TECHNICAL INFORMATION MANUAL

Revision 1.1 - 25 November 2019

Proton R4320P

Industrial 4-port RAIN RFID Long Range Reader

easy 2 read

® CAENRFID

Scope of Manual

The goal of this manual is to provide the basic information to work with the Proton R4320P Industrial 4-port RAIN RFID Long Range Reader.

Change Document Record

Date	Revision	Changes	Pages
30 Nov 2018	00	Preliminary Release	-
05 Nov 2019	01	Added *Proton R4320P CE Declaration of Conformity*	45
		Modified *Ordering Options* table	8
		Modified *Ethernet Port* paragraph	15
25 Nov 2019	1.1	Added FCC Compliance	44

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 – R4320P – Proton. Test report n. 19345 Rev. 00 – 26 October 2019.

Federal Communications Commission (FCC) Notice (Preliminary)

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.

Index

List of Figures

List of Tables

1   INTRODUCTION

Product Description

The Proton (Model R4320P) is a rugged long range RAIN RFID reader of the easy2read$^{©}$ product line, well suited for industrial environment installations.

The Proton reader has 4 antenna ports capable of a 31.5 dBm maximum power enabling to build RAIN RFID portals for logistic. Its compact form factor makes it easy to install and the IP65 protection permits outdoor or harsh environment installations. Featuring Power Over Ethernet, RS232 and GPIOs via industry standard M12 connectors the Proton is an ideal choice for industrial automation and Industry 4.0 solutions.

The Proton 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 Proton 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: Proton reader (Model R4320P)

Development Kit

A development kit with adapter, antennas, cable and demo tags is available:

Fig. 1.2: Proton R4320P Accessories Kit

The kit includes:

- n. 1 A927Z Temperature Logger Tag
- n. 1 RT0005 Temperature Logger Tag
- n. 1 Set of Labels
- n. 1 WANTENNAX019 (ETSI) or WANTENNAX020 (FCC) Circular polarized antenna
- n. 1 WALIM0000006 (EU) or WALIM0000007 (US) power supply for Proton R4320P Reader.
- n.1 WCAVOAAAX005 antenna cable
- n. 1 ECCANTRFX033 Ethernet cable (5 m)

The Proton R4320P reader and its development kit are a complete set up for a quick implementation of RFID solutions.

Ordering Options

	Code	Description
Reader	WR4320PXAAAA	R4320P Proton - Industrial 4-port RAIN RFID Long Range Reader
Development kit	WR4320PXDKEU	Proton - ETSI Dev Kit including RFID antenna with cable, power supply, Ethernet cable and tag samples (reader not included)
	WR4320PXDKUS	Proton - FCC Dev Kit including RFID antenna with cable, power supply, Ethernet cable and tag samples (reader not included)
Accessories	WALIM0000006	R4320P – Auxiliary Power Supply - EU
	WALIM0000007	R4320P – Auxiliary Power Supply - US
	WANTENNAX019	Circular polarized antenna 5.5dBi – ETSI
	WANTENNAX020	Circular polarized antenna 5.5dBi – FCC
	WCAVOAAAX005	Antenna RF cable with TNC/RP-N connectors
	ECCANTRFX033	Ethernet cable (5 m)

2 GETTING STARTED

Introduction

This quickstart guide will help you to get started with your Proton (Model R4320P) reader.

The reader can be configured in two 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.

- **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* page 39.

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 Proton Reader using the Ethernet port

Ethernet Communication Setup

The Proton 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 Proton 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.

2. Plug an Ethernet cable (not provided, see § *Ordering Options* page 8) into your computer and connect the other end of the Ethernet cable to the reader. By default, the Proton reader is configured with the static IP address 192.168.0.2. If your private network matches the default network configuration of the reader you can connect to it. Otherwise you can either change the network configuration of the reader (see § *NETWORK* page 23) to connect it to your network or 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. 3.12: Proton R4320P Antennas* page 20) of the reader.

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

Easy Controller

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

1. Download the latest version of the *Easy Controller software* from the Proton R4320P 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 *Connection Type* (TCP/IP Connection) and type the Proton 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 on 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 Proton R4320P web page, *Downloads* section or in the Manual and Documents web area.

3 EXTERNAL INTERFACE DESCRIPTION

LEDS
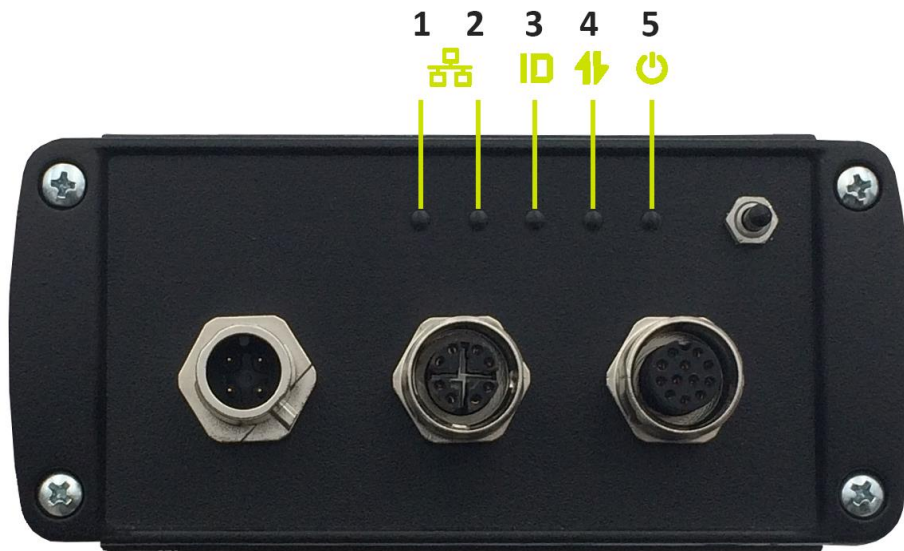
Fig. 3.1: Proton R4320P LEDs

No.	Name	Description
1	ETH Network activity	Yellow LED (see § *Tab. 3.6: Proton R4320P - Ethernet Connector LEDS* page 15)
2	ETH Speed connection	Yellow/Green LED (see § *Tab. 3.6: Proton R4320P - Ethernet Connector LEDS* page 15)
3	Tag-ID	Tag Detection – Blinking Red LED
4	Communication	Communication activity – Blinking Yellow LED
5	Power	Power On – Green LED

Tab. 3.1: Proton R4320P LEDs

Connectors
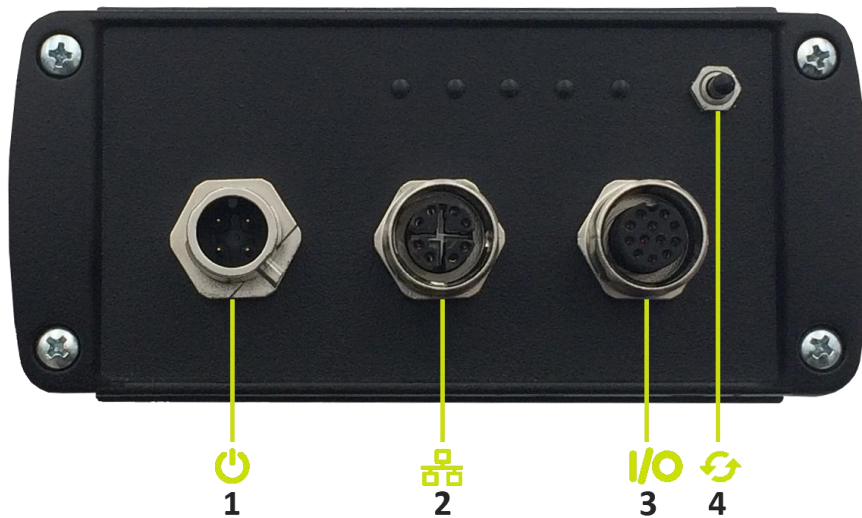
Fig. 3.2: Proton R4320P Interfaces Panel

No.	Name	Description
1	Power	Power Supply Connector
2	Ethernet	Ethernet 10/100/1000BASE-T (M12) / POE standard IEEE 802.3af
3	GPIO	General Purpose Input Output / RS232 (Tx/Rx signal)
4	RESET/UPGRADE	Restart device / Upgrade operative system

Tab. 3.2: Proton R4320P Interfaces Panel

Power Supply

The power supply connector shall be used to provide the Proton R4320P with the DC supply voltage in the range 9V÷36V. A recommended part number for coupling with the connector of the reader is the PHOENIX CONTACT: 1543029 (not provided, to be used on the supply voltage cable).

M12, 4-pin, A-coded, Male
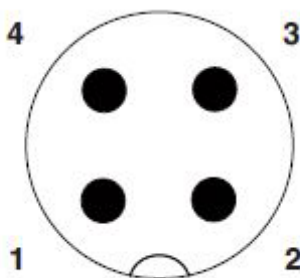
Fig. 3.3: Power Supply connector (reader side)

Pin #	Signal	Function
1	VDC	Positive pole
2	N.C.	Not Connected
3	GND	Ground
4	N.C.	Not Connected

Tab. 3.3: Proton R4320P - Power Supply Connector Poles

Power Supply Connector
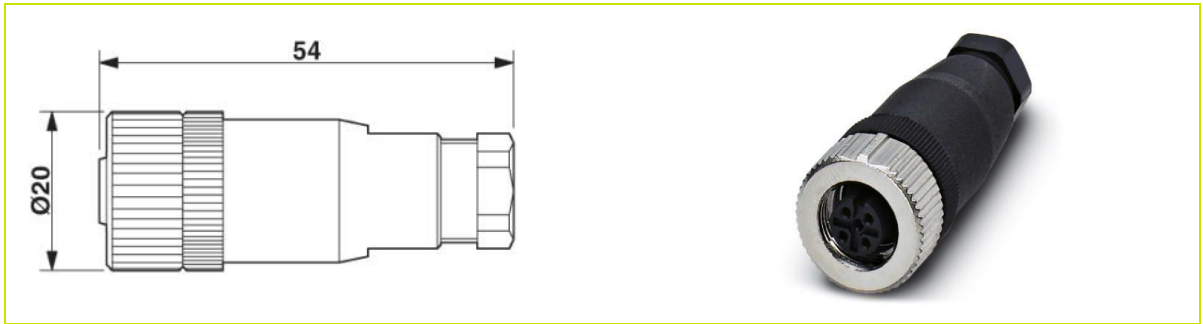
Fig. 3.4: Power Connector PHOENIX 1543029
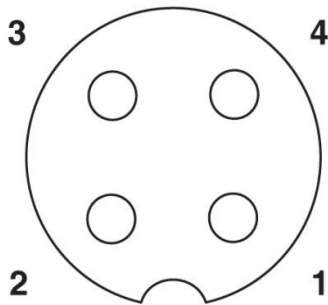
Fig. 3.5: Phoenix 1543029 connector

Pin #	Signal	Function
1	VDC	Positive pole
2	N.C.	Not Connected
3	GND	Ground
4	N.C.	Not Connected

Tab. 3.4: PHOENIX CONTACT: 1543029 Poles

Warning: To guarantee the IP65 degree of the device it is necessary that the male connector on the reader is coupled with the female one on the cable. If the male connector is free, a protective cap must be applied to guarantee the IP65 degree. The following part number is recommended: sealing cap PHOENIX 1560251.

