag name namespace index
- @VALUE : variable to store the tag value
- @ENABLE : TRUE -> FB is executed
FALSE -> FB is skipped

The FB has the following output parameters:
- RESULT : -2, when called with ENABLE=FALSE
-1, in case of any failure
0, if the process is still running
1, if the process has successfully finished

20.1.27 UAC_WRITE



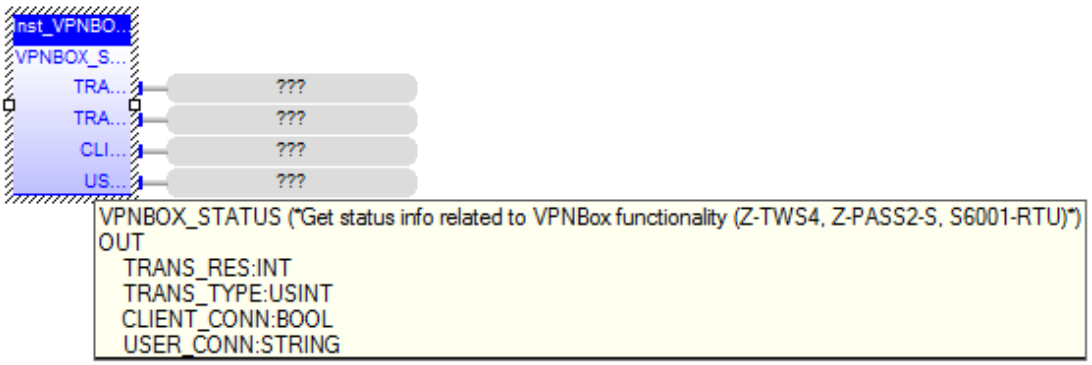
This Function Block can be used to write a value to a tag of an OPC-UA Server.

When first called, it runs a process which starts the procedure;
on subsequent calls, it only checks if the process has finished its job.

The FB has the following input parameters:
- CONN_ID : connection identifier, given by the UAC_CONNECT FB
- TAG : name of the tag to be written
- NS_ID : tag name namespace index
- VALUE : variable to be written to the tag

```
- @ENABLE : TRUE -> FB is executed
FALSE -> FB is skipped

The FB has the following output parameters:
- RESULT : -2, when called with ENABLE=FALSE
-1, in case of any failure
0, if the process is still running
1, if the process has successfully finished
```

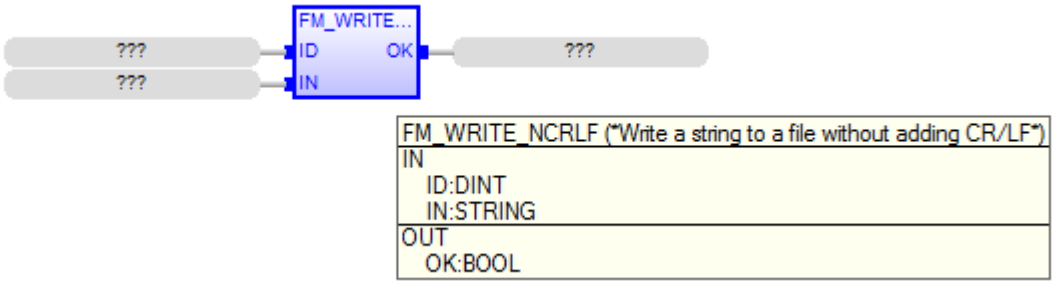
20.1.28 VPNBOX_STATUS




```
This FB provides information about the VPN Box functionality.

INPUTS:
none

OUTPUTS:
- TRANS_RES : the result of the last VPN Box transaction performed by the CPU;
possible values:
   -2: No response from VPN Box
   -1: Invalid response from VPN Box
    0: OK
    3: Wrong password
    7: License limit reached
  201: Generic error
  202: VPN Box not configured
 1000: No transaction has been performed (e.g.: VPN Box functionality is
disabled)
other: Unexpected response
- TRANS_TYPE : the type of the last VPN Box transaction performed by the CPU;
possible values:
  0: None (no transaction performed)
  1: Register
  2: Poll
- CLIENT_CONN : flag telling if a VPN Client is connected (meaningful only for
"Point-to-Point" VPN Box)
  0: no VPN client is connected
  1: a VPN client is connected
- USER_CONN : if a VPN Client is connected, this parameter provides the
authenticated username; otherwise, it is an empty string ('')
(meaningful only for "Point-to-Point" VPN Box)
```

