DADO

Internet / MODBUS Gateway

ENGLISH

INSTALLER MANUAL ver. 1.1

CODE 144EVD2E204

Important

Read this document thoroughly before installation and before use of the device and follow all recommendations; keep this document with the device for future consultation.

The following symbols support reading of the document:

- indicates a suggestion
- ⚠ indicates a warning.

Disposal

The device must be disposed of in compliance with local Standards regarding the collection of electric and electronic equipment.

Index

1 INTRODUCTION

1.1 Introduction

DADO is a series of internet / MODBUS gateways, which communicate with the CloudEvolution internet portal via Ethernet using the existing network infrastructure (on EVD2ETHB30), Ethernet or GPRS (on EVD2ETHG30).
It has been designed to be as much firewall-friendly as possible and to require a low data traffic. Static IP address not requested.

1.2 Basic knowledge needed to install a DADO

1.2.1 IP / Ethernet / Internet

A basic IP, Ethernet and Internet comprehension is required. You are supposed to know the meaning of IP network, MAC address, DHCP, static address, router, hub, PAT/NAT, firewall and to be familiar with the network configuration of your Windows PC.

1.2.2 Serial communication with devices and Modbus protocol

A basic RS485 serial communication knowledge is required, functioning and wiring, Modbus protocol addressing and communication parameters like baud rate, parity and stop bits, termination resistance, line polarization, daisy chain.

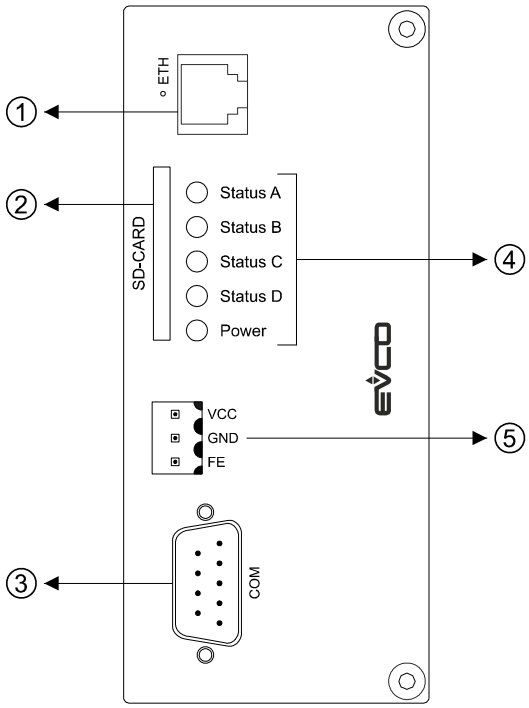
1.3 DADO identification

Each DADO has a serial number and a MAC address. These alphanumeric codes identify a DADO in the world, regardless in which network it is located.
The serial number depends on the MAC address.
These codes can be found on the DADO side label.

2 DESCRIPTION

2.1 Description of DADO Ethernet interface

The following drawing shows the DADO Ethernet interface.



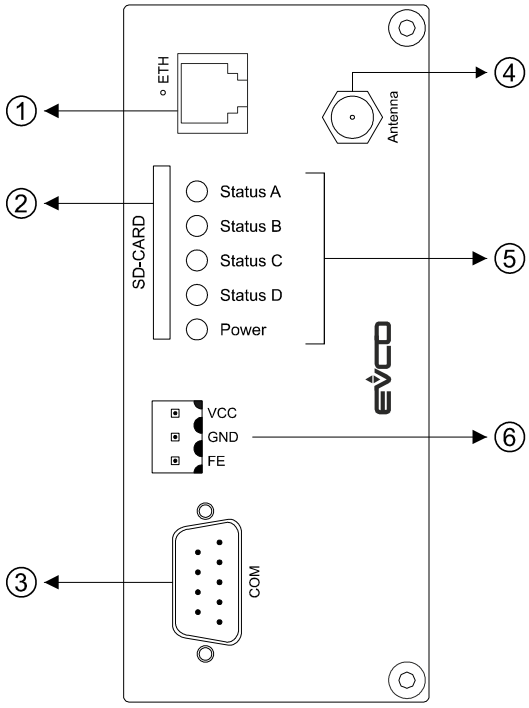
The following table describes DADO Ethernet interface parts.

Part	Description
1	Ethernet port
2	SD card slot
3	COM port
4	Status LEDs
5	Power supply connector

For further information, see the next chapters.

2.2 Description DADO Ethernet/GRPS interface

The following drawing shows the DADO Ethernet/GPRS interface.



The following table describes DADO Ethernet/GRSP interface parts.

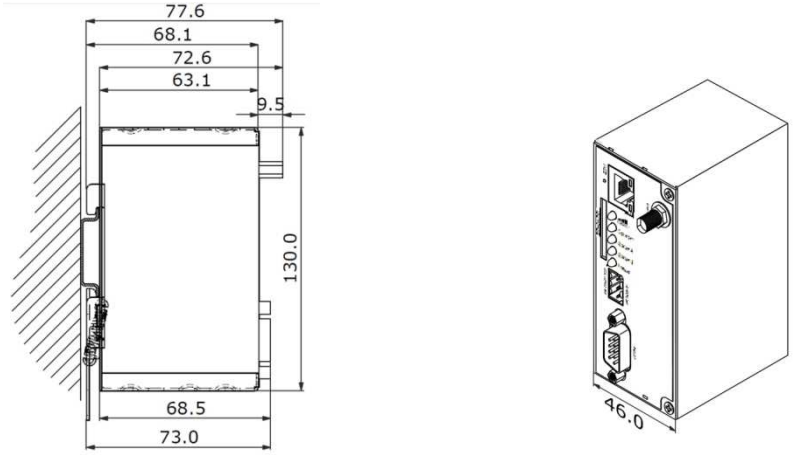
Part	Meaning
1	Ethernet port
2	SD card slot
3	COM port
4	Antenna connector
5	Status LEDs
6	Power supply connector

For further information, see the following chapters.

3 DIMENSIONS AND INSTALLATION

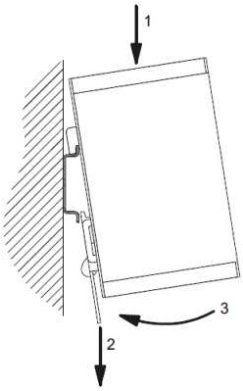
3.1 DADO dimensions

The DADO dimensions, expressed in mm, are indicated in the following drawing.



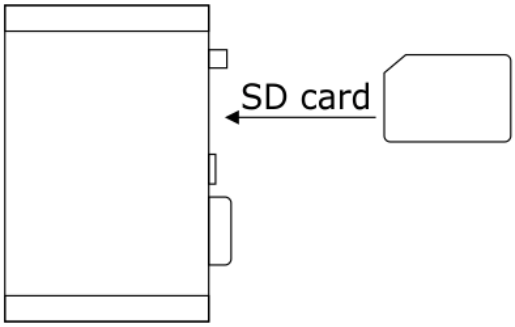
3.2 DADO installation

DADO is made for DIN rail installation.



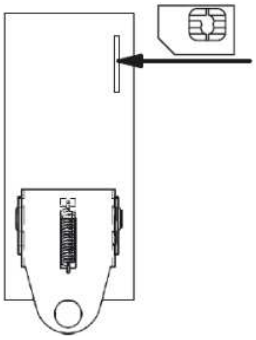
3.2.1 Inserting SD-Card

SD-Card must be inserted in the following way.



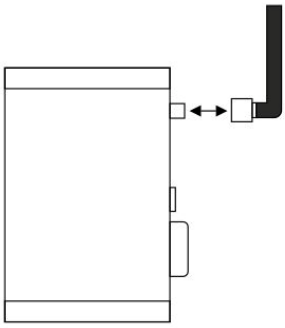
3.2.2 Inserting Sim Card (only for GPRS version)

Insert the SIM card in the device rear before the installation on the DIN rail, The device must be switched off (only on EVD2ETHG30). It is recommended to remove the SIM card PIN before use in the device, to do this, insert the SIM card inside a mobile phone and follow the documentation of the mobile phone to perform this operation.



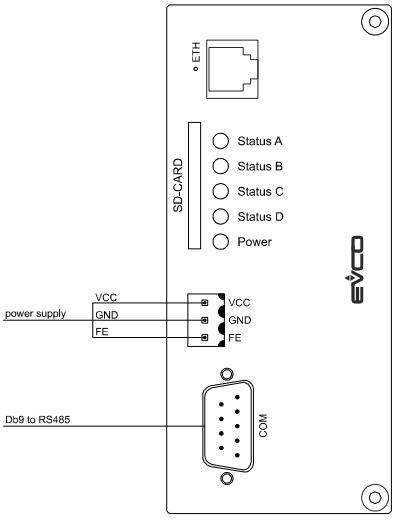
3.2.3 Antenna mounting

Never use the device in areas where the operation of wireless equipment is prohibited. The location for the antenna must guarantee the recommended radio electromagnetic limits (be at least 20 cm from persons and other antennas). When the antenna is installed outdoors the lightning protection standard VDE V0185 must be complied with. The EMC lightning protection zone concept must be observed. The device must be switched off during work on the antenna. It can not be guaranteed that there will not be any harmful interference for other devices. In case of interferences install the device or the antenna in another location (only for EVD2ETHG30).



