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# Introduction to the cLAN

## Purpose of this manual

The purpose of this manual is to provide the instructions to quickly and easily install and operate the cLAN equipment (with firmware V2.0+)

The installation of the cLAN also implies the installation of middleware and eventually any other application depending on the intended use for the system.

The cLAN can be used combined with the GRD

## Telemetry and control solutions with cLAN

The cLAN has multiple uses. These are the most common uses that will guide you to read this manual.

- **Ethernet RTU/Datalogger to Database (WEB server)**
  - Physical inputs/outputs
  - Modbus inputs/outputs (embedded Modbus master)
  - Serial port data (using script programming)
  - Local input/output control (using script programming)
  - *Database to store the registers sent by the cLAN*
- **RTU/Controller accessible by Modbus TCP and RTU/ASCII**
  - Physical inputs/outputs
  - Serial port data (using script programming)
  - *Modbus protocol to read input/outputs remotely*
- **RTU/Controller with SNMP agent (V1)**
  - Physical inputs/outputs
  - Modbus inputs/outputs (embedded Modbus master)
- **Remote Access to serial port**
  - Remote serial port with Redirector (Virtual COM port)
  - Remote serial port in Modbus mode
- **Programmable protocol converter**
  - Serial port data (using script programming)
  - Direct connection to SCADA using its Modbus TCP/RTU slave

## Ethernet RTU/Datalogger to Database (WEB server)

There are hundreds of types of sensors that can be contacted directly to the cLAN inputs to measure different types of variables. Depending on the cLAN model, sensors could be used to deliver signals in 0-10V, 4-20mA or pulses, or simply connect different devices to their inputs/outputs. The GRD can also be configured as Modbus master and queries can be made to different slaves to expand its inputs/outputs.

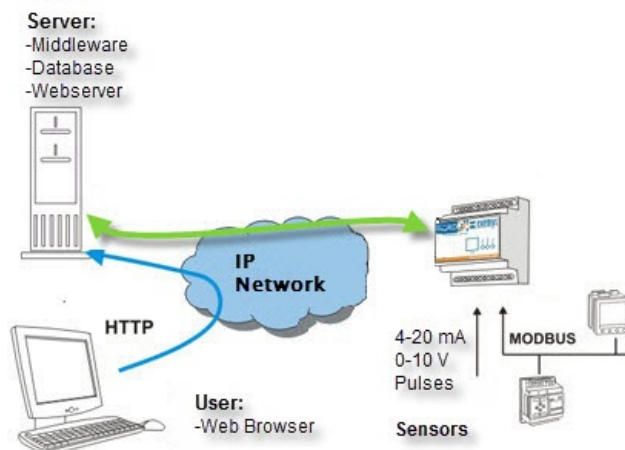
The cLAN works as a datalogger, creating records with timestamp with the value of the built-in or external I/Os and sending them to the Middleware (MW)

The MW will forward all the incoming records to an external database (MySQL or MS SQL)

You can also create a WEB site to show the value. Or you can use Exemys Telemetry service to connect your cLAN to our MW and web site ([www.exemys.com/m2mserver](http://www.exemys.com/m2mserver))

The cLAN can also be used to do a local control over its inputs/outputs using the script programming feature.

**Note:** The WEB server and the database engine are not provided by Exemys. You can use Apache HTTP Server and MySQL. Both of them are free tools.



For this type of solution the following procedure must be followed:

- Install the cLAN.
- Install the configuration software ("GRD Config"), this application will allow us to configure all cLAN parameters locally or remotely.
- If you won't connect the cLAN to the Exemys Telemetry Server, install and configure the MW on a computer that will work as a server.
- Have a running database engine and configure appropriately in the MW.
- Establish a connection between the cLAN and the MW.
- Configure the inputs/outputs in the cLAN according to their utilization:
  - Physical inputs/outputs
  - External Modbus inputs/outputs.
    - Configure the cLAN serial port.
    - Configure the "Embedded Modbus master" and the queries we want it to make.
- Configure the channels and enable the desired **reports** and **historical** records

## [RTU/Controller with SNMP agent \(V1\)](#)

The cLAN can work as a SNMP agent. This allows the user to get the valor of the digital an analog channel from a SMNP manager.

It can send SNMP traps also. They can be triggered by a change on a digital input or if an analog input goes over a high/low value.

For this type of solution the following procedure must be followed:

- Install the cLAN.
- Install the configuration software ("GRD Config") V9.0+, this application will allow us to configure all cLAN parameters locally or remotely.
- Configure the inputs/outputs in the cLAN according to their utilization:
  - Physical inputs/outputs
  - External Modbus inputs/outputs.
    - Configure the cLAN serial port.
    - Configure the "Embedded Modbus master" and the queries we want it to make.
  - Enable traps in case your SNMP manager can handle them
- Configure the channels and enable the desired **reports** and **historical** records

## [Remote serial port](#)

This solution allows you to remotely access the cLAN's serial port as if it were physically connected to the serial port of our computer.

You can think of it as an alternative to the telephone modems but with several advantages.

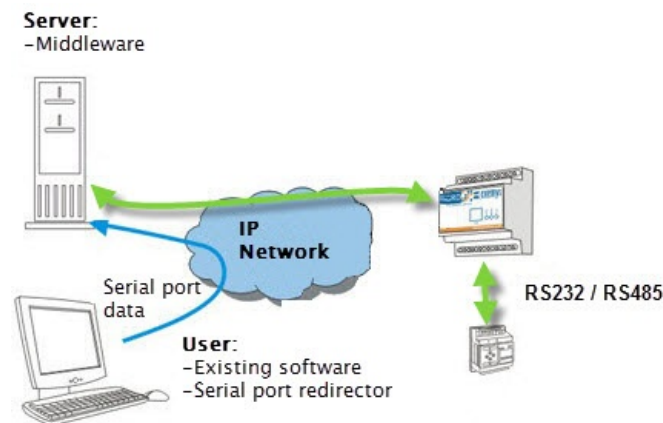
There are two way to do it:

- **Redirector of serial port**
- **Modbus for serial ports**

## **Remote serial port - Redirector (Virtual COM port)**

To access the remote serial port you must install the “Redirector of serial port” software. This software creates a virtual serial port that lets you use an existing software and connect to the remote equipment as if it were connected in a physical serial port of the computer.

Middleware is here only a link between the Redirector of serial port and the cLAN serial port.



For this type of solution the procedure below must be followed:

- Install the cLAN
- Install the configuration software (“GRD Config”), this application will allow us to configure all GRD parameters locally or remotely
- If you won't connect the cLAN to the Exemys Telemetry Server, install and configure the MW on a computer that will work as a server.
- Install and configure the “Redirector”.
- Establish a connection between the cLAN and the MW.
- Configure the serial port of the cLAN in remote mode
- If you are using you own MW, configure the operational mode of the serial port in the MW as TRANSPARENT.

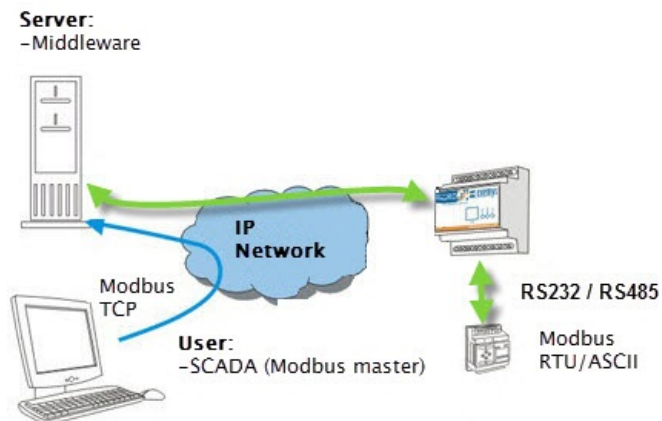
## **Remote Access to serial port – Modbus mode**

If the protocol used by the serial port of the remote equipment is Modbus, the MW can be configured in a special mode that will allow the optimization of the queries.

The Middleware has the capability of sending the Modbus query received to a particular cLAN depending on the ID of the Modbus slave of the received query.

This simplifies the communication between the user software and the Modbus slaves since they work as if the were connected to a unique Modbus network.

The master can establish the link using Modbus TCP, Modbus RTU or Modbus ASCII over TCP.



For this type of solution the procedure below must be followed:

- Install the cLAN
- Install the configuration software ("GRD Config"), this application will allow us to configure all cLAN parameters locally or remotely.
- Install and configure the Middleware in the PC working as a server, cLANs will be connected to this program and information will be sent to them.
- Establish a connection between the cLAB and the MW.
- Configure the serial port of the cLAN in remote mode
- Configure the operational mode of the serial port in the MW as Modbus and add the corresponding slaves.
- 
- If you are using you own MW, configure the operational mode of the serial port in the MW as TRANSPARENT.

## [Programmable protocol converter](#)

Using script programming is possible to use the cLAN as a protocol converter. It can be programmed to parse new protocols over its serial port. The acquired data can be read using Modbus RTU/ASCII on the other serial port, or Modbus TCP on its Ethernet interface. Some typical applications are using the cLAN to get Modbus data from scales, water quality analyzers, oil quality analyzers, card readers, weather stations, etc.

2020-07-20

## cLAN Models – Installation

### Selection table

Model	Serial	MODBUS Master	Digital Inputs	Digital Outputs	Analog Inputs	Pulse count	Script programming	Power supply
cLAN1205-XF	1 x RS232 - RS485/RS422 ISO	SI	-	-	-	-	SI	External 10 to 30Vcc
cLAN1520-XF	2 x RS232/RS485	SI	-	-	-	-	SI	External 10 to 30Vcc
cLAN2205-XF	1 x RS232 - RS485/RS422 ISO	SI	10(1)	10(1)	-	10(1)	SI	External 10 to 30Vcc
cLAN3404-XF	1 x RS232	SI	-	-	8(3)	-	SI	External 10 to 30Vcc
cLAN3524-XF	2 x RS232/RS485	SI	16(2)	8	8	8(2)	SI	External 10 to 30Vcc

(1) The device has 10 terminals that can be configure as digital inputs or outputs. All inputs can be used as pulse counters.

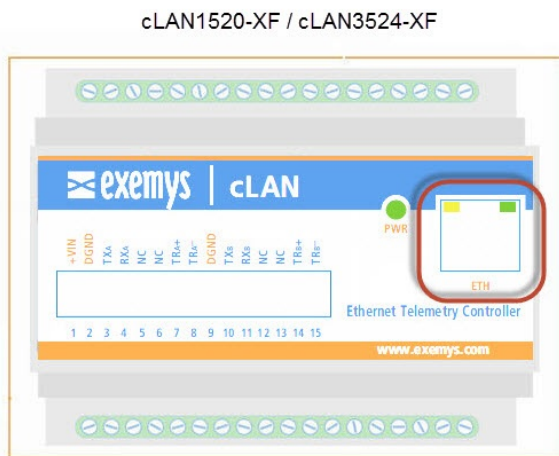
(2) Some digital inputs can be use as pulse inputs

(3) Differential inputs

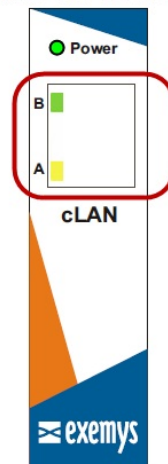
Read the "cLan Model" section to get serial ports, inputs/outputs and power wiring.

### Wiring – Ethernet Port

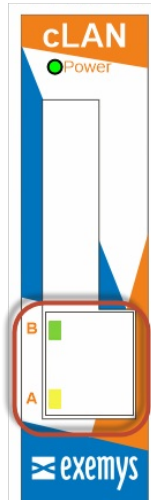
The cLAN's Ethernet port is a regular 10/100 Mbps port (10BASE-T / 100BASE-TX)



cLAN1205-XF / cLAN2205-XF



cLAN-3404-XF



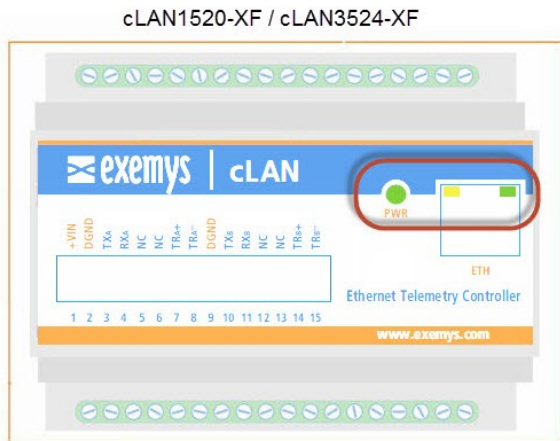
## LED Indicators

The cLAN has 3 LEDs indicators.

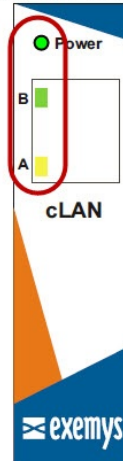
**PWR:** Power applied to the GRD

**Network (yellow) :** State of Ethernet port and IP configuration

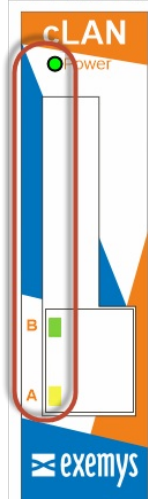
**LINK (green) :** State of the connection between the cLAN and the Middleware



cLAN1205-XF / cLAN2205-XF



cLAN-3404-XF



We find below the detail of the indication of each LED independently and in combination.

Green	Yellow	Description
Alternate blinking with the Yellow LED	Alternate blinking with the Yellow Green	Time to access the Serial port Console
Off	Fast blinking	Ethernet cable disconnected
-	90% ON, 10% OFF	Acquiring IP address using DHCP
-	10% ON, 90% OFF	IP address and Ethernet port are OK
Títula muy rápido	-	Connecting to the MW
Encendido	-	Connected to the MW
Encendido	Encendido	Deleting the registers memory

2020-07-20

## cLAN configuration software – GRDconfig

*GRDconfig* is the application program used to configure the cLAN equipment.

This application was developed with an easy-to-use feature in mind to configure and monitor the cLAN and the GRD devices.

The Configurator is supported on the following platforms: Windows 2003, XP, Vista, 2008, 7, 8 and 10 (32 and 64 bits).

Java Runtime Environment 1.8 or higher must be installed (available free in [www.java.com](http://www.java.com)).

## Installation

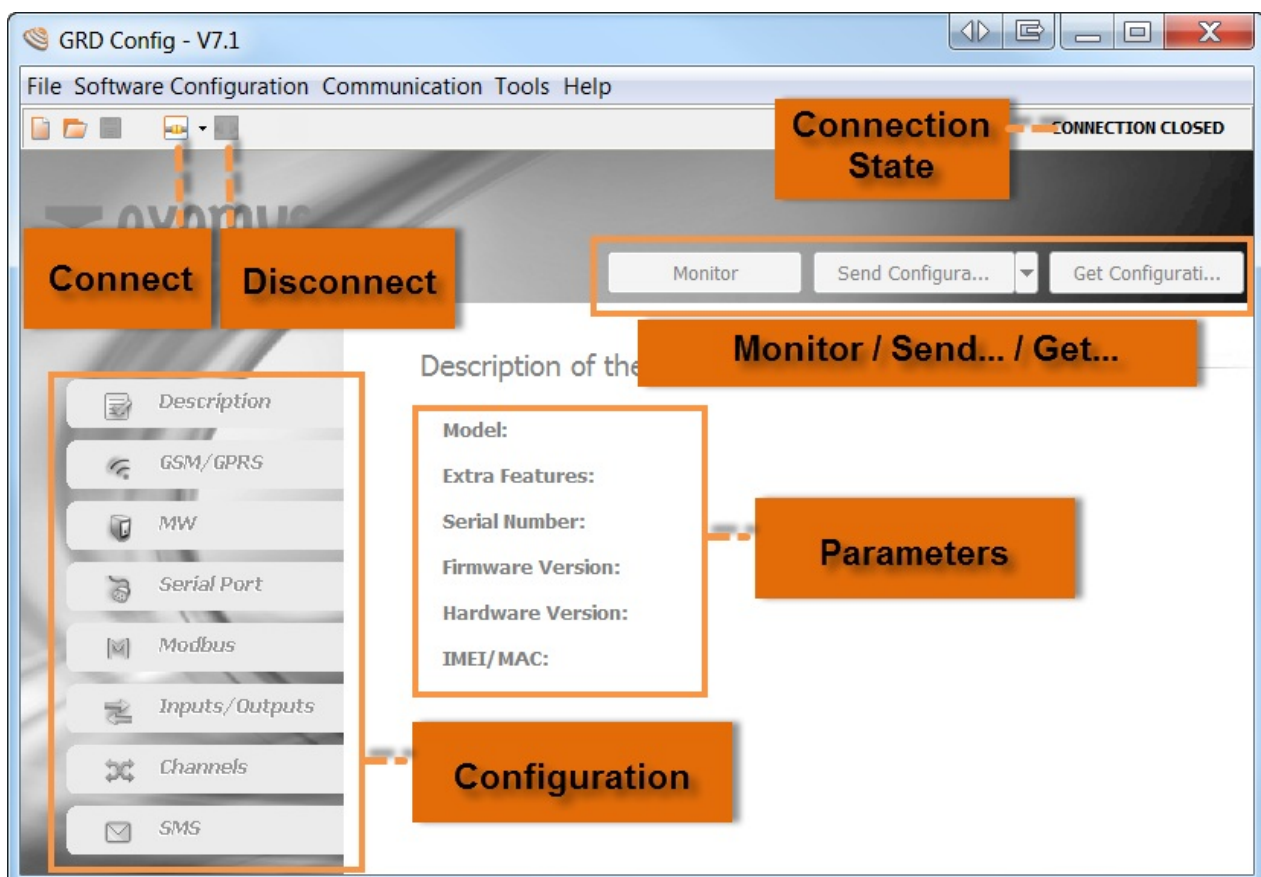
For installation follow these steps:

- Place the CD that comes with the equipment and select the installation of the Configurator.
- A welcome screen will be displayed, then follow the instructions of the Installation program which will request the necessary information to complete the installation. Click on “Next” to continue.
- Destination folder: Select the folder for the installation of the application program.
- Wait for the installation program to copy all necessary files onto the hard disk, and press “Finish” to end the installation process.

Once installed you will see in the Programs menu a folder called Exemys. Inside the folder you will find another folder called *GRDconfig*; this folder contains the *GRDconfig* and *Uninstall* icons and the *Script Programmer* folder.

## General description of the Configurator

The following figure shows the main screen of the Configurator.

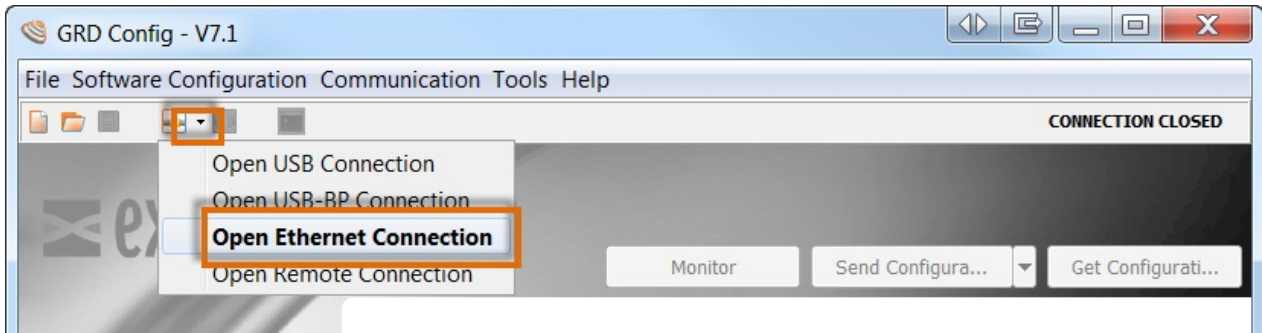




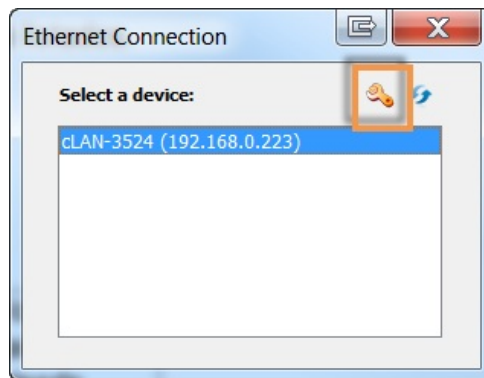
## Configuration cLAN's network parameters

The cLAN can be configured locally through its Ethernet port. Before connecting the GRDconfig with the cLAN you must configure its network parameters (IP address, Net mask, Gateway, etc)

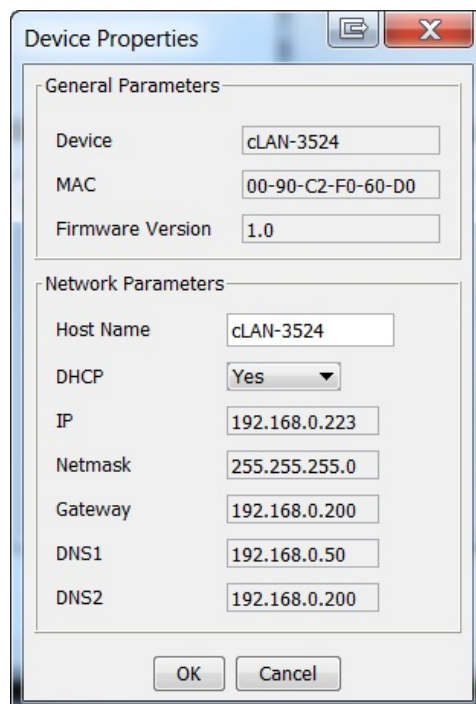
Press the triangle on the right of the "Connect" button and select "Open Ethernet Connection"



If there are cLAN devices connecter to your local network they will be listed, showing their IP address. If the device doesn't have an IP address yet it will show (0.0.0.0)



If you press the "config" button you will be able to see/edit the device network configuration



If you enable DHCP and there's a DHCP server on your network, these parameters will be assigned

automatically.

If you configure the parameters manually, have in mind that the Gateway is only necessary if the MW is in the different network than the cLAN. DNS1 and DNS2 are only used if the MW is located using a URL instead of an IP address.

If you are not using the Gateway or the DNS you can set them at 0.0.0.0

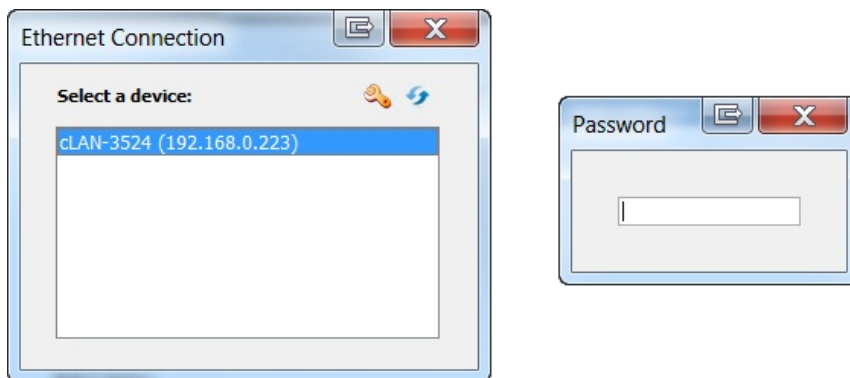
When changing these values the GRDconfig will ask you for a password. This password is the same the cLAN uses to connect to the MW. Factory default is a blank password.

## **Establishing a local connection with the cLAN**

To establish a local connection with the cLAN (LAN/Ethernet), your computer and the cLAN must be connected to the same network.

As described in the previous paragraph, search the cLAN pressing the Connect button (after choosing "Open Ethernet Connection") and then double click on the cLAN you want to configure.

The GRDconfig will prompt a password. This password is the same the cLAN uses to connect to the MW. Factory default is a blank password.

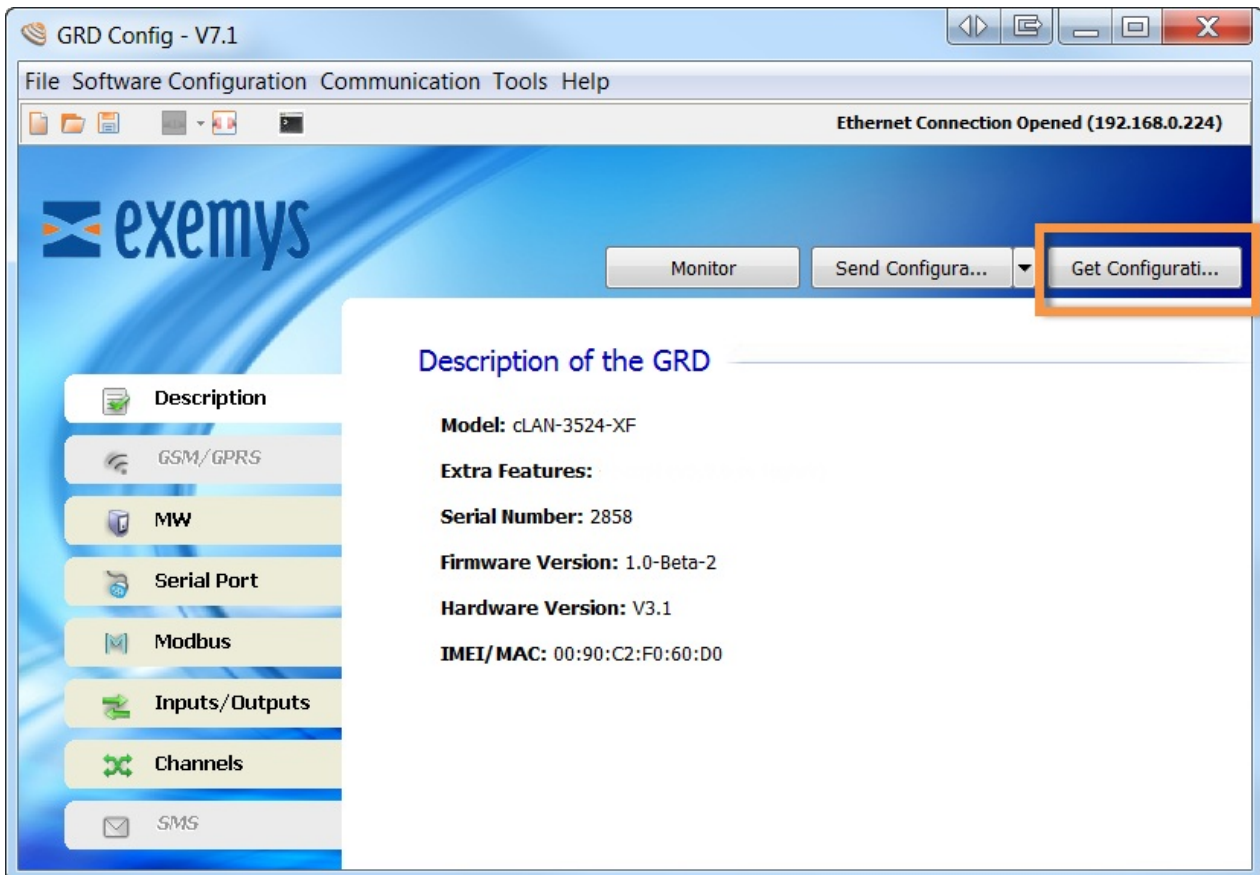


*If the Configurator finds an unknown model it will not enable any of the screens. Download the latest GRDconfig release from here:*

<http://www.exemys.com/GRDconfig>

## **Getting cLAN configuration**

To obtain the parameters of the equipment you will have to press the "Get Configuration" button and all the cLAN parameters will be displayed on the first screen, the model, Serial Number, MAC address, etc.

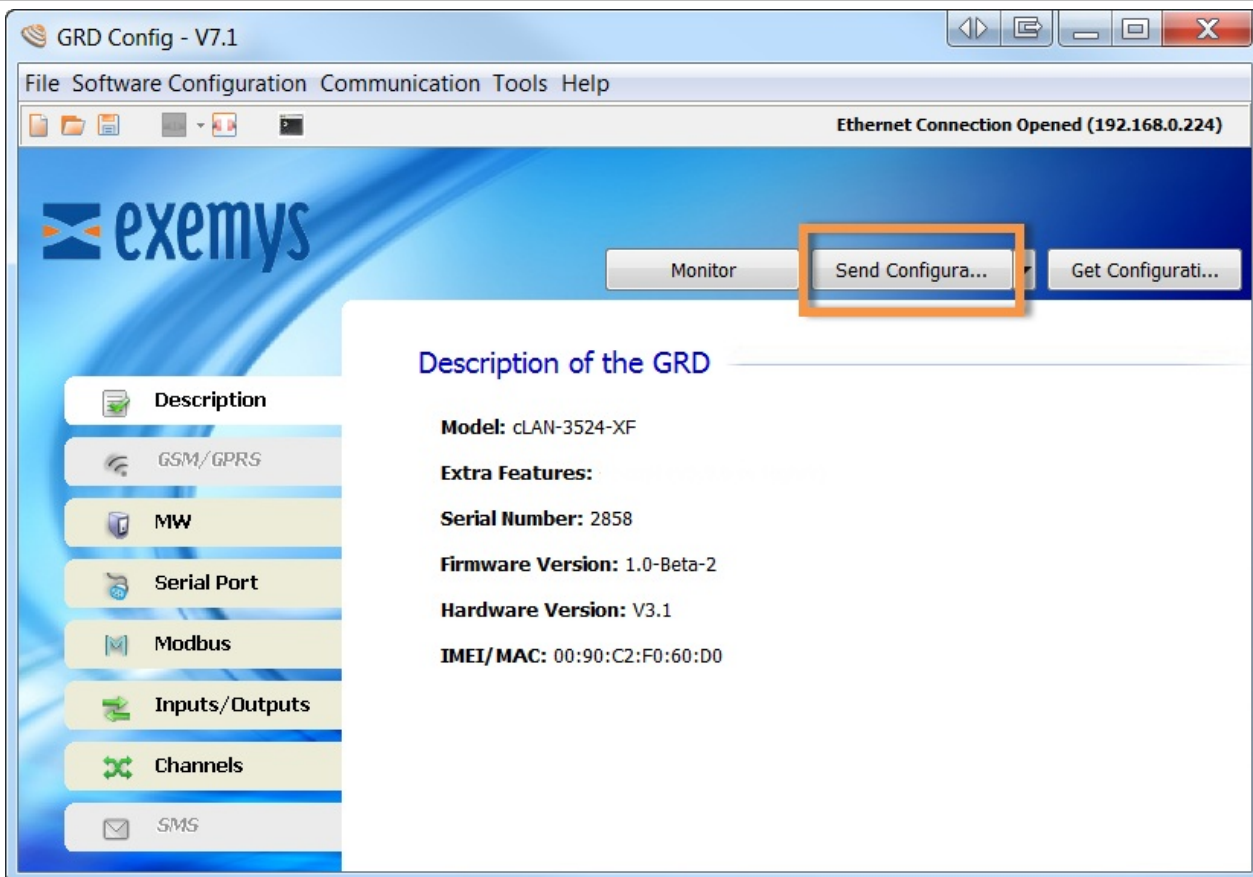


*If the Configurator finds an unknown model it will not enable any of the screens. Download the latest GRDconfig release from here:*

<http://www.exemys.com/GRDconfig>

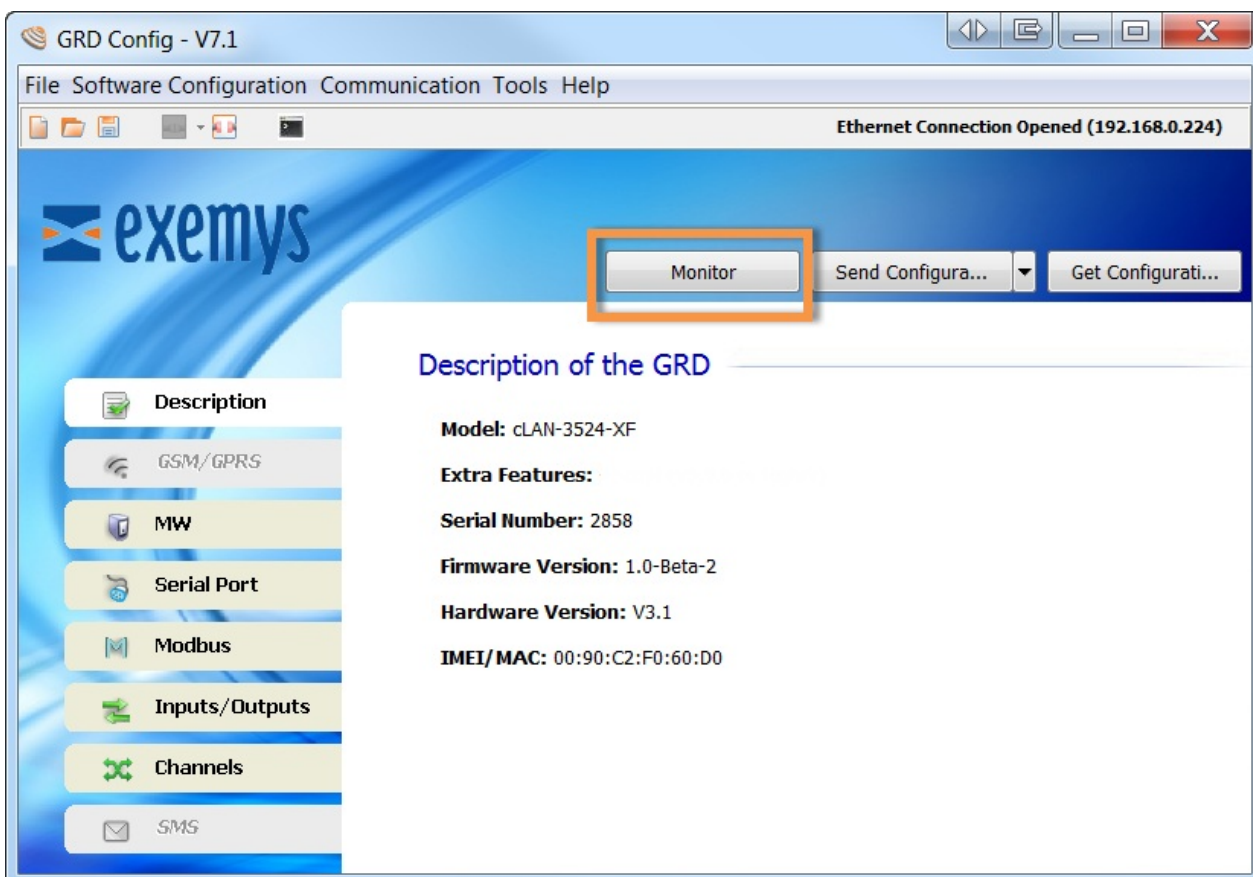
## [Sending the configuration to the cLAN](#)

If you want to send to the cLAN any change in the configuration press the “Send Configuration” button.

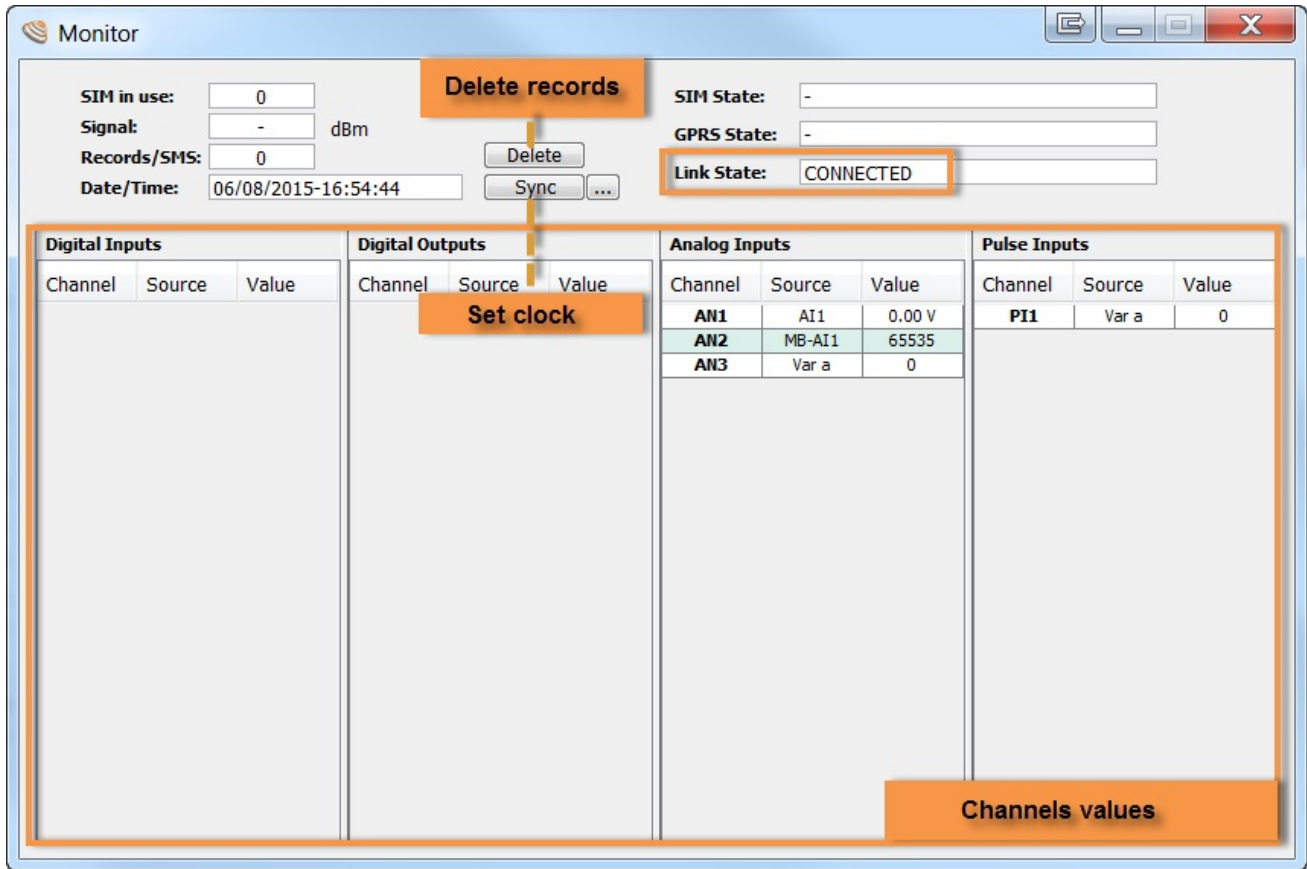


## Monitoring

To access the monitoring area where all the GRD parameters can be seen, you should press the “Monitor” button.