20.2 Functions

20.2.1 FM_WRITE_NCRLF

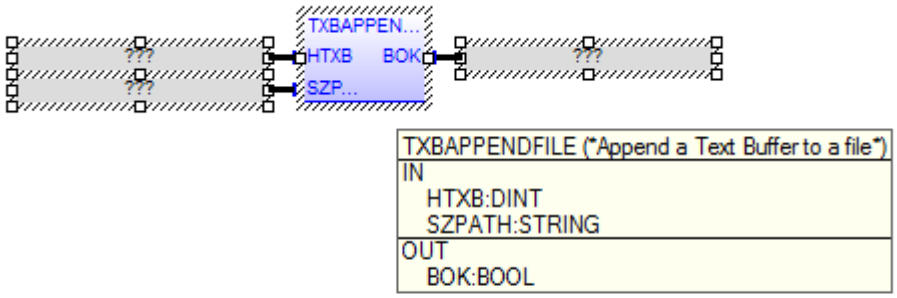


Same behaviour as FM_WRITE but without inserting final CR-LF

Input parameters:
- ID: id of the file (already open)
- IN: string to write into the file

Output parameters:
- OK: boolean result value: (TRUE:success, FALSE:failure)

20.2.2 TXBAPPENDFILE

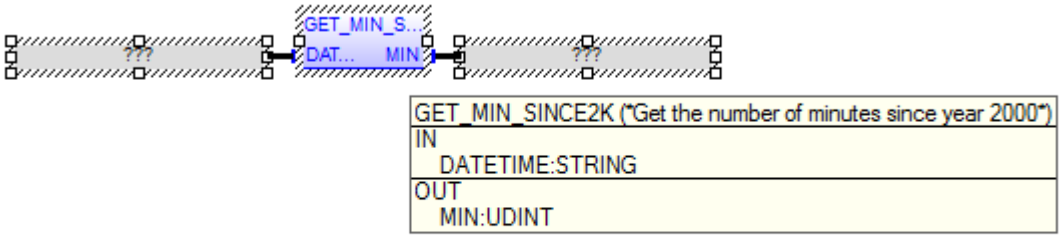


Append a Text Buffer to a file (without reloading the file).

Input parameters
- HTXB: Text Buffer handle
- SZPATH: file absolute path

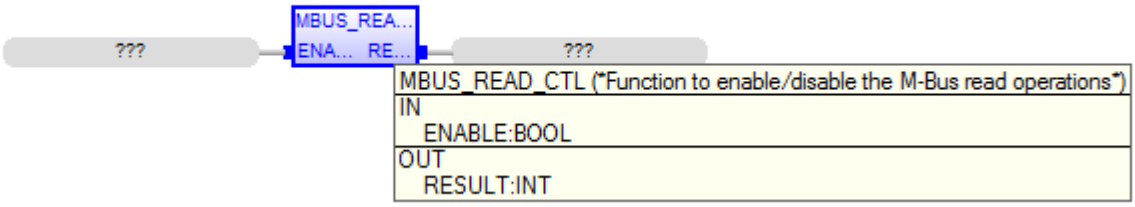
Output parameters
- BOK: boolean result value: (TRUE:success, FALSE:failure)

20.2.3 GET_MIN_SINCE2K



This function returns the current number of minutes since January 1, 2000 0:00:00, if DATETIME is empty or DATETIME is not a valid date/time; otherwise, it returns the number of minutes since January 1, 2000 0:00:00, corresponding to DATETIME.
DATETIME shall have the following format:
"dd/mt/yyyy hh:mm:ss"

20.2.4 MBUS_READ_CTL

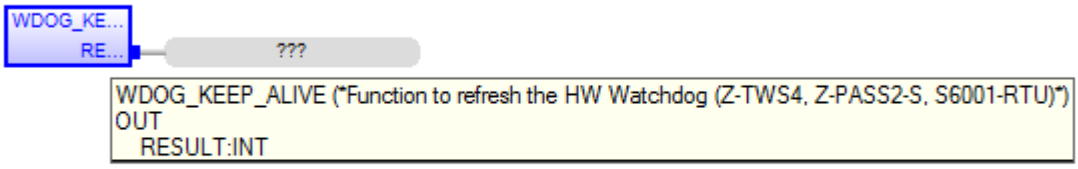


The MBUS_READ_CTL function can be used to enable/disable the M-Bus read operations.
It should be noticed that M-Bus read operations are enabled by default.