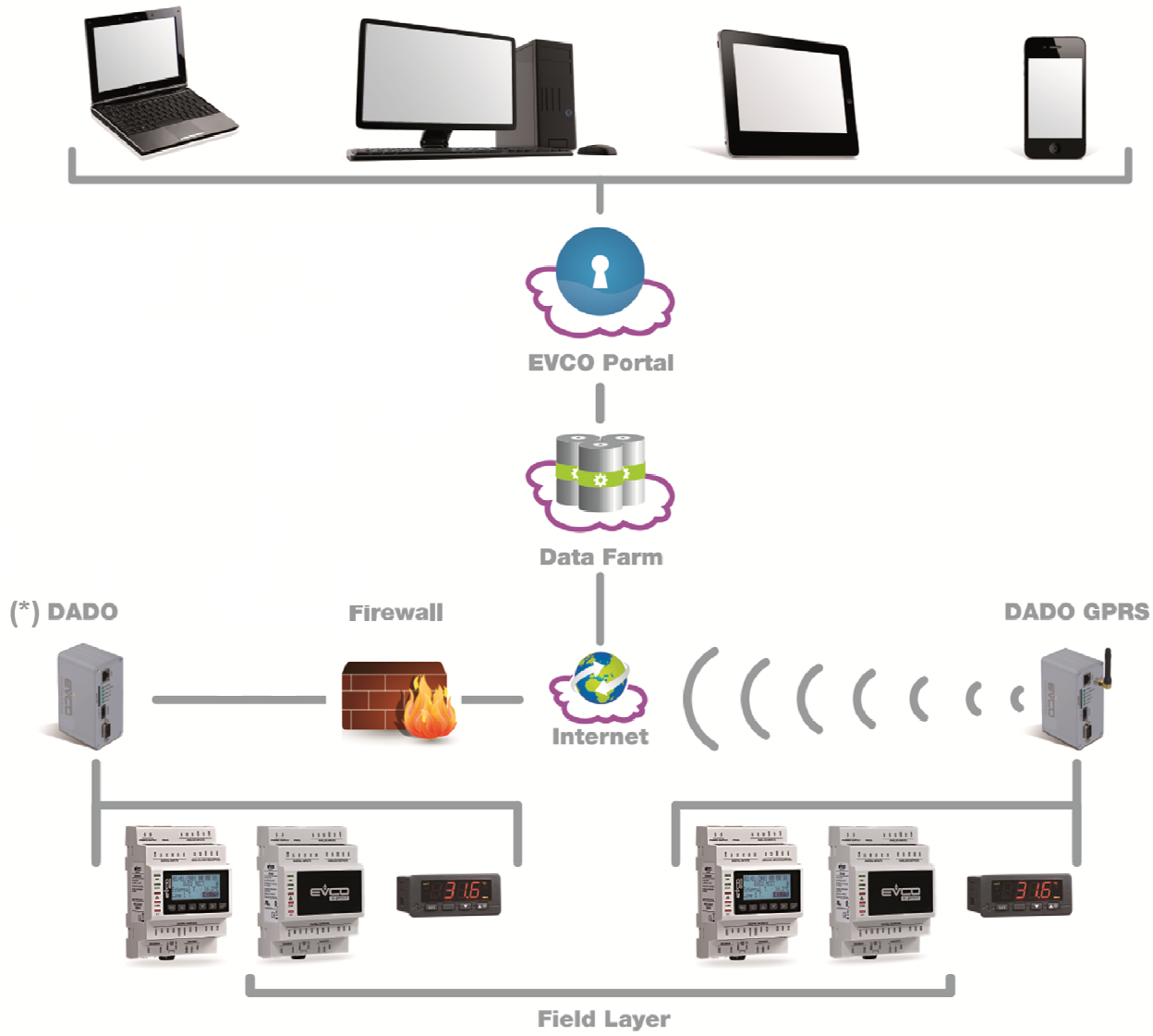
3.3 ELECTRIC CONNECTION

The following drawing illustrates the DADO electric connection.



4 HOW IT WORKS

The following scheme illustrate the full system working.



(*) : An external Wi-Fi adapter can be used for wireless connection to a Wi-Fi Hot Spot.

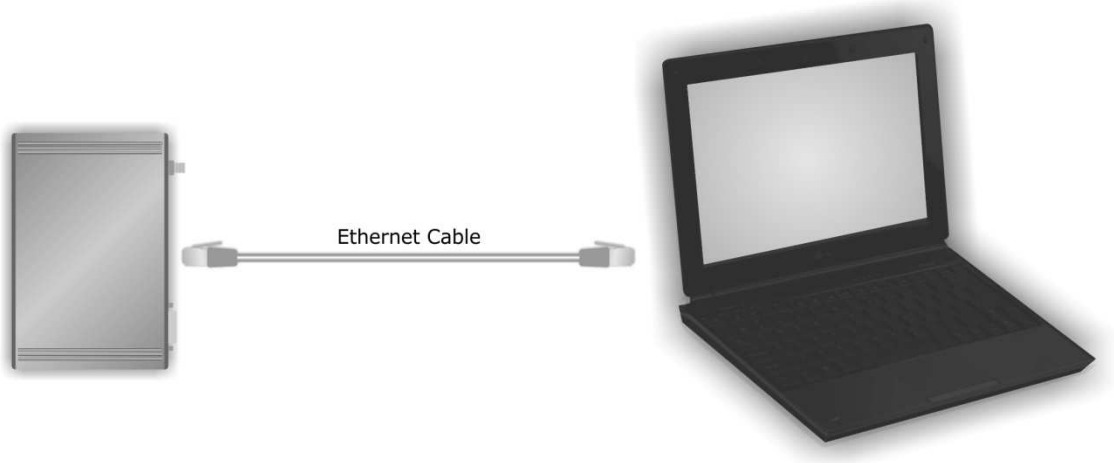
4.1 Preliminary configuration

When configuring DADO for the first time, you need first to establish a TCP/IP connection via ETHERNET port.

Note: Download the DADO_CFG software from http://www.evco.it/assets/doc/DADO_IPCFG_setup.zip . To run the software, a Windows PC is required.

4.2 Connection to PC with direct Ethernet cable

Connect the Ethernet cable between DADO and PC.



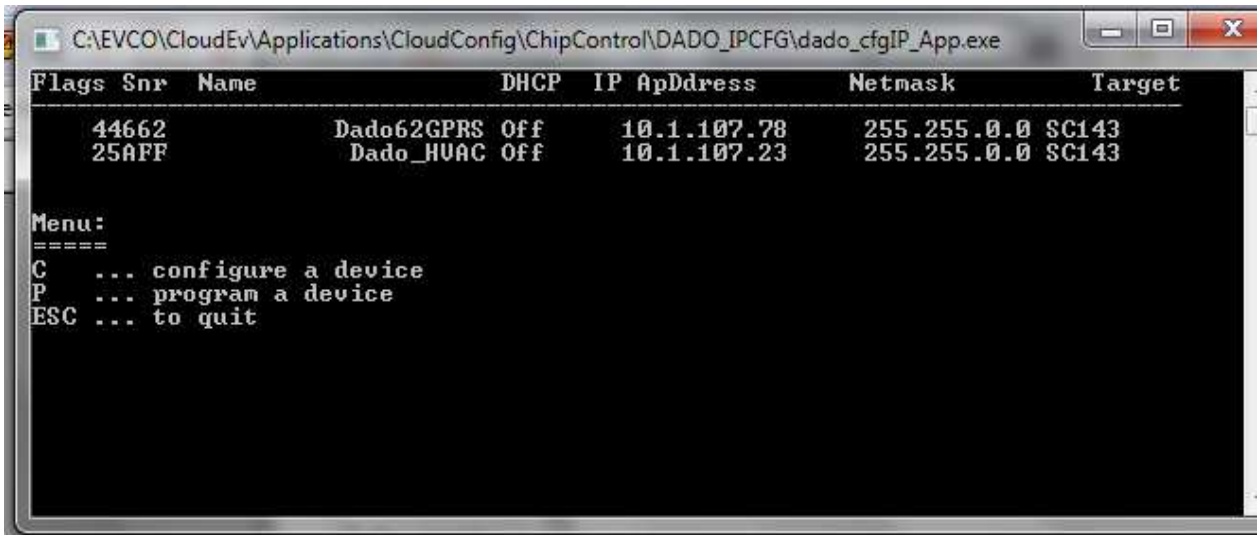
Depending on the PC, a special Ethernet cross cable maybe required. Modern PCs usually don't require this, so in many cases also a common Ethernet cable can be used.

It is also possible to connect DADO with an Ethernet switch using two standard Ethernet cables.
After the connection between DADO and the PC is established, supply power to DADO and then run the DADO_CFG software.

Note: It is not recommended to use the internal LAN for doing the first setup, because this can cause network conflicts. It is recommended to configure the devices before connecting them on the internal LAN.

4.3 Installing DADO in the user LAN

Run DADO_CFG software, press key "C" (never press "P") and set the values as requested by the software, then reboot the device.



Whenever the DADO must be connected to the pre-existing LAN, it is necessary to require from your IT manager the proper configuration to be used.

Your LAN could be using DHCP (dynamic IP addresses assignment). In case your LAN does not use DHCP, it is required to program the DADO only according to the IT manager indication. A bad configuration can generate network conflicts to equipment in your LAN, like PCs, servers, printers, and so on.

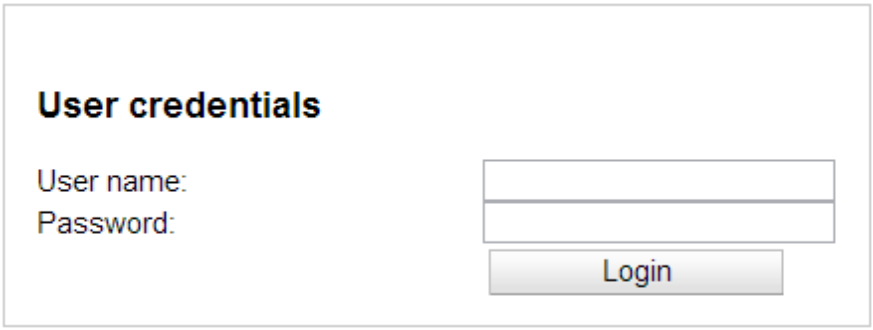
Setting: DHCP yes or no?
IP
MASK
Gateway
It is recommended to check static IP addresses using the **ping** command before configuring DADO.

4.4 Finishing Internet configuration

When the preliminary IP configuration phase is done, DADO can be connected to the Ethernet LAN. Finish the configuration using internet browser to connect to the internal web server.

Type "*http://IP address*" , i.e. if the IP address is 192.168.1.100 you must type in the browser *http://192.168.1.100*.
In case of connection failure check your firewall settings (if a firewall software is present on your PC, an "exception rule" may be needed) and check if Javascript is enabled.