Once we enter monitoring the following screen will be displayed, in which we will be able to see the values of the input/output channels, the time, quantity of accumulated Historicals, the SIM in use and the states of connection of the equipment.



## Remote configuration and Monitoring

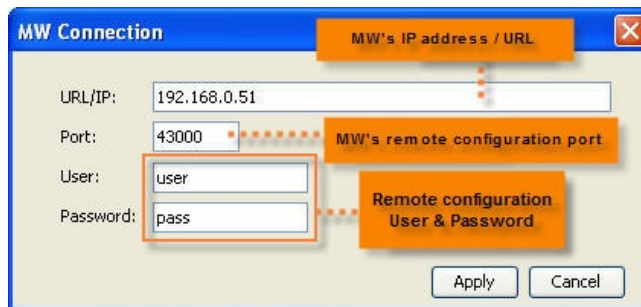
The configurator together with the MW have the capability to remotely access the configuration and monitoring of the cLAN, which means that they do not have to be connected locally to the PC. You must point out that the connection parameters of the MW cannot be modified this way.

### Configuration of parameters for remote access.

We must load in the configurator the MW parameters to which we want to connect in order to have remote access to the connected cLAN, we have to enter in "Software Configuration -> MW Connection"

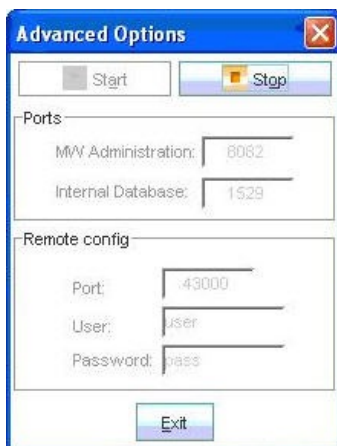


We then have to configure the URL/IP, Port, User and Password




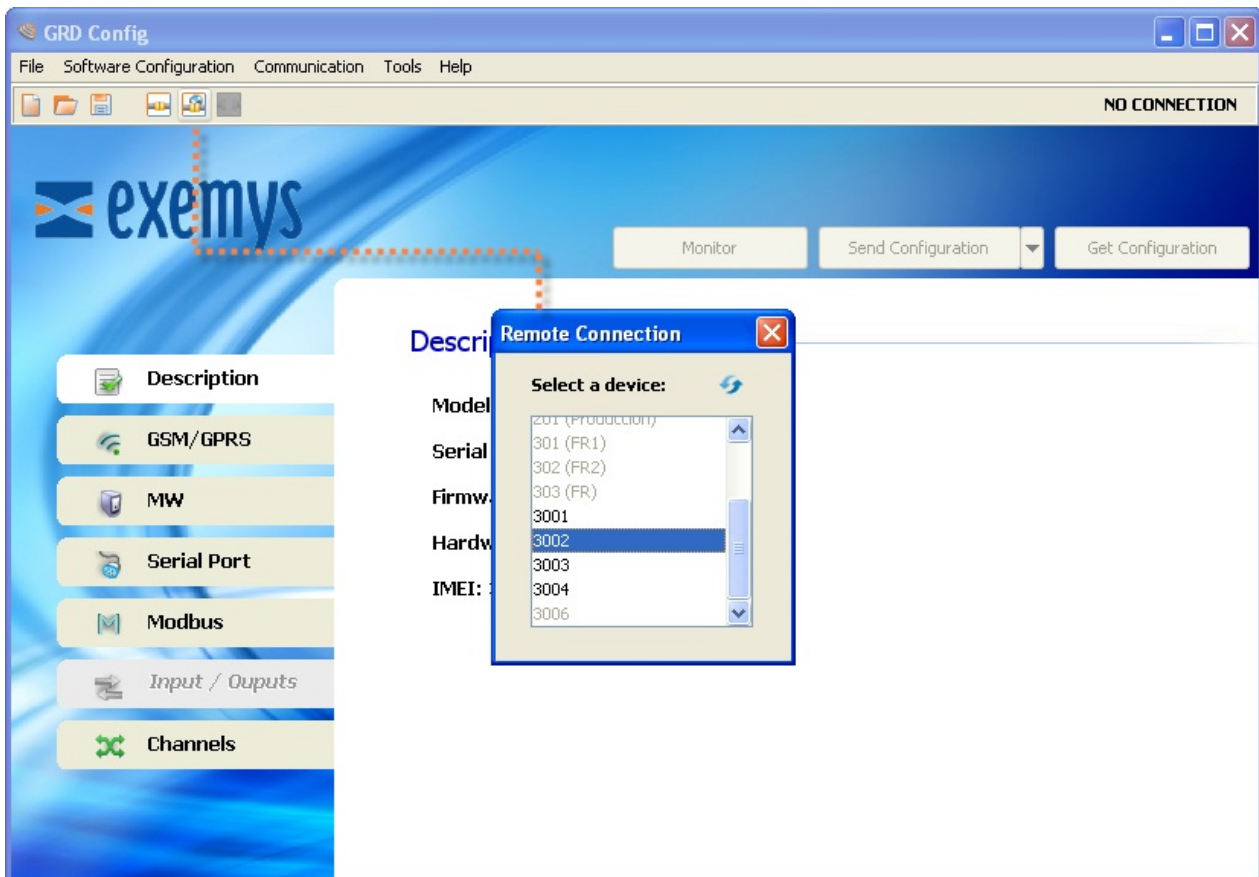
The IP to be loaded is the one the MW is running on, and the port is the one configured to have access to it.

We will now see how to configure these parameters in the MW, entering in *Configuration -> Advanced* and then in the subsection *Remote Configuration*.




### Remote connection

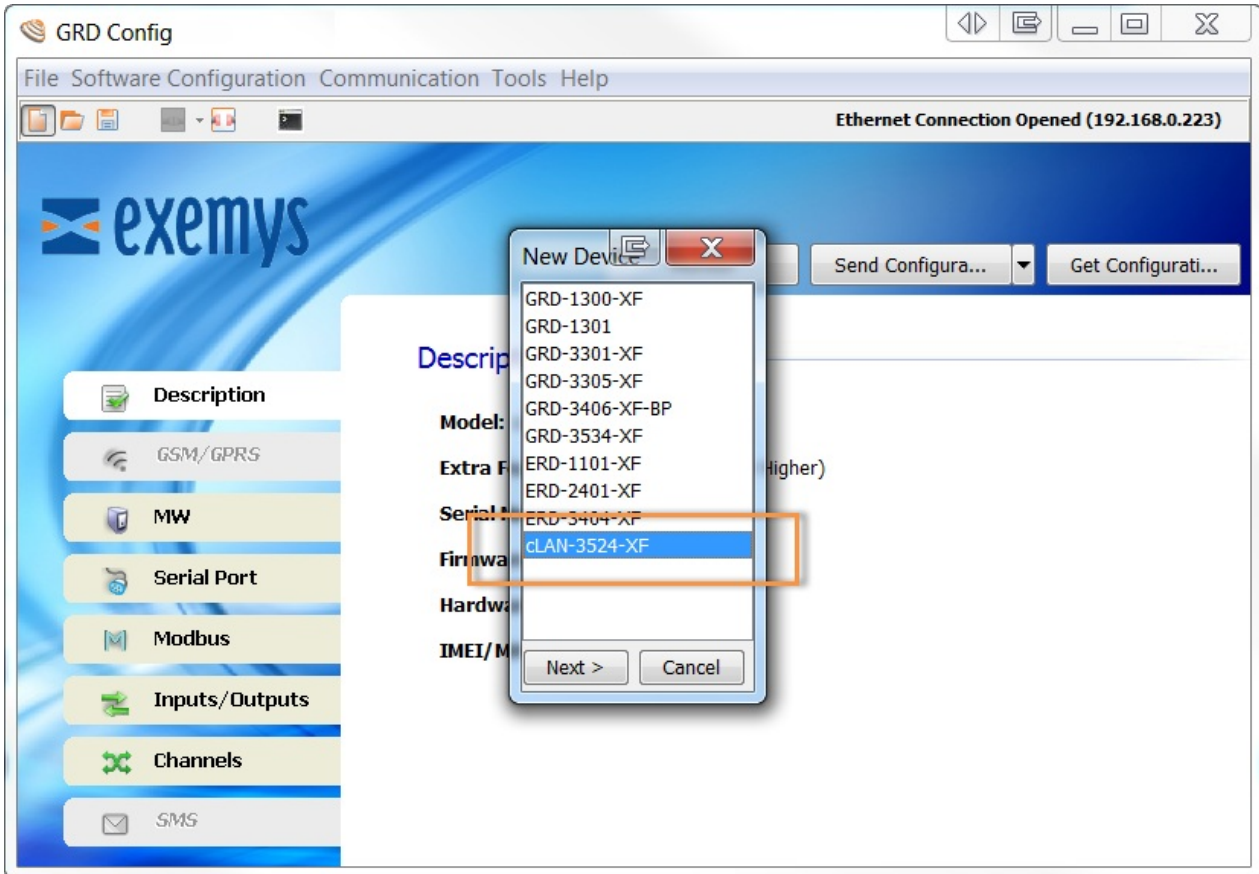
To connect remotely to a cLAN we have to enter in *Communication -> Open Remote Connection* or clicking on the  icon, then a window will be displayed with a list of the GRDs. Those available appear in black and those in grey are not connected to the MW at that moment.




## Saving configurations

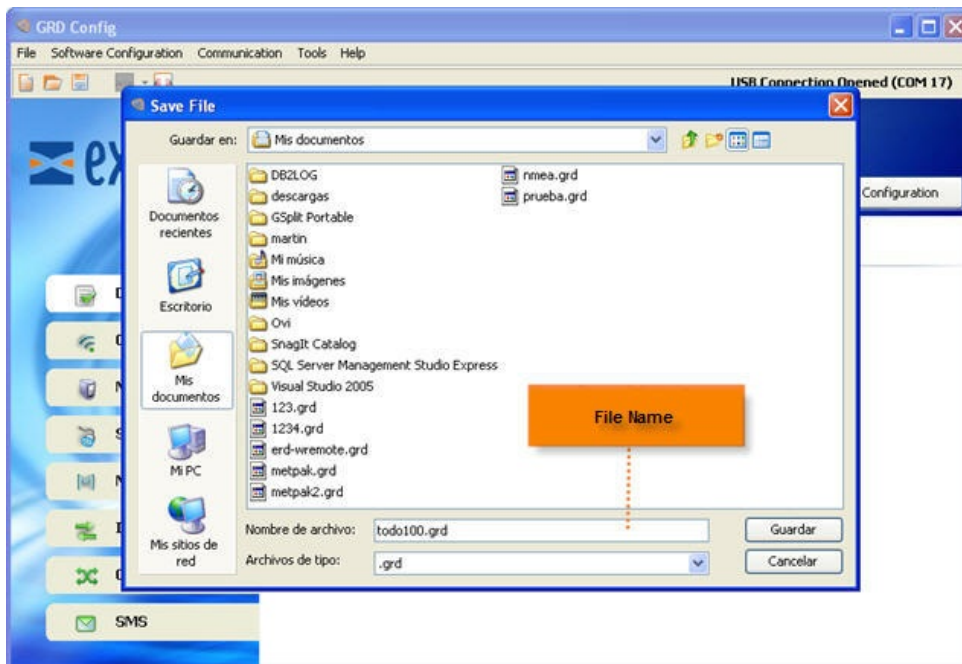
“GRDconfig” allows us to save the cLAN configuration so if we have to configure many equipments the same way, we won’t have to load again the parameters one by one, the only thing to take into account is that the ID number will have to be changed and avoiding to have a duplicate.

To create and save a configuration we don’t need to have a GRD connected, only clicking in “File -> New” or on the  icon a list of the models will be displayed from which we make the selection.



We then configure the parameters with “File -> Save As” or with the  icon to load them later when the GRD is connected.

Once the configuration is saved, we can open it and load to multiple GRDs entering “File -> Open” or with the  icon.



2017-06-07



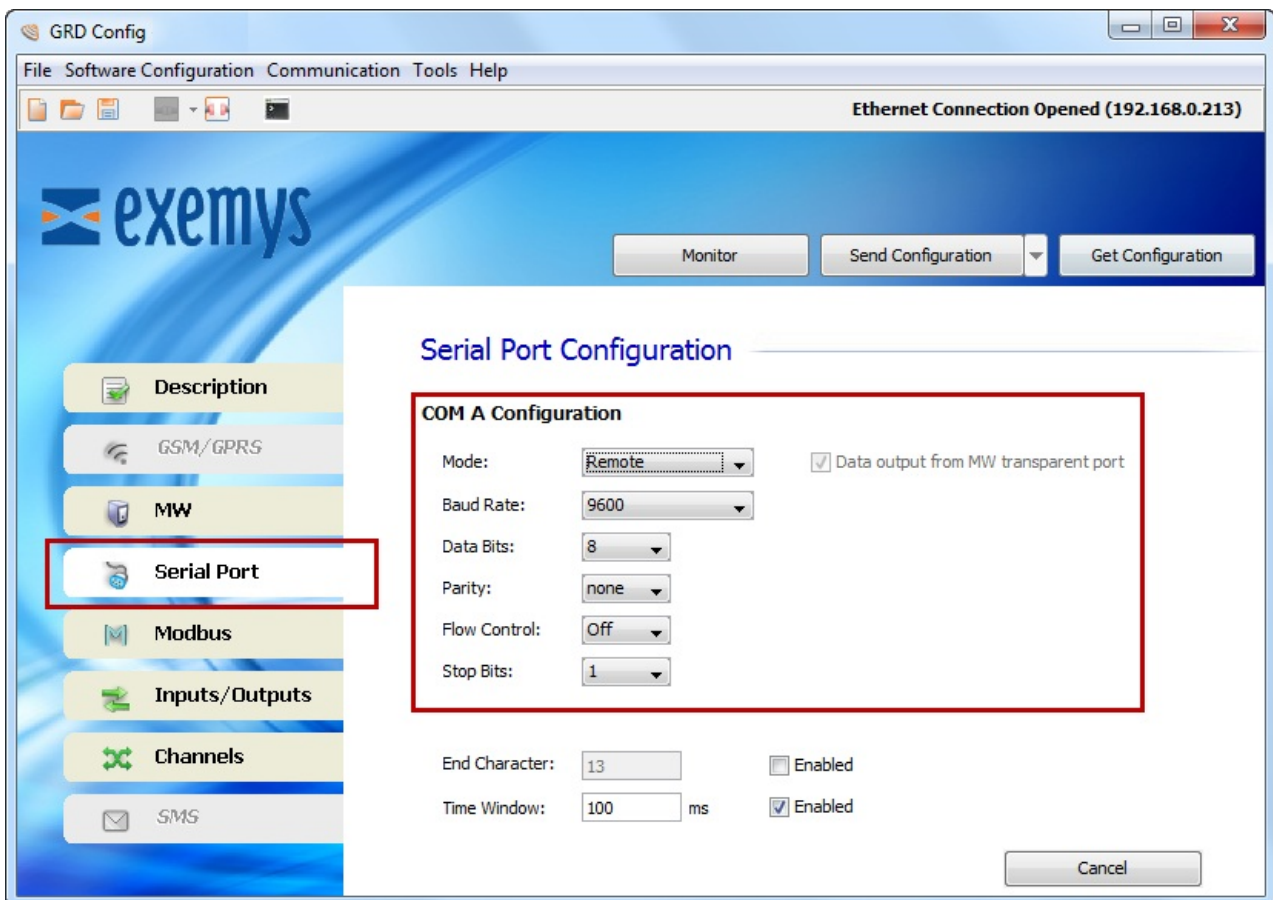


For GRD-3G and cLAN V2+ only

## Serial Port Modes

- "Remote" access using Redirector (Virtual COM port / Transparent)
- "Remote" access in Modbus mode
- Embedded "Modbus Master" (for I/O extension)
- Embedded "Modbus Slave" (to read I/Os from an external Modbus master)
- Data parsing from "Scripts"
- Connection to external "Satellite" modem

## Serial Port Configuration



In GRD with two serial ports you will be able to configure them individually. **Notice that the two serial ports cannot be configured on the same mode.**

**Mode:** Depending on how you are planning to use the GRD/cLAN you will choose one of these modes

- *Remote:* To access the GRD's serial port remotely in Modbus or Transparent Mode
- *Modbus Master:* To use the Embedded Modbus master to expand the I/Os
- *Script:* To parse incoming data or send data from the script (only on devices with script programming support)
- *Modbus Slave:* To use the Embedded Modbus slave to read/write the device channels (Physical, Modbus or script)
- *Satellite:* To connect an external satellite modem

**Data output from MW transparent port :** It allows you to configure which serial port can be reached remotely from the MW. Configuring a serial port will force this option to on.

**Baud Rate:** Serial Port speed (1200, 2400, 4800, 9600, 19200, 38400, 57600, 115200)

**Data bits:** Can be 7 or 8 bits

**Parity:** Error checking (none, even, odd)

**Flow control:** Allows automatic control of communication traffic according to the network availability. It is generally used for massive data transfer to avoid loss of information.

**Stop bits:** Allows to define the number of stop bits.

### Time window and End character

In the "Remote" serial port mode, the device will attempt to group several data before sending the packet through the network; this makes a better use of the bandwidth and reduces communication costs. The implemented criteria for the packet end are the following:

- Time window (0...1000ms): once data are received, the device will wait in silence during this period before sending the packet through the network. These criteria incorporate a delay in the transmission of the communication, so care must be taken depending on the serial communication protocol being used.
- End character (0...255): It is the end character of a serial stream before sending the data.



*If the end character criteria is enabled and the time window is disabled, the device will store the received data for an indefinite time until the configured character is received or the 1000 characters are accumulated.*

If both criteria are used, whichever is the earliest will cause data to be sent.

2017-06-16

## Physical Inputs/Outputs

Depending on the model, the GRD/cLAN can have or not physical inputs/outputs.

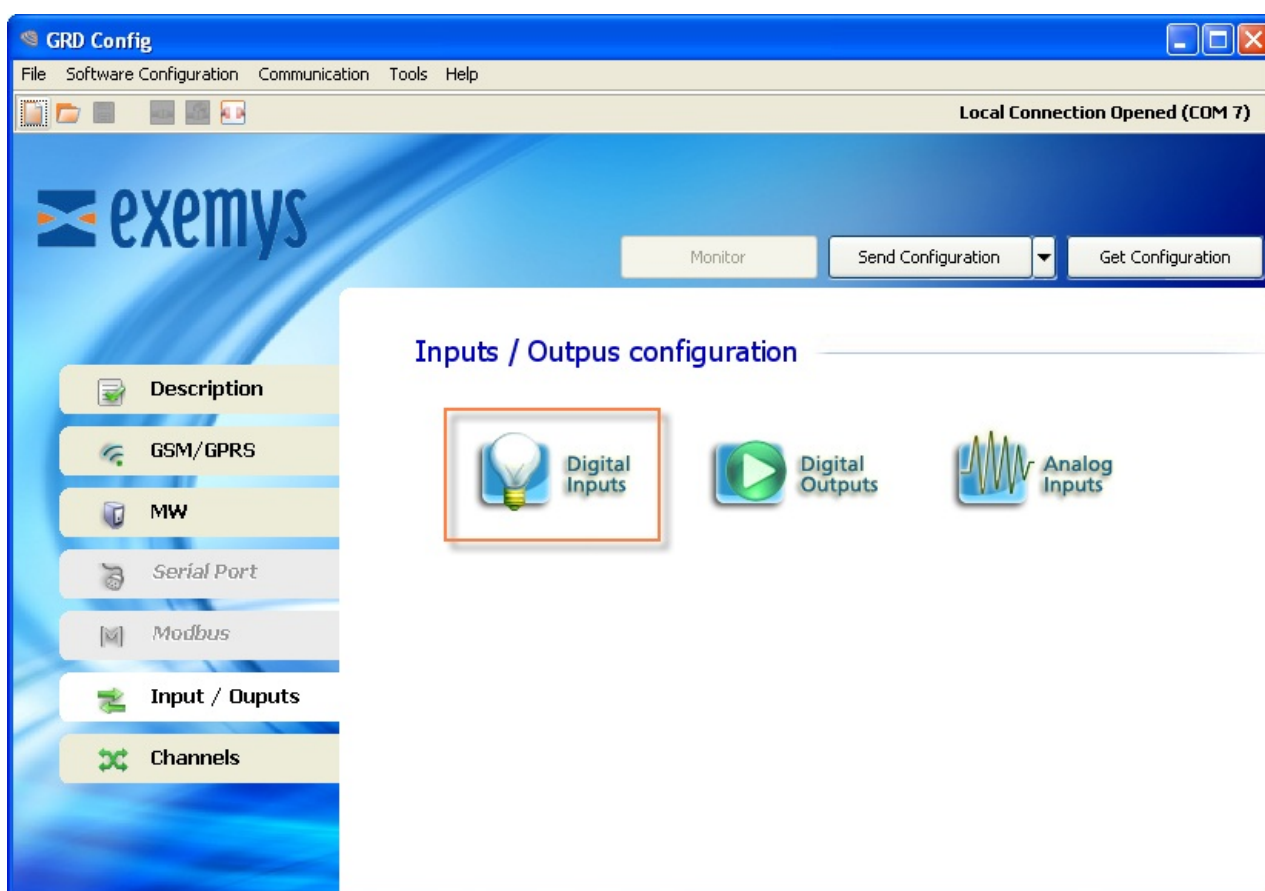
We will now see the types of inputs/outputs that we can have and which parameters we can configure of each one.

It is important to point out that this configuration is applicable only to physical inputs and not to inputs from the Modbus queries.

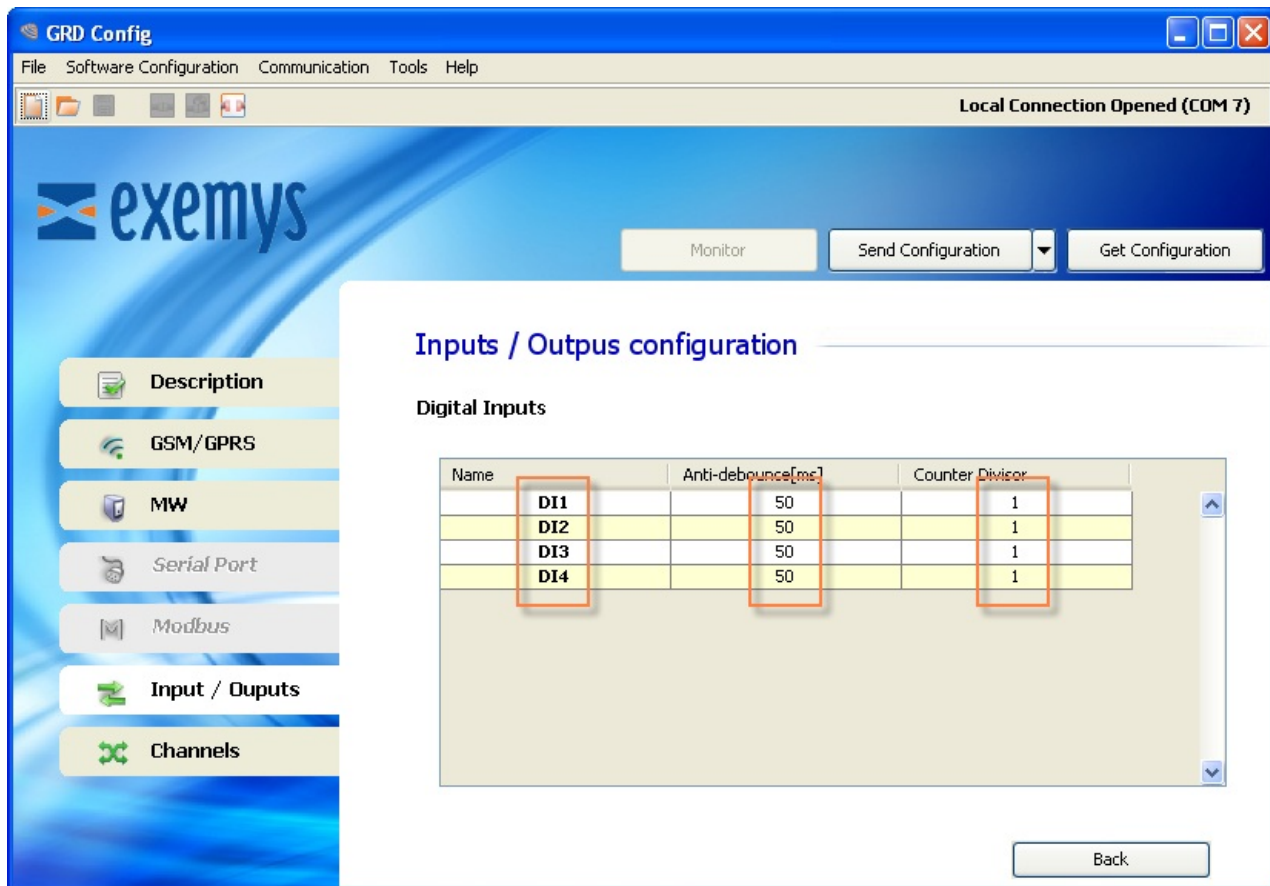
For the configuration of the parameters you will have to enter the "Inputs / Outputs" menu and then select the type of input / output which are:

- Digital inputs
- Digital outputs
- Analog inputs

## Digital inputs



When we enter the configuration of a digital input we will see that we can configure 2 parameters one is the anti-rebound to avoid noise and the counting splitter in case of use as pulse input.

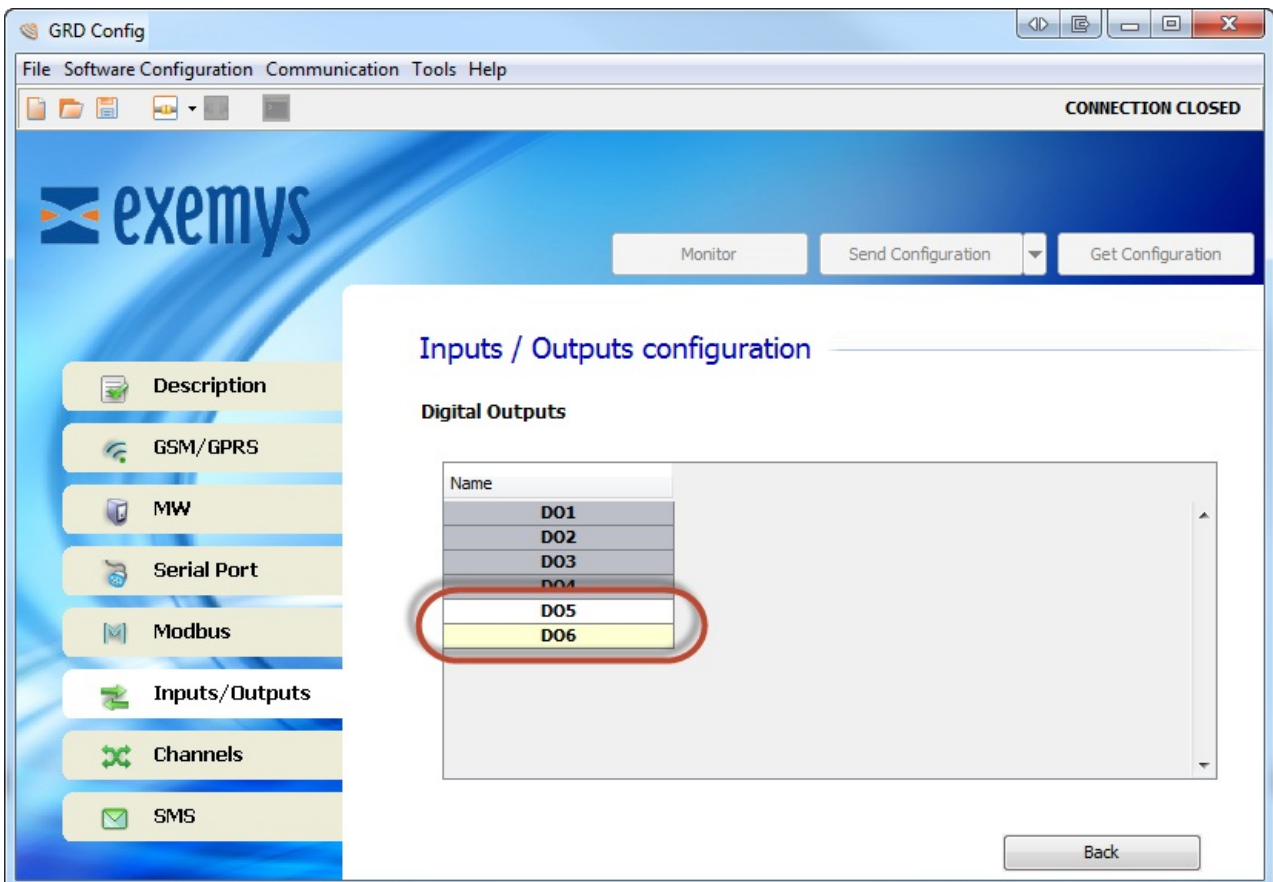
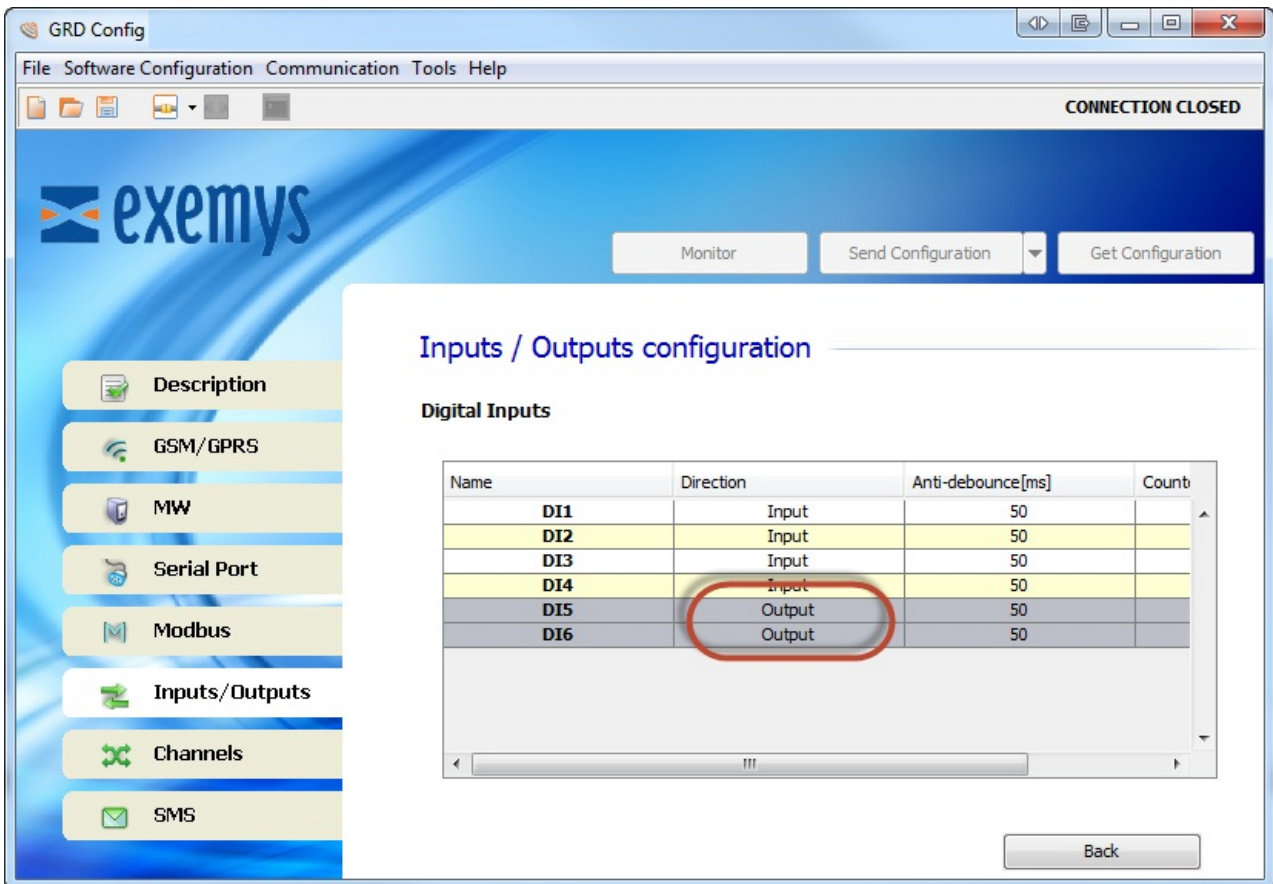


The value of the anti-debounce can be configured between 1 and 250 ms. On devices with more than 8 digital inputs, inputs higher than 8 will have an anti-debounce time fixed at 250 ms.

The counting divisor can take a value between 1 and 1000.

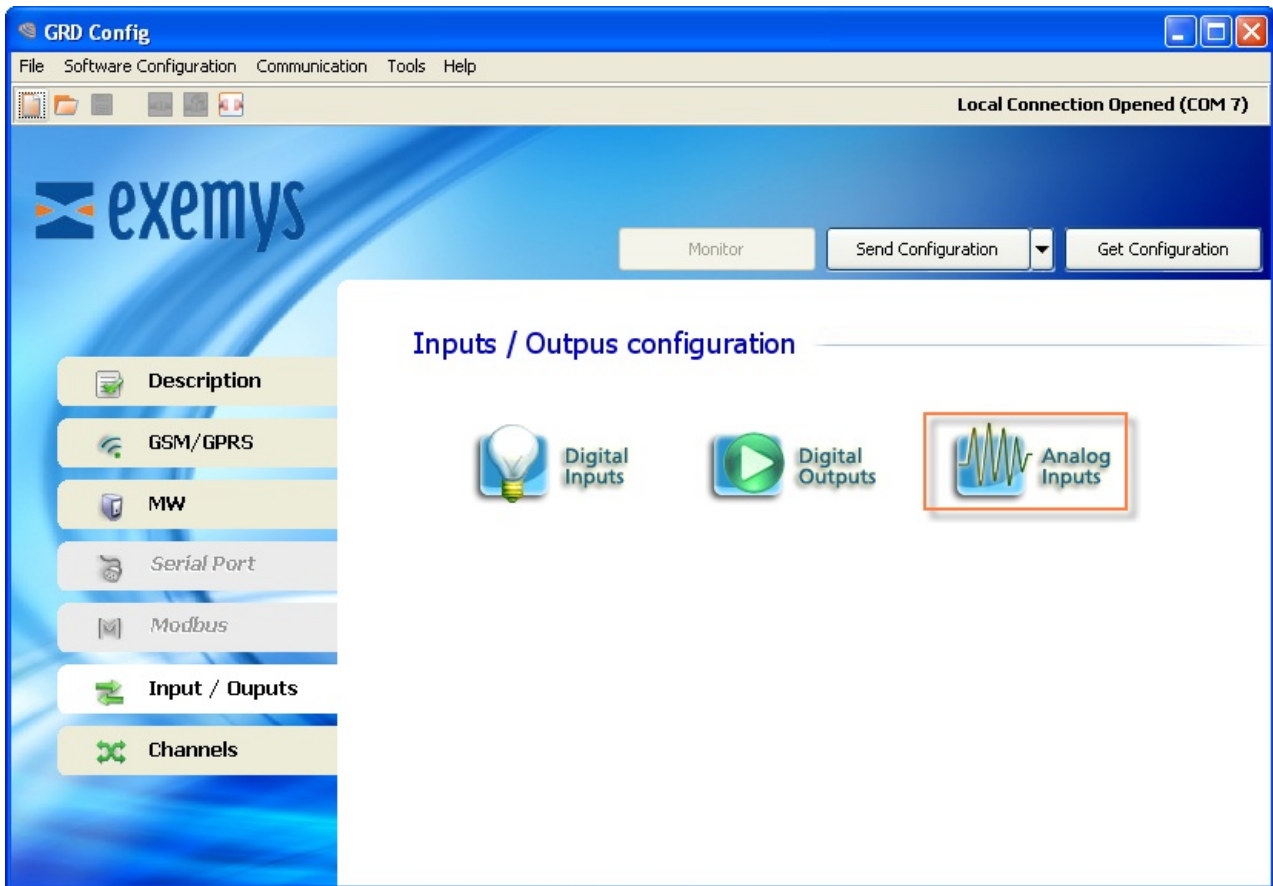
On the cLAN2205-XF, GRD3621-XF-3G and GRD3625-XF-3G you must configure whether a IO terminal will work as an input or as an output

Take special care not to apply direct voltage to a terminal configured as an output and in ON state.