Ethernet Port

The Ethernet interface of the Proton R4320P can be used to connect the reader to a 10/100/1000BaseT network using a M12 to RJ45 cable.

The Proton R4320P reader supports Power Over Ethernet (POE) standard IEEE 802.3 af.

The pinout of the connector in shown in the following figure:

M12, 8-pin, X-coded, Female
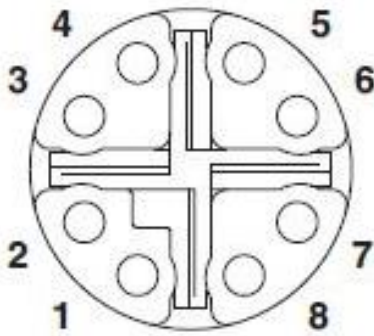
Fig. 3.6: Ethernet Connector (reader side)

Pin #	Signal	Function
1	TX+	Trasmission positive
2	TX-	Trasmission negative
3	RX+	Receive positive
4	RX-	Receive Negative
5	POWER-	POWER-
6	POWER-	POWER-
7	POWER+	POWER+
8	POWER+	POWER+

Tab. 3.5: Proton R4320P - Ethernet Connector Poles

The Ethernet connector has two LEDs with the following functionalities:

LED	Function	Type
Left	Network activity	Blinking Yellow
Right	10Mbps connection	OFF
Right	100Mbps connection	Yellow
Right	1000Mbps connection	Green

Tab. 3.6: Proton R4320P - Ethernet Connector LEDS

An Ethernet Cable (ECCANTRFX033) is available (not provided with the reader): see *Ordering Options* page 8.

Otherwise we suggest to use the following product:

- Network cable (5m) - NBC-MSX/ 5,0-94F/R4AC SCO – 1407473   PHOENIX CONTACT

Ethernet cable shall be CAT6 at least (type S/FTP or S/STP) for proper operation of the device.

⚠ **Warning**: To guarantee the IP65 degree of the device it is necessary that the female connector on the reader is coupled with the male one on the cable. If the female connector is free, a protective cap must be applied to guarantee the IP65 degree. The following part number is recommended: Sealing cap PHOENIX 1680539.

GPIO/Serial

The GPIO/Serial interface of the Proton R4320P is used to connect the reader with a standard RS232 serial communication and to provide the signals of 2 inputs and 2 outputs to the reader. The inputs are usually connected to devices (photocells, sensors ..) that enable the tag inventory. The outputs instead usually turn on accessory devices, following a pre-established event (sirens, flashing lights...).

M12, 12-pin, A-coded, Female
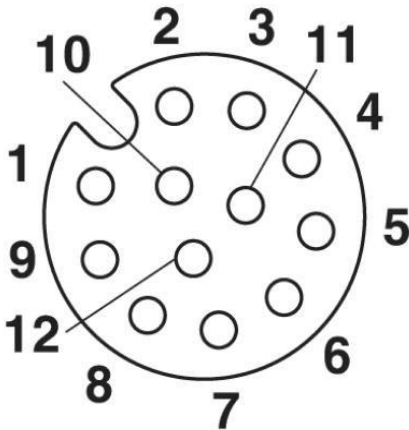
Fig. 3.7: GPIO/Serial Connector (reader side)

Pin #	Signal	Function
1	RS232_RX	RS232 receive signal
2	OUTPUT2.2	SS-Relay 2 Contact 2
3	OUTPUT2.1	SS-Relay 2 Contact 1
4	OUTPUT1.2	SS-Relay 1 Contact 2
5	OUTPUT1.1	SS-Relay 1 Contact 1
6	GND	Ground
7	RTN	Return
8	V_INT	Internal voltage[1]
9	RS232_TX	RS232 transmit signal
10	GPI0	General purpose input 0
11	GPI1	General purpose input 1
12	RTN	Return

Tab. 3.7: Proton R4320P – GPIO/Serial Connector Poles

A GPIO/Serial Cable is not provided. We suggest to use the following products:

- Sensor/Actuator cable (1,5 m)- SAC-12P-MS/ 1,5-35T SH SCO - 1430048 shielded

- Sensor/Actuator cable (1,5 m) - SAC-12P-MS/ 1,5-PVC SCO - 1554775

- Sensor/Actuator cable (3 m) - SAC-12P-MS/ 3,0-35T SH SCO - 1430051 shielded

- Sensor/Actuator cable (3 m) - SAC-12P-MS/ 3,0-PVC SCO - 1554788

> ⚠️ **Warning**: To guarantee the IP65 degree of the device it is necessary that the female connector on the reader is coupled with the male one on the cable. If the female connector is free, a protective cap must be applied to guarantee the IP65 degree. The following part number is recommended: Sealing cap PHOENIX 1680539.

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[1] When powered by a power supply, the internal voltage is equal to the supply voltage. When powered by POE, internal voltage is 5V.

Input signal

To have a valid input signal, apply a voltage between 4V and 48V to the pin indicated by GPI0 or GPI1

Using the signals on the connector you can connect the Internal Voltage pin to the GPI0 pin through a switch that enables the input signal when closed.

A connection between GND ground and RTN signal is also required:
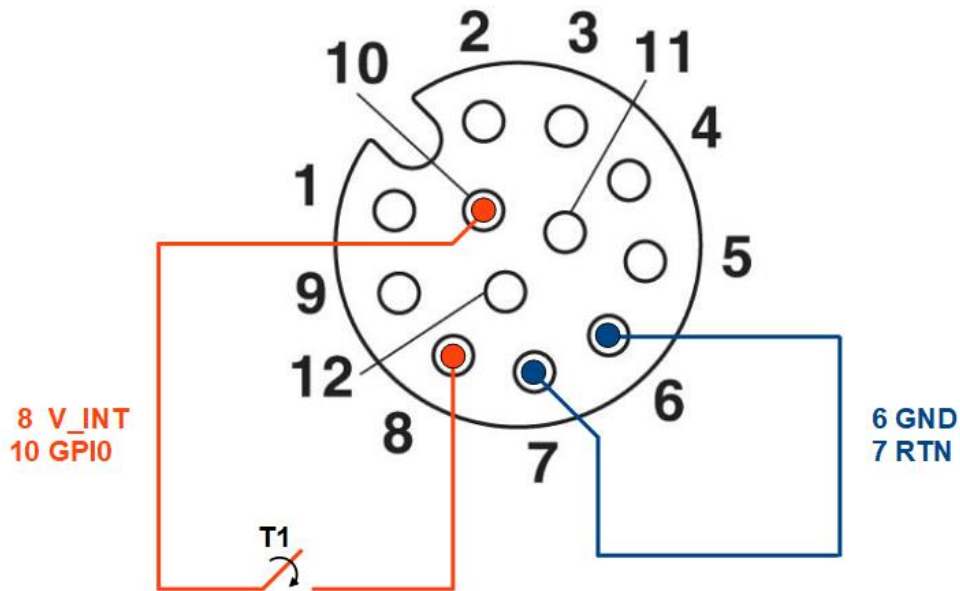
Fig. 3.8: GPIO Input Signal

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
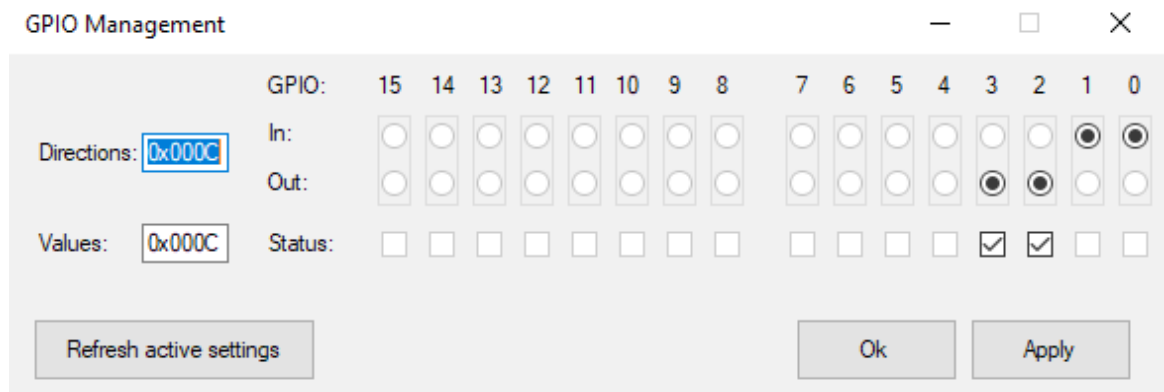
When a valid input is present, a check "V" appears in the Status box at the GPIO 0:
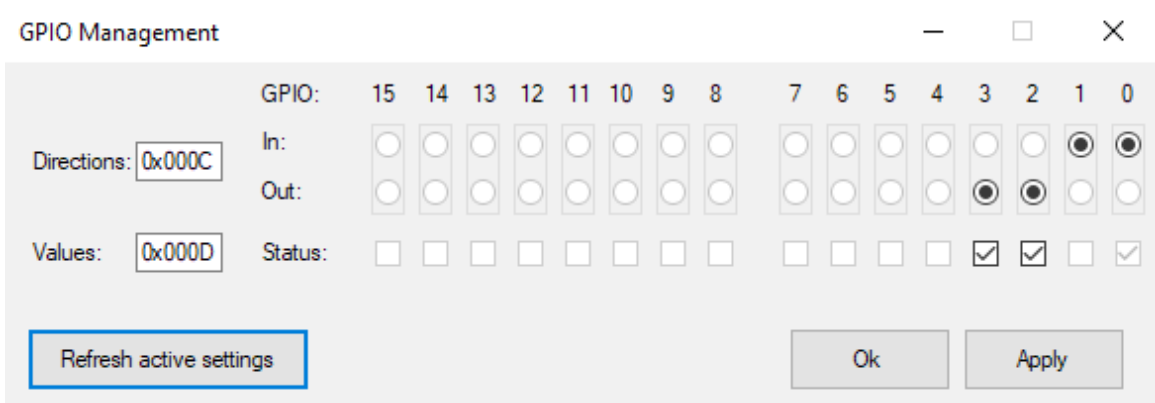
Output signal

