TECHNICAL INFORMATION MANUAL

Revision 3 – 29 September 2020

Quattro R4321P

Smart 4-port RAIN RFID Long Range Reader

easy2read

CAENRFID

Visit the Quattro R4321P web page, you will find the latest revision of data sheets, manuals, certifications, technical drawings, software and firmware. All you need to start using your reader in a few clicks!

Scope of Manual

The goal of this manual is to provide the basic information to work with the Quattro R4321P Smart 4-port RAIN RFID Long Range Reader.

This manual refers to Quattro R4321P DISTRO firmware revision 1.2.0.

Change Document Record

Date	Revision	Changes	Pages
16 Sep 2019	00	Preliminary Release	-
17 Feb 2020	01	Added *CE Compliance* paragraph and *Quattro R4321P CE Declaration of Conformity*	67, 69
		Added notes regarding the Ethernet cable specification	9, 17, 41
06 Apr 2020	02	Added *FCC Compliance* paragraph and *Quattro R4321P FCC Grant*	68, 70
29 Sep 2020	03	Added *Installation Notice paragraph*	7
		Modified *RFID* paragraph	21
		Modified *EASY2READ Configuration Options* and *CUSTOM Configuration Options* paragraphs	22, 34
		Added *HID Profile* chapter	49÷53
		Added *HID Configuration Options* paragraph	25
		Modified *EASY2READ Profile* and *CUSTOM Profile* chapters	37÷40, 54÷57
		Added firmware revision in *Scope of Manual* paragraph	2
		Added *Connecting to RA0003 Multiplexer* chapter	65÷67

Reference Document

[RD1] EPCglobal: EPC Radio-Frequency Identity Protocols Class-1 Generation-2 UHF RFID Protocol for Communications at 860 MHz – 960 MHz, Version 2.0.1 (April, 2015).

[RD2] G.S.D. s.r.l. - Report CE mark – R4321P – Quattro. Test report n. 19517 Rev. 00 – 03 January 2020.

[RD3] CMC Centro Misure Compatibilità S.r.l. - Report Federal Communication Commission (FCC) – Quattro R4321P – Smart 4-port RAIN RFID Long Range Reader. Test report n. R20020701 Rev. 1.0 – 05 Mar 2020

[RD4] CMC Centro Misure Compatibilità S.r.l. - Report Federal Communication Commission (FCC) – Quattro R4321P – Smart 4-port RAIN RFID Long Range Reader. Test report n. R20020801 Rev. 1.0 – 05 Mar 2020

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Disclaimer

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Federal Communications Commission (FCC) Notice

This device was tested and found to comply with the limits set forth in Part 15 of the FCC Rules. Operation is subject to the following conditions: (1) this device may not cause harmful interference, and (2) this device must accept any interference received including interference that may cause undesired operation. These limits are designed to provide reasonable protection against harmful interference when the equipment is operated in a commercial environment.

This device generates, uses, and can radiate radio frequency energy. If not installed and used in accordance with the instruction manual, the product may cause harmful interference to radio communications. Operation of this product in a residential area is likely to cause harmful interference, in which case, the user is required to correct the interference at their own expense. The authority to operate this product is conditioned by the requirements that no modifications be made to the equipment unless the changes or modifications are expressly approved by CAEN RFID.

Disposal of the product

Do not dispose the product in municipal or household waste. Please check your local regulations for disposal/recycle of electronic products.

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1 INTRODUCTION

Product Description

The Quattro (Model R4321P) is a smart 4-port RAIN RFID long range reader of the easy2read© product line, well suited for retail and warehousing installations.

The Quattro reader has 4 antenna ports capable of a 31.5 dBm maximum power enabling to build RAIN RFID portals for long range reading. Its slim form factor makes it easy to install even when limited space is available. It offers the Ethernet (PoE) and USB communication interface in order to simplify the installation both on large and single read point installations. The Power over Ethernet capability permits to provide power and to communicate with the reader with a single cable.

The USB host port, combined with the internal computing architecture, permits to connect USB peripherals like barcode scanners, keyboards, printers and many others transforming the Quattro reader in a powerful and versatile identification platform.

The Quattro is based upon an embedded Linux platform and it's easily configurable using an internal web interface. System integrators can customize the behaviour of the reader installing Java code that, having access to all the RFID features and interfaces, permits a full customization.

The Quattro reader complies with and can operate in both European and US regulatory environments and, due to its multiregional capabilities, it's ideal for integration in devices requiring compliance to different geographical regions.

Fig. 1.1: Quattro reader (Model R4321P)

Ordering Options

	Code	Description
Reader	WR4321PXAAAA	R4321P Quattro - Smart 4-port Long Range RAIN RFID
Development kit	WR4321PXDKEU	Quattro - ETSI Dev Kit including RFID antenna with cable, power supply, and tag samples (reader not included)
	WR4321PXDKUS	Quattro - FCC Dev Kit including RFID antenna with cable, power supply, and tag samples (reader not included)
Accessories	WANTENNAX019	Circular polarized antenna 8.5dBc – ETSI
	WANTENNAX020	Circular polarized antenna 8.5dBc – FCC
	WALIM0000005	R4321P - Auxiliary Power Supply

Installation Notice

The Quattro R4321P reader could be mounted either horizontally or vertically. Locate the four mounting slots on the reader, as illustrated in *Fig. 1.2: Quattro R4321P Technical drawings: top view*. In the four mounting slots there are rubber gaskets to facilitate adherence to smooth surfaces.

All measurements are in millimetres.

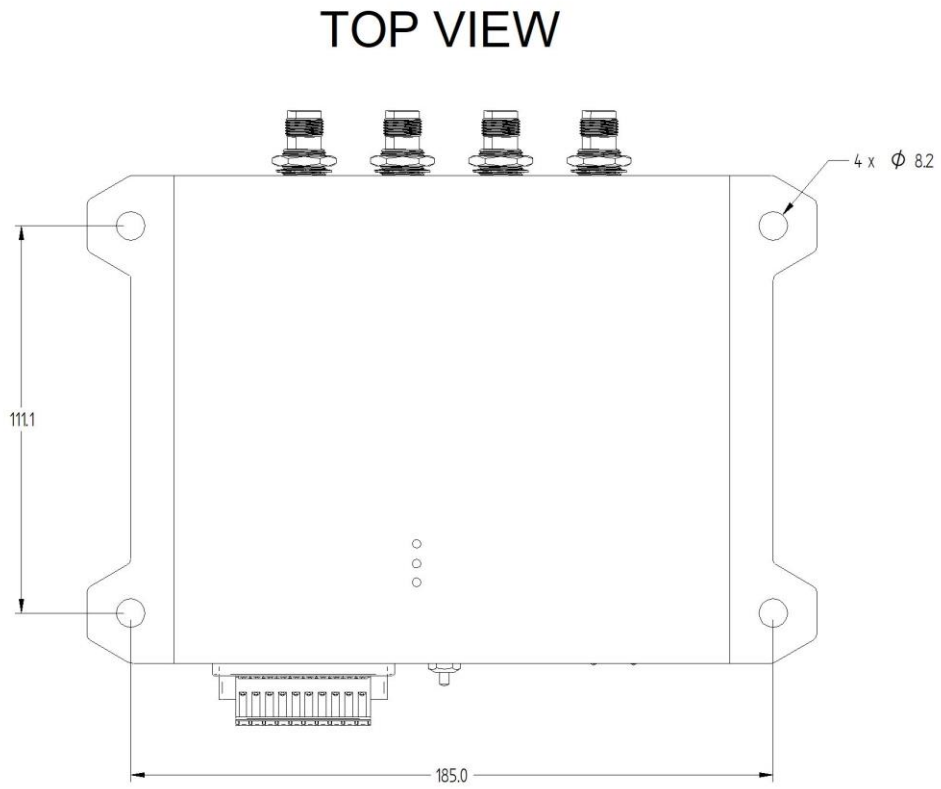
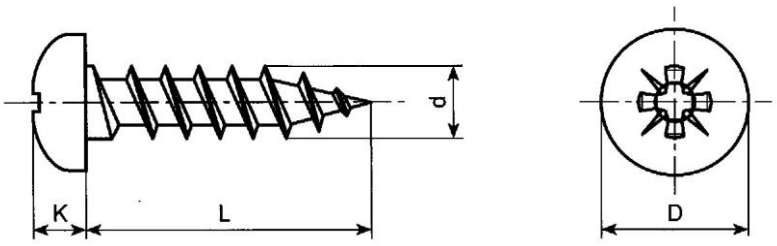


Fig. 1.2: Quattro R4321P Technical drawings: top view

Wall fixing

A cylindrical-head self-tapping screw (not provided) with the following measures is recommended to fix the reader directly to the wall:



where:

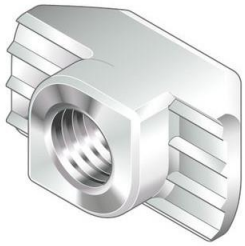
Parameter	Min value	Max value	Unit
K	2	5	mm
L	50	100	mm
d	5	8	mm
D	9	15	mm

Tab. 1.1: Cylindrical-head self-tapping screw measures

Fixing on Bosch Rexroth's profile

One of the fastenings that are very requested in the industrial field is the possibility of mounting on Bosch profiles. The 4 fixing slots of the Quattro R4321P reader are sized to facilitate this type of assembly.

An M8 screw with the respective M8 nut is required to fix the reader using Bosch profiles:

		
M8 nut	Bosch Rexroth's profile	M8 screw

Note that these accessories are not provided with the reader.

2 GETTING STARTED

Introduction

This quickstart guide will help you to get started with your Quattro (Model R4321P) reader.

The reader can be configured in three different profiles:

- **EASY2READ** (factory default): choosing this option you select the CAEN RFID easy2read communication protocol. Select this option in order to control the reader using the CAEN RFID Easy Controller Application or the SDK (Software Development Kits) library. For details on the use of the EASY2RD profile please refer to this quickstart guide.
- **HID:** choosing this option you select the keyboard emulation protocol.

  For details on the use of the HID profile please refer to *§ HID PROFILE* chapter page 49.
- **CUSTOM**: the use of this profile allows the user to upload their own scripts to the reader. For details on the use of the CUSTOM profile please refer to § *CUSTOM PROFILE* chapter page 54.

The reader is sold with the factory profile set to *EASY2READ*. This guide helps you to getting started with your reader using the EASY2READ profile.

For more detailed information on reader configuration, connections and setup options please refer to the next chapters.

Connecting to the Quattro Reader using the Ethernet port

Ethernet Communication Setup

The Quattro reader can be connected to a PC using an Ethernet cable. In order to correctly operate with the reader follow the steps above:

1. Connect the antenna cable to Ant-0 (see § *Fig. 3.6: Antennas* page 16) of the reader.
2. Connect the Quattro to the power supply, the power LED will turn on, wait about 30 seconds until you hear a beep, wait 10 seconds again and the reader is ready to work with the *EASY2READ* profile active.
3. Plug an Ethernet cable[1] (not provided) into your computer and connect the other end of the Ethernet cable to the reader. If your private network matches the default network configuration of the reader (IP address 192.168.0.2) you can connect to it, otherwise you can:
   a. change the network configuration of the reader (see § *NETWORK* page 19) to connect it to your network

      or

   b. disconnect your PC from your network and connect it to the network of the reader.

Now you can use the CAEN RFID Easy Controller Application to control the reader.

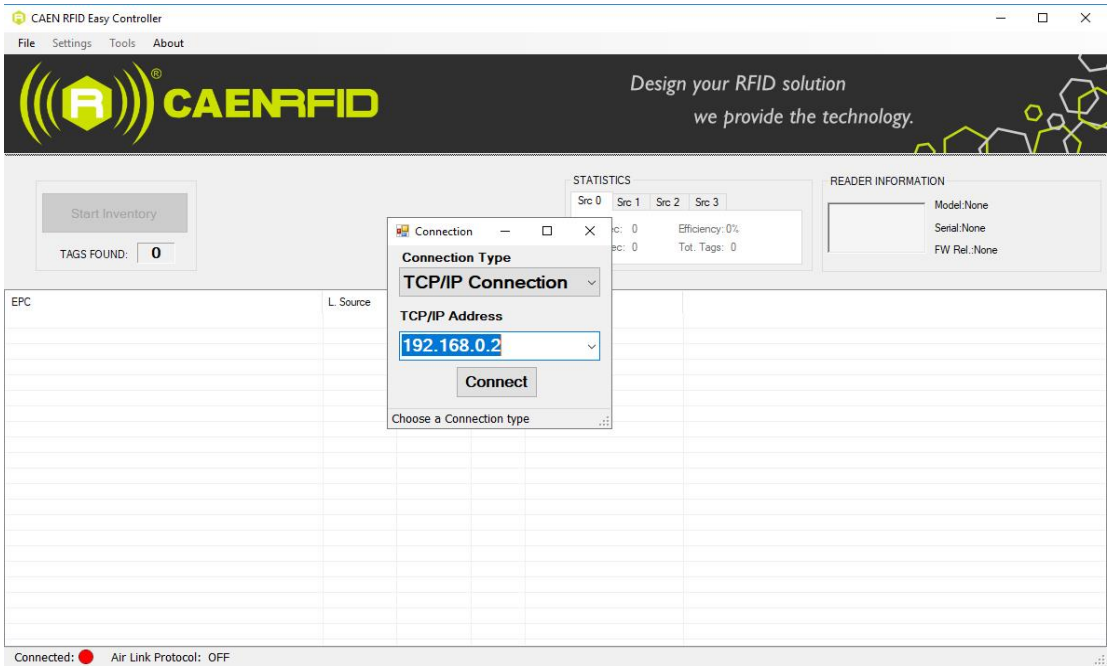
[1] For proper operation of the device:
- Ethernet cable shall be CAT6 at least (type S/FTP or S/STP)
- Put two ferrites (P.N. RRC-13-7-23-M-K5B by RICHCO; CAEN RFID ordering code LFAAFFP00004) on the Ethernet cable, near the reader connector.

Easy Controller

Follow these steps to connect the Quattro reader using the *Easy Controller* application for Windows:

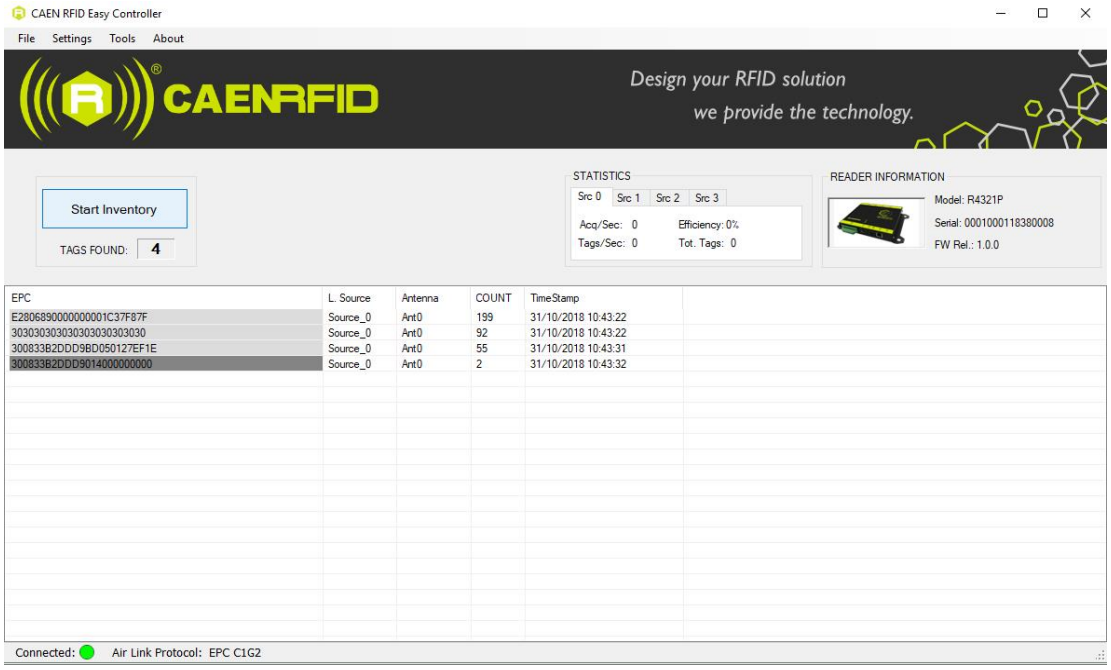
1. Download the latest version of the *Easy Controller software* from the Quattro R4321P web page, *Downloads* section and install it.
2. Launch the *Easy Controller* application:

3. On the main screen click on *File → Connect*. A Connection windows will open. Select the C*onnection Type* (TCP/IP Connection) and type the Quattro IP address into the *TCP/IP Address* box (default value is 192.168.0.2). Then click on *Connect*:



4. To verify if the connection with the reader has been established, check the green dot on the bottom left side of the sidebar. Into the *READER INFORMATION* box you can find information on reader model, serial number and firmware release:

5. Place a tag in the read range of the reader, click on *start inventory* and see the tag information displayed on the main window:



For more info on the use of the *Easy Controller*, please refer to the *CAEN RFID Easy Controller Software Technical Information Manual*, you can download it from the Quattro R4321P web page, *Downloads* section or in the Manual and Documents web area.

3 EXTERNAL INTERFACE DESCRIPTION

LEDS

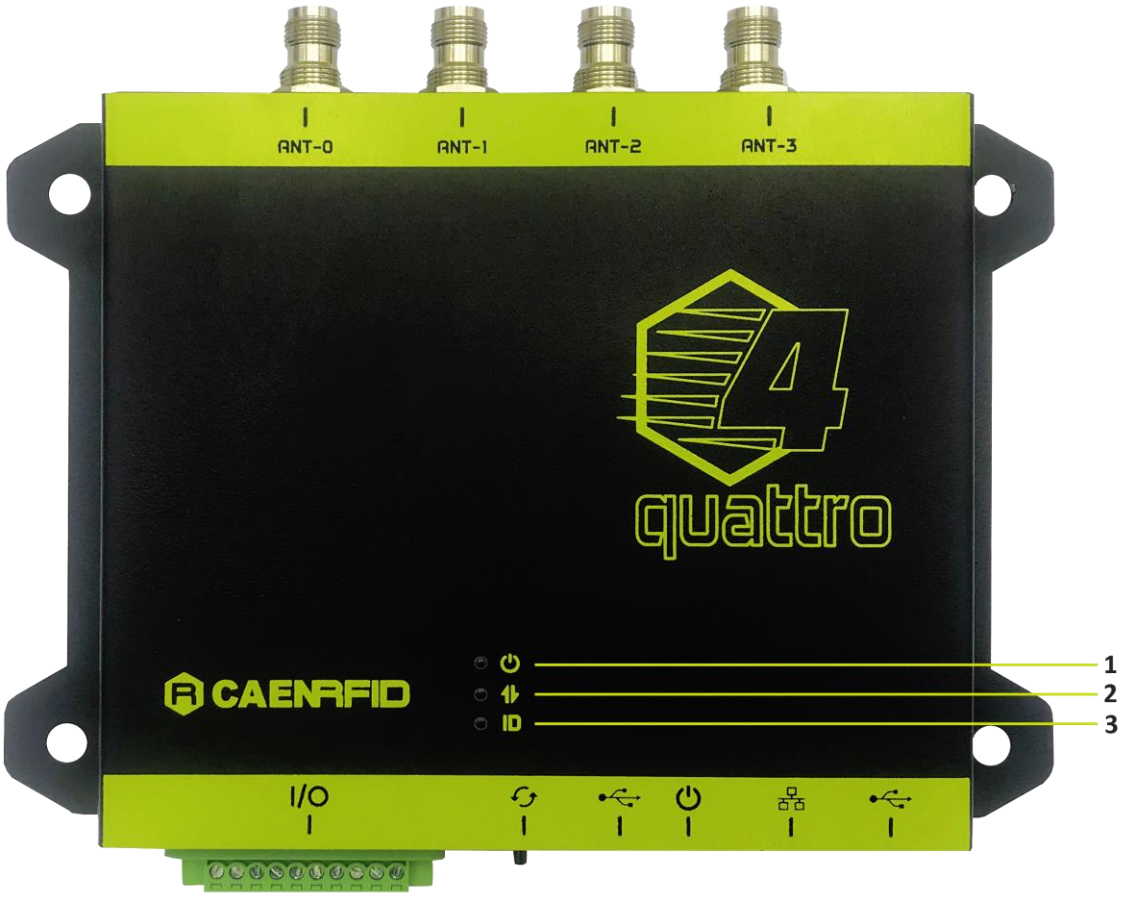


Fig. 3.1: LEDs

No.	Name	Description
1	Power	Power On – Green LED
2	Communication	Communication activity – Blinking Yellow LED
3	Tag-ID	Tag Detection – Blinking Red LED

Tab. 3.1: LEDs

Connectors

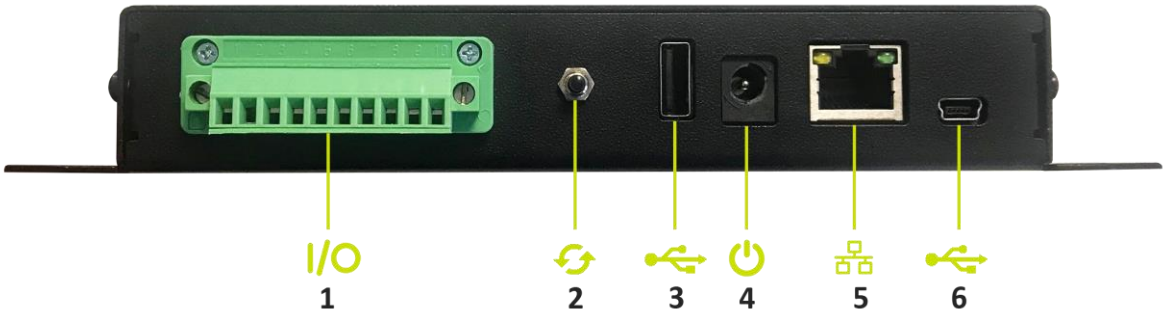


Fig. 3.2: Interfaces Panel

No.	Name	Description
1	GPIO	General Purpose Input Output
2	UPGRADE	Upgrade operative system
3	USB host	USB 2.0 Hi-speed Host port
4	Power	Power Supply Connector
5	Ethernet	Ethernet 10/100/1000BASE-T (RJ45) / POE standard IEEE 802.3af
6	USB device	USB 2.0 Hi-Speed Device port

Tab. 3.2: Interfaces Panel

GPIO

10 Poles terminal block with screw connection with tension sleeve:

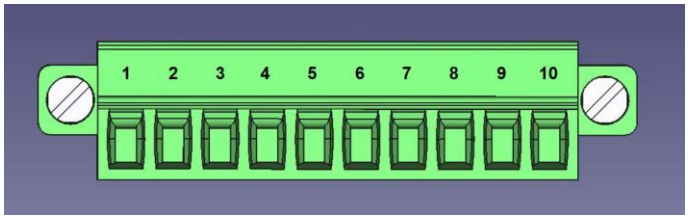


Fig. 3.3: GPIO Connector

No.	Name	Description
1	+5V	5VDC
2	GND	Ground
3	GPI0	General purpose input 0
4	RTN	Return
5	GPI1	General purpose input 1
6	RTN	Return
7	OUTPUT1.1	SS-Relay 1 Contact 1
8	OUTPUT1.2	SS-Relay 1 Contact 2
9	OUTPUT2.1	SS-Relay 2 Contact 1
10	OUTPUT2.2	SS-Relay 2 Contact 2

Tab. 3.3: GPIO Connector Poles

Input signal

To have a valid input signal, apply a voltage between 4V and 48V to the pin indicated by GPI0 (or GPI1) and its return (RTN) pin.

The most simply way to have a valid input signal is connecting the +5V pin, present on the terminal block connector, to the GPI0 pin through a switch that enables the input signal when it is closed. The connection between ground (GND) and return (RTN) is also required to complete the circuit.