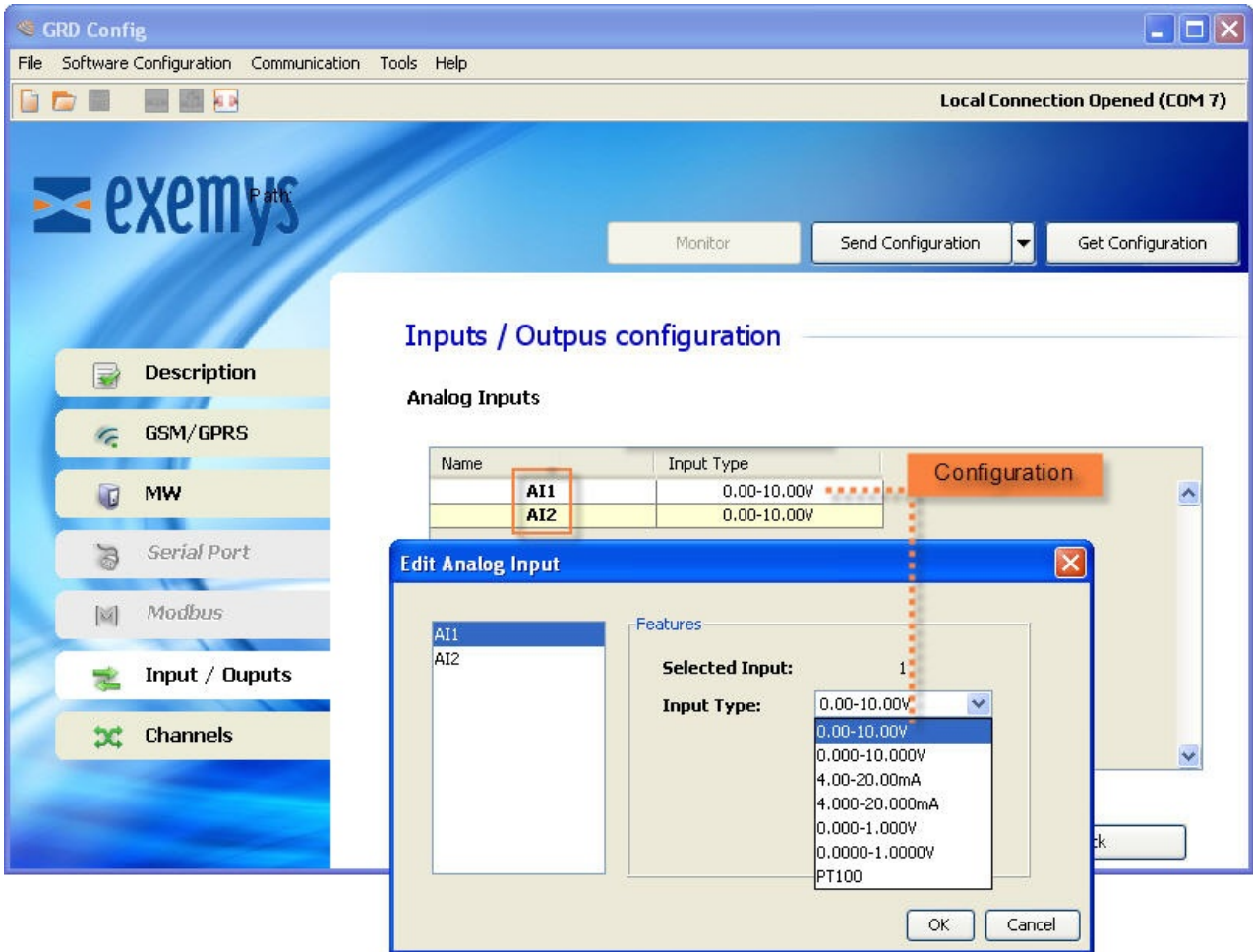



## Analog inputs

In the configuration of analog inputs we can select the operational mode depending on the GRD/cLAN model, this refers to whether we are going to measure voltage or current and its resolution.



The analog inputs can be configured as follows:



 To use AI1 in PT100 mode you must also set internal jumpers on the GRD-3301-XF and the GRD-3621-XF-3G

- **Voltage:**
  - 0 to 1V with 3 decimal digits
  - 0 to 1V with 4 decimal digits
  - 0 to 10V with 2 decimal digits
  - 0 to 10V with 3 decimal digits
- **Current:**
  - 4 to 20mA with 2 decimal digits
  - 4 to 20mA with 3 decimal digits
- **Temperature (PT100, GRD-3621-XF-3G only):**
  - -199 to 849 °C with decimal digit

2019-11-28

## Power supply and inputs / outputs

Below you will find the minimum and maximum admissible values of digital inputs and outputs as well as analog voltage and current inputs, and also cLAN consumption and power supply.

### Power supply

cLAN-1520-XF / cLAN-3524-XF

Parameter	Condition	Minimum	Maximum	Units
Input voltage		10	30	Vdc
Average consumption	@ 24 Vdc		100	mA
	@ 12 Vdc		190	

cLAN-1205-XF / cLAN-2205-XF

Parameter	Condition	Minimum	Maximum	Units
Input voltage		10	30	Vdc
Average consumption	@ 24 Vdc		50	mA
	@ 12 Vdc		80	

cLAN-3404-XF

Parameter	Condition	Minimum	Maximum	Units
Input voltage		10	30	Vdc
Average consumption	@ 24 Vdc		90	mA
	@ 12 Vdc		170	

### Digital inputs

To activate the digital inputs a continuous voltage must be applied externally. This source of power has to share the GND terminal with the power supply of the equipment. If necessary the same power supply that feeds the cLAN can be used. The input is of a Sinking type. It accepts sensor or PNP Sourcing type devices.

cLAN-3524-XF

Parameter	Minimum	Maximum	Units

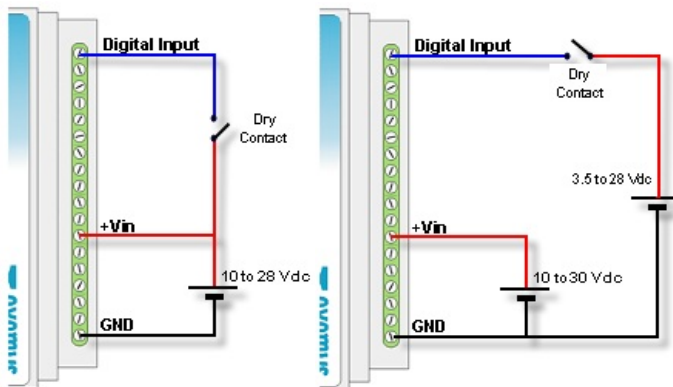


<b>Activated input</b>	3.5	25	Vdc
<b>Input impedance</b>	2		KΩ
<b>Count frequency</b>	0	1	Khz

cLAN-2205-XF

Parameter	Minimum	Maximum	Units
<b>Activated input</b>	7	50	Vdc
<b>Input impedance</b>	280		KΩ
<b>Count frequency</b>		45	Hz

We now show two examples of how to connect an input, directly from the same source feeding the equipment and from an external source where we can clearly see that they must share the common Terminal.



**Digital outputs**

Digital outputs are of the open collector type. The load to be connected must be fed with an external power supply and they have to share the GND Terminal with the equipment power supply. If necessary, the same power supply used to feed the equipment can be used.

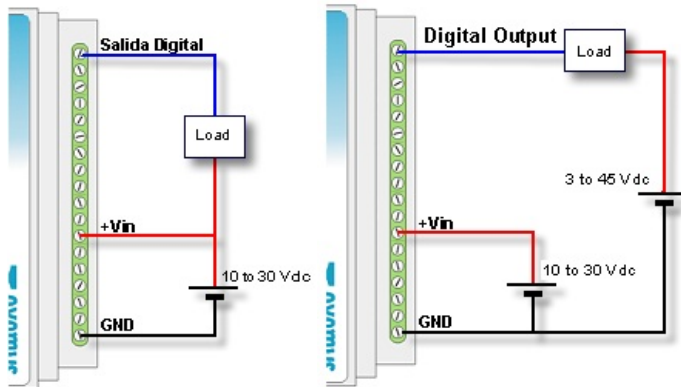
The output type is NPN Sourcing type (Open collector).

cLAN-3524-XF

Parameter	Maximum	Units
<b>Withstand voltage</b>	45	Vdc
<b>Current</b>	50	mA

cLAN-2205-XF

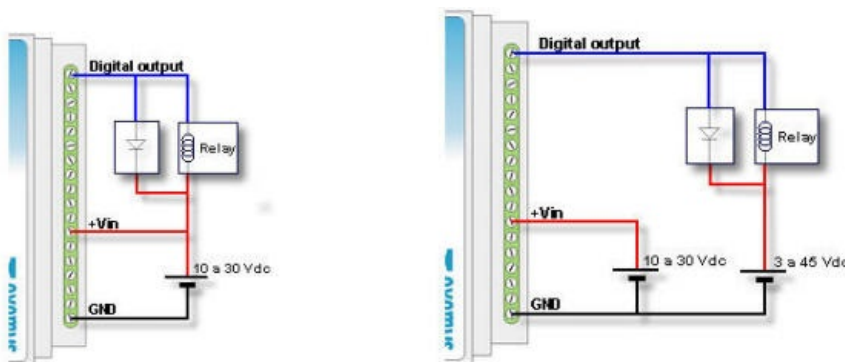
Parameter	Maximum	Units
Withstand voltage	50	Vdc
Current	200	mA



**Digital outputs to actuate a Relay**

When the digital output is used to actuate a relay coil a protection diode must be added to the connection to avoid damage to the output of the equipment. This must be connected in reverse, that is the anode to the output terminal of the equipment and the cathode to the positive terminal feeding the relay. The relay must be fed using an external power supply, sharing the GND terminal with the power supply of the equipment, or if necessary the same power supply feeding the cLAN can be used.

The following graph shows how to connect a relay to a digital output of the equipment.



**Analog Inputs**

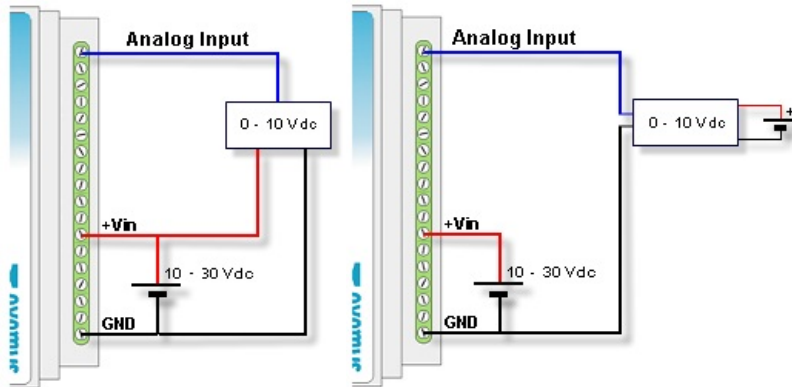
cLAN-3424-XF Analog inputs refer to the GND Terminal of the equipment, consequently, the power supply used to feed the sensor must share the GND terminal with the equipment.

**cLAN-3524-XF - Voltage inputs (0-10V / 0-1V)**

Parameter	Value	Units

<b>Full scale</b>	10 / 1	Vdc
<b>Resolution</b>	1 / 0.1	mV
<b>Input impedance</b>	11.4	KΩ

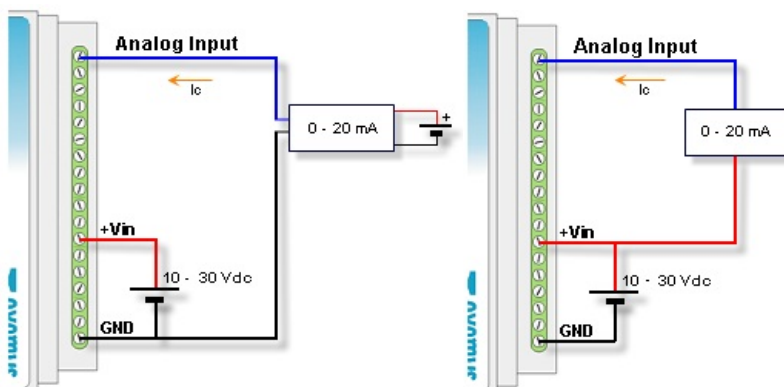
The following two examples show how to connect and analog voltage input for a single power supply or for independent power supplies.



**cLAN-3524-XF - Current inputs (4-20mA)**

Parameter	Value	Units
<b>Full scale</b>	20	mA
<b>Resolution</b>	10 / 1	uA
<b>Shunt resistance</b>	100	Ω

The following two examples show the connection of a 4 – 20 mA sensor sharing the power supply with the equipment for passive sensors or for active sensors with independent power supply.

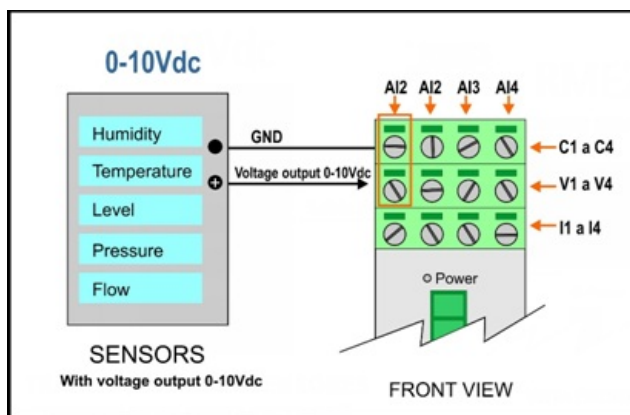


**cLAN-3404-XF - Voltage inputs (0-10V / 0-1V)**

Parameter	Value	Units
Full scale	10 / 1	Vdc
Resolution	1 / 0.1	mV
Input impedance	>600	KΩ

Analog inputs are diferential (two terminals per input)

Sensors with voltage output (0-10V) can be connected to the device as shown in the following figure.

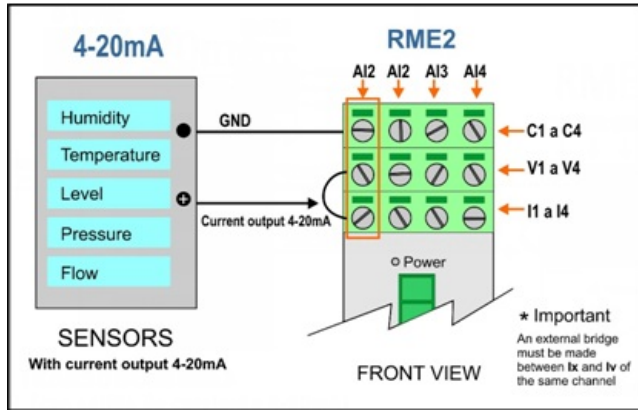


**cLAN-3524-XF - Current inputs (4-20mA)**

Parameter	Value	Units
Full scale	20	mA
Resolution	10 / 1	uA
Shunt resistance	62	Ω

Analog inputs are diferential (two terminals per input)

In this case, sensors with current loop output (4-20mA) can be connected to the device as shown in the following figure.



2020-08-10



For GRD-3G and cLAN V2+ only

## Embedded Modbus master (Input/Output extension)

Depending on the GRD/cLAN model, it can have an internal Modbus master, which will allow you to increase the number of inputs/outputs of the device. We will now see the configuration and utilization.

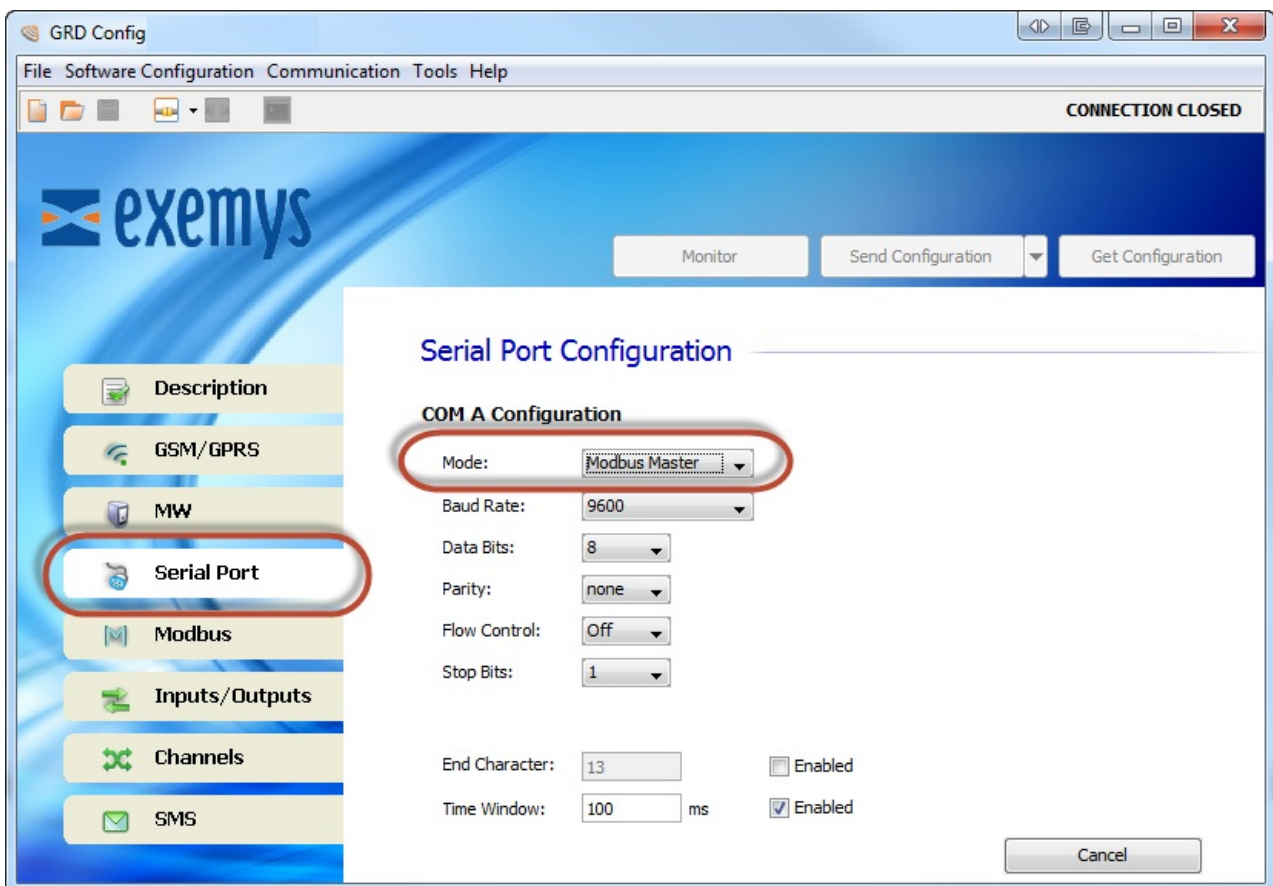
This master will let you load a maximum of 100 Modbus queries to which will be able to configure certain parameters. Each one of the queries can be mapped as an input/output channel, and be able to configure the generation of Historicals and reports.

In “GRD Config” you will find a tab called “Modbus” where you can configure the general characteristics of the Modbus master and Queries.

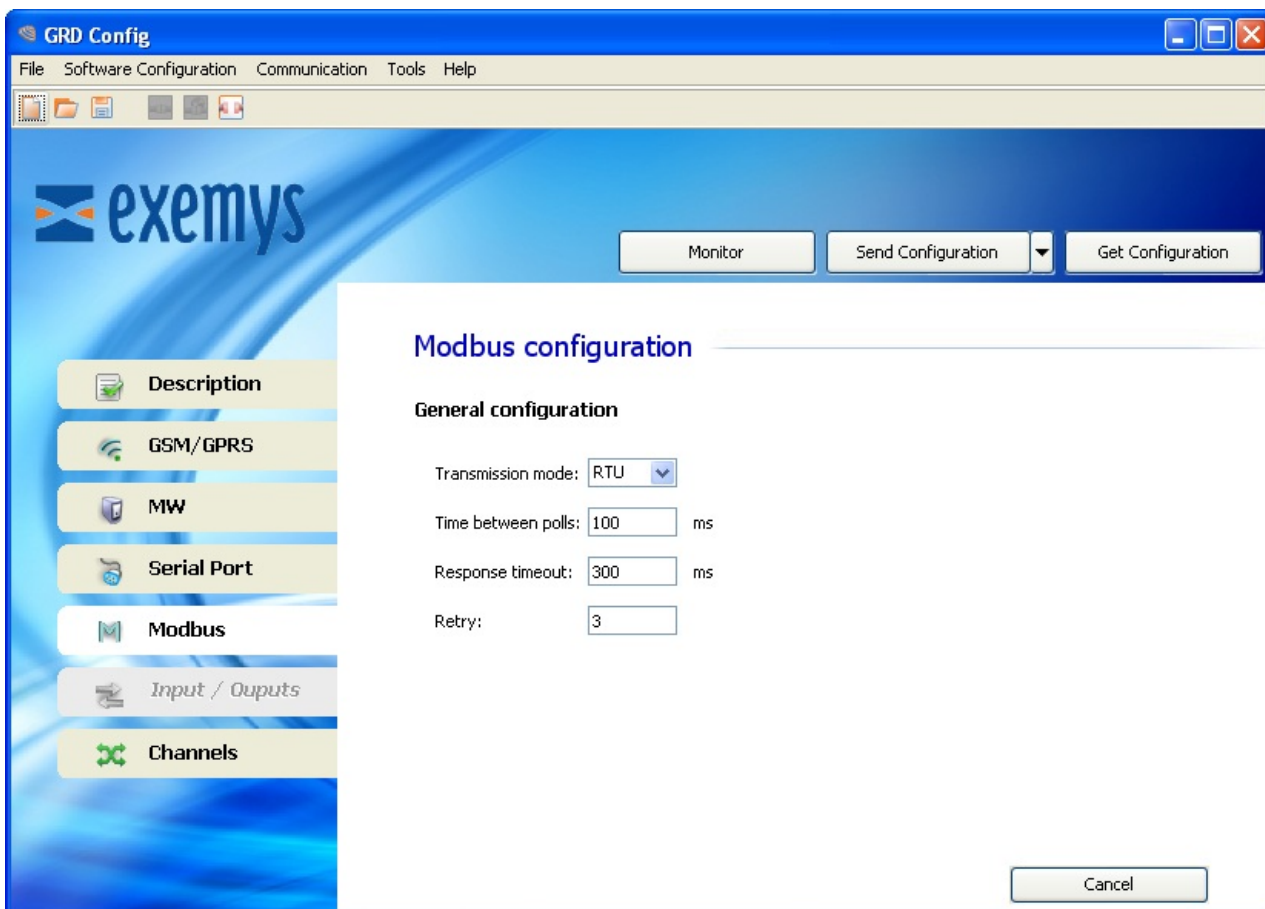
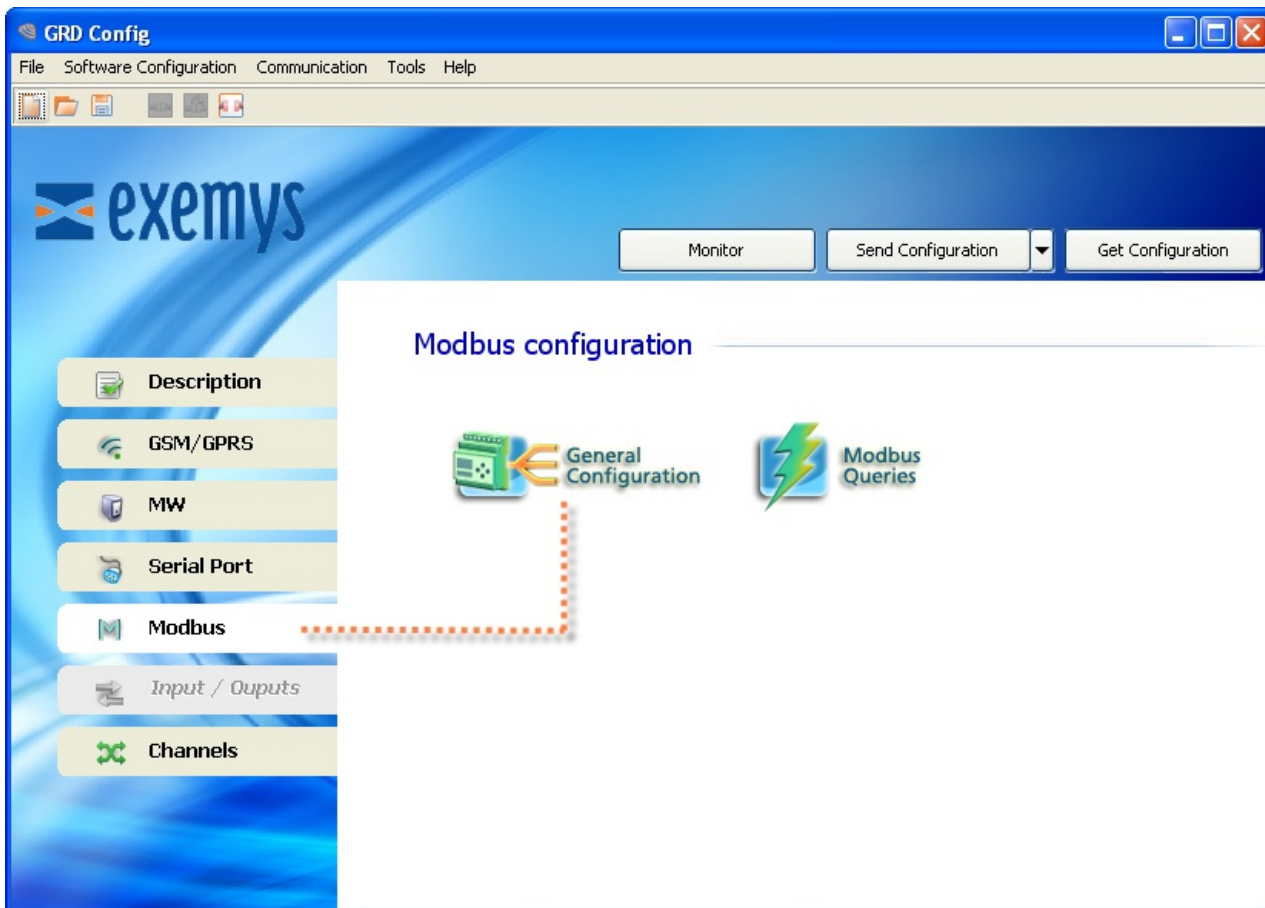
**To use the Modbus master set the serial port in "Modbus Master" mode**

## Configuration of the Modbus master

Configure one serial port in "Modbus Master" mode



Inside the “Modbus” tab enter the “General Configuration” menu, where you can configure the Modbus master.



**Transmission mode**

It refers to the Modbus protocol to be used, being RTU or ASCII.

### Time between polls

This is the time the equipment will wait before sending a query after having received the response to another query.

### Timeout

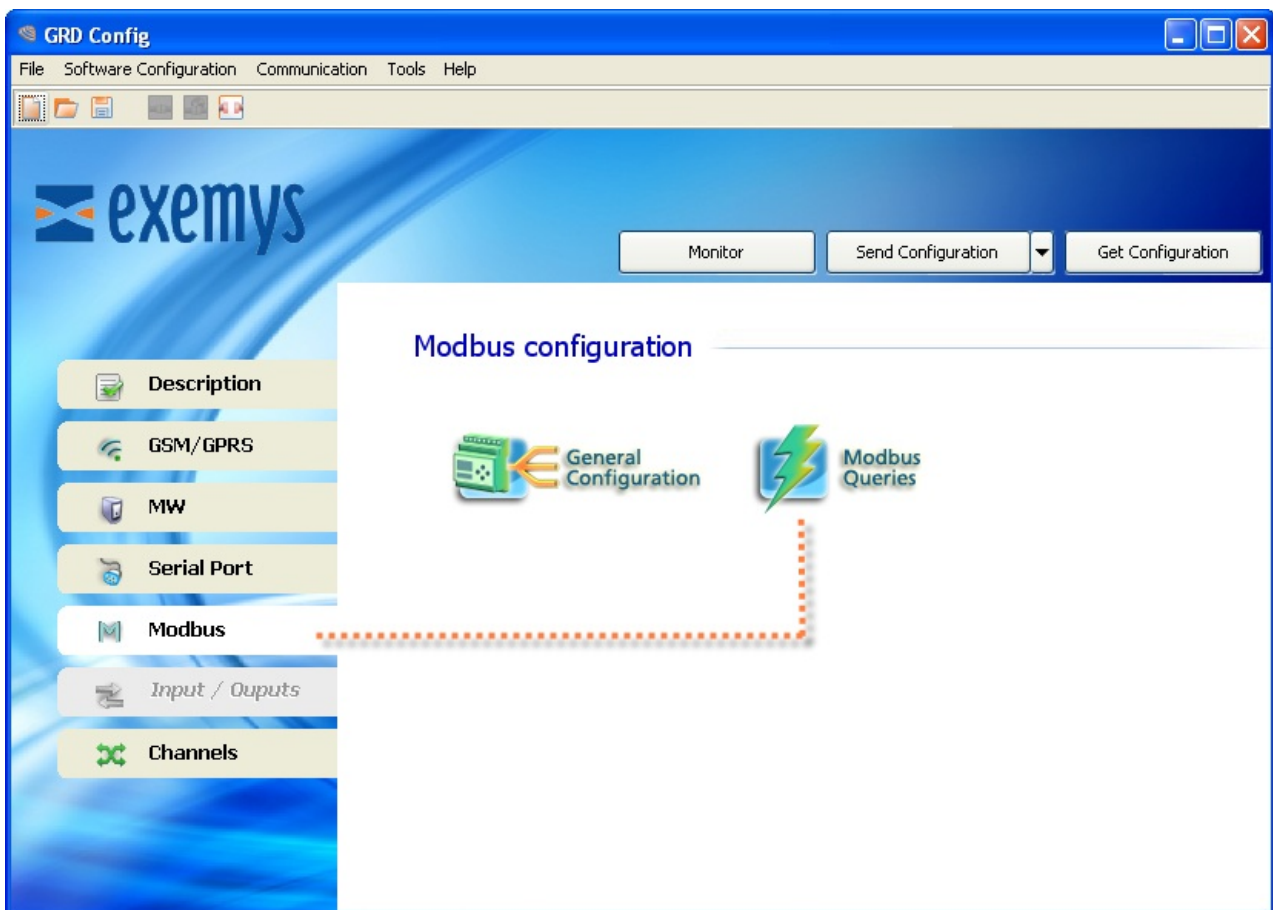
This is the time the GRD/cLAN waits for the arrival of a response from the slave.

### Retry

The retries are the number of times that the master will send the query if we don't have a valid response, before considering the value of the query as 0, while the quantity of retries is not met, the master will maintain the previous value.

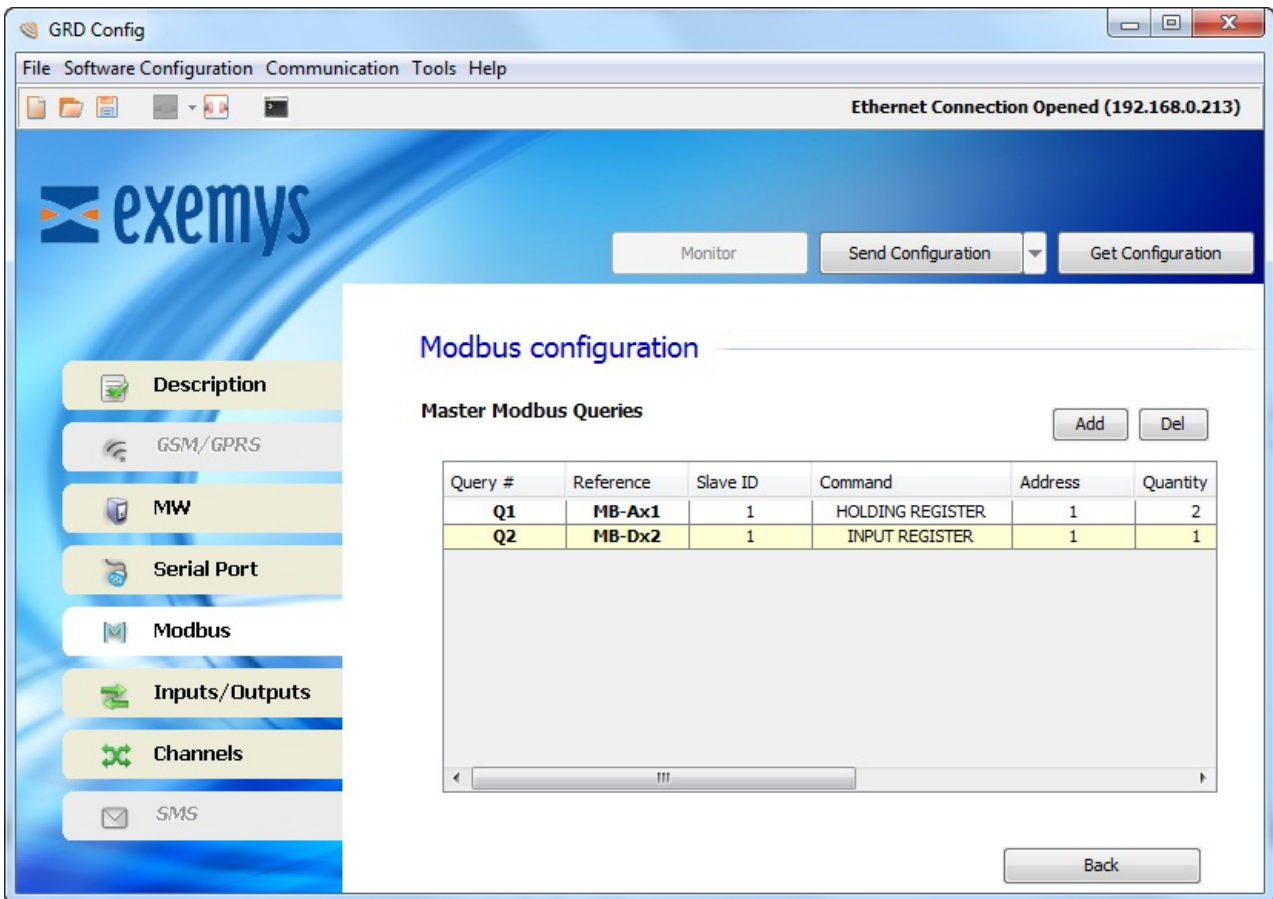
## Configuration of the Modbus queries

Once the master is configured we can add the desired queries entering the “Modbus Queries” menu and inside “Modbus”.

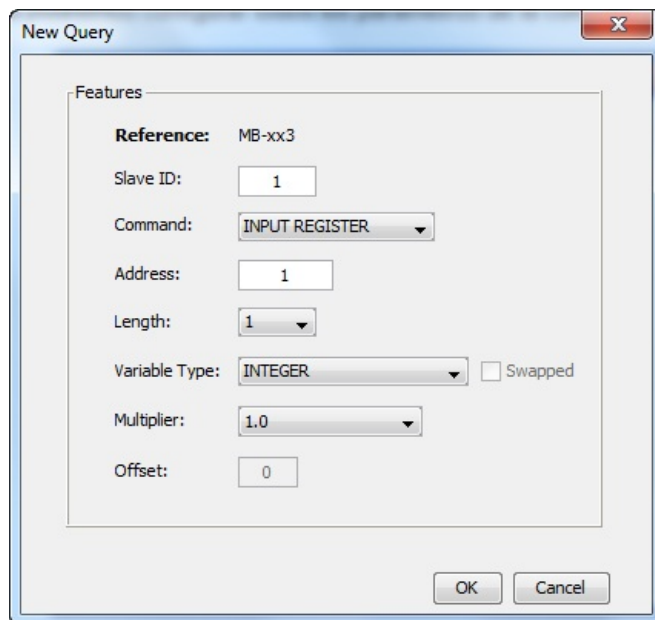


Inside the “Modbus Queries” a list will show us all the added queries and their parameters, which we will be able to modify. To add a query we click on “Add” or “Del” to erase it.





If we click on “Add” a screen will be displayed in which we will be able to configure all the parameters of the query



**Slave ID**

It is the address of the slave we wish to query.

**Command**

Here we can configure the type of register to be queried:

- **INPUT REGISTER**

- **INPUT STATUS**
- **HOLDING REGISTER**
- **INPUT REGISTER**

**Address**

In this parameter we load the address of the query, the value can be between 1 – 65536.

**Length**

With this parameter we will be able to define the number of registers we want to query, this length can be 1 or 2 according to the type of query.

If the query is of the “Input Status” or “Coil Status” type, the length will necessarily be 1, that is, no modification will be allowed.

If the query is of the “Input Register” or “Holding Register” type, the length can be 1 or 2, implying that as a result of the query we will have 16 or 32 bits respectively.

**Variable Type**

This parameter is very important since it defines how the GRD/cLAN is going to store data received from a query. The types of variable that we will select depend on the type of queried register and its length.

The types are:

- **BIT**
- **BIT WORD**
- **INTEGER**
- **INTEGER SIGNED**
- **INTEGER 32 BIT SIGNED** (Address 40001 will get registers 40002:40001)
- **FLOAT 32 BITS** (Address 40001 will get registers 40002:40001)
- **INTEGER 64 BITS** (Address 40001 will get registers 40004:40001)
- **FLOAT 64 BITS** (Address 40001 will get registers 40004:40001)

**Swapped**

Registers will be ordered in a different way in queries with register length greater than one.

- **INTEGER 32 BIT SIGNED** (Address 40001 will get registers 40001:40002)
- **FLOAT 32 BITS** (Address 40001 will get registers 40001:40002)
- **INTEGER 64 BITS** (Address 40001 will get registers 40001:40004)
- **FLOAT 64 BITS** (Address 40001 will get registers 40001:40004)

**Offset**

The offset can only be selected when we define the type of variable as “BIT WORD” this means that from a Modbus query that returns 16 bits we can keep the result of 1 bit. The value of this parameter goes from 0 to 15, being 0 the LSB and 15 the MSB.

