USER MANUAL

Z-LINK1

869 MHz Modbus RTU Cable replace

with

Special INPUTS to OUTPUTS remote function

SENECA s.r.l.

Via Austria, 26 – 35127 – PADOVA – ITALY

Tel. +39.049.8705355 – 8705359 Fax. +39.049.8706287

Web site: www.seneca.it

Technical assistance: supporto@seneca.it (IT), support@seneca.it (Other)

Commercial reference: commerciale@seneca.it (IT), sales@seneca.it (Other)

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Date	Revision	Notes
03/06/13	1.00	First Release
06/06/17	1.01	Changed Manual for –LO version
16/05/18	1.02	Fixed Upper title
17/05/18	1.03	Fix dip switch configuration for 9600 baud
26/03/18	1.04	Deleted mesh function for –LO and –NM models

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Seneca
Z-LINK1

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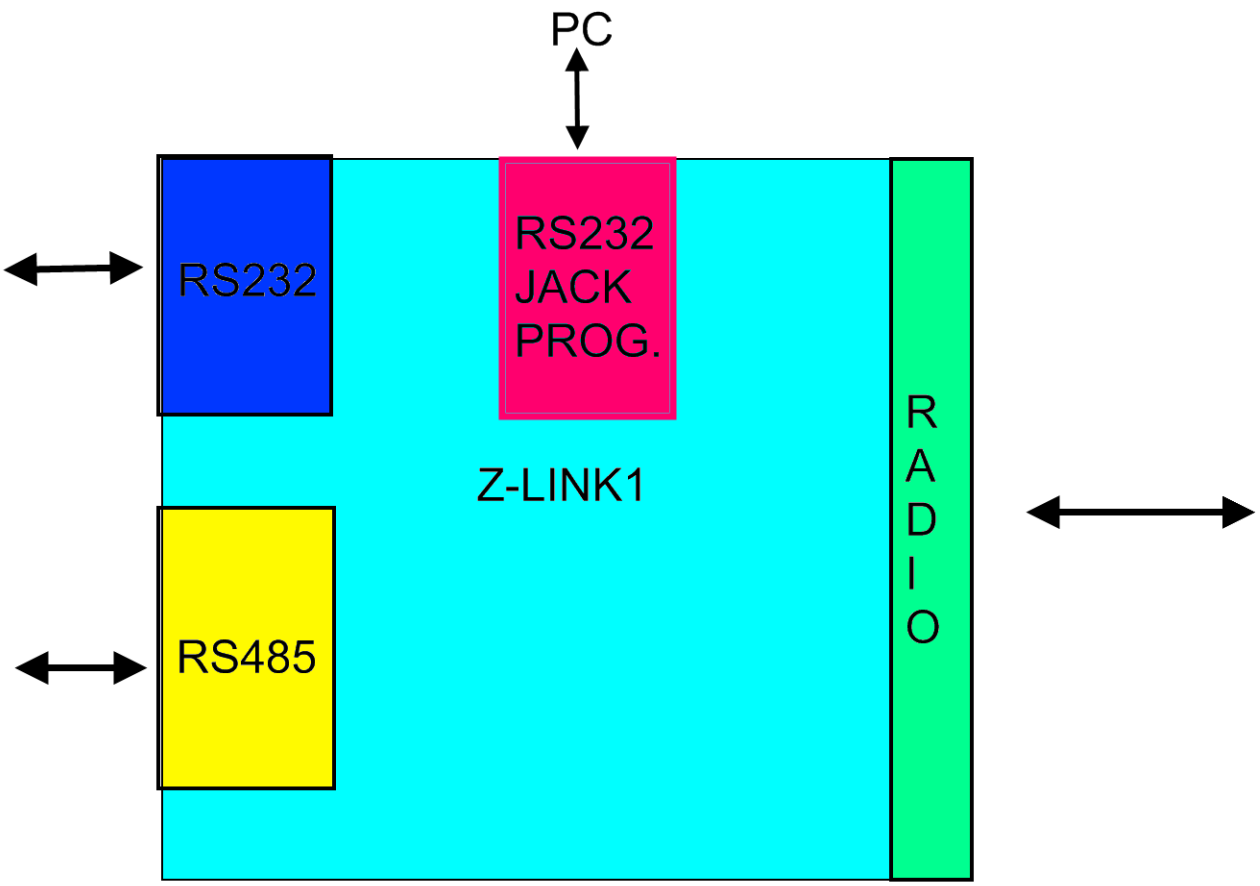
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1. INTRODUCTION

The Z-LINK1 device is designed for transferring in a transparent manner data packets compliant with the ModBus RTU standard over wireless network.

A simplified Z-LINK1 schematics is:



The RS232 jack prog. can only be used for programming Z-Link1 by a Windows ™PC.

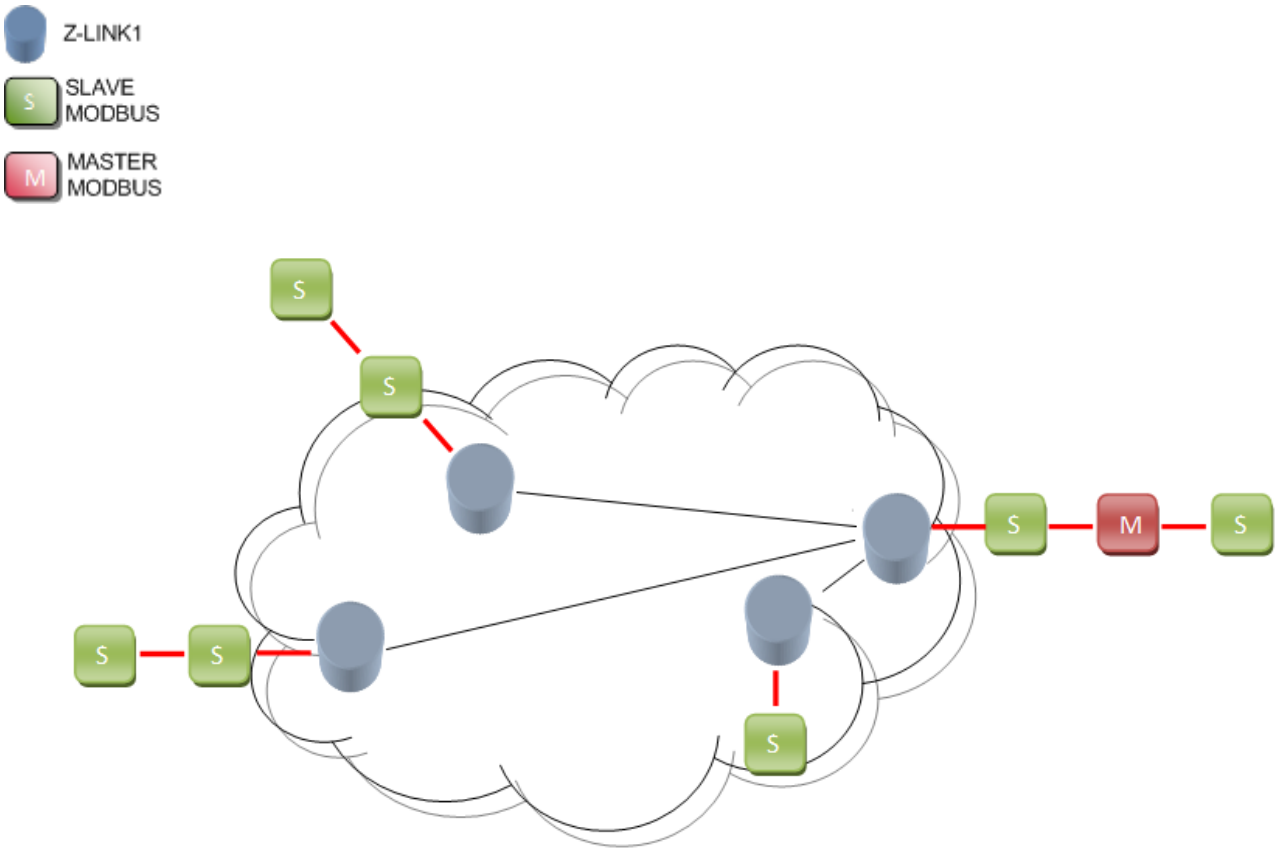
The RS232 or the RS485 can be used for connection with Modbus RTU devices.

The radio connect two or more Z-LINK1 devices.

Two working mode supported are: “Bridge mode” and “Remote I/O mode”.

