RF Modules

868MHz
50 Channels

Technical Operating Manual

INDEX

RADIO MODULE

RFTOOL CONFIGURATION SOFTWARE

PREMISE

This manual contains all the instructions for connecting and programming the radio module as well as all the information necessary for its correct functioning.

In thanking you for the acquisition of this module, we want to call to your attention some aspects of this manual:

- **This booklet is only intended to supply useful instructions for the operation and the programming of the radio module to which it refers; the manufacturing firm declines any responsibility derivable from possible weighing errors.**
- **The person responsible for using the radio module must make sure that all safety rules in force in the country of its use should be applied, in order to guarantee that the equipment is used in conformity with the use for which it is destined and avoid any dangerous situation for the user.**
- This booklet must be considered as an integral part of the radio module and must be included with the deed of sale;
- Neither this publication, nor part of it, can be reproduced without written authorization on the part of the manufacturing firm.
- All of the information reported herein is based on data available at the moment of printing; the manufacturing firm reserves the right to carry out modifications to its own products at any moment, without notice and without any sanction. It is therefore suggested to always verify possible updates.

⚠️ **WARNING** ⚠️

This instrument is covered under warranty provided that **IT HAS NOT BEEN OPENED BY THE USER** for any reason.
Any attempt to repair or alter the unit can expose the user to the danger of electric shock and it will void our warranty. If any problem with the unit or system has been experienced please notify the manufacturer or the dealer from which the instrument was acquired.

Do not pour liquids on the device

Do not use solvents to clean the device

Do not expose device to either direct sun light or any heat sources

READ CAREFULLY & APPLY WHAT DESCRIBED IN THE POWER SUPPLY & START-UP SECTION

Do not install in an environment with any risk of explosion

All the connections of the device have to be made respecting the rules applicable in the zone and in the installing environment

The crossed-out wheeled bin on the product means that at the product end of life, it must be taken to separate collection or to the reseller when a new equivalent type of equipment is purchased. The adequate differentiated refuse collection in having the product recycled, helps to avoid possible negative effects on the environment and health and supports the recycling of the materials of which the equipment is made. The unlawful disposal of the product by the user will entail fines foreseen by the current regulations.

1. MAIN TECHNICAL SPECIFICATIONS

The product of this manual is a multi channel radio module, with performance up to 25 mW of power in the 868 MHz ISM band (unlicensed frequency band).

SPECIFICATIONS:

POWER SUPPLY	5-12Vdc 100mA max
OPERATING TEMPERATURE	From -10 to +40 °C.
TIMING	Power Up Sequence: 135 ms Enter in Serial Stand-by: 3.2 ms Wake Up from Serial Stand-by: 5.5ms
MAXIMUM POWER	25mW
WORK FREQUENCY	From 868 to 870 MHz
NUMBER OF CHANNELS	Up to 52
RADIO TRANSMISSION SPEED	Up to 38.4 kbps
SERIAL TRANSMISSION SPEED	Up to 19.2 kbps
INPUT/OUTPUT	1 RS232 PORT on AMP connector or 1 USB port (with a 1m long USB cable fitted), depending on the model.
FUNCTIONING DISTANCE, IN APPROPRIATE CONDITIONS	Up to 70m indoors, up to 150m outdoors
CONTAINER	Box in PVC (depending on the model)
ANTENNA	Swivelling and inclinable

2. INSTALLATION

2.1 CONNECTION

232 MODEL

Please find below the connection of the radio module to PC through the 6-way AMP connector

	CONNECTION TO PC		
	RADIO MODULE AMP 6-way (male)	**PC 9 pin (male)**	**PC 25 pin (male)**
RX	1 Reception	2	3
TX	2 Transmission	3	2
GND	6 GND	5	7

	POWER SUPPLY
	RADIO MODULE AMP 6-way (male)
+VIN	4 Power supply + (5-12Vdc 100mA max)
GND	6 Power supply -

USB MODEL

To connect the radio module to PC through the USB connector, use a USB cable; the radio module will be auto-powered by PC.

2.2 DRIVER FOR USB CONNECTION

With the use of an RF module with a USB connector, one should install the drivers necessary for the communication.

The following procedure will explain how to install the driver needed from the PC, and the creation of the virtual COM port.

NOTES
- The minimum requirement of the PC operating system must be Windows XP.
- Do not disconnect the USB during the installation.

1) Save the driver in a folder on the PC.

2) Connect the radio module to a free USB port of the PC through a USB cable.

3) The operating system detects automatically the USB, then it asks for the driver to be used: if the request for the driver search on Internet appears, **click no** and then continue on.

4) Select the second option ("install from a specific folder") and go ahead.