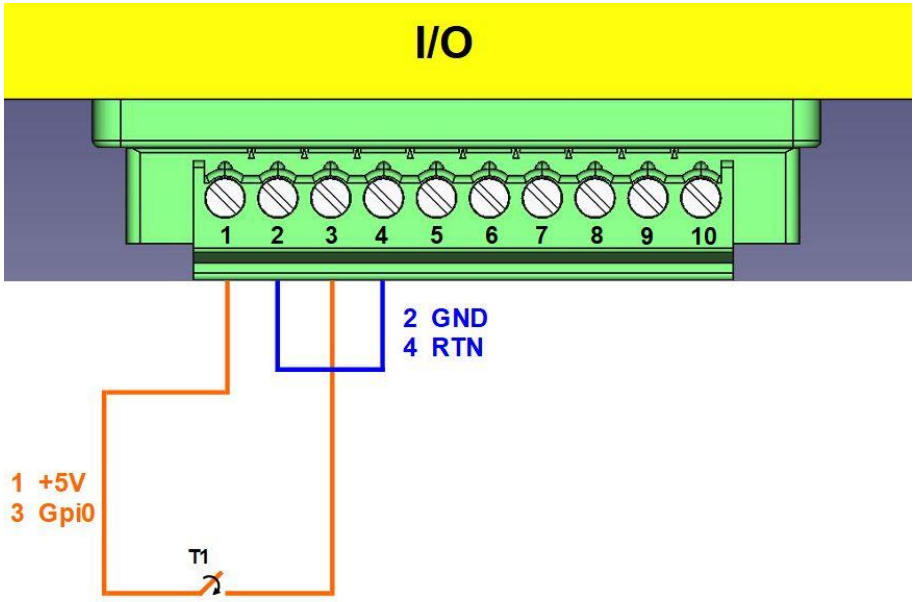
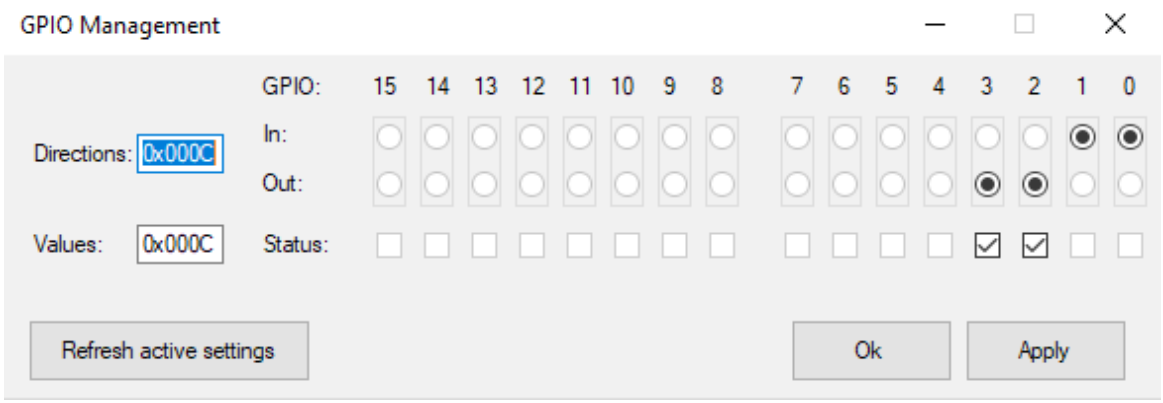


Fig. 3.4: GPIO Input Signal

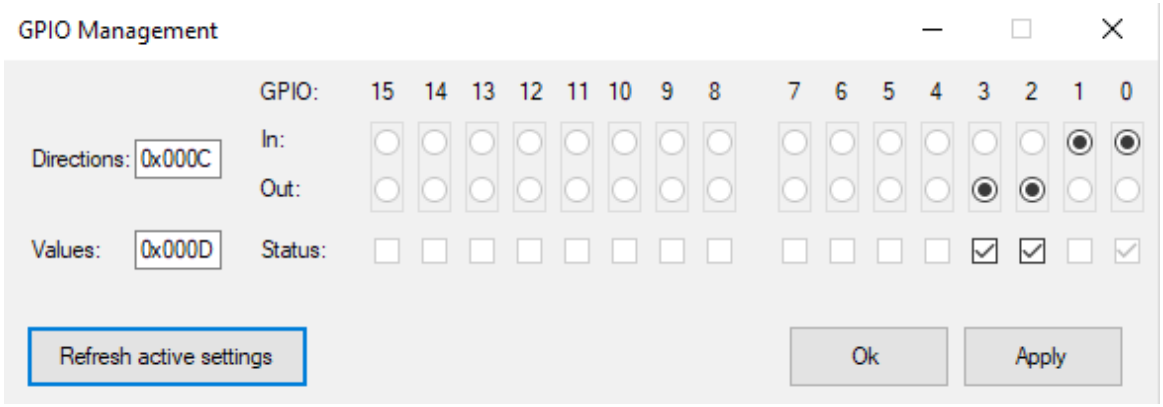
It is possible to verify the correct functioning of the circuit by connecting the reader to the CAEN RFID Easy Controller software, Tools-I/O management section:

GPI0 corresponds to GPIO0 of the Easy Controller software

GPI1 corresponds to GPIO1 of the Easy Controller software



When a valid input is present on the GPI0 pin, a check "V" appears in the Status box at the GPIO 0:



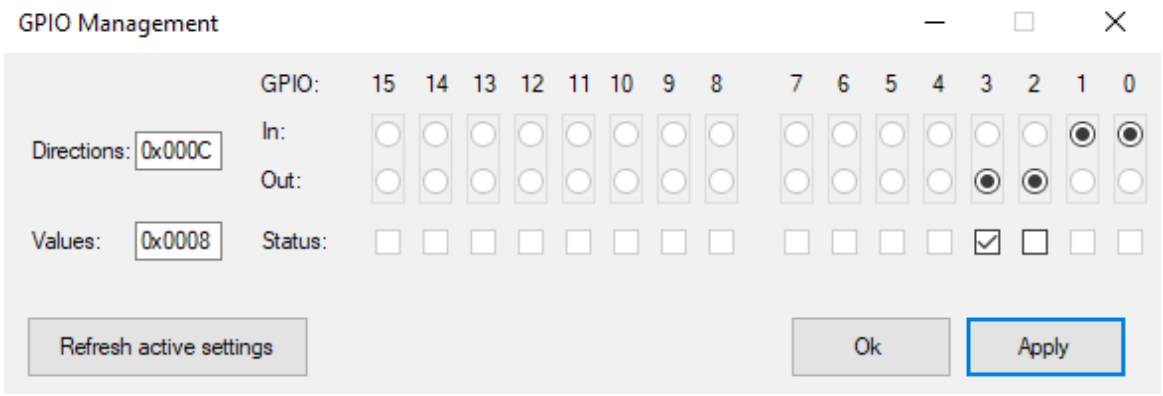
Output signal

The OUTPUT1.1 – OUTPUT1.2 and OUTPUT2.1 – OUTPUT2.2 pins are the terminals of a normally open dry contacts.

By connecting to the CAEN RFID Easy Controller Software, Tools-I/O management section, you can close the contact by removing the check from the Status box related to GPIO 2 and GPIO 3 and then press the Apply button.

OUTPUT1.1 – OUTPUT1.2 correspond to GPIO2 of the Easy Controller software

OUTPUT2.1 – OUTPUT2.2 correspond to GPIO3 of the Easy Controller software



To power a generic device at 5V DC (U1 symbol in *Fig. 3.5: GPIO Output Signal*), for example a light signal tower, a photocell or an alert siren, it is possible to use the connection shown in the drawing below. When you close the contact by the software command, the device is powered.

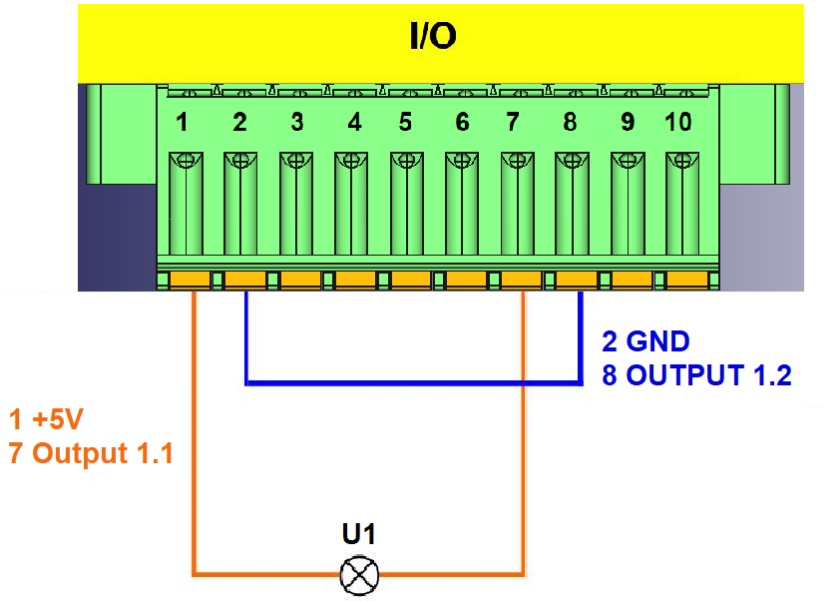


Fig. 3.5: GPIO Output Signal

Antennas

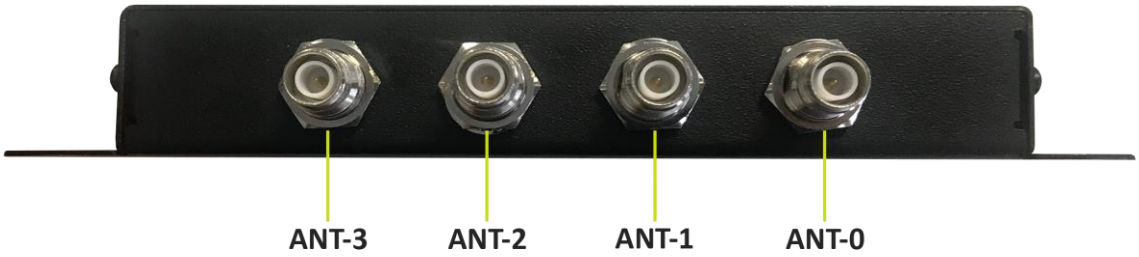


Fig. 3.6: Antennas

Name	Description
ANT 0	50Ω RP-TNC jack connector Antenna 0
ANT 1	50Ω RP-TNC jack connector Antenna 1
ANT 2	50Ω RP-TNC jack connector Antenna 2
ANT 3	50Ω RP-TNC jack connector Antenna 3

Tab. 3.4: Antennas

In order to achieve the best reading performances, the VSWR of the antenna shall be lower than 1.5:1.

4 CONFIGURATION USING THE WEB INTERFACE

Introduction

The reader can be configured via web interface.

The Web Interface is accessible only via the Ethernet connection:

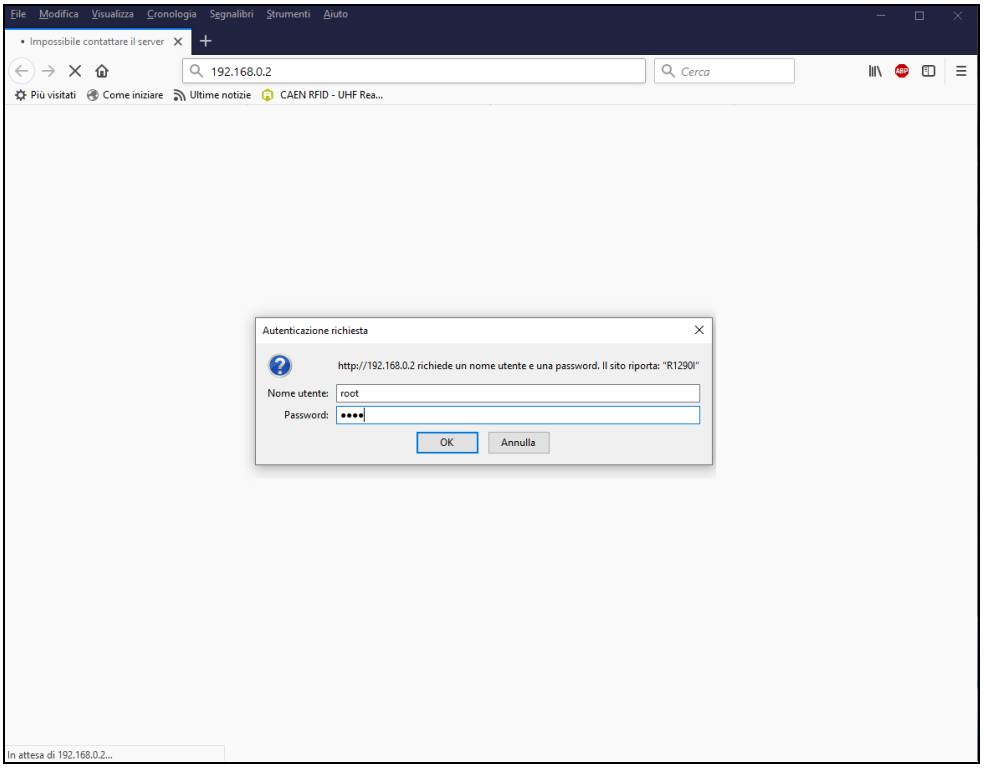
1. Connect the Quattro reader to the power supply.
2. Plug an Ethernet cable[2] (not provided) into your computer and connect the other end of the Ethernet cable to the reader. If your private network matches the default network configuration of the reader (IP address 192.168.0.2) you can connect to it, otherwise you can:
   a. change the network configuration of the reader (see § *NETWORK* page 19) to connect it to your network

      or

   b. disconnect your PC from your network and connect it to the network of the reader.

By factory default, the Quattro web interface is reachable at the following IP address: 192.168.0.2.

To login, type ***root*** in the Username text box and ***root*** in the Password textbox. To change the username and password please refer to *§ SYSTEM* page 20.



[2] For proper operation of the device:
- Ethernet cable shall be CAT6 at least (type S/FTP or S/STP)
- Put two ferrites (P.N. RRC-13-7-23-M-K5B by RICHCO; CAEN RFID ordering code LFAAFFP00004) on the Ethernet cable, near the reader connector.

When the connection with the reader is established, the main screen of the web interface is displayed:

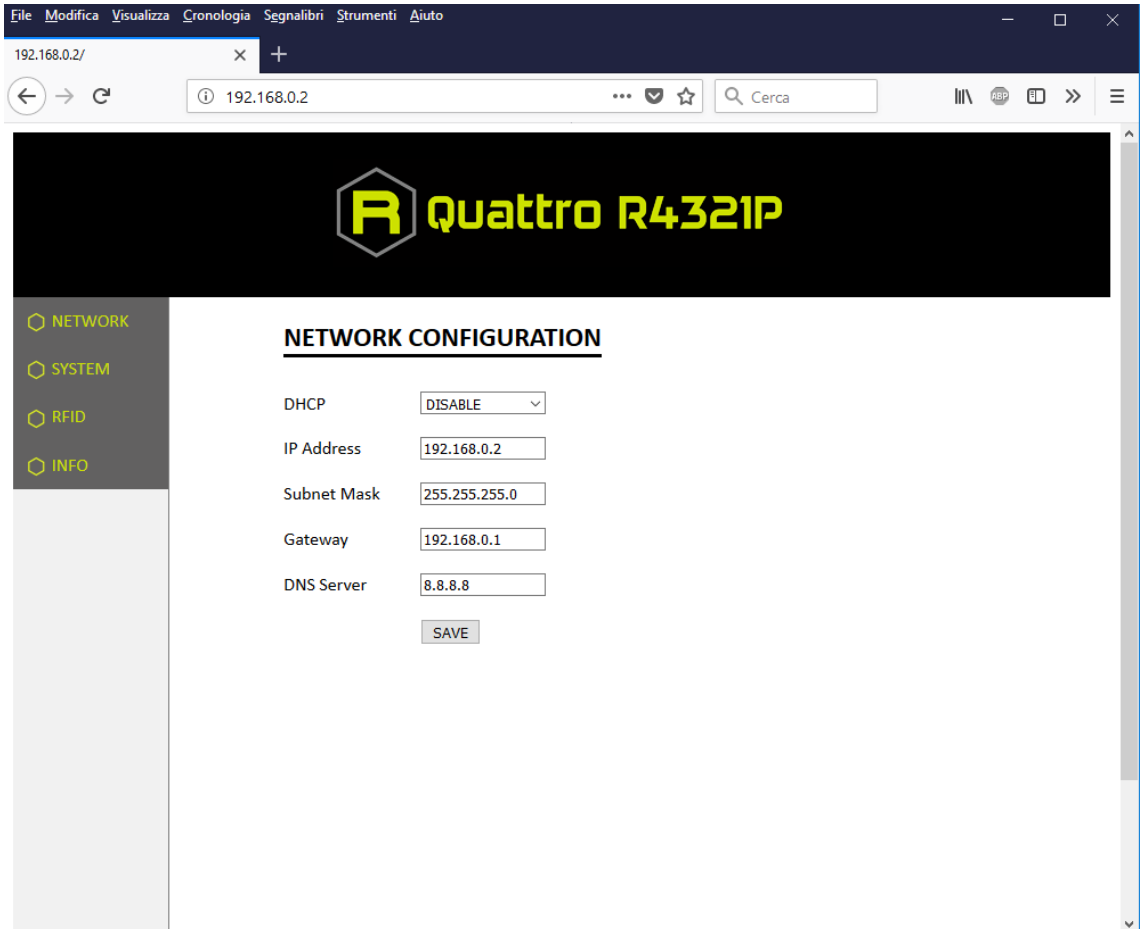
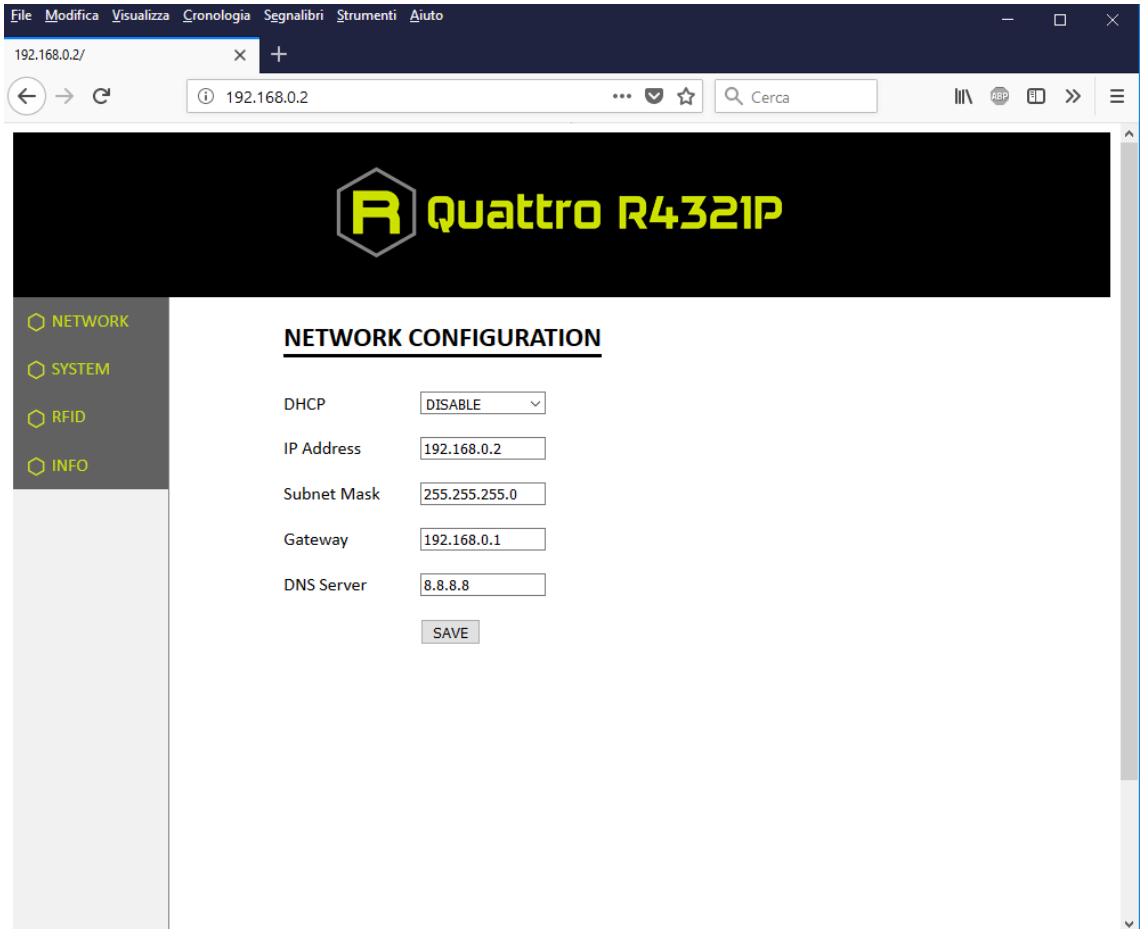


Fig. 4.1: Quattro R4321P Web Interface

The Web Interface menu options are the following:

- **NETWORK**
- **SYSTEM**
- **RFID**
- **INFO**

NETWORK

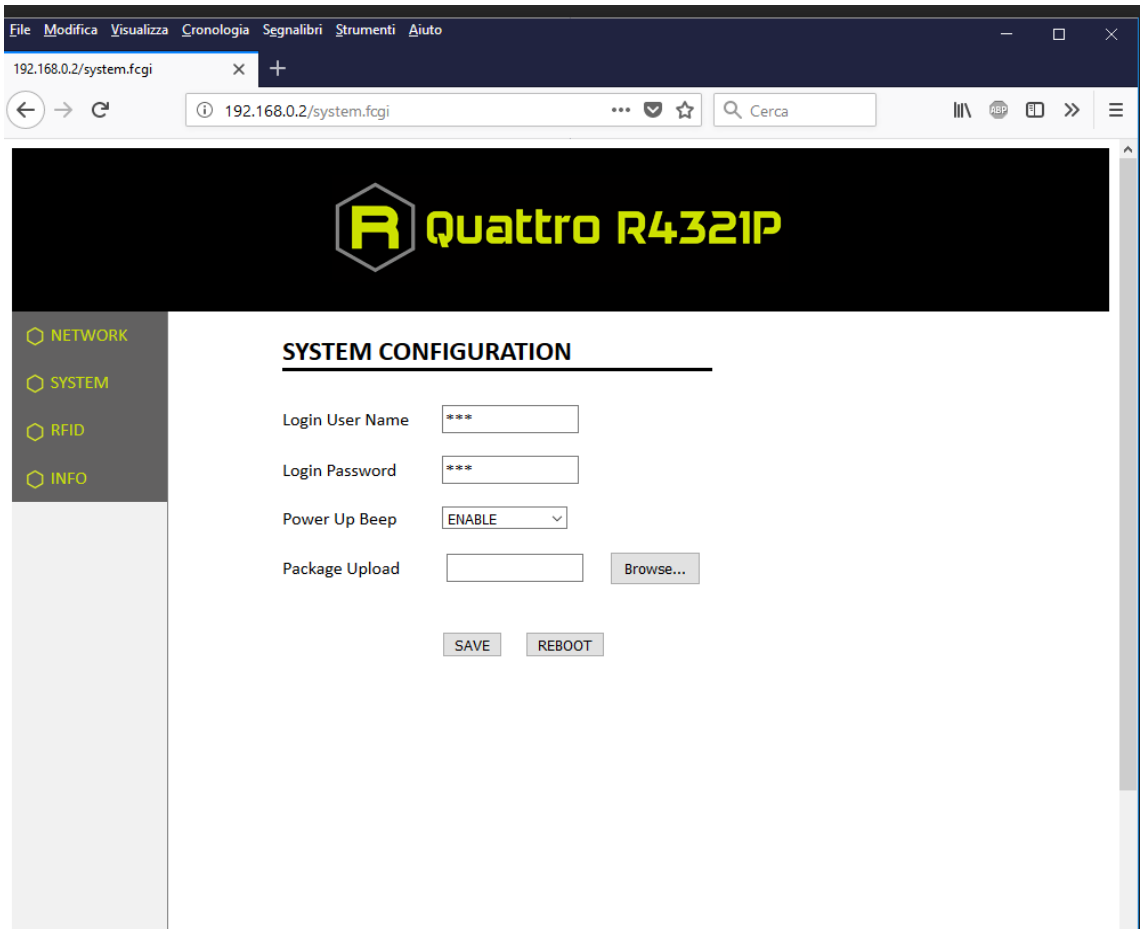


The NETWORK submenu options are the following:

- **DHCP:** Enable/Disable. By default the DHCP is set to *disable*. You can change the default value using the drop-down menu
- **IP Address:** the reader default IP address is 192.168.0.2. The Quattro reader can be connected to a PC using an Ethernet cable: in order to correctly operate with the reader refer to *Ethernet Communication Setup* page 41.
- **Subnet Mask:** the reader default subnet mask is 255.255.255.0.
- **Gateway:** the reader default gateway is 192.168.0.1.
- **DNS Server:** the reader default DNS server is 8.8.8.8.