If all is correct, the following login page will be displayed.

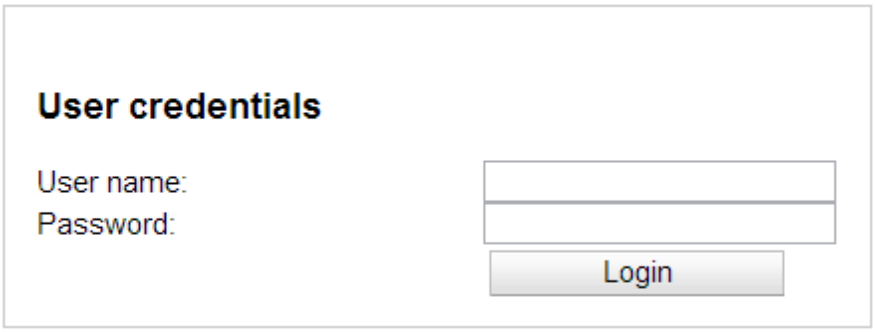


See the User Accounts chapter to get more information on how to login to the DADO internal web server.

Check paragraph 5.6 for information on Network configuration; chapter 5.4 for the status of network settings, chapter 4.1 to see Preliminary Setup.

5 DADO internal web server

5.1 User accounts

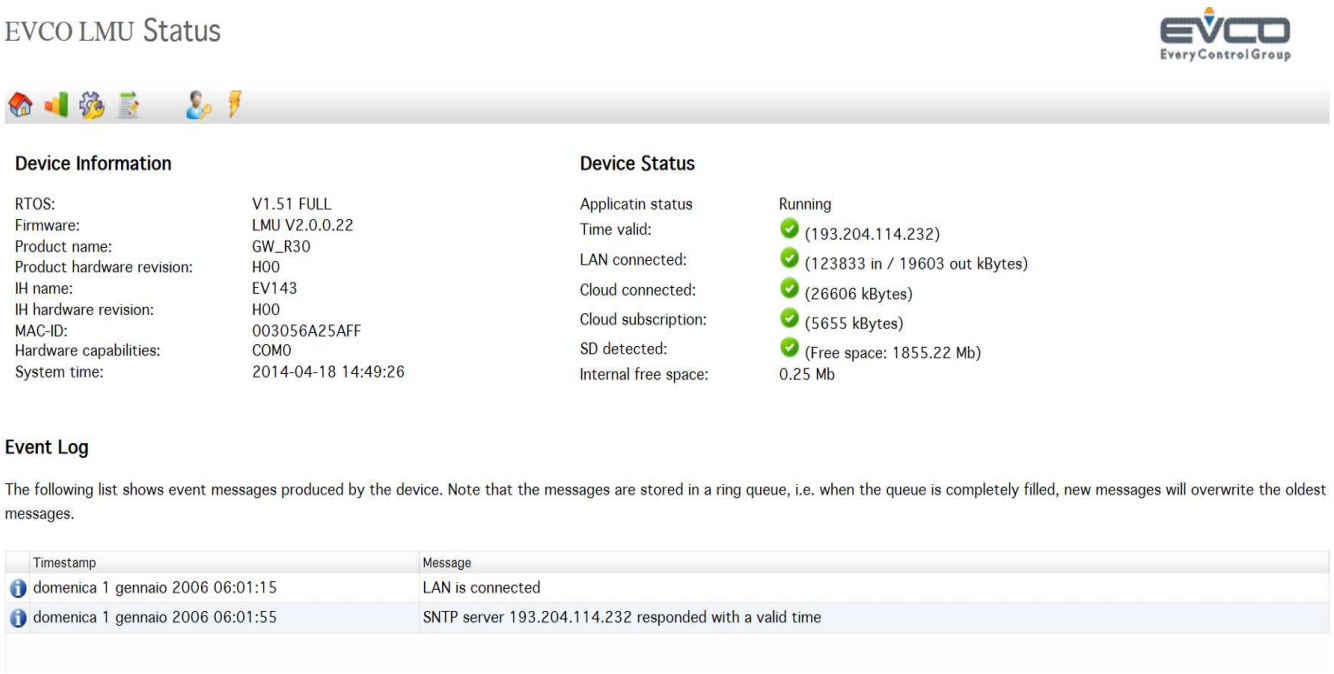


Use the "installerHigh" account to login. See password in the table below.

Predefined User accounts	User name	Password
User/user	User	user
installerLow	installerLow	xyz01w
installerHigh	installerHigh	xyz02h

5.2 Network operation status

In the first page of the web server it is possible to check details about the LAN/Internet communication



5.3 Trouble-shooting network problems

In case of no operation:

- check the IP configuration against network conflicts

- check if the gateway can be reached

- check if time server sent a valid time

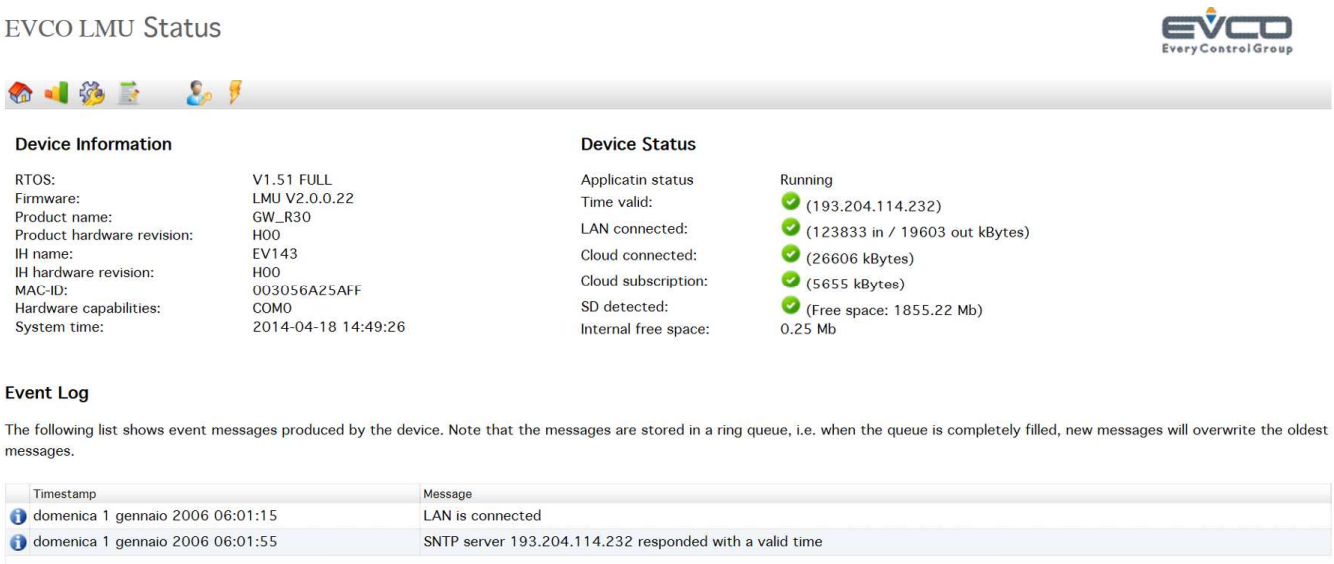
- check "cloud connection" status

- check "cloud subscription" status

- Check that TCP/UDP ports are allowed by the firewall (see appendix chapter 10 for the list of involved ports).

The fastest way to check and fix network/Internet issues is to use a Windows PC in the same LAN, this way it is possible to check configuration and status. See the following paragraph for some tooltip about how to configure your netbook in the LAN.

5.4 Status page



After logging in you will see the status page that contains:

- device information: it gives info about DADO firmware/hardware

- device status: it is a useful tool to see the present status of internet and devices connections

- event log: shows important events, useful to check the status.

Meaning of the most important items:

- RTOS: Real Time Operating System

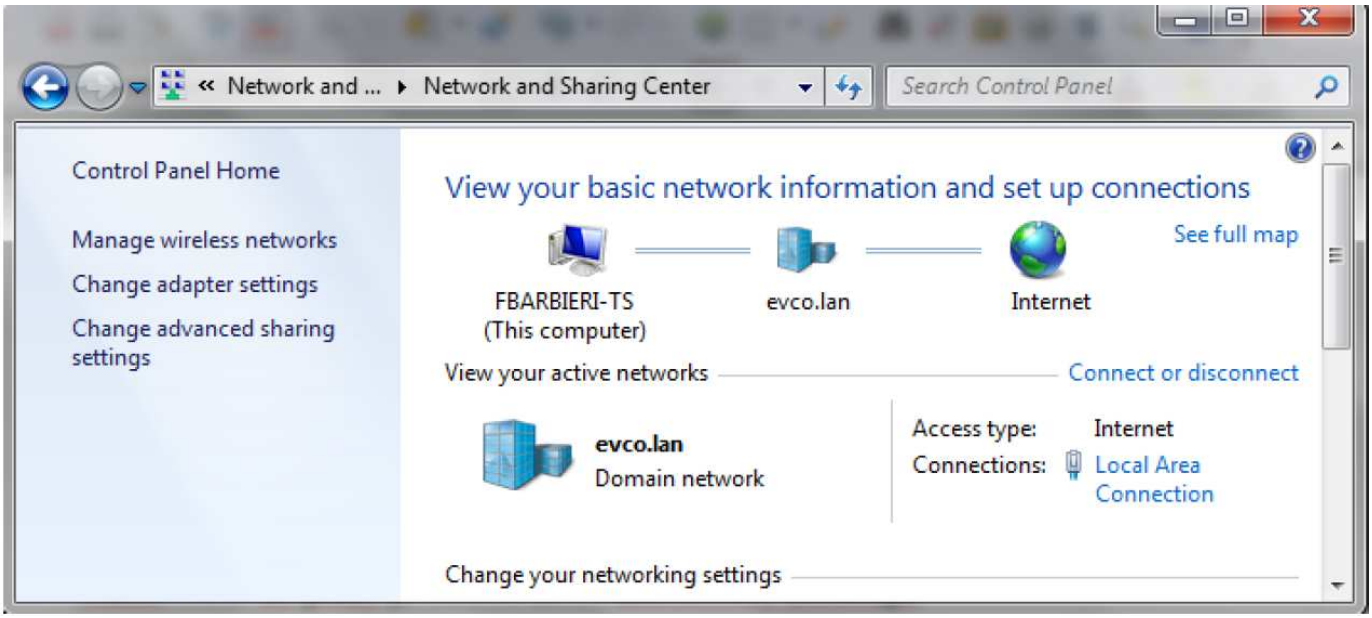
- Product name: an internal code identifying the kind of DADO

