

Radio frequency modules

OBRF



Technical Operating Manual

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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.



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(except 3GD ATEX version)

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 +85 °C.
MAXIMUM POWER	25mW
WORK FREQUENCY	From 868 to 870 MHz
NUMBER OF CHANNELS	Up to 50
RADIO TRANSMISSION SPEED	Up to 115.2 kbps
SERIAL TRANSMISSION SPEED	Up to 57.6 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)
RX	1 Reception	2
TX	2 Transmission	3
GND	6 GND	5

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.

OBRF MODEL

MEANING	COLOUR
TX	ORANGE
RX	YELLOW
GND	BLACK
+Vdc (5-12Vdc)	RED

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

- Do not disconnect the USB during the installation.

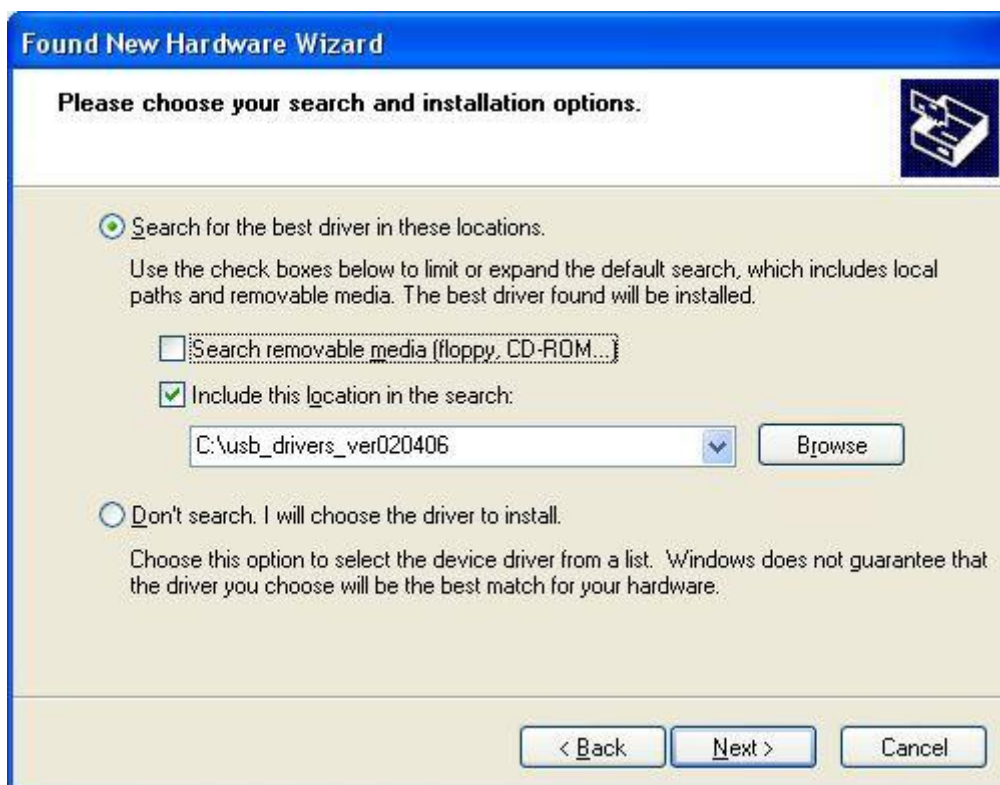
- 1) Save the driver in a folder on the PC.
- 2) Connect the radio module to a free USB port of the PC through a USB cable.
- 3) The operating system detects automatically the USB, then it asks for the driver to be used: if the request for the driver search on Internet appears, **click no** and then continue on.



4) Select the second option (“install from a specific folder”) and go Next.



5) Set the path of the folder which contains the driver previously saved and go Next.



6) Confirm the following message (if present):

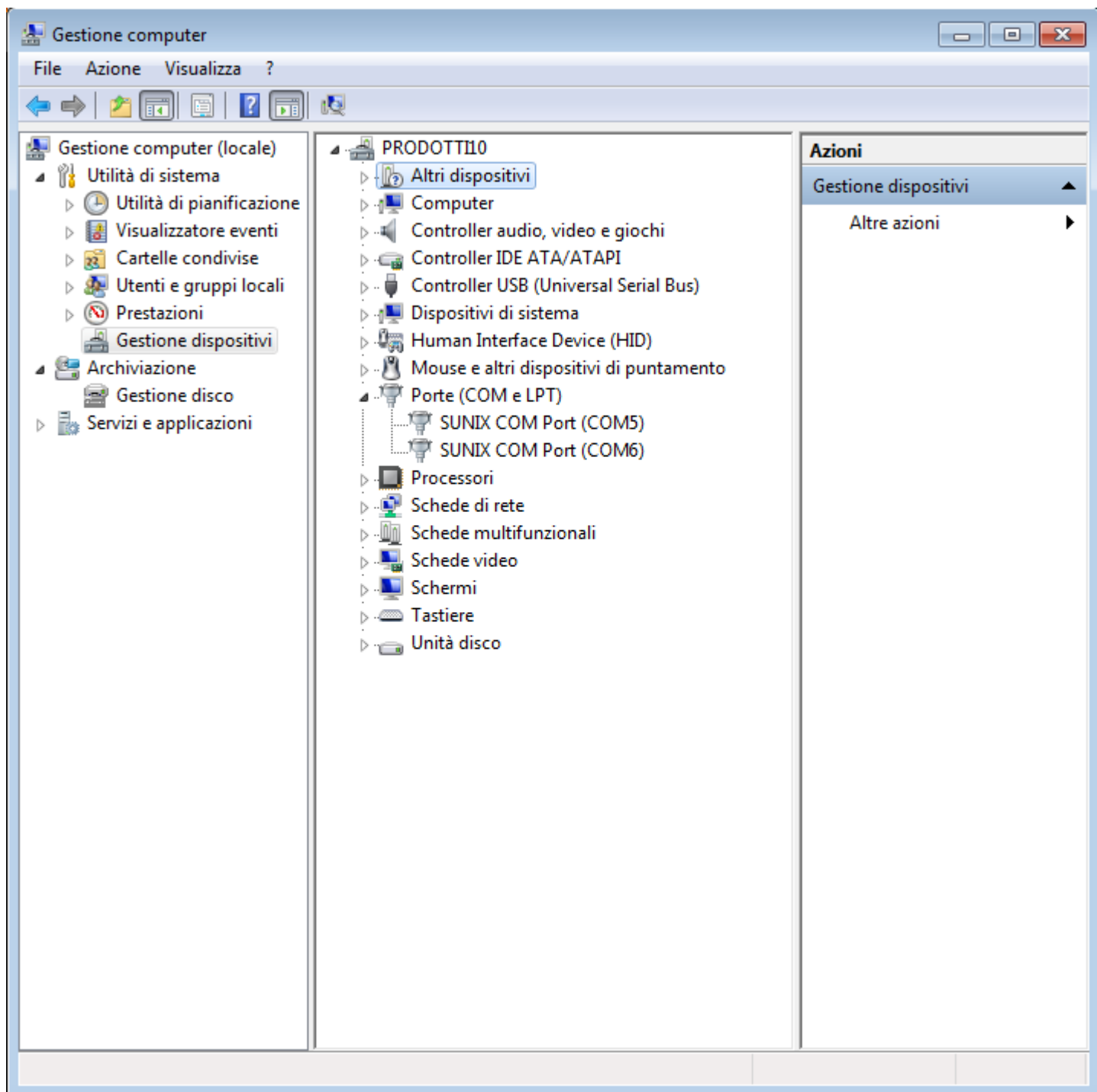




7) The first installation is complete: confirm the window.

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

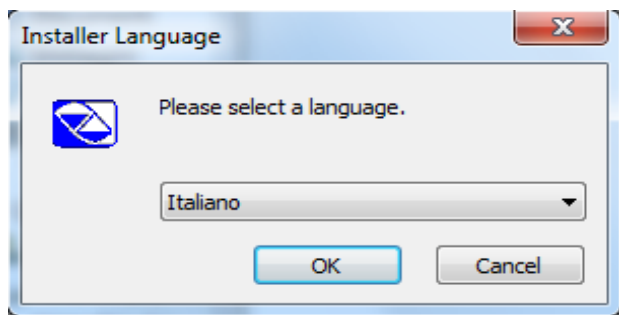
- Configuration of communication parameters and programming of the module
- Saving the configuration on a file
- Restoring the configuration from a file.
- Reception of the configuration from the module

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.