5) Set the path of the folder which contains the driver previously saved and go ahead.
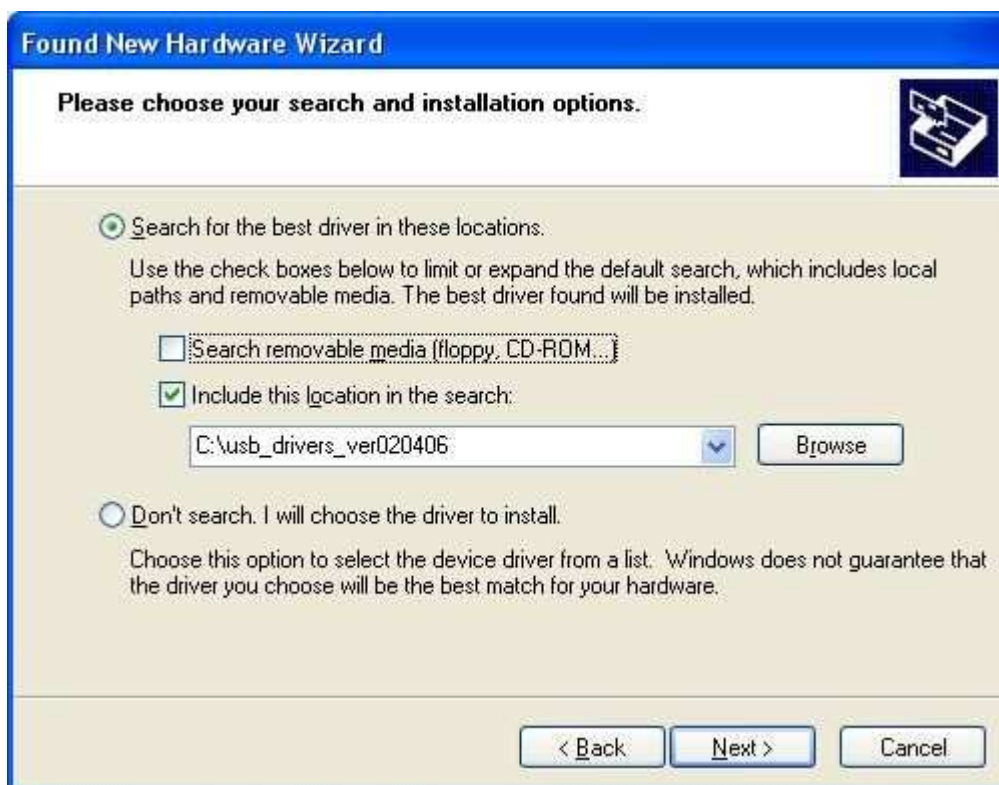
6) Confirm the following message (if present):

7) The first installation is complete: confirm the window.

8) The PC proceeds with the second installation: repeat the operations in the same way as previously mentioned.

9) The device is now ready to use: a virtual COM port will be automatically created; to check the port number open the Windows Device Manager:
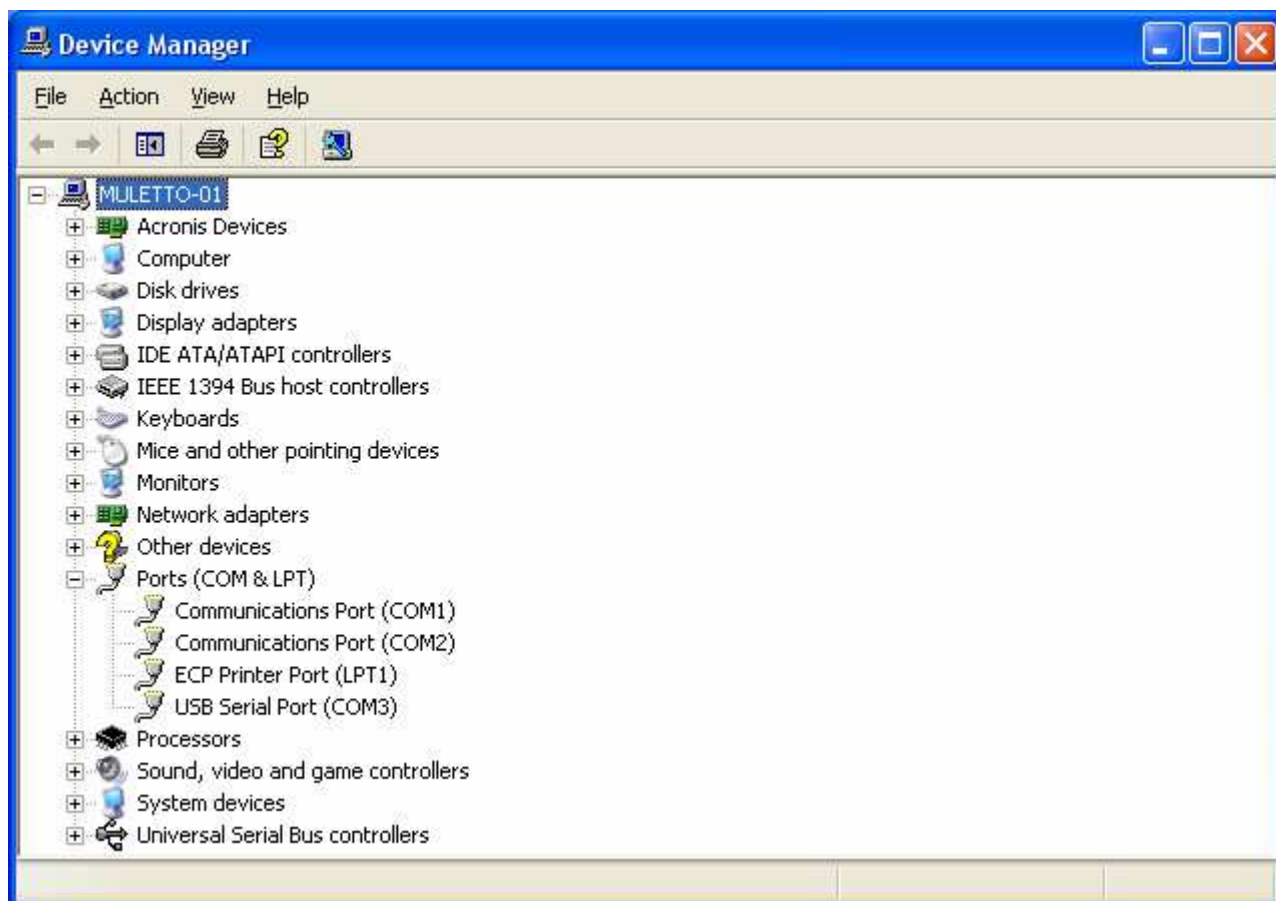
10) In the example, the COM3 can be used as a standard serial port of the PC.