- MAC-ID: It is the Ethernet MAC address

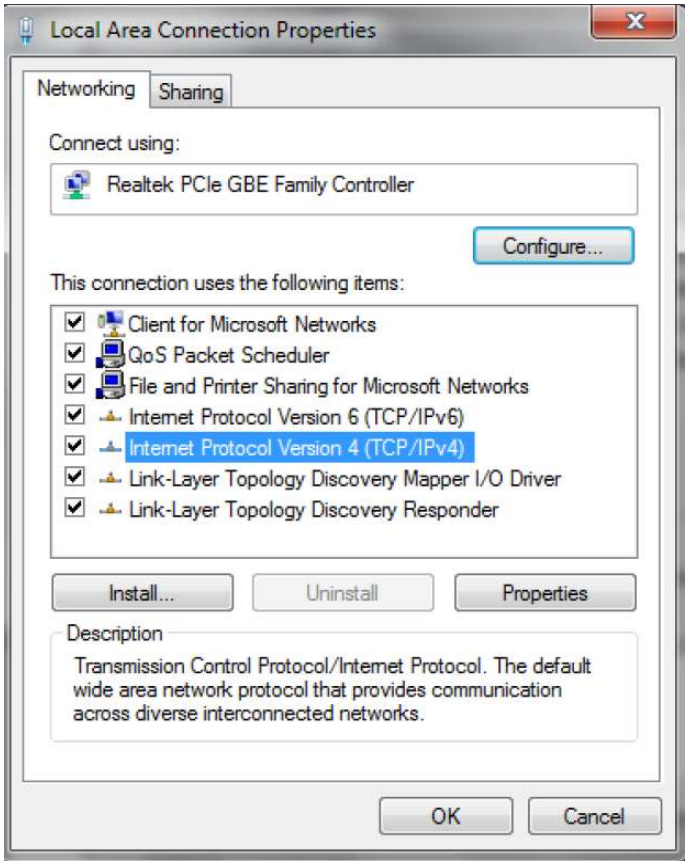
- System Time: you should see your current time

5.5 Setting Windows PC to be in user's LAN

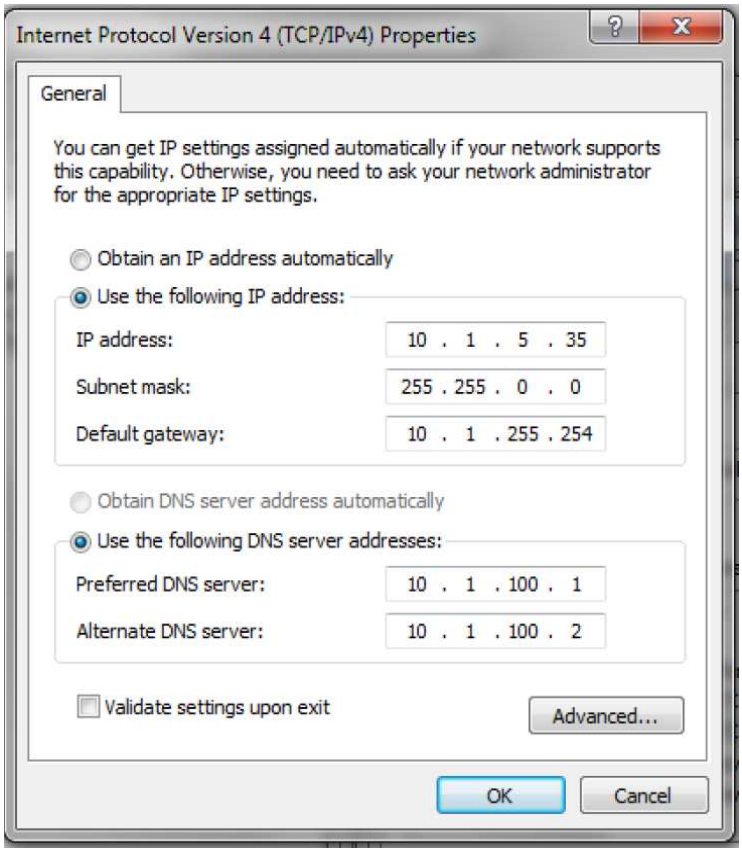
Go to control panel/Network and Internet/Network and sharing centre.



Open Change adapter settings, select Ethernet connection, then properties.



Note: Take note of your current LAN/Ethernet settings to restore configuration.



Properties of IPv4

Configure the IP address, mask, gateway, DNS1 (and DNS2 or leave empty) according to settings assigned by the I.T. manager.

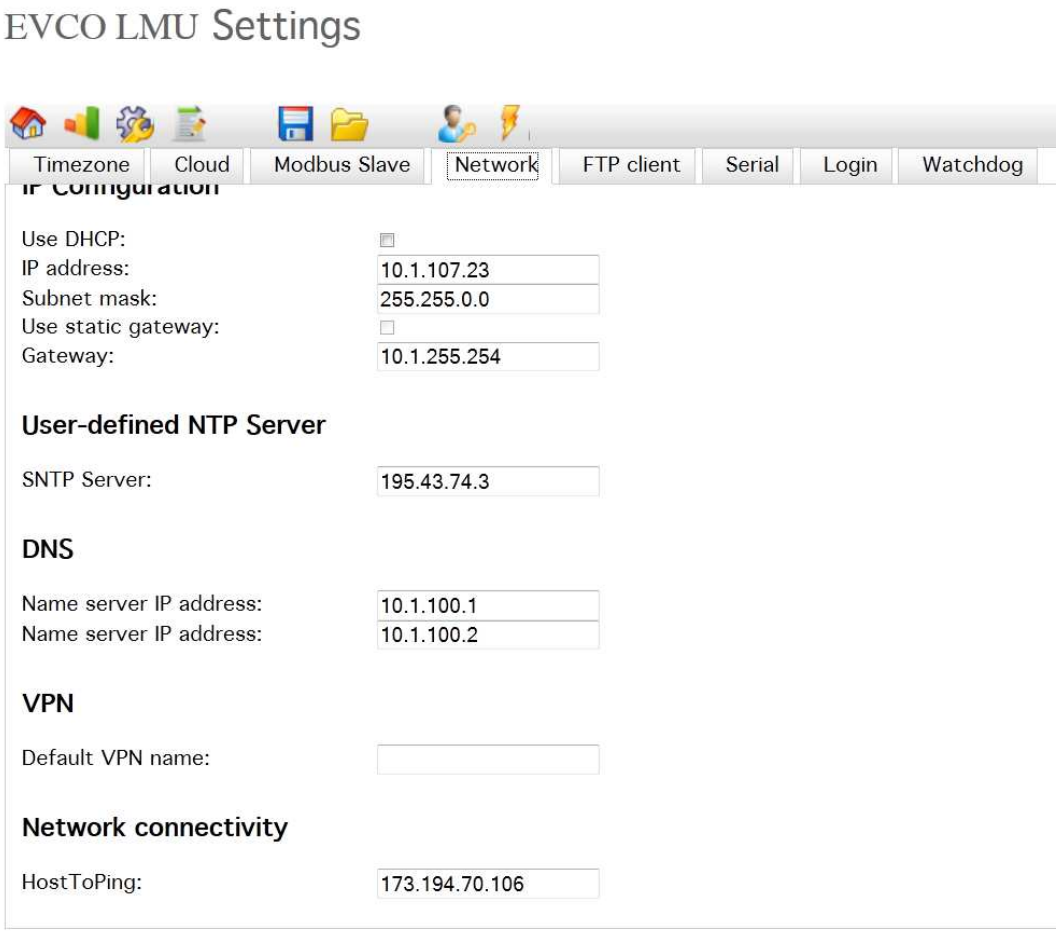
Be sure the Wi-Fi connection is disabled.

The IP address could be static or assigned dynamically via DHCP.

When IP is assigned via DHCP usually also the gateway address is automatic, but in some networks IP is dynamic while the gateway must be specified statically.
DADO and PC must have their own IP address (usually only last part is different).

5.6 Network configuration

After the IP configuration is done it is necessary to complete the internet/LAN configuration, before DADO is able to connect to the CloudEvolution portal.



Note: After changing the configuration, it is necessary to reboot the device.
Click the "reboot" icon on the icon bar line.

Basic LAN settings

Settings can be changed from the browser. In case of wrong configuration, it is possible to recover by executing DADO_CFG.exe again.
The new configuration will take effect after rebooting.

DHCP
Check if your network is DHCP. Set by DADO_CFG
IP Address
It is not used if DHCP is active. Set by DADO_CFG.
Subnet Mask
It is not used if DHCP is active. Set by DADO_CFG.
Use Static Gateway
Used when DHCP is active, in case the DHCP server is not providing a correct gateway or a different one must be used instead

Gateway

In case DHCP is active and USE STATIC GATEWAY is not, leave this box empty. Set by DADO_CFG.

SNTP server (time server)

User defined NTP (Network Time Protocol) server: address of a valid NTP server.

DADO is receiving the time from the Internet. Usually it is necessary to set this field with an internal or public NTP server. For a list of public available NTP servers, consult the Internet, searching for "NTP public servers".

DNS

Define primary and secondary DNS addresses.

Contact your I.T. Manager for proper values, or if you are in charge consult the Internet, searching for "Open DNS" or "Public DNS servers".

VPN

VPN stands for Virtual Private Network.

