

# UHF RFID System



## BLUEBOX CX-AVI INDUSTRIAL UHF

**BLUEBOX**  
RFid System

## Preface

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Issue 1.29a  
– 06. January 2023 –

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Printed in Germany

## Safety Instructions / Warning - Read before start-up!

- The device may only be used for the intended purpose designed by the manufacturer. The operation manual should be conveniently kept available at all times for each user.
- Unauthorized changes and the use of spare parts and additional devices that have not been sold or recommended by the manufacturer may cause fire, electric shocks or injuries. Such unauthorized measures shall exclude any liability by the manufacturer.
- The liability-prescriptions of the manufacturer in the issue valid at the time of purchase are valid for the device. The manufacturer shall not be held legally responsible for inaccuracies, errors, or omissions in the manual or automatically set parameters for a device or for an incorrect application of a device.
- Repairs may be executed by the manufacturer only.
- Only qualified personnel should carry out installation, operation, and maintenance procedures.
- Use of the device and its installation must be in accordance with national legal requirements and local electrical codes.
- When working on devices the valid safety regulations must be observed.



IP67



## This manual applies to the following devices:

### Description:

### Order Number :

Mid Range read / write UHF RFID device with integrated antenna. Serial and Ethernet 10-100M communication interface. Grey white (RAL 9002) case color. EU1 (865 MHz ... 868MHz) version.

5426U

Mid Range read / write UHF RFID device with integrated antenna. Serial and Ethernet 10-100M communication interface. Grey white (RAL 9002) case color. FCC (902 MHz ... 928MHz) version.

5426U-  
FCC

**Description:**
**Order  
Number  
:**

Mid Range read / write UHF RFID device with integrated antenna. Serial and Ethernet 10-100M communication interface. Grey white (RAL 9002) case color. Brazil (902 MHz ... 928MHz) version.

5426U-  
BRA

Mid Range read / write UHF RFID device with integrated antenna and RTC (Real Time Clock). Serial and Ethernet 10-100M communication interface. Grey white (RAL 9002) case color. EU1 (865 MHz ... 868MHz) version.

5426U-  
RTC

**NO PRODUCT  
IMAGE**

Mid Range read / write UHF RFID device with integrated antenna and RTC (Real Time Clock). Serial and Ethernet 10-100M communication interface. Grey white (RAL 9002) case color. FCC (902 MHz ... 928MHz) version.

5426U-  
RTC-FCC

Mid Range read / write UHF RFID device with integrated antenna and RTC (Real Time Clock). Serial and Ethernet 10-100M communication interface. Grey white (RAL 9002) case color. Brazil (902 MHz ... 928MHz) version.

5426U-  
RTC-BRA

Mid Range read / write UHF RFID device with integrated antenna. Serial and data bus communication interface. Grey white (RAL 9002) case color. EU1 (865 MHz ... 868MHz) version.

5427U

Mid Range read / write UHF RFID device with integrated antenna. Serial and data bus communication interface. Grey white (RAL 9002) case color. FCC (902 MHz ... 928MHz) version.

5427U-  
FCC

Mid Range read / write UHF RFID device with integrated antenna. Serial and data bus communication interface. Grey white (RAL 9002) case color. Brazil (902 MHz ... 928MHz) version.

5427U-  
BRA

Mid Range read / write UHF RFID device with integrated antenna. CAN bus and Ethernet 10-100M communication interface. Grey white (RAL 9002) case color. EU1 (865 MHz ... 868MHz) version.

5428U

Mid Range read / write UHF RFID device with integrated antenna. CAN bus and Ethernet 10-100M communication interface. Grey white (RAL 9002) case color. FCC (902 MHz ... 928MHz) version.

5428U-  
FCC

**Description:**
**Order  
Number  
:**

Mid Range read / write UHF RFID device with integrated antenna. CAN bus and Ethernet 10-100M communication interface. Grey white (RAL 9002) case color. Brazil (902 MHz ... 928MHz) version.