The figure shows a typical application of the Z-LINK1 device in “Bridge mode” within a ModBus RTU network:

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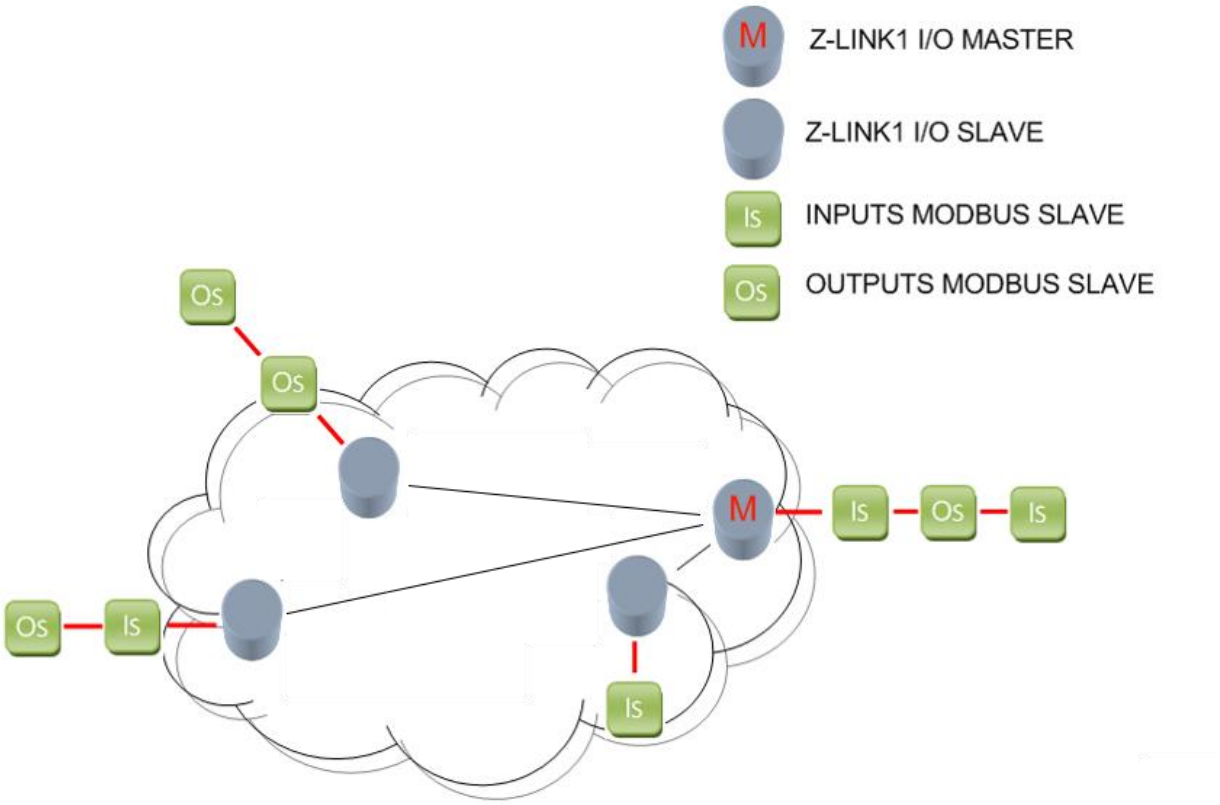


In this mode the Modbus field bus it's connected "by air" in transparent manner.

Note that the Z-LINK1 in "bridge mode" don't act as Master Modbus, you always need an external Modbus Master device.

The figure shows a typical application of the Z-LINK1 device in "Remote I/O mode" within a ModBus RTU network:

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The Inputs are replicated to the outputs. If the inputs are digital it's possible to negate it, if the inputs are analogic it's possible to scale the values. A Fault condition can be used for safe requirements.

Note that in this mode there is no need of an external Modbus RTU Master device because the Z-LINk1 act also as Modbus RTU Master on the bus.

CAUTION!

-ONLY THE MODBUS RTU PROTOCOL IS SUPPORTED

-ONLY ONE PORT (RS232 OR RS485) CAN BE USED AT THE SAME TIME

1.1. Features

- NR1 RS485 or RS232 serial communication with protocol MODBUS-RTU
- Transparent to the ModBUS RTU protocol
- Isolation between communication and power supply: 1500 Vac.
- Point to Point and Point to Multipoint networks supported
- Bridge Functioning modality configurable by DIP-switch.
- Repeater of inputs to remote outputs mode
- Easy Configuration software for easy programming by the Jack port
- Firmware update by Jack port

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1.2. General Specification

GENERAL SPECIFICATIONS	
Power supply	10..40 Vdc or 19..28 Vac (50..60 Hz)
maximum power consumption	1 W
Isolation	1500 Vac
COMMUNICATION PORTS	
RS232 Port	RJ10 connector or Screw terminals (Modbus RTU protocol Master/Slave)
RS485 Port	IDC10 connector or Screw terminals (Modbus RTU protocol Master/Slave), Max 32 devices on local bus.
Baudrate	1200..115200 configurable
Jack Port (only for programming)	Jack 3.5mm Modbus RTU fixed baudrate 9600 8,N,1 stop bit address 1 CPU, address 254 Radio CPU
WIRELESS COMMUNICATION PORT	
Frequency Band	G3 attached 1 ERC 70-03 (869.4 MHz - 869.650 MHz)
Modulation	GFSK (-NM model) DSSS (-LO model)
Class of radio module	2
Performance on free Air	-LO model: about 1000 m with the external optional antenna ANT-LINK1-MG placed at 2m From the soil -NM model: about 400 m with the external optional antenna ANT-LINK1-MG placed at 2m From the soil
Output Power (-LO model)	40 mW , 16dBm (-LO model) 20 mW, 13dBm (-NM model)
ENVIRONMENTAL CONDITIONS	
Temperature	0 °C.. +55 °C
Humidity	20 ..85% a 40 °C no condensing
Storage temperature	-25..+85 °C
STANDARDS	
Complies with	**ETSI EN 300 220-2 V2.1.2 (2007-06)** **ETSI EN 301 489-3 V1.4.1 (2002-08)** **CEI EN 61010** **It thus satisfies the basic requirements of directives:** **Radio and telecommunications terminal equipment 99/5/EC** **Electromagnetic compatibility 2004/108/EC** **Low Voltage equipment 2006/95/EC**

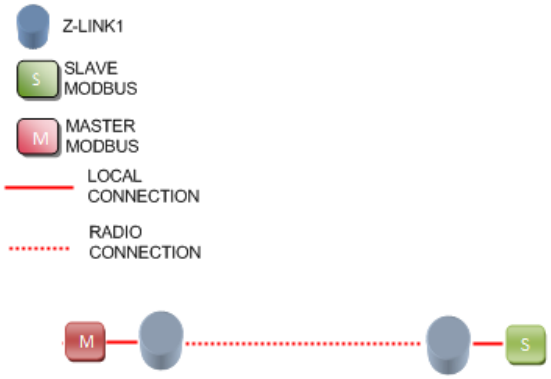
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2. Z-LINK1 BRIDGE MODE

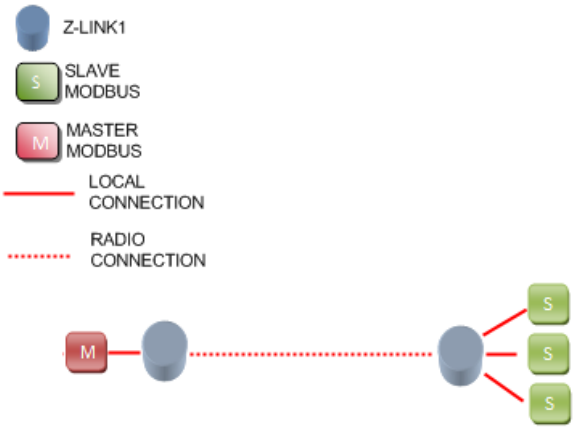
Z-Link1 can be used for linking two or more Modbus RTU buses in wireless mode.

Examples of point to multipoint connections are represented into the following figures:

The simplest it's the point to point connection: 1 Modbus master connected with 1 remote Modbus slave:

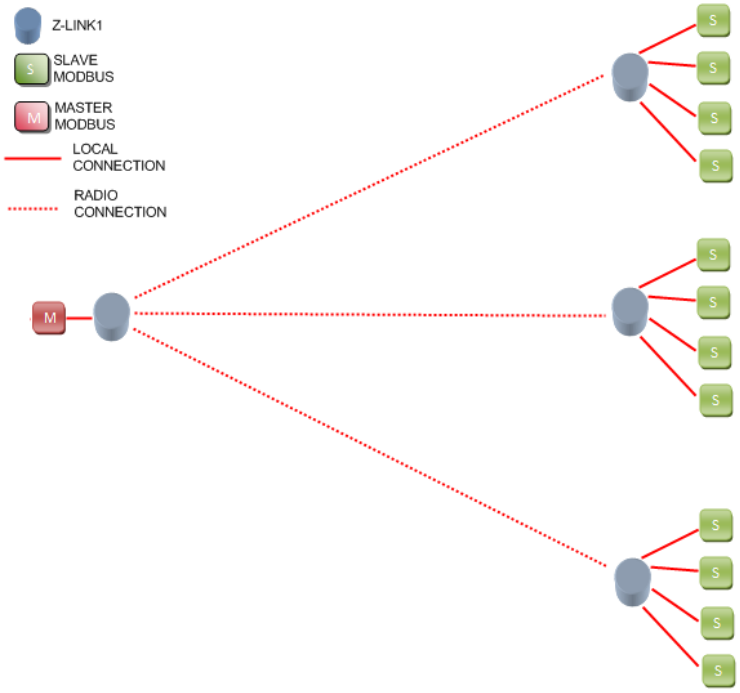


More complex, it's possible to connect 1 Modbus master with more Modbus slaves:

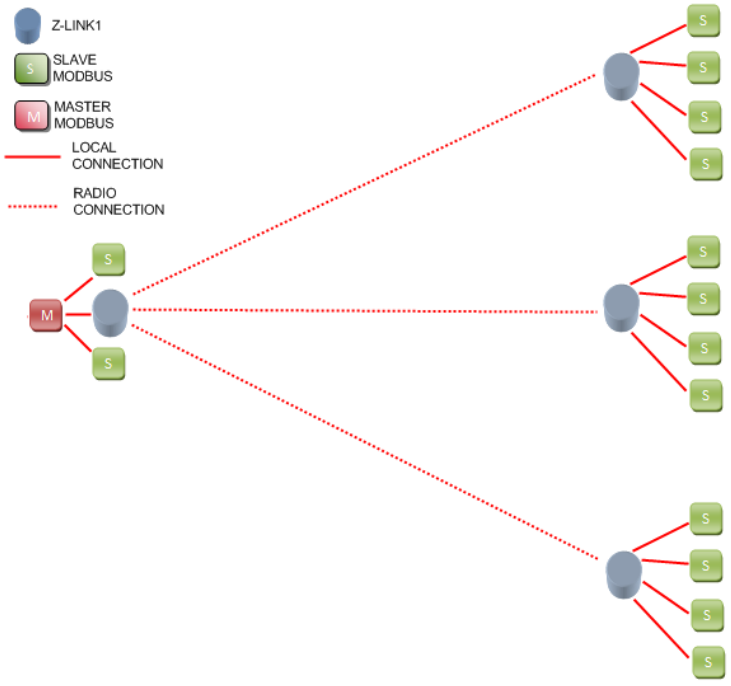


Also, it's possible to connect 1 Modbus master with no locals Modbus slaves (point to multipoint):

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You can also connect Slave Modbus on the local Modbus master bus:



Virtually there is no a limit for the number of slave device into a Z-LINK1 network (except the maximum number of node defined by Modbus RTU protocol) but the net performances decrease with the slaves number.