2.3 ⚠ REQUIREMENTS FOR INSTALLATION ⚠

The radio module, including the antenna, must not be put inside a metal container or near metallic parts or devices.

The antenna must be put far from the electronic parts which can cause disturbances.

It is advisable to put the radio module not too close to the ground.

Maintain a minimum distance of 3m between the modules having the same radio channel, and a minimum distance of 10 m between the modules having a different radio channel.

Verify the presence of the necessary adequate environmental conditions in order to guarantee the desired performance, being wary of the radio signal attenuation factors shown in the following table:

Factor / Environment	Signal loss in %
Open space	0
Window	15
Thin walls or of medium thickness (i.e. plasterboard or wood)	from 35 to 50
Walls, floors, or thick or armoured attics	from 60 to 80
Rain or fog	95

3. MAIN FUNCTIONS

- Configuration of communication parameters and programming of the module

- Saving the configuration on a file

- Restoring the configuration from a file.

- Reception of the configuration from the module

4. PC MINIMUM REQUIREMENTS

- Pentium 4 with 256 Mb Ram
- 200 MB of empty space on disk
- Windows XP operating system
- Monitor with 800x600 minimum resolution, 256 colours
- A RS232 serial port.
- Installation of the following components:
    - Microsoft .net Framework 2.0. **Careful:** larger or smaller frameworks do not support the application.

5. PROGRAM INSTALLATION

1) By launching the installation file, the following screenshot will appear:
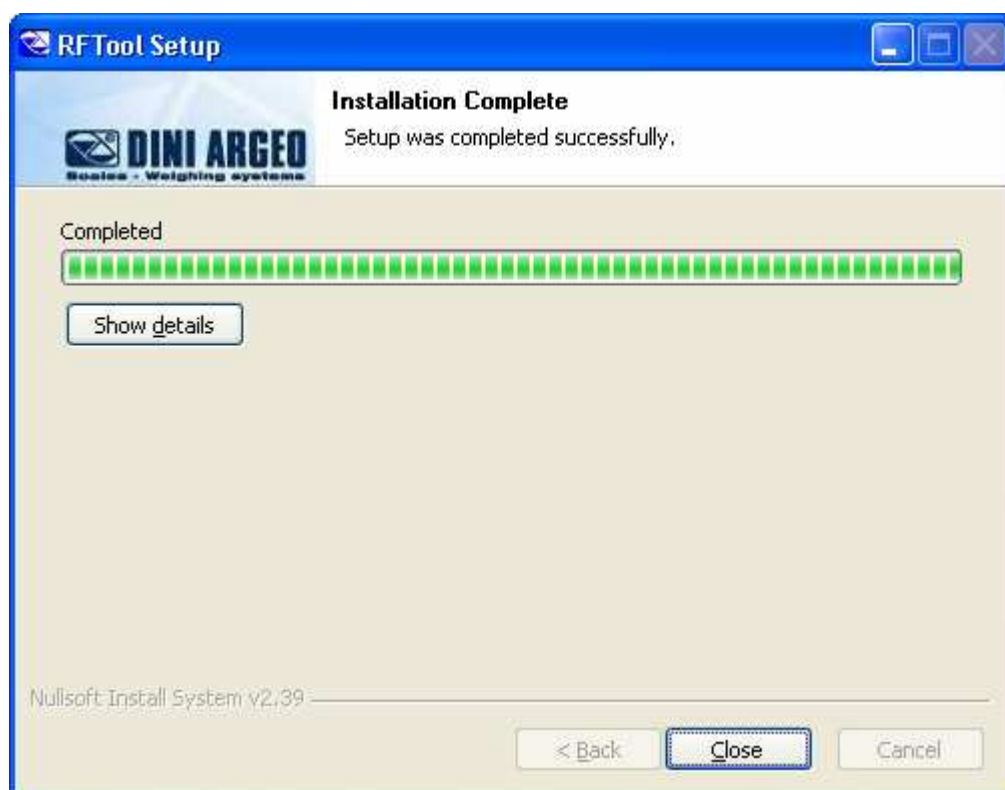

Select the language to be used in the installation wizard and press on "OK" to continue.

2) Accept the license terms by pressing on "**I agree**":

3) Follow the installation steps; at the end the following window will appear:

4) Click on "**Close**" to end the procedure; it's now possible to open the **RFTool** using the connection created on the desktop.