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
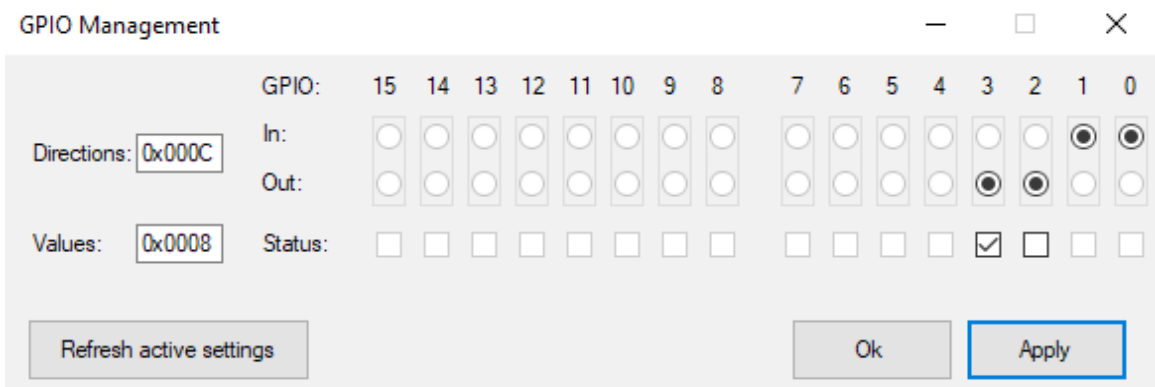
To supply a user U1 to V_INT , make the connection as shown in the drawing below:
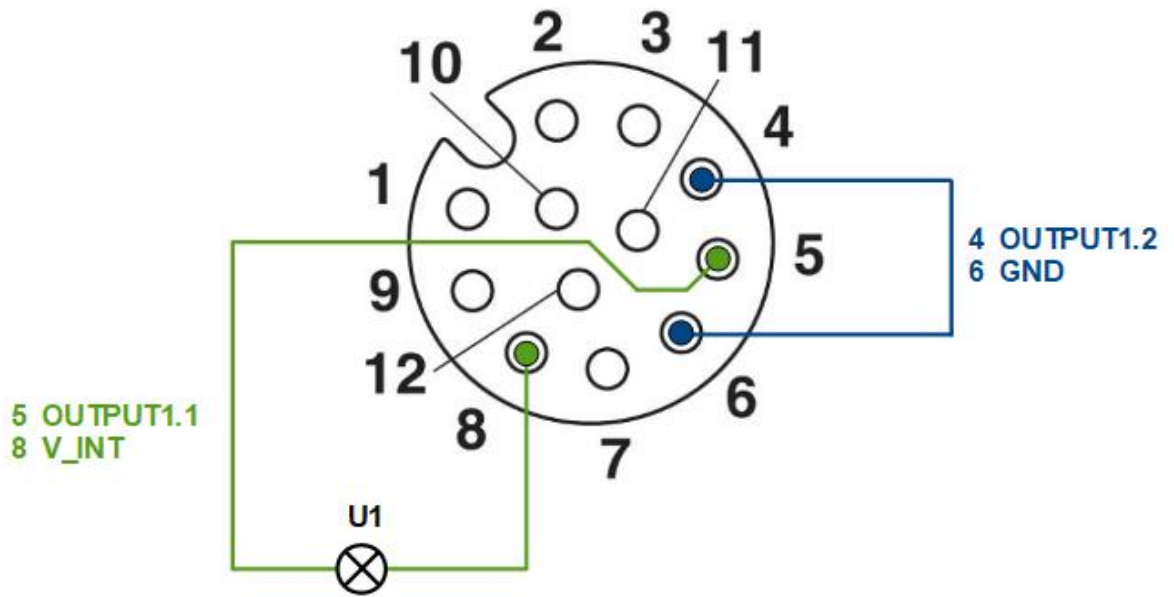
Fig. 3.9: GPIO Output Signal

RS232 Communication

The following figure shows an example of a serial connection between the reader and a PC:
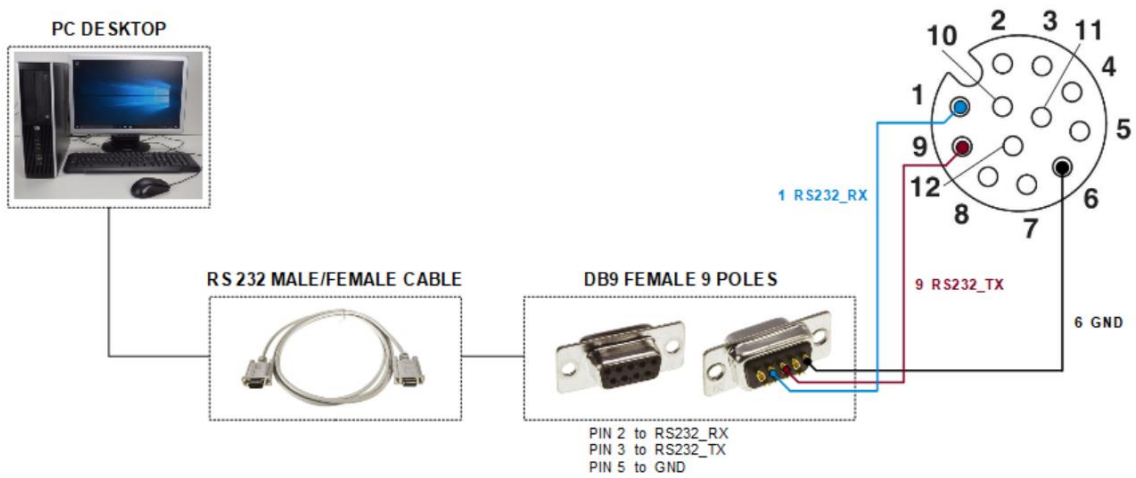
Fig. 3.10: Example of a serial connection between the reader and a PC

If your pc does not have a native RS232 port, it is possible to connect the reader using a USB/RS232 converter, as shown in the following figure. Note that this is the configuration used to execute the upgrade of the reader as indicated in the *FIRMWARE UPGRADE* paragraph page 41.
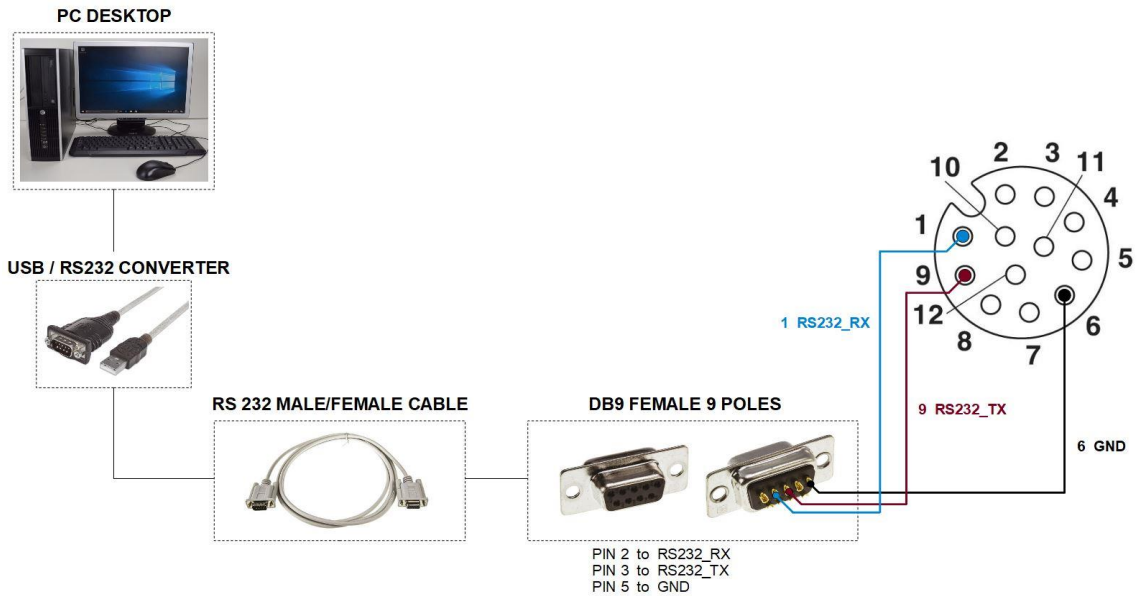
Fig. 3.11: Example of a serial connection between the reader and a PC using a USB/RS232 converter

PIN 2 to RS232_RX
PIN 3 to RS232_TX
PIN 5 to GND
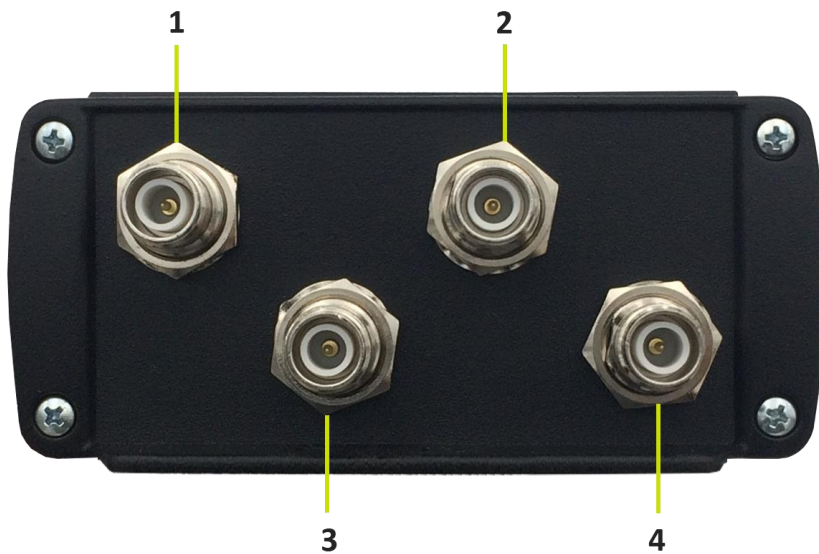
Antennas

Fig. 3.12: Proton R4320P Antennas

No.	Name	Description
1	ANT 0	50Ω RP-TNC jack connector Antenna 0
2	ANT 2	50Ω RP-TNC jack connector Antenna 2
3	ANT 1	50Ω RP-TNC jack connector Antenna 1
4	ANT 3	50Ω RP-TNC jack connector Antenna 3

Tab. 3.8: Proton R4320P Antennas

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

> ⚠️ **Warning**: To guarantee the IP65 degree of the device, the antennas must all be wired. If the connector is free, a protective cap must be applied to guarantee the IP65 degree. The following part number is recommended: TNC Cap for Female Connector - AMPHENOL part number 202101-12.