5428U-  
BRA

Mid Range read / write UHF RFID device with integrated antenna and RTC (Real Time Clock). CAN bus and Ethernet 10-100M communication interface. Grey white (RAL 9002) case color. EU1 (865 MHz ... 868MHz) version.

5428U-  
RTC

Mid Range read / write UHF RFID device with integrated antenna and RTC (Real Time Clock). CAN bus and Ethernet 10-100M communication interface. Grey white (RAL 9002) case color. FCC (902 MHz ... 928MHz) version.

5428U-  
RTC-FCC

Mid Range read / write UHF RFID device with integrated antenna and RTC (Real Time Clock). CAN bus and Ethernet 10-100M communication interface. Grey white (RAL 9002) case color. Brazil (902 MHz ... 928MHz) version.

5428U-  
RTC-BRA

Mid Range read / write UHF RFID device with integrated antenna. Serial and Ethernet 10-100M communication interface. Grey (RAL 7045) case color. EU1 (865 MHz ... 868MHz) version.

5426U-G

Mid Range read / write UHF RFID device with integrated antenna. Serial and Ethernet 10-100M communication interface. Grey (RAL 7045) case color. FCC (902 MHz ... 928MHz) version.

5426U-  
G-FCC

Mid Range read / write UHF RFID device with integrated antenna. Serial and Ethernet 10-100M communication interface. Grey (RAL 7045) case color. Brazil (902 MHz ... 928MHz) version.

5426U-  
G-BRA

Mid Range read / write UHF RFID device with integrated antenna and RTC (Real Time Clock). Serial and Ethernet 10-100M communication interface. Grey (RAL 7045) case color. EU1 (865 MHz ... 868MHz) version.

5426U-  
RTC-G

Mid Range read / write UHF RFID device with integrated antenna and RTC (Real Time Clock). Serial and Ethernet 10-100M communication interface. Grey (RAL 7045) case color. FCC (902 MHz ... 928MHz) version.

5426U-  
RTC-G-  
FCC

**NO PRODUCT  
IMAGE**

**Description:**
**Order  
Number  
:**

Mid Range read / write UHF RFID device with integrated antenna and RTC (Real Time Clock). Serial and Ethernet 10-100M communication interface. Grey (RAL 7045) case color. Brazil (902 MHz ... 928MHz) version.

5426U-  
RTC-G-  
BRA

Mid range read / write UHF RFID device with integrated antenna. Serial and data bus communication interface. Grey (RAL 7045) case color. EU1 (865 MHz ... 868MHz) version.

5427U-G

Mid range read / write UHF RFID device with integrated antenna. Serial and data bus communication interface. Grey (RAL 7045) case color. FCC (902 MHz ... 928MHz) version.

5427U-  
G-FCC

Mid range read / write UHF RFID device with integrated antenna. Serial and data bus communication interface. Grey (RAL 7045) case color. Brazil (902 MHz ... 928MHz) version.

5427U-  
G-BRA

Mid Range read / write UHF RFID device with integrated antenna. CAN bus and Ethernet 10-100M communication interface. Grey (RAL 7045) case color. FCC (902 MHz ... 928MHz) version.

5428-G-  
FCC

Mid Range read / write UHF RFID device with integrated antenna. CAN bus and Ethernet 10-100M communication interface. Grey (RAL 7045) case color. Brazil (902 MHz ... 928MHz) version.

5428-G-  
BRA

Mid Range read / write UHF RFID device with integrated antenna. CAN bus and Ethernet 10-100M communication interface. Grey (RAL 7045) case color. EU1 (865 MHz ... 868MHz) version.

5428-G

Mid Range read / write UHF RFID device with integrated antenna. CAN bus and Ethernet 10-100M communication interface. Grey (RAL 7045) case color. FCC (902 MHz ... 928MHz) version.

5428-G-  
FCC

Mid Range read / write UHF RFID device with integrated antenna. CAN bus and Ethernet 10-100M communication interface. Grey (RAL 7045) case color. Brazil (902 MHz ... 928MHz) version.