6. LANGUAGE SELECTION

1. Launch the software, the following screenshot will appear:

2. Click on the language button shown in the previous figure; the following window will appear:

Select one of the available languages to view the descriptions of the checks in the desired language, and confirm with "**Ok**" or press "**Cancel**" to not save; by confirming with "**OK**", the selected language will be automatically enabled.

7. QUICK CONFIGURATION

Through the quick configuration it is possible to quickly select one of the radio channels available in the selected sub-band, leaving the other parameters at the values set in the open configuration.

In the case that a greater number of channels is requested, one should carry out the advanced configuration procedure described in the following section.

PROCEDURE:

1. Launch the software; with each start of the programme, the last executed configuration is opened automatically, and it will be automatically saved in a file at the closing of the programme (see last section).

At the first start, the file contains already a factory configuration, with the following parameters:

2. Select the "Serial Port" of the PC to which the radio module is connected:

3. Select the "Radio Channel" in the combined box shown in the previous figure;

4. Connect the radio module to the PC and press on the "Module programme"; the following window will appear

After this, the following will show up in this sequence

If the communication is correct and the programming has gone well, otherwise

If the communication is not correct and the programming has not ended well (one should check the connections and verify the functioning of the serial line).

8. ADVANCED CONFIGURATION

Through the advanced configuration it is possible to modify all the module's communication parameters.

1. Launch the software: the following window will appear:

2. Click on the "Wizard" button: the following window will appear:

4. In the combined box, select the type of instrument to which you want the radio module connected:

- LCS: radio module connected to LCS instruments or instruments which communicate with it; it will be possible to configure only some parameters; the other parameters will be automatically set for the correct functioning with the selected indicator. For further details, see the description of the parameters in the following point.

- Generic instrument: radio module connected to a generic DINI ARGEO instrument, PC, or other instruments; it will be possible to configure all the parameters.

5. Click on the "Ahead" button: the first parameter to be configured will appear.

NOTE: Each of these parameters is already configured by the manufacturer; the **(!)** symbol indicates the value configured by the manufacturer.

- RADIO BIT-RATE (radio transmission speed of the data)

RADIO BIT-RATE
4.8 kbps
9.6 kbps
19.2 kbps
38.4 kbps

(!) 19.2 kbps

Select the desired radio speed and press on "Ahead".

NOTES:

- In order to communicate, the modules of the same group must have the same Radio Bit-Rate.

- The selected Radio Bit-Rate influences on the other communication parameters (see the description of the parameters for further details).

- With the LCS instrument, the parameter is not displayed and the Radio Bit-Rate is automatically configured at 19.2 kbps.

- RADIO SUB-BAND FREQUENCY

The radio band, in other words, the interval of selectable frequencies, goes from 868 to 870Mhz; it is subdivided in 9 sub-bands which determine specific limitations in terms of maximum power and spacing between the channels (work frequencies):

SUB-BAND	FREQUENCIES (Mhz)	Maximum Power (mW)	Channel spacing (khz)
1f	868 - 868.6	25	Not specified
7a	868.6 - 868.7	10	25
1g	868.7 - 869.2	25	Not specified
7d	869.2 - 869.25	10	25
7b	869.25 - 869.3	10	25
1h	869.3 - 869.4	10	25
1i	869.4 - 869.65	500	25 or the whole band
7c	869.65 - 869.7	25	25
1k	869.7 - 870	5	Not specified

(!) 1f (868 - 868.6 Mhz)

These restrictions are integrated in the same configuration of the module, which allows the only selection of the powers and the admitted channels in every sub-band.

The number of usable sub-bands vary according to the Radio Bit-Rate previously configured:

- With the Radio Bit-Rate configured at 4.8 or 9.6 kbps, the module can use any of the 9 sub-bands.

- With the Radio Bit-Rate configured at 19.2 or 38.4 kbps, the module is limited at the following 4 sub-bands:

SUB-BAND	FREQUENCIES (Mhz)
1f	868 - 868.6 Mhz
1g	868.7 - 869.2 Mhz
1i	869.4 - 869.65 Mhz
1k	869.7 - 870 Mhz

Select the desired sub-band and press on "Ahead".

NOTES:

- In order to communicate, the radio modules of the same group must have the same radio Sub-band and the same radio channel.

- The selected Radio Sub-band influences the other communication parameters (see the description of the parameters for further details).

- With the LCS instrument, the parameter is not displayed, and the sub-band is automatically configured at 1f   (868 - 868.6 Mhz).

- BAUD RATE ON THE SERIAL LINE

The maximum allowed Baud-Rate on the serial port depends on the previously set Radio Bit-Rate:

RADIO BIT-RATE	4.8 kbps	9.6 kbps	19.2 kbps	38.4 kbps
BAUD-RATE ON THE SERIAL LINE	1200 bps	1200 bps	1200 bps	1200 bps
	2400 bps	2400 bps	2400 bps	2400 bps
	-	4800 bps	4800 bps	4800 bps
	-	-	9600 bps	9600 bps
	-	-	-	19200 bps

(!) 9600 bps

Select the desired serial line speed and press on "Ahead".

NOTES:

- In order to communicate, the module and the instrument connected to it, must have the same serial line Baud-Rate.

- With the LCS instrument, the parameter is not displayed and the Baud-Rate on the Serial line is automatically configured at 9600 bps.