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 Proton to the power supply.

2. Plug an Ethernet cable (not provided) into your computer and connect the other end of the Ethernet cable to the reader. By default, the Proton R4320P is configured with the static IP address 192.168.0.2. If your private network matches the default network configuration of the reader you can connect to it. Otherwise you can either change the network configuration of the reader (see § *NETWORK* page 23) to connect it to your network or disconnect your PC from your network and connect it to the network of the reader.

By factory default, the Proton 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 24.
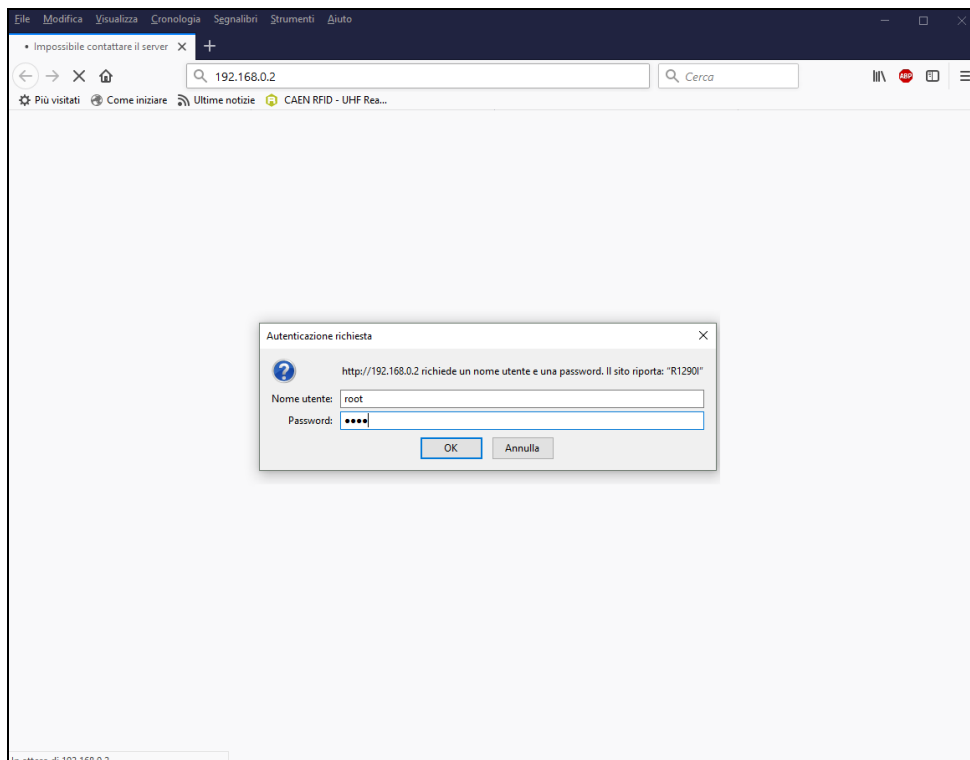
When the connection with the reader is established, the main screen of the web interface is displayed:
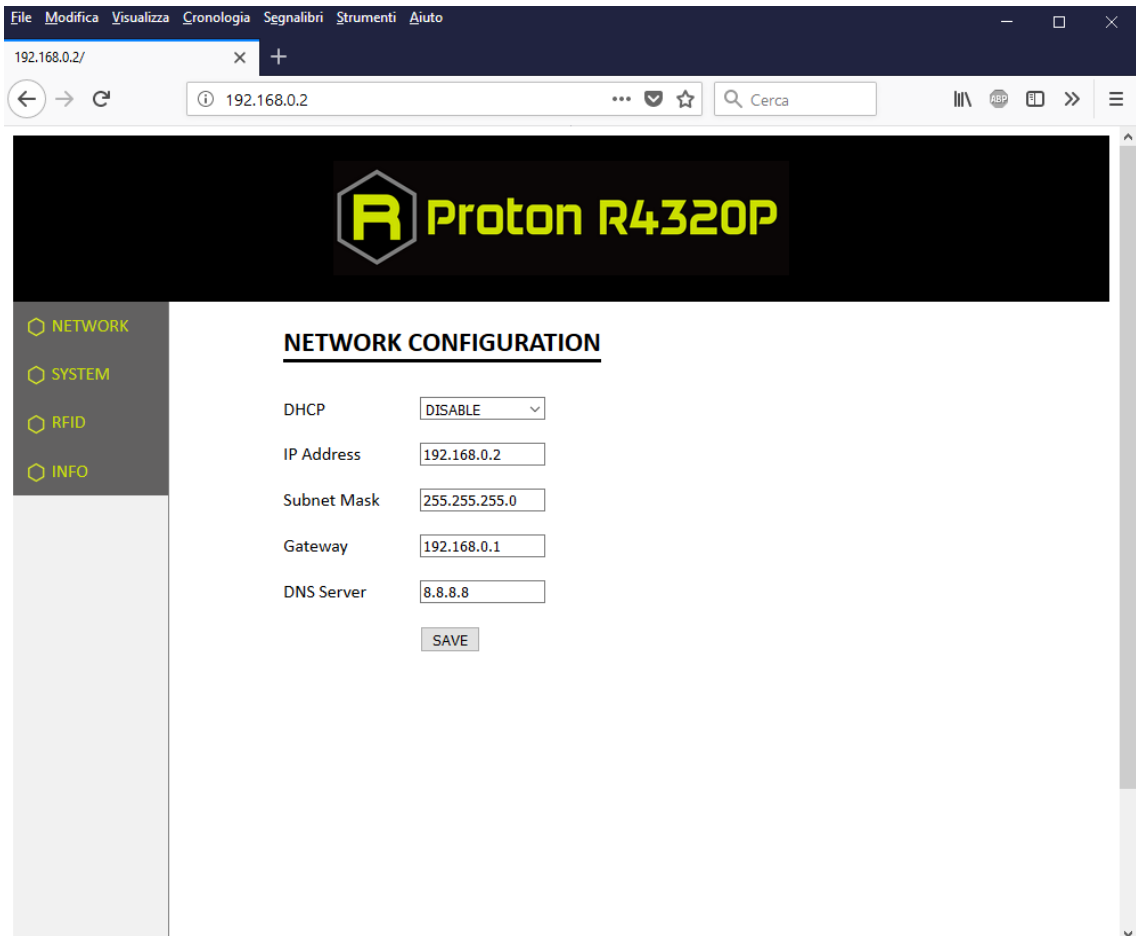
Fig. 4.1: Proton R4320P Web Interface

The Web Interface menu options are the following:

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

NETWORK
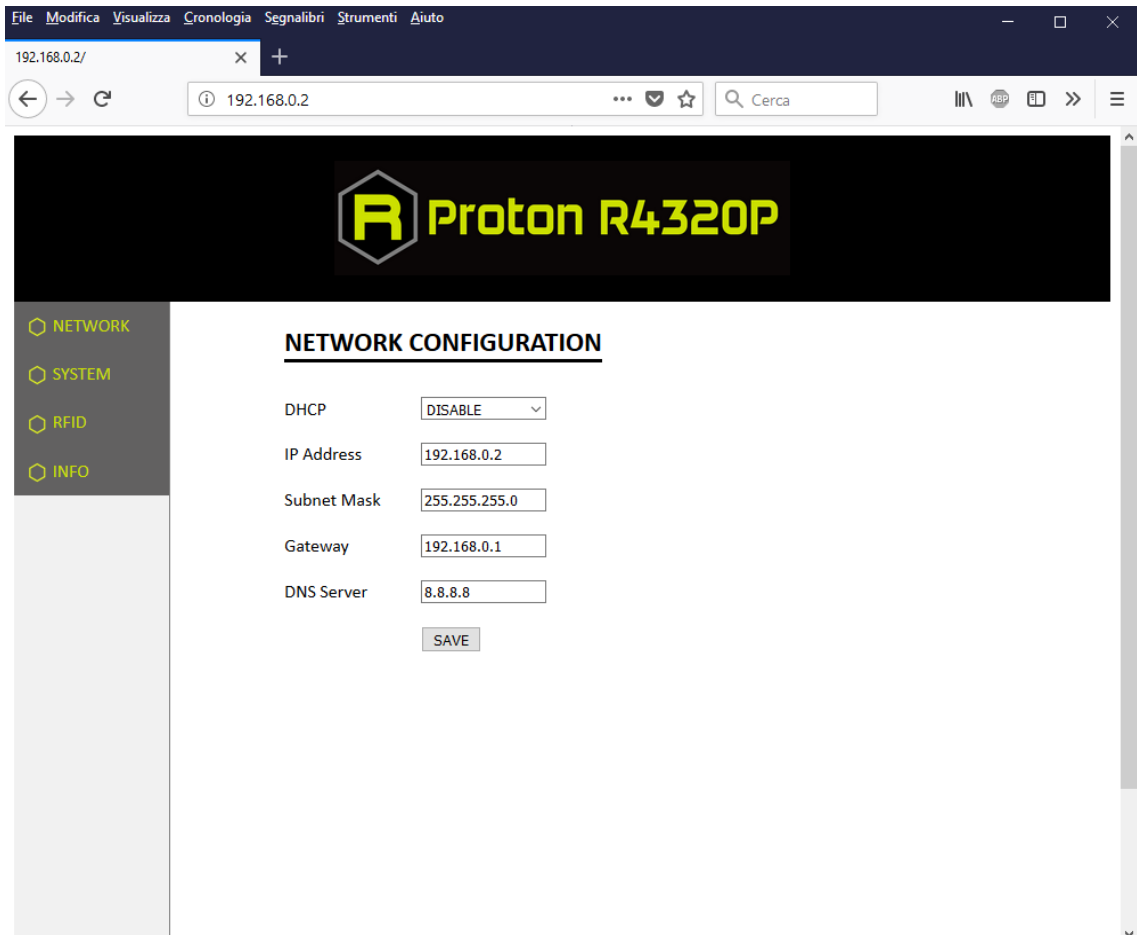
The NETWORK submenu options are the following:

- **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 Proton 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 31.