There is not a maximum number of Z-LINK1 that can be used in a network but Seneca recommends to install no more than 30 Z-LINK1 in a single network.

For more complex Network it's possible to use two or more parallel network changing the network Key.

NOTE

An useful Z-LINK1 characteristic is that it's possible to connect a Modbus Master to the Z-LINK1 Bridge master by RS232 port and the Modbus Slave devices by the Z-LINK1 Bridge slave RS485 port. So if your PC or PLC don't have a RS485 Z-LINK1 act as a RS232 to RS485 "by air" converter.

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3. SETTING Z-LINK1 AS “BRIDGE MODE” WITHOUT SOFTWARE CONFIGURATION

1) Please configure the dip switches on the Z-LINK1 that is connected to the ***Modbus RTU Master***:

CAUTION!

ONLY ONE Z-LINK1 CAN BE CONFIGURED AS “BRIDGE MASTER” ALL THE OTHERS MUST BE CONFIGURED AS “BRIDGE SLAVE”.

Set the Local port (RS485 or RS232) baudrate and the Master Bridge mode (dip 2-3 baudrate, dip 1 Bridge Master/Slave):

Baud rate 38400,8 bits data, parity None, 1 stop bit:



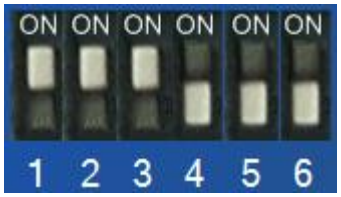
Baud rate 19200,8 bits data, parity None, 1 stop bit:



Baud rate 9600,8 bits data, parity None, 1 stop bit:



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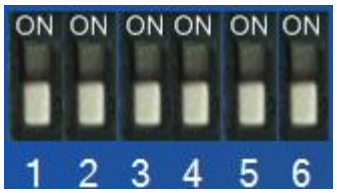


If you need different baudrates or parameters you must program the Z-LINK1 with the Easy Setup Program (see chapter 4)

2) Connect the ***Modbus RTU Master*** to the Z-LINK1 Bridge Master by RS485 or RS232 port.

3) Now Please configure the dip switches on the Z-LINK1(s) that is connected to the ***Modbus RTU Slave(s):***
Set the Local port (RS485 or RS232) baudrate and the Slave Bridge mode (dip 2-3 baudrate, dip 1 Bridge Master/Slave):

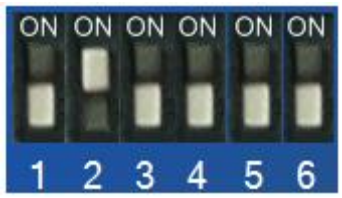
Baud rate 38400,8 bits data, parity None, 1 stop bit:



Baud rate 19200,8 bits data, parity None, 1 stop bit:



Baud rate 9600,8 bits data, parity None, 1 stop bit:



If you need different baudrates or parameters you must program the Z-LINK1 with the Easy Setup Program (see chapter 4)

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4) Connect the Modbus RTU Slave devices to the Z-LINK1 Bridge Slave by RS485 or RS232 port.

5) Now test that the communication it's fully functional by using the debug leds:

   On the Master side you must see the L1 and L2 leds flashing, and the L4 led ON

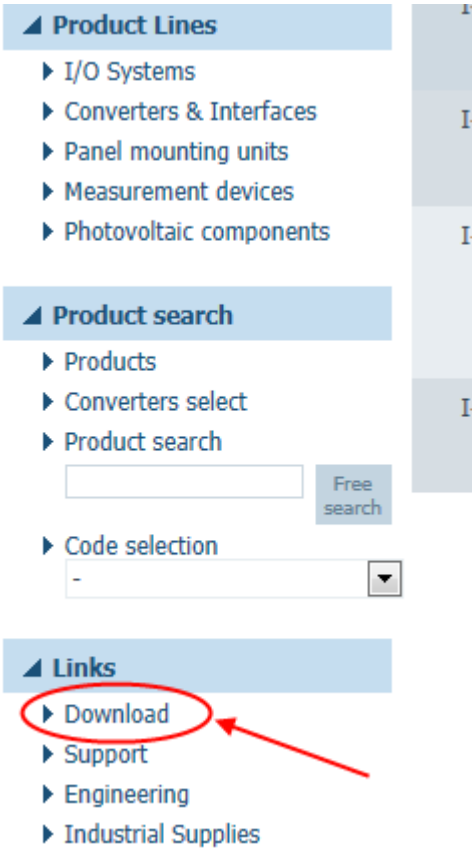
   On the Master side you must see the L1 and L2 leds flashing, and the L4 led ON

If on Master side the L2 led is flashing but on Slave side the L2 led is always OFF the problem can be that the Z-LINK1 Slave bridge it's out of the radio range: the solution can be to install the Z-LINK1 slave bridge closer the master or change the antenna see chapter 11 for more info.

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4. SETTING Z-LINK1 AS "BRIDGE MODE" WITH SOFTWARE CONFIGURATION

1) Connect to **www.seneca.it** in the download section please download and install the "Easy Setup" software:



Then download the last Easy Setup version:

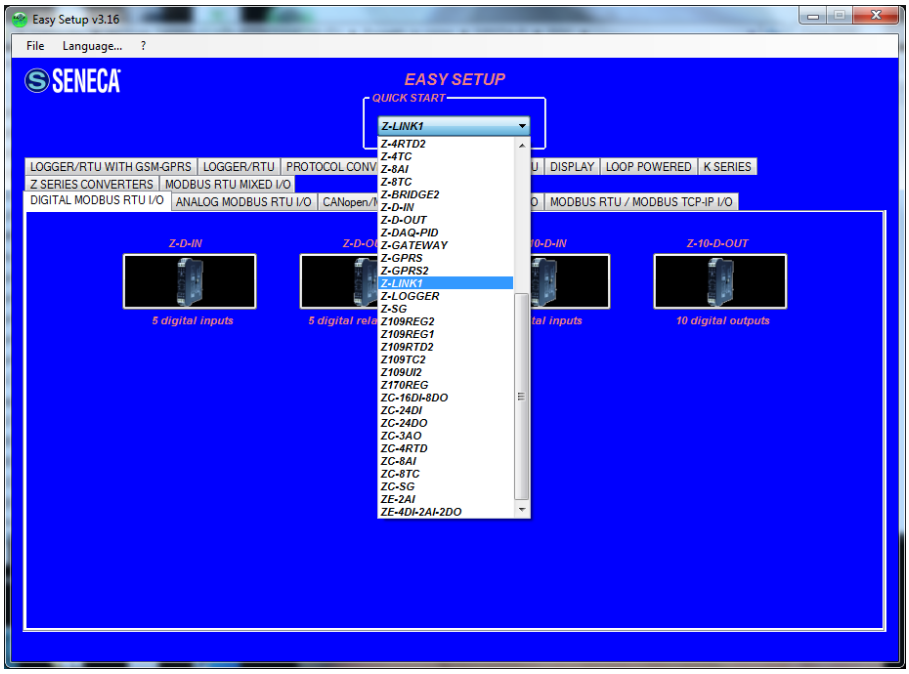


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Easy Setup works on Windows XP 32/64 bits, Windows Vista 32/64 bits, Windows 7 32/64 bits, Windows 8 32/64 bits.

Extract the zip file and double click on the Setup file for install the software.