5428-G-  
BRA

Mid Range read / write UHF RFID device with integrated antenna and RTC (Real Time Clock). CAN bus and Ethernet 10-100M communication

5428-  
RTC-G

**Description:**
**Order  
Number  
:**

interface. Grey (RAL 7045) case color. EU1 (865 MHz ... 868MHz) version.

Mid Range read / write UHF RFID device with integrated antenna and RTC (Real Time Clock). CAN bus and Ethernet 10-100M communication interface. Grey (RAL 7045) case color. FCC (902 MHz ... 928MHz) version.

5428-  
RTC-G-  
FCC

Mid Range read / write UHF RFID device with integrated antenna and RTC (Real Time Clock). CAN bus and Ethernet 10-100M communication interface. Grey (RAL 7045) case color. Brazil (902 MHz ... 928MHz) version.

5428-  
RTC-G-  
BRA

Long range read / write UHF RFID device with integrated antenna. Serial and Ethernet 10-100M communication interface. Grey white (RAL 9002) case color. EU1 (865 MHz ... 868MHz) version.

5526U



Long range read / write UHF RFID device with integrated antenna. Serial and Ethernet 10-100M communication interface. Grey white (RAL 9002) case color. FCC (902 MHz ... 928MHz) version.

5526U-  
FCC

Long range read / write UHF RFID device with integrated antenna. Serial and Ethernet 10-100M communication interface. Grey white (RAL 9002) case color. Brazil (902 MHz ... 928MHz) version.

5526U-  
BRA

Long range read / write UHF RFID device with integrated antenna and RTC (Real Time Clock). Serial and Ethernet 10-100M communication interface. Grey white (RAL 9002) case color. EU1 (865 MHz ... 868MHz) version.

5526U-  
RTC

Long range read / write UHF RFID device with integrated antenna and RTC (Real Time Clock). Serial and Ethernet 10-100M communication interface. Grey white (RAL 9002) case color. FCC (902 MHz ... 928MHz) version.

5526U-  
RTC-FCC

Long range read / write UHF RFID device with integrated antenna and RTC (Real Time Clock). Serial and Ethernet 10-100M communication interface. Grey white (RAL 9002) case color. Brazil (902 MHz ... 928MHz) version.

5526U-  
RTC-BRA

Long range read / write UHF RFID device with integrated antenna. Serial and data bus

5527U

**Description:**
**Order  
Number  
:**

communication interface. Grey white (RAL 9002) case color. EU1 (865 MHz ... 868MHz) version.

Long range read / write UHF RFID device with integrated antenna. Serial and data bus communication interface. Grey white (RAL 9002) case color. FCC (902 MHz ... 928MHz) version.

5527U-  
FCC

Long range read / write UHF RFID device with integrated antenna. Serial and data bus communication interface. Grey white (RAL 9002) case color. Brazil (902 MHz ... 928MHz) version.

5527U-  
BRA

Long range read / write UHF RFID device with integrated antenna. CAN bus and Ethernet 10-100M communication interface. Grey white (RAL 9002) case color. EU1 (865 MHz ... 868MHz) version.

5528U

Long range read / write UHF RFID device with integrated antenna. CAN bus and Ethernet 10-100M communication interface. Grey white (RAL 9002) case color. FCC (902 MHz ... 928MHz) version.

5528U-  
FCC

Long range read / write UHF RFID device with integrated antenna. CAN bus and Ethernet 10-100M communication interface. Grey white (RAL 9002) case color. Brazil (902 MHz ... 928MHz) version.

5528U-  
BRA

Long range read / write UHF RFID device with integrated antenna and RTC (Real Time Clock). CAN bus and Ethernet 10-100M communication interface. Grey white (RAL 9002) case color. EU1 (865 MHz ... 868MHz) version.

5528U-  
RTC

Long range read / write UHF RFID device with integrated antenna and RTC (Real Time Clock). CAN bus and Ethernet 10-100M communication interface. Grey white (RAL 9002) case color. FCC (902 MHz ... 928MHz) version.