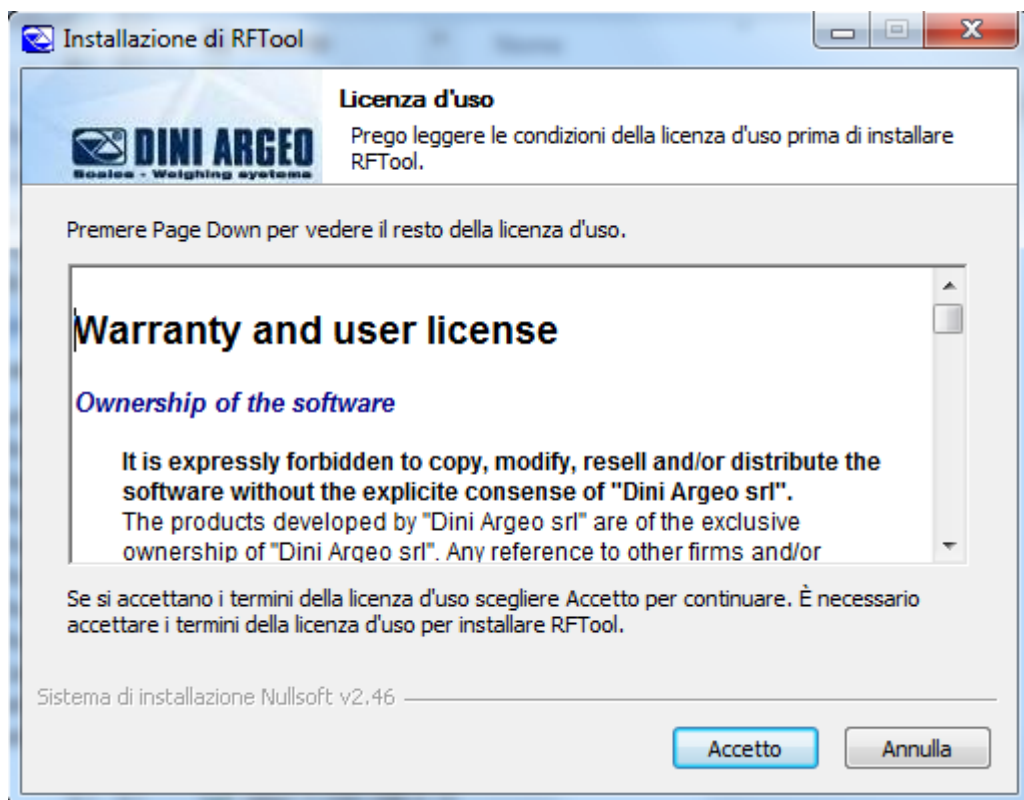
5. PROGRAM INSTALLATION

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

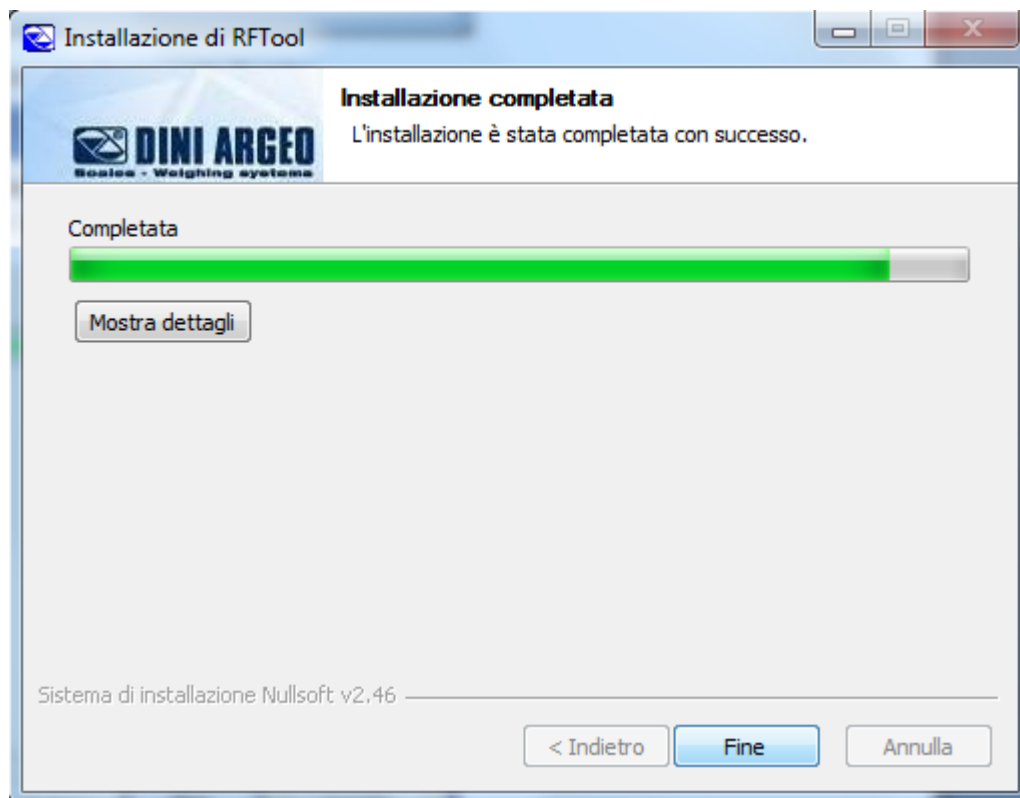


Select the language to be used in the installation wizard and press on "OK" to continue.

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



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



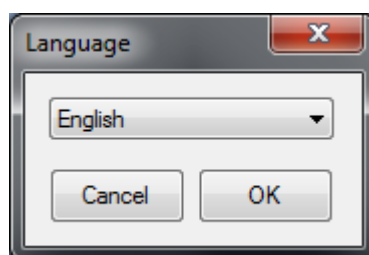
4) Click on "**Close**" to end the procedure; it's now possible to open the **RFTool** using the connection created on the desktop.

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. CONFIGURATION MODES

The software allows the configuration through 2 modes: BASIC or ADVANCED.

7.1 BASIC (THROUGH THE INDICATOR)

Through this mode it is possible to program the module connected to the indicator serial port, with the PC connected to another serial port of the indicator, giving the possibility to program the module also if it is not possible to connect it directly to the PC (module with TTL serial, or inside a sealed indicator).

To execute the programming it is required to read at first the module configuration, then it is possible to modify the parameters in the limits allowed with the set serial baud rate, that can not be changed.

NOTE: the indicator must foresee the special function to redirect all data from a serial port to the other one and vice versa, inside the diagnostic DIAG >> SERIAL step (see indicator manual).

PROCEDURE

- Connect the PC to a serial port of the indicator connected to the radio module (see indicator manual);
- Turn on the indicator;
- Enable the function to redirect the data from a serial port to the other, inside the DIAG >> SERIAL step (see indicator manual).
- Execute one of the configuration procedures described in the section 8.

7.2 ADVANCED (DIRECTLY FROM THE PC)

Through this mode it is possible to program the module directly from the PC, and configure all the parameters without limits.

NOTE: Do not use with radio module connected to the indicator.