The function has the following input parameter:
- ENABLE : TRUE, to enable read operations
FALSE, to disable read operations

The function has the following output parameter:
- RESULT : 1: function has been successfully executed
-1: function execution failed

20.2.5 WDOG_KEEP_ALIVE



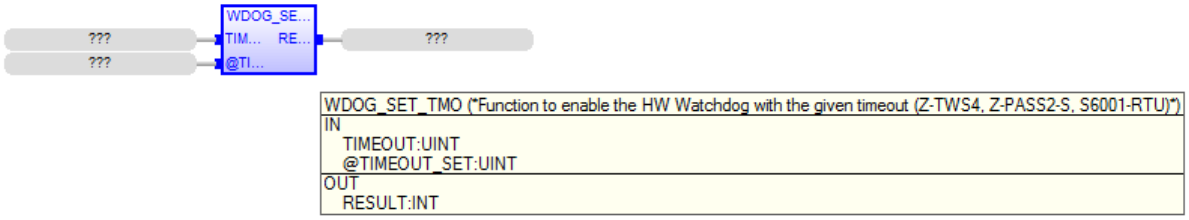
This function restarts the HW Watchdog timer.
NOTICE: once enabled, the HW Watchdog cannot be disabled; the WDOG_KEEP_ALIVE function shall be called to restart the timer; if timeout elapses, an HW reboot is triggered.

To let this function actually work, the "WATCHDOG/Enable" parameter in the CPU configuration shall be set to "OFF"; otherwise, the function will return the -2 value (see below).

INPUTS:
none

OUTPUTS:
- RESULT: the function result; possible values are:
  0: OK
  -1: watchdog setting failed (WDOG_SET_TMO function has not been called or failed)
  -2: watchdog controlled by system ("WATCHDOG/Enable" parameter set to "ON")
  -3: watchdog keep-alive failed

20.2.6 WDOG_SET_TMO



This function enables the HW Watchdog.
NOTICE: once enabled, the HW Watchdog cannot be disabled; the WDOG_KEEP_ALIVE function shall be called to restart the timer; if timeout elapses, an HW reboot is triggered.

The function can be called many times; if the timeout value is the same already set, it will do nothing; otherwise, the new timeout value will be set.

```
To let this function actually work, the "WATCHDOG/Enable" parameter in the CPU
configuration shall be set to "OFF"; otherwise, the function will return the -2
value (see below).

INPUTS:
- TIMEOUT: Watchdog timeout, in seconds; possibile values: [30..3600];
  if an out-of-range value is given, the default value 60 will be set
- @TIMEOUT_SET: at the end of the execution, this parameter will contain the
timeout value actually set (in seconds)

OUTPUTS:
- RESULT: the function result; possible values are:
   0: OK
  -1: watchdog setting failed
  -2: watchdog controlled by system ("WATCHDOG/Enable" parameter set to "ON")
```

21 Z-NET4

When using Z-TWS4/Z-PASS2-S/S6001-RTU with Modbus RTU I/O Modules, a very useful and powerful tool is provided by the Z-NET4 program suite, running on Windows PCs.

Among other things, these programs let you:

- automatically discover the I/O modules available on the bus;
- configure the CPU (Z-TWS4/Z-PASS2-S/S6001-RTU) and the I/O modules;
- automatically create a StratON project containing the I/O variables, with the Modbus tasks needed to acquire/control them; for S6001-RTU, variables corresponding to the CPU I/Os are also inserted into the project
- automatically generate code for the StratON project, performing “Remote Control Functions”, such as:
  - Data Logging
  - Command and Status SMS
  - Alarm generation
- easily create custom web pages, with graphic widgets, and upload them to the CPU (these pages can be accessed on the standard HTTP [80] TCP port).

The Z-NET4 SW is available at the following link:

http://www.seneca.it/products/z-net4

Please contact Seneca to get more information about the Z-NET4 suite.

22 Access to Straton variables

The aim of this chapter is to explain how an application (typically, web-based) can access the variables of the Straton Soft-PLC running on Z-TWS4/Z-PASS2-S/S6001-RTU.