Warning: To save the changes click on the "*SAVE*" button. Note that all changes made via the web interface are active only after the reader's reboot. Click on *SYSTEM* option in the Web Interface panel and then click on the "Reboot" button. After reboot, the new settings are active.

SYSTEM



The SYSTEM CONFIGURATION options are the following:

- **Login User Name:** To access the web interface, the default username is "root". Use this option to change the login username.

  If you forgot your username you must necessarily make a factory reset (see § *FIRMWARE UPGRADE* page 61)

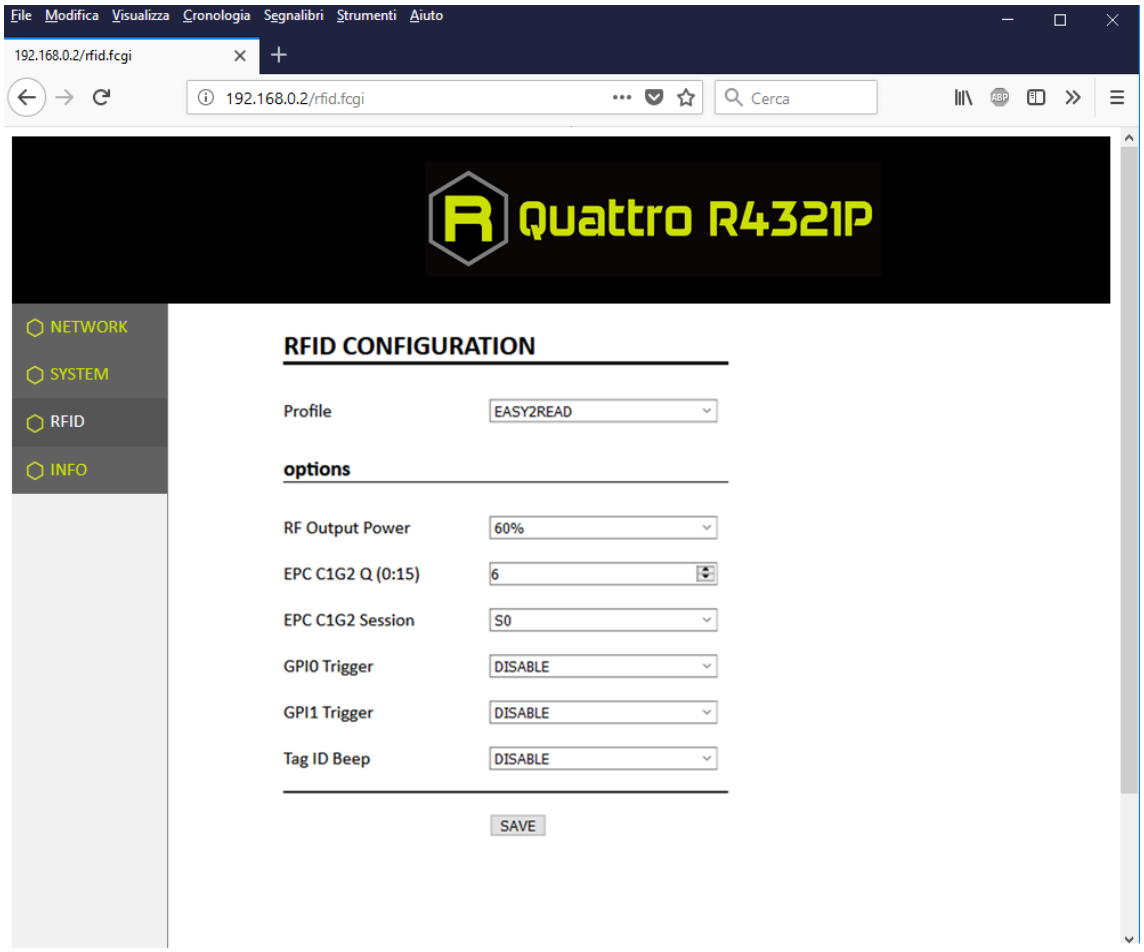
- **Login Password:** To access the web interface, the default password is "root". Use this option to change the login password.

  If you forgot your password you must necessarily make a factory reset (see § *FIRMWARE UPGRADE* page 61)

- **Power Up Beep:** enable or disable. By default, the *Power Up Beep* is enabled. Through this option you can enable or disable the beep at the power up of the reader.
- **Package Upload:** use this function to upload the script program to be used with the CUSTOM profile. Give the package the same name used for the code. Please remember to keep your code as simple as possible; the R4321P reader scripting capability is meant for running inside the reader very simple task (max 3 MB). For more information on the use of the CUSTOM profile please refer to § *CUSTOM Profile* page 54.

Warning: To save the changes click on the "*SAVE*" button. Note that all changes made via the web interface are active only after the reader's reboot. Click on the "Reboot" button. After reboot, the new settings are active.

RFID



Use this section in order to set the desired profile and then the related configuration options.

The available profiles are:

- **EASY2READ (factory default)** is the CAEN RFID easy2read communication protocol that permits to control the reader using the CAEN RFID Easy Controller Application or the SDK (Software Development Kit) library. For details on the use of the EASY2READ profile please refer to *§ EASY2READ Profile* chapter page 37.

  For details on the EASY2READ configuration options, refer to § *EASY2READ Configuration Options* page 22.

- **HID:** choosing this option you select the keyboard emulation protocol.

  For details on the use of the HID profile please refer to *§ HID PROFILE* chapter page 49.

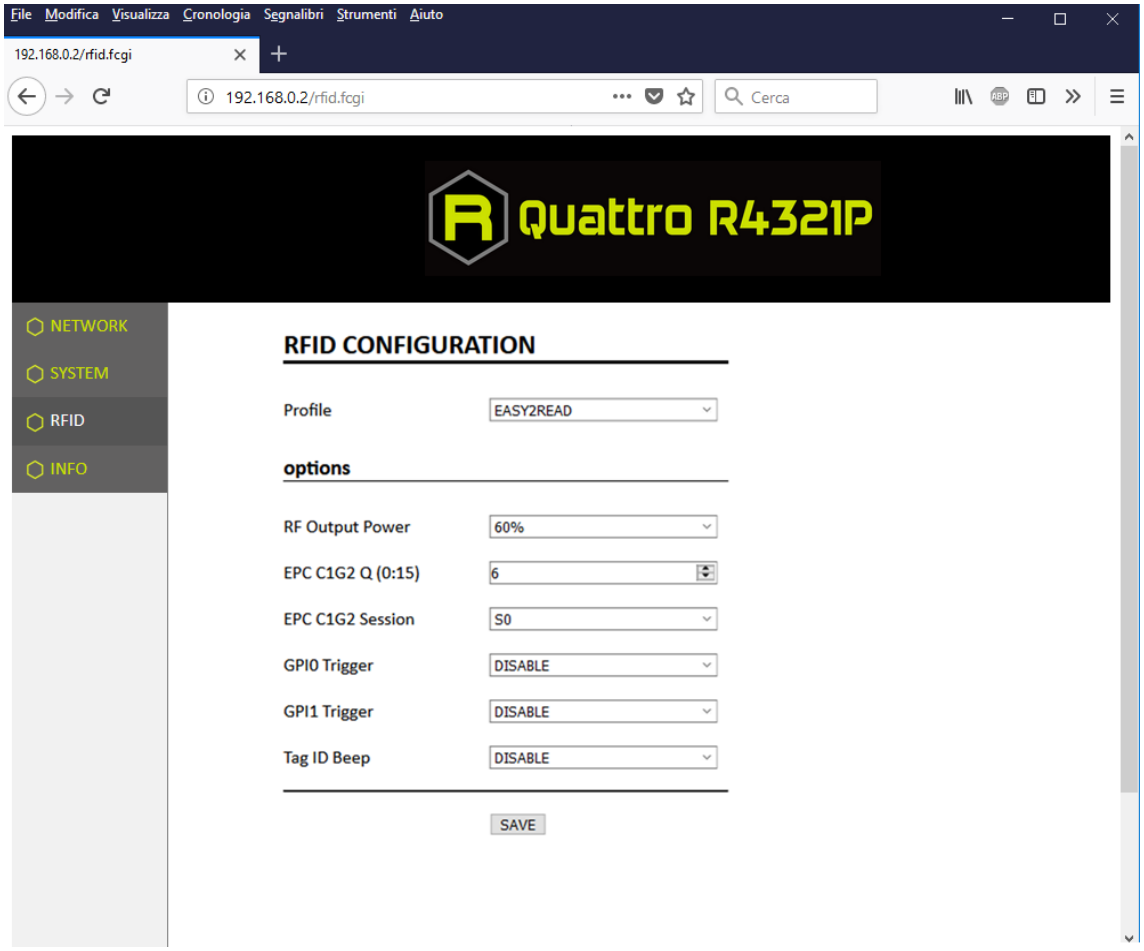
  For details on the HID configuration options, refer to § *HID Configuration Options* page 25.

- **CUSTOM:** the use of this profile allows the user to upload his own scripts to the reader. For details on the use of the CUSTOM profile please refer to § *CUSTOM PROFILE* page 54.

  For details on the CUSTOM configuration options, refer to § *CUSTOM Configuration Options* page 34.

Warning: To save the changes click on the "*SAVE*" button. Note that all changes made via the web interface are active only after the reader's reboot. Click on *SYSTEM* option in the Web Interface panel and then click on the "Reboot" button. After reboot, the new settings are active.

EASY2READ Configuration Options



Choosing the EASY2READ profile, the RFID Configuration submenu options are the following:

- **RF Output Power:** the default RF Power is 60%. The RF Power value at power up is expressed as a percentage value of the maximum RF output power. Through the *RF Output Power* submenu you can set the power level emitted by the reader. You can change the value using the drop-down menu:
  - **5%**
  - **10%**
  - **20%**
  - **40%**
  - **60%**
  - **80%**
  - **100%**

The correspondent values are:

Percentage	Conducted Power ETSI (mW)	Conducted Power FCC (mW)
5%	70	70
10%	140	140
20%	280	280
40%	560	560
60%	840	840
80%	1120	1000[3]
100%	1400	1000[3]

Tab. 4.1: Conducted power

Note that, when the reader is configured in the EASY2READ profile, to set the power you can also use the CAEN RFID Easy Controller Application or the *SetPower* function of the SDK (Software Development Kit) library.

- **EPCC1G2 Q:** Q parameter (integer 0÷15) is useful for the optimization of the inventory efficiency: as a rule of thumb, if you have to read a huge population of tags you need to select a high value for the Q parameter, otherwise you can select a lower value. For more information on Q parameter see EPC Class1 Gen2 protocol specification [RD1]. Default value is EPCC1G2 Q =6. You can change the default value using the drop-down menu.
- **EPC C1G2 Session:** the Session used by the anticollision algorithm. The reader chooses one of four sessions available (S0, S1, S2 and S3) and inventories tags within that session. For more information on *session* see EPC Class1 Gen2 protocol specification [RD1]. Default value is *EPC C1G2 Session* = S0. You can change the default value using the drop-down menu.
- **GPIO0 Trigger:** enable or disable. By default, the *GPIO0 Trigger* is disabled. You can change the default value using the drop-down menu. Through this option you can enable/disabled the tag inventory at the change of state of the GPIO0.

Note: In the EASY2READ profile, in order to enable the tag inventory on GPIO0 trigger, it is necessary to perform a second activation via software:

- ***Using the Easy controller Software:*** for more details see § *Inventory on GPIO state change* page 47.

or

- ***Using the API:*** for more details see the *EventInventoryTag* Method (the *event trigger flag*, bit 5, set to 1) in the *CAEN RFID API Reference Manual* downloadable from Quattro R4321P web page, *Documents* section or in the Manual and Documents web area.

- **GPIO1 Trigger:** enable or disable. By default, the *GPIO1 Trigger* is disabled. You can change the default value using the drop-down menu. Through this option you can enable/disabled the tag inventory at the change of state of the GPIO1.

Note: In the EASY2READ profile, in order to enable the tag inventory on GPIO1 trigger, it is necessary to perform a second activation via software:

- ***Using the Easy controller Software:*** for more details see § *Inventory on GPIO state change* page 47.

or

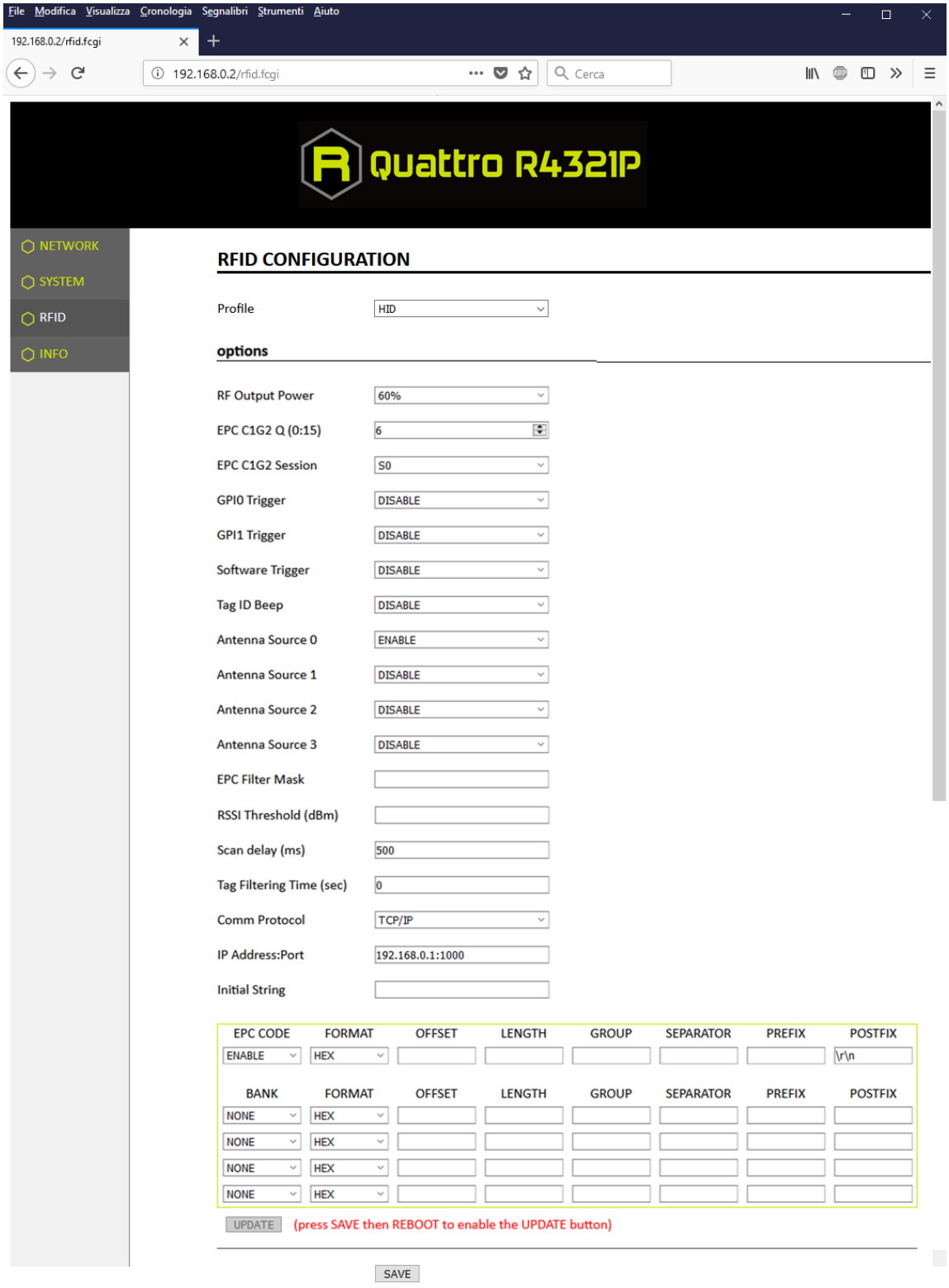
- ***Using the API:*** for more details see the *EventInventoryTag* Method (the *event trigger flag*, bit 5, set to 1) in the *CAEN RFID API Reference Manual* downloadable from Quattro R4321P web page, *Documents* section or in the Manual and Documents web area.

[3] The reader with the FCC regulation cannot supply more than 1000 mW to the connector. By analogy with the power expressed in the ETSI table, the percentage refers to the full scale of 1400mW, but the percentage of 80% and 100% (that exceed 1000mW) are limited to the maximum of 1000 mW.

- **Tag ID Beep:** enable or disable. By default, the *Tag ID beep* is disabled. You can change the default value using the drop-down menu. If the *Tag ID beep* is enabled, the reader will beep when detects 1 tag during the inventory.

Warning: To save the changes click on the "*SAVE*" button. Note that all changes made via the web interface are active only after the reader's reboot. Click on *SYSTEM* option in the Web Interface panel and then click on the "Reboot" button. After reboot, the new settings are active.

HID Configuration Options



The use of the *HID* profile allows the user to select the keyboard emulation protocol.

Choosing the HID profile, the HID Configuration submenu options are the following:

- **RF Output Power:** the default RF Power is 60%. The RF Power value at power up is expressed as a percentage value of the maximum RF output power. Through the *RF Output Power* submenu you can set the power level emitted by the reader. You can change the default value using the drop-down menu:
  - **5%**

- **10%**
- **20%**
- **40%**
- **60%**
- **80%**
- **100%**

The correspondent values are:

Percentage	Conducted Power ETSI (mW)	Conducted Power FCC (mW)
5%	70	70
10%	140	140
20%	280	280
40%	560	560
60%	840	840
80%	1120	1000[4]
100%	1400	1000[4]

Tab. 4.2: Conducted power

- **EPCC1G2 Q:** Q parameter (integer 0÷15) is useful for the optimization of the inventory efficiency: as a rule of thumb, if you have to read a huge population of tags you need to select a high value for the Q parameter, otherwise you can select a lower value. For more information on Q parameter see EPC Class1 Gen2 protocol specification [RD1]. Default value is EPCC1G2 Q =6. You can change the default value using the drop-down menu.
- **EPC C1G2 Session:** Session used by the anticollision algorithm. The reader chooses one of four sessions available (S0, S1, S2 and S3) and inventories tags within that session. For more information on *session* see EPC Class1 Gen2 protocol specification [RD1]. Default value is *EPC C1G2 Session* = S0. You can change the default value using the drop-down menu.
- **GPIO0 Trigger:** Through this option you can enable/disabled the tag inventory at the change of state of the GPIO0. By default, the GPIO0 Trigger is disabled. You can change the default value using the drop-down menu:
  - **Enable (one shot):** enables the tag inventory each time the GPIO0 toggles from *Low* to *High*
  - **Enable (start/stop):** starts the tag inventory when the GPIO0 toggles to *High* and repeats the inventory until the GPIO0 returns to *Low* (stop)
- **GPIO1 Trigger:** Through this option you can enable/disabled the tag inventory at the change of state of the GPIO1. By default, the GPIO1 Trigger is disabled. You can change the default value using the drop-down menu:
  - **Enable (one shot):** enables the tag inventory each time the GPIO1 toggles from Low to High
  - **Enable (start/stop):** starts the tag inventory when the GPIO1 toggles to High and repeats the inventory until the GPIO0 returns to Low (stop)
- **Software Trigger:** Through this option it is possible to enable/disable the tag inventory via software. By default, the software trigger is disabled. You can change the default value using the drop-down menu. If enabled, the reader waits to receive xml data from the host to perform the inventory. The xml data must be as follows:

  <**trigger**><action> *value* </action><repetition><duration> *value* </duration><interval> *value* </interval></repetition><echo> *value* </echo></trigger>

[4] The reader with the FCC regulation cannot supply more than 1000 mW to the connector. By analogy with the power expressed in the ETSI table, the percentage refers to the full scale of 1400mW, but the percentage of 80% and 100% (that exceed 1000mW) are limited to the maximum of 1000 mW.

Where:

Parameter		Description	Values Range	Unit
action		To start/ stop the inventory	Start/stop	-
repetition	duration	Inventory duration	≥ 0	seconds
	interval	Time between two inventories	0÷inf	seconds
echo		If on, the reader returns the command sent by the host as proof of correct data receipt	on/off	-

The *interval* is the equivalent of the *Scan Delay* (see § *Scan Delay* page 28).

Warning: By setting the *Scan Delay* when the software trigger is in use, the total interval will be given by the sum of the two times:

Total interval = Scan delay + Interval (software trigger).

Examples:

1. TRIGGER START:

<trigger><action>start</action><repetition><duration>20</duration><interval>15</interval></repetition><echo>on</echo></trigger>

The reader performs the inventory for the duration of 20 seconds and then stops the inventory for an interval of 15 seconds, and repeats this configuration until a *trigger stop* xml command.

Note that in this example the reader returns to the host the command of *trigger start* as proof of correct command receipt (echo= on).

2. TRIGGER STOP:

<trigger><action>stop</action><repetition><duration>20</duration><interval>15</interval></repetition><echo>on</echo></trigger>

The reader stops the inventory, after the end of the current repetition.

3. TRIGGER MONOSTABLE:

<trigger><action>start</action><repetition><duration>20</duration><interval>inf</interval></repetition><echo>on</echo></trigger>

The reader performs the inventory for the duration of 20 seconds and then stops the inventory (interval= inf).

In this case it is not necessary the xml *trigger stop* to stop the inventory activity.

Note that in this example the reader returns to the host the command of *trigger start* as proof of correct command receipt (echo= on).

4. TRIGGER SINGLE:

<trigger><action>start</action><repetition><duration>0</duration><interval>15</interval></repetition><echo>off</echo></trigger>

The reader performs a single inventory (duration= 0) and then stops the inventory for an interval of 15 seconds, and repeats this configuration until a *trigger stop* xml command.

Note that in this example the reader doesn't return to the host the command of *trigger start* (echo= off).

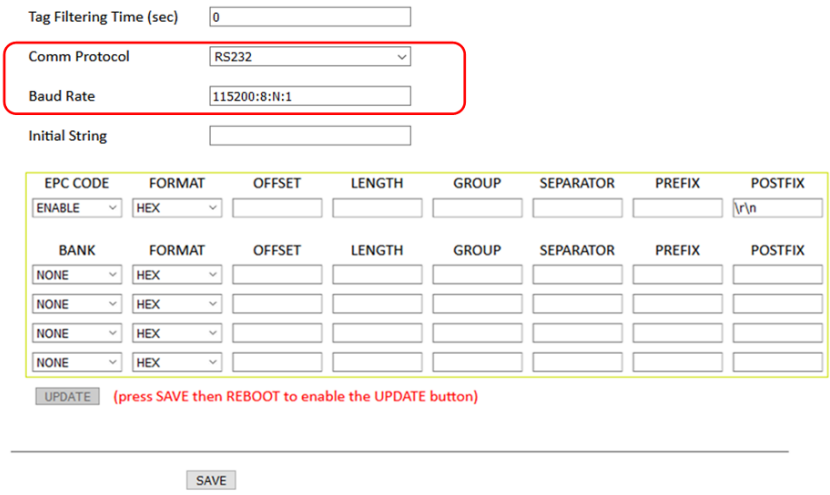
- **Tag ID Beep:** enable or disable. By default, the *Tag ID beep* is disabled. You can change the default value using the drop-down menu. If the *Tag ID beep* is enabled, the reader will beep when detects 1 tag during the inventory.
- **Antenna Source 0:** enable or disable. By default, the *Antenna Source 0* is enabled. You can change the default value using the drop-down menu. If the *Antenna Source 0* is enabled, the reader performs the inventory using this antenna.
- **Antenna Source 1:** enable or disable. By default, the *Antenna Source 1* is disabled. You can change the default value using the drop-down menu. If the *Antenna Source 1* is enabled, the reader performs the inventory using this antenna.