- RADIO CHANNEL

The selectable Radio Channels vary depending on the Radio Bit-Rate and the radio Sub-Band previously configured:

Sub-band	1f	7a	1g	7d	7b	1h	1i	7c	1k
Frequency (Mhz)	868 - 868.6	868.6 - 868.7	868.7 - 869.2	869.2 - 869.25	869.25 - 869.3	869.3 - 869.4	869.4 - 869.65	869.65 - 869.7	869.7 - 870
Radio Bit-Rate: 4.8 kbps & 9.6 kbps									
RADIO CHANNELS	12	4	10	2	2	4	10	2	6
0 CHANNEL (MHZ)	868.025	868.6125	868.725	869.2125	869.2625	869.3125	869.4125	869.6625	869.725
SPACING (khz)	50	25	50	25	25	25	25	25	50
Radio Bit-Rate: 19.2 kbps									
RADIO CHANNELS	6	-	5	-	-	-	1	-	3
0 CHANNEL (MHZ)	868.05	-	868.75	-	-	-	868.525	-	869.75
SPACING (khz)	100	-	100	-	-	-	100	-	100
Radio Bit-Rate: 38.4 kbps									
RADIO CHANNELS	3	-	2	-	-	-	1	-	2
0 CHANNEL (MHZ)	868.1	-	868.85	-	-	-	869.525	-	869.775
SPACING (khz)	200	-	200	-	-	-	200	-	200

(!) Channel 0

Select the desired radio channel and press on "Ahead".

NOTES:

- In order to communicate, the modules of the same group must have the same Radio Channel.

- If various groups of modules are present in the same zone, each group must be set on a different radio channel in order to communicate without interferences from other groups. It is advisable to select the channel of each group, or the farthest possible from the channel of the other groups, in order to avoid interference between the channels.

- RADIO SIGNAL OUTPUT POWER

The power of the Radio Signal Output determines the maximum communication distance between the modules of the same group: higher the value, and greater is the distance which can be obtained.

The selectable powers of the Radio Signal Output vary depending on the Radio Bit-Rate Radio and the radio Sub-band previously configured:

Band	1f	7a	1g	7d	7b	1h	1i	7c	1k
Frequency Sub-band (MHz)	868 - 868.6	868.6 - 868.7	868.7 - 869.2	869.2 - 869.25	869.25 - 869.3	869.3 - 869.4	869.4 - 869.65	869.65 - 869.7	869.7 - 870
Radio Bit-Rate: 4.8 kbps									
RADIO SIGNAL POWER	1mW 3mW 8mW 25mW	1mW 3mW 8mW	1mW 3mW 8mW 25mW	1mW 3mW 8mW	1mW 3mW 8mW	1mW 3mW 8mW	1mW 3mW 8mW 25mW	1mW 3mW 8mW 25mW	1mW 3mW
Radio Bit-Rate: 9.6 kbps									
RADIO SIGNAL POWER	1mW 3mW 8mW 25mW	1mW 3mW 8mW	1mW 3mW 8mW 25mW	1mW 3mW 8mW	1mW 3mW 8mW	1mW 3mW 8mW	1mW 3mW 8mW	1mW 3mW 8mW	1mW 3mW
Radio Bit-Rate: 19.2 kbps & 38.4 kbps									
RADIO SIGNAL POWER	1mW 3mW 8mW 25mW	-	1mW 3mW 8mW 25mW	-	-	-	1mW 3mW 8mW 25mW	-	1mW 3mW

(!) 25 mW

Select the desired power and press on "Ahead.

- LOW CONSUMPTION MODE

By enabling the Low Consumption Mode, it is possible to put the radio module in stand-by when it is not used and "woken up" when necessary, in order to reduce the consumption.

To enter and exit the stand-by status, one should use the following serial commands:

SEQUENCE OF STAND-BY COMMANDS
"+++"   Enter in setup
"ATP"**<CR>**   Enter in stand-by status

SEQUENCE OF AWAKENING COMMANDS
<NULL>   Exits the stand-by status
"ATO"**<CR>**   Exits the set-up

LEGEND:
<NULL> = Null (ASCII 0 character).
<CR> = Carriage Return (ASCII 13 character).

LOW CONSUMPTION MODE
Disabled
Enabled

(!) Disabled

Select the desired option, and press on "Ahead".

- PROGRAMMING

1. Once the last parameter is configured, the following window will appear:

2. Select the "Serial Port" of the PC to which the radio module is connected:

3. If necessary, modify the "Radio Channel" in the combined box shown in the previous figure;

4. Connect the radio module to the PC and press on the "Module programme" button; the following window will appear:

After this, in sequence

if the communication is correct and the programming has gone well, otherwise

if the communication is not correct and the programming has not gone well (one should check the connections and verify the functioning of the serial line).