- **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
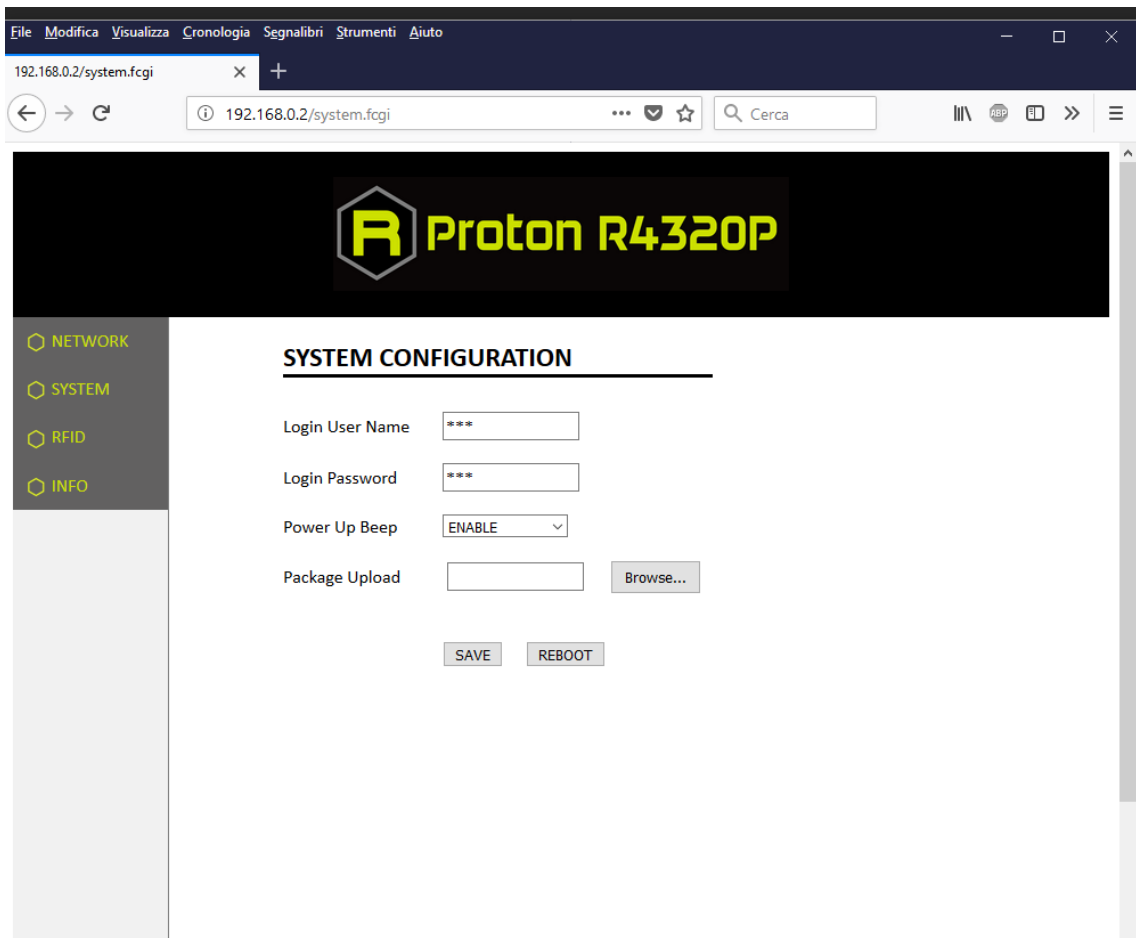
The SYSTEM CONFIGURATION options are the following:

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

  ⚠️ **Warning**: If you forgot your username you must necessarily make a factory reset (see *§ FIRMWARE UPGRADE* page 41)

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

  ⚠️ **Warning**: If you forgot your password you must necessarily make a factory reset (see *§ FIRMWARE UPGRADE* page 41)

- **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 R4320P 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 39.

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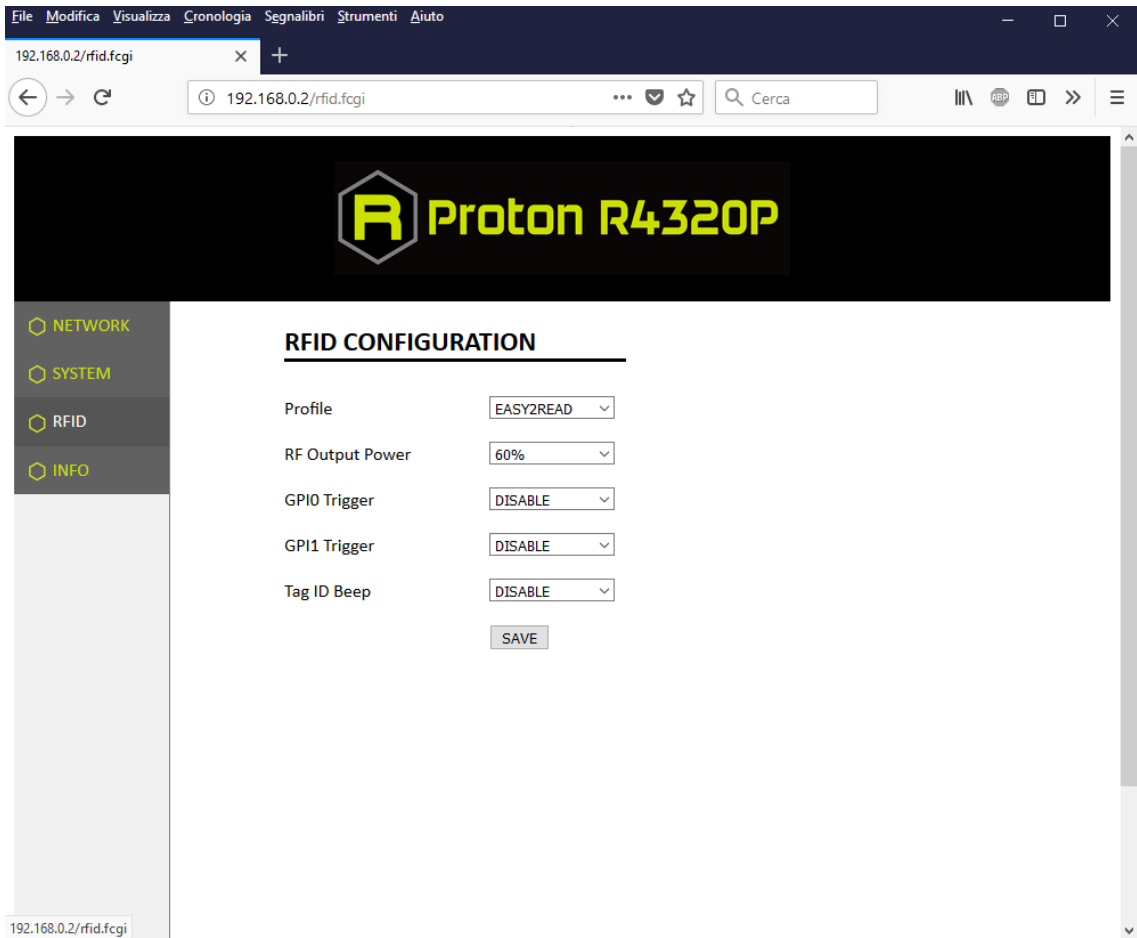
Use this section in order to set the desired profile and then the related configuration options.

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 31.

  For details on the easy2read configuration options, refer to § *Easy2read* page 26.

- **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 39.

  For details on the Custom configuration options, refer to § *Custom* page 28.

Easy2read
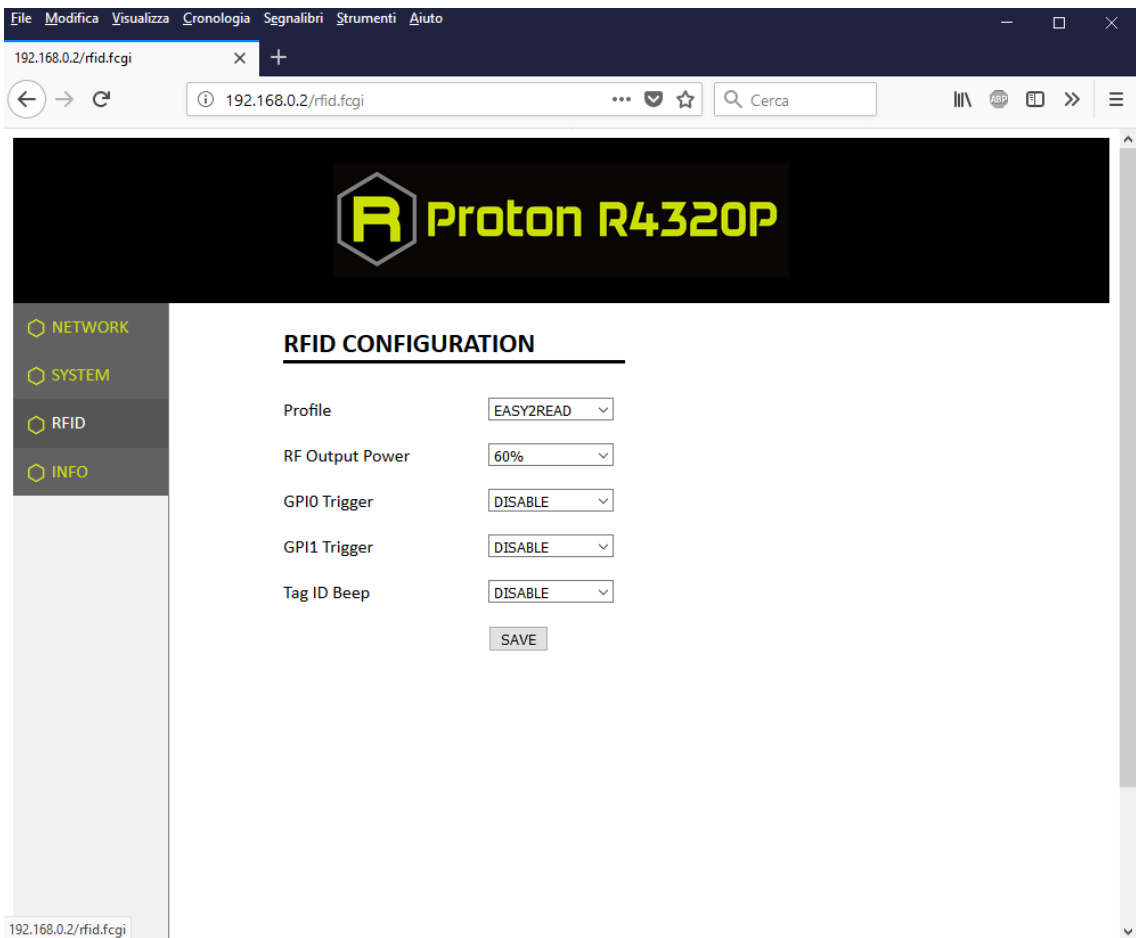
Choosing the easy2read profile, the RFID Configuration submenu options are the following:

- **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 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[2]
100%	1400	1000[2]

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.