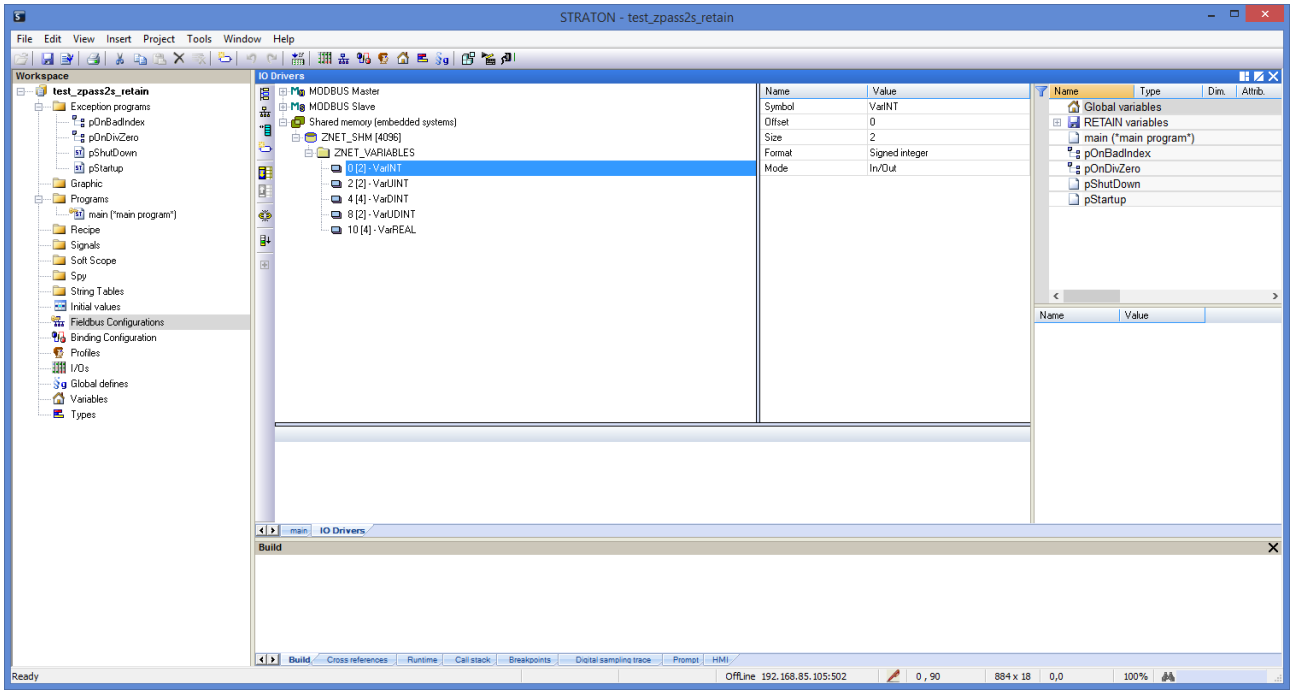
Currently, there are two ways to access Straton variables:

- direct access to Straton shared-memory
- access by means of CGI

The main differences between the two methods is that the first requires developing a C program, running on the Device, typically invoked by the *lighttpd* web server, while the second does not require any changes in the Device FW, provided that the currently supported CGIs are used.