9. SAVE A CONFIGURATION ON A FILE

1. Once all the parameters are configured, the programme shows the following window:

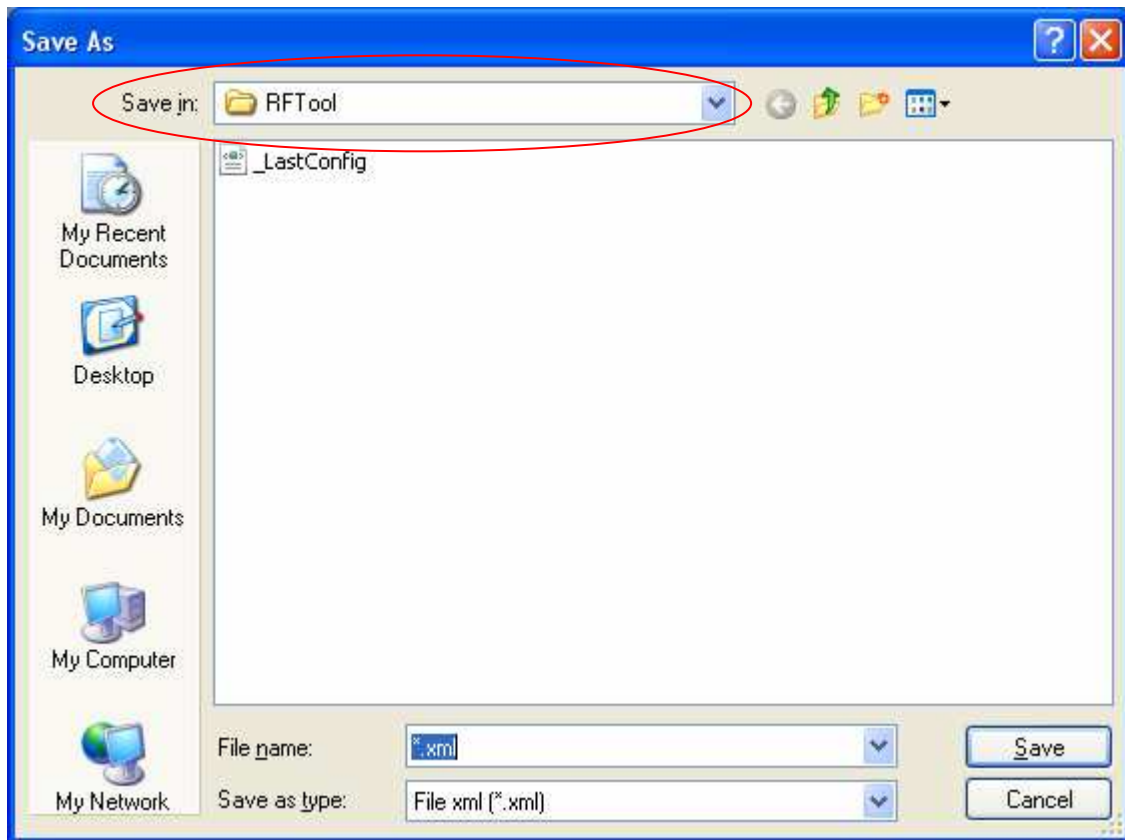**2.** If necessary, enter a description in the field shown in the previous figure;

3. Press on the "**Save Configuration**" key; if a description has not been entered, the following message will appear:
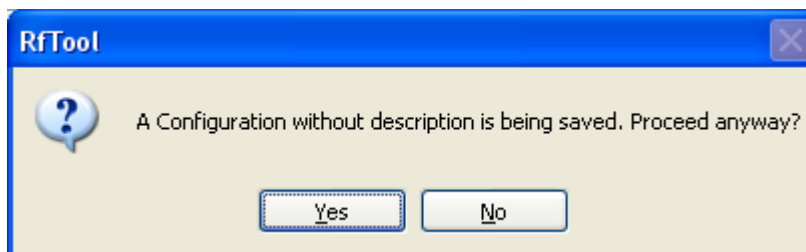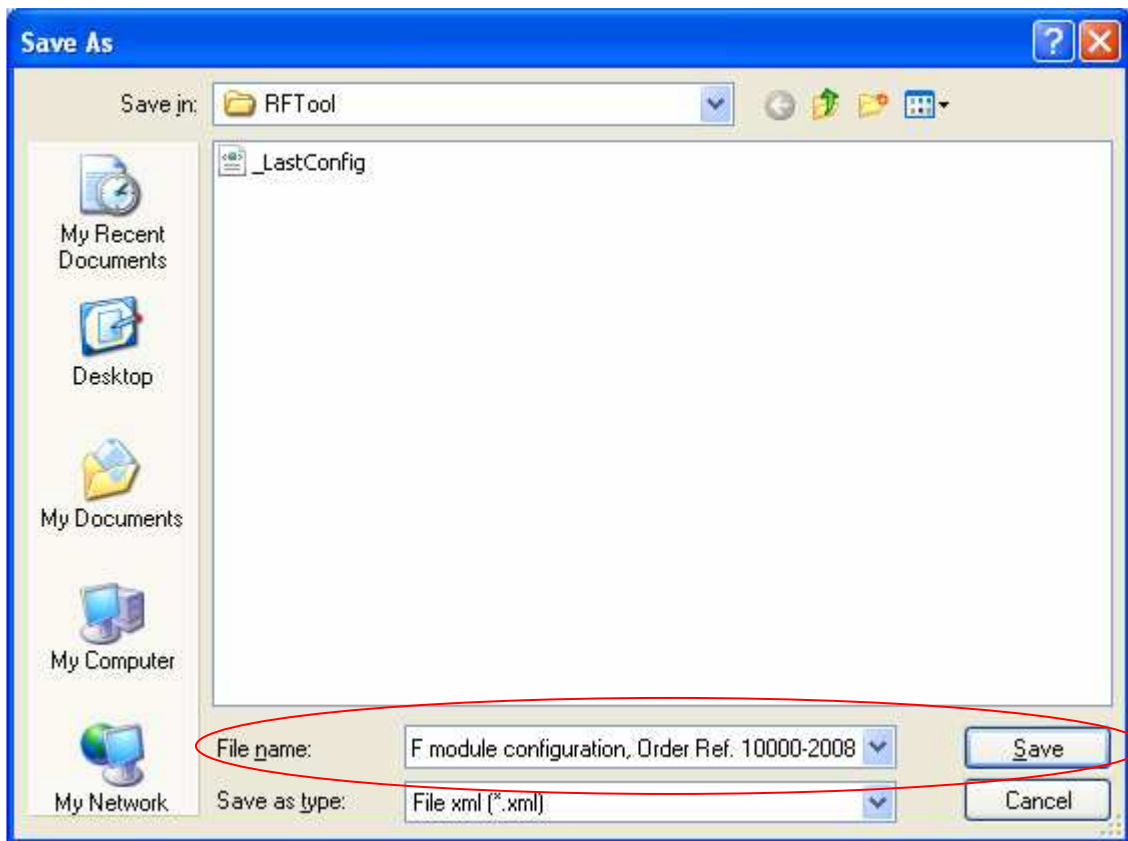