- **Antenna Source 2:** enable or disable. By default, the *Antenna Source 2* is disabled. You can change the default value using the drop-down menu. If the *Antenna Source 2* is enabled, the reader performs the inventory using this antenna.
- **Antenna Source 3:** enable or disable. By default, the *Antenna Source 3* is disabled. You can change the default value using the drop-down menu. If the *Antenna Source 3* is enabled, the reader performs the inventory using this antenna.
- **EPC Filter Mask:** EPC Filter Mask is an editable field. By default the field is empty. It allows to filter read tags by sending only those with the specified EPC mask. For example, by inserting the mask *12345...* in the *EPC Filter Mask*, the reader returns only the read tags that have an EPC starting with 12345.
- **RSSI Threshold (dBm):** RSSI Threshold is an editable field and the value is expressed in dBm. By default, the field is empty. It allows the user to filter the read tags by sending only those with RSSI greater than the threshold. For example, entering the value *-50* in the *RSSI Threshold field*, the reader returns only the read tags with RSSI threshold greater than -50 dBm.
- **Scan Delay (ms):** Scan Delay is an editable field and the value is expressed in ms. By default, the scan delay is 500 ms. The scan delay is the time between two inventories (in case of continuous inventory mode with no triggers enabled). It is the equivalent of the *interval* of the software trigger (see *Software Trigger* in the *HID Configuration Options* page 25) .

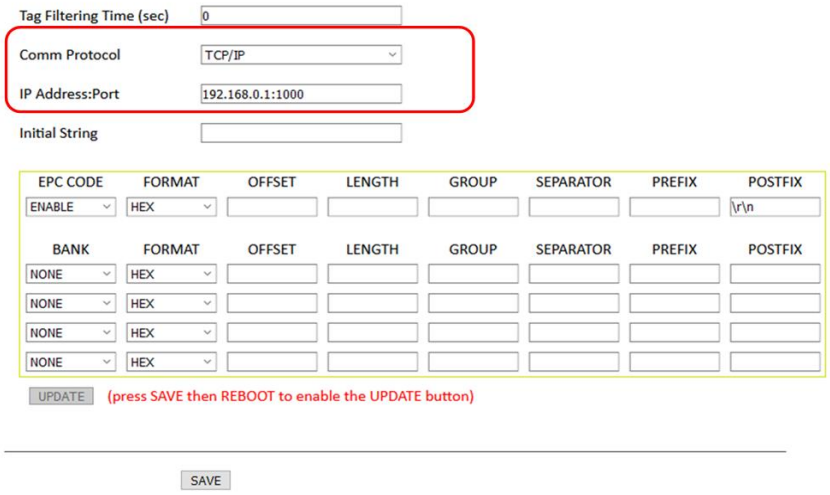
  Warning: By setting the *Scan Delay* when the software trigger is in use, the total interval will be given by the sum of the two times:

  Total interval = Scan delay + Interval (software trigger).

  Note that if the GPIO0 trigger or GPIO1 trigger are enabled, the scan delay is ignored.
- **Tag Filtering Time (sec):** this option is useful to avoid the retransmission of the same tag for a time equal to the tag filtering time. By default, the *Tag Filtering Time* is set to 0 and the tag is transmitted at each reading. For example, if *Tag Filtering Time* is set to 5s and a tag is read, it is transmitted the first time then it will be retransmitted after 5 seconds if read again.
- **Comm Protocol:** *Comm Protocol* determines the format and transmission of data of the read tags. By default, the *Comm Protocol* is set to TCP/IP. You can change the default value using the drop-down menu:
  - **RS232:** choosing this option, it is requested to insert the *Baud Rate*, see the example below:



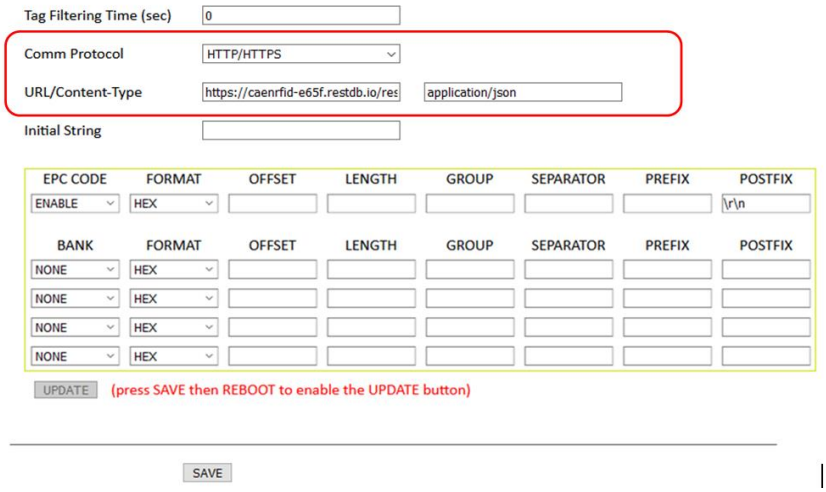
– **TCP/IP:** choosing this option, it is requested to insert the *IP Address:Port*, see the example below:



– **HTTP/HTTPS:** choosing this option, it is requested to insert:

- the *URL* in the following format: *http://server/path* or *https://server/path*
- the *Content-Type*: using the drop-down menu choose the available options between *text/plain*, *text/xml*, *text/xtml* or *application/json*.

  See the example below:



- **Initial string:** This option permits to specify a constant string to be scat as beginning string at each tag transmission (for example the serial number of the reader).

  The following list shows the accepted characters for the prefix:

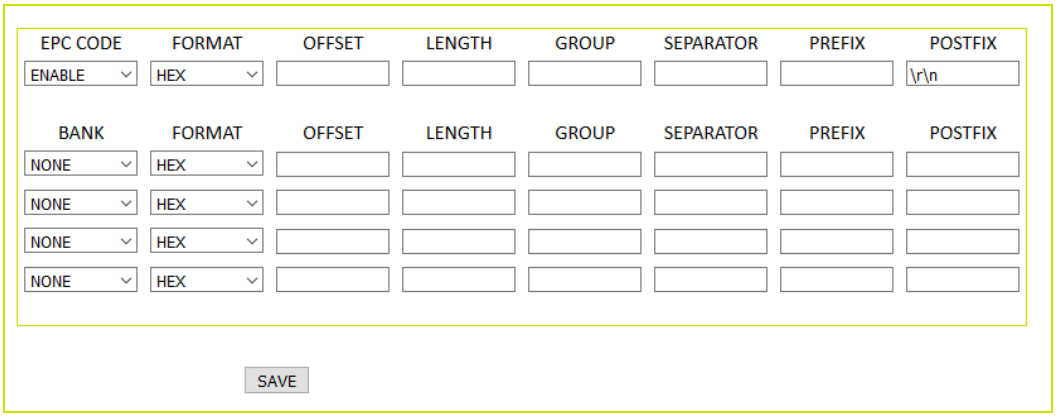
  'a', 'b', 'c', 'd', 'e', 'f', 'g', 'h', 'i', 'j', 'k', 'l', 'm', 'n', 'o', 'p', 'q', 'r', 's', 't', 'u', 'v', 'w', 'x', 'y', 'z', 'A', 'B', 'C', 'D', 'E', 'F', 'G', 'H', 'I', 'J', 'K', 'L', 'M', 'N', 'O', 'P', 'Q', 'R', 'S', 'T', 'U', 'V', 'W', 'X', 'Y', 'Z', '0', '1', '2', '3', '4', '5', '6', '7', '8', '9', '{', '|', '}', '!', '"', '#', '$', '(', ')', '*', '+', ',', '.', '/', ':', ';', '=', '?', '@', '[', ']', '^', '_', '-'

  By default the initial string is empty.

> **Warning:** if you are using a qwerty keyboard, pay attention that it is a **standard** qwerty keyboard because if not the conversion of symbols could create display problems.

EPC code parameters

Using the table below you can customize the text of the code displayed on the screen:



Tab. 4.3: EPC Code parameters

- **EPC Code:** enable or disable. By default, the *EPC Code* is enabled and the EPC code is returned in the message sent by the reader. You can change the default value using the drop-down menu.
- **FORMAT:** In the HID profile you can set different EPC formats:
  - HEX: The EPC code is represented as a hexadecimal number. For example, an EPC Code of 96 bits long corresponds to 24 hexadecimal digits (96/4=24).
  - ASCII: The EPC code is interpreted as 8 bits at a time, each byte being represented as ASCII character. For example, an EPC Code of 96 bits corresponds to a string of 12 ASCII characters (96/8 = 12).

  By default the EPC HID format is set to “HEX”. You can change the default value using the drop-down menu.
- **OFFSET:** optional. The “offset” indicates after how many characters start counting the “length” value. By default the offset string is empty.
- **LENGTH:** number of characters of the EPC code to be displayed counting from the “offset”. If not set, all the EPC code is displayed. By default the length string is empty.
- **GROUP:** the EPC code characters are grouped according to the value set in “group”. By default the group string is empty.
- **SEPARATOR:** separator used to distinguish groups. By default the separator string is empty.
- **PREFIX:** The PREFIX option permits to specify a string to add before the EPC when a tag is read.

  The following list shows the accepted characters for the prefix:

  'a', 'b', 'c', 'd', 'e', 'f', 'g', 'h', 'i', 'j', 'k', 'l', 'm', 'n', 'o', 'p', 'q', 'r', 's', 't', 'u', 'v', 'w', 'x', 'y', 'z', 'A', 'B', 'C', 'D', 'E', 'F', 'G', 'H', 'I', 'J', 'K', 'L', 'M', 'N', 'O', 'P', 'Q', 'R', 'S', 'T', 'U', 'V', 'W', 'X', 'Y', 'Z', '0', '1', '2', '3', '4', '5', '6', '7', '8', '9', '{', '|', '}', '!', '"', '#', '$', '(', ')', '*', '+', ',', '.', '/', ':', ';', '=', '?', '@', '[', ']', '^', '_', '-'

  By default the prefix string is empty.

  > **Warning:** if you are using a qwerty keyboard, pay attention that it is a **standard** qwerty keyboard because if not the conversion of symbols could create display problems.

- **POSTFIX:** The POSTFIX option permits to specify a string to add after the EPC when a tag is read.

  The following list shows the accepted characters for the postfix:

  'a', 'b', 'c', 'd', 'e', 'f', 'g', 'h', 'i', 'j', 'k', 'l', 'm', 'n', 'o', 'p', 'q', 'r', 's', 't', 'u', 'v', 'w', 'x', 'y', 'z', 'A', 'B', 'C', 'D', 'E', 'F', 'G', 'H', 'I', 'J', 'K', 'L', 'M', 'N', 'O', 'P', 'Q', 'R', 'S', 'T', 'U', 'V', 'W', 'X', 'Y', 'Z', '0', '1', '2', '3', '4', '5', '6', '7', '8', '9', '{', '|', '}', '!', '"', '#', '$', '(', ')', '*', '+', ',', '.', '/', ':', ';', '=', '?', '@', '[', ']', '^', '_', '-'

  By default the postfix string is \r\n\ (see the following table *Tab. 4.4: Escape Sequences supported* page 31).

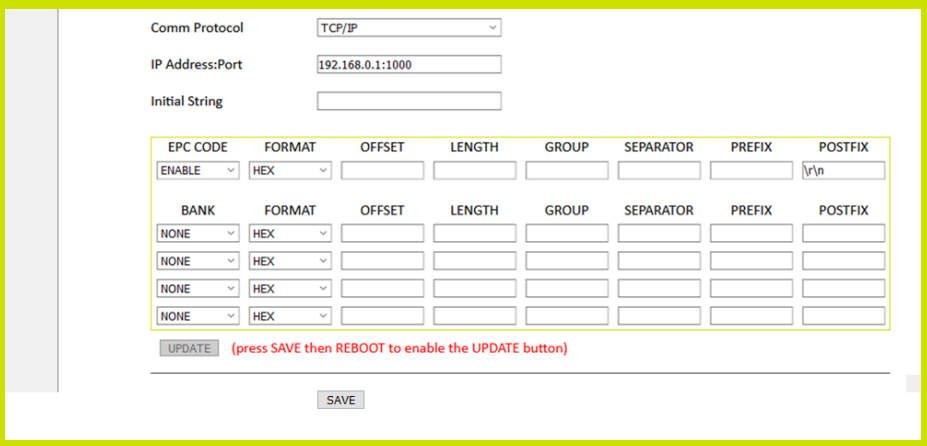
Warning: if you are using a qwerty keyboard, pay attention that it is a **standard** qwerty keyboard because if not the conversion of symbols could create display problems.

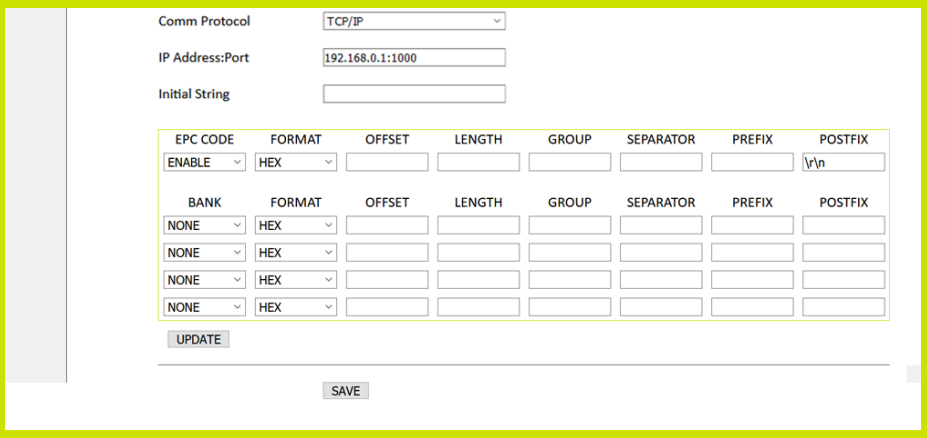
Escape Sequences	Description
\n	Newline (Line Feed)
\r	Carriage Return
\t	Horizontal Tab
\v	Vertical Tab
\\	Backslash

Tab. 4.4: Escape Sequences supported

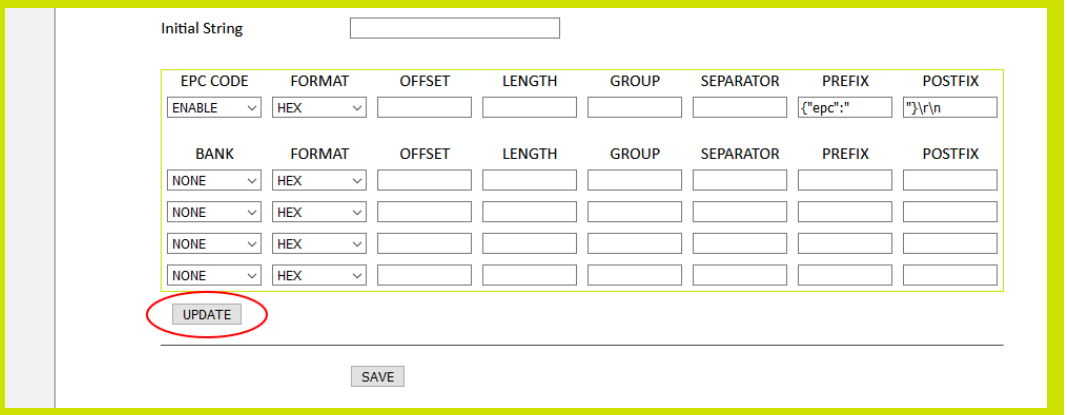
Using the second part of the *Tab. 4.3: EPC Code parameters* page 30, the same parameters (Format, Offset, Length, Group, Separator, Prefix, Postfix) can be set for individual memory banks (RESERVED, EPC, TID and USER).

Warning: To activate the HID profile click on the "*SAVE*" button. Note that all changes made via the web interface are active only after the reader's reboot. Click on *SYSTEM* option in the Web Interface panel and then click on the "Reboot" button. After reboot, the new settings are active and the "UPDATE" button is enabled:



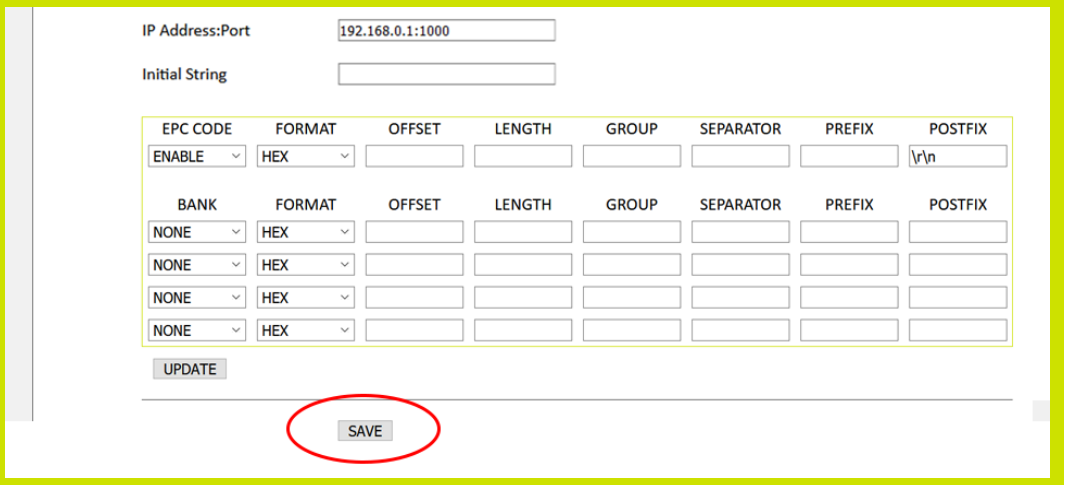


Warning: Once the HID profile has been activated, it is possible to carry out tests by changing values to the various HID options and clicking only on the “UPDATE” button to make the changes immediately active:



Warning: To return to the last saved configuration, just click on SYSTEM option in the Web Interface panel and then click on the "Reboot" button.

Otherwise, to save the new settings, click on the “SAVE” button. Then click on SYSTEM option in the Web Interface panel and click on the “Reboot” button. After reboot, the new settings are active.



EXAMPLES

Consider the following EPC MEMORY CONTENT (RAW):

0x41 0x42 0x43 0x44 0x45 0x46 0x47 0x48 0x49 0x4A 0x4B 0x4C

HEX FORMAT: 414243444546474849 4A4B4C

OFFSET	LENGTH	GROUP	SEPARATOR	PREFIX	POSTFIX
1	6	1	-		.

Result:
1-4-2-4-3-4.

OFFSET	LENGTH	GROUP	SEPARATOR	PREFIX	POSTFIX
3	14	2	:	00	

Result:
0024:34:44:54:64:74:84

OFFSET	LENGTH	GROUP	SEPARATOR	PREFIX	POSTFIX
4	20			CAEN	-

Result:
CAEN434445464748494A4B4C-

ASCII FORMAT: ABCDEFGHIJKL

OFFSET	LENGTH	GROUP	SEPARATOR	PREFIX	POSTFIX
1	6	1	-	-	

Result:
-B-C-D-E-F-G

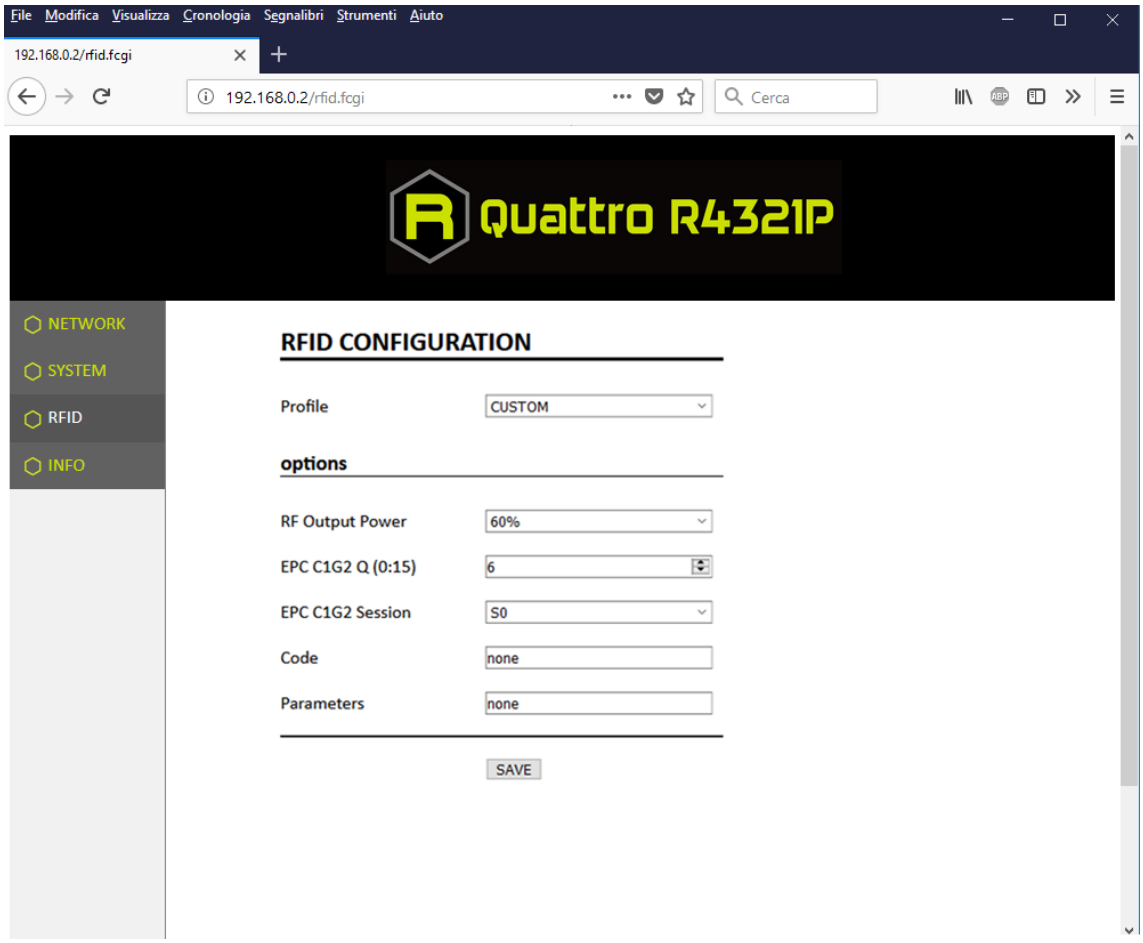
OFFSET	LENGTH	GROUP	SEPARATOR	PREFIX	POSTFIX
3	6	2	:	-	-

Result:
-DE:FG:HI-

OFFSET	LENGTH	GROUP	SEPARATOR	PREFIX	POSTFIX
				Tag	CAEN

Result:
TagABCDEFGHIJKLCAEN

CUSTOM Configuration Options



The use of the CUSTOM profile allows the user to upload his own scripts to the reader.