**Types of queries**

We will now see the types of queries we can create and according to its parameters to which channel we will be able to add them.

Register type	Length	Data type	Offset	Channel
Input Status	1	BIT	-	I or O

Coil Status	1	BIT	-	I or O
Holding Register	1	BIT WORD	0 to 15	I or O
		INTEGER	-	AN or PI
		INTEGER SIGNED	-	AN or PI
	2	INTEGER 32 BITS SIGNED	-	AN or PI
		FLOAT 32 BITS	-	AN or PI
	4	INTEGER 64 BITS		
FLOAT 64 BITS		-	AN or PI	
Input Register	1	BIT WORD	0 to 15	I or O
		INTEGER	-	AN or PI
		INTEGER SIGNED	-	AN or PI
	2	INTEGER 32 BITS SIGNED	-	AN or PI
		FLOAT 32 BITS	-	AN or PI
	4	INTEGER 64 BITS		
		FLOAT 64 BITS	-	AN or PI

2017-06-12

## Channels

Channels are the media through which information about inputs/outputs of the MW equipment are sent or received.

These channels can be linked to physical entry points of the equipment like MODBUS queries according to their compatibility with the channel.

The GRD/cLAN have 4 types of channels::

- Digital inputs channels
- Digital outputs channels
- Analog inputs channels
- Pulse inputs channels

The most common option is to link them in the following manner:

Channel	Input/Output
I1..n	DI1..n
O1..n	DO1..n
AN1..n	AI1..n
PI1..n	DI1..n

Where:

**Ix:** is a digital input channel.

**DIx:** is a physical digital input.

**Ox:** is a digital output channel.

**DOx:** is a physical digital output.

**ANx:** is an analog input channel.

**AIx:** is a physical analog input.

**PIx:** is a pulse input channel

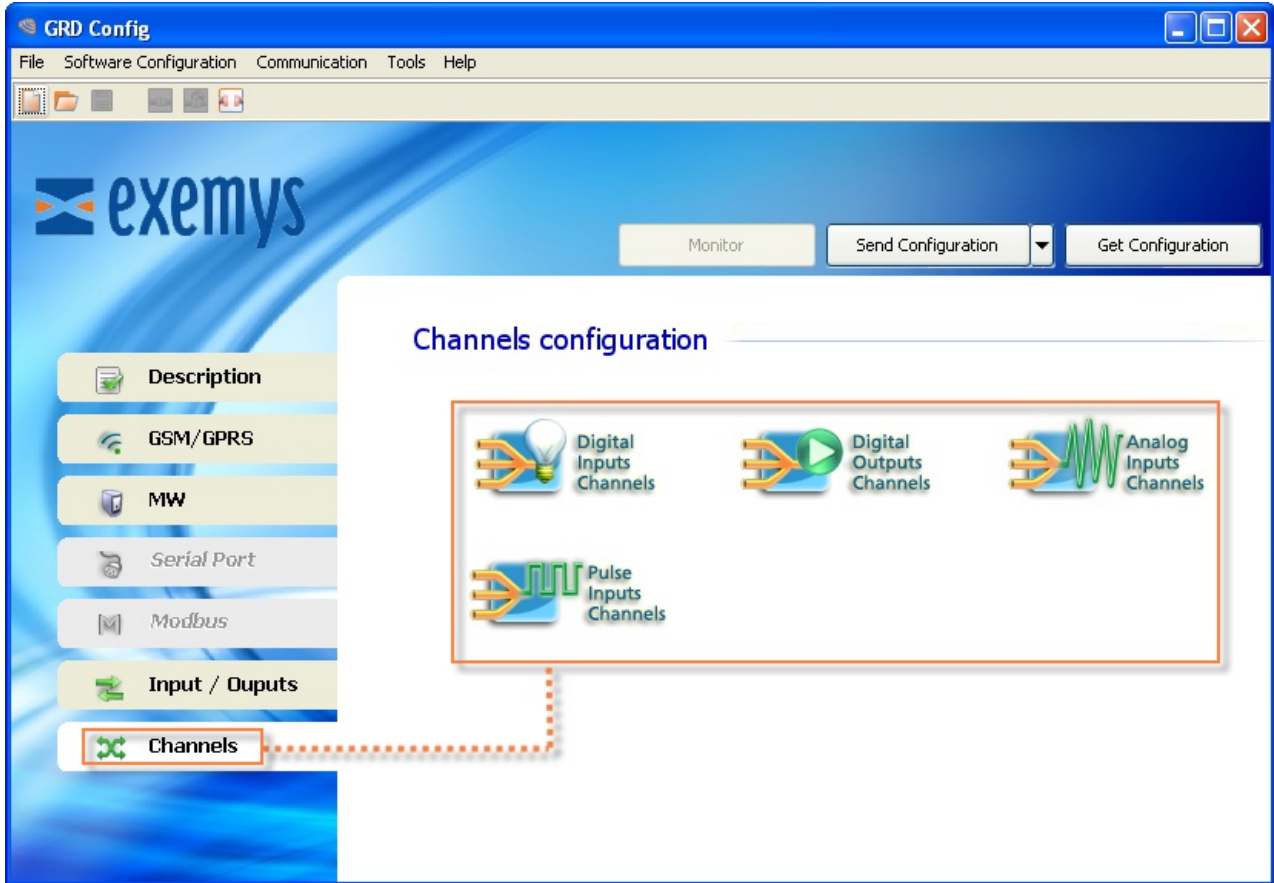
Beyond the most common way to link the channels like the previous example, it can be done in a disordered manner or repeating them. This means that you could create a channel I5 linked with the DI13 input and a channel I6 that is also linked to the DI13 input.

On GRD/cLAN with serial port, I/O channels can be linked to Modbus queries if you use the embedded Modbus master feature. If you do it, the queries will be shown on the "source" combo box (MB-DIx, MB-DOx, MB-AIx or MB-PIx)

On GRD/cLAN with script programming support you can link script variables to any channel. The channel will take variable value to send reports and when creating historical records. You can also change the variable channel remotely if you link it with a digital output channel.

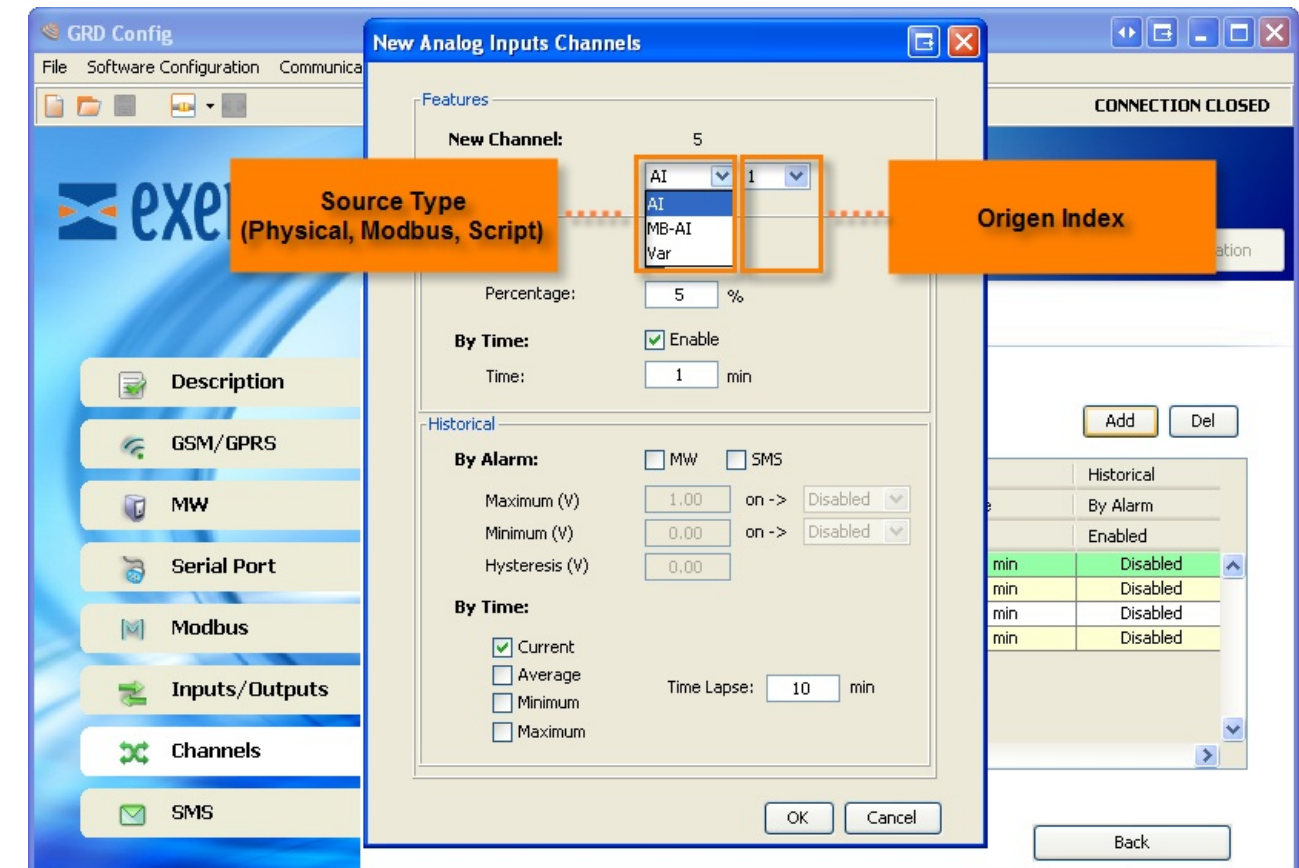
## Adding Channels

To add channels in the "Configurator" you must enter the menu "Channels -> Type of desired channel".



After selecting the desired channel and among any of the 4 you'll have the option to add or remove, it is important to point out that within each channel only inputs and outputs compatible with that channel will appear.

You will now see an example of how to add a digital input channel.



To erase a channel you only have to click on the “Del” button of the channel previously selected.



The signal level can be configured as analog channel source in GRD-2G with firmware 4.0.0 or higher.

This feature is available in all GRD-3G

2017-08-18



For GRD-3G and cLAN V2.0+ only

## Reports and Historical records

There are 2 types of information that the GRD/cLAN can send. On one side, we have the reports that contain the real values of inputs and outputs updated according to the criteria configured in the device. We can select the values we want to have updated and under which conditions and only when there is a connection with the MW. On the other hand, and independently, we have the Historicals, which are made of registers of events and time (logs) that are stored in the GRD and are sent to the MW. If there is no connection the registers remain in the equipment until they are recovered.

Historicals and reports are configured on the channels.

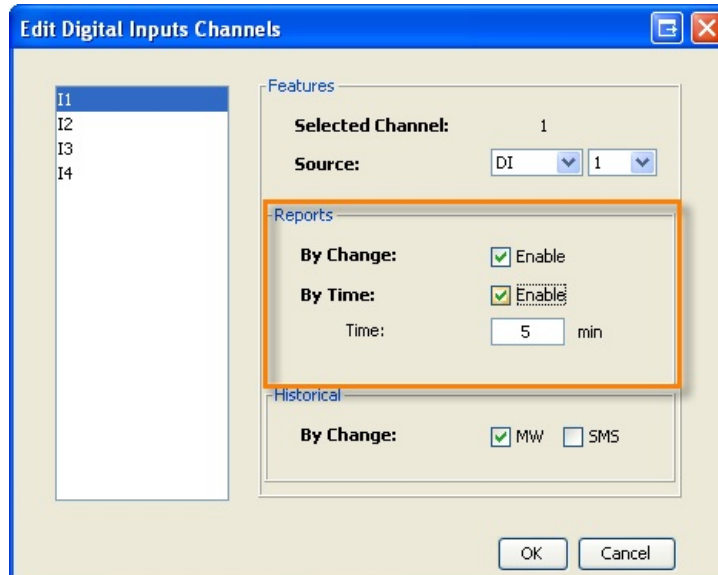
### Reports

We will now see the types of reports and how to configure them. The reports are configured individually in each channel, to access the report configuration screen go to the Configurator, the “Channels” menu and here select the type of channel and channel number by double clicking on it. A configuration screen will be displayed where you have the available configurations for that channel.

It is important to be aware that when the GRD loses connection with the MW and recovers it or is the first time it is connected, it sends a message with all configured reports.

#### Digital inputs channels reports:

The following figure shows the configuration screen of the digital inputs reports:



#### Report by change

If a report by change of a digital input channel is enabled, a change of value will generate a message that will be sent to the MW. This way, only the events of interest at the moment they occur, are reported, if one of the inputs with a disabled report changes value it will not be reported.

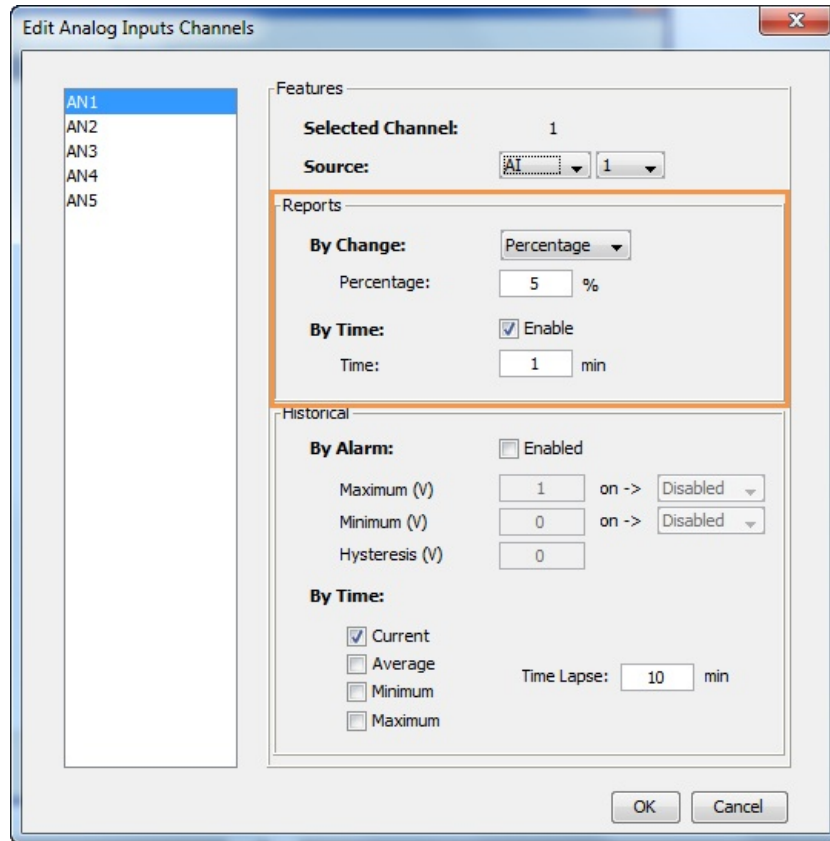
#### Report by time

It defines the time in minutes which determines how often a report message is generated. Let's suppose that we are interested in updating an input channel every five minutes independently of the changes that occur, the only thing we need to do is to enable the report by time and configure in 5 minutes, this will

force the report message that will update the input value in the MW every 5 minutes.

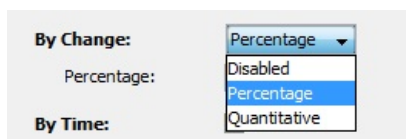
**Analog inputs channels reports:**

The following screen shows the configuration screen of the analog inputs report. The analog inputs have 2 types of reports, on one side reports by percentage change and the other one temporary report.



**Report by change**

The report by change is enabled in the channels we want to be updated in the MW every time that the signal changes



The "percentage" report will report if the input changes a percentage from full scale. The full scale value will depend on the input type.

The "quantitative" report will report if the input changes a configured absolute value. .

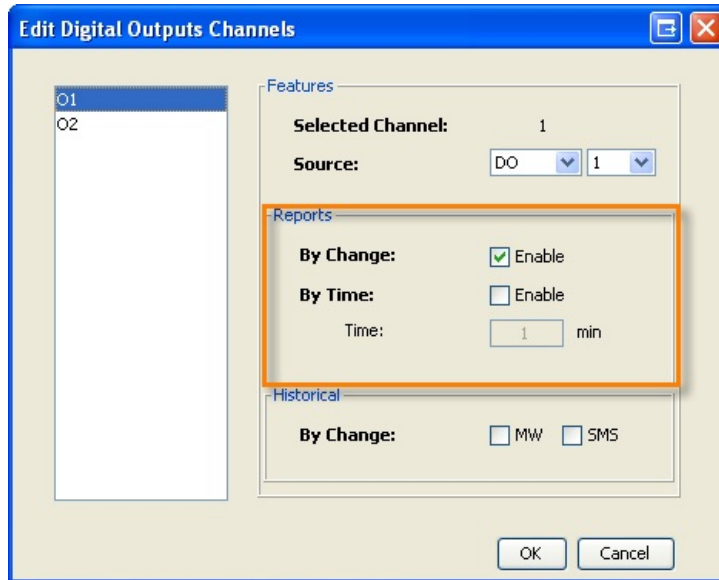
**Report by time**

It defines a time in minutes which determines how often a report message is generated.

**Digital outputs channels reports:**

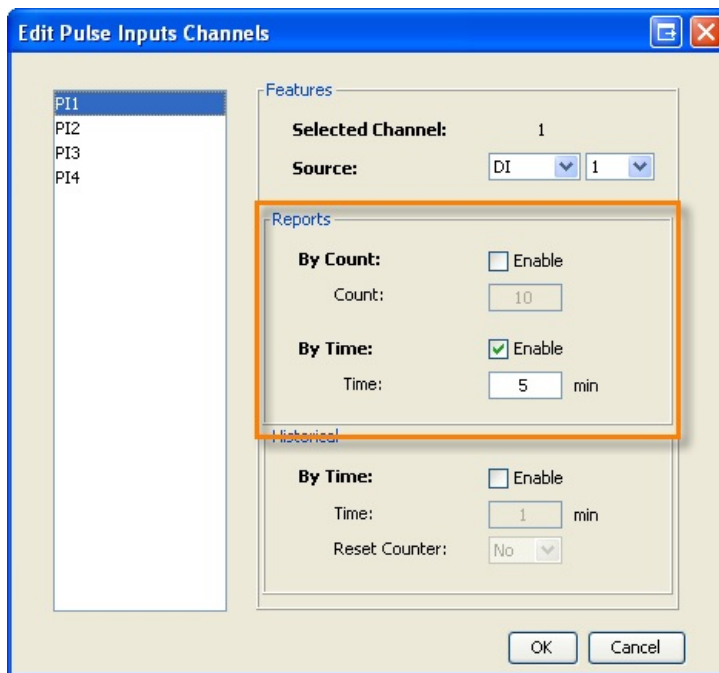
In this case we only count on a temporary report, the change report is always enabled, this means that when a change occurs in one of the outputs, it will be immediately reported. The purpose of having the change report permanently enabled, is because the report can be used as verification of a remote activation.





**Pulse inputs channels reports:**

The pulse channels have 2 types of reports. On one side the reports by performed count and on the other the temporary report.



**Report by count**

In the counts number report the device sends a message to the MW each time the desired input counts a number of pulses from the last report of this channel, by counts or by time.

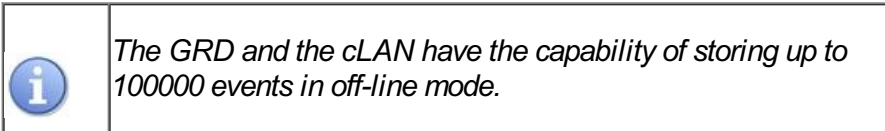
**Report by time**

It defines time in minutes which determines how often a report message is generated.

**Historical records**

Historicals allow the device to store the events as changes in inputs or outputs being either on-line or off-line and then transmit them to the MW for further visualization and analysis. These Historicals will let you know the value and number, of an input or an output that has been modified and the date and time the

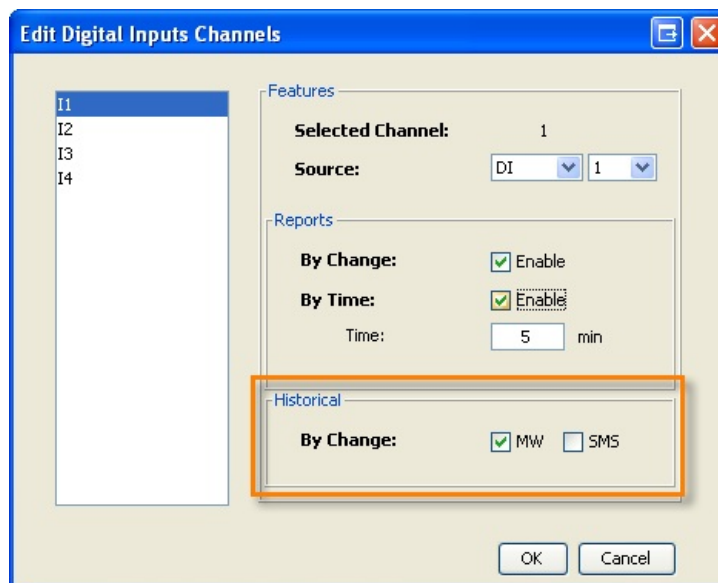
event took place.



Para acceder a la pantalla de configuración de históricos debe ir en el Configurador al menú “Channels” allí seleccionar el tipo de canal y luego el número de canal haciendo doble clic sobre él de esta manera accederá a una pantalla de configuración donde tendrá las configuraciones disponibles para dicho canal.

### Digital input channels historical records

In this case the digital input channels have Historicals by change, this means that a register is generated for every change of this input. The following figure shows the screen to enable these Historicals.



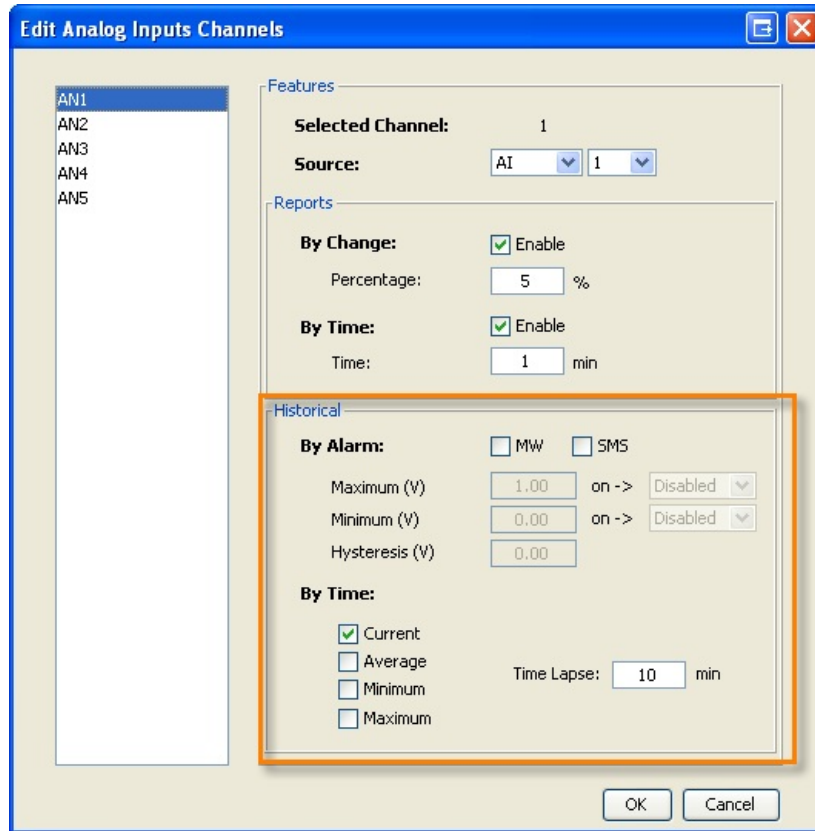
### Analog input channels historical records

Just as in digital inputs it is possible to keep a Historical of analog inputs under two clearly defined criteria.

On one side we have an alarm type register of Historicals that allows monitoring the limits of tensions with a determined value of hysteresis.

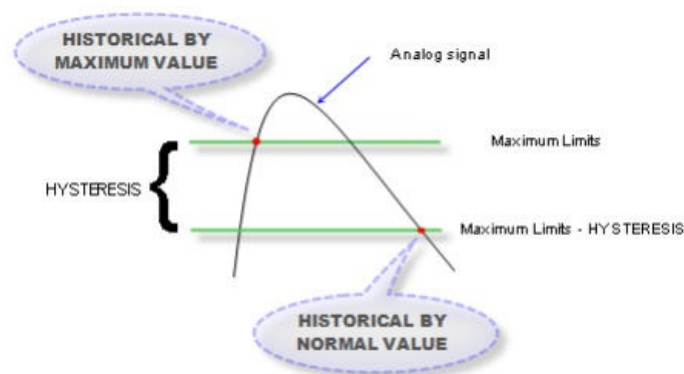
On the other side, we can create a register of Historicals by time, that is, sample the analog inputs and store its value every specific time, this type of Historical, in turn, is subdivided into 4 since we can store the real value, the minimum value, the maximum value or the average in the configured time period.

Once stored in the device's memory, it is transmitted whenever possible, but is never lost under any circumstance.

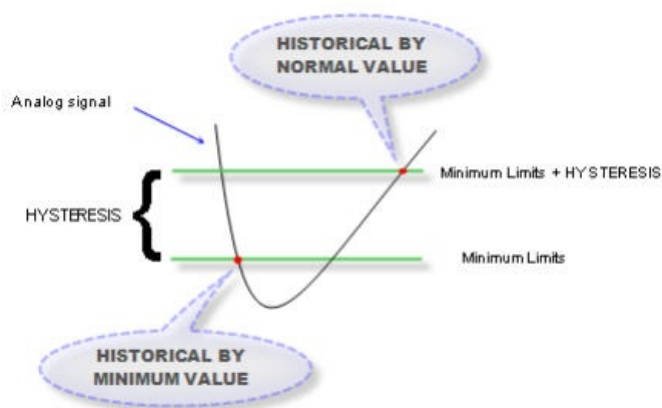


**By alarm**

This criterion defines an operational band through a maximum and minimum. When the analog input exceeds the maximum value a Historical is generated by maximum, when the analog input is lower than the minimum a Historical by minimum is generated and when the analog input passes from a maximum value or from a minimum value to a normal value between both a Historical by normal value is generated. In this manner we can follow the evolution of the input when it fluctuates between the specified limits. In addition to the maximums and minimums a value of hysteresis must be defined to avoid continuous generation of Historicals when the analog signal oscillates above a threshold value. In the following figure we can see how the hysteresis mechanism works for the maximum.



The same happens for minimum values but in an exactly opposite manner.



It is not possible to configure a value of hysteresis greater than the difference between the maximum and minimum, and also a maximum smaller than a minimum. We can also associate a digital output channel to the alarm event by maximum and another one of alarm by minimum, this means that when the analog input in the maximum range will activate an output and in the minimum another one.

### **By time**

In this case the Historical by time has 4 sub-types. En este caso el histórico por tiempo tiene 4 subtipos.

- Current Historical by time:

This type of Historical makes a unique capture of the value of the analog channel at the moment the configured time is due and generates the register.

- Maximum Historical by time:

In this case captures are made from the last Historical until the register time is due, when this happens a Historical is generated with the maximum value measured in this period.

- Minimum Historical by time:

This Historical is similar to the maximum but only registers the minimum value in the time period.

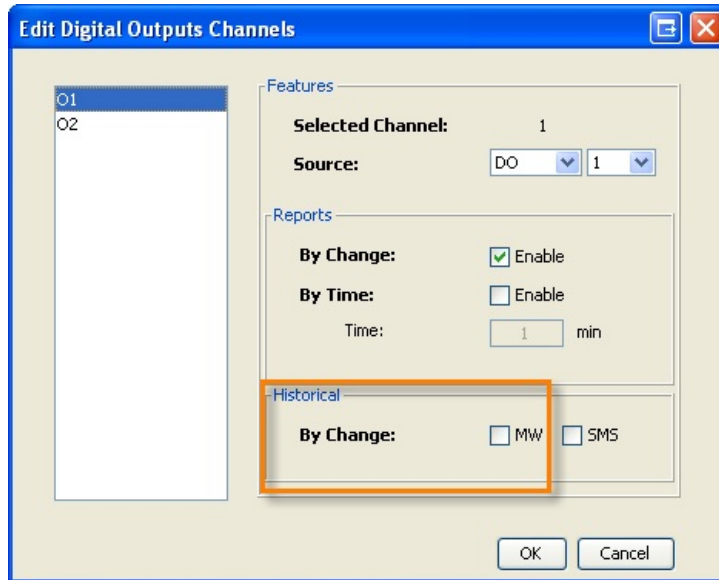
- Average Historical by time:

The concept is the same as in the previous ones but in this case it calculates an average of the value of the channel in the time period.

The device is prepared to register by cardinal time, this means that if we configure the time in 60 minutes at 8:38 it will register for the first time at 9:00 hrs, then at 10:00 hrs and so on.

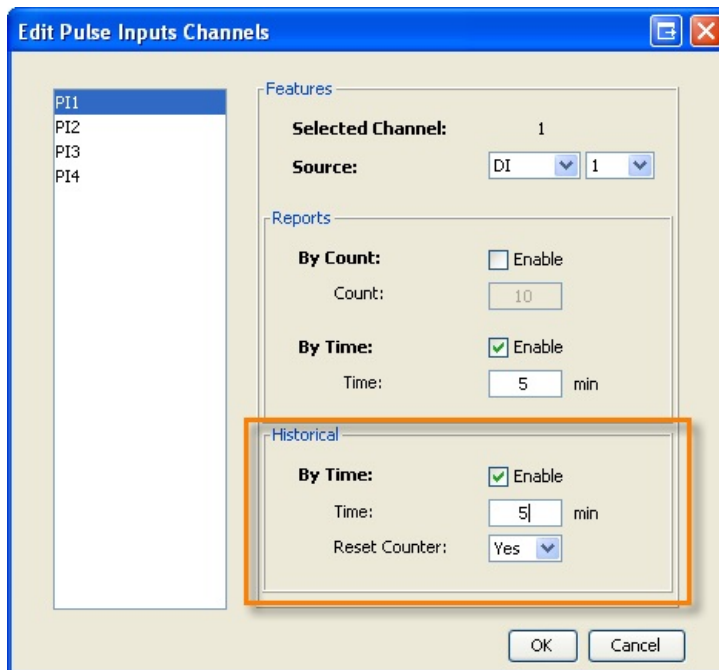
### **Digital outputs channels historical records**

Just as the inputs a Historical by change of the output channels can be made. Take into account that modifying one of the outputs remotely depends on the availability of the communication with the MW at that moment



**Pulse input channels historical records**

The pulse channels can also generate Historicals in a specific time that can be configured the same way as in the other channels, as it is shown in the following figure. We can also decide if once the Historical is generated, we want the counter reset to 0 or not.



**Delete Historicals**

In the need of erasing Historical registers, this can be done by means of the “GRD Config” in the monitor window with the “Delete” button located next to the indicator of stored Historicals.

The screenshot shows the 'Monitor' application window. At the top, there are status fields: 'SIM in use: 1', 'Signal: -101 dBm', 'Used Records: 1', and 'Date/Time: 26/05/2011-09:10:49'. To the right, 'SIM State: READY', 'GPRS State: CONNECTING', and 'Link State: WAITING GPRS READY' are displayed. Below these are four data tables: 'Digital Inputs', 'Digital Outputs', 'Analog Inputs', and 'Pulse Inputs'. A 'Delete' button is highlighted with a red box, and a dashed orange arrow points from it to a 'Historical erase' dialog box. The dialog box contains a question mark icon and the text: 'Historical records will be deleted. Continue anyway? This may take several minutes'. It has 'Si' and 'No' buttons.

This operation can take a considerable time.

### Configuring time

The time can be updated on the monitoring screen by clicking on the “Sync” button. The time is synchronized with the PC time to which is connected.

This screenshot shows a close-up of the 'Monitor' application's top section. The 'Date/Time' field now displays '26/05/2011-10:19:53'. The 'Sync' button is highlighted with a red box, indicating it is the focus of the configuration instruction.

*It is important to disable the Windows option “Automatic time change according to daylight savings time”. In case of being in a region with no daylight savings time change the time zone and in an area with daylight savings time change the time zone to a region with it and disable it, then return to your time zone.*

2017-06-16



If you connect the GRD/cLAN to the **Exemys Telemetry Server** you don't need to read this section

## Intermediary Software - Middleware

Middleware (also called MW-XF or simply MW) is software that together with the GRD/cLAN constitutes a complete tool for the collection of remote data. The MW is basically a server with multiple connections that allows the collection of data from all existing /cLAN in the field and dumps the information in different formats to be accessed in different ways.

The MW can be installed on any of these platforms: Windows 2003, XP, Vista (32 bits), 2008, 7, 8 and 10 (32 and 64 bits). **32 bits** Java Runtime Environment 1.8 or higher must be installed (available for free in [www.java.com](http://www.java.com)).

## Installation

To install follow the next steps:

- Download the latest MW version from here [www.exemys.com/mw](http://www.exemys.com/mw) and run the installation file
- A welcome screen will appear, follow the instructions of the installation program which will request the necessary information to complete the installation. Click on "Next" to continue.
- Destination folder: Select the folder where you want the application program to be installed.
- Wait for the installation program to finish copying all the necessary files on your hard disk, and press "Finish" to complete the installation process.

Once the program is installed you will see in the Programs menu a folder called Exemys. Inside this folder you will find another one called *MW-XF*; this one contains the *MW-XF Administrator icon*. If the 32 bit Java Runtime Enviroment 1.8 or higher is not installed you will have problems in the installation. If this happens, uninstall the MW, install the *Java Runtime Environment* and install again the MW.



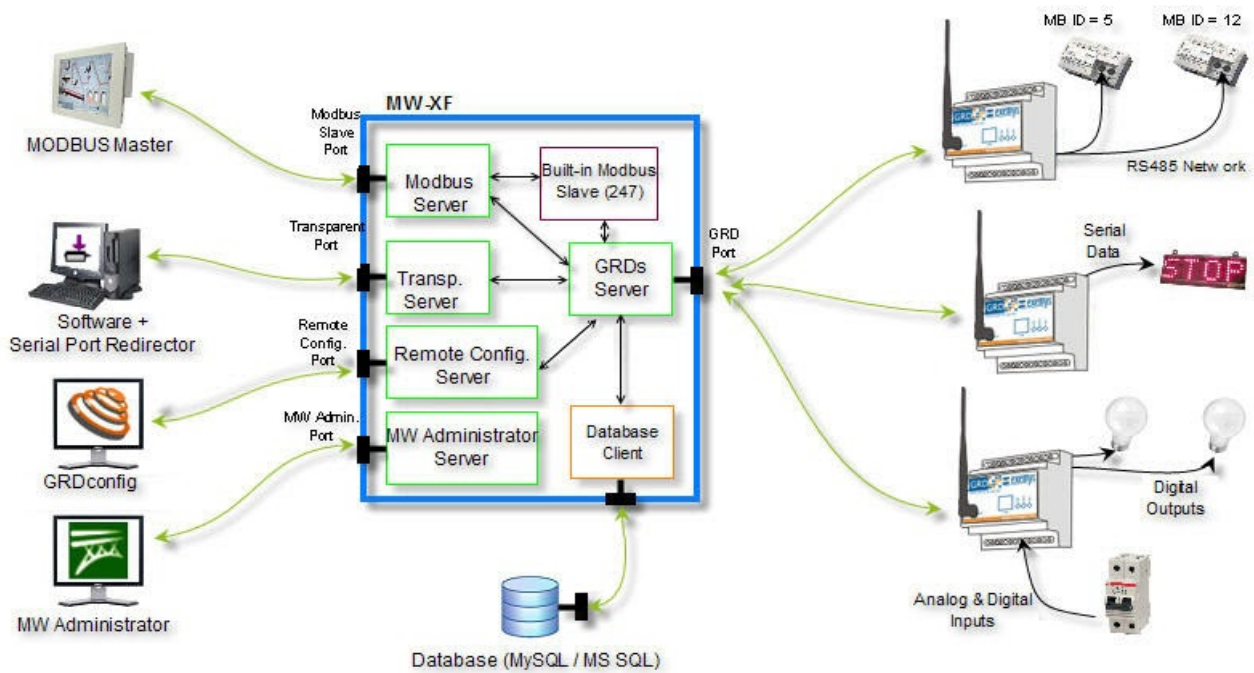
*In Windows you should have the option "Automatic change of time according to daylight savings time" disabled, in case of being in a region without daylight savings time, change the time zone to one zone that has it and disable it, then retake the time zone.*

In case of any other inconvenience during installation contact us at [support@exemys.com](mailto:support@exemys.com)

## Operation

It is important to point out that the MW Works is a Windows service. This means that is a program that works even if no user is logged in and it does not have a graphical interface. To configure you must use the **MW-XF Administrator** program, installed together with the MW (or the **MW-XF remote Administrator** to do it from another computer).

We now show an internal diagram of the MW-XF. We will be explaining its different parts as we advance in this manual.



## Configuration

To configure the Middleware start the **MW-XF Administrator** program. The following screen will be displayed.

The Administrator main screen is divided into three parts:

- The configuration menu
- The control buttons
- TCP/IP ports of servers that include the MW

In this section we will make a general comment about the use of TCP/P Ports. In the corresponding chapter we will discuss it in detail.

- GRD Server (GRD/cLAN port): Server port to which GRD/cLAN will be connected.
- Transparent Serial Port (TR port): Server port to which the **Serial Port Redirector** will be connected
- Modbus Server (MB Port): Server port/s to which the Modbus masters (SCADA) will be connected

There are three more ports that generally are not modified but they are worth mentioning here:



- MW Administration: Port used by the MW Administrator to connect with the MW service.
- Internal database: Port of internal use between the MW and the internal database that is used to save the configuration.
- Remote configuration server, this port is used by the **GRD Config** to connect to the MW and remotely configure the GRDs.