- **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 37.
>
>   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 Proton R4320P 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 37.
>
>   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 Proton R4320P web page, *Documents* section or in the Manual and Documents web area.

- **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 a tag is detected.

> ⚠️ **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.

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[2] 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.

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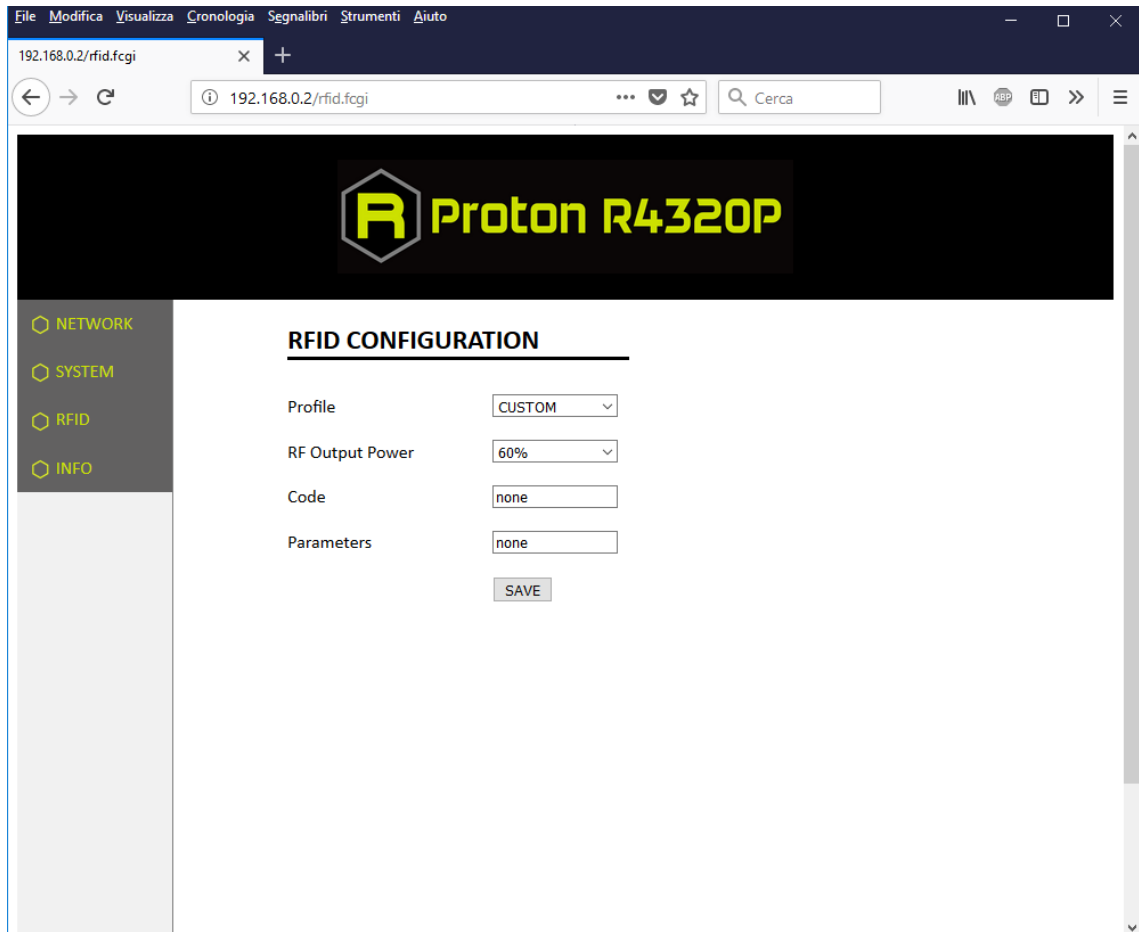
The use of the *Custom* profile allows the user to upload his own scripts to the reader.

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[3]
100%	1400	1000[3]

Tab. 4.2: Conducted power

- **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.

---

[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.

INFO
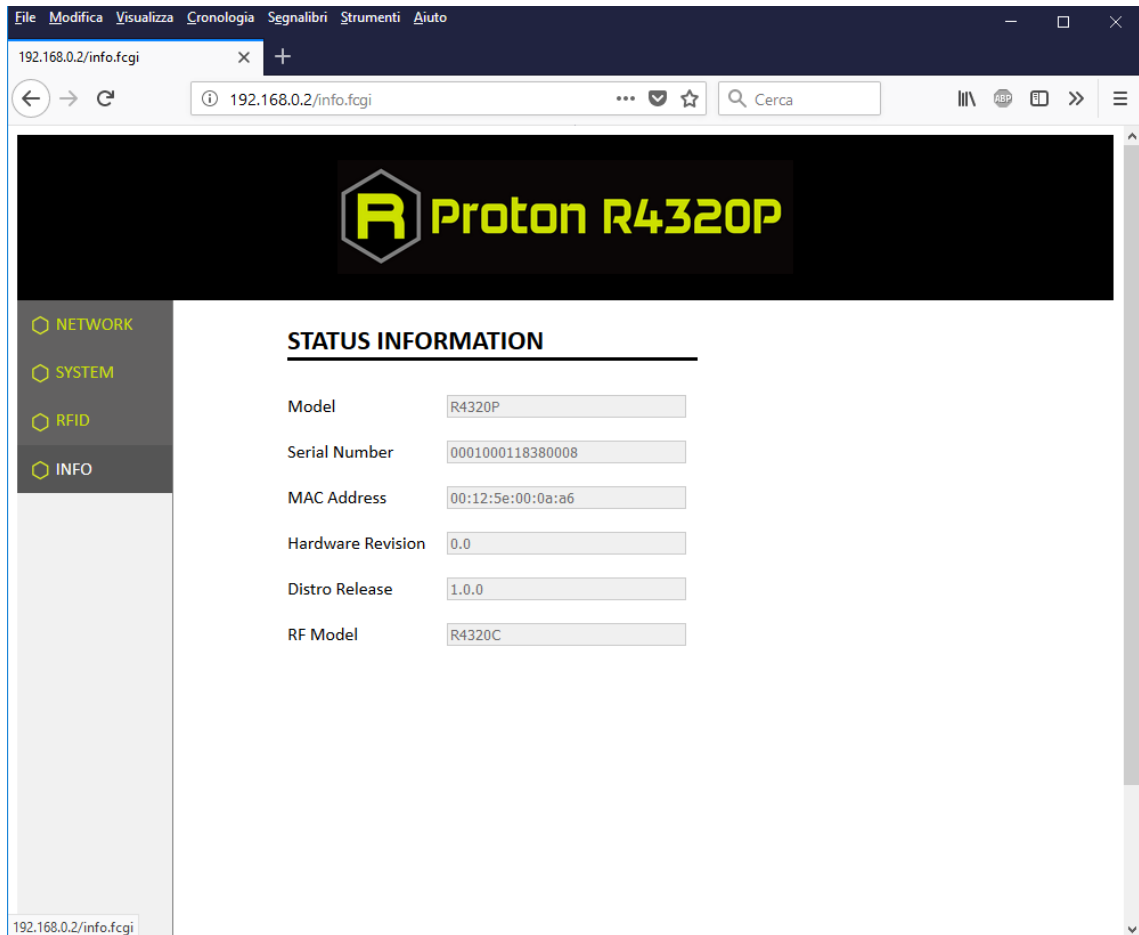
The INFO submenu options are the following:

- **Model**: the model name (e.g. R4320P)
- **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. For details on the available profiles and on the activation method, please refer to § *RFID* paragraph page 25 (configuration via web interface).

With the *easy2read* profile active you will use 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 Kit)](#) library.

To configure the reader when using the easy2read profile please refer to the § *Easy2read* paragraph page 26.

Connecting to the Proton Reader using the Ethernet port

Ethernet Communication Setup

The Proton 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 Proton 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.

2. Plug an Ethernet cable (not provided, see § *Ordering Options* page 8) into your computer and connect the other end of the Ethernet cable to the reader. By default, the Proton reader is configured with the static IP address 192.168.0.2. If your private network matches the default network configuration of the reader you can connect to it. Otherwise you can either change the network configuration of the reader (see § *NETWORK* page 23) to connect it to your network or 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. 3.12: Proton R4320P Antennas* page 20) of the reader.

Now you can use the [CAEN RFID Easy Controller](#) Application to control the reader.

Easy Controller

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

1. Download the latest version of the Easy Controller software from the [Proton R4320P 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 *Connection Type* (TCP/IP Connection) and type the Proton 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 on 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 Proton R4320P web page, *Downloads* section or in the Manual and Documents web area.

# Connecting to the Proton Reader using the serial port

Serial Communication Setup

1. Connect the Proton 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.

2. Connect the Proton to the I/O-Serial cable (not provided). Make the connections as indicated in the paragraph *RS232 Communication* page 19 (example of serial connection between the reader and a PC).

3. Connect the antenna cable to Ant-0 (see § *Fig. 3.12: Proton R4320P Antennas* page 20) of the reader.

4. If you use a native COM PORT of the PC, connect to the COM assigned by the operating system.

   Otherwise if you use a USB-SERIAL converter go to *Control Panel → Hardware and Sound → Devices and Printers.* Look at the COM port number assigned to the USB/serial converter.

Easy Controller

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

1. Download the latest version of the Easy Controller software from the Proton R4320P web page, *Downloads* section and install it.