By pressing "**No**" one cancels the saving request, while with "**Yes**" one confirms.

4. The following window will appear:
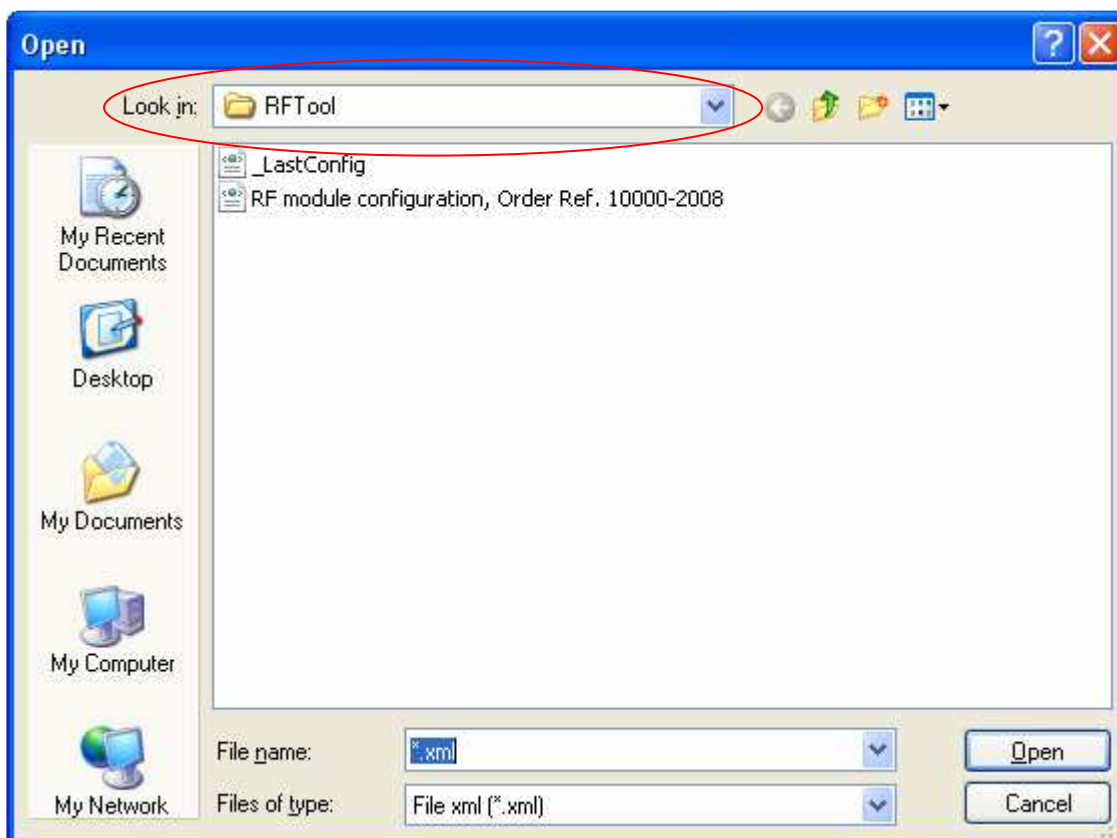

5. Select the destination path of the file.

6. Enter the name of the file and press on "**Save**"; one will find a new XML file in the selected path, containing the configured parameters.