This field is not used by present DADO firmware. Leave the field empty.

Host To Ping

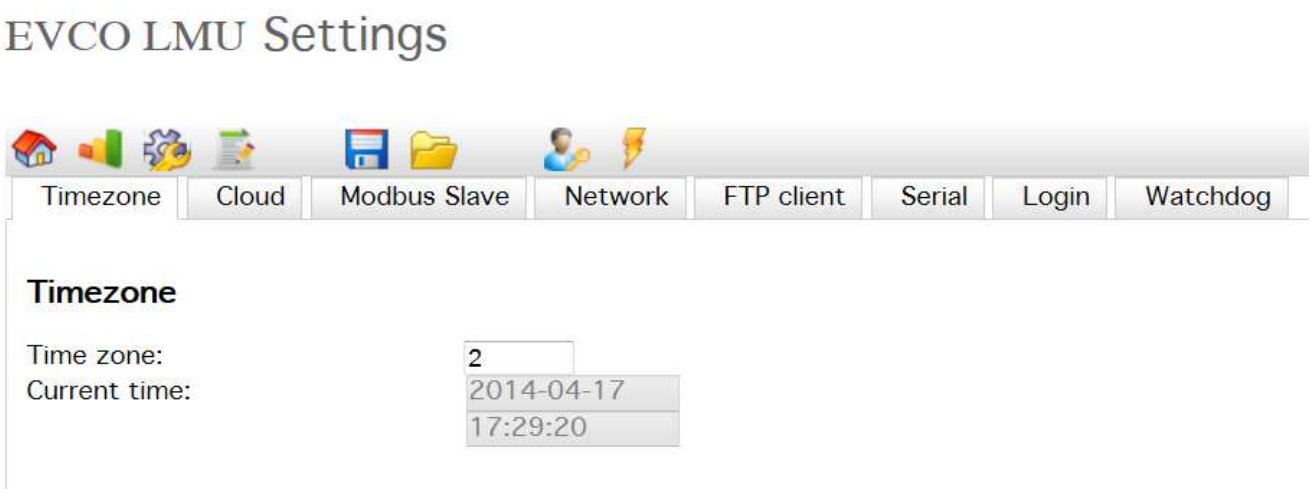
It is the IP address checked to verify the Internet connection status.

5.7 Checking and setting the timezone (UTC offset)

Before DADO can be used in the CloudEvolution portal it is necessary to set up the Time Zone offset.

The CloudEvolution portal must handle devices all over the world in different time zones, so it is necessary that DADO and CloudEvolution portal be synchronized.

Example: in Italy the value is 1 or 2 respectively on the solar time and on the daylight saving time



This kind of setup must be done in the CloudEvolution portal.

5.8 MODBUS connection

DADO can be connected to EVCO devices via MODBUS protocol, the connection is usually done via RS485 serial line.
It is necessary a basic knowledge about MODBUS protocol addressing and communication parameters.

5.8.1 MODBUS RTU

Important: Each MODBUS slave node must be programmed with the same communication parameters (baud rate, parity, stop bit) according to the MODBUS RTU specification.

5.8.2 MODBUS slave address

Each MODBUS slave must have a unique address, usually defined by a configuration parameter inside the slave.
An address is a number in the 1-247 range.
The MODBUS network can not work before this configuration is correctly completed. In case of an incorrect configuration resulting in conflicts, the behaviour is not predictable, it is possible to get no data or bad readings.

5.8.3 Typical settings

A common configuration is assigning 1 to the first device, 2 to the second device and so on.

5.9 EVCO controllers and MODBUS

EVCO has different product lines, each one featuring different peculiarities bout MODBUS/Serial settings.

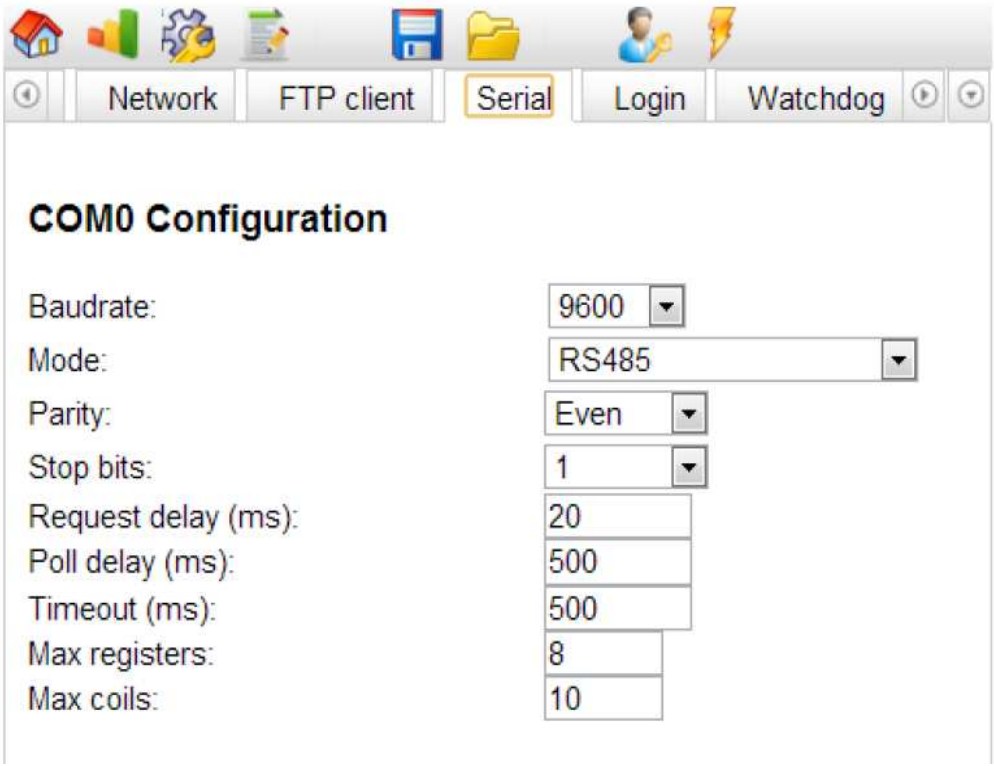
- Some devices require to be switched OFF/ON before a new configuration take effect, the ON/Stand-by button could be not enough to make the device accept the new settings.

  It is highly recommended to perform this "reboot" after setting devices.
- Some EVCO controllers has the "Direct RS485 printer" option. If the function is active, the serial port is used as a Master and it may inhibit the operation of the entire RS485 MODBUS network. It is necessary to configure parameters to enable "MODBUS slave port" function.
- Some EVCO controller is set by default on address 1, some other to address 247, it is necessary to assign a unique address to each device.
- A conflict or no connection on address 1 or 247 could mean there are devices not properly set or not reconfigured
- MODBUS RTU specification requires to have exactly 1 stop bit with parity bit (even/odd) and 2 stop bits with parity None. Some devices allow a free configuration of the number of bits, it is mandatory to follow specifications, otherwise devices could not communicate or communicate in a wrong way.
- Many Evco controllers use 9600 Baudrate as default communication speed.

5.10 Serial interface

The COM0 port can be configured in two ways: RS232 or RS485

An adapter is necessary to connect to RS485 lines



- Baud rate: depends on how the MODBUS network has been set up;

- Mode: RS485 will configure the COM port as RS485 port, no external RS232-485 adapter module must be used. The specific adapter is required between the DB9 connector and the 3 wires connection of RS485;

- Parity: parity bit (None, Odd, Even);

- Stop bits: according to the standard MODBUS specifications the number of stop bits required is strictly depending on the usage of the parity, in others words with None: 2 stop bits, Even: 1 stop bit, Odd: 1 stop bit;

- Request delay (ms): it is the number of milliseconds between two requests, put 0 for maximum speed and increase only in case of problems;

- Poll request delay: use the default value;

- Timeout: it is the base timeout for the command-reply sequence of MODBUS communication;

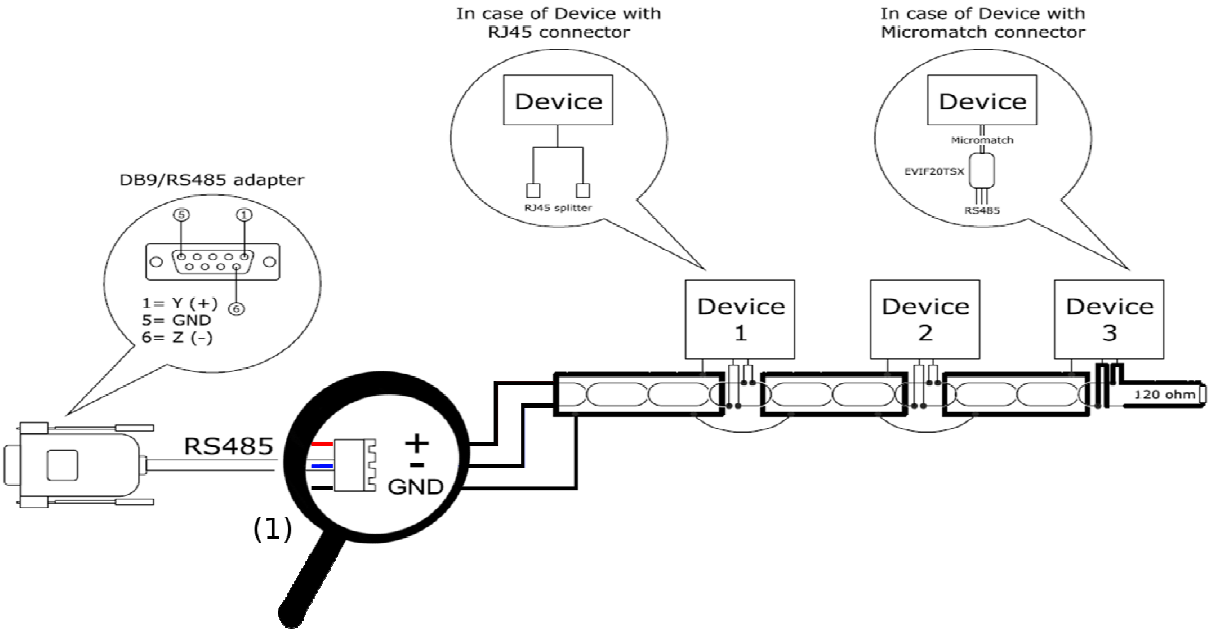
- Max registers: when possible MODBUS requests are grouped to speed up the polling loop. Some devices could require a different value;

- Max coils: same as Max registers for “read coils” command.