2. Launch the Easy Controller application:
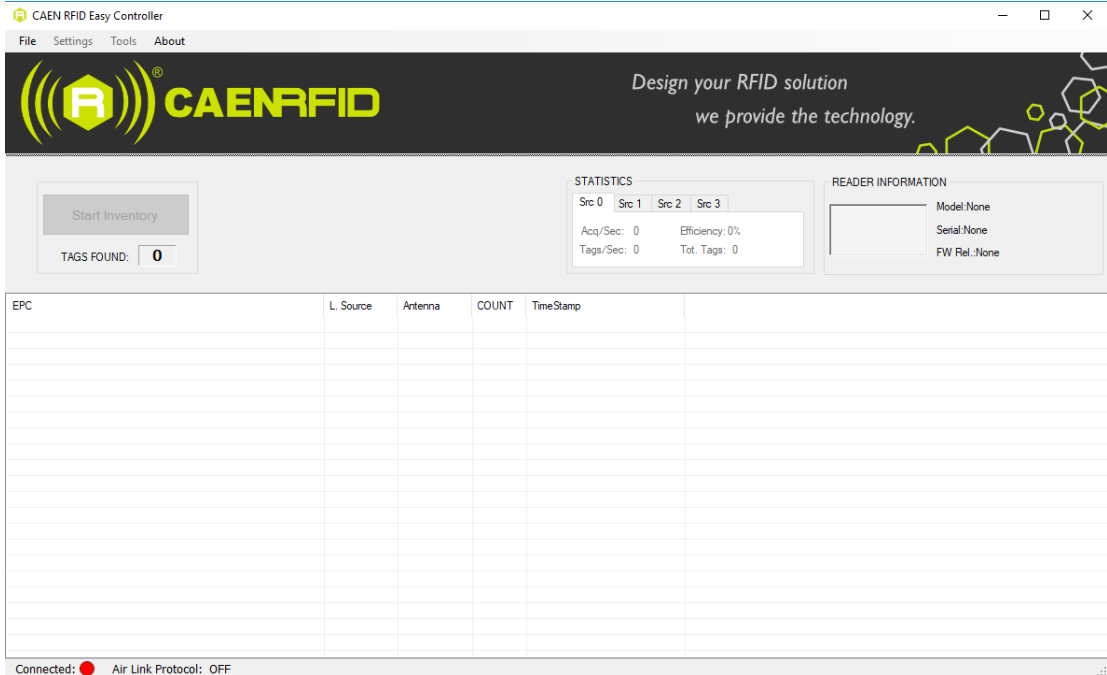
3. On the main screen click on File → Connect. A Connection window will open. Select the Connection Type (RS232) and specify the RS232 port (COM 5 in this example):
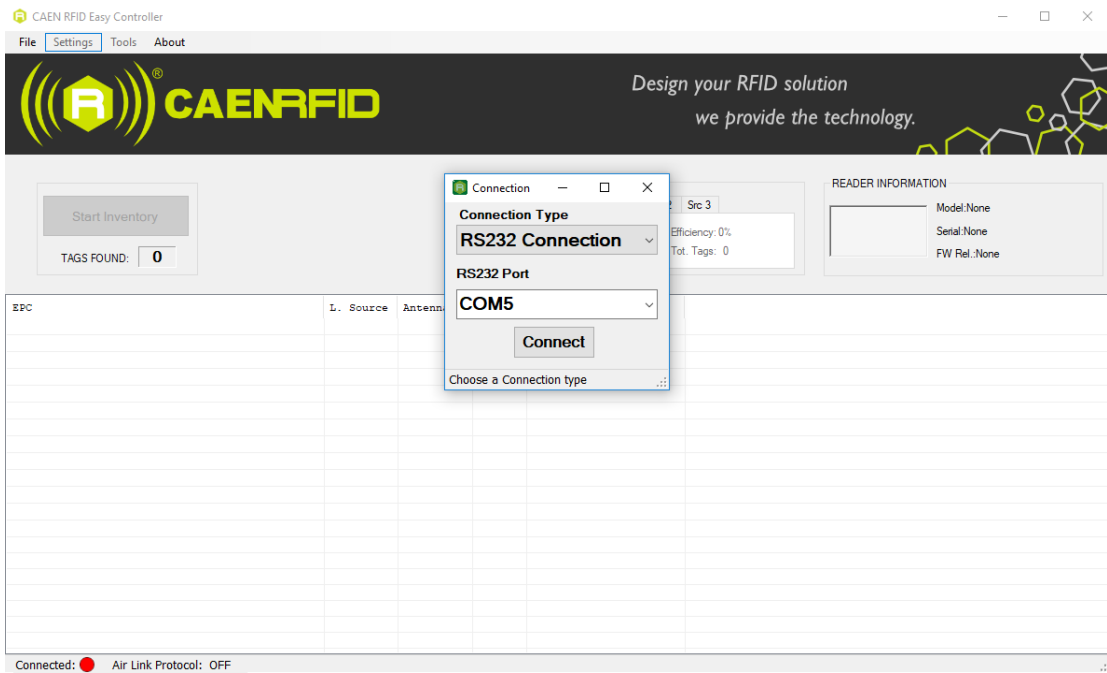
4. To verify if the connection with the reader has been established, check the green dot on the bottom left side of the sidebar and on the READER INFORMATION box you can find information on reader model, serial number and firmware release:

5. Place a tag on the read range of the reader, click on *start inventory* and see the tag information displayed on the main window:
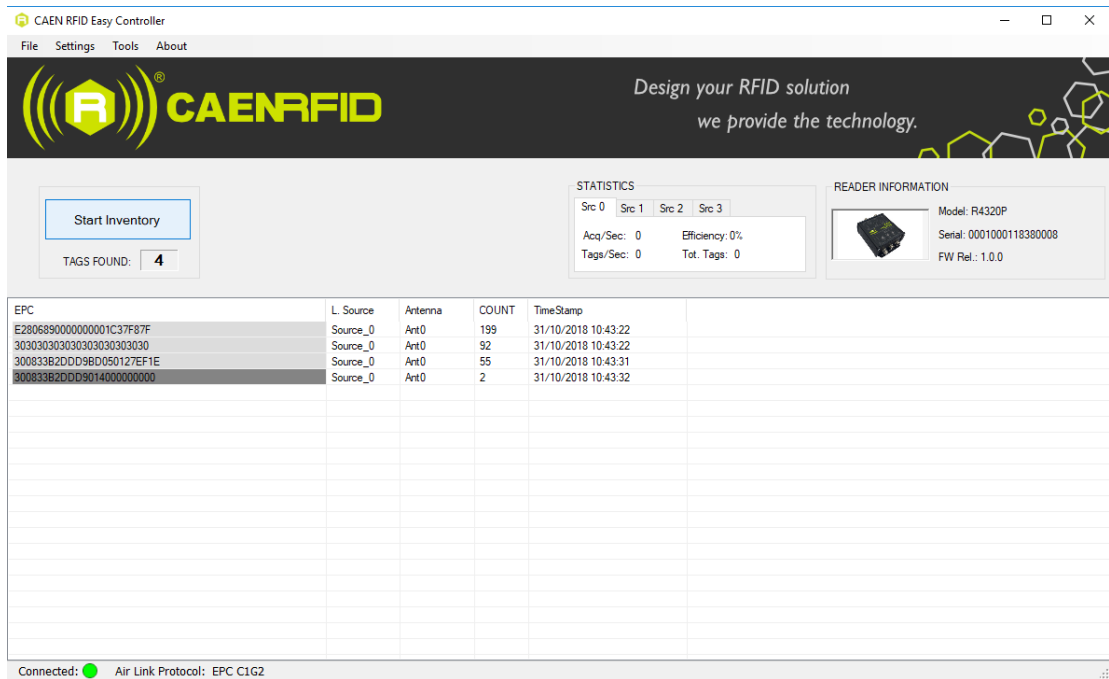
For more information on the CAEN RFID *Easy Controller for Windows* application usage, please refer to the relevant user manual: you can download it from the [Proton R4320P web page](#), *Downloads* section or in the [Manual and Documents](#) web area.

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 17. 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* page 26)