Choosing the CUSTOM profile, the RFID Configuration submenu options are the following:

- **RF Output Power:** the default RF Power is 60%. The RF Power value at power up is expressed as a percentage value of the maximum RF output power. Through the *RF Output Power* submenu you can set the power level emitted by the reader. You can change the default value using the drop-down menu:
  - **5%**
  - **10%**
  - **20%**
  - **40%**
  - **60%**
  - **80%**
  - **100%**

The correspondent values are:

Percentage	Conducted Power ETSI (mW)	Conducted Power FCC (mW)
5%	70	70
10%	140	140
20%	280	280
40%	560	560
60%	840	840
80%	1120	1000[5]
100%	1400	1000[6]

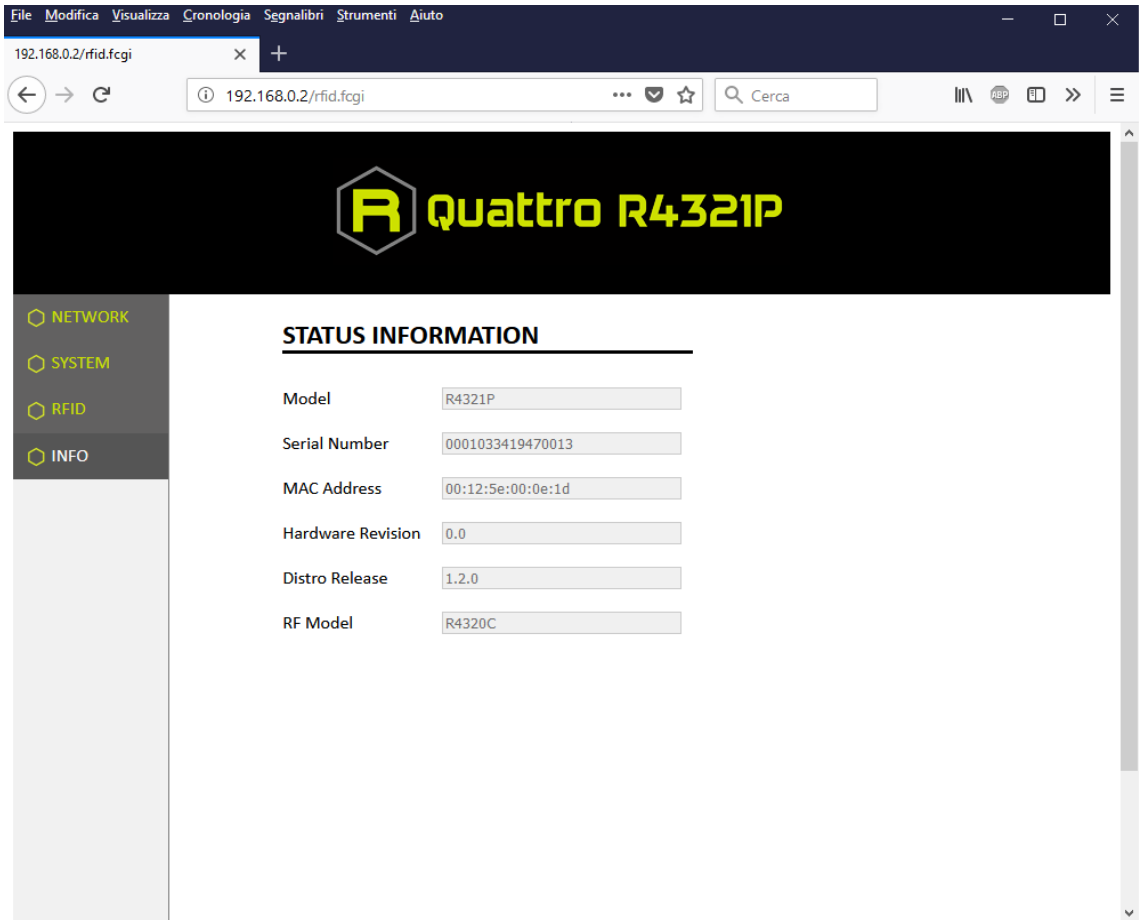
Tab. 4.5: Conducted power

- **EPCC1G2 Q:** Q parameter (integer 0÷15) is useful for the optimization of the inventory efficiency: as a rule of thumb, if you have to read a huge population of tags you need to select a high value for the Q parameter, otherwise you can select a lower value. For more information on Q parameter see EPC Class1 Gen2 protocol specification [RD1]. Default value is EPCC1G2 Q =6.
- **EPC C1G2 Session:** You can change the value using the drop-down menu: S0, S1, S2 and S3. This method can be used to set the Session used by the anticollision algorithm. The reader chooses one of four sessions and inventories tags within that session. For more information on *session* see EPC Class1 Gen2 protocol specification [RD1]. Default value is *EPC C1G2 Session* = S0.
- **Code:** alphanumeric characters. The "code" is the name assigned by the user to the custom program. When the reader is turned on, if the profile is set to CUSTOM, among all the programs loaded by the user, the reader starts the custom program named "code".
- **Parameters:** alphanumeric characters. This string can be used to assign values to the parameters defined by the user in the custom program (e.g. Q=8; n=6; cycles=20, etc…).

Warning: To save the changes click on the "*SAVE*" button. Note that all changes made via the web interface are active only after the reader's reboot. Click on *SYSTEM* option in the Web Interface panel and then click on the "Reboot" button. After reboot, the new settings are active.

[5] The reader with the FCC regulation cannot supply more than 1000 mW to the connector. By analogy with the power expressed in the ETSI table, the percentage refers to the full scale of 1400mW, but the percentage of 80% and 100% (that exceed 1000mW) are limited to the maximum of 1000 mW.
[6] The reader with the FCC regulation cannot supply more than 1000 mW to the connector. By analogy with the power expressed in the ETSI table, the percentage refers to the full scale of 1400mW, but the percentage of 80% and 100% (that exceed 1000mW) are limited to the maximum of 1000 mW.

INFO



The INFO submenu options are the following:

- **Model**: the model name (e.g. R4321P)
- **Serial Number**: the reader serial number (16 numbers)
- **MAC Address:** the reader MAC address
- **Hardware Revision**: the hardware revision of the reader
- **Distro Release:** Distribution firmware release
- **RF Model**: the internal RF module model, R4320C

5 EASY2READ PROFILE

Introduction

By default, the reader profile is set to EASY2READ. If your reader is in HID or CUSTOM profile active, in order to set the EASY2READ profile please refer to the next paragraph § *Set the EASY2READ profile* page 37.

With the EASY2READ profile active you will use the CAEN RFID easy2read communication protocol and the reader can be controlled using the CAEN RFID Easy Controller Application or the SDK (Software Development Kit) library.

The connection to the Quattro Reader using the EASY2READ profile is possible via the Ethernet port or the USB port.

Set the EASY2READ profile

If your reader is in HID or CUSTOM profile active, in order to set the EASY2READ profile, access the web interface that is possible only via the Ethernet connection:

1. Connect the Quattro to the power supply.
2. Plug an Ethernet cable[7] (not provided) into your computer and connect the other end of the Ethernet cable to the reader. If your private network matches the default network configuration of the reader (IP address 192.168.0.2) you can connect to it, otherwise you can:
    a. change the network configuration of the reader (see § *NETWORK* page 19) to connect it to your network

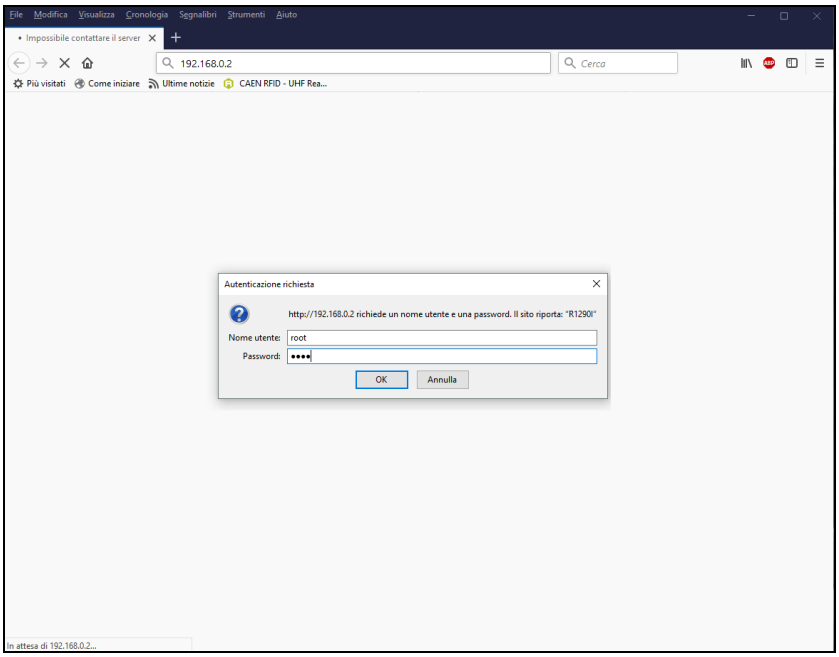
    or

    b. disconnect your PC from your network and connect it to the network of the reader.

By factory default, the Quattro web interface is reachable at the following IP address: 192.168.0.2.

To login, type ***root*** in the Username text box and ***root*** in the Password textbox. To change the username and password please refer to *§ SYSTEM* page 20.

[7] For proper operation of the device:
- Ethernet cable shall be CAT6 at least (type S/FTP or S/STP)
- Put two ferrites (P.N. RRC-13-7-23-M-K5B by RICHCO; CAEN RFID ordering code LFAAFFP00004) on the Ethernet cable, near the reader connector.



When the connection with the reader is established, the main screen of the web interface is displayed:

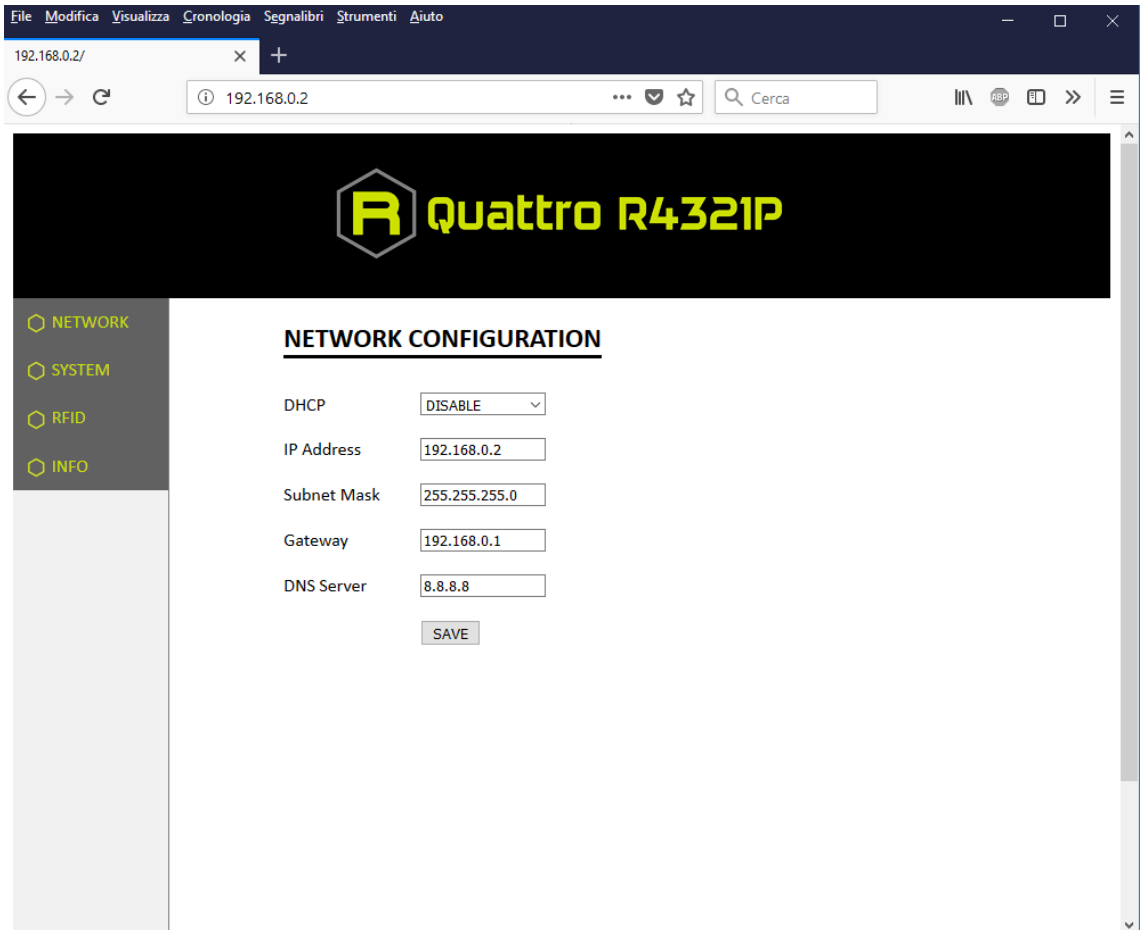
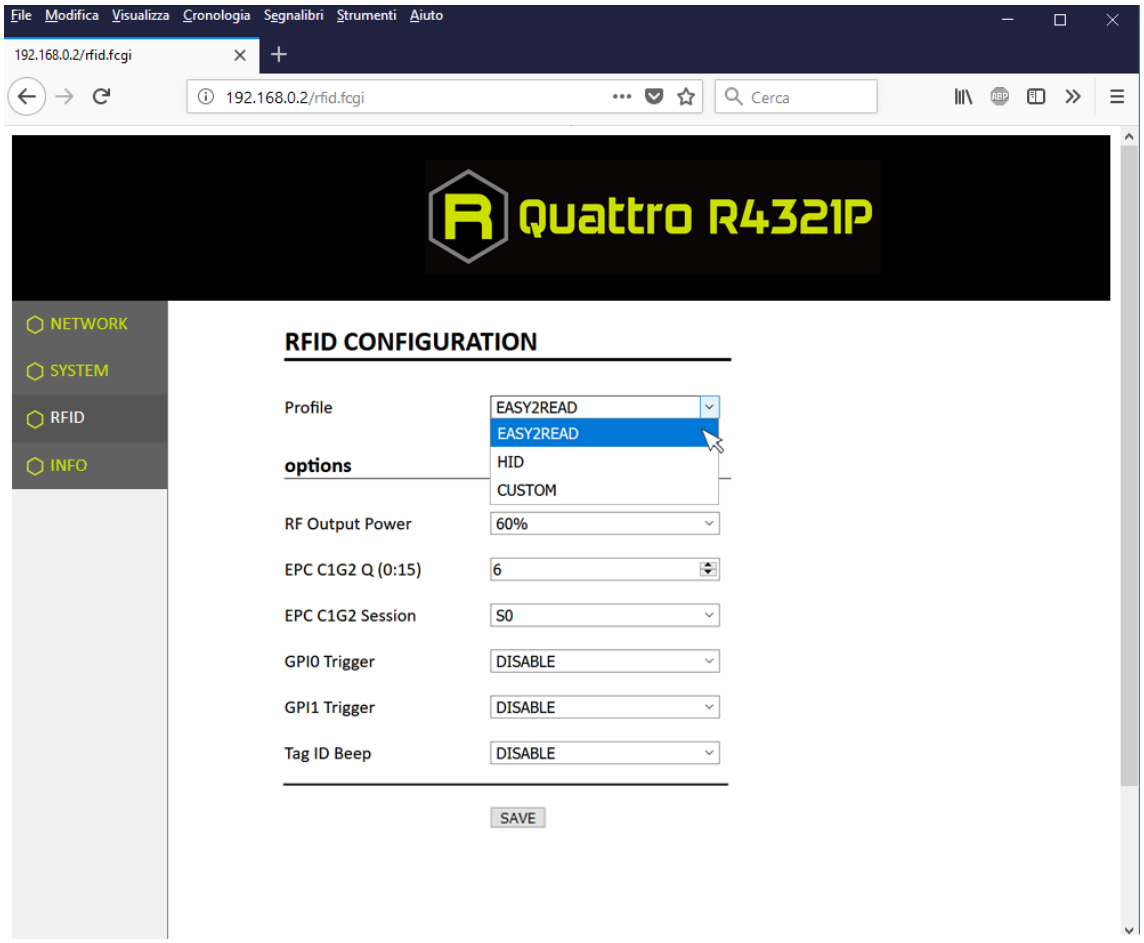


Fig. 5.1: Quattro R4321P Web Interface

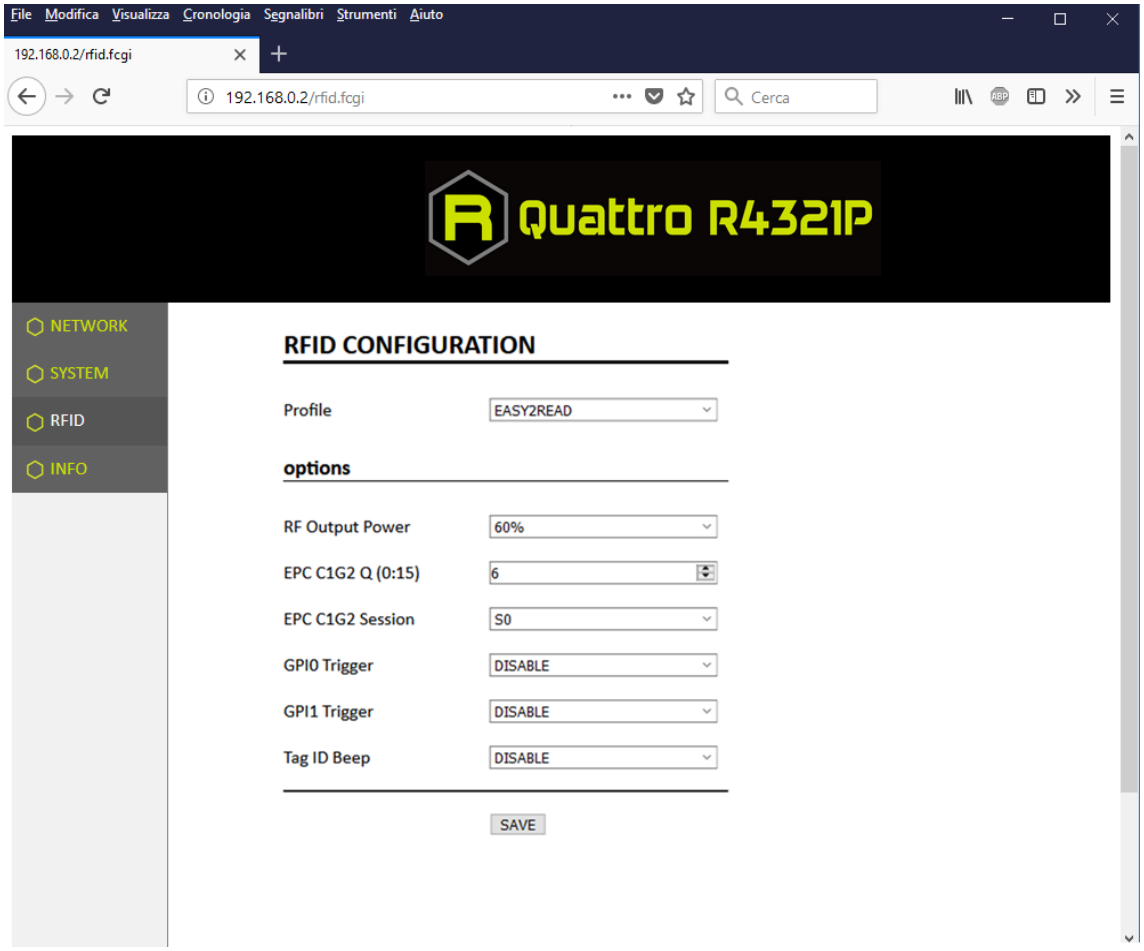
Click on *RFID* menu options in order to set the EASY2READ profile, you can change the profile using the drop-down menu:



Warning: To save the changes click on the "*SAVE*" button. Note that all changes made via the web interface are active only after the reader's reboot. Click on *SYSTEM* option in the Web Interface panel and then click on the "Reboot" button. After reboot, the new settings are active.

EASY2READ configuration options

It is possible to configure various options using the EASY2READ profile (configuration via web interface):



For details on the EASY2READ configuration options, refer to § *EASY2READ Configuration Options* page 22.

Connecting using the Ethernet port

Ethernet Communication Setup

The Quattro reader can be connected to a PC using an Ethernet cable. In order to correctly operate with the reader follow the steps above:

1. Connect the antenna cable to Ant-0 (see § *Fig. 3.6: Antennas* page 16) of the reader.
2. Connect the Quattro to the power supply, the power LED will turn on, wait about 30 seconds until you hear a beep, wait 10 seconds again and the reader is ready to work with the EASY2READ profile active.
3. Plug an Ethernet cable[8] (not provided) into your computer and connect the other end of the Ethernet cable to the reader. If your private network matches the default network configuration of the reader (IP address 192.168.0.2) you can connect to it, otherwise you can:
    a. change the network configuration of the reader (see § *NETWORK* page 19) to connect it to your network

    or

    b. disconnect your PC from your network and connect it to the network of the reader.

Now you can use the CAEN RFID Easy Controller Application to control the reader.

[8] For proper operation of the device:
- Ethernet cable shall be CAT6 at least (type S/FTP or S/STP)
- Put two ferrites (P.N. RRC-13-7-23-M-K5B by RICHCO; CAEN RFID ordering code LFAAFFP00004) on the Ethernet cable, near the reader connector.

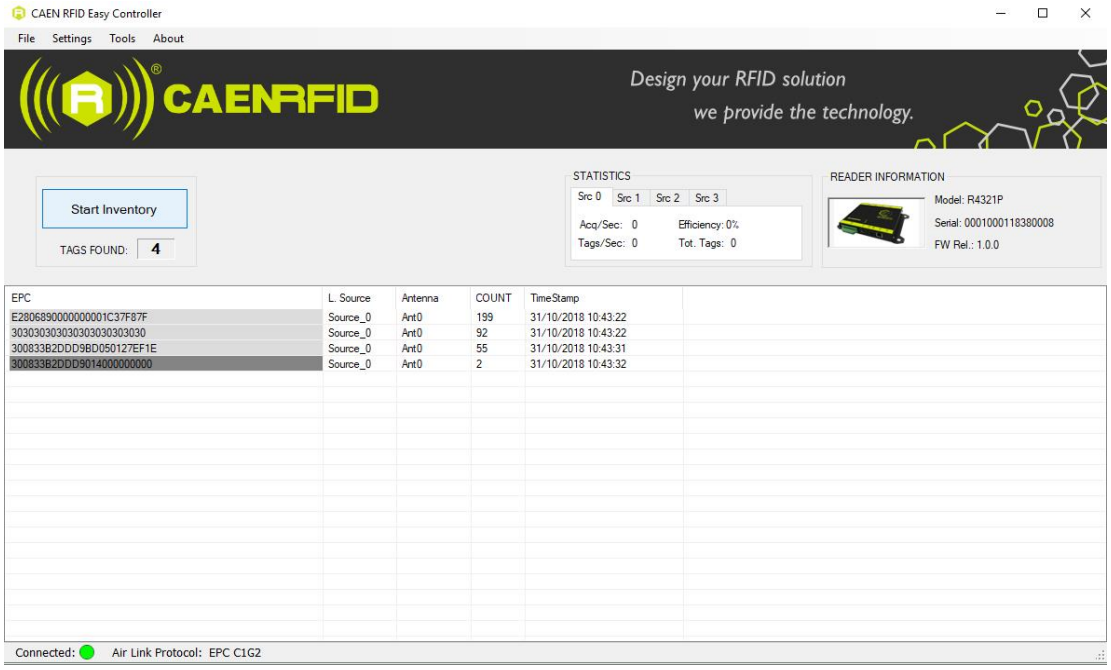
Easy Controller

Follow these steps to connect the Quattro using the *Easy Controller* application for Windows:

1. Download the latest version of the Easy Controller software from the Quattro R4321P web page, Downloads section and install it.
2. Launch the *Easy Controller* application:
3. On the main screen click on *File → Connect*. A Connection windows will open. Select the C*onnection Type* (TCP/IP Connection) and type the Quattro IP address into the *TCP/IP Address* box (default value is 192.168.0.2). Then click on *Connect*:

4. To verify if the connection with the reader has been established, check the green dot on the bottom left side of the sidebar. Into the *READER INFORMATION* box you can find information on reader model, serial number and firmware release:

5. Place a tag in the read range of the reader, click on *start inventory* and see the tag information displayed on the main window:



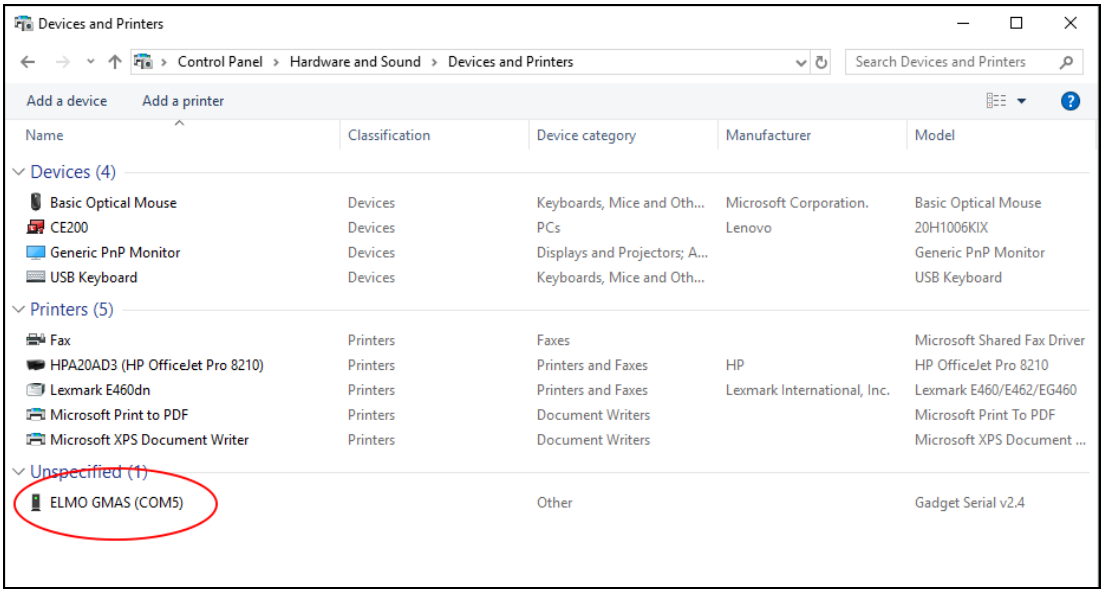
For more info on the use of the *Easy Controller*, please refer to the *CAEN RFID Easy Controller Software Technical Information Manual*, you can download it from the Quattro R4321P web page, *Downloads* section or in the Manual and Documents web area.