5.11 Connecting MODBUS RTU units over RS485 line

Use the adapter provided by EVCO, or an equivalent one according the table below:

	RS232	RS485
Pin 1	**NC**	**Y (+)**
Pin 2	**RxD**	**NC**
Pin 3	**TxD**	**NC**
Pin 4	**NC**	**NC**
Pin 5	**GND**	**GND**
Pin 6	**NC**	**Z (-)**
Pin 7	**RTS**	**NC**
Pin 8	**CTS**	**NC**
Pin 9	**NC**	**NC**
Housing	**Connected to functional earth**	

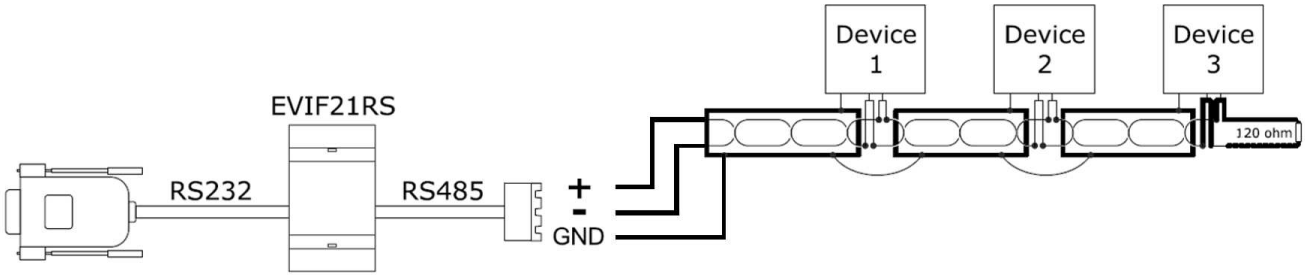


Consult the specification for each device, if it can be connected directly in RS485 or if it need an adapter.

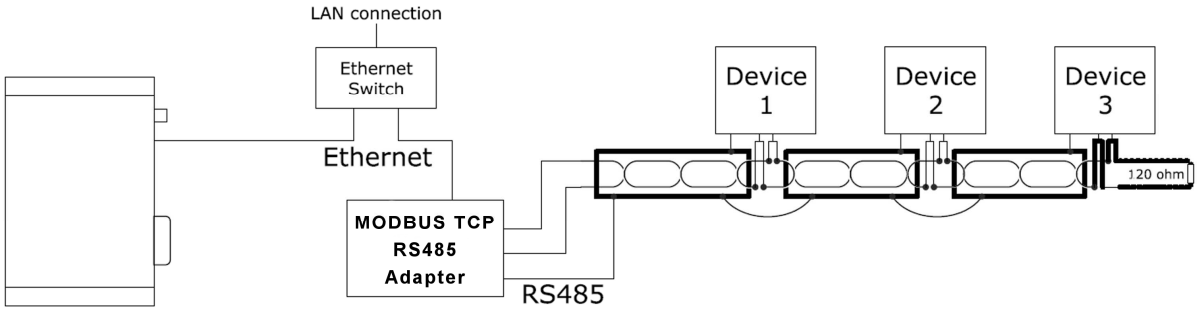
Notes:

(1) For the correct connection check wires colors: (**Red** for **+**, **Blue** for **-**, **Black** for **GND**) on the adapter.

5.12 Connecting MODBUS RTU units over an external RS232-RS485 interface

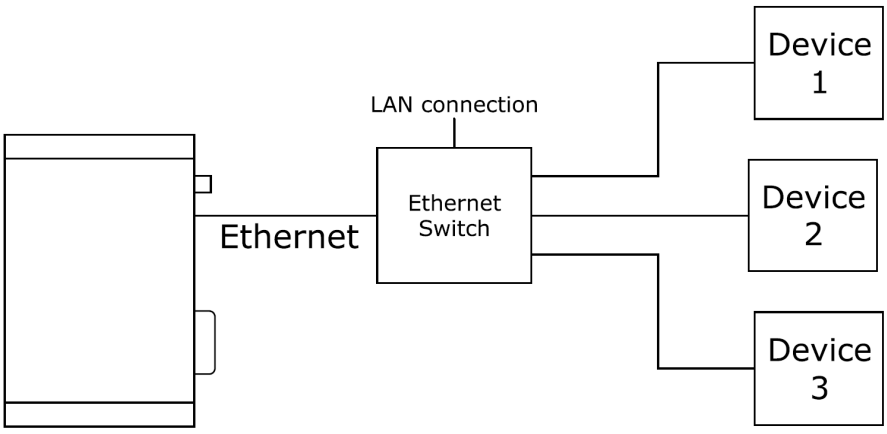


5.13 Connecting MODBUS RTU units via an external MODBUS TCP module



5.14 Connecting MODBUS TCP units over an Ethernet connection

DADO can read directly devices acting as a "MODBUS TCP slave" protocol.



5.15 Defining slave nodes

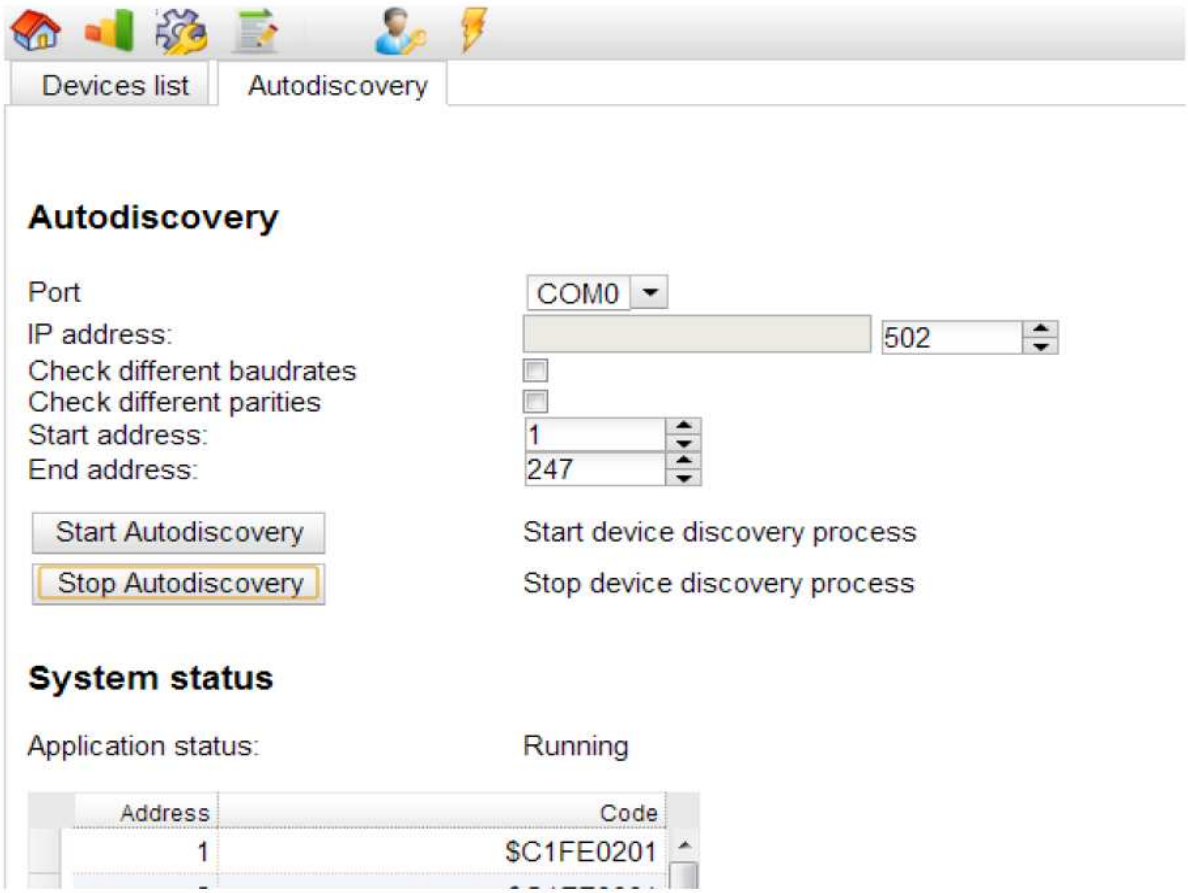
DADO must be programmed to define the structure of the slave nodes connected.

This can be done via the Devices list, the reference icon is: 

5.16 Autodiscovery feature

DADO has a procedure to discover automatically how many devices are connected, their MODBUS address and kind.

The procedure can not correctly detect devices in case of bad wiring, protocol conflicts, bad settings and so on.
In that case it maybe necessary to manually define or adjust the configuration.



Scanning a MODBUS RTU network (RS485)

- Port: COM0
- IP address/port: not used
- Check different baudrates: the autodiscovery will check also other baud rates
- Check different parities: the autodiscovery will check also other parities
- Start-end address: the scan will be limited inside the specified range, this is useful to speed up the process in case you know the range in advance (you generally know because it is expected it was you to set the addresses).