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*:
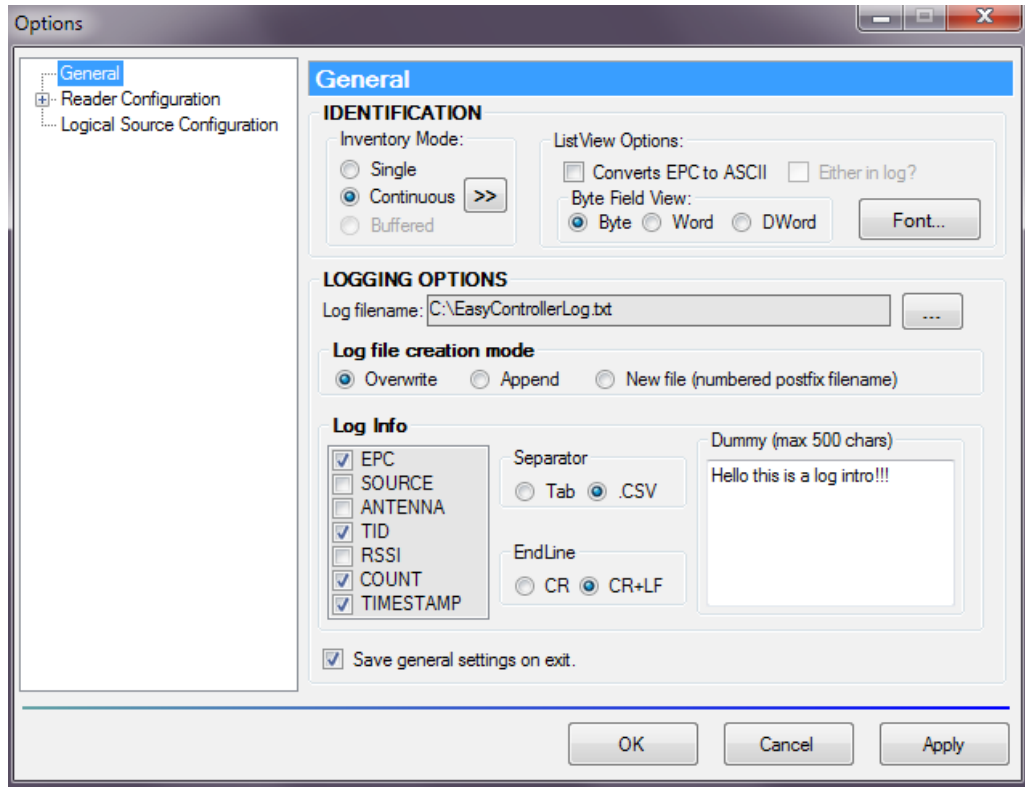
b. By clicking on [>>] button in the Identification box, you can access the Continuous Inventory Options window:
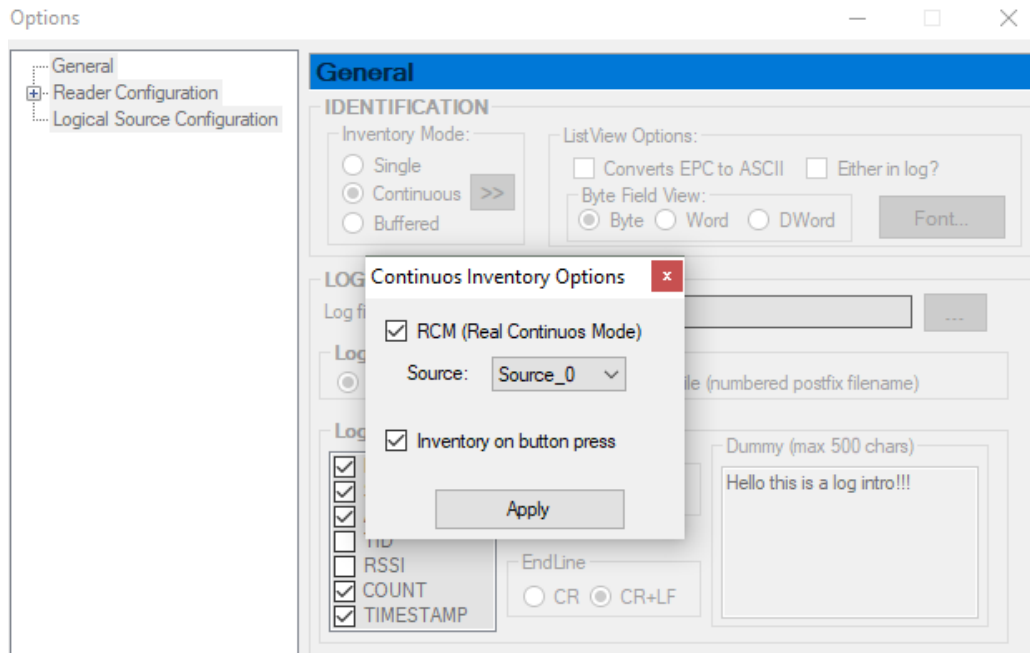
c. Select the *RCM (Real Continuous Mode)* to perform continuous mode (i.e., a continuous inventory via hardware on the source indicated by the RCM Source parameter) and the *Inventory on button press*. Click on *Apply*. Now click on *Start Inventory* on the main window:
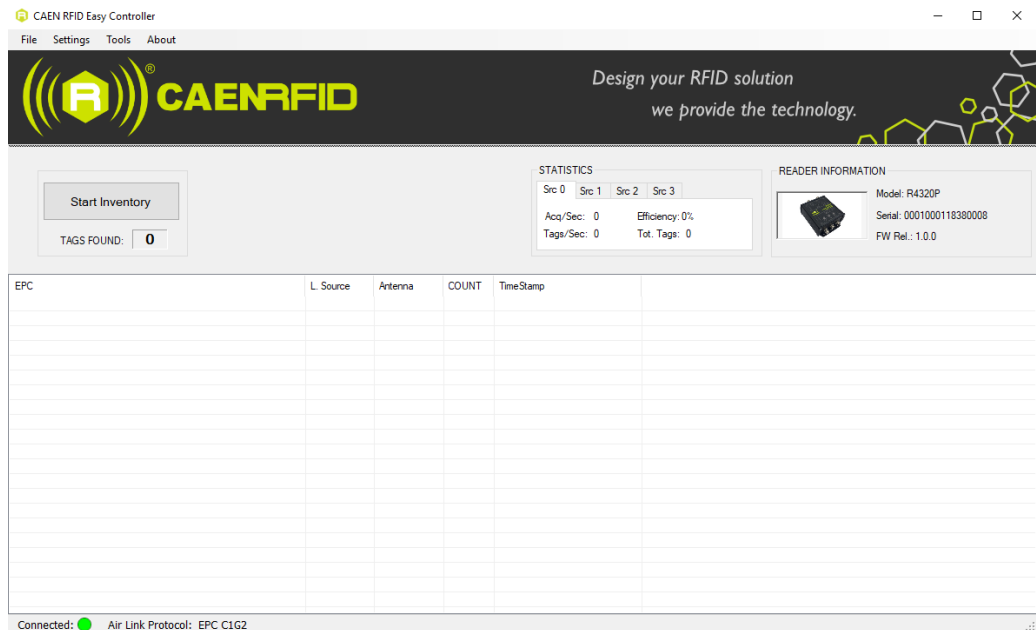
d. Now the tag inventory is performed at the change of state of the GPIO0/1.

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 Proton R4320P web page, *Downloads* section or in the Manuals and Documents web area.

6   CUSTOM PROFILE

Introduction

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

For details on the available profiles and on the activation method, please refer to § *RFID* paragraph page 25 (configuration via web interface).

> ⚠ **Warning:** The *Custom* profile can be activate **only** via web interface.

To configure the reader when using the Custom profile please refer to the § *Custom* paragraph page 28 (configuration via web interface).

Java Virtual Machine

The user can write his own scripts in Java code and use the "Package Upload " function of the *SYSTEM* section page 24 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* section page 32.

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.

7 RESET THE READER

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

1. Turn off the reader (disconnect the power supply), **wait about 10 seconds** 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 21), select the *SYSTEM* option and then click on the "Reboot" button. Wait for the reboot to be completed.

    or

3. Press the RESET/UPGRADE button for three seconds (see § *Connectors* page 13) until the green power LED turn off. When the LED is off, it means that the reader has been reset and the button can be released. Wait for the reboot to be completed.

8 FIRMWARE UPGRADE

The Proton R4320P firmware upgrade can be performed only via serial port.

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

1. Connect the Proton 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.

2. Connect the Proton to the I/O-Serial cable (not provided). Make the connections as indicated in the paragraph *RS232 Communication* page 19 (example of serial connection between the reader and a PC).

3. Connect to the PC a USB/Serial converter with a transfer rate up to 1Mbps.

4. In your PC, go to *Control Panel → Hardware and Sound → Devices and Printers*. Look at the COM port number assigned to the USB/Serial converter when detected.

5. Hold down the reset button (see § *Tab. 3.2: Proton R4320P Interfaces Panel* page 13) for about 20 seconds to enter the "upgrade mode".

6. Download the *Proton Upgrade Tool* and the *firmware image file* at the Proton R4320P web page of the CAEN RFID Web Site, *Downloads* section.

7. Open the FW upgrade program and click on "*Next*":

8. Select the COM port number assigned to the USB/Serial converter, upload the FW image file by clicking on the "Browse" button and click on the "Upgrade Firmware" button:
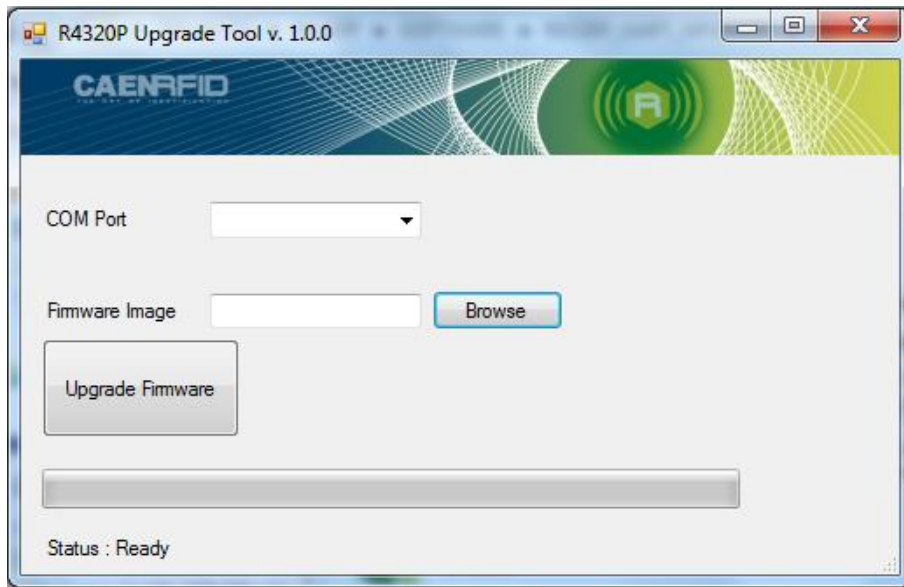
9. Wait for the upgrade process to be completed. In the window you will see the message "Status: upgrading".

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

10. Turn off the reader (disconnect the power supply), **wait about 10 seconds** and then turn on the reader again (connect the power supply). Now the reader is ready to work with the new firmware upgraded.

⚠ **Warning:** The firmware upgrade is a factory reset: all the scripts uploaded into the reader are deleted.

9 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	− RS232 Serial Communication (M12 connector) ▪ Baudrate up to 115.200kbps ▪ Databits: 8 ▪ Stopbit: 1 ▪ Parity: none ▪ Flow control: none − Ethernet 10/100/1000BASE-T (M12 connector) − PoE standard IEEE 802.3af
I/O Interface	− M12 connector − 2 digital inputs optically isolated − 2 solid state photorelay outputs optically isolated (500mA max)
Antenna Connectors	4 TNC Reverse Polarity
Power Supply	− 9÷36V DC 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	IP65[4]
Dimensions	− (W)131 x(L)106 x (H)50 mm^3 − (5.15 x 4.17 x 1.96 inch^3)
Weight	530 g

Tab. 9.1: Proton R4320P 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.

---

[4] Warning: To guarantee the IP65 degree of the device, the antennas must all be wired. If the connector is free, a protective cap must be applied to guarantee the IP65 degree.

10 REGULATORY COMPLIANCE

CE Compliance

Reference standard:

ETSI EN 301 489-1 V2.2.0:2017

ETSI EN 301 489-3 V2.1.1:2017

EN 55032:2015

EN 55024:2010 + /A1:2015

ETSI EN 302 208 V3.1.1:2017

EN 62368-1:2014 +/AC:2015 +/A11:2009 +/A1:2010 +/A2:2013 +/A12:2011

Reference document:

Test report n. 19345 [RD2].

See § *Proton R4320P CE Declaration of Conformity* page 45 for the Proton R4320P CE Compliance Certificate.

RoHS EU Directive

The Proton R4320P 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).

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.

Proton R4320P
CE DECLARATION OF CONFORMITY

We

CAEN RFID Srl
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Mail: info@caenrfid.com
Web site: www.caenrfid.com

herewith declare under our own responsibility that the product:

Code: **WR4320PXAAAA**

Description: **R4320P Proton - Compact 4 - port UHF RFID Reader**

corresponds in the submitted version to the following standards:

ETSI EN 301 489-1 V2.2.0:2017

ETSI EN 301 489-3 V2.1.1:2017

EN 55032:2015

EN 55024:2010 + /A1:2015

ETSI EN 302 208 V3.1.1:2017

EN 62368-1:2014 +/AC:2015 +/A11:2009 +/A1:2010 +/A2:2013 +/A12:2011

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: 05/11/2019

Adriano Bigongiari (Chief Executive Officer)

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