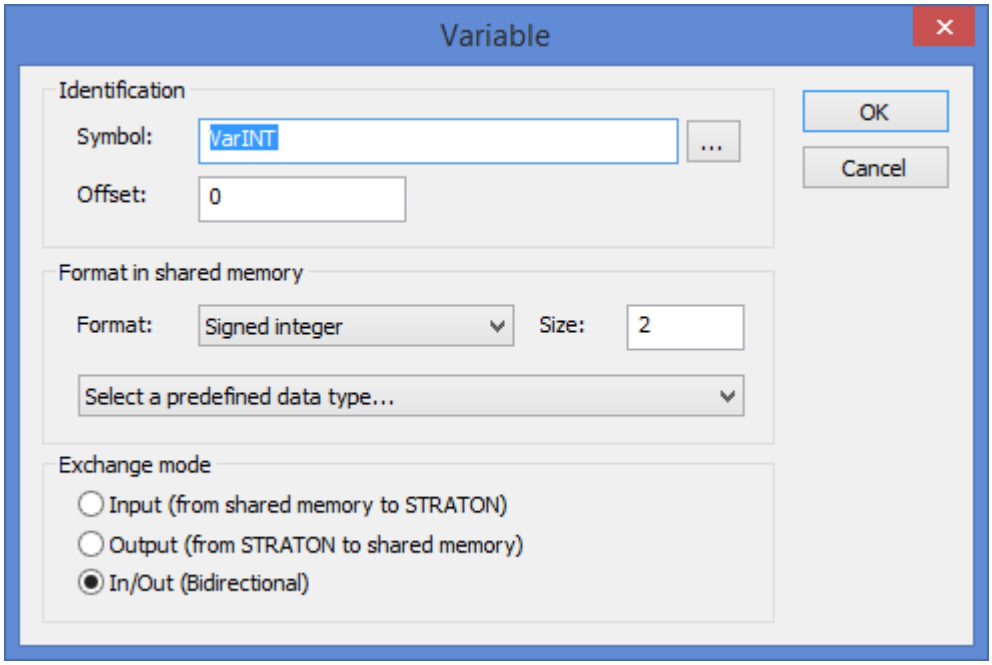
22.1 Shared Memory

Straton Workbench lets you define a shared-memory area and tell which PLC variables shall be put in it.



For each variable in the shared-memory, the Workbench lets you define the following properties:

- *Symbol*: the name of a Straton variable defined elsewhere (Global Variables, Retain Variables etc.)
- *Offset*: the offset in the shared-memory
- *Size*: the variable size, in bytes
- *Format*: the kind of variable, i.e. “signed integer”
- *Mode*: if the variable is an *Input*, an *Output* or an *In/Out* (from the Straton point of view)



The list of variables in the shared-memory, along with their properties, can be saved to / loaded from a *csv* file; the format of this file is as in the following example:

```
"NAME";"OFFSET";"SIZE";"FORMAT";"MODE";"ERROR_REPORT"
"VarINT";"0";"2";"0";"2";"CPU_ErrorReport_dummy"
"VarUINT";"2";"2";"1";"2";"CPU_ErrorReport_dummy"
"VarDINT";"4";"4";"0";"2";"CPU_ErrorReport_dummy"
"VarUDINT";"8";"4";"1";"2";"CPU_ErrorReport_dummy"
"VarREAL";"12";"4";"2";"2";"CPU_ErrorReport_dummy"
```

22.2 C program example

In this paragraph, an example is given of a simple C program which can be used to access a shared-memory.

The program arguments lets you specify:

- the shared-memory name
- the shared-memory size
- the offset, used to tell the program from which address in the shared-memory it shall start printing byte values

```
int main(int argc, char* argv[])
{
    long shmid;
    char *pMap;
    sem_t *sem;
    int i, iCpt ;

    for (i=1; i<argc; i++)
    {
        if (strcmp (argv[i], "?") == 0 || strcmp (argv[i], "/?") == 0)
        {
            printf ("Syntax:  shmtest [options]\n");
            printf ("Options:\n");
            printf ("  /name=       Named memory\n");
            printf ("  /size=       Memory size\n");
```

```
            printf ("  /offset=     Memory offset\n");

            return 0;
        }

        if (strncmp (argv[i], "/name=", 6) == 0)
        {
            strcpy (szName,  (argv[i] + 6)) ;
        }
        else if (strncmp (argv[i], "/size=", 6) == 0)
        {
            wSize = atoi (argv[i] + 6);
        }
        else if (strncmp (argv[i], "/offset=", 8) == 0)
        {
            wOffset = atoi (argv[i] + 8);
        }
    }

    shmid = shm_open(szName, O_RDWR, S_IRWXO|S_IRWXG|S_IRWXU) ;
    if (shmid < 0L)
    {
        printf("Error shm_open : <%s>\n", szName) ;
        return 0;
    }
    ftruncate(shmid, wSize) ;

    pMap = mmap(NULL, wSize, PROT_READ | PROT_WRITE, MAP_SHARED, shmid, 0);
    if (pMap == MAP_FAILED)
    {
        printf("Error mmap : <%s> size <%d>\n", szName, wSize) ;
        return 0;
    }

    sem = sem_open(szName, O_RDWR, S_IRUSR | S_IWUSR, 0);
    if (sem == SEM_FAILED)
    {
        printf("Error sem_open : <%s>\n", szName) ;
        return 0;
    }
    init_keyboard() ;

    iCpt = 0 ;
    while(_ShouldTerminate()==0)
    {
        sem_wait(sem) ;
        printf("Iteration %d\n", iCpt++) ;
        for (i=0+wOffset ; i<wSize ; i++)
        {
          printf ("%02X ", (unsigned char)pMap[i]);
          if ((i+1)%16 == 0)
            printf("\n") ;
        }
        sem_post(sem);
        usleep(100*1000) ;
        system("clear") ;
    }

    close_keyboard() ;
    munmap(pMap, wSize);
    sem_close(sem);
    close (shmid) ;

    return 0;
}
```

Note that the above code will print shared-memory byte values, without any knowledge of the variables properties.