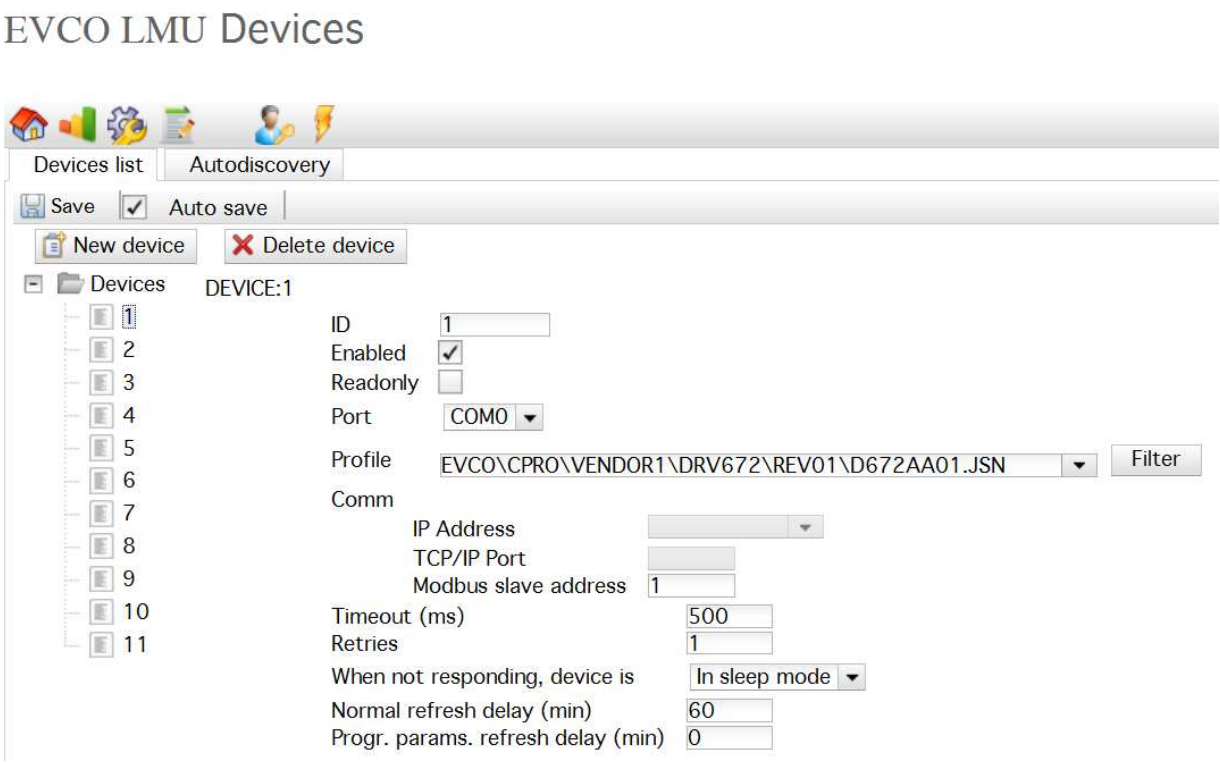
Scanning a MODBUS TCP gateway

- Port: TCP
- IP address/port: of the gateway to scan
- Check different baudrates: not used, do not select
- Check different parities: not used, do not select

Result of autodiscovery

- the devices found are shown in the on screen list
- the code is a identifier telling the kind of electronic controller discovered
- refer to appendix (chapter 10) for a list of supported devices.

5.17 Device setup



- ID: progressive numeric identification of the device;
- Enabled: if not checked, the device is excluded from polling;
- Readonly: if enabled it is not possible to write on the device from the portal;
- Port: COM0 is the DB9 connector used for RS485/RS232 connections, TCP in case the slave is a MODBUS TCP slave (connected via Ethernet)
- Profile: File path defining the end-device profile;
- Normal refresh delay: The number of minutes after which items must be re-sent to the portal, in case their value is not changing;
- Program params. refresh delay: same as normal refresh delay for configuration parameters, if 0 the "normal refresh delay" will be used.

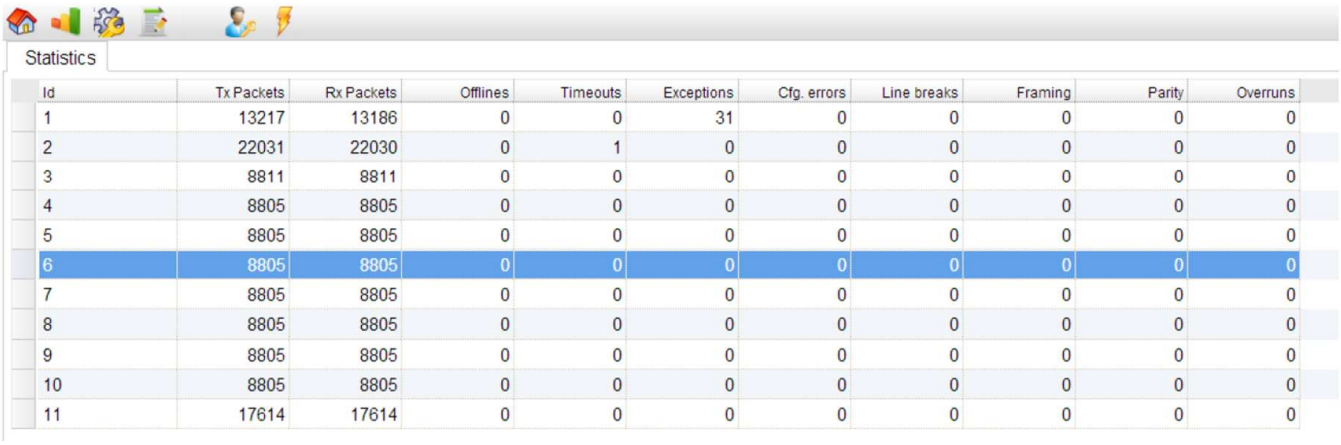
5.18 Serial communication statistics

This page contains useful information for checking correctness and quality of the MODBUS communication.

Timeouts, line breaks, parity or framing errors may indicate bad settings, network conflicts or bad wiring.

If Tx packets is equal to timeouts it means the slave node is not answering at all. This may indicate the address or communication parameters settings are not correct, or the device is not correctly wired and powered up. In most cases, the "exceptions" column may indicate an error in the profile describing the device, rather than a communication problem.
Tx counter being equal to RX (and > 0) indicate an optimum communication.

EVCO LMU Device statistics



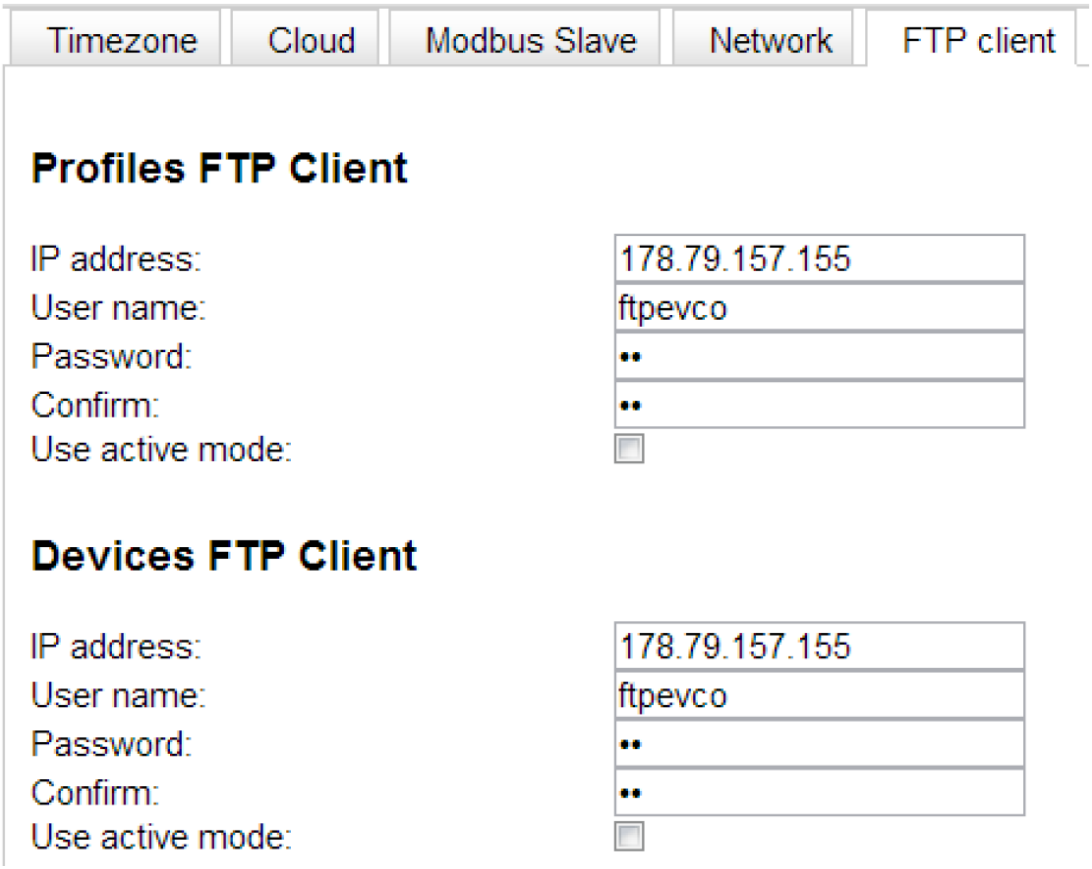
Statistics

Id	Tx Packets	Rx Packets	Offlines	Timeouts	Exceptions	Cfg. errors	Line breaks	Framing	Parity	Overruns
1	13217	13186	0	0	31	0	0	0	0	0
2	22031	22030	0	1	0	0	0	0	0	0
3	8811	8811	0	0	0	0	0	0	0	0
4	8805	8805	0	0	0	0	0	0	0	0
5	8805	8805	0	0	0	0	0	0	0	0
6	8805	8805	0	0	0	0	0	0	0	0
7	8805	8805	0	0	0	0	0	0	0	0
8	8805	8805	0	0	0	0	0	0	0	0
9	8805	8805	0	0	0	0	0	0	0	0
10	8805	8805	0	0	0	0	0	0	0	0
11	17614	17614	0	0	0	0	0	0	0	0

6 FTP CLIENT FEATURE

DADO can download profiles from the Internet and send its configuration.