PROCEDURE

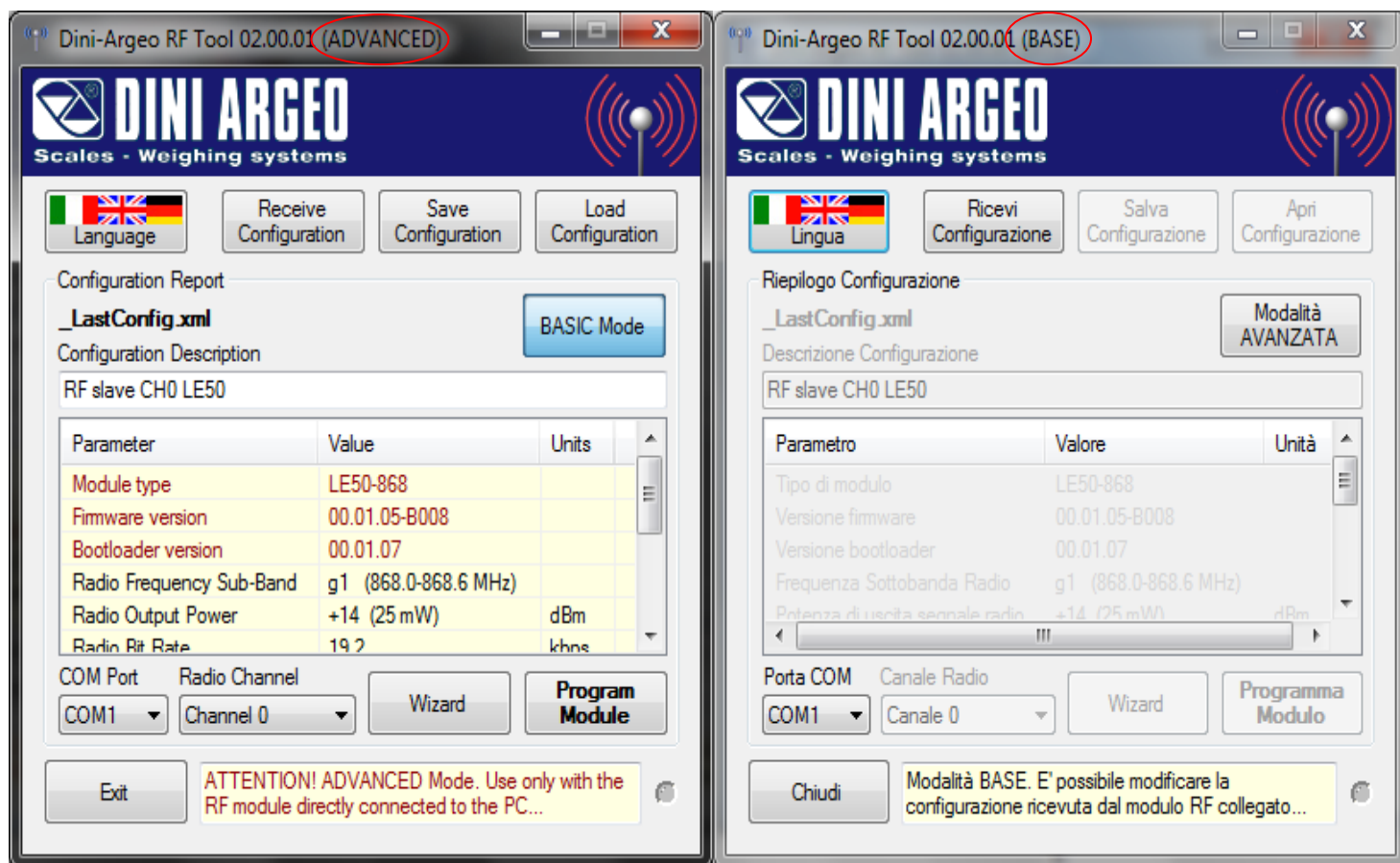
- Connect the radio module to the PC and to the power supply (see section 2.1)
- Execute one of the configuration procedures described in section 8.

7.3 SELECTION

At start-up the program starts in basic mode; to pass from basic mode to the advanced one and vice versa, press the ADVANCED MODE / BASIC MODE button:



The active mode is shown in the upper bar:



8. CONFIGURAZION PROCEDURE

8.1 QUICK CONFIGURATION

Through the quick configuration it is possible to quickly select one of the possible radio channels in the opened configuration, or the one received from the radio module, by leaving the other parameters on the set value.

In the case that a greater number of channels is requested, one should carry out the complete configuration procedure described in the section 8.2.

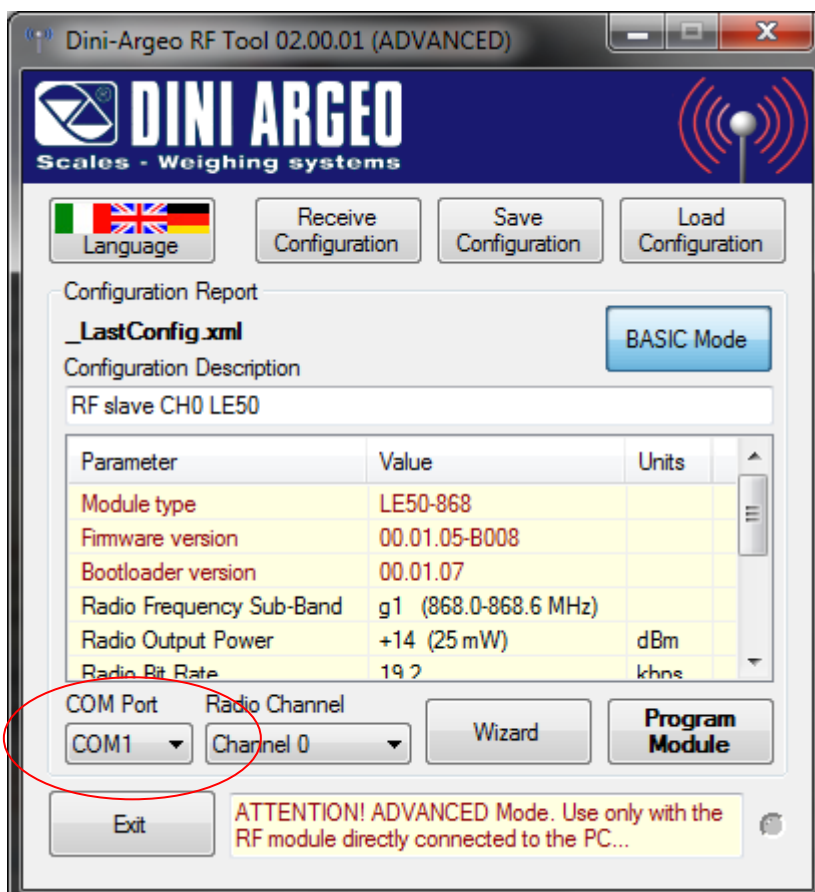
PROCEDURE:

1. Connect the radio module depending on the selected mode (see section 7).
2. 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).

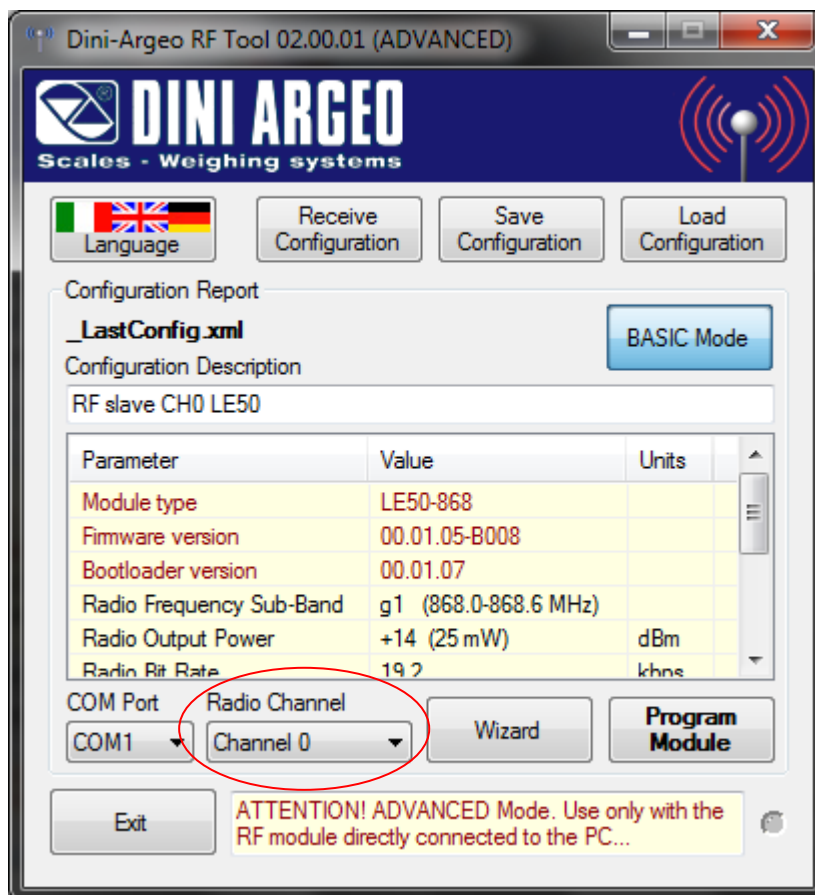
At the first start, the file contains already a factory configuration, with the following parameters (shown only in the advanced mode):



3. Select the configuration mode (see section 7); in the case the basic mode is selected, one has to receive the configuration from the module (see section 11) to enable the configuration and programming buttons.



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



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



6. 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).