10. OPEN A CONFIGURATION FROM A FILE

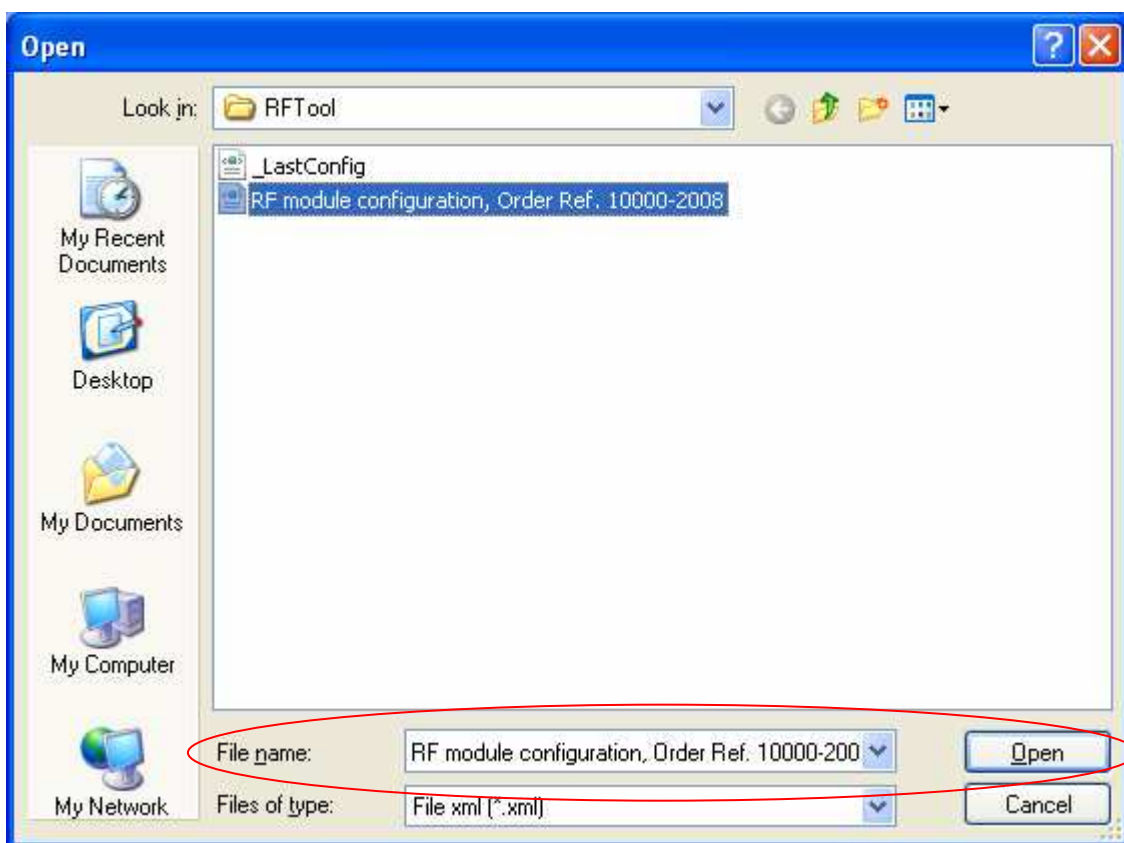**1.** Launch the software, the following window will appear:

2. Press on the "**Open Configuration**" key; the following window will appear:

3. Select the destination path of the file.

4. Select the desired configuration file and press on "**Open**"; the configuration parameters saved in the file will be automatically uploaded.

11. RECEIVE THE CONFIGURATION FROM THE MODULE

1. Launch the software; the following window will appear:

2. Select the "Serial Port" of the PC to which the radio module is connected:

3. Connect the radio module to the PC and press on the "Receive configuration" button; the following window will appear:

After this, if the communication is correct, and the programming has finished well, the following will appear in sequence:

The configuration parameters of the module and the firmware and loader version will be uploaded automatically.

If instead the communication is incorrect and the programming has not finished well, the following will appear:
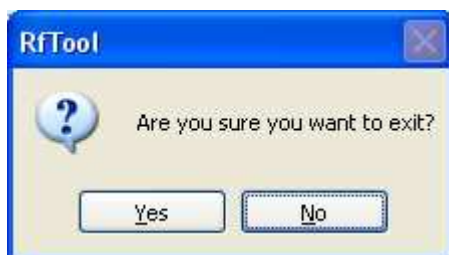

In this case, one should check the connections and verify the functioning of the serial line; after this, try again.

12. EXITING THE PROGRAMME AND AUTOMATIC SAVING/OPENING OF THE LAST CONFIGURATION

To end the work session:

- Press the closing button in the upper right of the RfTool window; a message will appear asking for the confirmation of the choice:

By pressing "**No**" one cancels the request to end the work session, while with "**Yes**" one definitely exits.

- The programme automatically saves the last open configuration in the "_LastConfig.xml" file, opened automatically with each start-up of the programme.

DECLARATION OF CONFORMITY

This device conforms to the essential standards and norms relative to the applicable European regulations. The Declaration of Conformity is available in the web site www.diniargeo.com

WARRANTY

The TWO YEARS warranty period begins on the day the instrument is delivered. It includes spare parts and labour repair at no charge if the INSTRUMENT IS RETURNED prepaid to the DEALER'S PLACE OF BUSINESS. Warranty covers all defects NOT attributable to the Customer (such as improper use) and NOT caused during transport.

If on site service is requested (or necessary), for any reason, where the instrument is used, the Customer will pay for all of the service technician's costs: travel time and expenses plus room and board (if any).

the Customer pays for the transport costs (both ways), if the instrument is shipped to DEALER or manufacturer for repair.

The WARRANTY is VOIDED if any of the following occurs: repairs or attempted repairs are made by unauthorised personnel, connected to equipment installed by others, or is incorrectly connected to the power supply, or instrument has defects or damage due to carelessness or failure to follow the guidelines in this instruction manual.

This warranty DOES NOT provide for any compensation for losses or damages incurred by the Customer due to complete or partial failure of instruments, even during the warranty period.

AUTHORIZED SERVICE CENTRE STAMP