## Starting the MW

To do this we only have to press the “Start”  button located in the MW main screen.

Once this is done, the MW is ready to receive the GRD/cLAN connections, Redirectors of serial port and Modbus Masters, and connect to the database (in case it is enabled and configured).



The **Start**  and **Stop**  buttons do not stop the MW service, they only act on the MW servers.

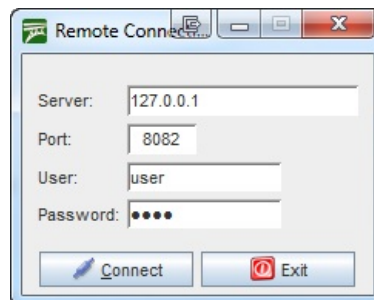
If when you press the start button it does not remain pressed as shown in the following figure, it may be that some of the TCP/IP ports used by the MW might be busy by some other service of your computer. Please contact [support@exemys.com](mailto:support@exemys.com) to get assistance on how to solve this problem.



## [MW-XF Remote Administrator](#)

If you need to configure the remote from a remote computer you can install the Remote administrator. You can download it from here: [www.exemys.com/mwadmin](http://www.exemys.com/mwadmin)

After opening it you will be asked for the IP address/URL where the MW is running. You must also enter the MW's remote configuration user and password.



This user and password can be modified on the MW's administrator Start menu, Administrator Authentication option

2017-06-15



- 1) If you connect the GRD/cLAN to the **Exemys Telemetry Server** you don't need to read this section.
- 2) If you use the GRD/cLAN in **Remote Serial Port** mode you don't need to read this section.

## Database

The MW has the capability of connecting with a MySQL or SQL database. In doing so, it creates a schema and a database with the designated name in its respective configuration that in turn is made up of 3 tables where information is exchanged with the MW. Through these tables, you can get information on the status of the device inputs and outputs, you can also read historical values and you can also actuate on the outputs.

You have to bear in mind that there are 2 types of information that the device can send. On one side, the reports containing real values of inputs and outputs that are updated according to the criterion configured in the device, from which we can choose what we want to have updated and under which conditions, the values are updated only when there is a connection with the MW. On the other side, we keep historicals, consisting of records of events or by time (logs) that are stored in the device and sent to the MW. In case of not having a connection the records remain in the equipment until the recovery of the connection.

When loading the parameters of the connection with the database and the MW is started, the schema and tables are created automatically.

A detail of the tables with their different fields are detailed and in a separate appendix some queries are shown regarding the access to them.

## Reports table

The reports table stores the latest values sent by the device, as well as its status. When a new GRD/cLAN is created, this is automatically added to the reports table and from then on the status is available through this means, it only remains to make the appropriate queries to know the desired parameters. There is an entry in the table for each GRD/cLAN and the table being updated with the reports from that device. The date field in first instance takes the NULL value until the arrival of a consistent report.

**Table name: "reports"**

Field	Description	Condition	Possible values
grd_id	GRD/cLAN ID number	-	1 to 4000
state	Shows the link state	Connected	1
		Disconnected	0
i1 to i200	Status of digital inputs channels	On	1
		Off	0
o1 to o200	Status of digital outputs channels	On	1
		Off	0

an1 to an200	Value of analog inputs channels	0-1v with 3 decimals	0 to 1000
		0-10v with 2 decimals	0 to 1000
		0-1v with 4 decimals	0 to 10000
		0-10v with 3 decimals	0 to 10000
		4-20mA with 2 decimals	400 to 2000
		4-20mA with 3 decimals	4000 to 20000
		Signed Modbus	-32768 to 32767
		Unsigned Modbus	0 to 65535
		Script Variable	-2147483648 to 2147483647
	PT 100 (-200 °C a 850 °C)	-2000 to 8500	
p1 to p200	Values of the pulse inputs channels	Physical inputs	0 to 1000000000
		Modbus or script variable	-2147483648 to 2147483647
date	Date of last report	-	Ex.: 2008-12-30 17:44:50

### Historicals table

The Historicals table stores history reported by all the devices. There are different types of Historicals, for example, by digital inputs, by digital outputs, by analog inputs and within these it could be by time or by change.

For more detail on Historical types that can be reported, please refer to the device manual which shows details of each one and how to configure them.

The table containing the information has the following format.

**Name of the Table: "historical"**

Field	Description	Condition	Possible values
historical_id	Record ID number	-	-
grd_id	GRD/cLAN ID number	-	1 to 4000
register_type	Channel type	Digital inputs channel (Ix)	8
		Digital outputs channel (Ox)	9
		Analog inputs channel (ANx)	11

		Pulse inputs channel (Plx)	12	
timestamp	Record date and time	-	Ex.: 2008-12-30 17:44:50	
insertion_time	Record database insertion time	-	Ex.: 2008-12-30 17:44:50	
address	Channel address	All channel type	1 to 100	
value	Channel value	Digital inputs channel (Ix)	0 or 1	
		Digital outputs channel (Ox)	0 or 1	
		0-1V analog inputs channel with 3 decimals	0 to 1000	
		0-10V analog inputs channel with 2 decimals	0 to 1000	
		0-1V analog inputs channel with 4 decimals	0 to 10000	
		0-10V analog inputs channel with 3 decimals	0 to 10000	
		4-20mA analog inputs channel with 2 decimals	400 to 2000	
		4-20mA analog inputs channel with 3 decimals	4000 to 20000	
		Pulse inputs channel (Plx)	0 to 999999999	
		MODBUS signed ANx/Plx channel	-32768 to 32767	
		MODBUS unsigned ANx/Plx channel	0 to 65535	
		MODBUS 32 bits Integer ANx/Plx channel	-2147483648 to 2147483647	
		MODBUS 32 bits Float ANx/Plx channel	-2147483648 to 2147483647	
		MODBUS 64 bits Integer ANx/Plx channel	-2147483648 to 2147483647	
		MODBUS 64 bits Float ANx/Plx channel	-2147483648 to 2147483647	
		Script variable ANx/Plx channel	-2147483648 to 2147483647	
PT100 (-200 °C a 850 °C) analog inputs channel	-2000 to 8500			
historical_type	Historical record type	Digital inputs channel	NULL	
		Digital outputs channels	NULL	
		"By Time" analog inputs channel record	Current	1
			Period Minimum	5
			Period Maximum	6
Period Average	7			

		"By alarm" analog inputs channel record	Minimum level	2
			Normal level	3
			Maximum level	4
		"By Time" pulse inputs channel record. Current		1

## Commands Table (For MW 4.4.2 or superior)

The commands table is used to remotely on the GRD/cLAN. By writing parameters on the database it is possible to:

- 1) Turn ON/OFF digital output channels (Ox)
- 2) Turn ON/OFF digital input channels (Ix) (GRD-3G or cLAN V2.0 or superior only)
- 3) Set the value to analog inputs channels (ANx) (GRD-3G or cLAN V2.0 or superior only)
- 4) Set the value to pulse inputs channels (PIx) (GRD-3G or cLAN V2.0 or superior only)
- 5) Force the GRD/cLAN to send a report (Ix, Ox, ANx or PIx) (GRD-3G or cLAN V2.0 or superior only)

The channel value can be set remotely only on channels linked to sources that can be written (physical output, script variables, Modbus holding registers, Modbus coil status, pulse channels linked to physical inputs)

The MW is continuously checking if any command has been written, if this is the case, it removes it from the database and takes action. If the entered data have errors, the parameters will be eliminated without taking any action.

**Name of the table: "commands"**

Field	Description	Valid values
command_id	Command ID value (this value can be null)	Any unused integer value
function	Command type to execute	0 - Modify channel value (Ix, Ox, ANx or PIx) 1 - Force channel report
grd_id	GRD/cLAN ID number	1 to 4000
register_type	Channel type	8 - Digital inputs channel (Ix) 9 - Digital outputs channel (Ox) 11 - Analog inputs channel (ANx) 12 - Pulse inputs channel (PIx)
output_number	Channel address to modify/report (the name output_numbr is used for backwards compatibility)	1 to 100
state	Value to set (ignored in reports)	Digitals: 0 or 1  Analog/Pulses: Depending on the source linked to this channel.

date	Current date (it can be ignored)	Ex: 2008-12-30 17:44:50
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## Commands Table (For MW 4.4.1 or previous)

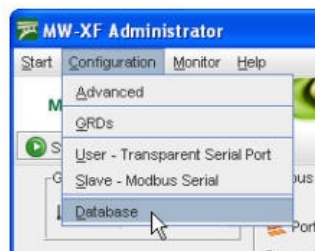
The commands table is used to actuate on digital outputs of the GRD/cLAN. By writing parameters on the database it is possible to enable or disable any of the equipment outputs. The MW is continuously checking if any command has been written, if this is the case, it removes it from the database and takes action. If the entered data have errors, the parameters will be eliminated without taking any action.

**Name of the table: "commands"**

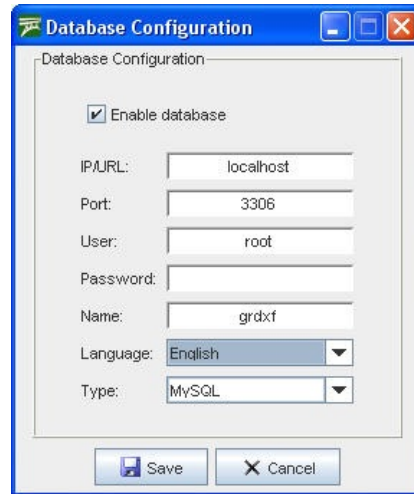
Field	Description	Valid values
command_id	Command number	
grd_id	GRD/cLAN ID number	1 to 4000
output_number	Output number that wants to be modified	1 to 100
state	Status to be taken	0 (Off)
		1 (On)
date	Current date (it can be ignored)	Ex: 2008-12-30 17:44:50

## Database configuration

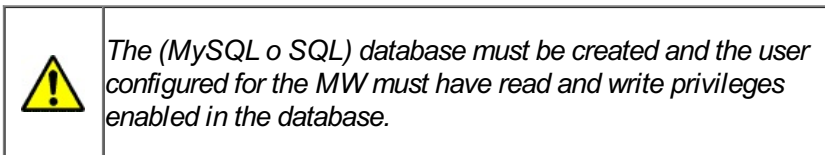
To access the database screen the MW must be stopped by pressing the Stop button on the main screen, we then go to Configuration -> Database.



The Database screen displays the database where Historicals, reports are stored and it accepts possible changes in the digital outputs.



From here we can modify the configuration of the base, the IP address, the port, name and type of database (MySQL and SQL) containing the information and also configure the user and password so the MW can have access to the database.

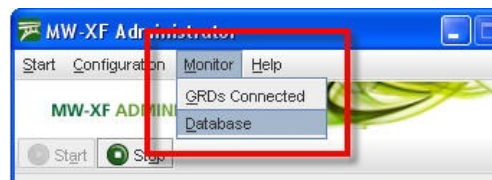


## Database monitoring

To determine the status of the database we can access the monitoring screen in Monitoring -> Database.




Database monitoring indicates the functioning of database tables and are presented in the following screen.



The IP address, the port and the name of the database must coincide with the data entered in the original configuration, then we find the three tables that make the database for the MW. If everything is working correctly, the three tables should indicate "Ready", if this is not the case verify the IP address, the connection port, the user name and password; verify that the MySQL base is working and that the users have read and write privileges to access the database.

2020-07-06

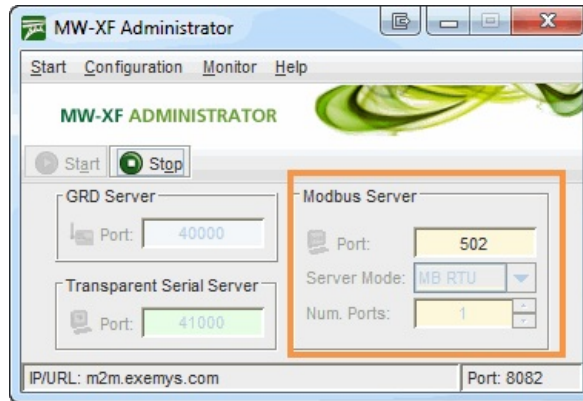
	<p><i>If you connect the GRD/cLAN to the <b>Exemys Telemetry Server</b> you don't need to read this section</i></p>
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## Internal Modbus slave of the MW

The MW has an internal Modbus slave that contains the values of inputs and outputs, the values read from this slave are those corresponding to the GRD/cLAN reports and not to the Historicals, these are not accessible via Modbus. In order to visualize the current GRD/cLAN values the desired reports in the equipment must be enabled. Access to the internal slave is through queries to slave number 247.

Queries to external slaves are made the same way as to the internal slave. Its map contains the values of 8 analog inputs, 8 digital inputs, 8 digital outputs, 2 pulse inputs and the state of all GRD/cLAN from ID 1 to 4000, this means that if the GRD/cLAN has more inputs/outputs we won't be able to query them through this method. It is also possible to act on the digital outputs modifying their state at any instance. Queries can be made, for example, from a SCADA.

The TCP port to accept the incoming queries must be configured on the MW's main screen. You can also choose here to use Modbus TCP, Modbus RTU over TCP or Modbus ASCII over TCP.



## Internal map

The information of each GRD can be visualized in different forms according to the type of parameter you want to see. Each GRD has a specific location in the Modbus map, this location is determined through the ID number.

## Input Register

In the input register we find the digital and analog inputs, as well as the value of digital outputs. Each GRD has a total of 16 registers that contain the following information.

Record number	Information
Record 1 to 8	Analog 1 to 8
Record 9	Digital inputs



Record 10	Digital outputs
Records 11 to 14	Pulse inputs 1 to 2
Record 15	Reserved
Record 16	State

The calculation to determine the address of a record for a particular device is the following:

$$\text{Records X} = 30000 + (\text{GRD\_ID} - 1) * 16 + \text{Record number (1 to 16)}$$

As an example, let's suppose that we want to read the analog input 3 of the GRD with the ID = 87. Analog input 3 corresponds to record 3, then.

$$\text{Record 3 (GRD 87)} = 30000 + (87 - 1) * 16 + 3$$

To be able to see the desired value we have to access record 31379.

Digital inputs and outputs are grouped in a single record that contain in its bits the corresponding values, knowing that input 1 of the device corresponds to bit 0 of the record and input 16 corresponds to bit 15 of the record we can determine each one. The outputs are located in the records the same way.

To know the state of the connection we can read record 16 in bit 0, if this bit is 1 indicates that equipment is connected, while 0 indicates that the equipment is disconnected.

Pulse inputs are located in records 11 to 14, each one of the inputs takes 2 records to be able to cover the range 0 to 1000000000, the lower record represents the higher part of the number and the upper record represents the lower part of the pulse count.

## Holding Register

All Input registers values are copied to holding registers. Use the same calculation to get the right address for every channel.

## Input Status

In the input status we can read the state of digital inputs of all GRD/cLAN. Each device occupies 16 positions and the calculation to read the value of one of the inputs is the following.

$$\text{Input X} = 10000 + (\text{GRD\_ID} - 1) * 16 + \text{Input number (1 to 16)}$$

For example, if we want to know the value of input 8 of the GRD with and ID =6 the calculation is the following.

$$\text{Input 8 (GRD 6)} = 10000 + (6 - 1) * 16 + 8$$

It is equivalent to address Modbus 10088.

## Coil Status

In the coil status records we visualize the digital outputs of the equipment. To determine the address of the outputs for each GRD/cLAN we calculate:

$$\text{Output X} = (\text{GRD\_ID} - 1) * 16 + \text{Output number (1 to 16)}$$

For example, if we want to access output 4 of the GRD with an ID = 45 the calculation is the following:

$$\text{Output 4 (GRD 45)} = (45 - 1) * 16 + 4 = 708$$

It is equivalent to address Modbus 708 of the coil status.

If we write on these records the state of the outputs are modified, this means that we can modify the state of the outputs of a device from the Internal Modbus slave.

2017-11-23

## Connection between the cLAN and Middleware


### Configuration of the GRD-MW connection

Communication with Middleware uses a TCP connection. To be able to establish the connection it is necessary to:

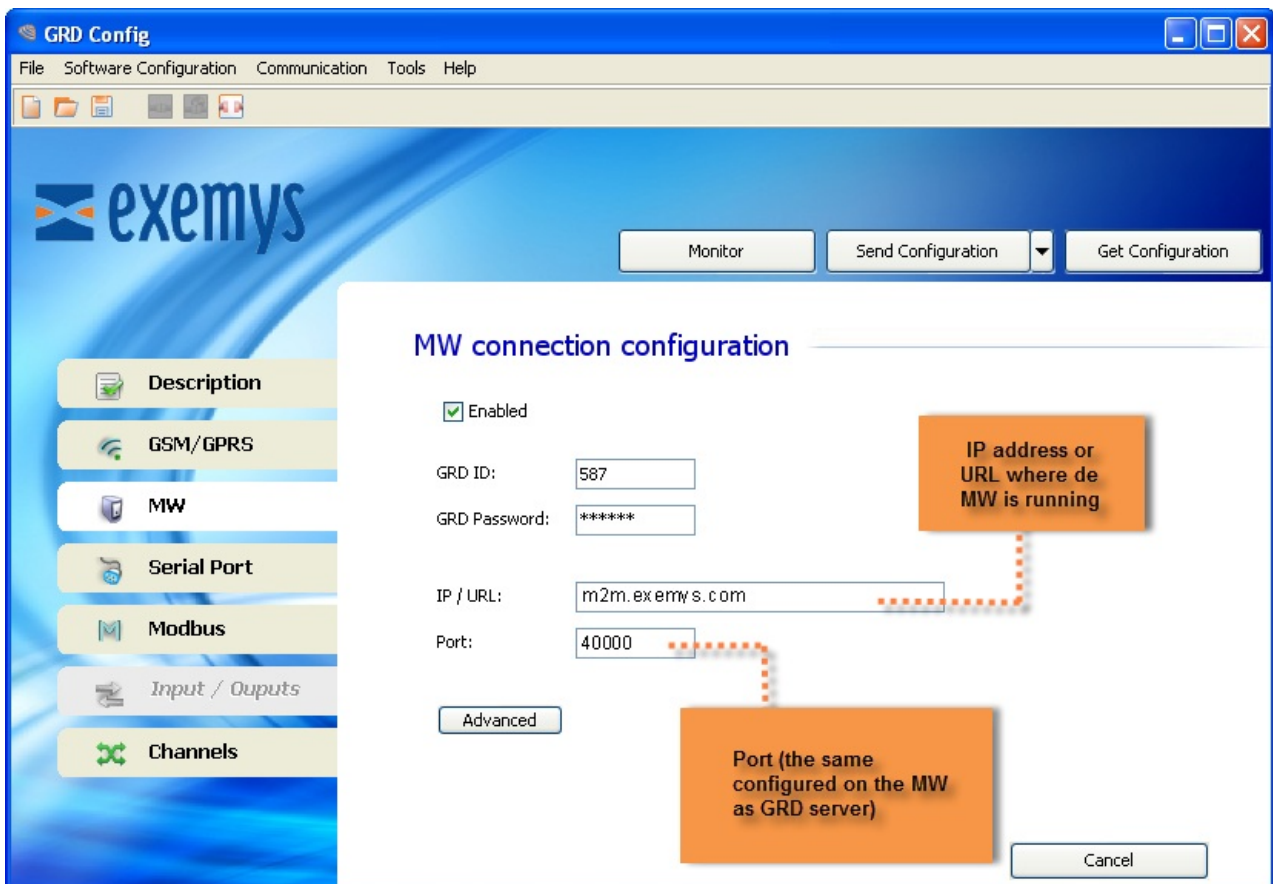
- Configure the cLAN network parameters
- Configure correctly the connection from the cLAN to the MW
- Configure the cLAN ID and password.
- Have a MW server running (read the "Intermediary Software - Middleware" section)

#### Configuring the MW connection

All TCP connections need a Server which awaits a connection request in a pre-established port and a client that, at the right time, will establish the connection to such server. cLAN equipment work as TCP clients, so we must have a Server (MW) to wait for the connection request. We now explain how to configure the cLAN to establish communication with the Middleware. We enter the MW menu and configure the following parameters:



*If connect the cLAN to **Exemys Telemetry Server** the GRD ID, GRD Password, IP/URL and Port will be provided by Exemys.*



#### Enabling the connection with MW

When this option is enabled, we tell the cLAN to establish connection with the specified configuration. If this option is disabled the cLAN will not establish connections.

## IP

The IP address or URL of the server where the MW running must be entered here. The cLAN can resolve URLs using DNS.

## Port

The server port must be entered in this field.

## Configuring the ID and password

The cLAN must be connected to a MW, this is why it is absolutely necessary to place an ID number to identify the cLAN at the moment of connection and with a password if necessary.

## ID

If the cLAN must establish a connection with the Middleware (MW), it has to be identified in order for the MW allows to remain connected. The ID is part of this identification. If the MW has not configured such an ID as valid, it will close the connection with the cLAN, this is a number from 1 to 4000 and it must be unique.

## Password

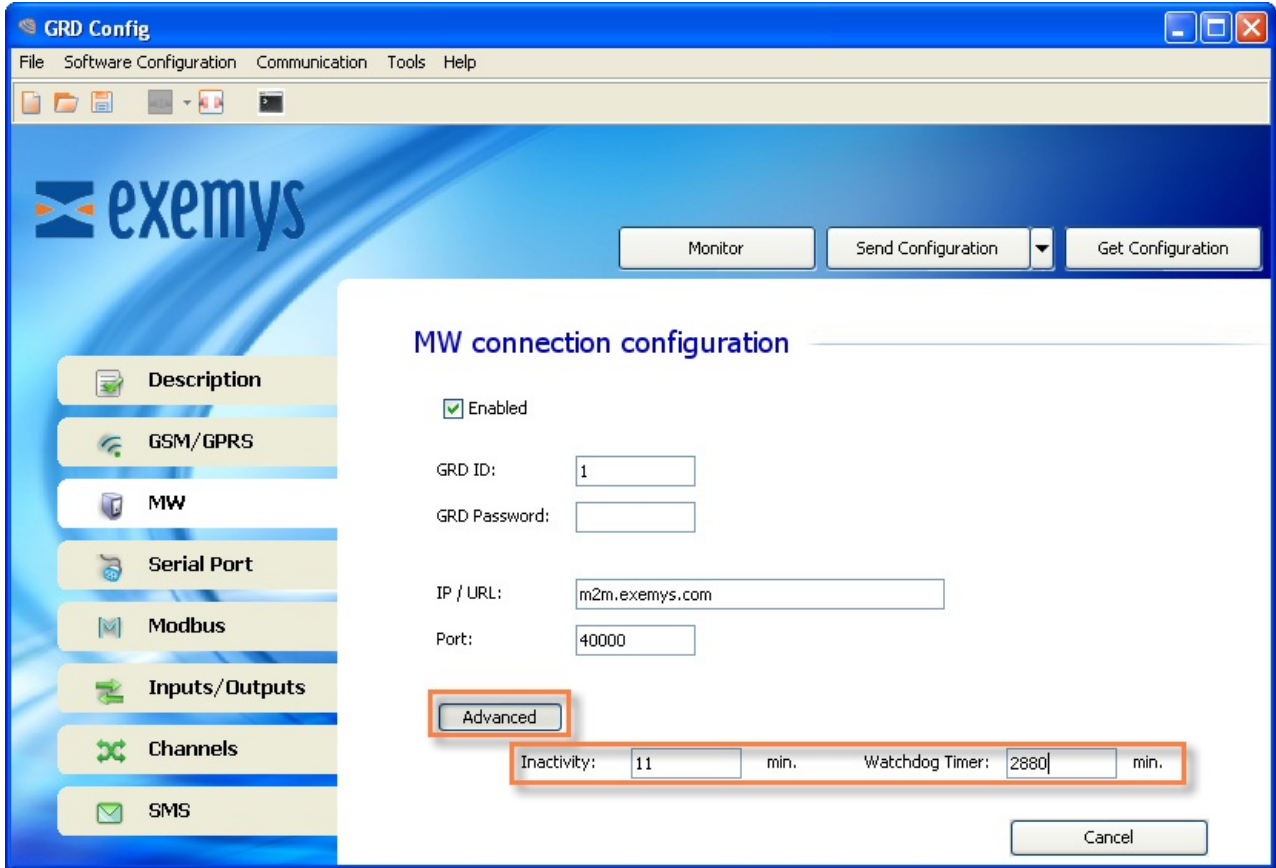
The cLAN equipment has a password for authentication with the MW, therefore, at the moment of connection the password is verified against the MW password, if there is a coincidence, the connection is accepted. The password should have a maximum length of 8 characters.

This password will be prompted everytime you try to configure the cLAN locally (LAN/Ethernet)



Remember this password to be able to configure the cLAN locally

## Advanced:




**Inactivity time**

This is the time the cLAN takes to decide that the connection with the MW has been closed.

**Watchdog Timer**

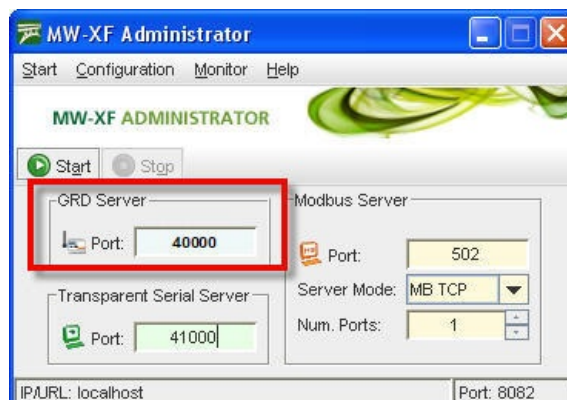
This parameter defines how long will wait the cLAN to reboot if it can't establish a connection to the MW.

**Configuration of the connection in the MW**



*If connect the GRD to **Exemys Telemetry Server** you don't need to read this section*

The port in the MW must have the same configuration as the one in the cLAN, that is the TCP port through which the “GRD server” connections are received. This port must be ready to receive connections, which means that it should not be blocked by any type of firewall or router.



**Adding a new cLAN to the MW**

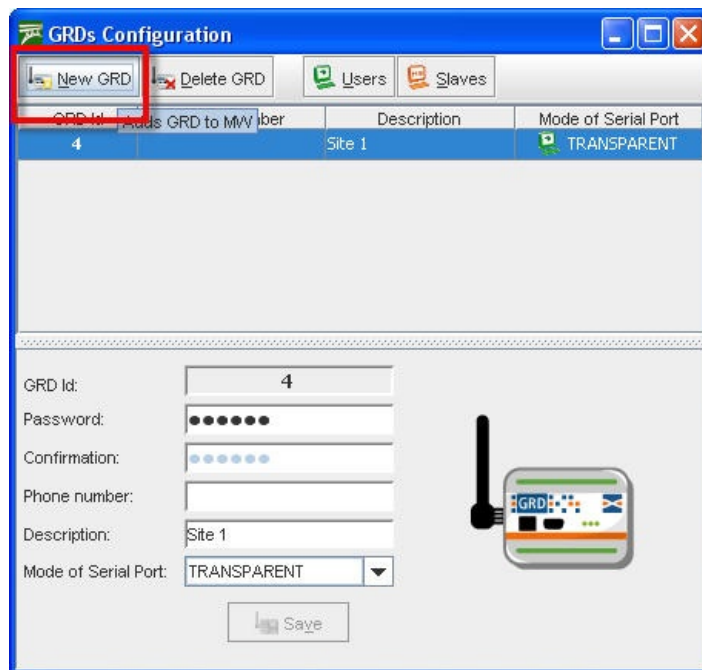
We first create a cLAN with the same ID as the one loaded previously in the equipment, this is done from “Configuration -> GRDs” click on “New GRD”.


The password must be entered if there is one previously loaded in the equipment, otherwise, it should be kept blank.

The “Telephone” and “Description” parameters are optional, these help the user with the identification of the device using that ID.

As to the "Serial port mode" we select as an example “Not Configured”, this refers to the mode of operation of the cLAN serial port, in this case it will not be used.

The 2 operational modes will be detailed later, as at the moment we just want to establish the connection between the cLAN and the MW.





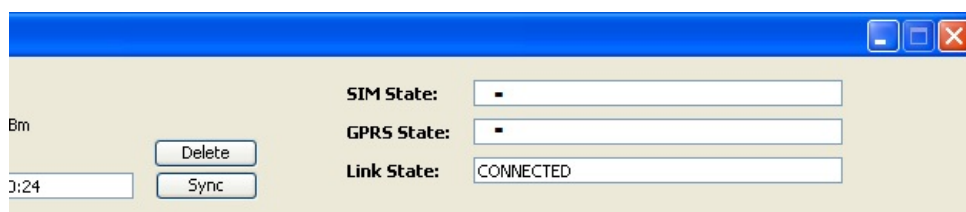
With this, the cLAN is added so the connection can be established. We end the basic configuration in the MW.

**Monitoring the cLAN-MW connection**

**Monitoring the connection in the GRD**

To verify whether the entered configuration into the cLAN is the correct one we have the possibility of monitoring the status of the connection.

To access the monitoring screen of the configurator click on the “Monitor” button. Then, the following screen will be displayed:



## [Link State](#)

The TCP connection state can also be monitored. The possible TCP connection states are:

- **Disabled:** The TCP connection has not been enabled. In this state the Link LED is off.
- **Connecting:** The cLAN is attempting to establish a connection to the indicated IP address and port. If the cLAN is not able to establish the TCP connection, the length of time in this state might be an indication of a failure. If it remains in this state for a few seconds (less than 10), it might be trying a connection to a closed port. If it maintains the state during a minute or more it might be attempting to connect to a port and/or IP behind a firewall and is being filtered.
- **Connection Failed, Host Unreachable and Connection Refused:** The 3 states imply that the connection to the MW was not possible, but individually, they indicate the reason why they occurred. In general, each one has a specific motive although it depends on the TCP connection on the server side for the indication to be correct, even so, any of these 3 errors indicate a problem in the TCP connection.
  - **Connection Failed:** This error appears when a connection to the configured IP is not possible.
  - **Host Unreachable:** This happens when a connection to the IP is possible the port is open, through the router or firewall, but there is nothing connected to that port.
  - **Connection Refused:** In this case the connection cannot be established because the configured port is closed, this could happen because a router or firewall are blocking it.
- **Connected:** The TCP connection has been established, at this time the cLAN registers in the MW, if the ID and password are valid, the connection is maintained.
- **DNS Failure :** The cLAN can't convert the URL into an IP address. Check if the IP address is OK and if the DNS servers are valid.
- **Error:** The event occurs if the connection was not completed after a certain time and no other type of failure was reported.

## [Monitoring the connection in the MW](#)

cLAN and GRD devices connected to the MW can be monitored, this can be done by accessing "Monitor -> GRDs Connected", a list will be displayed showing all GRD/cLAN added to the MW ordered by ID, and showing if it is connected and if it is so it will show its IP.

GRD Id	Description	State	IP address	Statistics	Monitor	Configuration
22	Temperature			Open	Open	Open
654	Slave	Connected	200.49.201.26	Open	Open	Open

## [Statistics](#)

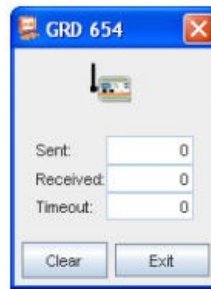
Statistics are made based on the quantity of information received and transmitted. The information given by these statistics differ according to how the cLAN/GRD type was defined.

To have access to statistics of each cLAN/GRD the button located in the statistics column must be pressed.

When the cLAN/GRD shows the serial port mode as "NOT CONFIGURED", we will not be able to access the statistics.

## [Modbus statistics](#)

The Modbus statistics screen is shown below:



When the cLAN/GRD is connected the window is displayed as enabled, on the contrary if the device is disconnected the window is shown in grey as disabled. The window shows the number of packets sent to the device and received from it, those queries sent that are unanswered are part of the Timeout count. The erase button resets the counters to zero.

### Transparent mode statistics


The transparent mode statistics screen is shown below.



When the cLAN/GRD is connected and a user is connected to the MW pointing to that device, the screen will be shown as enabled. In the statistics of the TR mode we can find the name of the user and the IP to which he is connecting, as well as the number of bytes transmitted to the serial port of the device and bytes received from it. The erase button resets again the counters to zero.

2015-08-06



	<b>If you connect the GRD/cLAN to the <i>Exemys Telemetry Server</i> you don't need to read this section</b>
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## Remote serial port - Redirector / Transparent serial port

We will see now how to configure the MW to operate with the serial port in a transparent mode.

- Let's assume the following example:

**User:** *John*

**Password:** *exemys*

You want to communicate to the flow meter connected to the GRD/cLAN with ID 268 located in a water well.

**GRD ID:** *268*

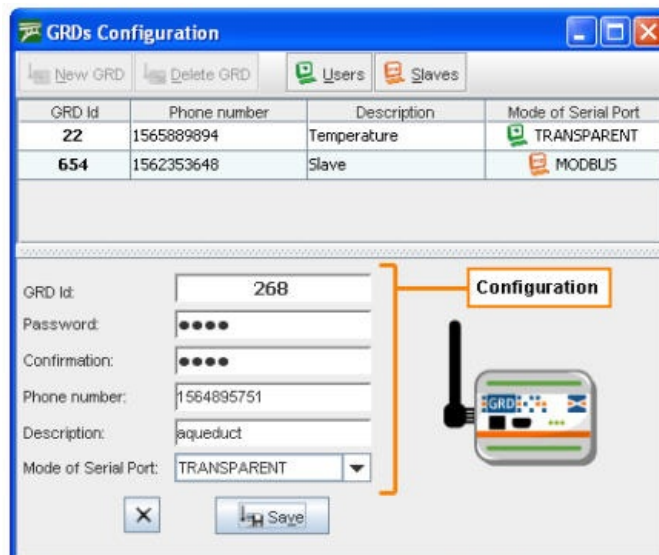
**Password:** *well*

MW data: (These parameters are configured in the MW connection)

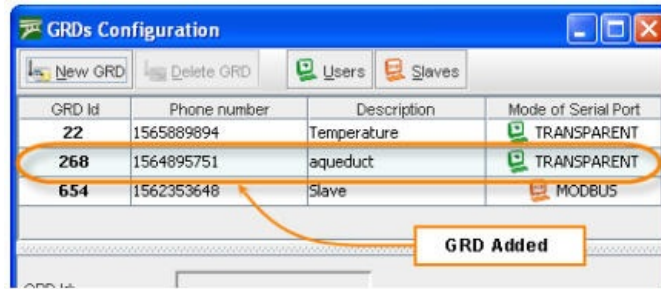
**TR port:** *41000*

We must have first the MW connected and the GRD/cLAN added as we saw in "Connection between GRDs and Middleware".

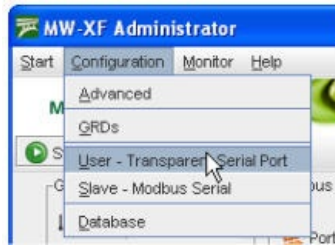
In the MW we enter into "Configuration -> GRDs" and here we edit the equipment configuration in "Serial port mode" -> "TRANSPARENT".



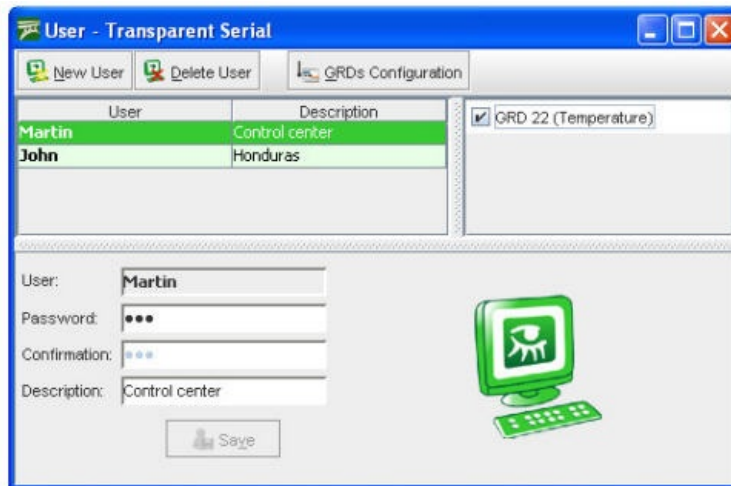
The Telephone and Description options are optional and not necessary. When we finish loading all necessary data we press the "Save" button to add the GRD/cLAN to the list.



Then a user must be added who will have access to these GRD/cLAN. To access the User and permits screen for transparent mode go to “Configuration -> Users – Serial Transparent”.



The Users and transparent permits screen allows us to add or delete users and assign permits to the users for the GRD/cLAN you consider convenient. The GRD/cLAN that can be assigned are those with transparent operating mode.



The configured user name and password are used for authentication of the port redirector. When a redirector connects to the MW it must indicate the user name and password.

2017-06-16

## Remote serial port with Redirector (Virtual COM port)

### Principles of Operation

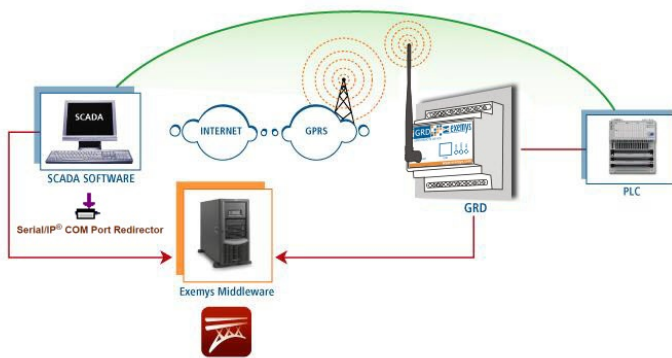
This Redirector allows transparent communication with equipment located in remote places, simulating a serial COM port.