8.2 COMPLETE CONFIGURATION

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

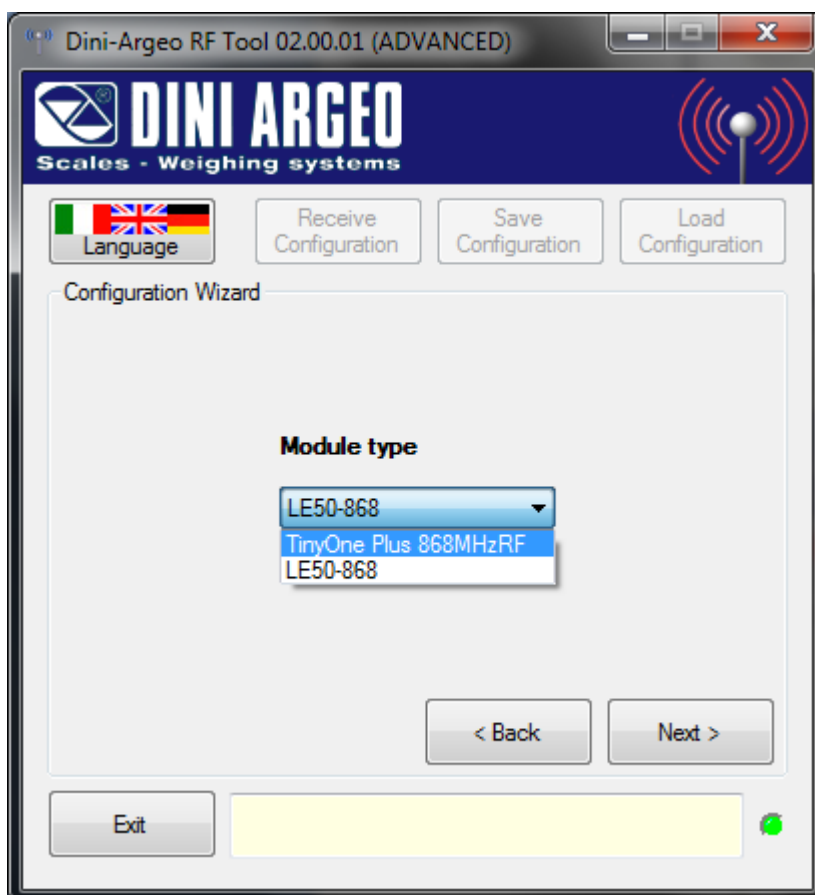
1. Connect the radio module depending on the selected mode(see section 7).
2. Launch the software; the following window will appear:



3. Select the configuration mode (see section 7); in the case the basic mode is selected, one has to receive the configuration from the module (see section 11) to enable the configuration and programming buttons.



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



5. In the combined box select if you want to configure the old radio module (TinyOne Plus 868MHzRF) or the new module (LE50-868).

In the event that you have selected the type of module "TinyOne 868MHzRF Plus", after you have clicked next, you can select if you want to configure an "Generic Instrument" or a "LCS". If, in the previous step was selected module LE50-868

you can only configure one "Generic Instrument"
 (Warning: the two radio module are not compatible)



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

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

7. Click on the "Next" 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 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):



Frequencies	Sub Band	Maximum power (mW)	Channel spacing(khz)	Duty cycle(%)
G1	868.0-868.6 MHz	25	Non specificata	1
G2	868.7-869.2 MHz	25	Non specificata	0,1
G3	869.4-869.65 MHz	25	25 (per uno o più canali)	10
G4	869.7-870 MHz	5	Non specificata	100
G	863.0-870.0 MHz	1	=<100 per 47 o più canali	100

(!) 868.0-868.6 MHz

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).

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



BIT-RATE RADIO
4.8 kbps
9.6 kbps
19.2 kbps
38.4 kbps
115,2 kbps

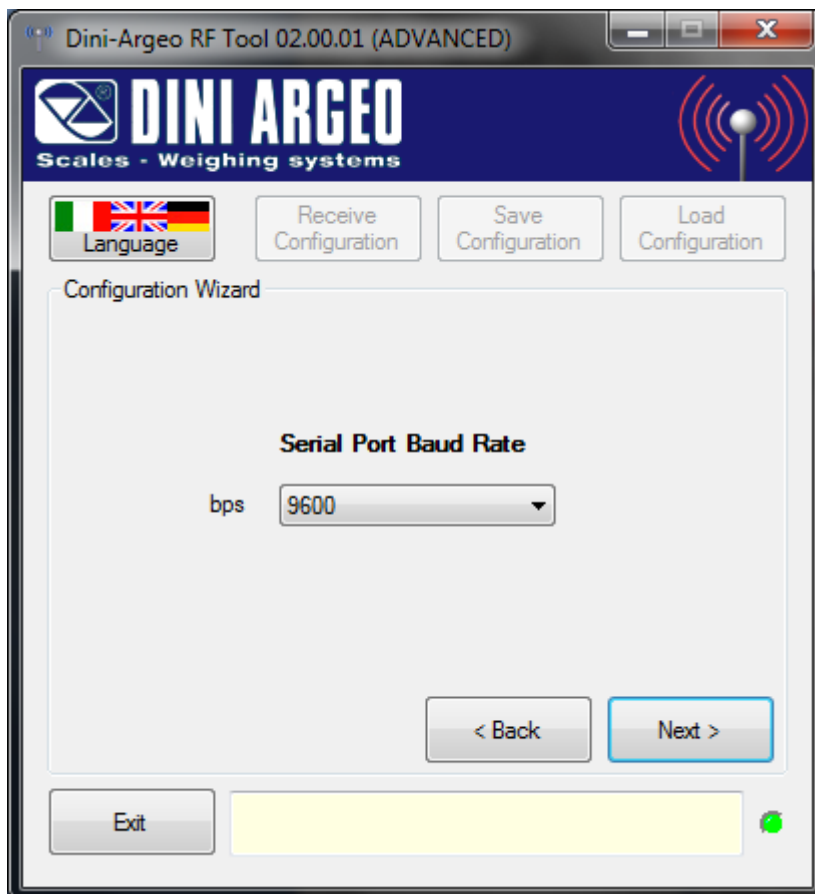
(!) 38,4 kbps

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

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).

- BAUD RATE ON THE SERIAL LINE



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

BIT-RATE RADIO	38.4 kbps	115,2 kbps
BAUD-RATE SU SERIALE	1200 bps	1200 bps
	2400 bps	2400 bps
	4800 bps	4800 bps
	9600 bps	9600 bps
	19200 bps	19200 bps

(!) 19,2 kbps

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

NOTES:

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

- SERIAL TIMEOUT



Select the timeout of the serial port between the values proposed in milliseconds, then press "Next"

(!) 5 ms

(Values from 3 to 20)

RADIO CHANNEL



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

ERC/REC70-03 Frequency (Mhz)	Band g 868.0 – 867.0	Band g1 868.0 - 868.6	Band g2 868.7 - 869.2	Band g3 869.4 - 869.65	Band g4 869.7 – 870.0
Global					
RF data rate	(1): 19.2 Kbps (2): 38.4 Kbps (3): 115.2 Kbps				
Numero di canali	20 (1) 10 (2) 0 (3)	6 (1) 3 (2) 1 (3)	5 (1) 2 (2) 1 (3)	1 (1) 1 (2) 0 (3)	3 (1) 2 (2) 0 (3)
Ampiezza canale	100 Khz (1) 200 Khz (2)	100 Khz (1) 200 Khz (2) 600 Khz (3)	100 Khz (1) 200 Khz (2) 500 Khz (3)	250 Khz (1)	100 Khz (1) 150 Khz (2)
Canale 0	865.550 Mhz (1) 865.600 Mhz (2)	868.050 Mhz (1) 868.100 Mhz (2) 868.300 Mhz (2)	868.750 Mhz (1) 868.850 Mhz (2) 868.950 Mhz (2)	869.5250 Mhz	869.750 Mhz (1) 869.775 Mhz (2)
Totale ampiezza di banda	2 Mhz	600 Khz	500 Khz	250 Khz	300 Khz

ERC/REC70-03 Frequency (Mhz)	Band g	Band g1	Band g2	Band g3	Band g4
	868.0 – 867.0	868.0 - 868.6	868.7 - 869.2	869.4 - 869.65	869.7 – 870.0
Global					
RF data rate	(1): 4.8 Kbps (2): 9,6 Kbps				
Numero di canali	60 (1) 60 (2)	12 (1) 12 (2)	10 (1) 10 (2)	1 (1) 1 (2)	6 (1) 6 (2)
Ampiezza canale	50 KHz	50 KHz	50 KHz	250 KHz	50 KHz
Canale 0	865.025 Mhz	868.025 Mhz	868.725 Mhz	869.525 Mhz	869.725 Mhz
Totale ampiezza di banda	3 Mhz	600 KHz	500 KHz	250 KHz	300 KHz

(!) Channel 0

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

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.