2) From the Quick Start menu select the Z-LINK1 model (you can also click on the tab “Radio Modbus RTU” and select the Z-LINk1 button):



Set the dip switches like figure:

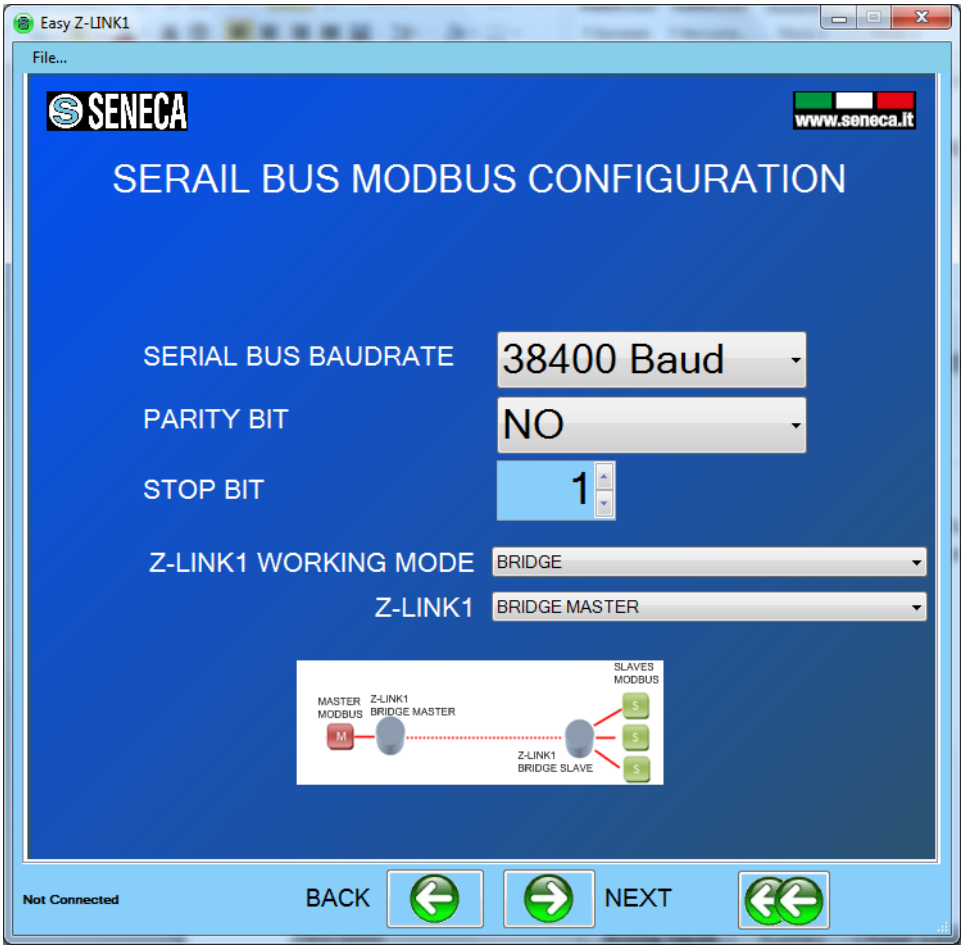
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3) Connect the Jack cable to the Z-LINK1, ***the configuration can ONLY BE DONE WITH THE INCLUDED JACK CABLE***.
   For a PC connection, an RS232 to USB converter can be used, in this case only Seneca USB devices are tested (for example the product S117P1 see www.seneca.it for more info).

4) In the section Serial Bus Modbus Configuration select the Modbus Master serial baudrate and the working mode:

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The Z-Link1 connected to the Master is called “Bridge Master”, the others Z-LINK1 (connected to the slaves) are called “Bridge Slave”.

CAUTION!

ONLY ONE Z-LINK1 CAN BE CONFIGURED AS “BRIDGE MASTER” ALL THE OTHERS MUST BE CONFIGURED AS “BRIDGE SLAVE”.

5) Now that the local bus configuration it’s done we must configure the radio:

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The advanced parameters will be filled with standard parameters, the baudrate configured in the previous page must be >9600 (the default is 38400). All the Z-LINK1 in the same network must have the same network key. If you want to create for example 3 parallel networks you need to create 3 different network keys.

There is not a maximum number of parallel network but for an acceptable performance networks don't exceed the number of 8.

CAUTION

TWO Z-LINK1 WITH DIFFERENT NETWORK KEYS CAN NOT BE INSERTED IN THE SAME NETWORK BECAUSE THEY ARE NOT VISIBILE TO EACH OTHER.

6) When the configuration is sent to the Z-LINK1, Power off the Z-LINK1 and the set the dip switches:

For Z-Link1 "Bridge Master":

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For Z-Link1(s) “Bridge Slave” :



7) Now it’s possible to connect the Modbus devices by the Rs485 or the Rs232 port.
The RS485 port is available by the terminal screw 7-8-9 or by the IDC10 bus connector.
The RS232 port is available by the terminal screw 5-4-1 or by the RJ10 (J1) connector.
A RJ10 to DB9 cable can be purchased (see **www.seneca.it** in the Z-link1 section for more info)

8) Now test that the communication it’s fully functional by using the debug leds:

On the Master side you must see the L1 and L2 leds flashing, and the L4 led ON

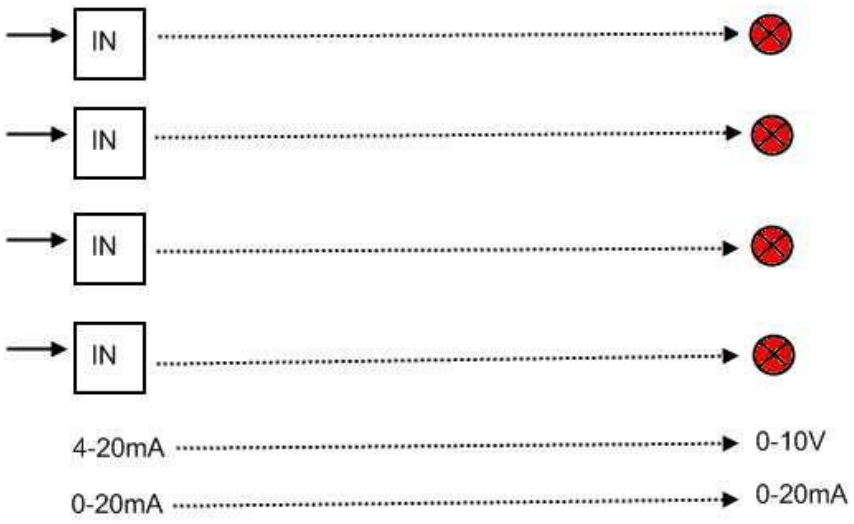
On the Master side you must see the L1 and L2 leds flashing, and the L4 led ON

If on Master side the L2 led is flashing but on Slave side the L2 led is always OFF the problem can be that the Z-LINK1 Slave bridge it’s out of the radio range: the solution can be to install the Z-LINK1 slave bridge closer the master or change the antenna see chapter “Solution to problems” for more info.

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5. Z-LINK1 “REMOTE I/O MODE”

Z-Link1 can be used for copy inputs to remote outputs, for example it’s possible to move the Alarm indications or retransmit an analog measure without connecting cables:



Using Seneca I/O Modbus RTU slave modules the above example can be obtained with:

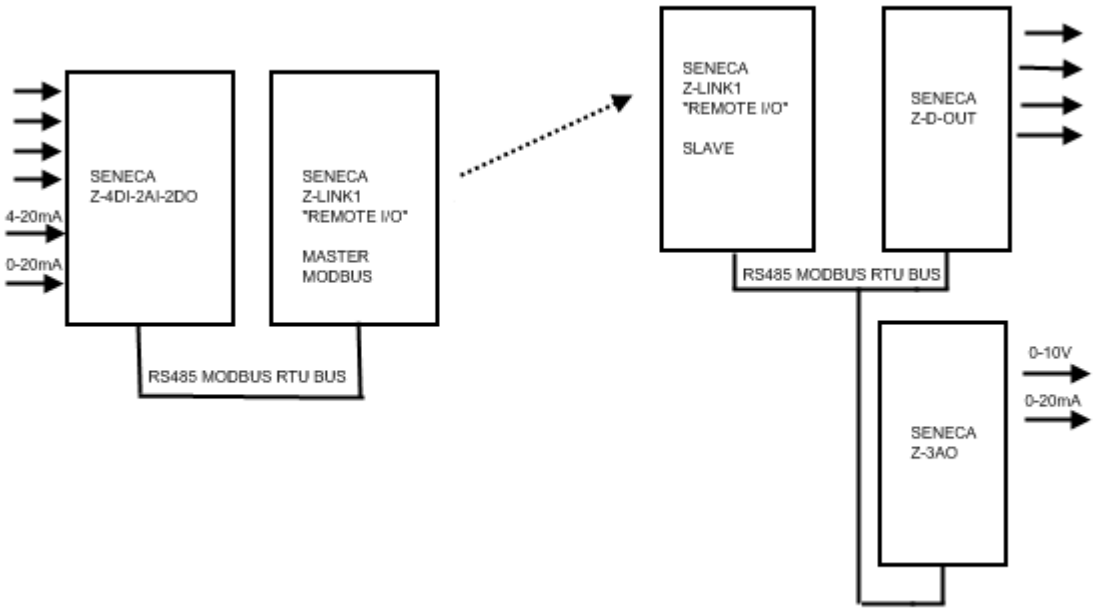
NR1 Seneca Z-4DI-2AI-2DO

NR1 Z-DOUT

NR1 Z-3AO

NR2 Z-LINK in Remote I/O mode

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The digital inputs can be negated before the retransmission, the analog measures can be scaled before the retransmission.

The maximum number of digital inputs supported is 20.

The maximum number of analog inputs/outputs supported is 50.

On the outputs side can be activated a fault condition: if there is a fault on the Inputs the outputs can be switched to a programmed safe condition .