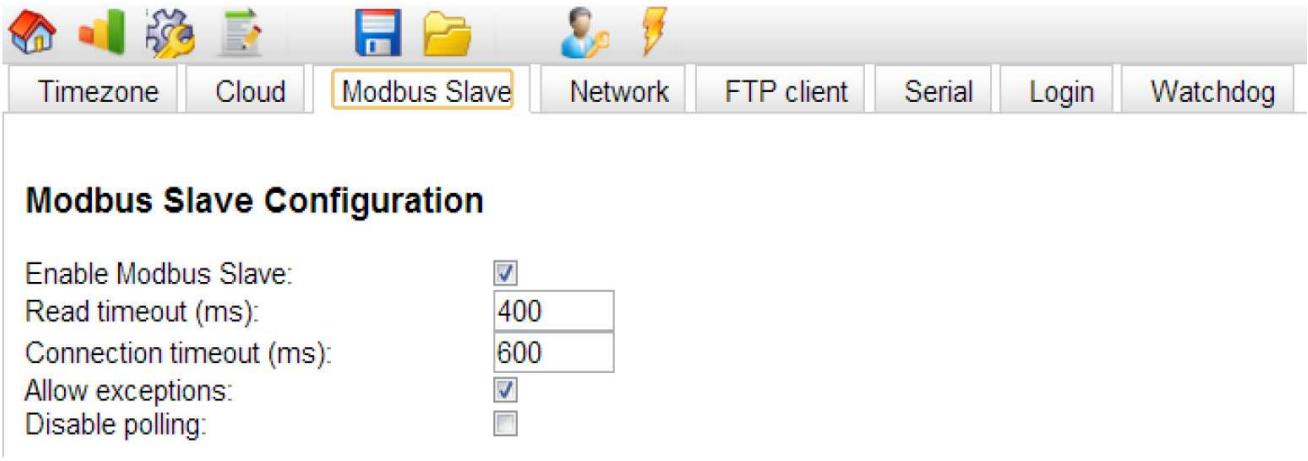
In a common CloudEvolution application these settings has not to be changed.



7 MODBUS BRIDGE

7.1 Accessing devices with a MODBUS TCP master

DADO offers an auxiliary function, it can act as a MODBUS TCP-MODBUS RTU bridge; every MODBUS TCP master (like a S.C.A.D.A.) can access the devices connected to the RS485 line via MODBUS TCP connection (Ethernet connection).



- Enable MODBUS slave: when checked, DADO listen on TCP port 502 and routes incoming MODBUS TCP requests to the serial line;

- Read timeout: external MODBUS request use this timeout, while internal generated request use the settings defined per each device;

- Connection timeout: an open session is automatically closed by DADO (the server) if the client is inactive for more than this time;

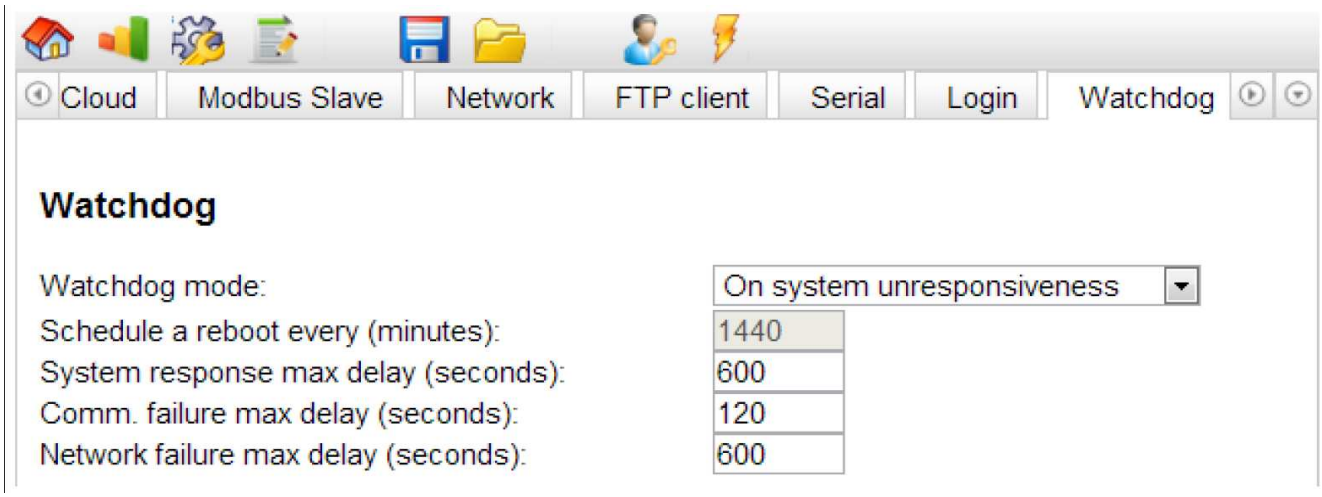
- Allow exceptions: when a slave is not answering, DADO will answer with an exception code 11 (gateway timeout) if this option is checked, otherwise it will not answer;

- Disable polling: this disable the operation with CloudEvolution, check this option only if DADO has not be used as a CloudEvolution gateway;

8 WATCHDOG

This feature is a redundant check on the DADO firmware/hardware internal status, usually it is not required.

In case of heavily electrical disturbed environment or other problems (Ethernet conflicts, power supply instability) it may be a good to have option.

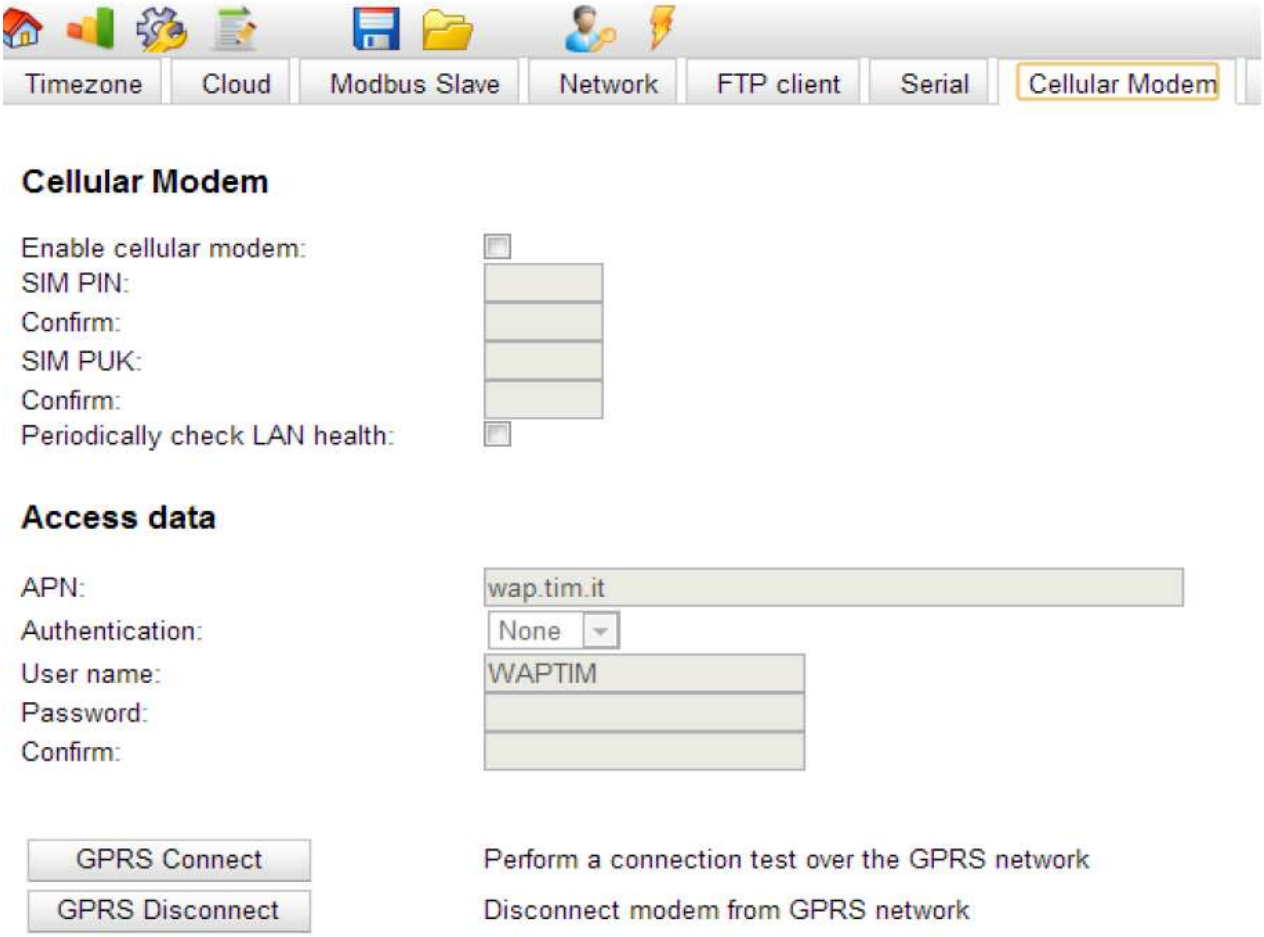


9 GPRS OPERATION

9.1 Setting up GPRS

See the paragraph 5.5 about how to connect DADO with PC.

Once the connection has been established, open the "Cellular Modem" tab.



APN, Authentication, user name and password depends on the kind of SIM-CARD used.

The SIM-CARD operation to be used for M2M (machine to machine) depends on your telephone company.

10 APPENDIX LIST OF USED TCP/UDP PORTS

The table below lists and describes the TCP and UDP ports in use:

Port Number	Direction	Public	Description	Mandatory
1883 TCP	Out	Yes	CloudEvolution Data communication	Yes
80 TCP	Out	Yes	HTTP	Yes
502 TCP	Out/in	No	Modbus TCP	No/yes (yes only for Modbus TCP devices)
20, 21 TCP	In/Out	Yes	FTP	Yes
1993 TCP	Out	Yes	Encrypted CloudEvolution Data communication	Yes
80 TCP	In	No	Internal HTTP Web Server	Yes

DADO
Internet / MODBUS Gateway
Installer manual ver. 2.0
GL - 45 / 14
Code 144EVD2E204

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