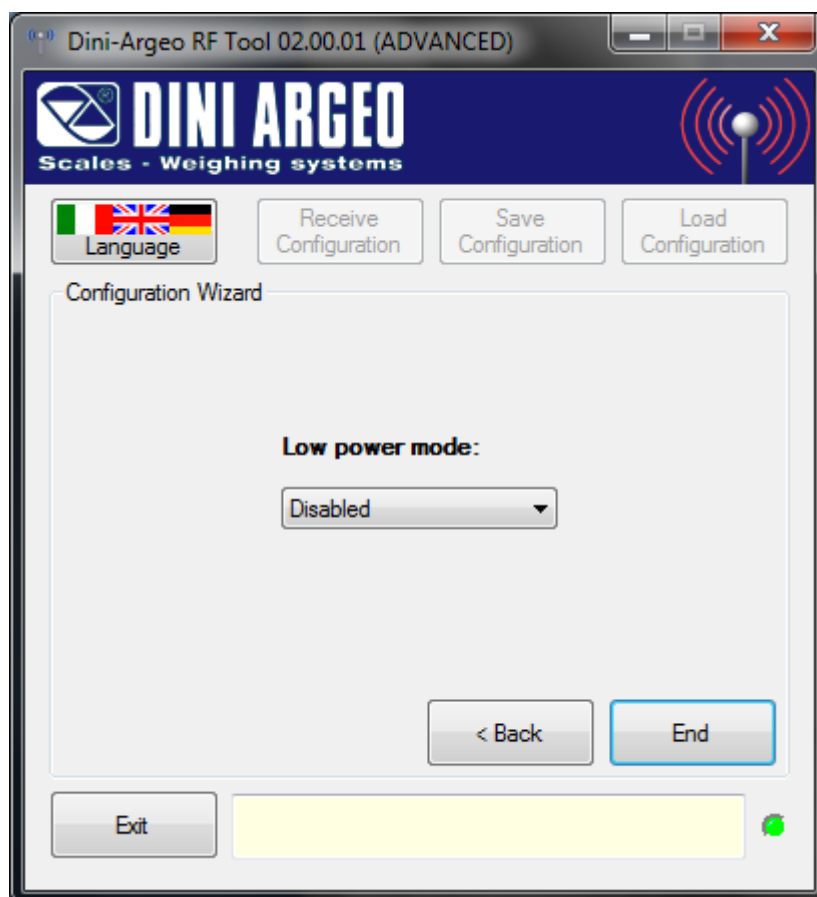
The selectable powers of the Radio Signal Output vary depending on the Radio Bit-Rate Radio and the radio Sub-band previously configured:

ERC/REC70-03 Frequency (Mhz)	Band g	Band g1	Band g2	Band g3	Band g4
	868.0 – 867.0	868.0 - 868.6	868.7 - 869.2	869.4 - 869.65	869.7 – 870.0
Bit-Rate Radio: 4.8 kbps					
POTENZA SEGNALE RADIO	25mW	25mW	25mW	25mW	5mW
Bit-Rate Radio: 9.6 kbps					
POTENZA SEGNALE RADIO	25mW	25mW	25mW	25mW	5mW
Bit-Rate Radio: 19.2 kbps & 38.4 kbps					
POTENZA SEGNALE RADIO	25mW	25mW	25mW	25mW	5mW
Bit-Rate Radio: 115,2 kbps					
POTENZA SEGNALE RADIO	25mW	25mW	25mW	25mW	5mW

(!) 25 mW

Select the desired power and press on "Next."

- 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.

LOW CONSUMPTION MODE
Disabled
Enabled

(!) Disabled

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

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



In that window we can see: module type, firmware version, bootloader version, radio frequency sub-band, output power of the radio signal, bit-rate radio, radio channel, baud network of serial, serial time out and if is enabled the low-power mode.

- PROGRAMMING



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



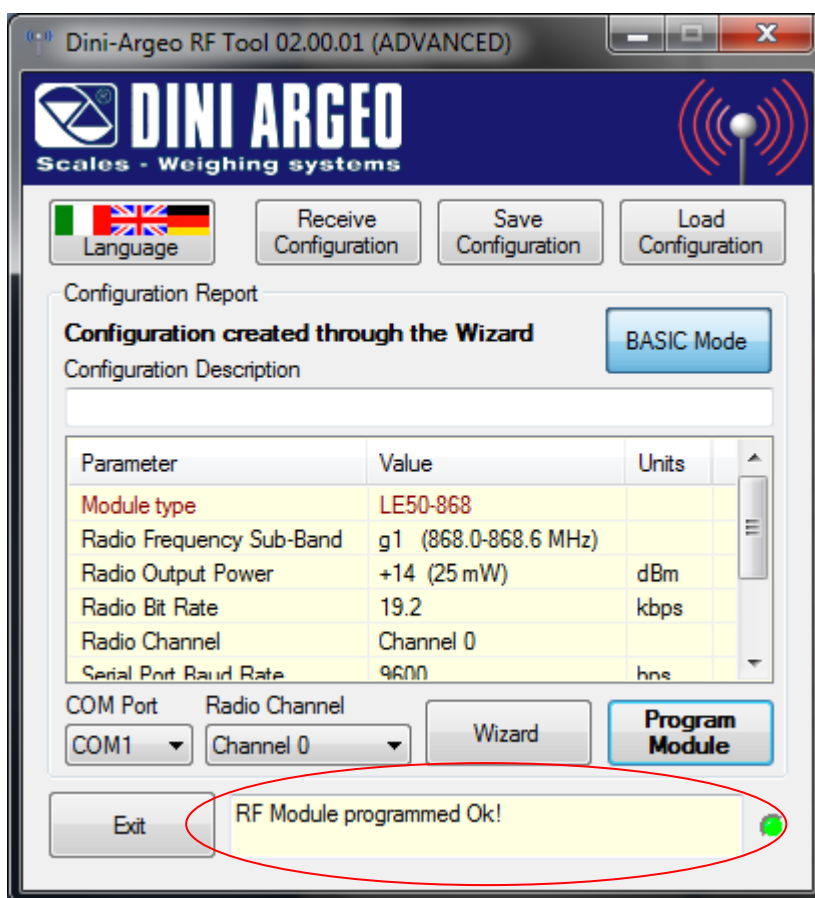
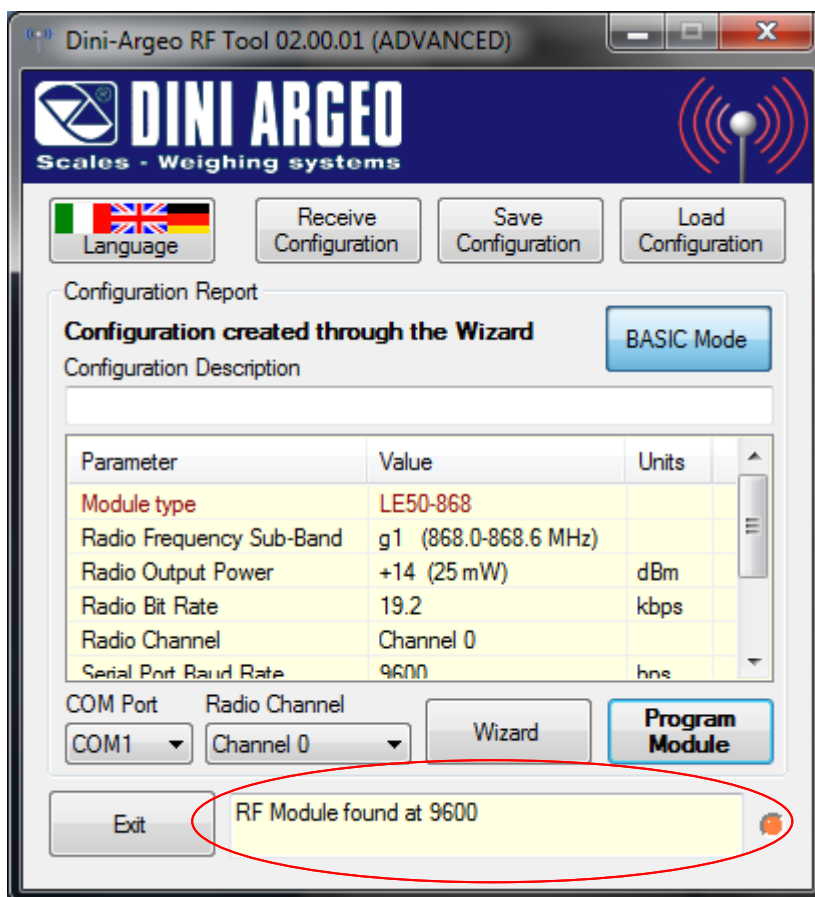
2. If necessary, modify the "Radio Channel" in the combined box shown in the previous figure;



3. 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).