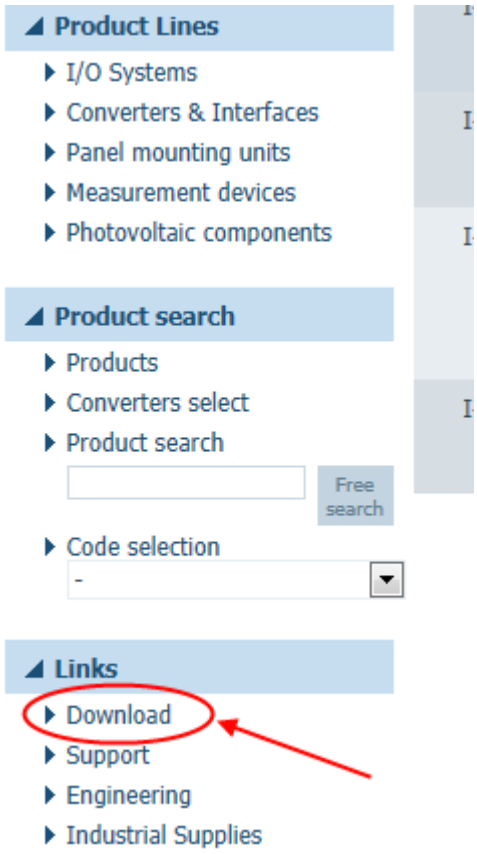
CAUTION!

For using the outputs fault condition it's best to connect the inputs to the "Remote I/O Master" and the outputs to the "Remote I/O Slave"(s).

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6. SETTING Z-LINK1 AS "REMOTE I/O MODE"

1) Connect to **www.seneca.it** in the download section please download and install the "Easy Setup" software:



Then download the last Easy Setup version:

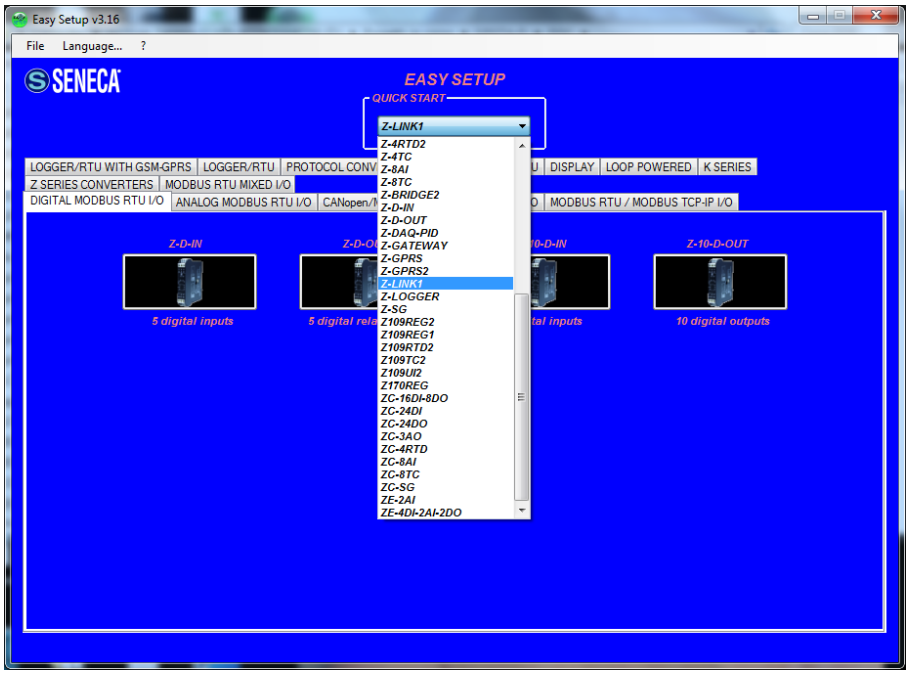


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Easy Setup works on Windows XP 32/64 bits, Windows Vista 32/64 bits, Windows 7 32/64 bits, Windows 8 32/64 bits.

Extract the zip file and double click on the Setup file for install the software.

2) From the Quick Start menu select the Z-LINK1 model (you can also click on the tab “Radio Modbus RTU” and select the Z-LINk1 button):



Set the dip switches like figure:

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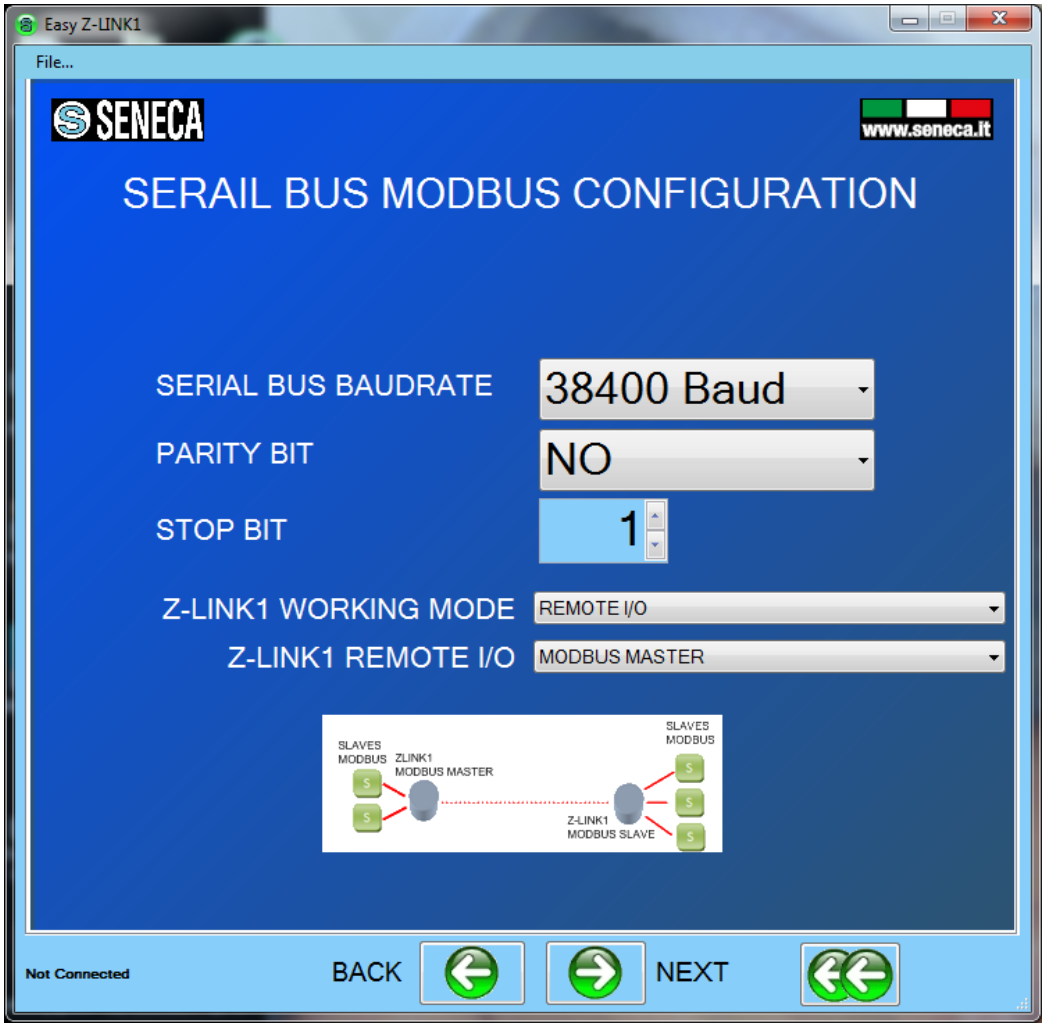


3) Connect the Jack cable to the Z-LINK1, ***the configuration can ONLY BE DONE WITH THE INCLUDED JACK CABLE***.
   For a PC connection, an RS232 to USB converter can be used, in this case only Seneca USB devices are tested (for example the product S117P1 see www.seneca.it for more info).

6.1. SETTING THE Z-LINK1 AS "REMOTE I/O MASTER MODBUS"

1) In the section Serial Bus Modbus Configuration select the Modbus Master serial baudrate and the working mode:

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The Z-Link1 that act as Modbus Master is called “Modbus Master

CAUTION!

ONLY ONE Z-LINK1 CAN BE CONFIGURED AS “MODBUS MASTER” EVERY OTHER MUST BE CONFIGURED AS “MODBUS SLAVE”.

2) Now that the local bus configuration it’s done we must configure the radio:

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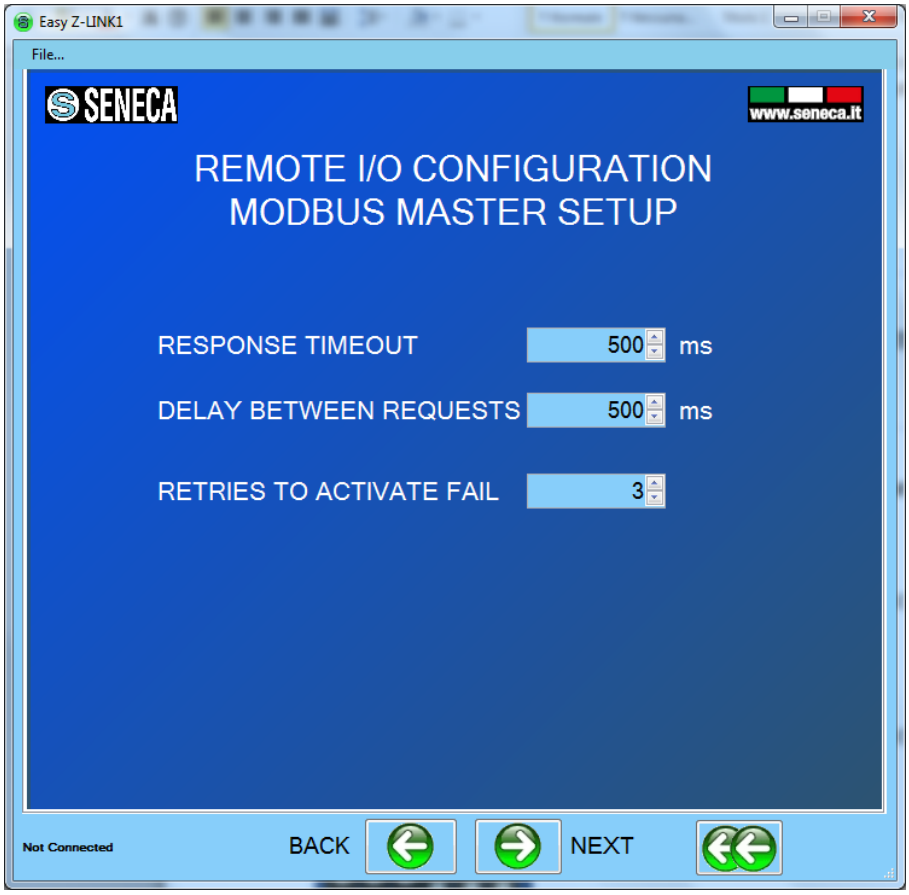
The advanced parameters will be filled with standard parameters, the baudrate configured in the previous page must be >9600 (the default is 38400). All the Z-LINK1 in the same network must have the same network key. If you want to create for example 3 parallel networks you need to create 3 different network keys.
There is not a maximum number of parallel network but for an acceptable performance networks don't exceed the number of 8.

CAUTION

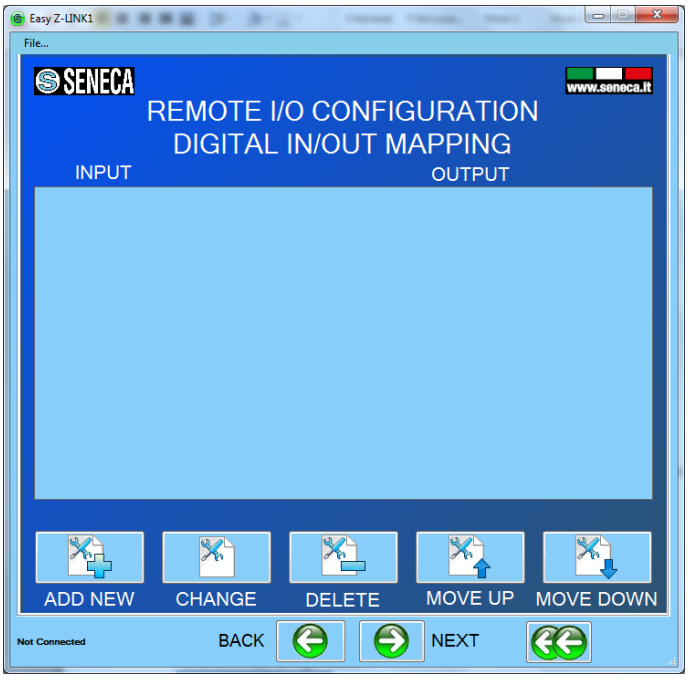
TWO Z-LINK1 WITH DIFFERENT NETWORK KEYS CAN NOT BE INSERTED IN THE SAME NETWORK BECAUSE THEY ARE NOT VISIBILE TO EACH OTHER.

3) Now we must configure the Modbus Master parameters:

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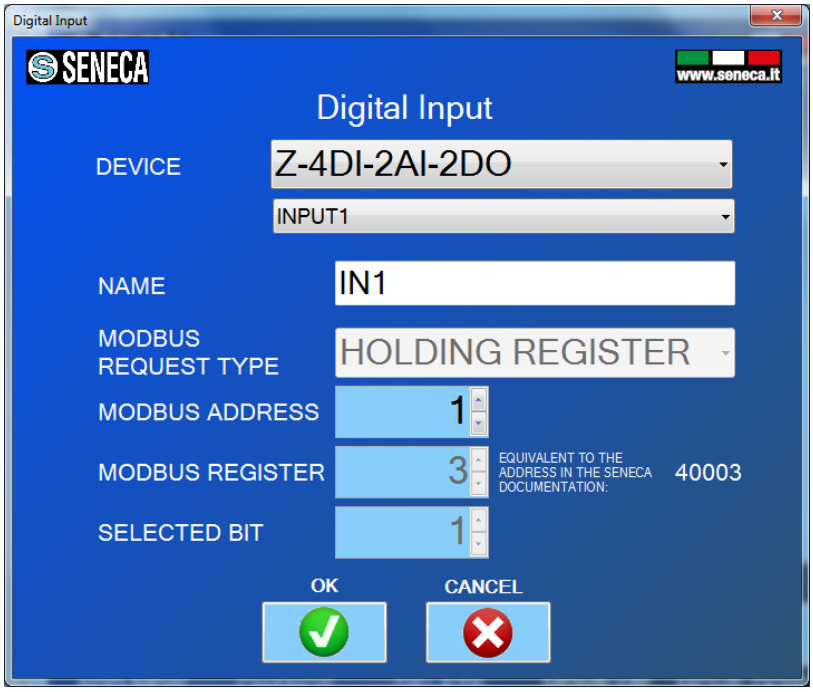


4) Now we configure the Digital Inputs that must be retransmitted to the Digital outputs:



Press “Add new” and select from the internal Seneca database device the Digital Input that must be retransmitted to the output:

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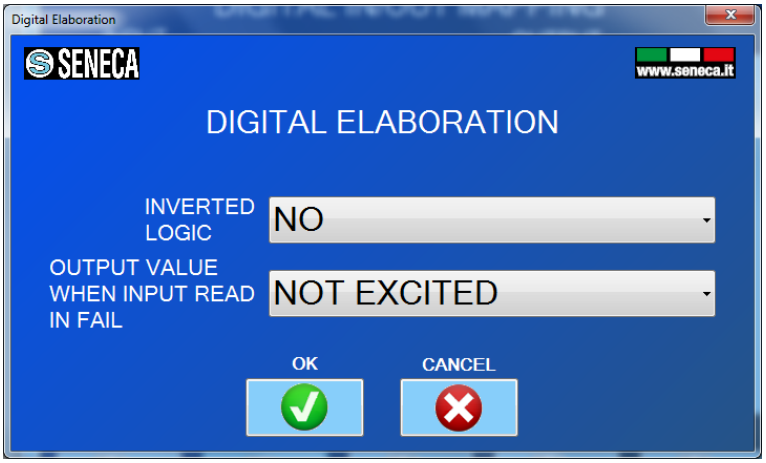


Then select the Digital output that retransmit the Digital input:

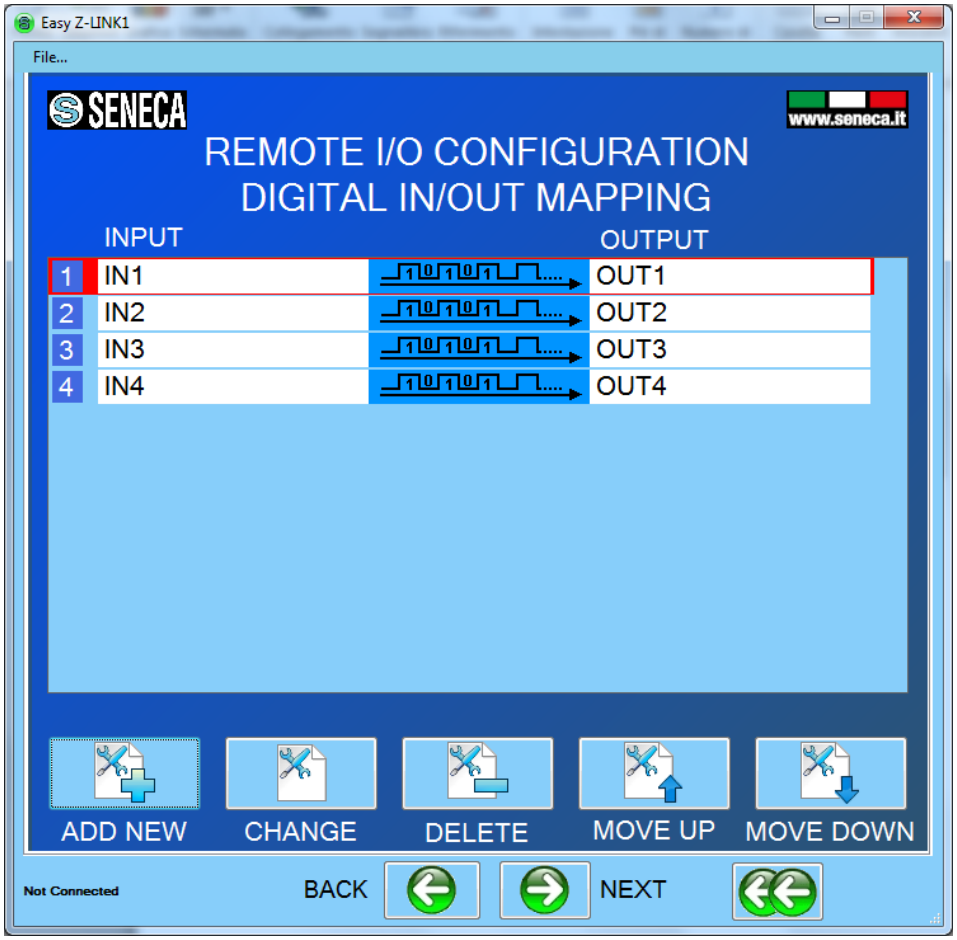


Now select if you need a digital elaboration of the signal and what will be the output value in case of digital input fail:

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After the full configuration you'll see something like this:



5) Now we configure the Analog Inputs that must be retransmitted to the Analog outputs:

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Press “Add new” and select from the internal Seneca database device the Digital Input that must be retransmitted to the output:

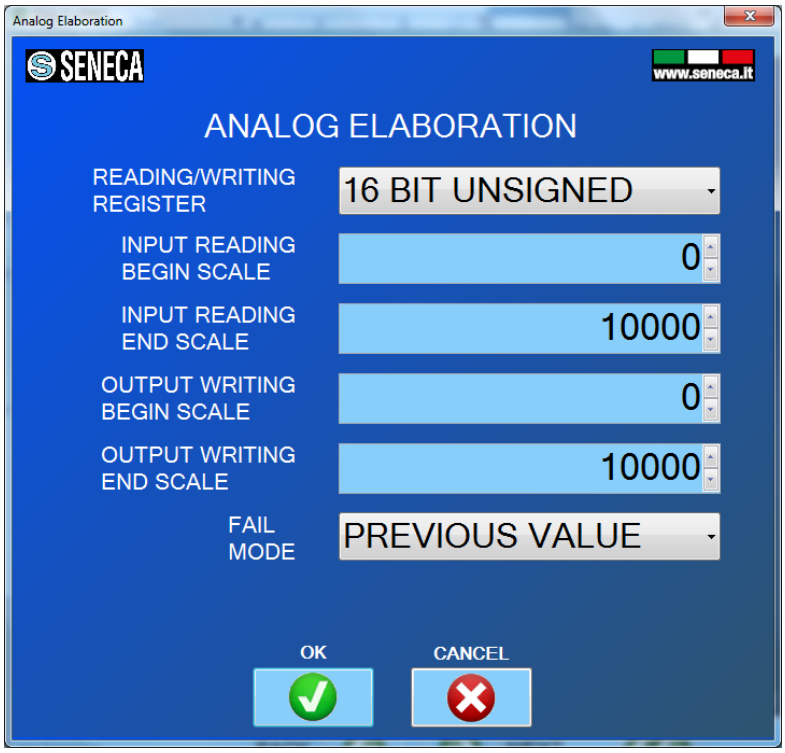


Then select the Analog output that retransmit the Analog input:



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Now select if you need an analog elaboration of the signal and what will be the output value in case of digital input fail:



So if you want to scale a 4000-20000 input to a 0-10000 output you must enter:

Input Reading Begin scale = 4000

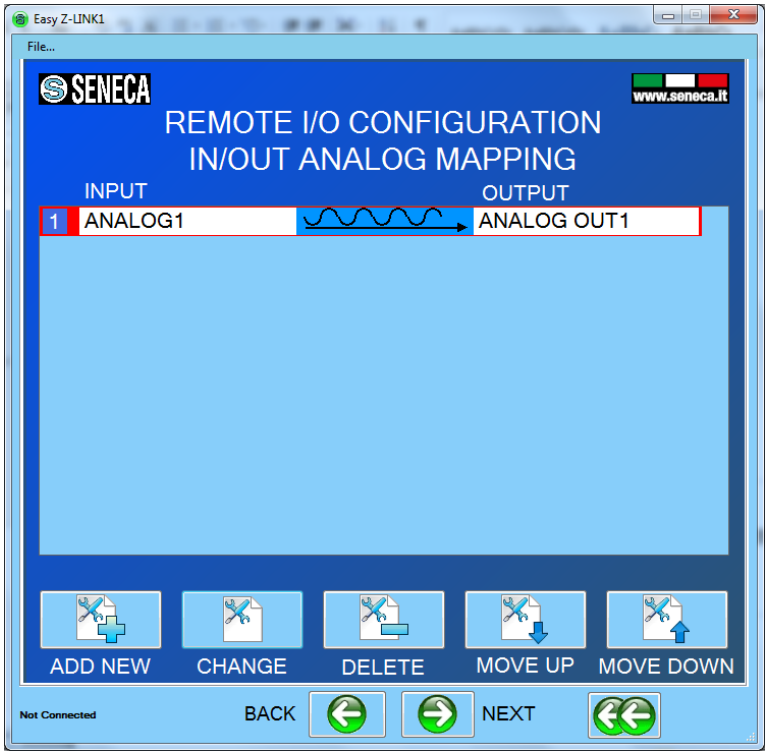
Input Reading End scale = 20000

Output Writing Begin scale = 0

Output Writing End scale = 10000

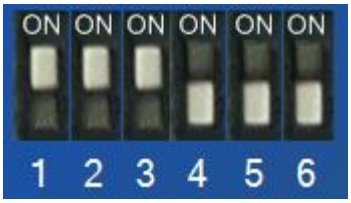
After the full configuration you'll see something like this:

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6) When the configuration is sent to the Z-LINK1, Power off the Z-LINK1 and the set the dip switches:

For Z-Link1 “Remote I/O Master”:



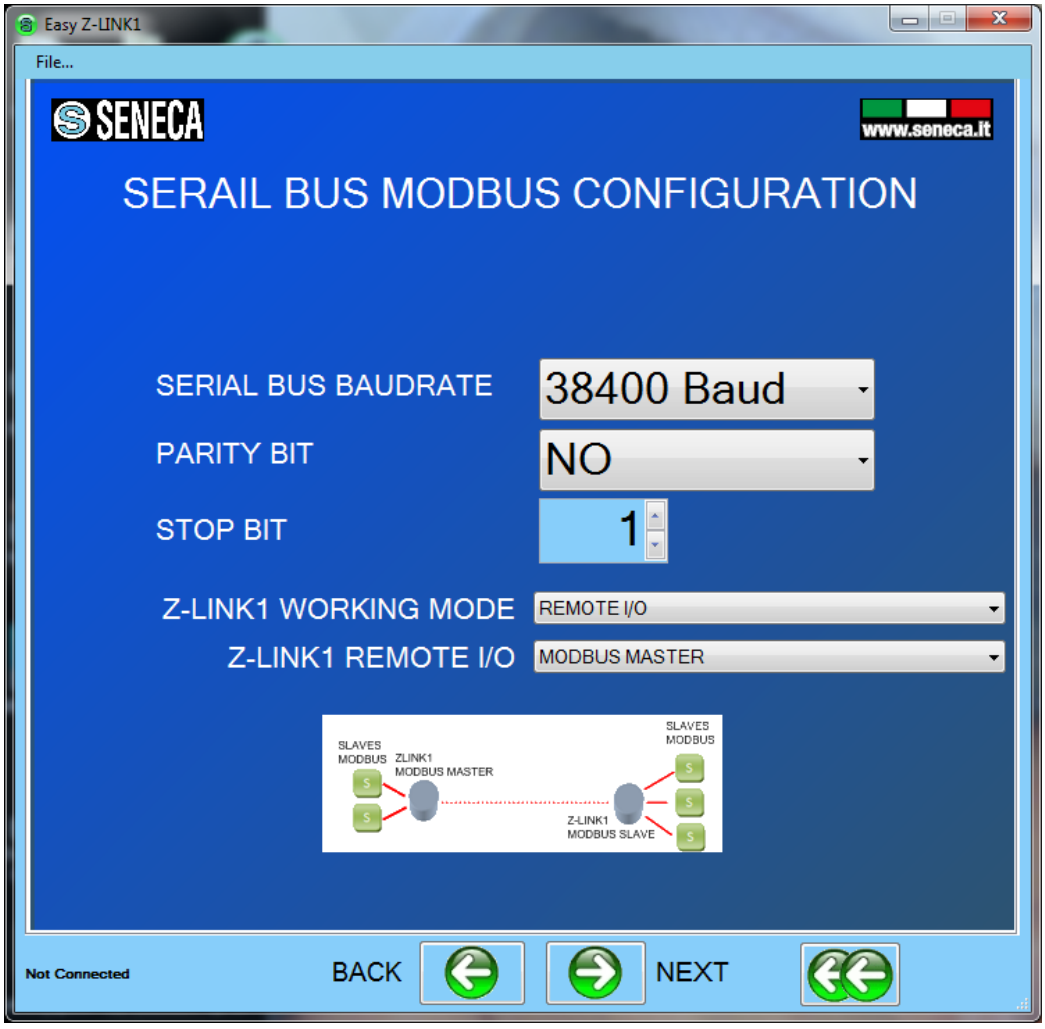
7) Now it’s possible to connect the Modbus devices by the Rs485 or the Rs232 port.
The RS485 port is available by the terminal screw 7-8-9 or by the IDC10 bus connector.
The RS232 port is available by the terminal screw 5-4-1 or by the RJ10 (J1) connector.
A RJ10 to DB9 cable can be purchased (see www.seneca.it in the Z-link1 section for more info).

CAUTION!
-on a RS485 bus can be connected a maximum of 32 different devices.
-on a RS232 port can be connected only 1 device
NOTE
-Seneca suggests the Z –series Modbus RTU Slave devices, see www.seneca.it for more info.

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6.2. SETTING THE Z-LINK1 AS "REMOTE I/O SLAVE MODBUS"

1) In the section Serial Bus Modbus Configuration select the bus baudrate and the working mode:



The Z-Link1 that act as Modbus Slave is called "Remote I/O Modbus Slave"

CAUTION!