Exemys recommends to use [Serial/IP COM port redirector from Tactical Software](#). To download a 30 day free trial license or to buy a license please contact us at [sales@exemys.com](mailto:sales@exemys.com)

Use the following items:

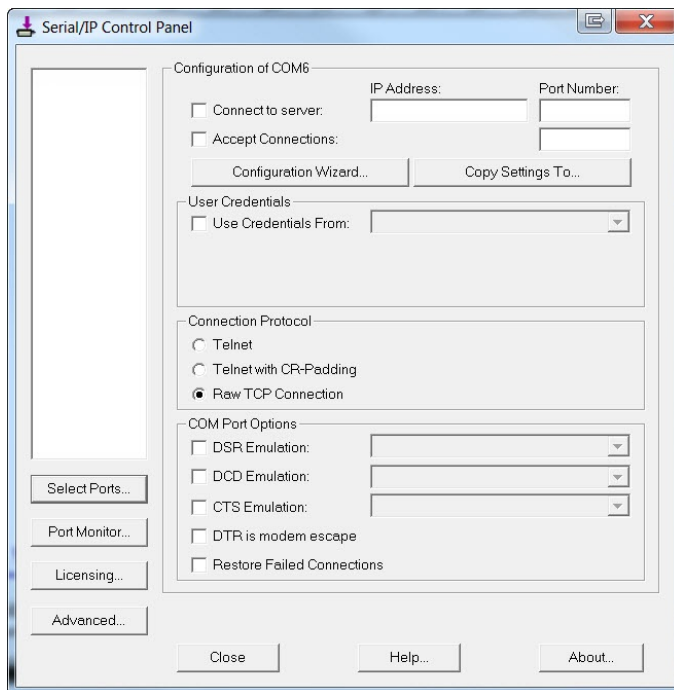
- **GRD/cLAN:** converts a RS-232/485/422 Communication to TCP/IP (over GPRS on the GRD)
- **Middleware:** provides connectivity with GRD equipment, allows the establishment of access policies and provides tools for monitoring of equipment.
- **Serial Port Redirector:** simulates a virtual serial port that we will be able to use to communicate with the remote equipment as if we were connected locally. It also provides the necessary interface to configure the connection with the MW, select the remote equipment with which we want to communicate and also monitor the status of the connection.

In this manner, a serial communication could be replaced by the following scheme:



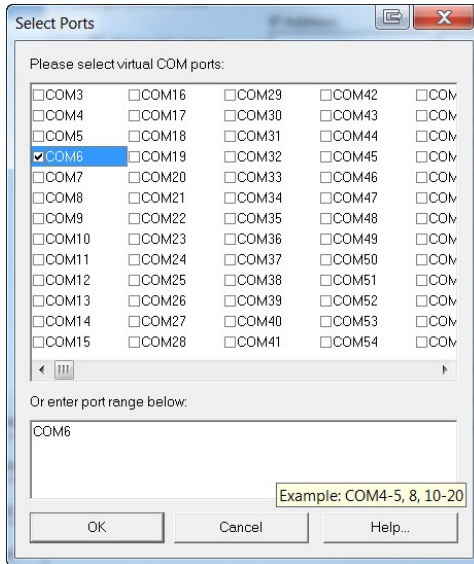
### Configuration

To open the Configuration Windows click with the right button on the icon and select "Configure". The first time you enter, the screen to be displayed will be the following:




### Select the virtual port

In the configuration screen, press the "Select Ports..." button. A screen will be displayed with a list of all virtual COMs from which you will be able to choose from. The Redirector discards from this list the reserved ports. Select the desired virtual port and press "OK".



Once the port to be used is selected, the configuration screen will let you configure the rest of the configuration parameters.

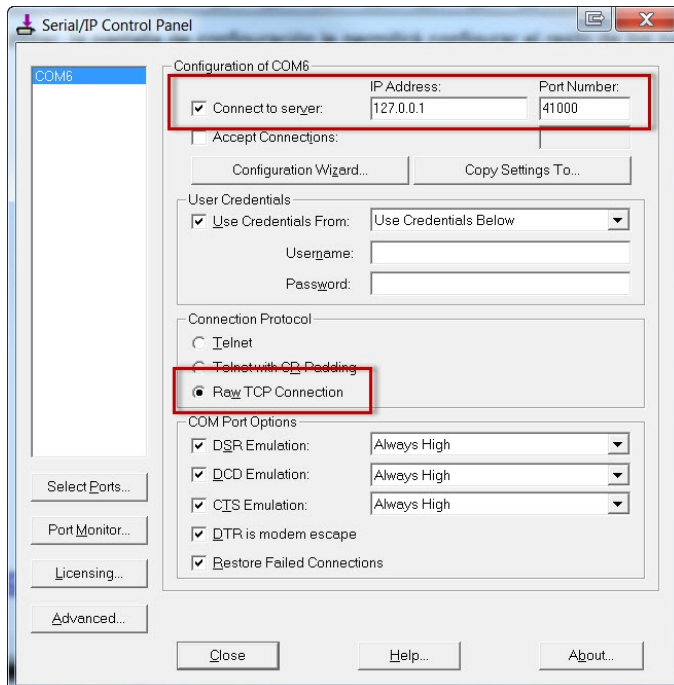
### Configuration of the connection with the MW

 **If you connect the GRD/cLAN to the *Exemys Telemetry Server* the IP address, port number, user and password will be provided by Exemys**

#### IP address

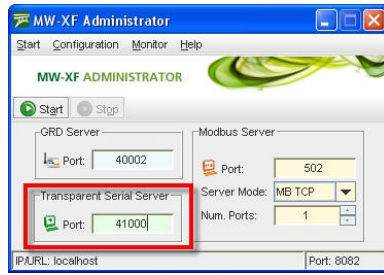
It is the IP address of the Server where the transparent MW is running. If a URL is entered instead of an IP address the Redirector will attempt to resolve it.

An existing established connection will not be affected by the changes, they will be applied the next time the virtual port is open.



#### Port

It is the port of the remote server where the transparent MW is running the Transparent Serial server service. The default port is 41000.

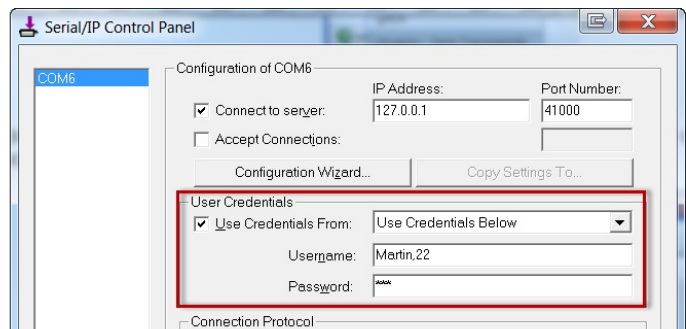
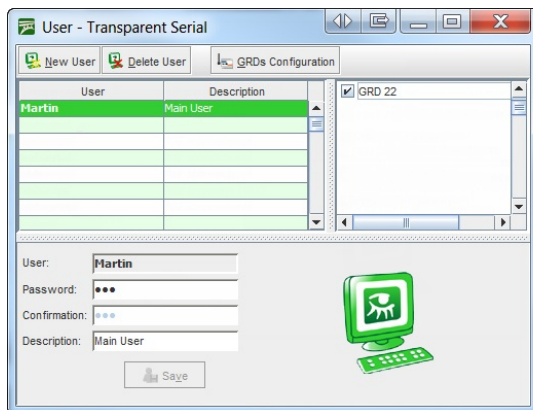


If an established connection already exists it will not be affected by the changes, these will apply the next time the virtual port is opened.

**Username and password**

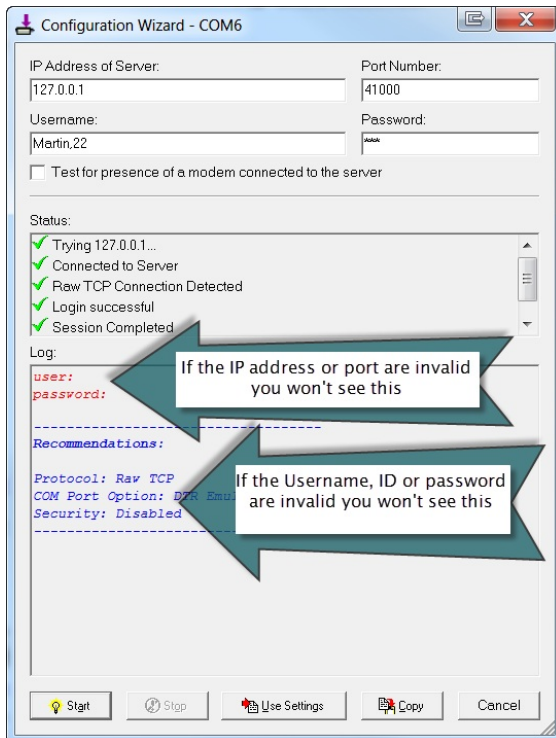
To connect with the GRD/cLAN, you must have a user name and password so the MW can allow to access them. The parameters must be the same ones that were configured in the MW in "Transparent" mode.

In the "Username" box type the User followed by a comma an the device's ID number.



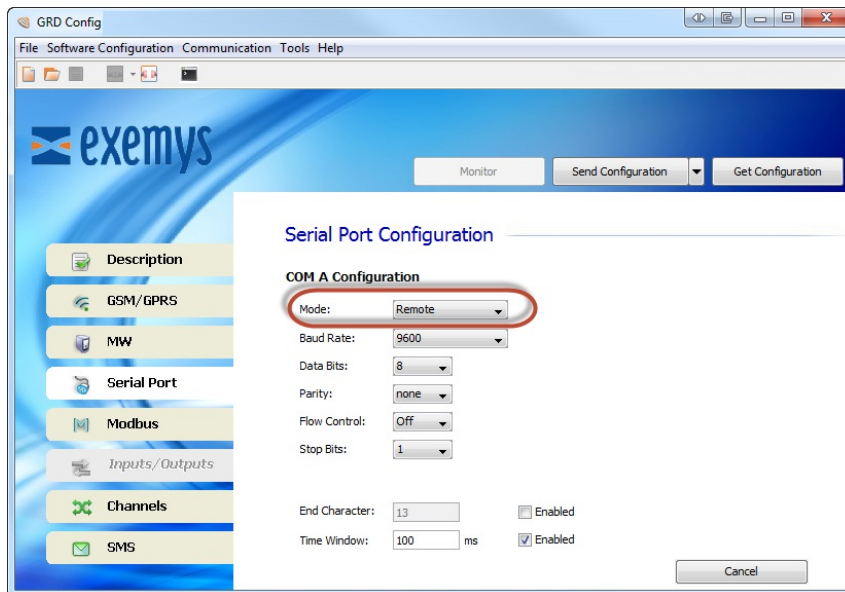
**Testing the connection with the MW**

Once the configuration is completed you can test it pressing the "Configuration Wizard..." button and then the "Start" button. You should see something like this is the configuration is OK.



**GRD/cLAN serial port configuration**

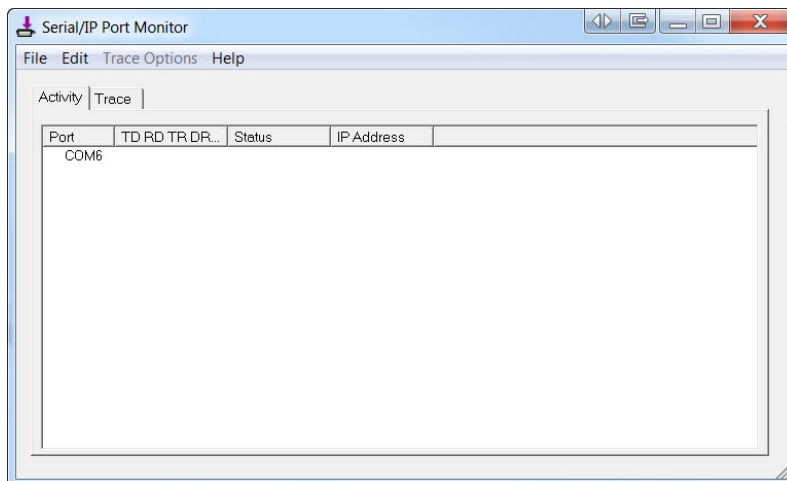
To access the GRD/cLAN serial port remotely configure it in "Remote" mode



**Activity and data monitor**

With the right button click on the icon, select "Port Monitor".

With this screen you are able to follow in real time, the status of the connection of the Redirector.



Read the Serial/IP user's manual for more details.

**Multiple COM ports and Serial/IP licencing**

The Serial/IP redirector requires a license to work. You can use it for free for 30 days to test it.

The one port license won't limit how many COM ports you can configure, but you will be able only to open one COM port at a time.

If the software you are using doesn't allow you to create multiple COM ports, you can configure Serial/IP to create a list of devices on a single COM port without having to edit the cLAN/GRD ID number. Please read the section "Configuration Presets" in the Serial/IP user's manual for more details. If you need help to configure this feature contact us at [support@exemys.com](mailto:support@exemys.com)

2017-06-16

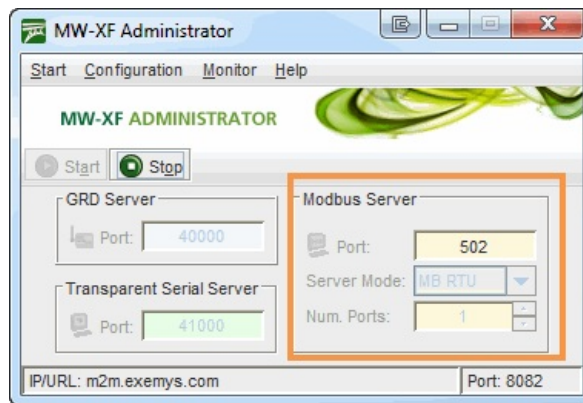


If you connect the GRD/cLAN to the **Exemys Telemetry Server** you don't need to read this section

## Remote Access to serial port in Modbus mode - MW configuration

We will now see how to configure in the MW the GRDs that we use to multiplex Modbus. In this mode of operation the MW will receive the “Modbus TCP” queries sent to the port/s of the “Modbus Server” which will resend to the GRD with the slave being queried.

The TCP port to accept the incoming queries must be configured on the MW's main screen. You can also choose here to use Modbus TCP, Modbus RTU over TCP or Modbus ASCII over TCP.



Slave number 247 is reserved for use by the “MW internal slave”.

We must first have the MW connected and the GRD added as indicated in “Connection between the GRD and MW”.

- Let's look at the following example:

We have 2 Modbus (RTU) devices connected in port 485 of the GRD with GRD ID = 10 without a password.

Device 1: ID Modbus 43 (query from port 502)

Device 2: ID Modbus 66 (query from port 503)

We also have 1 Modbus (ASCII) device in port 232 of the GRD with GRD ID = 13 without password.

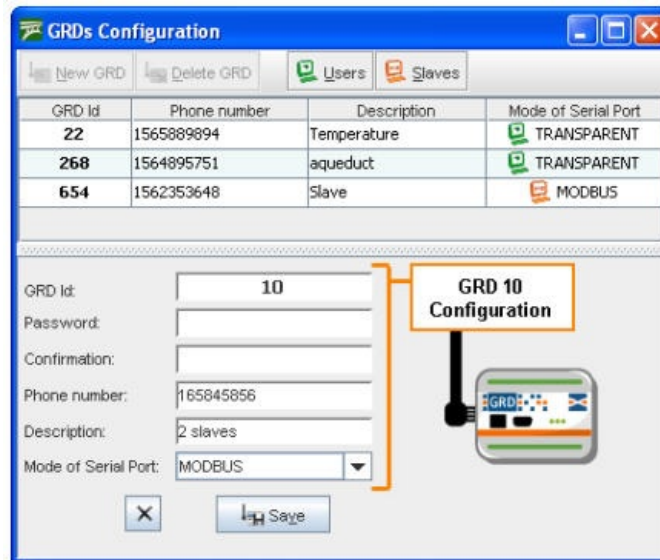
Device 1: ID Modbus 87 (query from port 504)

MW data: (These parameters are configured in the MW connection).

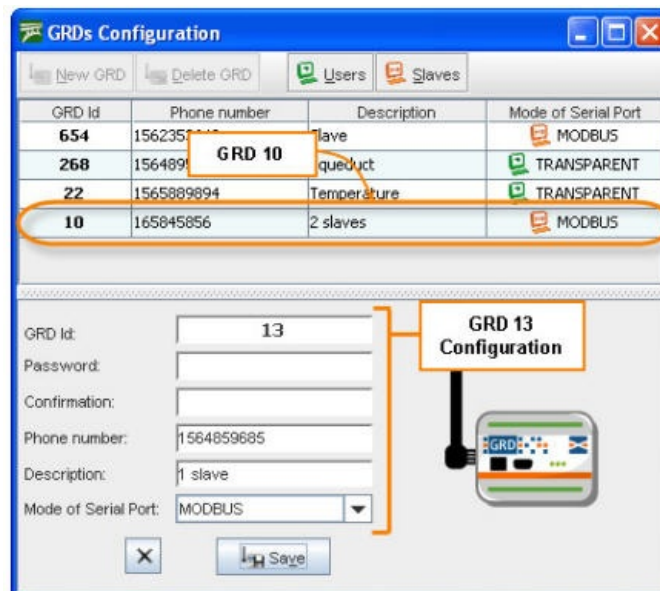
MB Port: 502

Number of ports: 3

In the MW we enter in “Configuration -> GRDs” and we edit the “Serial port mode” placing it in “Modbus”.



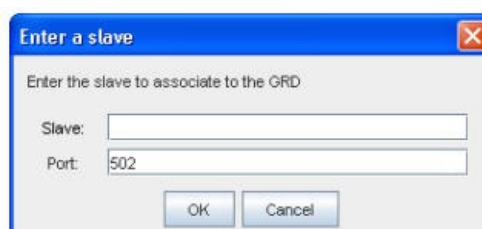
When you press the save button it is stored in the list of valid GRDs. The mode must be MB for it to work in this manner. The following figure shows the addition of the other GRD and in the upper part the GRD added previously.



Once both GRDs are incorporated to the list we can assign them the corresponding slaves to each one and also indicate what type of Modbus protocol will be used.

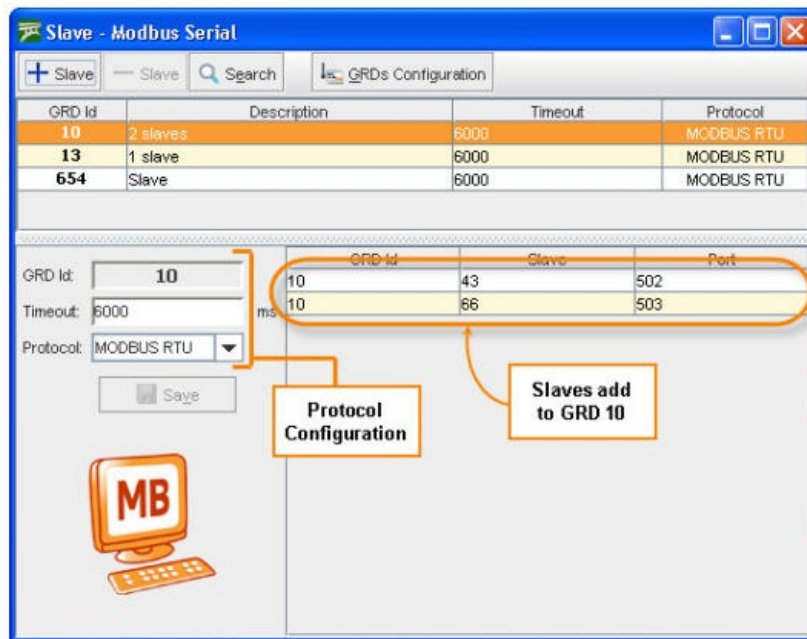
### Slaves

To be able to add the slaves to each GRD we have to enter the Administration screen of GRDs MB and slaves, we place the cursor on the GRD in the upper part and press the +Slaves button; a window will open as the one shown in the figure below where you enter the number of the slave connected to the GRD in its serial port and the port number of the MB server from where the query will be made to that slave.





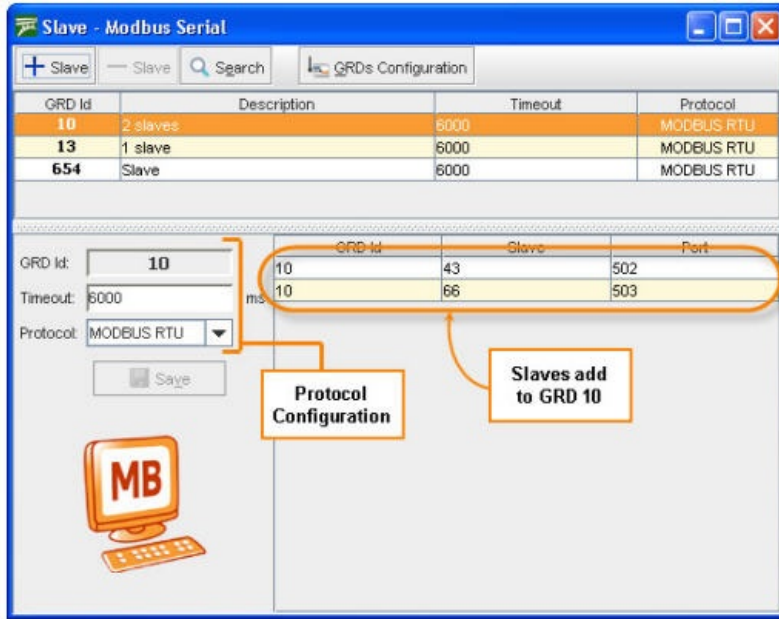
Once the corresponding slaves and its port are entered, the Modbus protocol to be used must be selected, which could be RTU or ASCII.



As it can be seen in the previous figure the GRD 10 has 2 Modbus slaves. We also determine the communications protocol, that in this case is RTU, the Timeout of the communication and then we press the save button to store the changes. The purpose of Timeout is to prevent the system from waiting for a response for an undetermined time, this time is expressed in milliseconds, therefore, when a query is sent, this is the maximum waiting time for a response, once this time is up the systems discards all the responses from that GRD until a new query occurs.

*Verify that the Modbus master timeout is greater than the timeout configured for the GRD to avoid losing responses to the queries.*

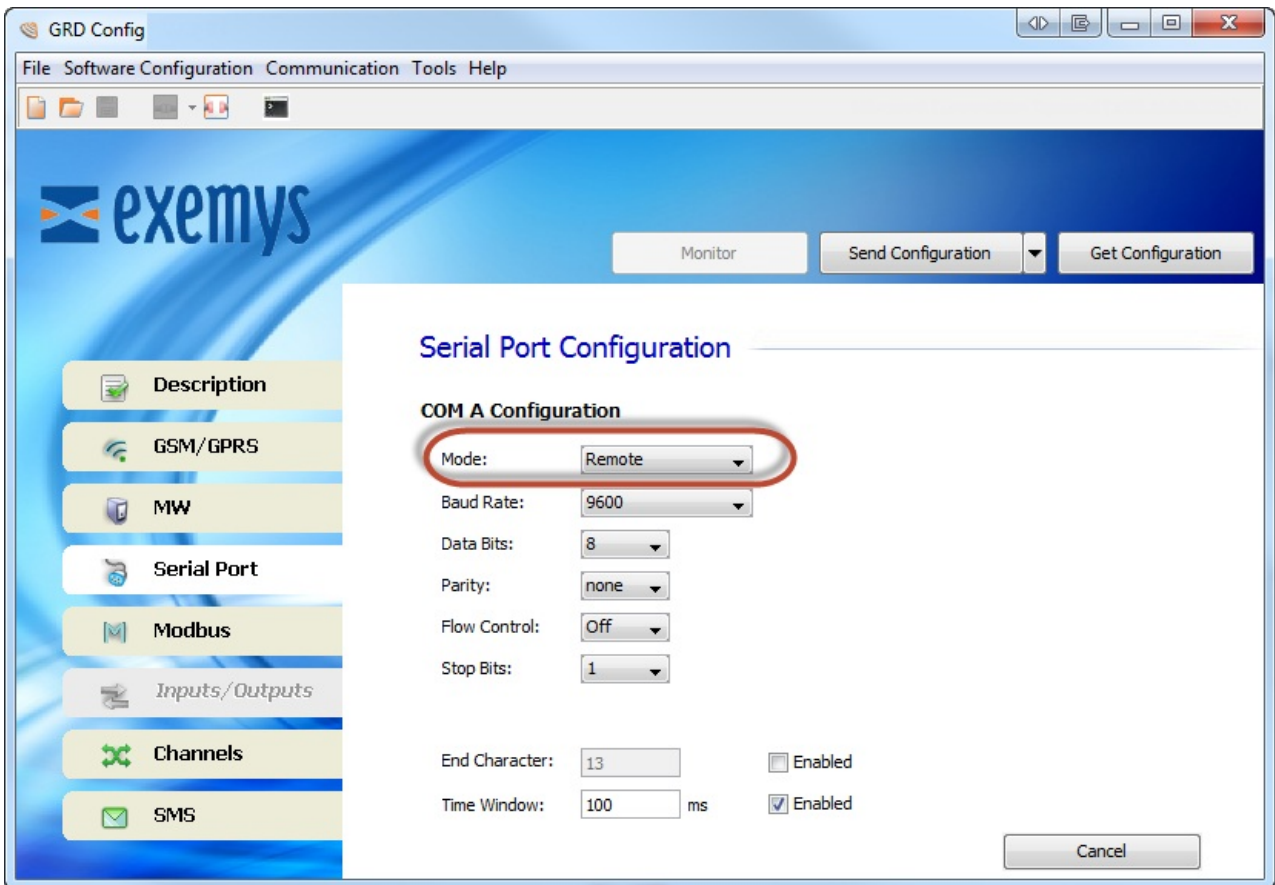
In the same manner, the slaves are added for the following GRD, but in contrast to the previous one, this one has an ASCII communication protocol. The communication protocol is determined by the devices connected to the GRD, this means that, the required communication protocol will depend on the device to be connected.



In this manner, the two GRDs are configured from the MW side and working according to what was established in the beginning.

## Serial Port Configuration

To access the GRD's serial port remotely you must configure it in "Remote" mode.



2017-11-23

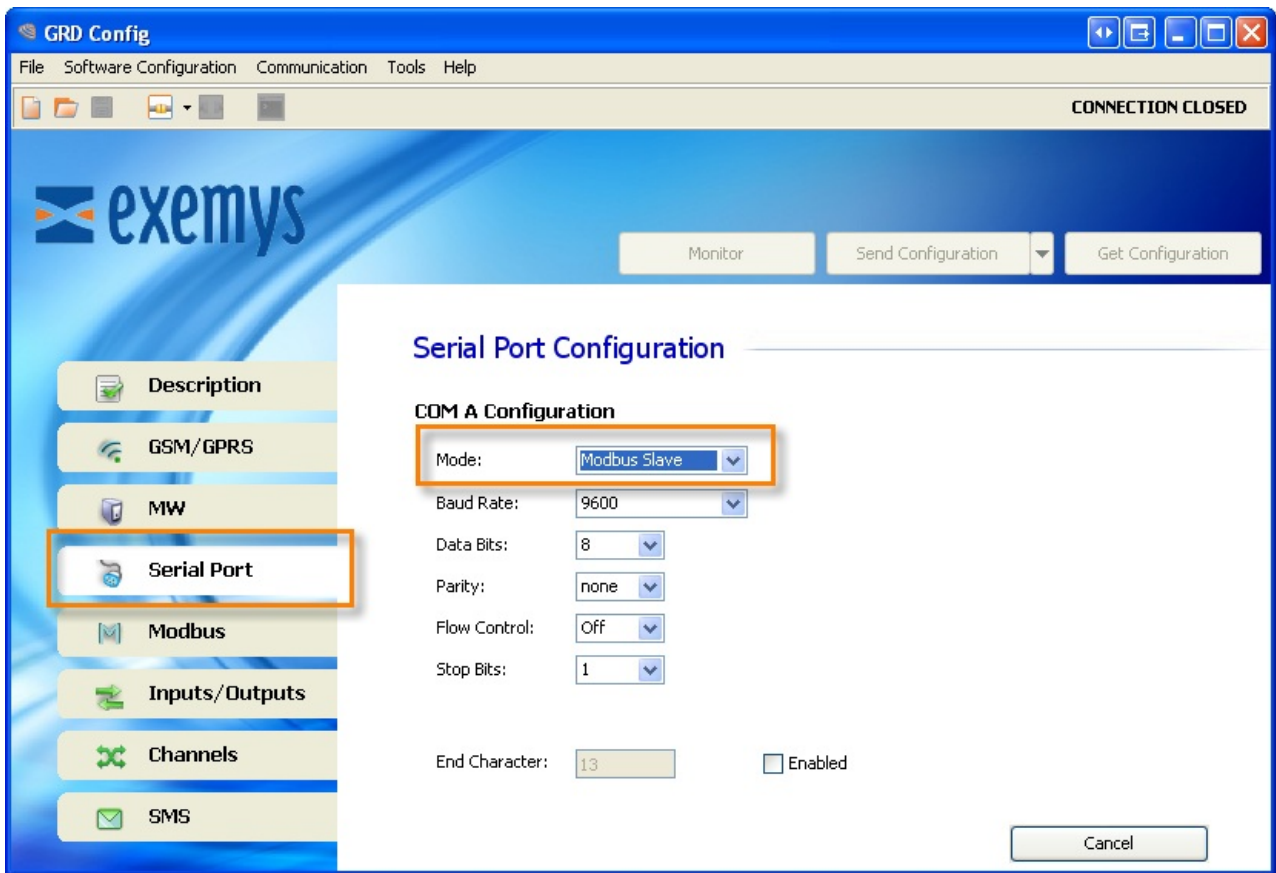


## [cLAN Modbus Slaves \(Modbus Serial and Modbus TCP\)](#)

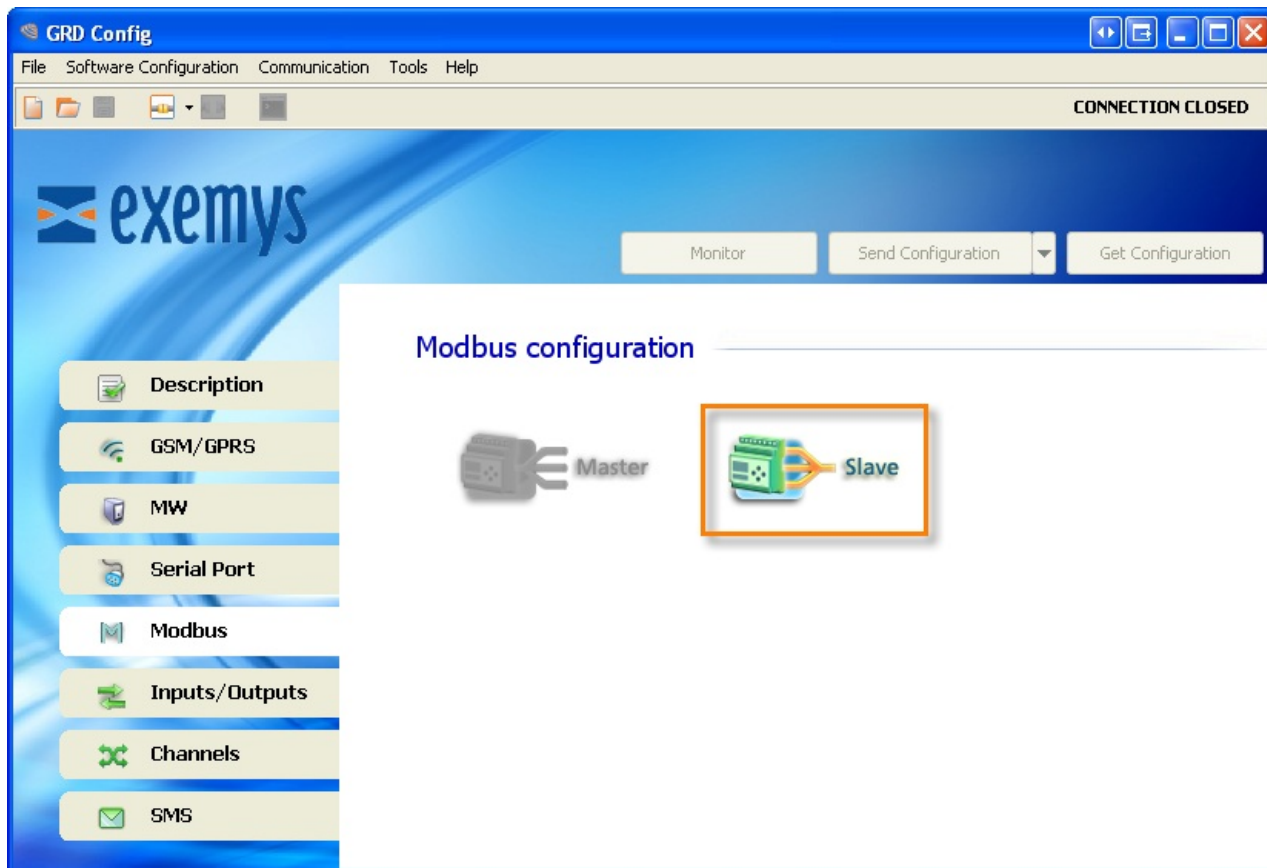
The cLAN has two Modbus slaves that can be used to read the value of the device's channels. One slave can be configured in one serial port (Modbus RTU or Modbus ASCII). The other one in it's Ethernet port (Modbus TCP)

### [Serial Modbus slave configuration](#)

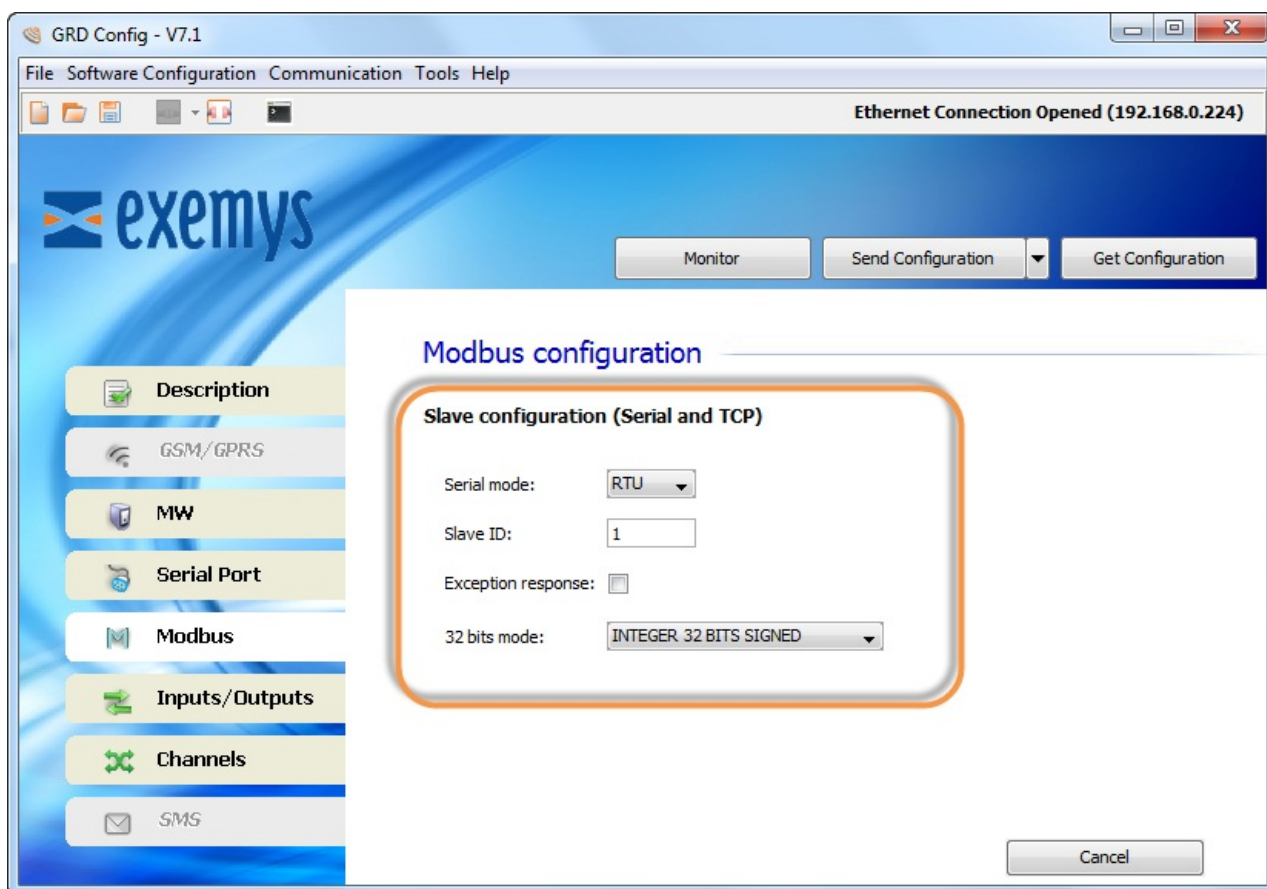
To use the serial port Modbus slave configure one serial port in "Modbus Slave" mode



Then, go to the "Modbus" tab and select "Modbus Slave"



Here you can configure the following parameters



**Serial mode**

It refers to the Modbus protocol to be used, being RTU or ASCII.

## Slave ID

The cLAN will answer when it receives a Modbus query to this Modbus slave ID

## Exceptions

If enabled the cLAN will answer with an exception to a query sent with an invalid command, address range or value.