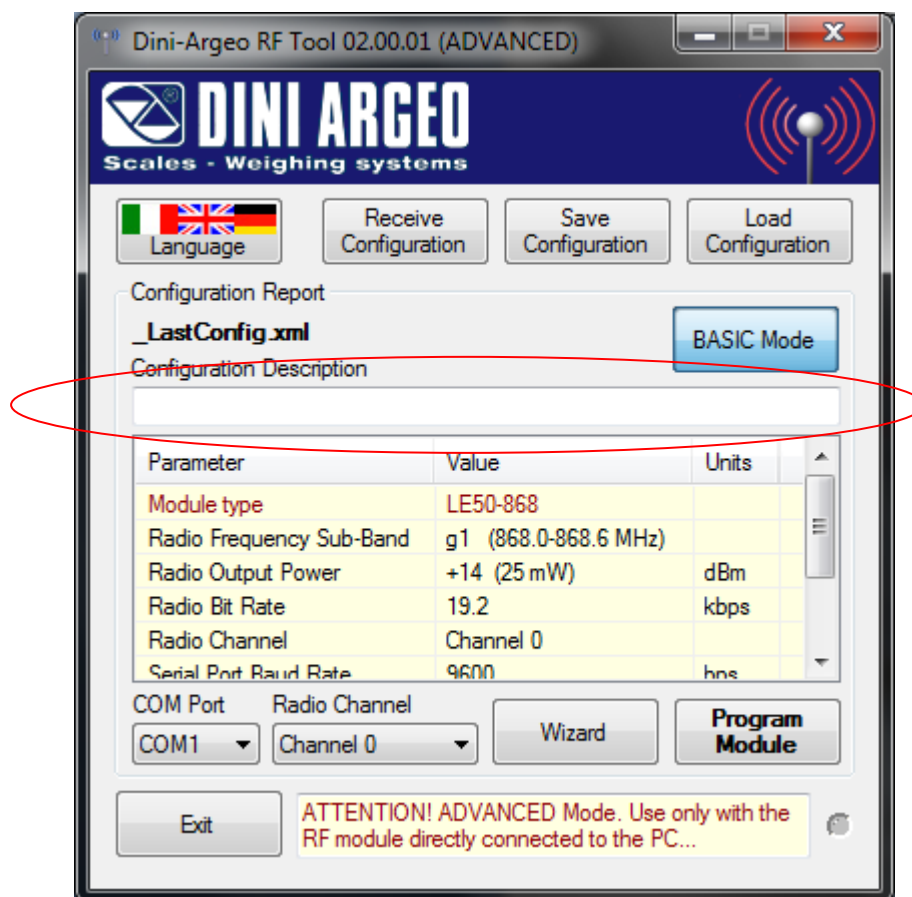
9. STANDARD DINI ARGEO CONFIGURATION

In the table below is present the standard configuration for the Dini Argeo indicators.

Parameter	Value
Instrument to configure	General purpose instrument
Radio Frequency Sub-Band	g1 (868,0 – 868,6 MHz)
Radio Bit Rate	19,6 Kbps
Serial Port Baud Rate	9600 bps
Serial Timeout	10 ms
Radio Channel	Channel 0
Radio Output Power	+14dBm (25 mW)
Low power mode	Disabled

10. SAVE A CONFIGURATION ON A FILE

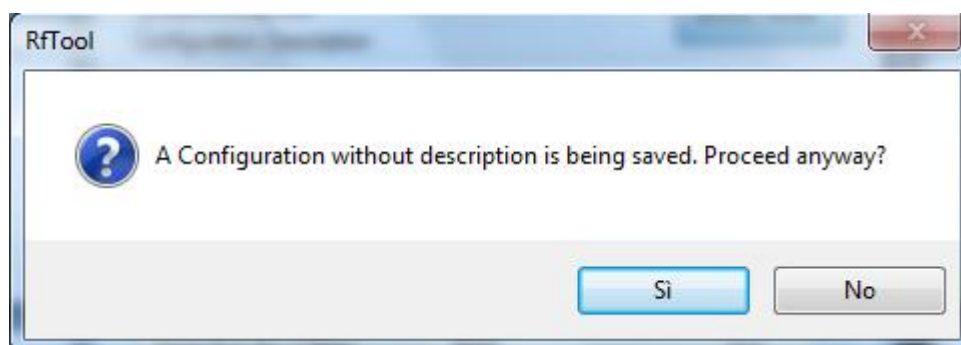
1. Once all the parameters are configured, the programme shows the following window:



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

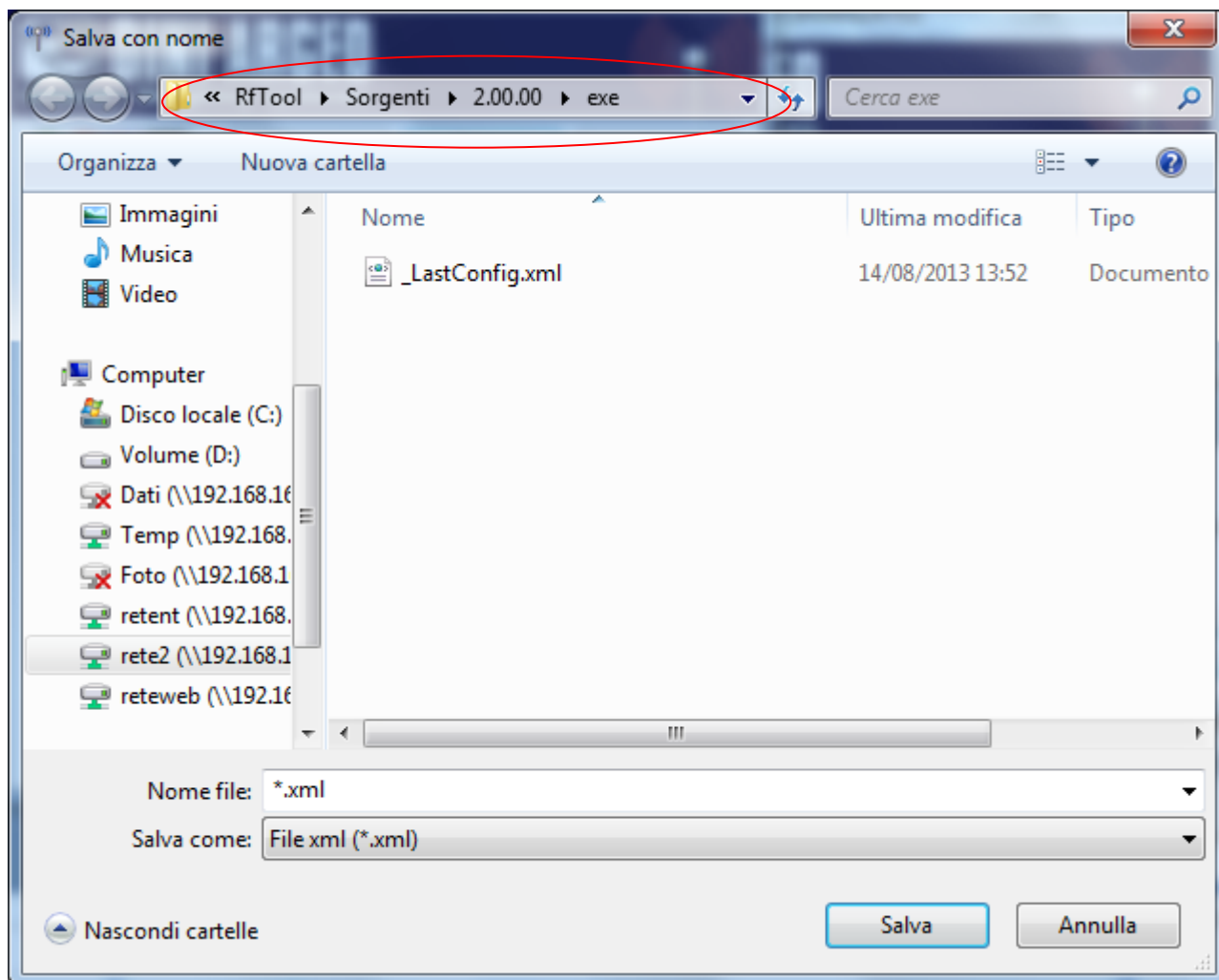


3. Press on the "Save Configuration" key; if a description has not been entered, the following message will appear:

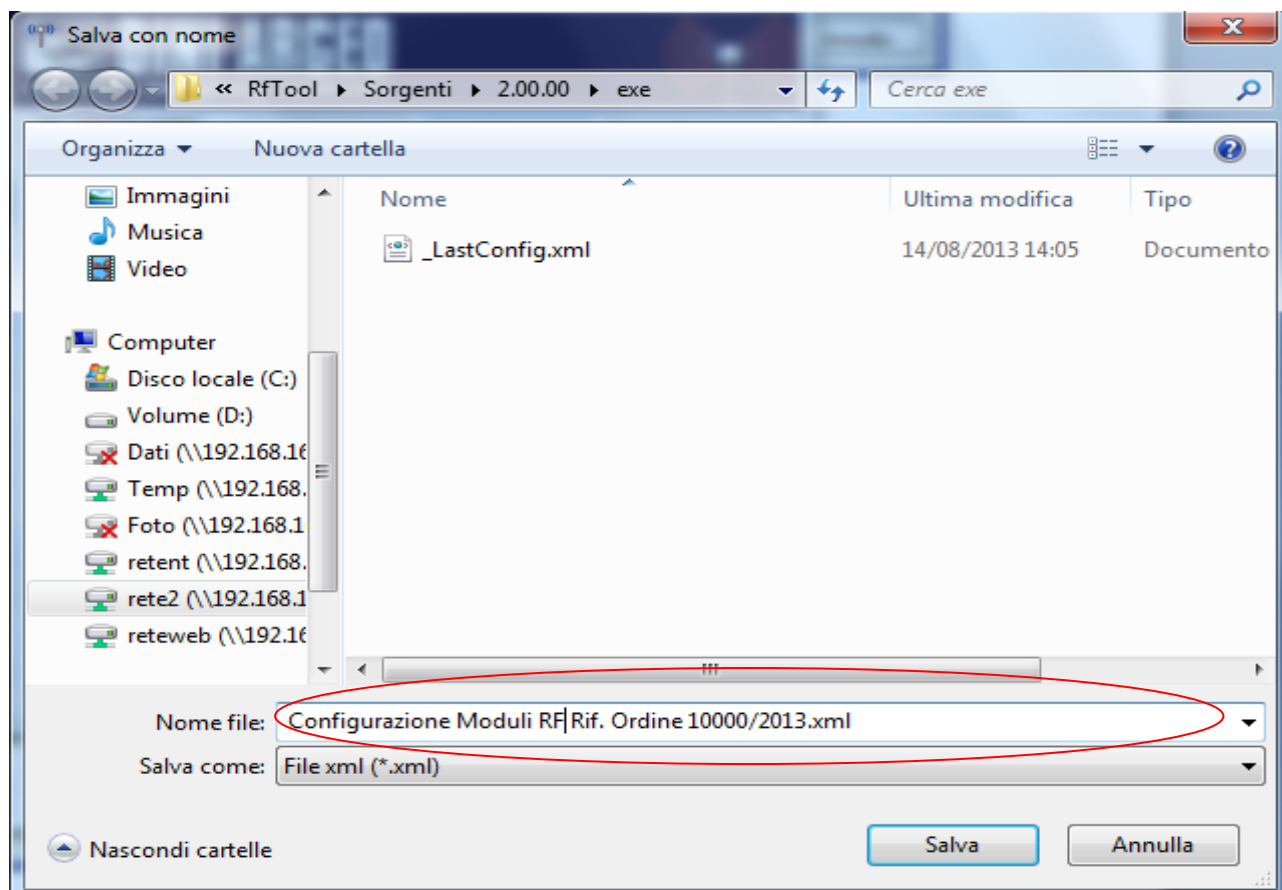


By pressing "No" one cancels the saving request, while with "Yes" one confirms.

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.

11. OPEN A CONFIGURATION FROM A FILE

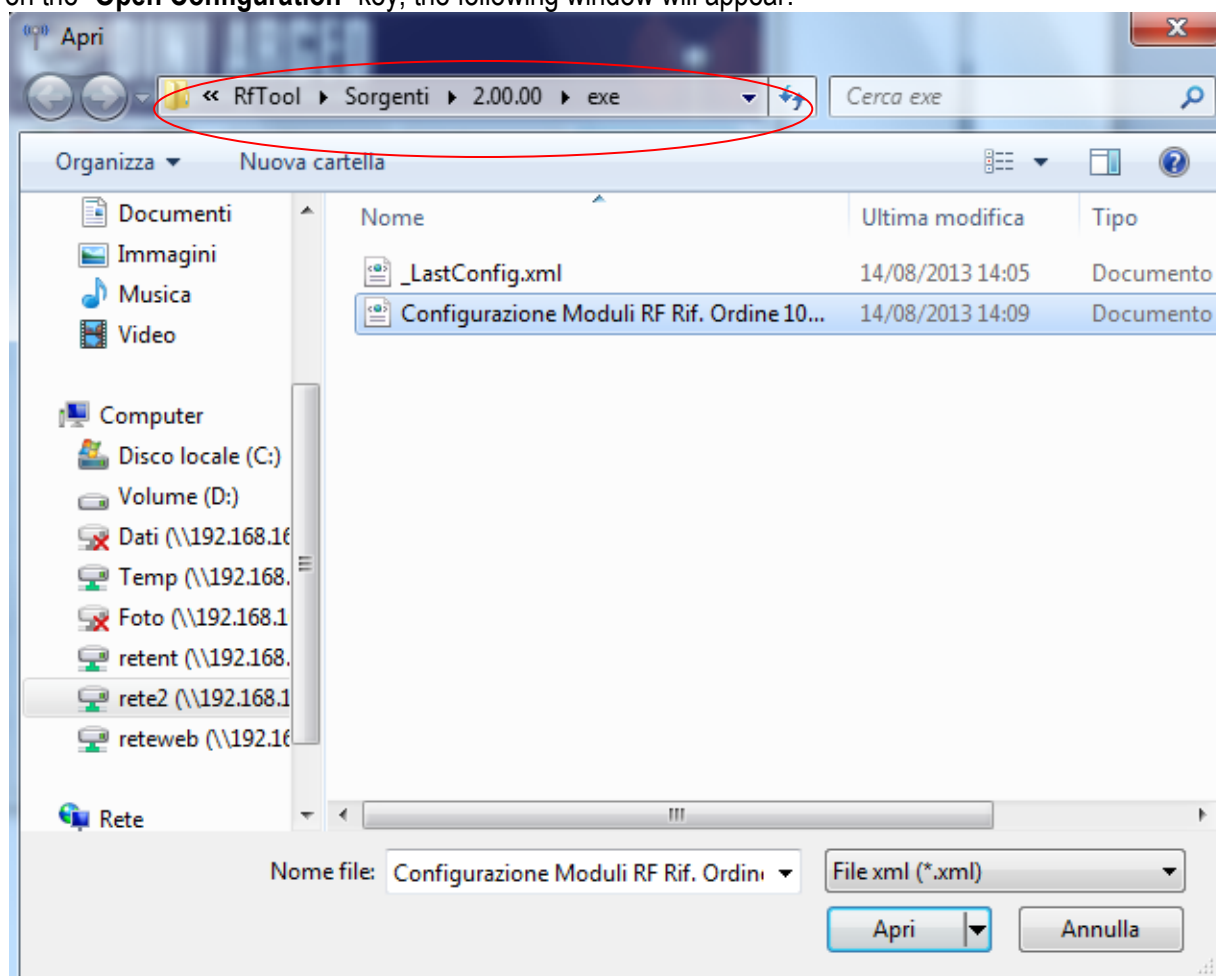
1. Launch the software, the following window will appear:



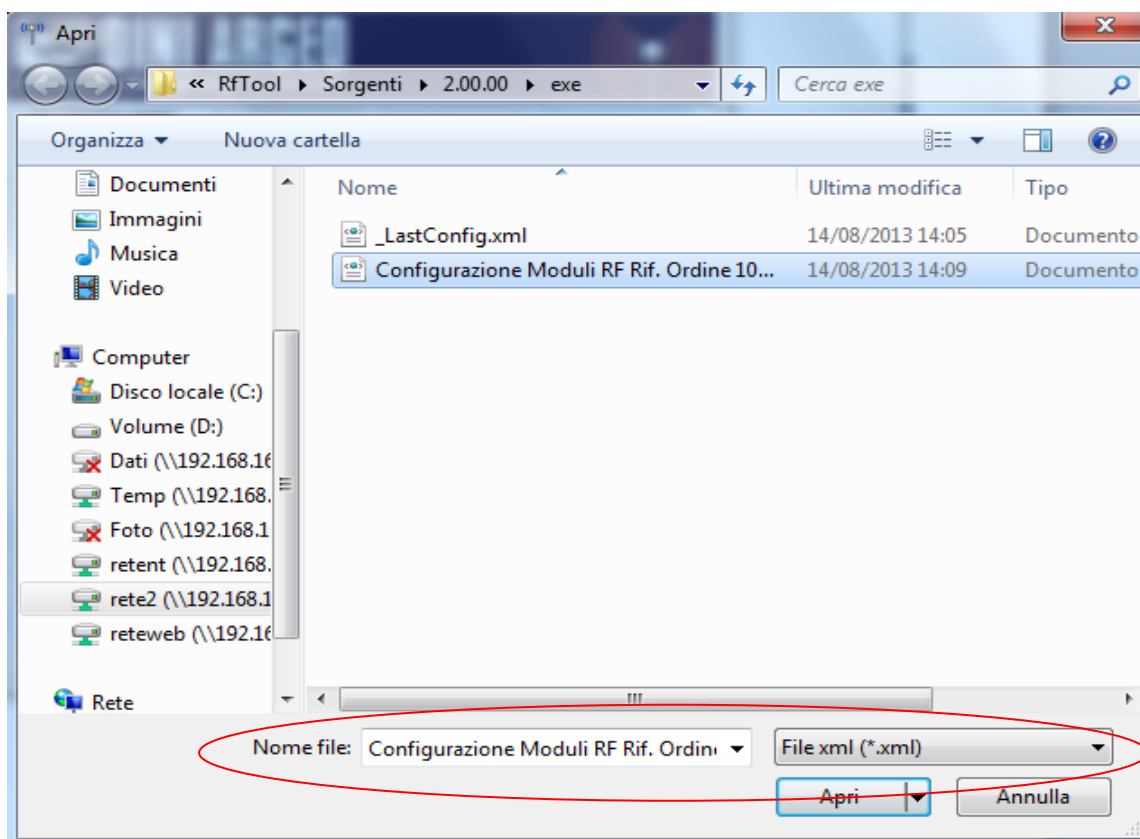
2. Select the advanced configuration mode (see section 7).



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



4. Select the destination path of the file.



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



12. RECEIVE THE CONFIGURATION FROM THE MODULE

1. Connect the radio module depending on the selected mode (see section 7).
2. Launch the software; the following window will appear:



3. Select the configuration mode (see section 7).



4. Select the "Serial Port" of the PC to which the radio module or the indicator is connected:

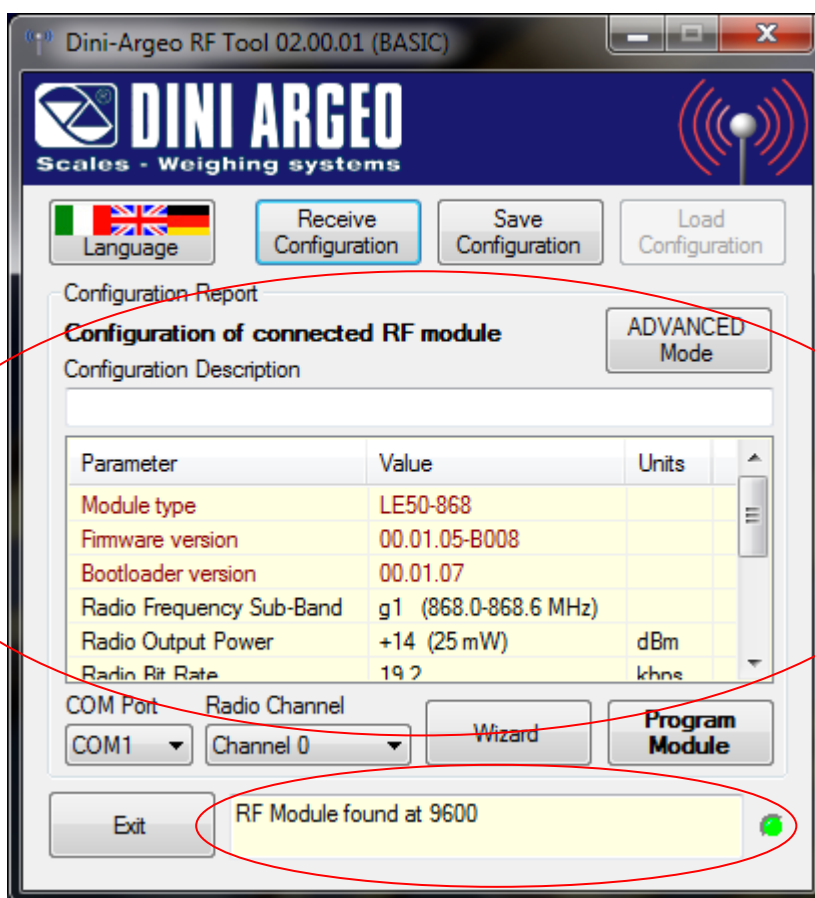


5. Press on the "Receive configuration" button; the following window will appear:



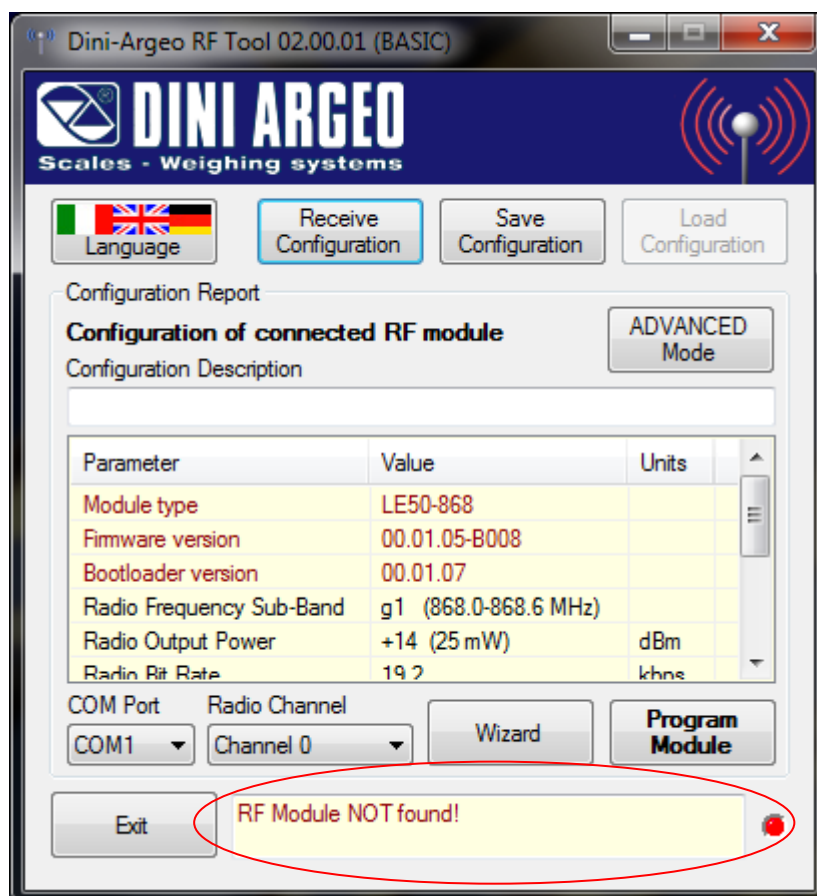
After this, if the communication is correct, and the programming has finished well, the following will appear in sequence:





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:

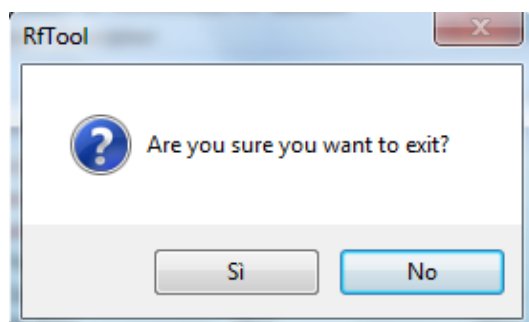


In this case, one should check the connections and verify the functioning of the serial line; after this, try again.

13. 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.