Connecting using the USB port

USB Communication Setup

> **Warning:** If your PC is running a Windows version older than Windows 10, in order to correctly operate with the reader, you need to install the *Gadget Serial USB driver*. You can download it for Windows based systems from the Quattro R4321P web page, *Downloads* section or from the Software and Firmware download area.

1. Plug an USB cable (mini USB) into your computer and connect the other end of the USB cable to the reader.
2. Connect the Quattro to the power supply, the power LED will turn on, wait about 30 seconds until you hear a beep, wait 10 seconds again and the reader is ready to work with the EASY2READ profile active.
3. In your PC, go to *Control Panel → Hardware and Sound → Devices and Printers.* After having installed the driver (if your PC is running a Windows version older than Windows 10, otherwise the installation of the driver is not necessary), the reader is detected by the PC as an *ELMO GMAS* (Gadget Serial) device. Look at the COM port number (COM5 in this example):



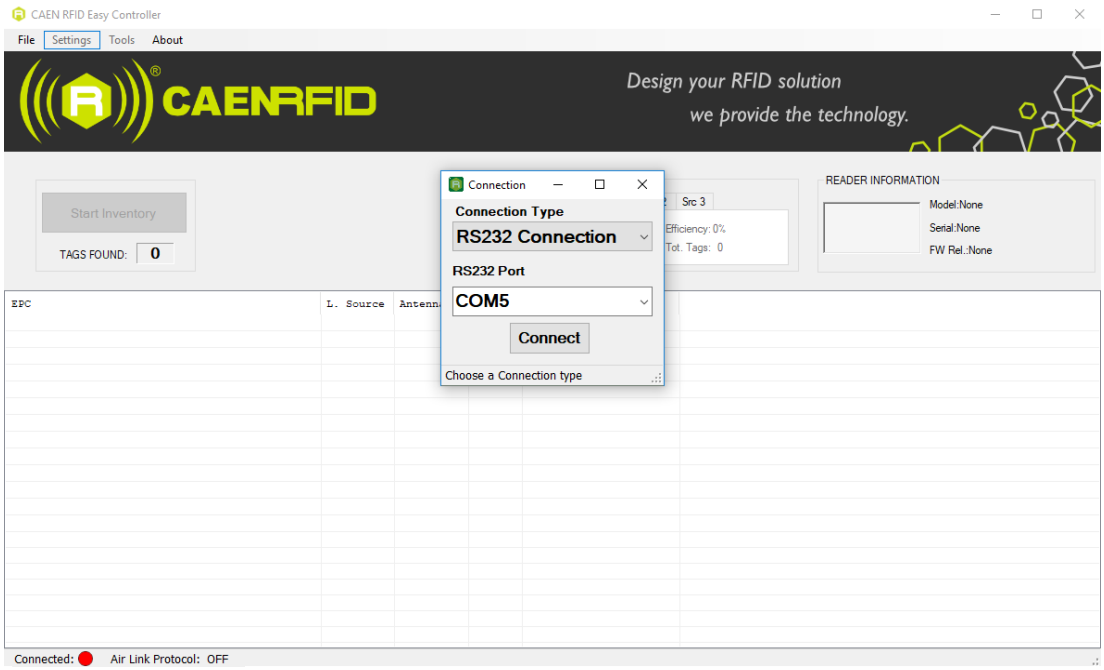
4. Connect the antenna cable to Ant-0 (see § *Fig. 3.6: Antennas* page 16) of the reader.

Easy Controller

Follow these steps to connect the Quattro using the *Easy Controller* application for Windows:

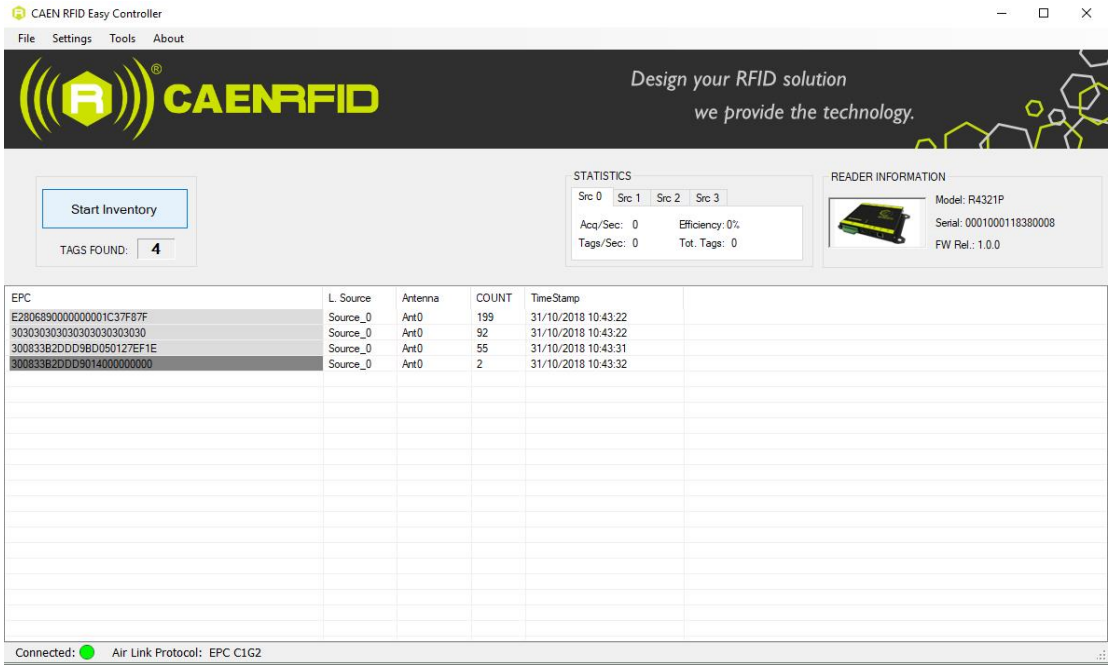
1. Download the latest version of the *Easy Controller software* from the Quattro R4321P web page, *Downloads* section and install it.
2. Launch the *Easy Controller* application:

3. On the main screen click on *File → Connect*. A Connection window will open. Select the C*onnection Type* (RS232) and specify the RS232 port (COM 5 in this example):



4. To verify if the connection with the reader has been established, check the green dot on the bottom left side of the sidebar and on the *READER INFORMATION* box you can find information on reader model, serial number and firmware release:

5. Place a tag in the range of the reader, click on *start inventory* and see the tag information displayed on the main window:



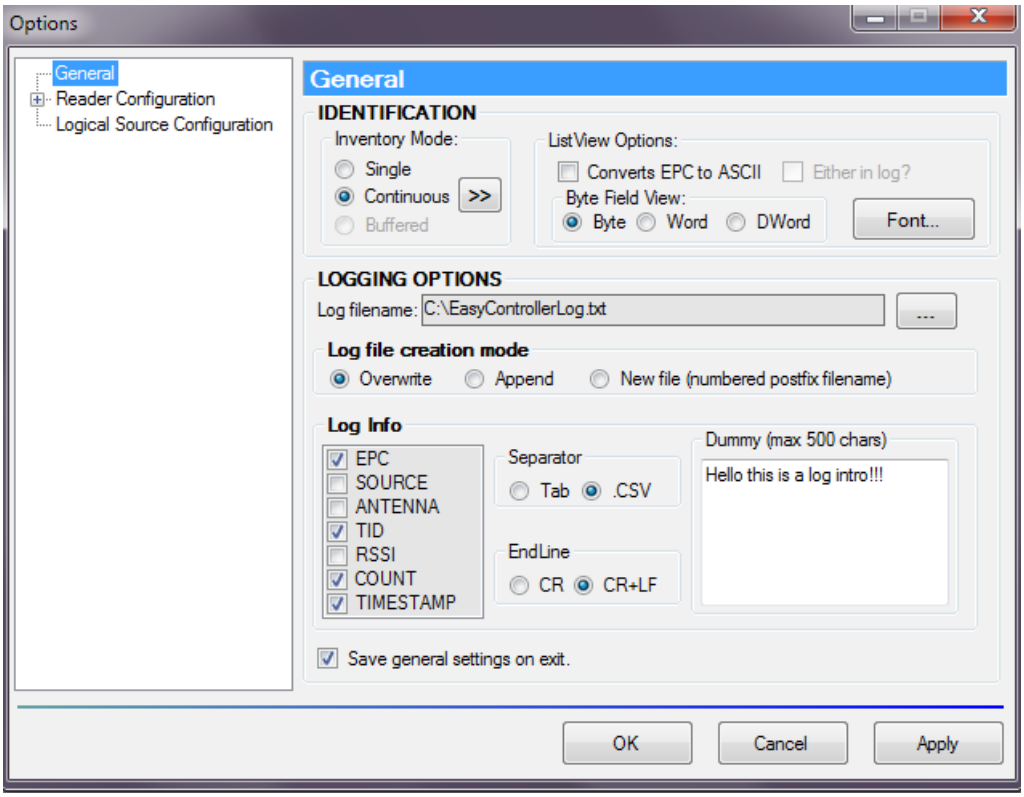
For more information on the CAEN RFID *Easy Controller for Windows* application usage, please refer to the relevant user manual: you can download it from the Quattro R4321P web page, *Downloads* section or in the Manual and Documents web area.

Inventory on GPIO state change

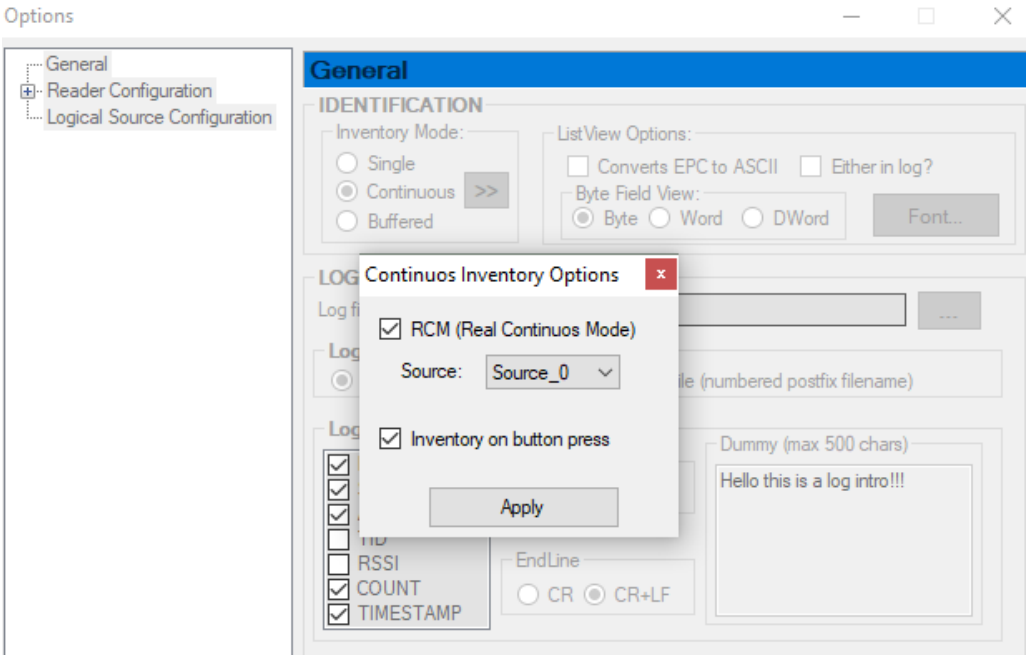
This mode has been designed to enable the inventory at the change of state of the GPIO0 and GPIO1 as illustrated in the paragraph *Input signal* page 14. The inventory is executed until the state change persists.

In the EASY2READ profile it is necessary a **double** activation to perform the inventory on GPIO state change:

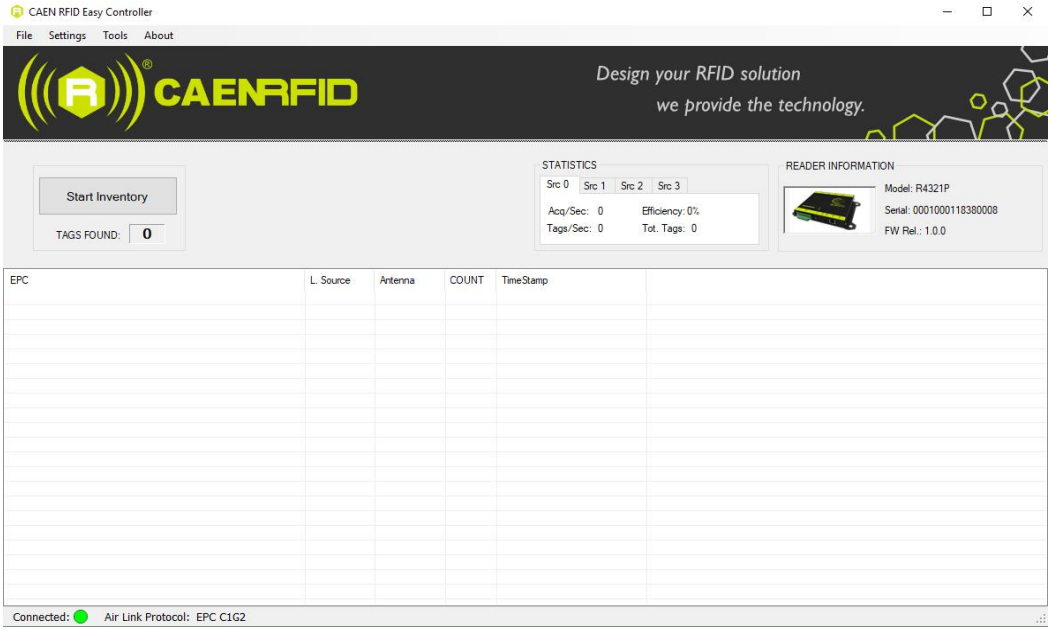
1. Activation **via web interface** (see § *EASY2READ Configuration Options* page 22)
2. Activation **via Easy Controller Software**:
    a. Connect the reader to the Easy Controller software. On the main menu of the application, click on *Settings* → *Options*:



b. By clicking on [>>] button in the Identification box, you can access the Continuous Inventory Options window:



c. Select the *RCM (Real Continuous Mode)* to perform continuous mode (i.e., a continuous inventory via hardware on the source indicated by the RCM Source parameter) and the *Inventory on button press*. Click on *Apply*. Now click on *Start Inventory* on the main window:



d. Now the tag inventory is performed at the change of state of the GPIO0/1.

For more information on the CAEN RFID *Easy Controller for Windows* application usage, please refer to the relevant technical information manual: you can download it from the Quattro R4321P web page, *Downloads* section or in the Manuals and Documents web area.

6 HID PROFILE

Introduction

The connection to the Quattro Reader using the HID profile is possible via the Ethernet port or the USB port.

If your reader is in EASY2READ or CUSTOM profile active, in order to set the HID profile please refer to the next paragraph § *Set the HID profile* page 49.

Warning: Note that, when configured in the HID profile, the Quattro R4321P reader cannot be controlled using the *CAEN RFID Easy Controller Application*.

Set the HID profile

If your reader is in EASY2READ or CUSTOM profile active, in order to set the HID profile, access the web interface:

1. Connect the Quattro to the power supply.
2. Plug an Ethernet cable[9] (not provided) into your computer and connect the other end of the Ethernet cable to the reader. If your private network matches the default network configuration of the reader (IP address 192.168.0.2) you can connect to it, otherwise you can:
    a. change the network configuration of the reader (see § *NETWORK* page 19) to connect it to your network

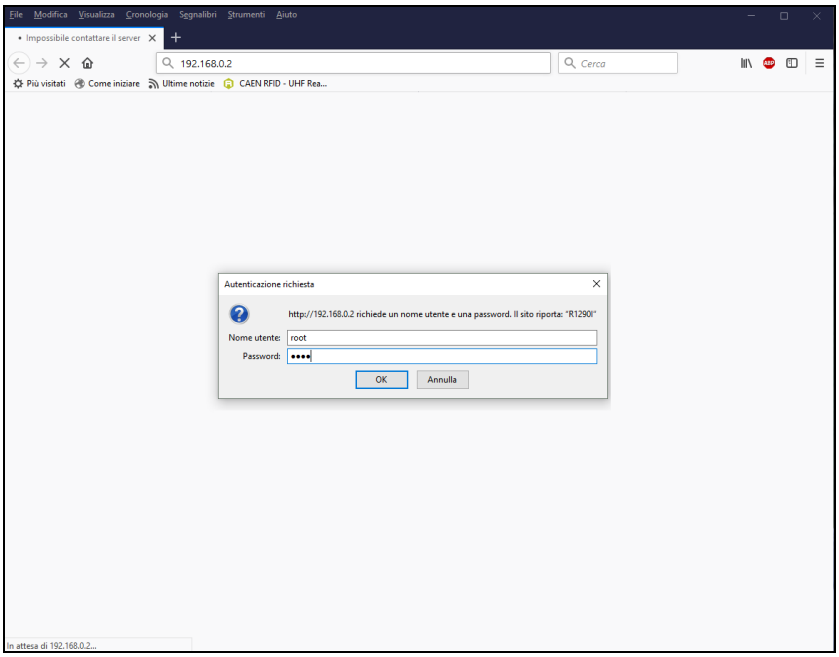
    or

    b. disconnect your PC from your network and connect it to the network of the reader.

By factory default, the Quattro web interface is reachable at the following IP address: 192.168.0.2.

To login, type ***root*** in the Username text box and ***root*** in the Password textbox. To change the username and password please refer to *§ SYSTEM* page 20.

[9] For proper operation of the device:
- Ethernet cable shall be CAT6 at least (type S/FTP or S/STP)
- Put two ferrites (P.N. RRC-13-7-23-M-K5B by RICHCO; CAEN RFID ordering code LFAAFFP00004) on the Ethernet cable, near the reader connector.



When the connection with the reader is established, the main screen of the web interface is displayed:

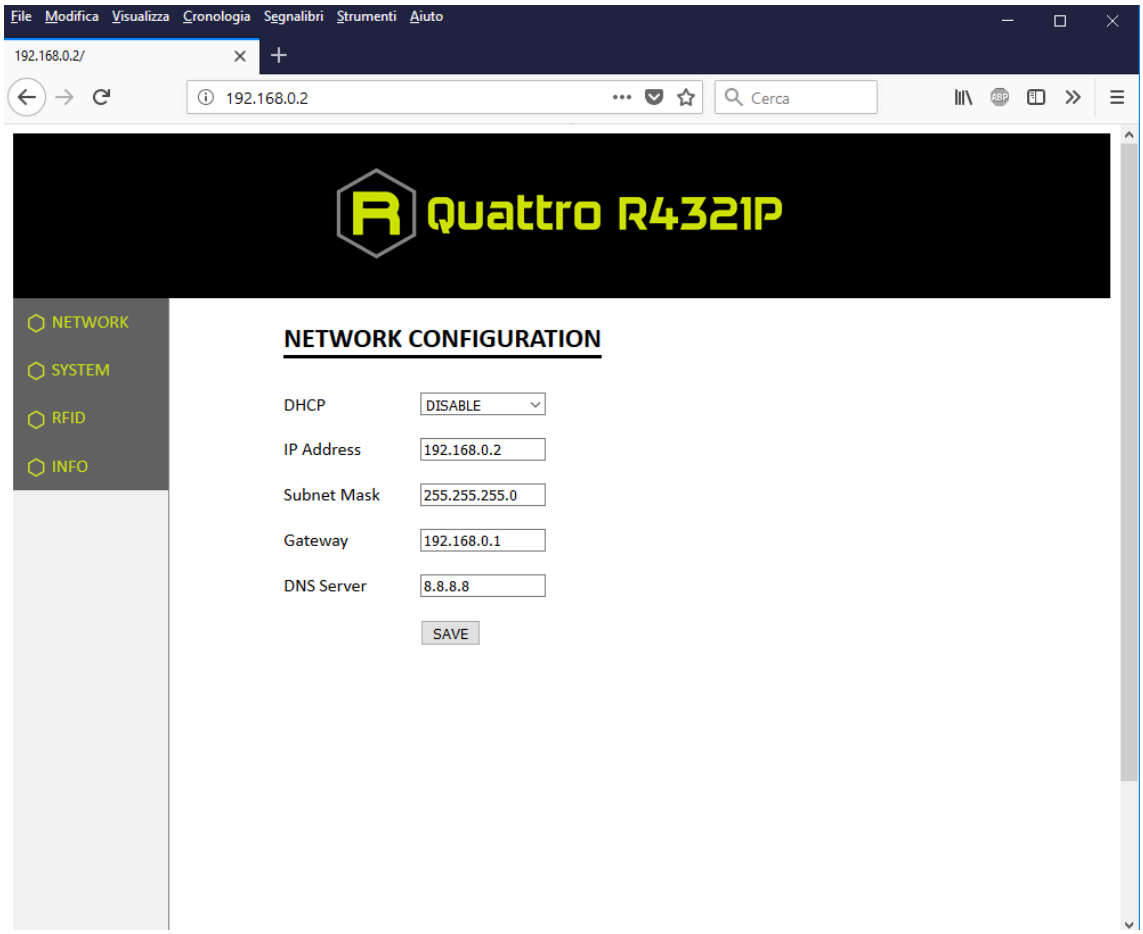
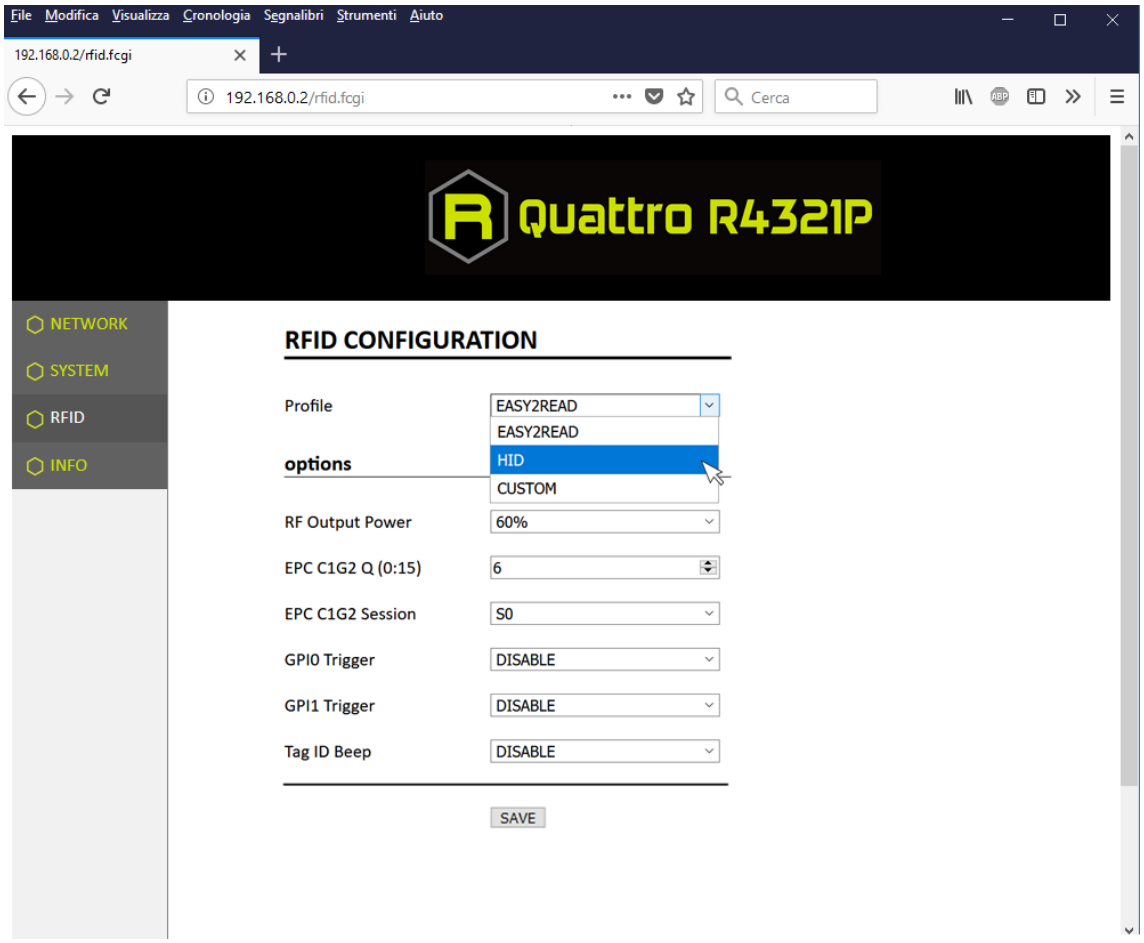