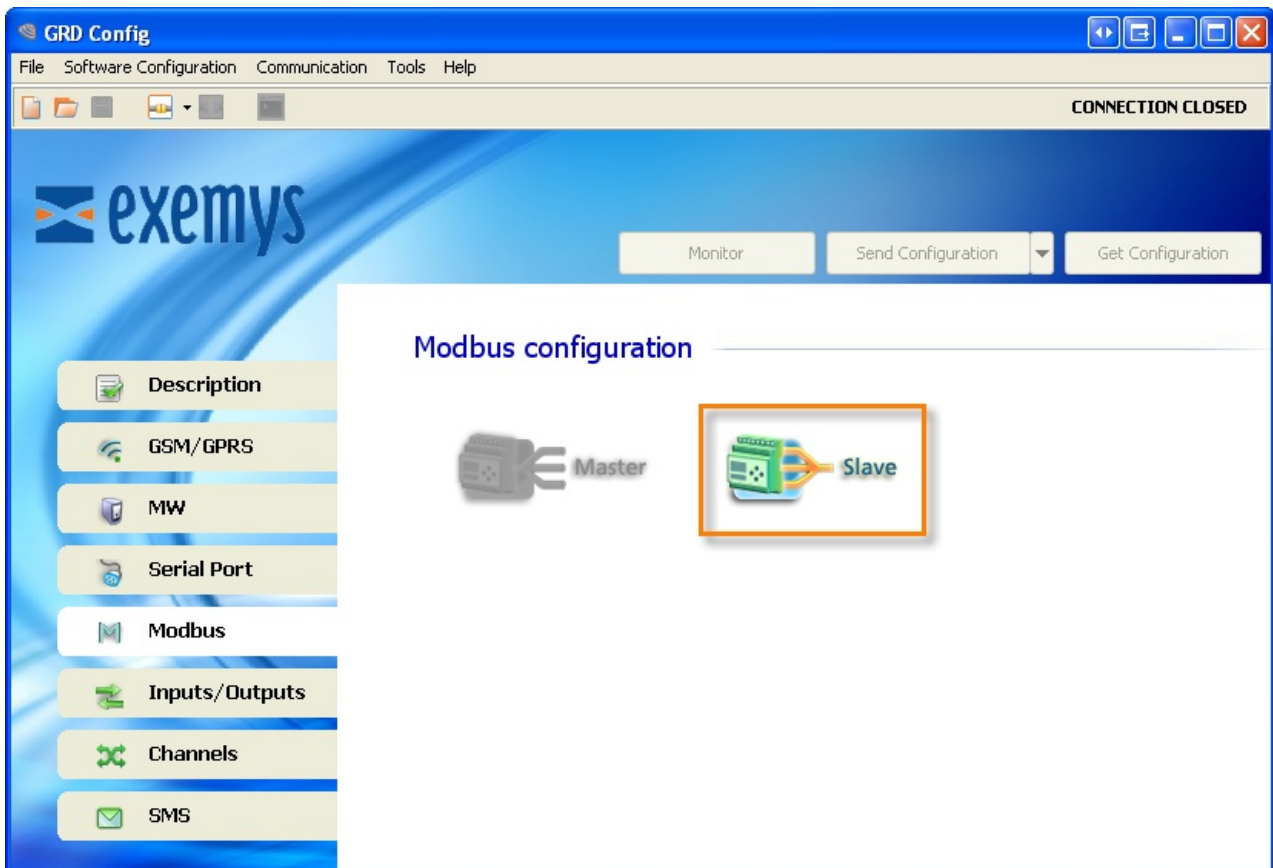
## 32 bits mode

AN an P channels are mapped in 32 bit registers. Here you can configure if the most significant word is mapped in the first or the second register

## Ethernet Modbus (Modbus TCP) slave configuration

The Modbus TCP is always enabled. The cLAN will answer the Modbus TCP queries on port 502. It can support up to four simultaneous connections.

Go to the “Modbus” tab and select “Modbus Slave”



Here you can configure the following parameters:

## Slave ID

The cLAN will answer when it receives a Modbus query to this Modbus slave ID

## Exceptions

If enabled the cLAN will answer with an exception to a query sent with an invalid command, address range or value.

**32 bits mode**

Pulse channels are mapped in 32 bit registers. Here you can configure if the most significant word is mapped in the first or the second register

**Channels mapping**

This is how cLAN channels are mapped

Start Address	End Address	cLAN Channel	Format
10001	10100	I1 a I100	Bit
00001	00100	O1 a O100	Bit
40001	40200	AN1 a AN100	32 Bits integer
40201	40400	PI1 a PI100	32 Bits integer

Example. On a cLAN-3524-XF with the default configuration, the physical I/Os are mapped like this

Start Address	End Address	cLAN Channel
10001	10016	I1 a I16
00001	00008	O1 a O8
40001	40016	AN1 a AN8
40201	40216	PI1 a PI8

2019-07-18

# Script Programming

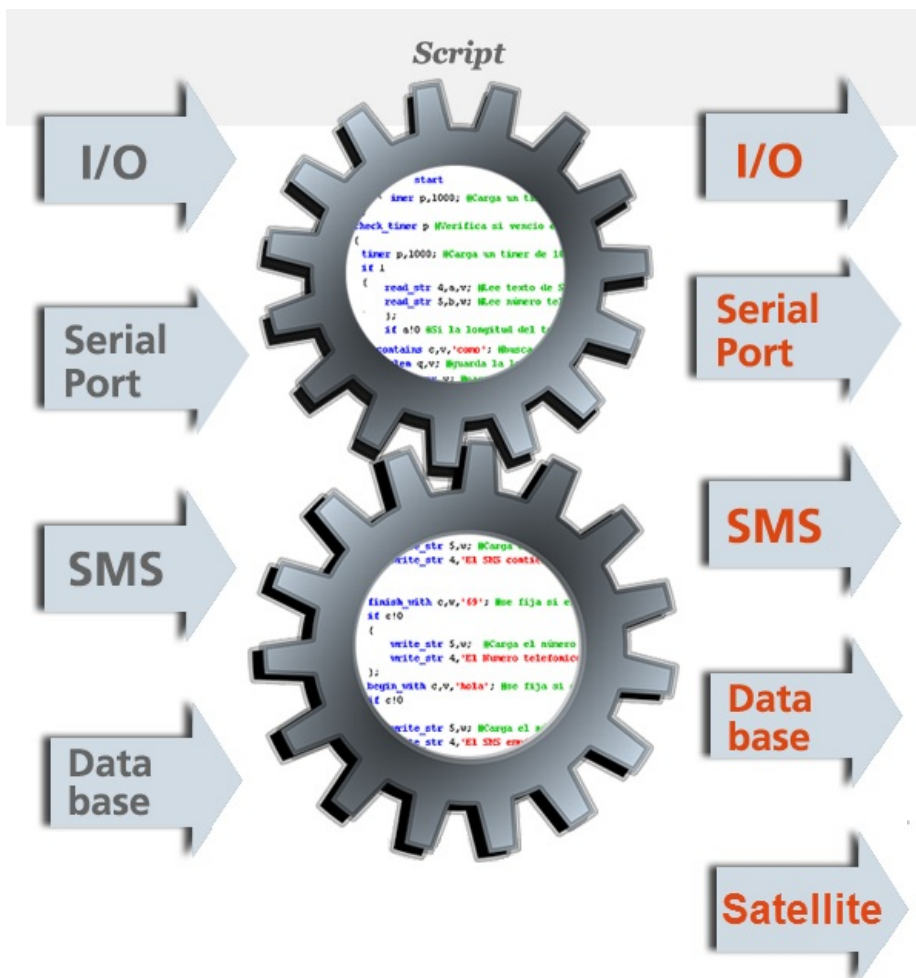
## Description

The GRD/cLAN with script programming support allows you to run user written scripts on the device, making it more powerful and flexible.

The GRD/cLAN will continue working normally while the script is running.

## Script Features

- **Math** operations
- **Logic** operations
- **Timing** functions
- Physical and Modbus channels readings
- Digital outputs control
- **SMS** sending and receiving (GRD only)
- **Serial port** data parsing
- Sending and receiving data using external **Satellite** modem



2017-06-14

## Satellite modem support

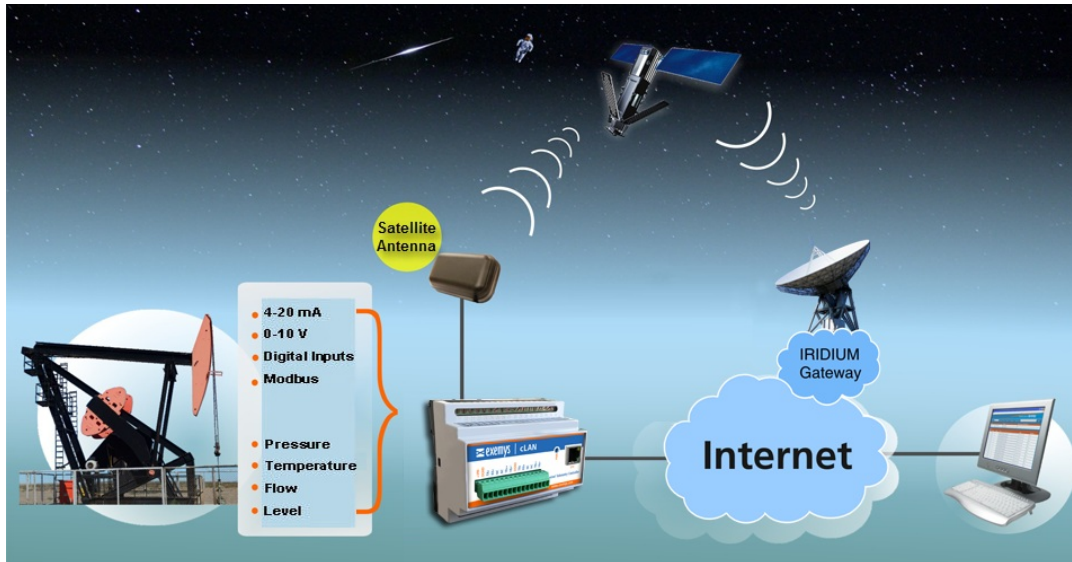
### Introduction

If you connect an SBD Iridium modem (EDGE or ITAS) to the cLAN serial port, you can send historical records to the Middleware using the Iridium satellite network.

The satellite modem can be used as a backup link the Ethernet port or as the main method to send data.

**The satellite modem is controlled using the script programming feature. Please the read the script programmer user's manual to know more about it.**

The information sent will be finally received by the Middleware.

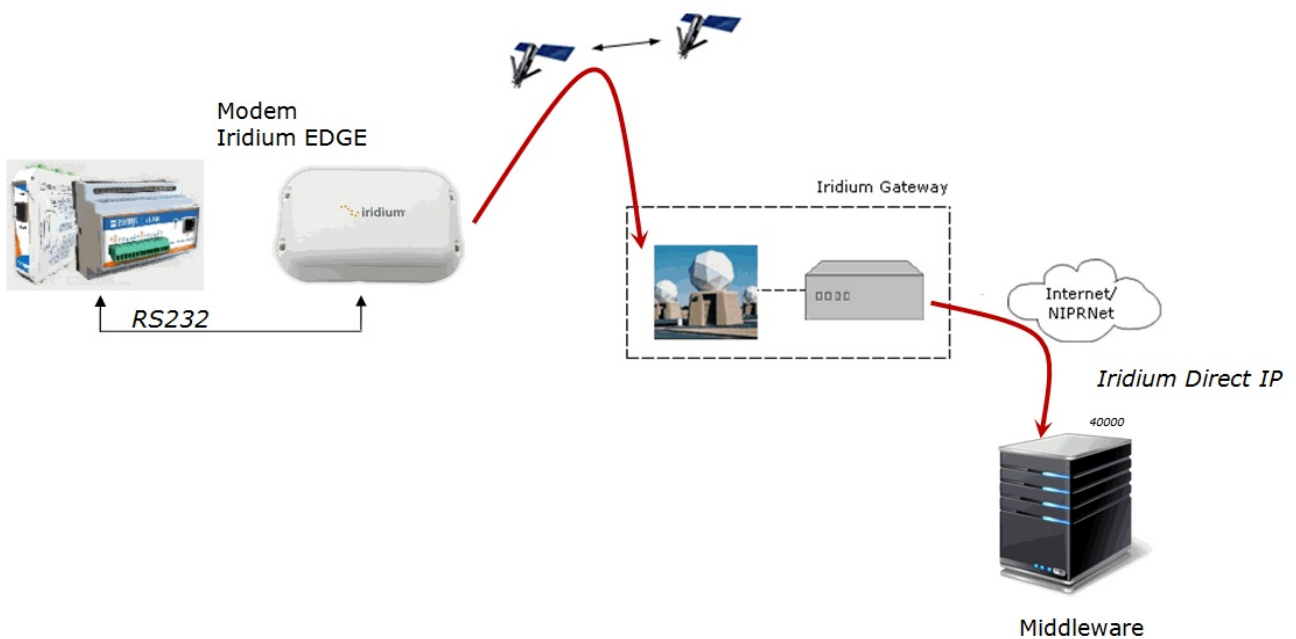


### Communication

The records sent using the satellite modem are forwarded by the Iridium gateway to an IP address and port defined when hiring the SBD service.

The Middleware can received data from the Iridium gateway on the "GRD server" port (40000). It will use the modem IMEI (Mobile System Equipment Identity) to link the received data to an ID.

Middleware version must be 4.4.0 or higher.



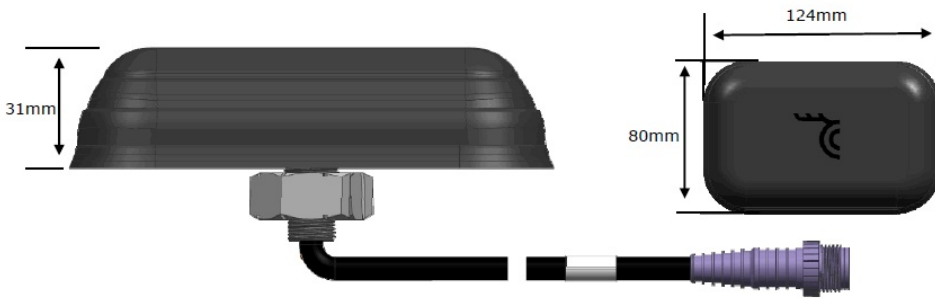
### Satellite modem and service

The Iridium EDGE/ITAS modem uses the SBD service to send data. You must hire this service from an authorized dealer.



The EDGE modem has a unique ordering code (**IR EDGE1601**)

The recommend ITAS models are **HIRD-SX-0129x-30** or **HIRD-SX-0129x-01** in second place. Both models can also be named **ITAS 832SP**



When hiring the service you must ask to link it to the modem's IMEI and to send the data to the IP address and port (40000) where you are running the Middleware. This method to send IP data is called *DirectIP* by Iridium.

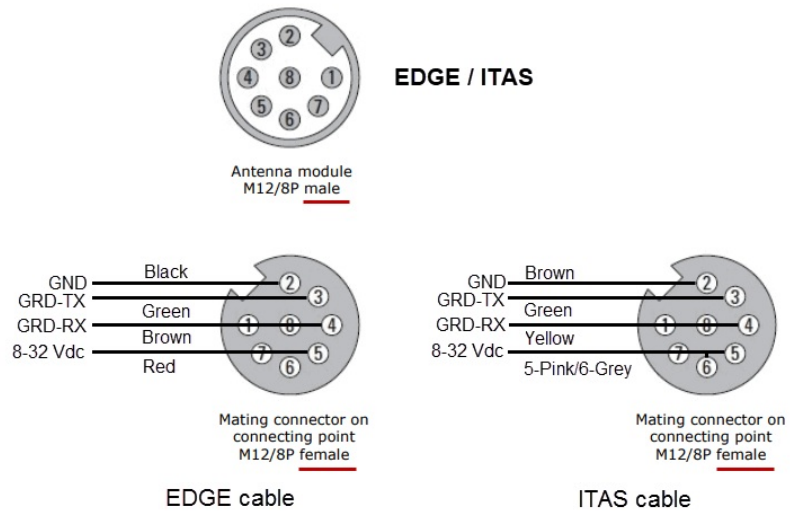
You can find the IMEI on a label on the modem's bottom



**Wiring the modem**

The modem is connected to the cLAN using an RS232 cable.

Pin	Male M12/8 on antenna module
1	Chassis Gnd
2	Signal Gnd
3	Rx
4	Tx
5	Power in
6	On/Off Control <small>HIRD-SX-0129x-01 only</small>
7	Network status
8	Tamper detect



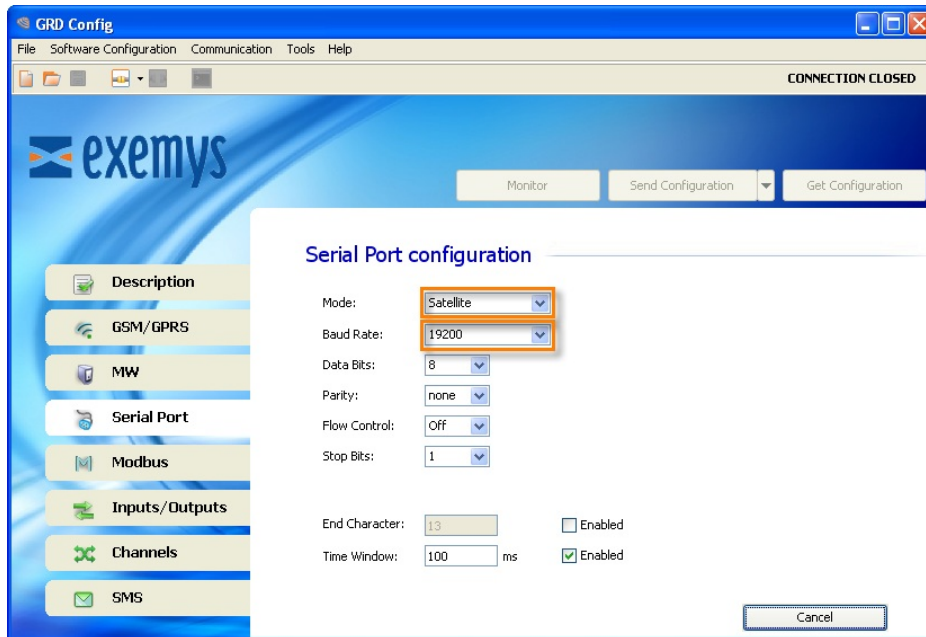
It is recommended to share the same power supply between the cLAN and the modem.

Pin 6 needs only to be connected on ITAS **HIRD-SX-0129x-01**

**Configuration**

**GRD Config**

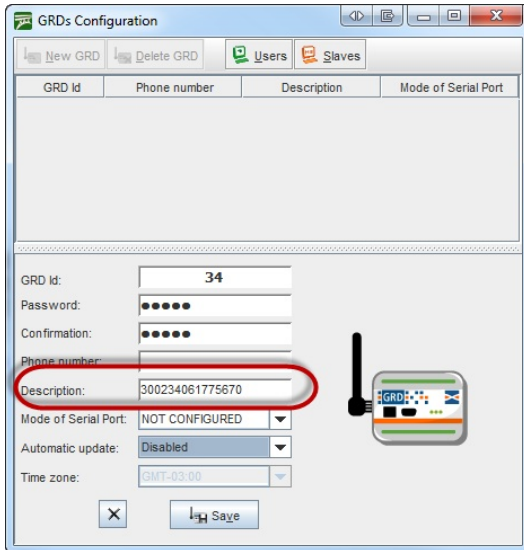
Use the "GRD Config" software to configure the serial port as shown on the following picture.



**Middleware**

The Middleware version must 4.4.0 or higher to receive satellite data on the "GRD server" port.

You only need to configure the modem's IMEI in the "Description" field as shown here:



**[Creating historical records](#)**

Historical records to be sent by the satellite modem can be configured on every channel as usual.

To optimize when to create historical records you can also use the script programming feature.

2020-07-06



For cLAN V2.5+ and GRD Config V9.0+

## SNMP agent with traps

### How it works

The cLAN can work as a SNMP agent. This allows the user to get the valor of the digital an analog channel from a SMNP manager.

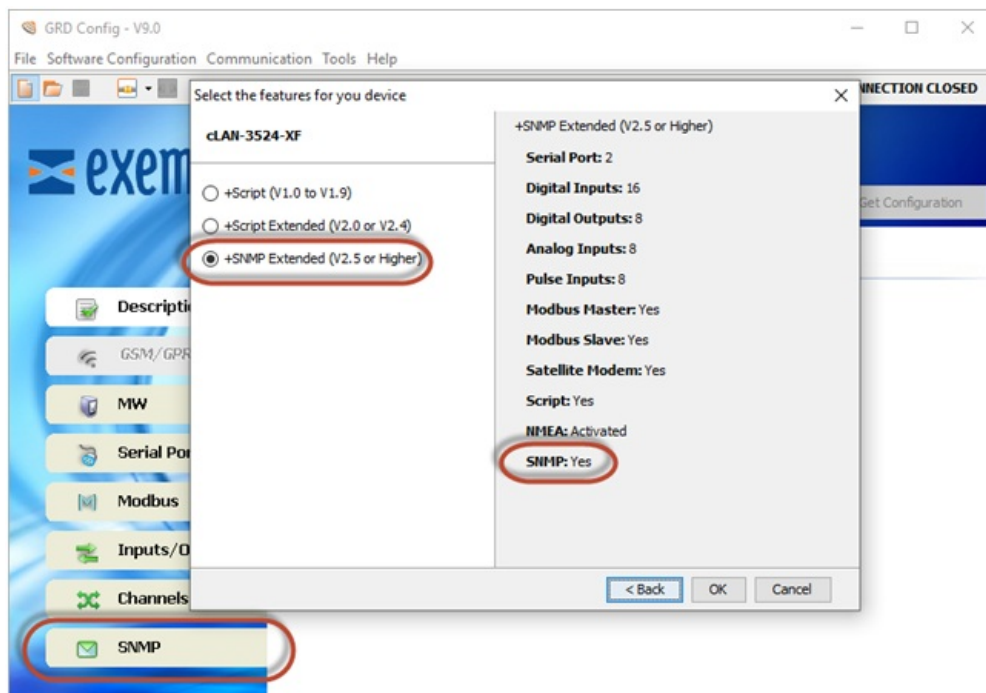
It can send SNMP traps also. They can be triggered by a change on a digital input or if an analog input goes over a high/low value.

For this type of solution the following procedure must be followed:

- Install the cLAN.
- Install the configuration software (“GRD Config”) V9.0+, this application will allow us to configure all cLAN parameters locally or remotely.
- Configure the inputs/outputs in the cLAN according to their utilization:
  - Physical inputs/outputs
  - External Modbus inputs/outputs.
    - Configure the cLAN serial port.
    - Configure the “Embedded Modbus master” and the queries we want it to make.
  - Enable traps in case your SNMP manager can handle them
- Configure the channels and enable the desired **reports** and **historical** records

### SNMP agent configuration

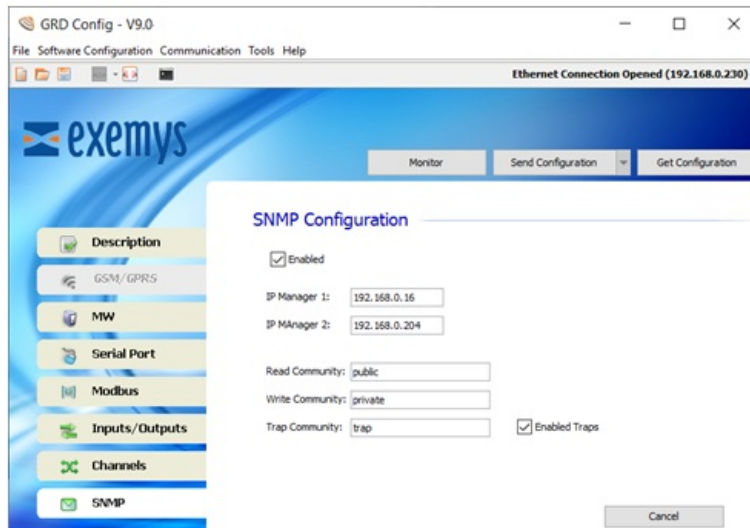
1. Install GRDconfig 9.0 or higher
2. Open GRDconfig and establish a connection to the cLAN. You should see the SNMP tab.



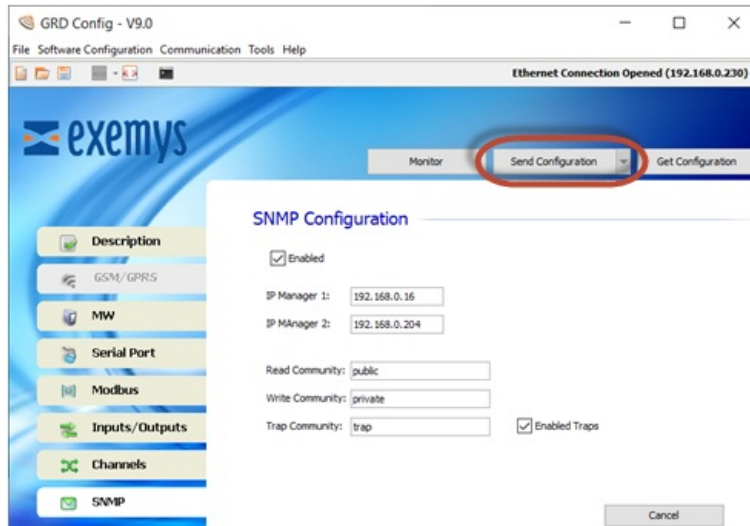
3. Click the SNMP tab and configure.

- IP Manager 1: 1st Manager to send SNMP traps
- IP Manager 2: 2nd Manager to send SNMP traps
- Read Community
- Write Community
- Trap Community.

Note: To enable this click Enable Traps first



4. Click the "Send Configuration" button to send the configuration to the cLAN.

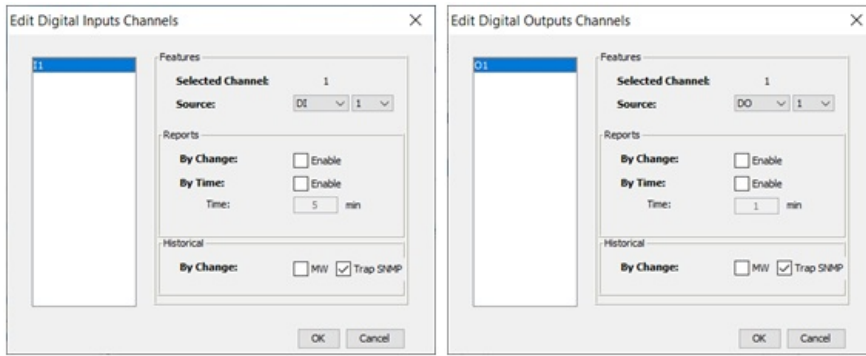


## Traps configuration

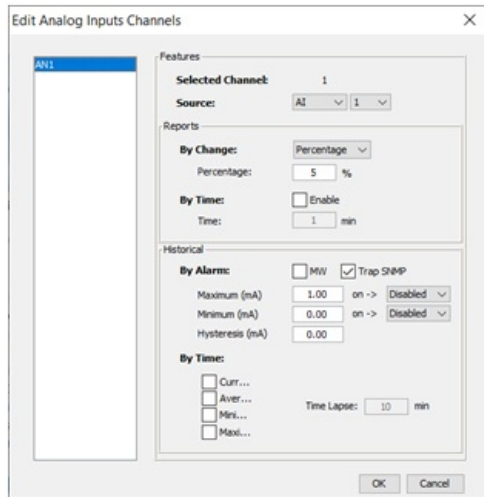
Traps are configured on each channel. Remember to enable traps and configure the trap community too.

**Digital Input Channel**

**Digital Output Channel**



**Analog Input Channel**

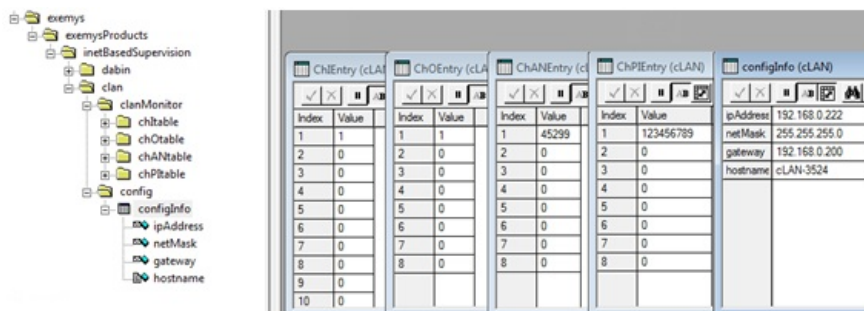


**MIB, Getting channel values and network configuration**

To be able to get the channel values you must compile the cLAN MIB in you SNMP manager (<https://www.exemys.com/beta/MIBS/CLAN.MIB>)

The cLAN will allow allow you to get the four different channels in independent tables (digital inputs, digital outputs, analog inputs, pulse inputs)

The IP address, netmask, gateway and host name are also mapped.



The device will also answer with the values of the MIB-II objects sysDescr, sysOID and sysUpTime.

2020-07-20

## cLAN1205-XF

### Hardware features

- Ethernet port: RJ45 10/100 Mbit
- Serial ports: 1 RS232 and 1 RS485
- Power supply requirements: 10 to 30 Vdc
- Dimensions: 100 x 22.5 x 112 mm (Height x Width x Length)
- Operation Temperature: -15°C a +65°C

### Data Acquisition

- Modbus inputs/outputs (embedded Modbus master)
- Embedded Modbus slave
- Other protocols using script programming

### Operating modes:

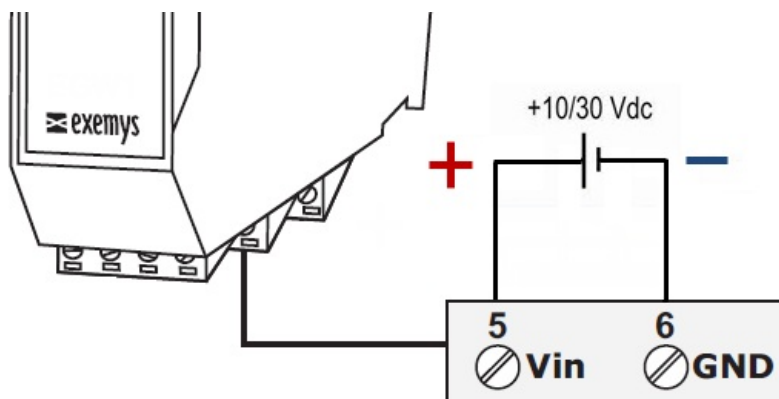
- Monitoring by WEB page / Database (Ethernet datalogger)
- Monitoring from SCADA
- Remote access to serial port
- Telemetry Controller
  - Local Modbus I/O control (using the script programming feature)
  - Direct connection with SCADA using its Modbus RTU and Modbus TCP slaves

### Server link :

- Ethernet (Local network or using the Internet)
- Satellital (with external satellite modem)

## Wiring

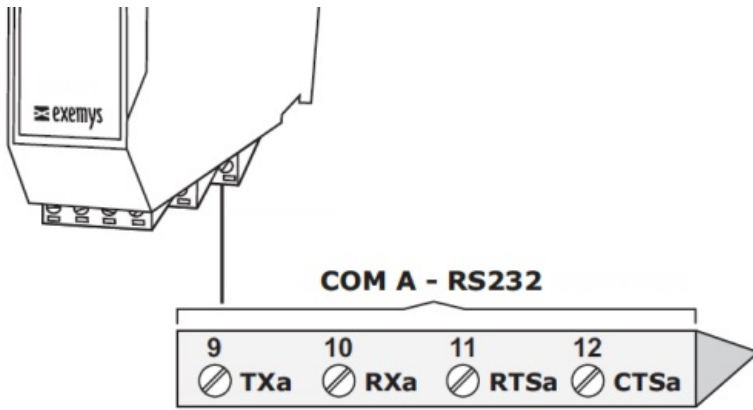
### Wiring – Power supply



### Wiring – RS232 port – RS485 port

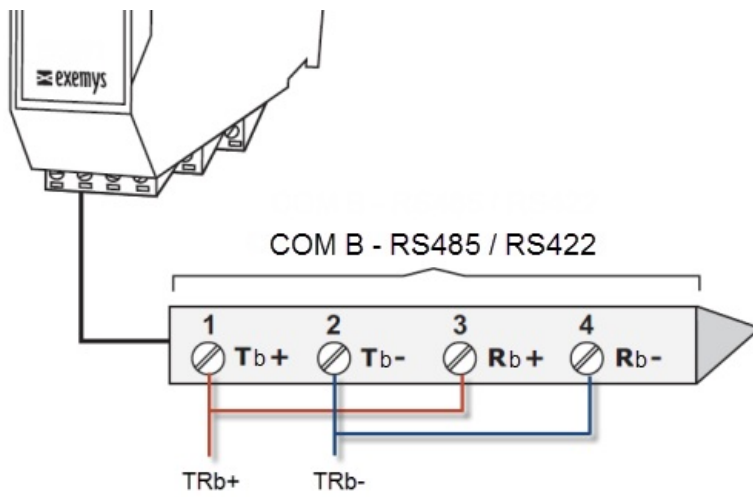
The **RS232** port is of the 5-wire DTE type (TX, RX, RTS, CTS, GND) and has a terminal board for its connections. GND can be connected to terminal 8.

The **RS485** port is of the 2-wire type (TR+ and TR-) and has a terminal board for its connections.



The **RS485/RS422** is available on 4 terminals (Tb+ y Tb-, Rb+ y Rb-).

To use it in RS485 mode put together Tb+ with Rb+ and Tb- with Rb- as shown in the following diagram



2019-11-28



## cLAN1520-XF

### Hardware features

- Ethernet port: RJ45 10/100 Mbit
- Serial ports: 2 (Both are RS232 and RS485)
- Power supply requirements: 10 to 30 Vdc
- Dimensions: 85 x 60 x 105 mm (Height x Width x Length)
- Operation Temperature: -15°C a +65°C

### Data Acquisition

- Modbus inputs/outputs (embedded Modbus master)
- Embedded Modbus slave
- Other protocols using script programming

### Operating modes:

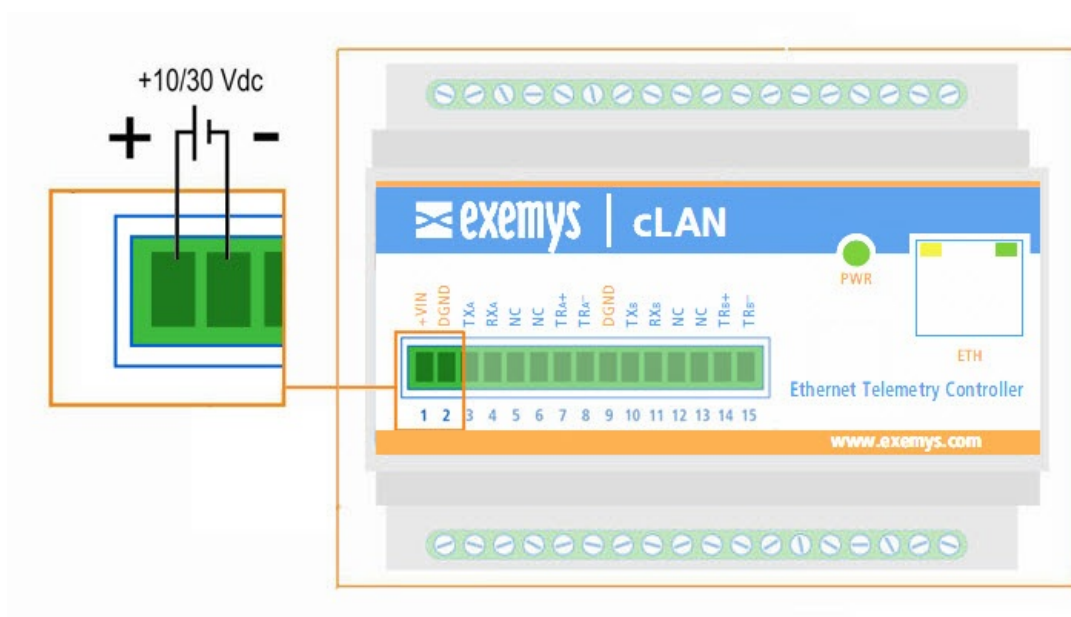
- Monitoring by WEB page / Database (Ethernet datalogger)
- Monitoring from SCADA
- Remote access to serial port
- Telemetry Controller
  - Local Modbus I/O control (using the script programming feature)
  - Direct connection with SCADA using its Modbus RTU and Modbus TCP slaves

### Server link :

- Ethernet (Local network or using the Internet)
- Satellital (with external satellite modem)

## Wiring

### Wiring – Power supply



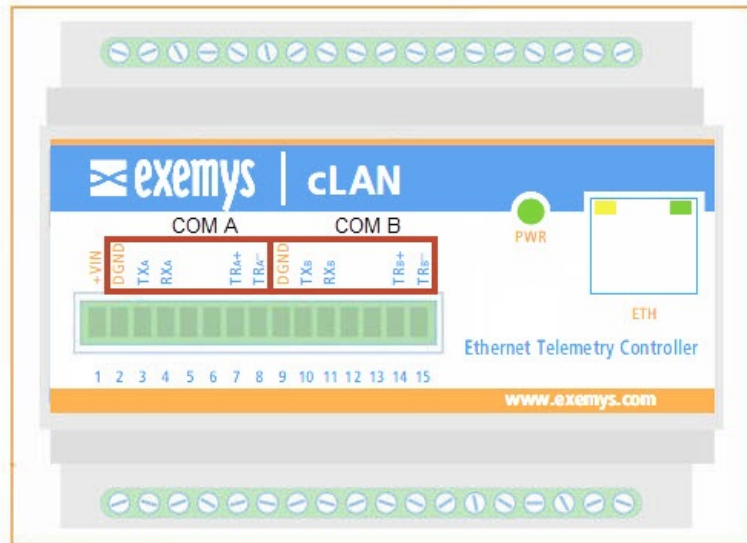
### Wiring – RS232 port – RS485 port

The **RS232** port is of the 5-wire DTE type (TX, RX, RTS, CTS, GND) and has a terminal board for its

connections.