Indeed, it is important to understand that the shared-memory contains only the variables values; the variables properties shall be retrieved, for example, by loading them from the *csv* file, shown above.

Below, some lines of code are given providing some definitions useful for variables properties handling.

```
#define VAR_NAME_MAX_LEN 50

#define VAR_MAX_NUM 100

typedef enum
{
    VAR_FORMAT_INT,
    VAR_FORMAT_UINT,
    VAR_FORMAT_FLOAT,
    VAR_FORMAT_STRING,
    VAR_FORMAT_NUM
} VAR_FORMAT_T;

const char *var_format_str[] =
{
    "integer",
    "unsigned integer",
    "float",
    "string"
};

typedef enum
{
    VAR_MODE_IN,
    VAR_MODE_OUT,
    VAR_MODE_INOUT,
    VAR_MODE_NUM
} VAR_MODE_T;

const char *var_mode_str[] =
{
    "input",
    "output",
    "input/output"
};

typedef struct VarDescrS
{
    char name[VAR_NAME_MAX_LEN+1];
    unsigned int offset;
    unsigned int size;
    VAR_FORMAT_T format;
    VAR_MODE_T mode;
} VarDescrT;

static VarDescrT *vars[VAR_MAX_NUM];
```

22.3 CGI

Another way to gain access to the Straton variables is by means of CGIs.

The variables that can be read/written by means of CGIs are those which are placed in the Straton shared-memory.

In the Device FW, a daemon is running which:

- parses the CGI requests
- reads/writes the requested variables from/to the shared-memory
- gives back the values/results in the CGI responses

Two CGIs are defined, one to read and one to write variables, as described in the following.

Both CGIs shall be inserted into HTTP POST requests.

It is important to note that, as far as the variables properties are concerned, normally the application sending the CGIs doesn't need to know the offset, size and format of a variable, while it needs to know the variables names and, possibly, the variables modes, to tell which variables can be read/written and which can only be read.

22.3.1 CGI "readVariable"

To read one variable:

request:
```
goform/readVariable?nVars=1&var1=<var_name1>
```
response:
```
#<var_name1>                <var_code1> <var_add_info1>
<var_value1>
```

Example:
request:
```
goform/readVariable?nVars=1&var1=M1_Output_1
```
response (successful case):
```
# M1_Output_1               0
1
```
response (failure case):
```
# M1_Output_1               5 Operation timeout
```

The CGI can be extended to read N variables (N>1), for example to read 2 variables:

```
goform/readVariable?nVars=2&var1=<var_name1>&var2=<var_name2>
```

The response contains N sections with the format described above.

22.3.2 CGI "writeVariable"

To write one variable:

request:
```
goform/writeVariable?nVars=1&var1=<var_name1>&value1=<var_value1>
```
response:
```
#<var_name1>                <var_code1> <var_add_info1>
```

Example:

request
```
goform/writeVariable?nVars=1&var1=M1_Output_1&value1=1
```
response (successful case):
```
# M1_Output_1                0
```
response (failure case):
```
# M1_Output_1                5 Operation timeout
```

The CGI can be extended to write N variables (N>1), for example to write 2 variables:

```
goform/writeVariable?nVars=2&var1=<var_name1>&var2=<var_name2>&value1=<va
r_value1>&value2=<var_value2>
```

The response contains N sections with the format described above.

23 Glossary

Router: a networking device that forwards data packets between computer networks, e.g. between a LAN and a WAN (the Internet).

Switch: a networking device that connects devices together on a computer network, by using a form of packet switching to forward data to the destination device.

VPN: a Virtual Private Network extends a private network across a public network, such as the Internet. It enables a device to send and receive data across the public network as if it were directly connected to the private network. A VPN is created by establishing a virtual point-to-point connection through the use of tunnelling protocols, with traffic encryption.

Tunnel: an IP tunnel is an Internet Protocol (IP) network communications channel between two networks. It is used to transport another network protocol by encapsulation of its packets.