Fig. 6.1: Quattro R4321P Web Interface

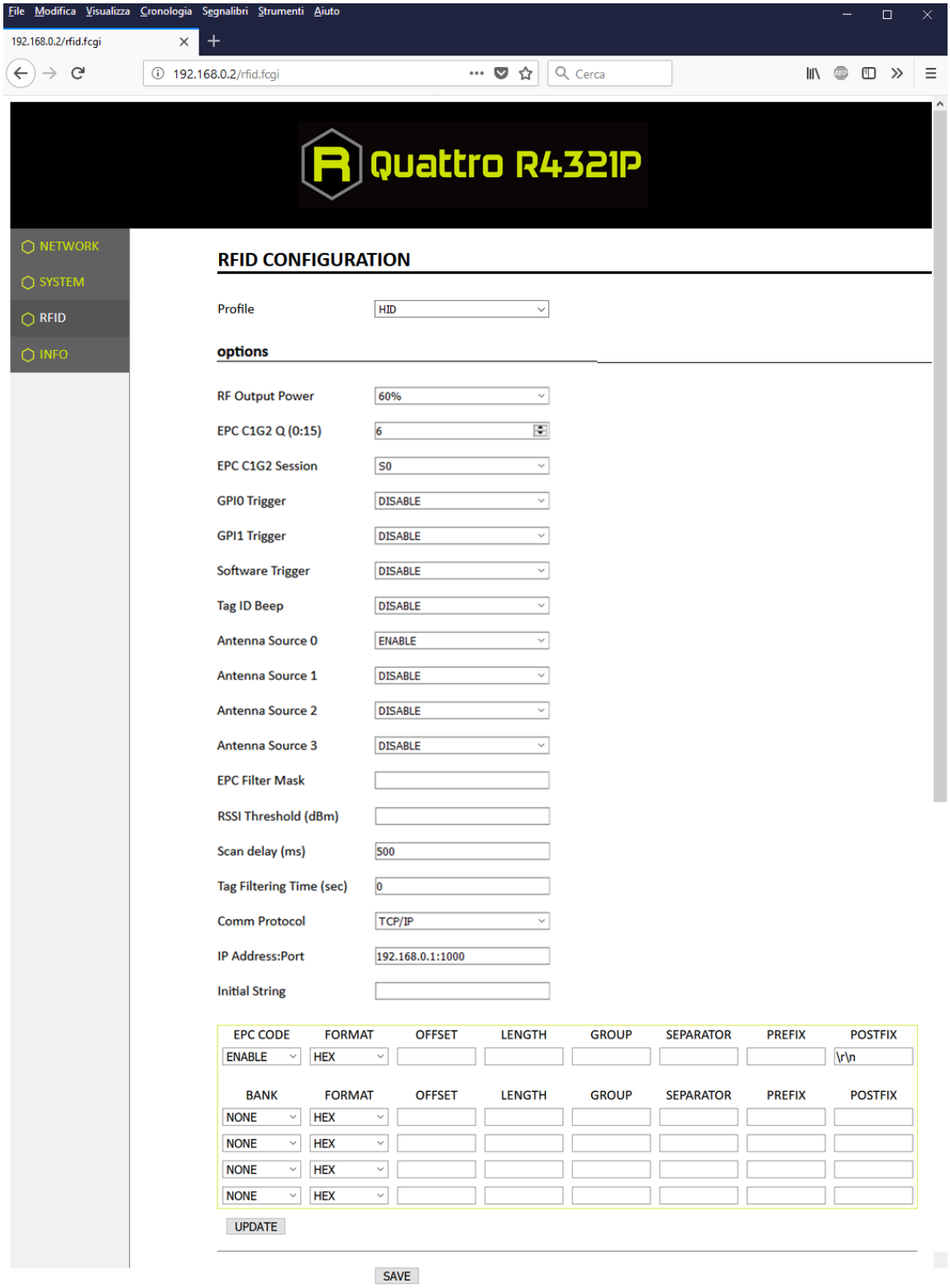
Click on *RFID* menu options in order to set the HID profile, you can change the profile using the drop-down menu:



Warning: To save the changes click on the "*SAVE*" button. Note that all changes made via the web interface are active only after the reader's reboot. Click on *SYSTEM* option in the Web Interface panel and then click on the "Reboot" button. After reboot, the new settings are active.

HID configuration options

It is possible to configure various options using the HID profile (configuration via web interface):



For details on the HID configuration options, refer to § *HID Configuration Options* page 25.

Connecting using the Ethernet port

Ethernet Communication Setup

The Quattro reader can be connected to a PC using an Ethernet cable. In order to correctly operate with the reader follow the steps above:

1. Connect the antenna cable to Ant-0 (see § *Fig. 3.6: Antennas* page 16) of the reader.
2. Connect the Quattro to the power supply, the power LED will turn on, wait about 30 seconds until you hear a beep, wait 10 seconds again and the reader is ready to work with the HID profile active.
3. Plug an Ethernet cable[10] (not provided) into your computer and connect the other end of the Ethernet cable to the reader. If your private network matches the default network configuration of the reader (IP address 192.168.0.2) you can connect to it, otherwise you can:
    a. change the network configuration of the reader (see § *NETWORK* page 19) to connect it to your network

    or

    b. disconnect your PC from your network and connect it to the network of the reader.

When connected via Ethernet, the reader uses a TCP/IP or HTTP/HTTPS communication protocol (please refer to *Comm Protocol* option in the § *HID Configuration Options* page 25).

Now you can use a custom server or existing servers available on the web (e.g. restdb.io) to work with your Quattro R4321P reader.

Note that the EPCs of the tags are shown in the format defined in the § *EPC code parameters* paragraph page 30 (configuration via web interface): using the *Tab. 4.3: EPC Code parameters* page 30 you can customize the text of the EPC code displayed on the screen.

Connecting using the USB port

USB Communication Setup

Warning: If your PC is running a Windows version older than Windows 10, in order to correctly operate with the reader, you need to install the *Gadget Serial USB driver*. You can download it for Windows based systems from the Quattro R4321P web page, *Downloads* section or from the Software and Firmware download area.

1. Plug an USB cable (mini USB) into your computer and connect the other end of the USB cable to the reader.
2. Connect the Quattro to the power supply, the power LED will turn on, wait about 30 seconds until you hear a beep, wait 10 seconds again and the reader is ready to work with the HID profile active.
3. Connect the antenna cable to Ant-0 (see § *Fig. 3.6: Antennas* page 16) of the reader.

When connected via USB, the reader uses a USB-CDC (SPP) communication protocol (please refer to *Comm Protocol* option in the § *HID Configuration Options* page 25).

Now you can use a custom application or an open-source terminal emulator program (e.g. as Tera Term) to work with your Quattro R4321P reader.

Note that the EPCs of the tags are shown in the format defined in the § *EPC code parameters* paragraph page 30 (configuration via web interface): using the *Tab. 4.3: EPC Code parameters* page 30 you can customize the text of the EPC code displayed on the screen.

[10] For proper operation of the device:
- Ethernet cable shall be CAT6 at least (type S/FTP or S/STP)
- Put two ferrites (P.N. RRC-13-7-23-M-K5B by RICHCO; CAEN RFID ordering code LFAAFFP00004) on the Ethernet cable, near the reader connector.

7 CUSTOM PROFILE

Introduction

The use of the CUSTOM profile allows the user to upload his own scripts to the reader.

The connection to the Quattro Reader using the CUSTOM profile is possible only via the Ethernet port.

If your reader is in EASY2READ or HID profile active, in order to set the CUSTOM profile please refer to the next paragraph § *Set the CUSTOM profile* page 54.

Warning: Note that, when configured in the CUSTOM profile, the Quattro R4321P reader cannot be controlled using the *CAEN RFID Easy Controller Application*.

Set the CUSTOM profile

If your reader is in EASY2READ or HID profile active, in order to set the CUSTOM profile, access the web interface that is possible only via the Ethernet connection:

1. Connect the Quattro to the power supply.
2. Plug an Ethernet cable[11] (not provided) into your computer and connect the other end of the Ethernet cable to the reader. If your private network matches the default network configuration of the reader (IP address 192.168.0.2) you can connect to it, otherwise you can:
    a. change the network configuration of the reader (see § *NETWORK* page 19) to connect it to your network

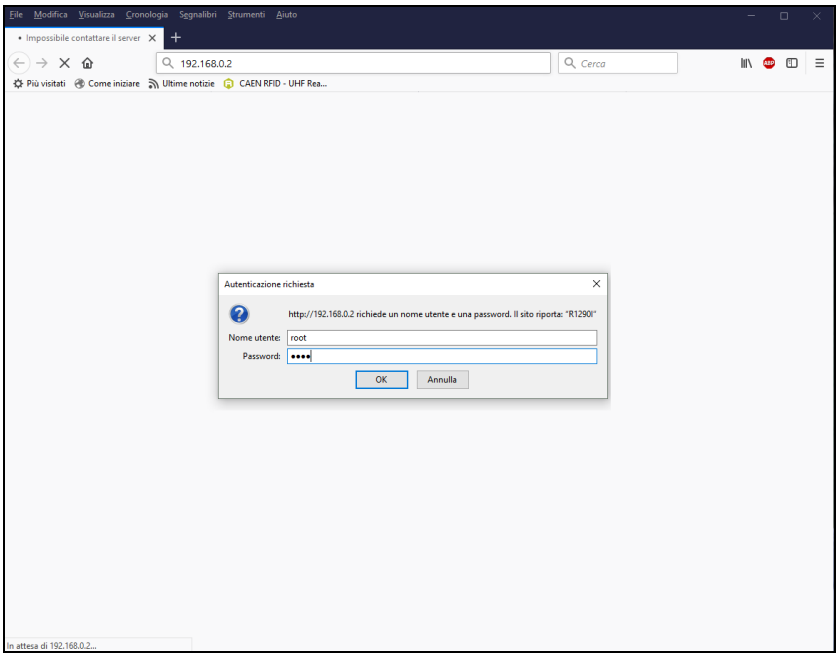
    or

    b. disconnect your PC from your network and connect it to the network of the reader.

By factory default, the Quattro web interface is reachable at the following IP address: 192.168.0.2.

To login, type ***root*** in the Username text box and ***root*** in the Password textbox. To change the username and password please refer to *§ SYSTEM* page 20.

[11] For proper operation of the device:
- Ethernet cable shall be CAT6 at least (type S/FTP or S/STP)
- Put two ferrites (P.N. RRC-13-7-23-M-K5B by RICHCO; CAEN RFID ordering code LFAAFFP00004) on the Ethernet cable, near the reader connector.



When the connection with the reader is established, the main screen of the web interface is displayed:

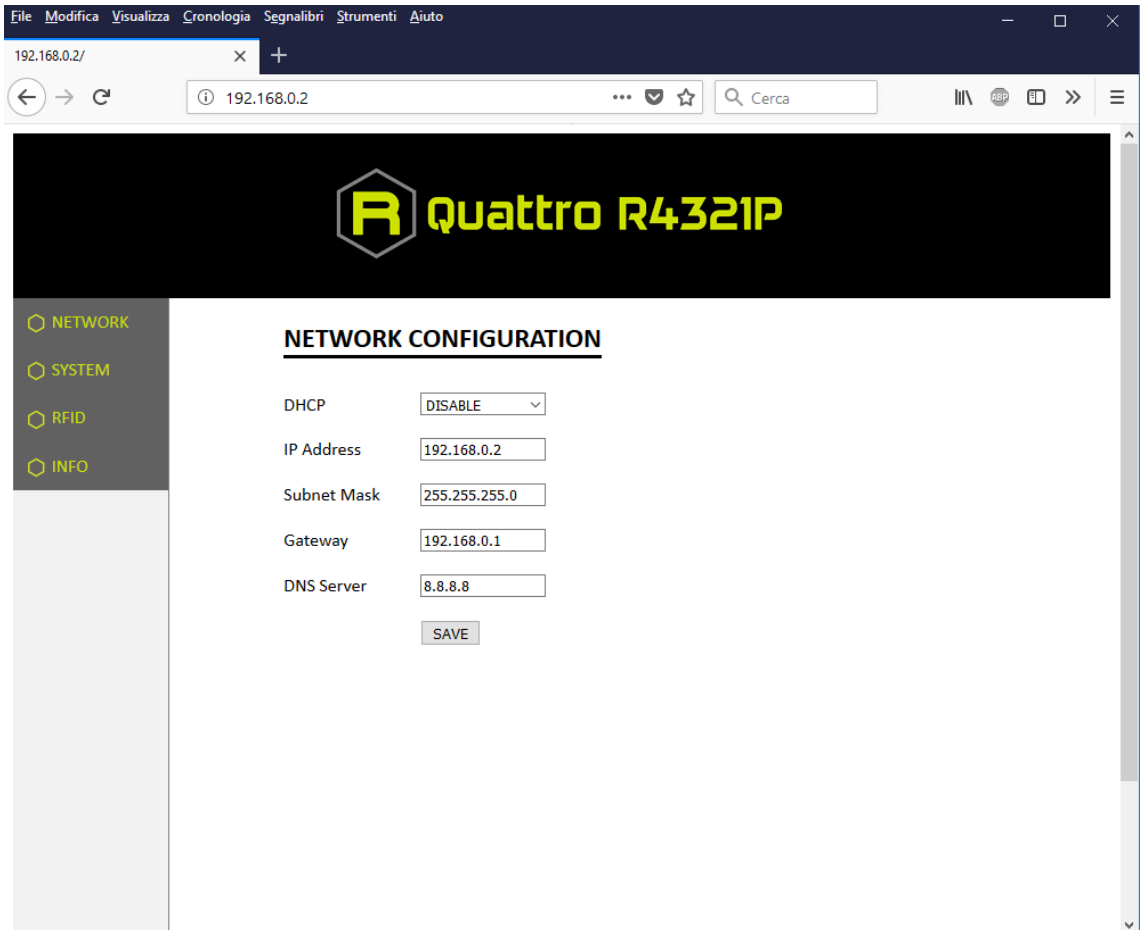
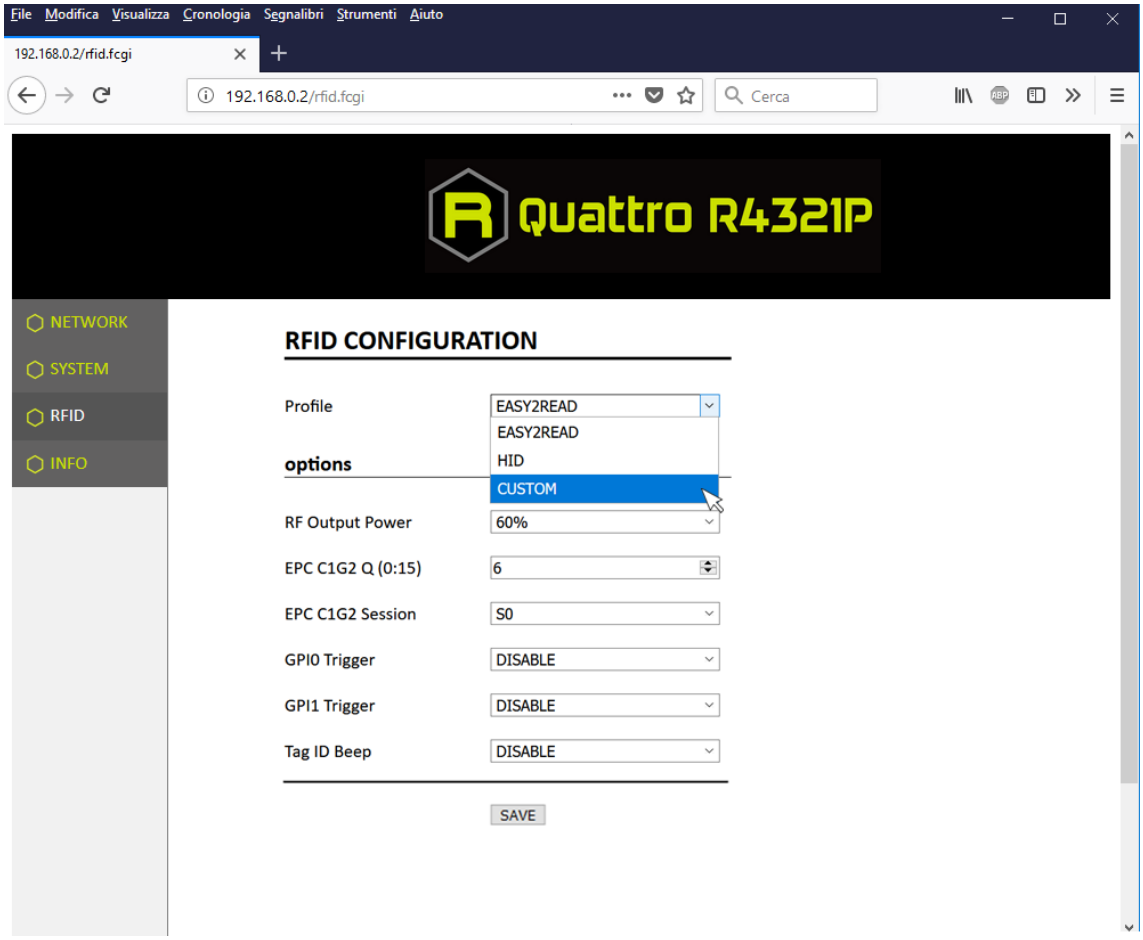


Fig. 7.1: Quattro R4321P Web Interface

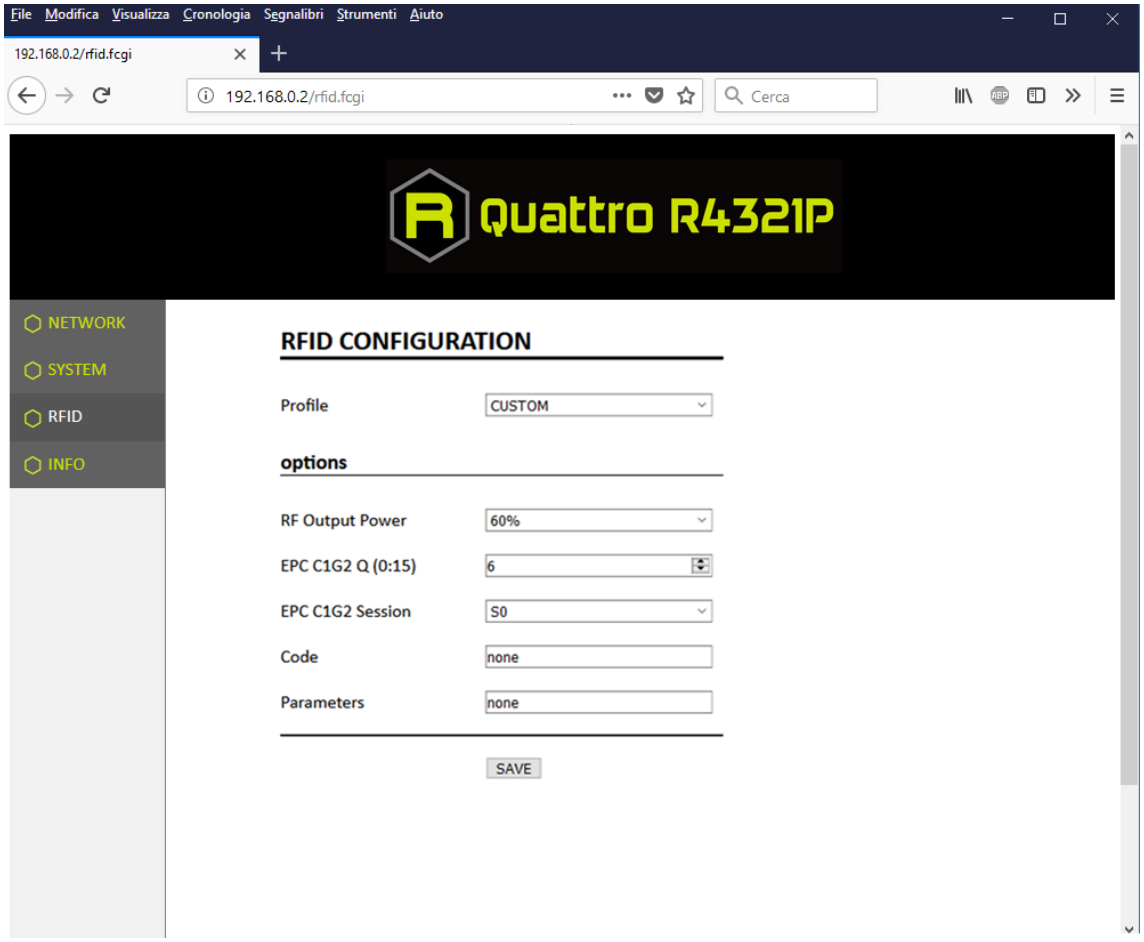
Click on *RFID* menu options in order to set the CUSTOM profile, you can change the profile using the drop-down menu:



Warning: To save the changes click on the "*SAVE*" button. Note that all changes made via the web interface are active only after the reader's reboot. Click on *SYSTEM* option in the Web Interface panel and then click on the "Reboot" button. After reboot, the new settings are active.

Configuration options

It is possible to configure various options using the CUSTOM profile (configuration via web interface):



For details on the CUSTOM configuration options, refer to § *CUSTOM Configuration Options* page 34.