The **RS485** port is of the 2-wire type (TR+ and TR-) and has a terminal board for its connections.

There's no need to configure whether you are going to use the port RS232 or RS485. Just connect the wires to the corresponding terminals.



2019-11-28

## cLAN2205-XF

### Hardware features

- Ethernet port: RJ45 10/100 Mbit
- Serial ports: 1 RS232 and 1 RS485
- Digital Inputs/Outputs: 10 Configurable
  - As inputs: voltage activated (They can count pulses of up to 45 Hz)
  - As outputs: open collector type
- Power supply requirements: 10 to 30 Vdc
- Dimensions: 100 x 22.5 x 112 mm (Height x Width x Length)
- Operation Temperature: -15°C a +65°C

### Data Acquisition

- Physical inputs/outputs
- Modbus inputs/outputs (embedded Modbus master)
- Embedded Modbus slave
- Other protocols using script programming

### Operating modes:

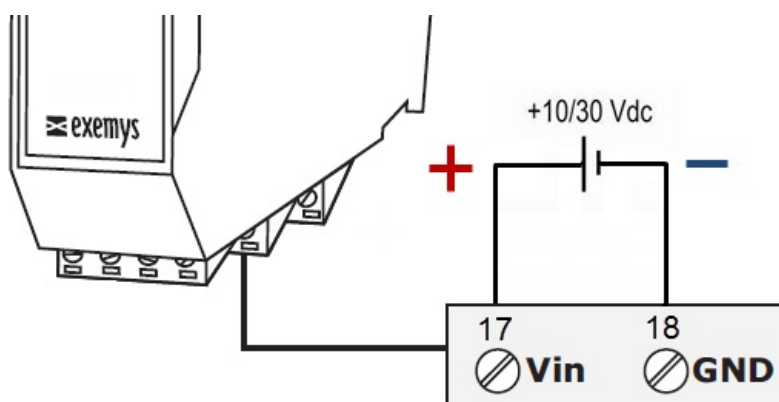
- Monitoring by WEB page / Database (Ethernet datalogger)
- Monitoring from SCADA
- Remote access to serial port
- Telemetry Controller
  - Local I/O control (using the script programming feature)
  - Direct connection with SCADA using its Modbus RTU and Modbus TCP slaves

### Server link :

- Ethernet (Local network or using the Internet)
- Satellital (with external satellite modem)

## Wiring

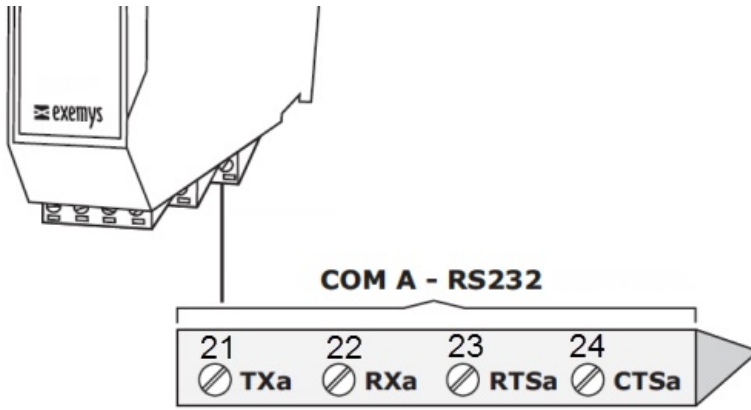
### Wiring – Power supply



### Wiring – RS232 port – RS485 port

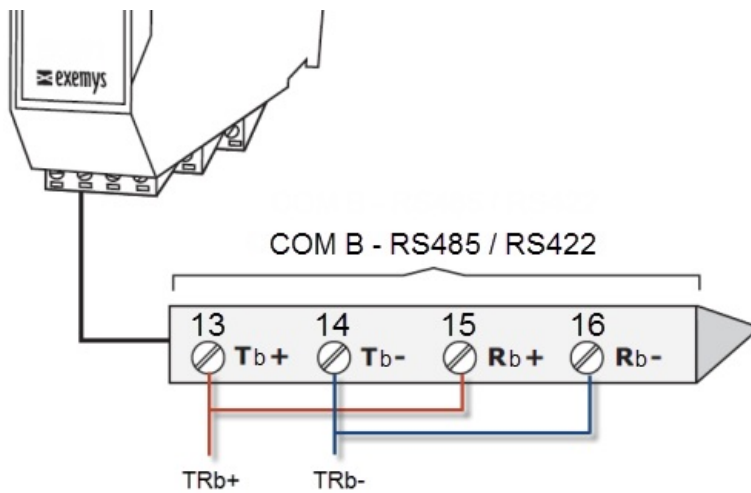
The **RS232** port is of the 5-wire DTE type (TX, RX, RTS, CTS, GND) and has a terminal board for its connections. GND can be connected to terminal 8.

The **RS485** port is of the 2-wire type (TR+ and TR-) and has a terminal board for its connections.

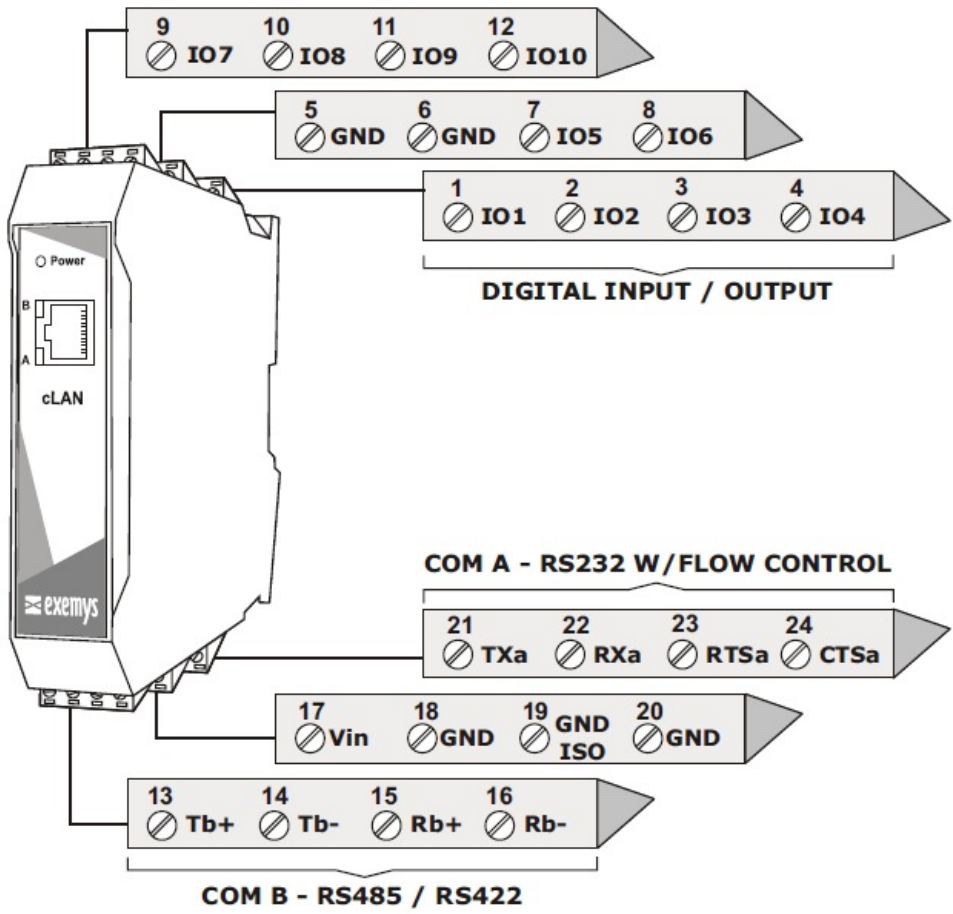


The **RS485/RS422** is available on 4 terminals (Tb+ y Tb-, Rb+ y Rb-).

To use it in RS485 mode put together Tb+ with Rb+ and Tb- with Rb- as shown in the following diagram



## Wiring – Inputs / Outputs



2019-11-28

## cLAN3404-XF

### Hardware features

- Ethernet port: RJ45 10/100 Mbit
- Serial ports: 1 RS232
- Analog Inputs: 8 diferential and configurable as 0-1V / 0-10V / 4-20mA
- Power supply requirements: 10 to 30 Vdc
- Dimensions: 100 x 22.5 x 112 mm (Height x Width x Length)
- Operation Temperature: -15°C a +65°C

### Data Acquisition

- Physical analog inputs
- Modbus inputs/outputs (embedded Modbus master)
- Embedded Modbus slave
- Other protocols using script programming

### Operating modes:

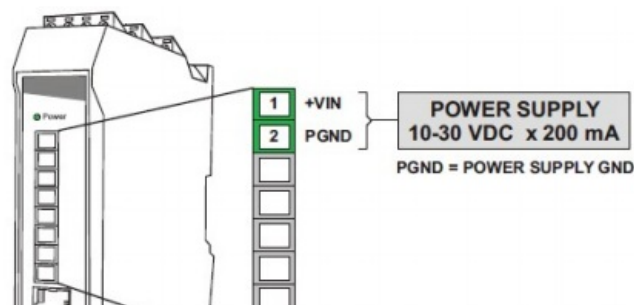
- Monitoring by WEB page / Database (Ethernet datalogger)
- Monitoring from SCADA
- Remote access to serial port
- Telemetry Controller
  - Local I/O control (using the script programming feature)
  - Direct connection with SCADA using its Modbus RTU and Modbus TCP slaves

### Server link :

- Ethernet (Local network or using the Internet)
- Satellital (with external satellite modem)

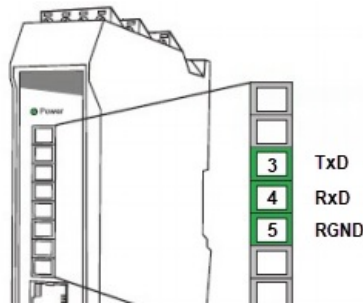
## Wiring

### Wiring – Power supply



### Wiring – RS232 port

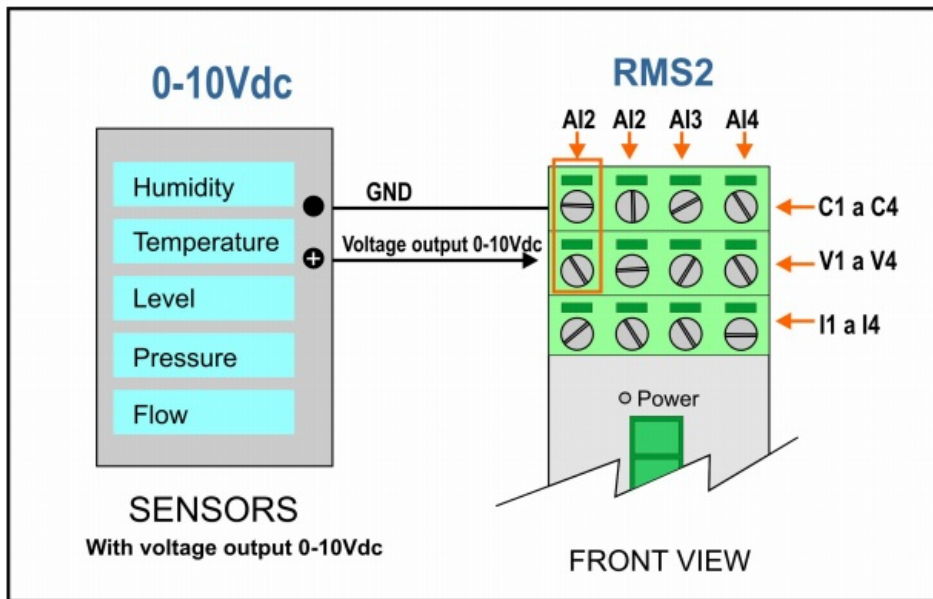
The **RS232** port is of the 3-wire DTE type (TX, RX, RGND) and has a terminal board for its connections.



## Wiring – Analog Inputs

### Voltage input wiring (0-10V):

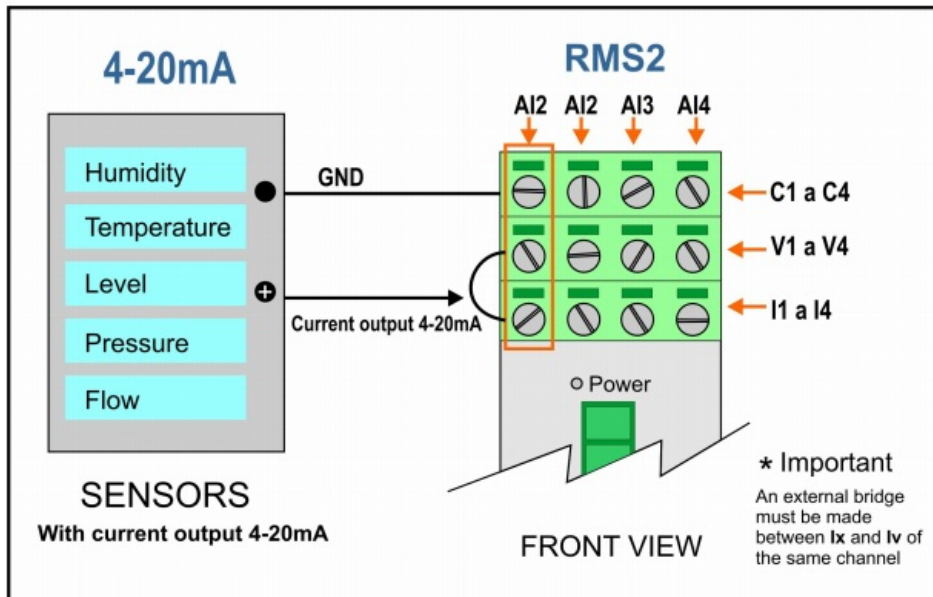
Sensors with voltage output (0-10V) can be connected to the device as shown in the following image



### Current input wiring (4-20mA):

In this case, sensors with current loop output (4-20mA) can be connected to the device as shown in the following image.

The input impedance value of each track is 62Ω.



2020-07-20



## cLAN3524-XF

### Hardware features

- Ethernet port: RJ45 10/100 Mbit
- Serial ports: 2 (Both are RS232 and RS485)
- Digital Inputs : 16 voltage activated (8 of them can count pulses of up to 1 KHz)
- Analog Inputs: 8 configurable as 0-1V / 0-10V / 4-20mA
- Digital Outputs: 8 open collector type
- Power supply requirements: 10 to 30 Vdc
- Dimensions: 85 x 60 x 105 mm (Height x Width x Length)
- Operation Temperature: -15°C a +65°C

### Data Acquisition

- Physical inputs/outputs
- Modbus inputs/outputs (embedded Modbus master)
- Embedded Modbus slave
- Other protocols using script programming

### Operating modes:

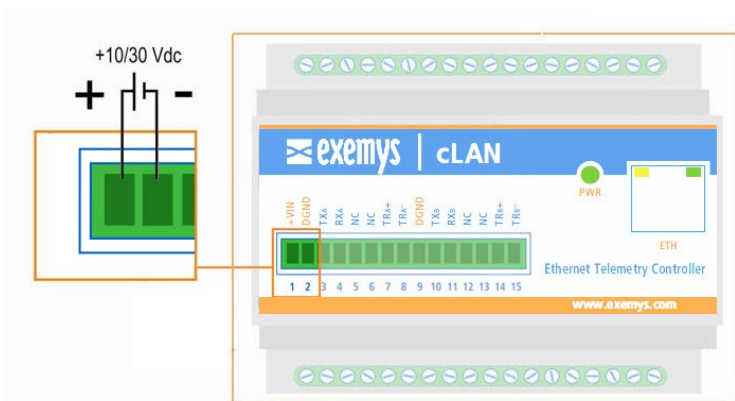
- Monitoring by WEB page / Database (Ethernet datalogger)
- Monitoring from SCADA
- Remote access to serial port
- Telemetry Controller
  - Local I/O control (using the script programming feature)
  - Direct connection with SCADA using its Modbus RTU and Modbus TCP slaves

### Server link :

- Ethernet (Local network or using the Internet)
- Satellital (with external satellite modem)

## Wiring

### Wiring – Power supply

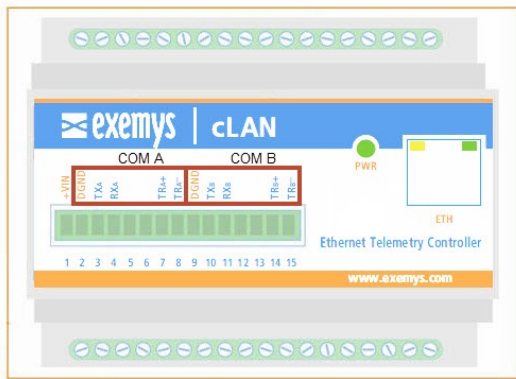


### Wiring – RS232 port – RS485 port

The **RS232** port is of the 5-wire DTE type (TX, RX, RTS, CTS, GND) and has a terminal board for its connections.

The **RS485** port is of the 2-wire type (TR+ and TR-) and has a terminal board for its connections.

There's no need to configure whether you are going to use the port RS232 or RS485. Just connect the wires to the corresponding terminals.



### Wiring – Inputs / Outputs

We now indicate the terminal board for the connection of inputs and outputs of the cLAN.

Ethernet Telemetry Controller									cLAN3524 - XF																										
AI01	AI02	AI03	AI04	AI05	AI06	AI07	AI08	AGND	DO01	DO02	DO03	DO04	DO05	DO06	DO07	DO08	DGND	DI16	DI15	DI14	DI13	DI12	DI11	DI10	DI09	DGND	DI08	DI07	DI06	DI05	DI04	DI03	DI02	DI01	DGND
1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	36	35	34	33	32	31	30	29	28	27	26	25	24	23	22	21	20	19

In this model it is not necessary to open the cLAN con switch between current and voltage inputs.

2019-11-28

## Troubleshooting

- **The MW connection cannot be established.**
  - The status shows “**DISABLED**” (the Green LED is off): there is no configured connection or the cLAN is waiting for the next try.
  - The status shows “**Connecting...**” (The Green LED blinks rapidly).
    - If the LED blinks rapidly during several seconds (a minute or more) verify:
      - That the equipment to which you are trying to connect is not behind a firewall which is filtering the connection. Please read the "Windows Firewall" section
      - You might not have configured the MW's public IP address and/or forgot to open the TCP port in you router. Please read the "Port forwarding" section
    - If the LED blinks rapidly a few seconds (2 or 3) and then blinks slowly verify:
      - That the IP address and port to which the cLAN is attempting to connect are the correct ones.
      - That there is no reason why the server is rejecting the connection request (ex. That is requesting identification or authentication).
- **A connection is established and then it closes**
  - Verify that there is no reason why the server is rejecting the connection request (ex. That is requesting identification or authentication).
- **The connection is established but the communication fails**
  - If the Green LED remains constantly on and it does not blink, is indicating that there is no data reception or transmission. If the Green LED blinks sporadically, it is indicating that data are being sent and/or received. In any case verify:
    - That the established TCP connection was made to the correct IP and port

For more information on troubleshooting problems please contact [support@exemys.com](mailto:support@exemys.com)

2015-08-06

## Windows Firewall configuration

The Windows "Firewall" feature is created to protect the computer from hacker attacks. The Middleware receives incoming TCP/IP connection from the GRD/cLAN and the firewall can block them.

The easiest way to avoid firewall issues is to disable it. But this can be considered unsafe. So we suggest adding the MW as an exception to allow incoming TCP connections from the GRD/cLAN the MW to reach it.

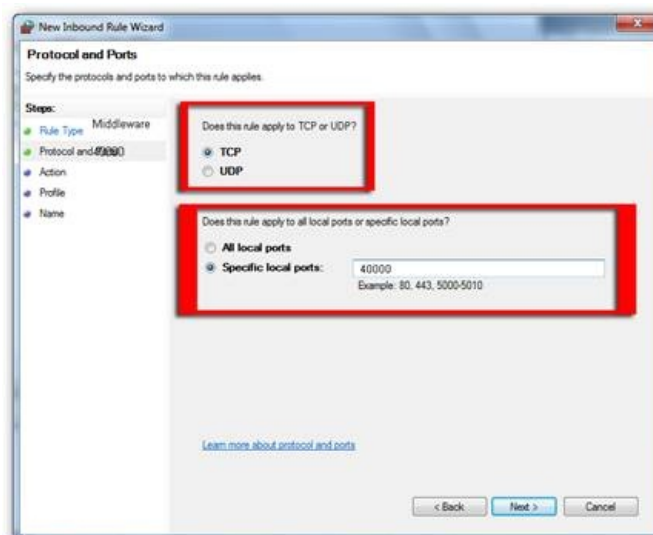
### Windows XP

- Go to Control Panel -> Windows Firewall -> Exceptions -> Add Ports



### Windows 7

- Go to Control Panel
- In the search box, type firewall, and then click Windows Firewall.
- In the left pane, click Advanced settings
- In the Windows Firewall with Advanced Security dialog box, in the left pane, click Inbound Rules, and then, in the right pane, click New Rule
- Create a new rule to allow inbound connections to TCP port 40000.



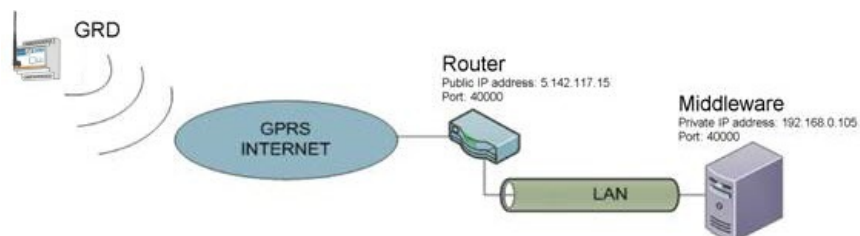
2017-06-02

## Port Forwarding

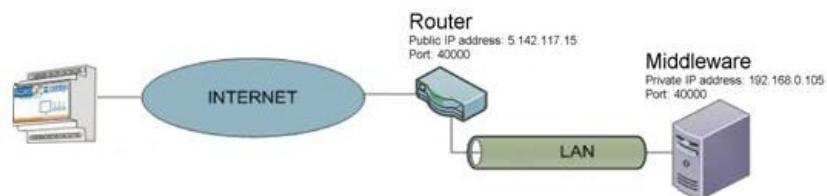
### When to consider doing it

The GRD/cLAN performs outgoing TCP connections (client) to reach the MW. You might need open a TCP port on your router (port forwarding) to allow the GRD/cLAN to reach the MW.

A) With GRD. The computer where you are running the MW doesn't have a public IP address, but it's connected to the internet using a router .



B) With cLAN. If the device is using the Internet to reach then MW, and the computer where you are running the MW doesn't have a public IP address, but it's connected to the internet using a router .



### Getting the public IP address

Most routers will show you their public IP address in their web site "status" page. If you can't find it there you can go to any of these web sites using a browser on any computer connected to that network. They will show you your network's public IP address.

<http://whatismyipaddress.com/>

<http://ipaddress.com/>

<http://www.ip-adress.com/>

<http://www.myipaddress.com/>

<http://www.whatsmyip.org/>

### Getting the MW's private IP address

This procedure may vary a little depending on your Windows version.

In **Windows XP**, follow these steps:

- Open the Control Panel from the Start menu
- Open the Network Connections icon
- Open the icon representing your PC's network connection
- When you have more than one icon, just pick the main one
- In the Status dialog box, click on the Support tab
- The Connection Status area lists the IP address.



In **Windows 7**, follow these steps:

- Open the Network and Sharing Center window
- On the right side of the window, choose the link Local Area Connection. A dialog box appears, listing some brief information about the network connection.
- Click the Details button
- You find the PC's IP address listed as IPv4 IP Address in the Network Connection Details dialog box

In **any windows version** you can type "ipconfig" on the command prompt and get your computer's IP address

- Open the command prompt. The command prompt is usually located within the Accessories folder
- At the "Command Prompt" screen type ipconfig then press Enter
- The IP address should appear along with other LAN details in the readout

```
H:\>ipconfig
Windows IP Configuration

Ethernet adapter Local Area Connection:

    Connection-specific DNS Suffix . : 
    IP Address . . . . . : 192.168.0.105
    Subnet Mask . . . . . : 
    Default Gateway . . . . . :
```



We suggest using a fixed ip address (Not assigned by DHCP) because you will have to type this IP address on the router configuration

### [Configuring Port forwarding](#)

According to the router's manufacturer, port forwarding can also be called "virtual server", "port opening" or "NAT".

We'll give you an example here, but if it's not a good guide to configure your router please check your router's manual.

### Gaining access to the router

To configure the router you will need its IP address, user name and password.

The router's IP address is the default gateway IP address.

You can find it while determining the private IP address.

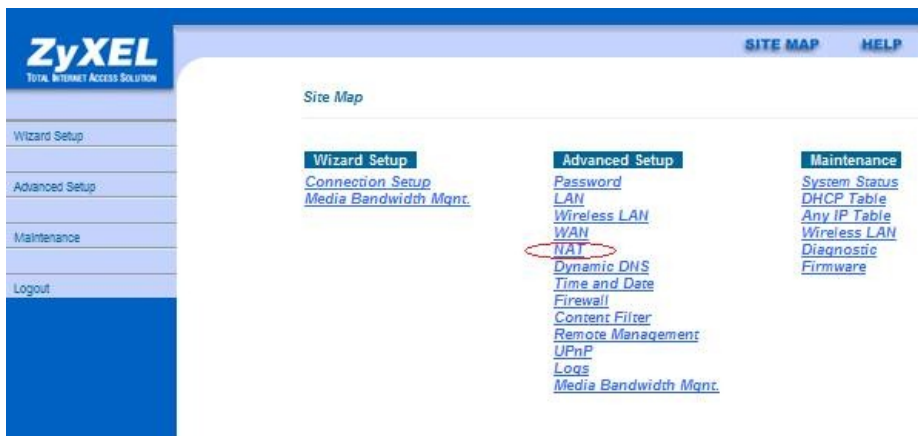
If you don't have the user name and password of your router try the default ones that you'll find on the router's user manual.

Open a browser window and type your router's IP address. You'll be prompted to enter the user name and password



### Opening the port

Once you are logged into the router's web server you can open the port used by the GRD to access the MW. The default port is TCP 40000.



You'll have to configure to

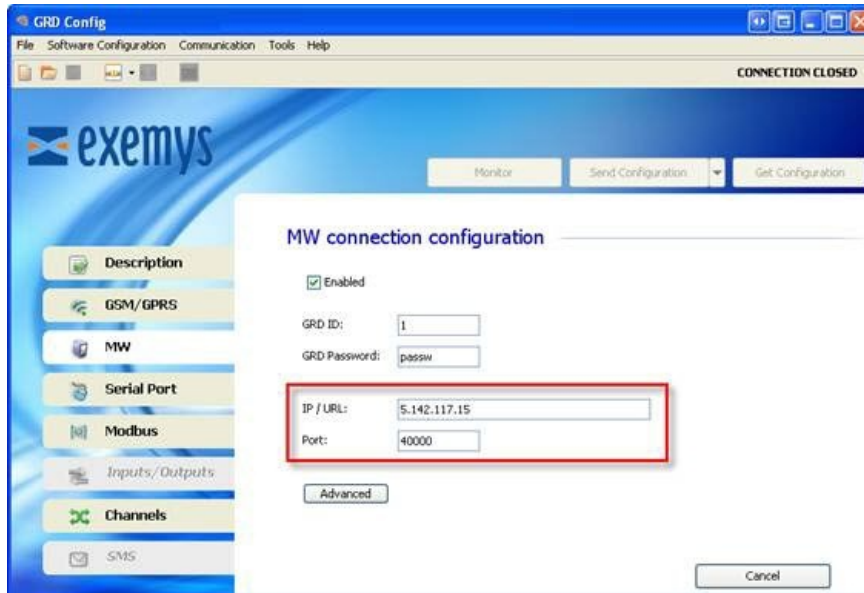
open port TCP 40000 to the MW's private IP address.

	Start Port No.	End Port No.	IP Address
1	All ports	All ports	0.0.0.0
2	40000	40000	192.168.0.105
3			
4			
5			

### Configuring the GRD/cLAN

Once the MW is ready, configure the public IP address in the cLAN/GRD configuration





### Dynamic public IP address and Dynamic DNS services (DDNS)

The MW's IP public address should be a fixed IP address in order to allow the GRD/cLAN to maintain the link with the MW.

If you don't have a public fixed IP address you can still use the GRD/cLAN and the MW in your network, but you must notice that the GRD/cLAN will lose the link to the MW as soon as the public IP changes.

You can configure the GRD to access a new IP address by SMS as described in the GRD's user manual in section "SMS alarms and configuration / SMS - Monitoring and Configuration"

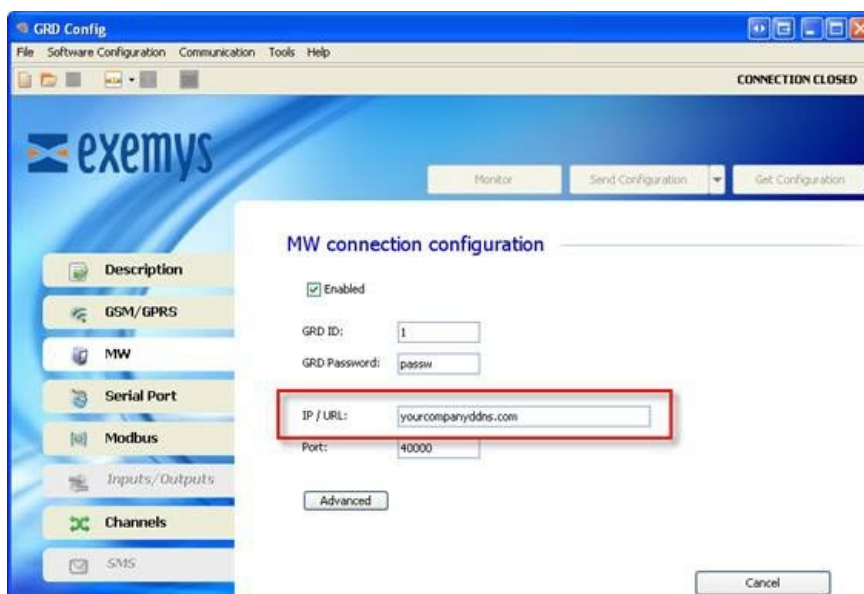
To have a permanent solution to this issue you can use any Dynamic DNS provider (DDNS). Here's a list with some of them:

[www.Dyndns.com](http://www.Dyndns.com)

[www.No-ip.com](http://www.No-ip.com)

[www.zoneedit.com/dynamicDNS.html](http://www.zoneedit.com/dynamicDNS.html)

Once you link your public IP address with a URL using one of these DDNS providers, the GRD/cLAN will re-establish the link to the MW in a few minutes every time the public IP address changes. You must then configure the URL instead of the public IP address on the GRD/cLAN.



2015-08-06

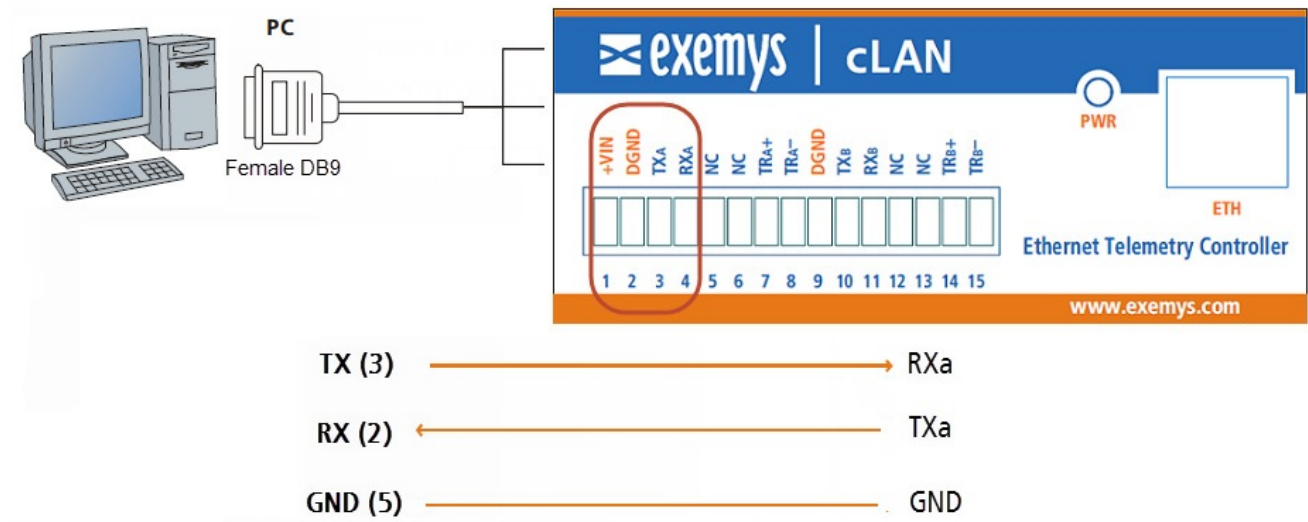
## Serial Command Console

The cLAN has a basic serial console that allows you to set the configuration to factory default values or to change the password in case you've forgotten the original one.

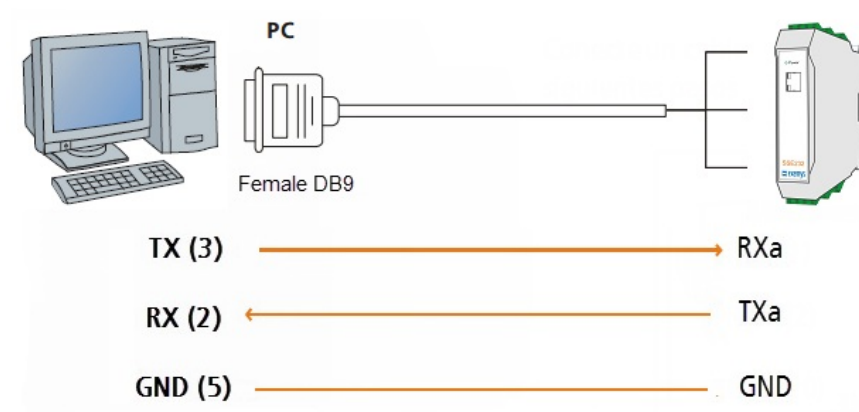
To enter the command mode you must connect your computer to the cLAN using a RS232 cable using serial terminal software (Like Hyperterminal) . We suggest you to use Exemys terminal software that you can download from this link <http://www.exemys.com/console>

### RS232 cable pin-out

On cLAN-1520-XF and cLAN-3524-XF

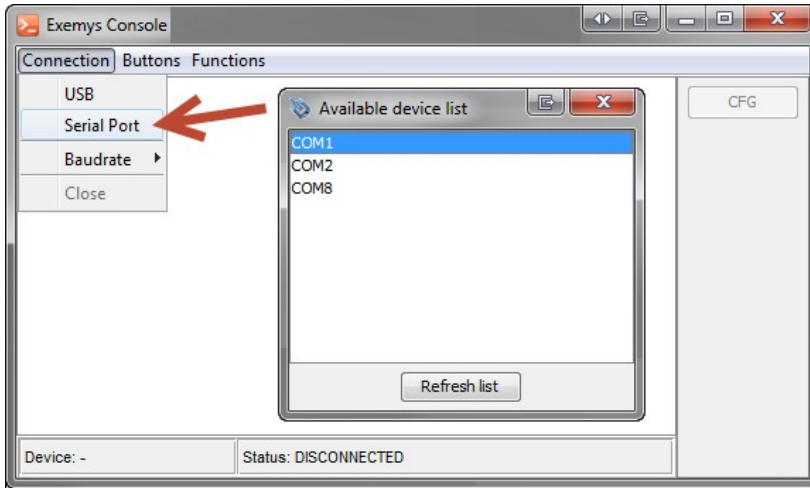


On cLAN-1205-XF and cLAN-2205-XF



### Entering command mode

Open the terminal software and select the correct COM port. Check the baud rate is configured at 9600 bps.



Power the device, and press the CFG button until you see a welcome message. You must do it within the first 7 seconds after powering the device on.

Welcome to the command console

>

Once you enter the command mode you can use these commands.

**Commands**

Command	Description
<b>FACTRESET</b>	Reset the device to factory defaults
<b>PASSWORD:xxx</b>	Change the password
<b>NETWORK:DHCP/IP, NM, GW</b>	Set network paramaters. There are two options 1) DHCP to enablea automatic IP address asigment 2) IP, NM, GW where IP if the device IP address, NM is the netmask and GW the gateway. Example: NETWORK:192.168.0.15,255.255.255.0,192.168.0.1
<b>LIST</b>	List some configuration parameters
<b>END</b>	Close the console and reset the device

**RS232 cable**

The RS232 cable must be assembled like this.

cLAN terminal block	DB9-H connector
TXa	2
TXa	3
DGND	5

**Changing the password (example)**

To set to set the password to "exemys" you must this on the console.

PASSWORD:exemys

You will receive a message acknowledging the command

Then type END to finish.

2017-12-12