ONLY ONE Z-LINK1 CAN BE CONFIGURED AS "MODBUS MASTER" ALL THE OTHERS MUST BE CONFIGURED AS "MODBUS SLAVE".

2) Now that the local bus configuration it's done we must configure the radio:

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The advanced parameters will be filled with standard parameters, the baudrate configured in the previous page must be >9600 (the default is 38400). All the Z-LINK1 in the same network must have the same network key. If you want to create for example 3 parallel networks you need to create 3 different network keys.
There is not a maximum number of parallel network but for an acceptable performance networks don't exceed the number of 8.

CAUTION

TWO Z-LINK1 WITH DIFFERENT NETWORK KEYS CAN NOT BE INSERTED IN THE SAME NETWORK BECAUSE THEY ARE NOT VISIBILE TO EACH OTHER.

3) When the configuration is sent to the Z-LINK1, Power off the Z-LINK1 and the set the dip switches:

For Z-Link1 "Remote I/O Slave":

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4) Now it's possible to connect the Modbus devices by the Rs485 or the Rs232 port.
   The RS485 port is available by the terminal screw 7-8-9 or by the IDC10 bus connector.
   The RS232 port is available by the terminal screw 5-4-1 or by the RJ10 (J1) connector.
   A RJ10 to DB9 cable can be purchased (see www.seneca.it in the Z-link1 section for more info).

   CAUTION!
   -on a RS485 bus can be connected a maximum of 32 devices.
   -on a RS232 port can be connected only 1 device

5) Now program as "Remote I/O Slave" all the others Z-LINK1.

6) Now test that the communication it's fully functional by using the debug leds:

   On the Master side you must see the L1 and L2 leds flashing, and the L4 led ON

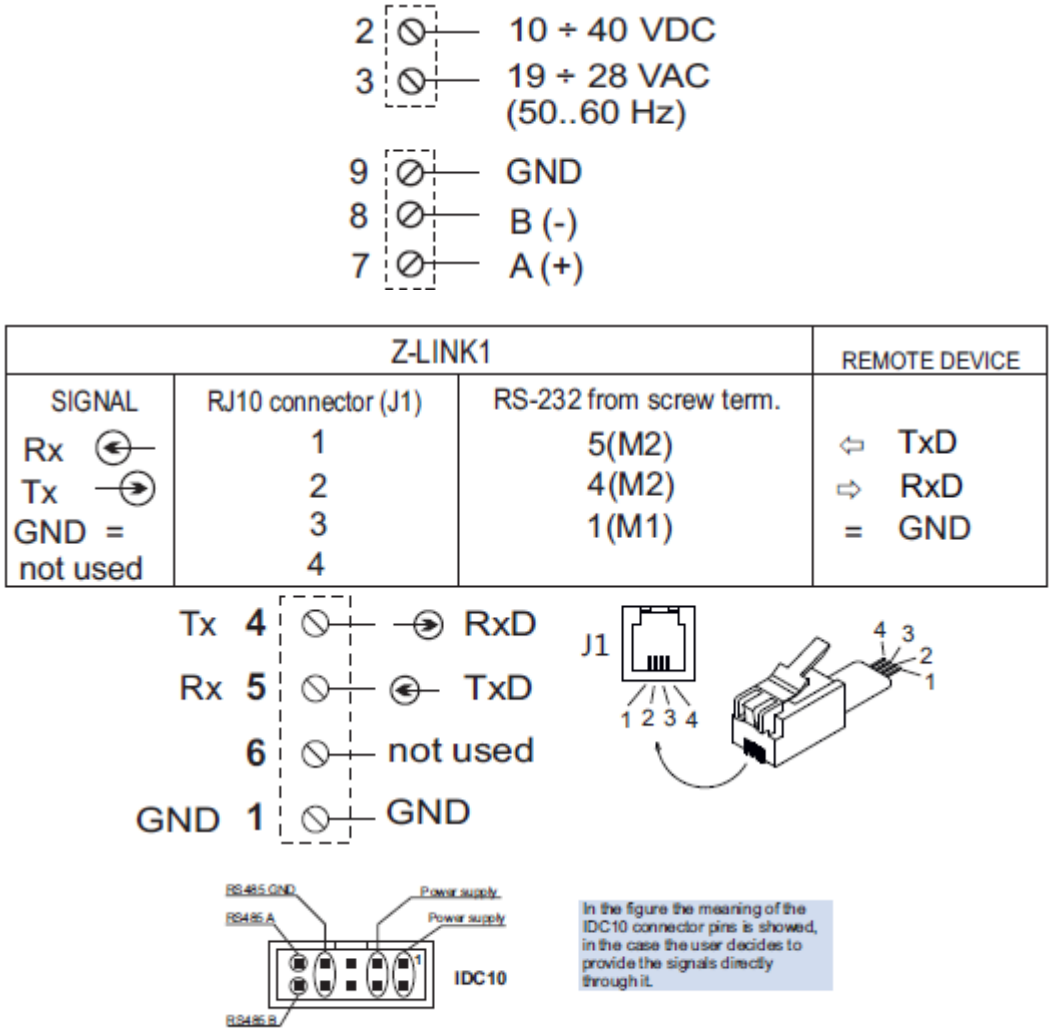
   On the Master side you must see the L1 and L2 leds flashing, and the L4 led ON

If on Master side the L2 led is flashing but on Slave side the L2 led is always OFF the problem can be that the Z-LINK1 Slave bridge it's out of the radio range: the solution can be to install the Z-LINK1 slave bridge closer the master or change the antenna see chapter "Solution to problems" for more info.

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7. Electrical Connections

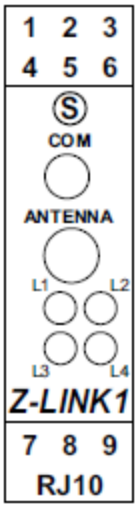
7.1. Terminal Positions



For more info refers to the installation manual (see www.seneca.it into Z-LINK1 section).

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8. DEBUG LEDs



LED NAME	MEANING
L1	Local bus RS485 or Rs232 port Data activity
L2	Radio data activity
L3	Not used
L4	ON = the device is power on OFF = the device is power off

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9. Modbus RTU Protocol

The protocol supported for both RS232 or RS485 port is the Modbus RTU, for more information about this protocol please refer to Modbus specification website:

http://www.modbus.org/specs.php

NOTE

Only the Modbus RTU protocol is supported.

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10. Firmware Update

With a new revision of Easy Setup, Seneca can include a new device firmware.

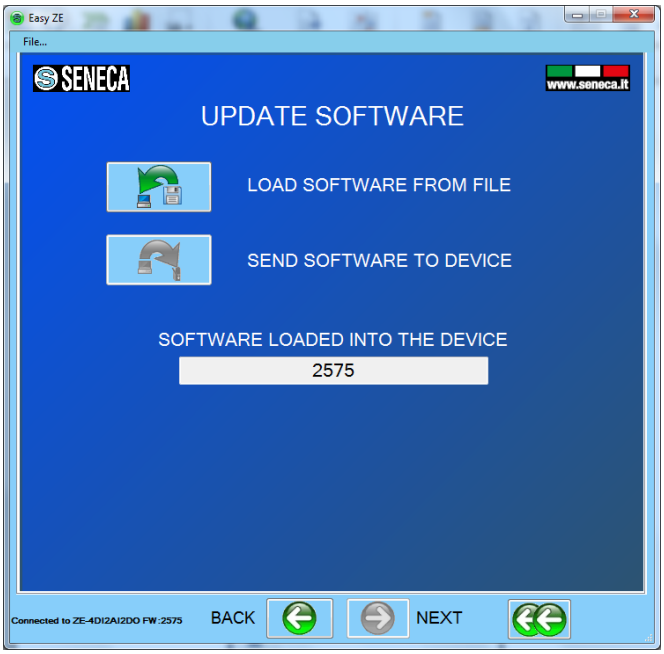
A new firmware update can include new features or bugfix.

WARNING!

When the firmware update it's started don't power down the device until all the procedure it's finished.

Power ON Z-LINK1 device and connect it to the PC by using the jack cable.

On the configuration menu click on "Software update"



Press the "Load software from file", the software will open directly the firmware directory.

If the "new software" revision is newer the "software in the device" revision click on "Send software to the device"

The firmware update takes about 1 minute.

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11. SOLUTIONS TO PROBLEMS

PROBLEM	SOLUTION
On Master side leds L1 and L2 are flashing but on Slave side no leds are flashing	-The Z-LINk1 slave side it's out of the radio range, install the Z-LINk1 Slave closer the Z-Link1 Master: Change the provided antennas with the external antennas (see www.seneca.it in the Z-LINK1 section for more information) -Verify the correct dip switches configuration
Bridge Mode: On Master side leds L1 and L2 are not flashing	The Master Modbus don't send packets through the RS232 or RS485 port, so try to: -Power ON the Master Modbus Device
On Master side leds L1 and L2 are flashing, on slave side leds L1 and L2 are flashing too but it's not possible to read data from RS232 or Rs485 ports	-Change the Master Modbus Device baudate in agreement with the Z-LINk1 Master Bridge configuration -Verify the Modbus registers and addresses of the slave devices.
Connecting the Jack cable to a master Modbus the Bridge functionality doesn't works	The Jack cable can only be used for setup programming with the Easy Setup software. Connect the RS232 port by using the RJ11 to DB9 cable (see www.seneca.it in the Z-LINK1 section for more information)
Remote I/O mode: I need more than 20 digital inputs to repeat to more than 20 outputs	Create 2 or more parallel networks by changing the Z-link1 network keys

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