Connecting using the Ethernet port

Ethernet Communication Setup

The Quattro reader can be connected to a PC using an Ethernet cable. In order to correctly operate with the reader follow the steps above:

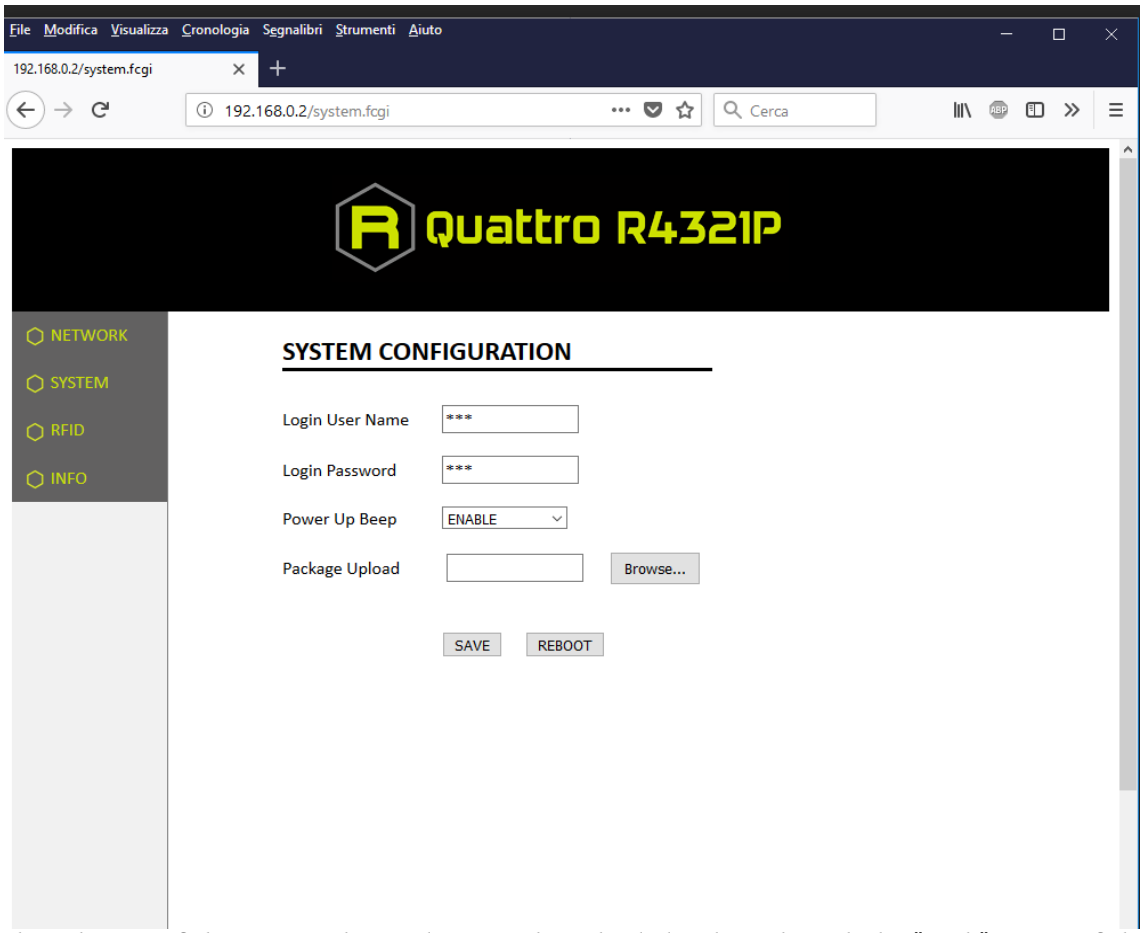
1. Connect the Quattro to the power supply, the power LED will turn on, wait about 30 seconds until you hear a beep, wait 10 seconds again and the reader is ready to work with the HID profile active.
2. Plug an Ethernet cable[12] (not provided) into your computer and connect the other end of the Ethernet cable to the reader. If your private network matches the default network configuration of the reader (IP address 192.168.0.2) you can connect to it, otherwise you can:
    a. change the network configuration of the reader (see § NETWORK page 19) to connect it to your network

    or

    b. disconnect your PC from your network and connect it to the network of the reader.
3. Connect the antenna cable to Ant-0 (see § *Fig. 3.6: Antennas* page 16) of the reader.

Java Virtual Machine

The user can write his own scripts in Java code and use the "Package Upload " function of the *SYSTEM* section page 20 of the web configuration to upload them on the reader:



The selection of the script to be used among those loaded is done through the "*Code*" option of the § *CUSTOM Configuration Options* page 34.

[12] For proper operation of the device:
- Ethernet cable shall be CAT6 at least (type S/FTP or S/STP)
- Put two ferrites (P.N. RRC-13-7-23-M-K5B by RICHCO; CAEN RFID ordering code LFAAFFP00004) on the Ethernet cable, near the reader connector.

To use the uploaded script, the user needs a Java Virtual Machine. Contact the CAEN RFID support to obtain the Virtual Machine and the guideline to its use.

8 RESET THE READER

It is possible to reset the reader in two different ways:

1. Turn off the reader (disconnect the power supply), **wait about 15 seconds** until the power LED power off, then turn on the reader again (connect the power supply). Wait for the reboot to be completed.

   or

2. Connect the reader to the Web Interface (for more info see § *CONFIGURATION USING THE WEB INTERFACE* page 17), select the *SYSTEM* option and then click on the “Reboot” button. Wait for the reboot to be completed.

9 FIRMWARE UPGRADE

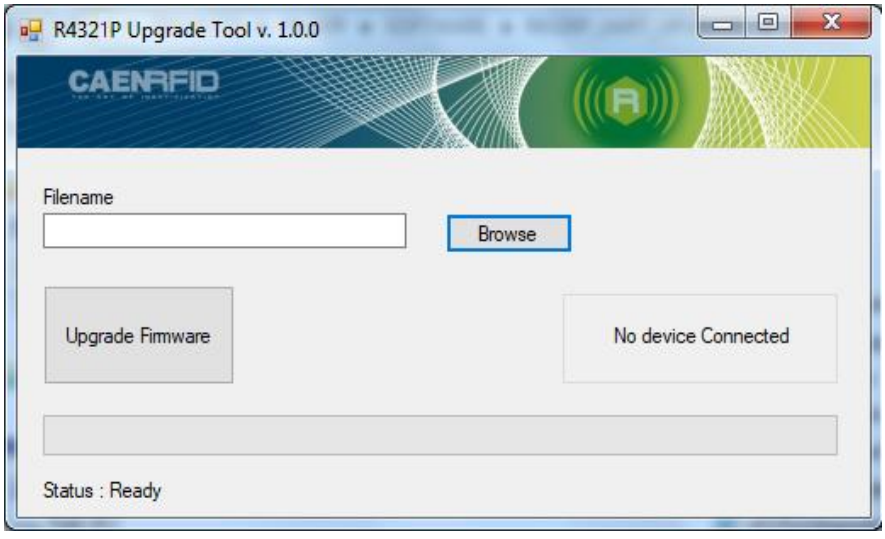
Warning! The firmware upgrade is a factory reset: any scripts uploaded to the reader are deleted.

The Quattro R4321P firmware upgrade can be performed only via USB.

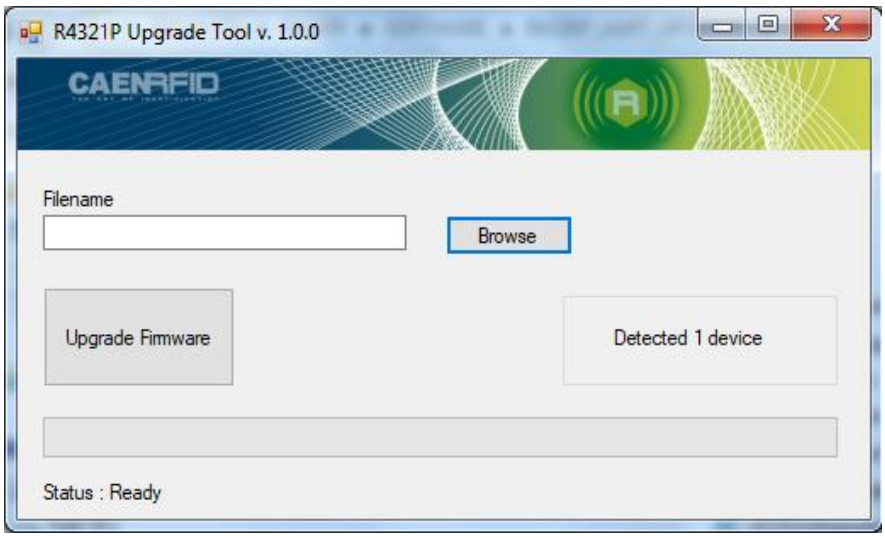
In order to upgrade the firmware follow the steps described below:

1. Download the *Quattro Upgrade Tool* and the *firmware image file* at the *Quattro R4321P web page* of the CAEN RFID Web Site, *Downloads* section.
2. Connect the Quattro reader to your PC using the USB port.
3. Open the FW upgrade program:

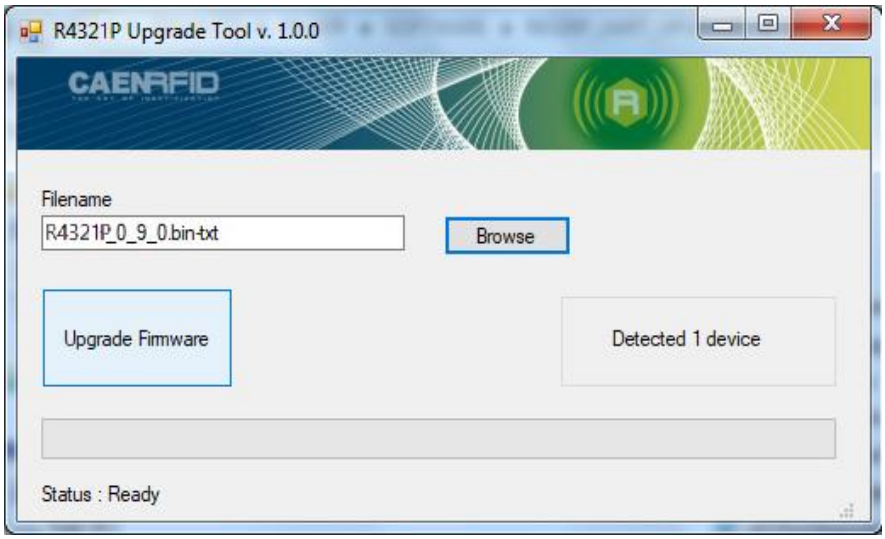
4. Click on *Next*. In the window you will see the message “No device Connected”:



5. To connect the reader, press the upgrade button (see § *Fig. 3.2: Interfaces Panel* page 13) for about 10 seconds. The “No device connected” box will turn into “Detected 1 device” and informs you that the reader is correctly connected to the upgrade program:

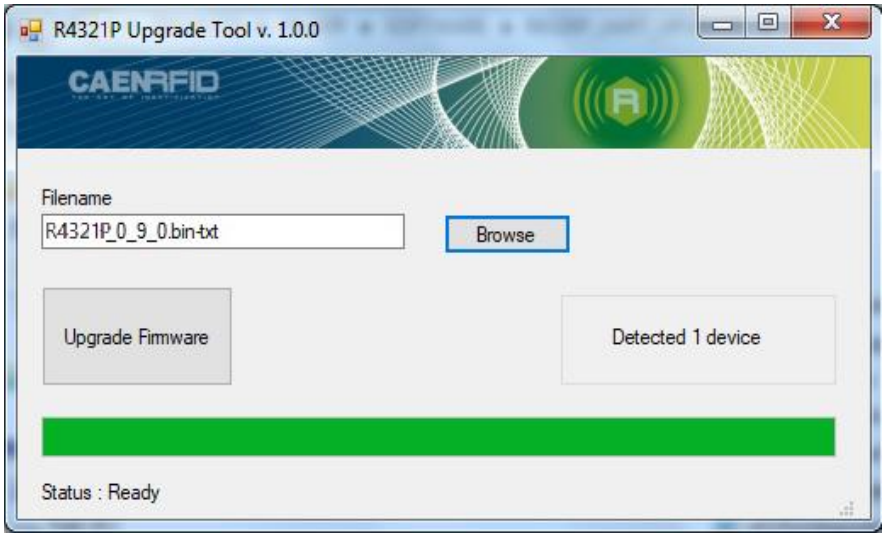


6. Select the FW image file by clicking on the “Browse” button:



7. Click on the “Upgrade Firmware” button and wait for the upgrade process to be completed. In the window you will see the message “Status: upgrading”.

8. At the end of procedure, if the upgrade has been successfully performed, you will see the message “Status: ready”:



9. Turn off the reader (disconnect the power supply), **wait about 15 seconds** and then turn on the reader again (connect the power supply). Now the reader is ready to work with the new firmware upgraded.

10 TECHNICAL SPECIFICATIONS

Technical Specification Table

Frequency Range	865.600÷867.600 MHz (ETSI EN 302 208 v3.1.1) 902÷928 MHz (FCC part 15.247)
RF Power	Up to 31.5 dBm (1.4W) conducted (ETSI) Up to 30 dBm (1W) conducted (FCC)
Number of Channels	4 channels (compliant to ETSI EN 302 208 v3.1.1) 50 hopping channels (compliant to FCC part 15.247)
Standard Compliance	EPC C1G2/ISO 18000-63
CPU	ARM9 @ 400Mhz on Atmel AT91SAM9G25
Operating system	Linux
Receiving Capability	Gen 2 Dense Reader Mode Management Data rate up to 400 Kb/s
Connectivity	USB 2.0 Hi-Speed (480 Mbit/s) device port (USB mini connector) Virtual COM port parameters: – Baudrate: up to 115200 kbps – Databits: 8 – Stopbits: 1 – Parity: none – Flow control: none Ethernet 10/100/1000BASE-T (RJ45) POE standard IEEE 802.3af
I/O Interface	10 Poles Terminal Block with screw connection 2 digital inputs optically isolated 2 solid state photorelay outputs optically isolated (500mA max)
Antenna Connectors	4 TNC Reverse Polarity
Electrical Power	5 VDC power supply (12W) POE standard IEEE 802.3af (12,95W)
Visual Status Indicators	Multicolor LEDs: Power, Activity, Status and Applications
Operating Temperature	-10°C to +55°C
IP Rating	IP30
Dimensions	(W)210 x(L)140 x (H)27 mm^3 (8.27 x 5.51 x 1.06 $inch^3$)
Weight	740 g

Tab. 10.1: Technical Specifications

Warning: The RF settings must match the country/region of operating to comply with local laws and regulations.

The usage of the reader in different countries/regions from the one in which the device has been sold is not allowed.

11 CONNECTING TO RA0003 MULTIPLEXER

RA0003 Multiplexer

The RA0003 module is a 1 to 4 UHF antenna multiplexer that allows to expand read points management of CAEN RFID easy2read product line.

Typical usages of the device is the extension of number of read points of multiantenna reader like Quattro R4321P for smart shelves installations, manufacturing lines and all others applications requiring a large number of antennas to be connected.

RA0003 has SMA RF connectors, is able to manage up to 2W RF power and can be used in the whole range of UHF RFID worldwide band.

The module has a extended supply voltage range (9Vdc – 36Vdc) and TTL level address signal.

Five leds provide the user with information about module operation.

Warning: The RA0003 device has a 9-36V power supply and cannot be powered directly by the Quattro R4321P reader which has only 5V. An external power supply is required.

The power supply is available upon request.

Fig. 11.1: RA0003 UHF Antenna Multiplexer

Quattro R4321P – RA0003 Multiplexer Connection

The figure below shows how to connect the Quattro R4321P reader to the RA0003 multiplexer.

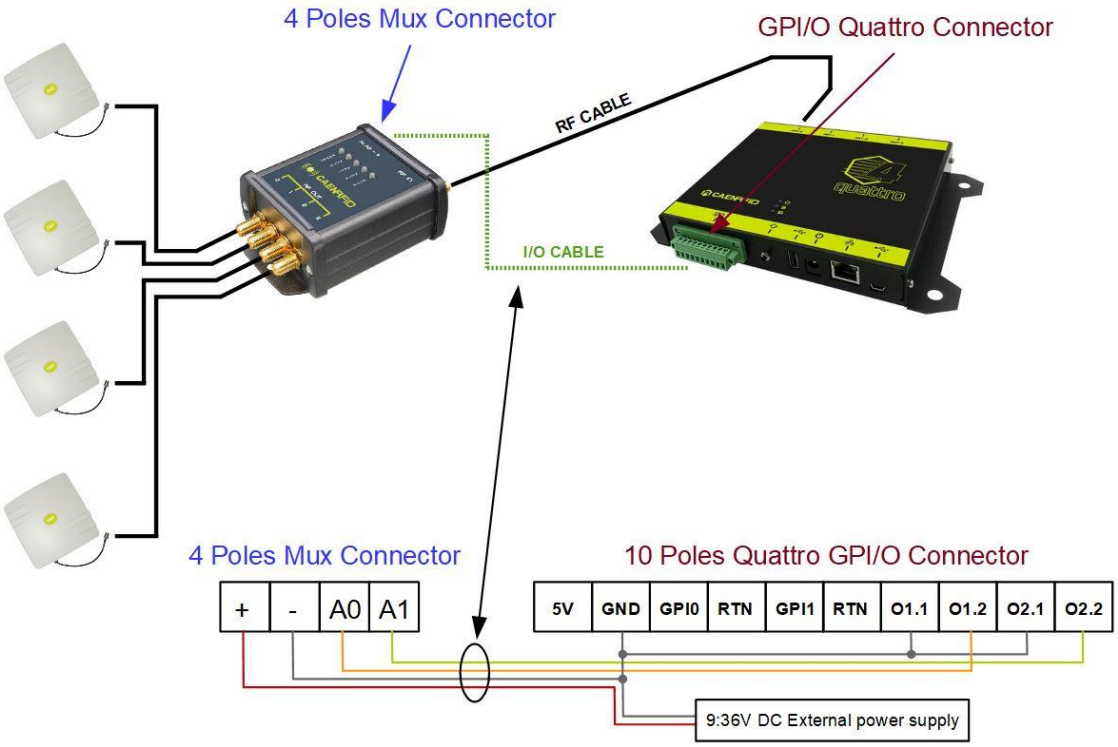


Fig. 11.2: Quattro reader – RA0003 MUX Connection

GPIO QUATTRO CONNECTOR		MUX CONNECTOR
pin 2 : GND	→	pin 2 : GND
pin 8 : OUTPUT1.2	→	pin 3 : A0
pin 10 : OUTPUT2.2	→	pin 4 : A1

9:36 DC EXTERNAL POWER SUPPLY		MUX CONNECTOR
pin + : Positive	→	pin 1 : Vin
pin - : Negative	→	pin 2 : GND

GPIO QUATTRO CONNECTOR		GPIO QUATTRO CONNECTOR
pin 2 : GND	→	pin 7 : OUTPUT1.1
pin 2 : GND	→	pin 9 : OUTPUT2.1

By enabling the relay contact (as described in the § *GPIO* paragraph page 13), pin A0 - A1 are connected to GND (low logic level) enabling the antennas according to this table:

A1	A0	Signal Path
Low	Low	IN connected to OUT0
Low	High	IN connected to OUT1
High	Low	IN connected to OUT2
High	High	IN connected to OUT3

12 REGULATORY COMPLIANCE

CE Compliance

Reference standard:

ETSI EN 301 489-1 V2.2.3

ETSI EN 301 489-3 V2.1.1

ETSI EN 302 208 V3.1.1

EN 55032:2015

EN 61000-3-2:2019

EN 61000-3-3:2013+A1:2019

EN 55035:2017+/AC:2019

EN 62368-1:2014+/AC:2015+/A11:2017

Reference document:

Test report n. 19517 [RD2].

See § *Quattro R4321P CE Declaration of Conformity* page 69 for the Quattro R4321P CE Compliance Certificate.

Warning: The CE compliance is guaranteed only if the reader is used as described in this manual.

FCC Compliance

This equipment has been tested and found to comply with the limits for a Class B digital device, pursuant to Part 15 of the FCC Rules. These limits are designed to provide reasonable protection against harmful interference in a residential installation.

This equipment generates uses and can radiate radio frequency energy and, if not installed and used in accordance with the instructions, may cause harmful interference to radio communications. However, there is no guarantee that interference will not occur in a particular installation. If this equipment does cause harmful interference to radio or television reception, which can be determined by turning the equipment off and on, the user is encouraged to try to correct the interference by one of the following measures:

a. Reorient or relocate the receiving antenna.

b. Increase the separation between the equipment and receiver.

c. Connect the equipment into an outlet on a circuit different from that to which the receiver is connected.

d. Consult the dealer or an experienced radio/TV technician for help.

This device complies with Part 15 of the FCC Rules. Operation is subject to the following two conditions: (1) This device may not cause harmful interference, and (2) this device must accept any interference received, including interference that may cause undesired operation.

Any changes or modification not approved by CAEN RFID could void the user's authority to operate the equipment.

The device shall be used with CAEN RFID antenna Mod. WANTENNAX020 Circular polarized antenna FCC with 5.5dBi gain.

The device shall be used such that a minimum separation distance of 25cm is maintained between the reader and user's/nearby people's body.

Reference documents:

Test report n. R20020701 [RD3] and n. R20020801 [RD4].

See § *Quattro R4321P FCC Grant* page 70 for the Quattro R4321P FCC Compliance Certificate.

Warning: The FCC compliance is guaranteed only if the reader is used as described in this manual.

RoHS EU Directive

The Quattro R4321P RAIN RFID reader is compliant with the EU Directive 2011/65/CE on the Restriction of the Use of certain Hazardous Substances in Electrical and Electronic Equipment (RoHS2).

Quattro R4321P
CE DECLARATION OF CONFORMITY

We

CAEN RFID Srl
Via Vetraia, 11
55049 Viareggio (LU)
Italy
Tel.: +39.0584.388.398 Fax: +39.0584.388.959
Mail: info@caenrfid.com
Web site: www.caenrfid.com

herewith declare under our own responsibility that the product:

Code: **WR4321PXAAAA**

Description: **R4321P Quattro - Compact 4 - port UHF RFID Reader**

corresponds in the submitted version to the following standards:

ETSI EN 301 489-1 V2.2.3

ETSI EN 301 489-3 V2.1.1

ETSI EN 302 208 V3.1.1

EN 55032:2015

EN 61000-3-2:2019

EN 61000-3-3:2013+A1:2019

EN 55035:2017+/AC:2019

EN 62368-1:2014+/AC:2015+/A11:2017

and declare under our sole responsibility that the specified product meets the principle requirements and other applicable regulations of directives 2014/53/EU (RED) and 2011/65/EU (RoHS2)

Date: 03/02/2020

Adriano Bigongiari (Chief Executive Officer)

On the basis of this declaration, this product will bear the following mark: CE

The compliance is guaranteed only if the reader is used as described in this manual.

Quattro R4321P
FCC GRANT

TCB

GRANT OF EQUIPMENT AUTHORIZATION

TCB

Certification
Issued Under the Authority of the
Federal Communications Commission
By:

EMCCons DR RASEK GmbH & Co. KG
Stoernhofer Berg 15
Unterleinleiter, 91364
Germany

Date of Grant: 03/19/2020

Application Dated: 03/19/2020

CAEN RFID srl
via Vetraia, 11 - 55049 Viareggio (LU) - ITALY
Viareggio, 55049
Italy

Attention: Adriano Bigongiari , CEO

NOT TRANSFERABLE

EQUIPMENT AUTHORIZATION is hereby issued to the named GRANTEE, and is VALID ONLY for the equipment identified hereon for use under the Commission's Rules and Regulations listed below.

FCC IDENTIFIER: UVECAENRFID030
Name of Grantee: CAEN RFID srl
Equipment Class: Part 15 Class B Computing Device Peripheral
Notes: R4321P Quattro - Smart 4-port RAIN RFID reader

Grant Notes	FCC Rule Parts	Frequency Range (MHZ)	Output Watts	Frequency Tolerance	Emission Designator
	15B	-			

This device contains a certified RFID module.