5528U-  
RTC-FCC

Long range read / write UHF RFID device with integrated antenna and RTC (Real Time Clock). CAN bus and Ethernet 10-100M communication interface. Grey white (RAL 9002) case color. Brazil (902 MHz ... 928MHz) version.

5528U-  
RTC-BRA

Long range read / write UHF RFID device with integrated antenna. Serial and Ethernet 10-100M

5526U-G



**Description:**
**Order  
Number  
:**

communication interface. Grey (RAL 7045) case color. EU1 (865 MHz ... 868MHz) version.

Long range read / write UHF RFID device with integrated antenna. Serial and Ethernet 10-100M communication interface. Grey (RAL 7045) case color. FCC (902 MHz ... 928MHz) version.

Long range read / write UHF RFID device with integrated antenna. Serial and Ethernet 10-100M communication interface. Grey (RAL 7045) case color. Brazil (902 MHz ... 928MHz) version.

Long range read / write UHF RFID device with integrated antenna and RTC (Real Time Clock). Serial and Ethernet 10-100M communication interface. Grey (RAL 7045) case color. EU1 (865 MHz ... 868MHz) version.

Long range read / write UHF RFID device with integrated antenna and RTC (Real Time Clock). Serial and Ethernet 10-100M communication interface. Grey (RAL 7045) case color. FCC (902 MHz ... 928MHz) version.

Long range read / write UHF RFID device with integrated antenna and RTC (Real Time Clock). Serial and Ethernet 10-100M communication interface. Grey (RAL 7045) case color. Brazil (902 MHz ... 928MHz) version.

Long range read / write UHF RFID device with integrated antenna. Serial and data bus communication interface. Grey (RAL 7045) case color. EU1 (865 MHz ... 868MHz) version.

Long range read / write UHF RFID device with integrated antenna. Serial and data bus communication interface. Grey (RAL 7045) case color. FCC (902 MHz ... 928MHz) version.

Long range read / write UHF RFID device with integrated antenna. Serial and data bus communication interface. Grey (RAL 7045) case color. Brazil (902 MHz ... 928MHz) version.

Long range read / write UHF RFID device with integrated antenna. CAN bus and Ethernet 10-100M communication interface. Grey (RAL 7045) case color. EU1 (865 MHz ... 868MHz) version.

5526U-  
G-FCC

5526U-  
G-BRA

5526U-  
RTC-G

5526U-  
RTC-G-  
FCC

5526U-  
RTC-G-  
BRA

5527U-G

5527U-  
G-FCC

5527U-  
G-BRA

5528U-G

**NO PRODUCT  
IMAGE**

**Description:**
**Order  
Number  
:**

Long range read / write UHF RFID device with integrated antenna. CAN bus and Ethernet 10-100M communication interface. Grey (RAL 7045) case color. FCC (902 MHz ... 928MHz) version.

5528U-  
G-FCC

Long range read / write UHF RFID device with integrated antenna. CAN bus and Ethernet 10-100M communication interface. Grey (RAL 7045) case color. Brazil (902 MHz ... 928MHz) version.

5528U-  
G-BRA

Long range read / write UHF RFID device with integrated antenna and RTC (Real Time Clock). CAN bus and Ethernet 10-100M communication interface. Grey (RAL 7045) case color. EU1 (865 MHz ... 868MHz) version.

5528U-  
RTC-G

Long range read / write UHF RFID device with integrated antenna and RTC (Real Time Clock). CAN bus and Ethernet 10-100M communication interface. Grey (RAL 7045) case color. FCC (902 MHz ... 928MHz) version.

5528U-  
RTC-G-  
FCC

Long range read / write UHF RFID device with integrated antenna and RTC (Real Time Clock). CAN bus and Ethernet 10-100M communication interface. Grey (RAL 7045) case color. Brazil (902 MHz ... 928MHz) version.

5528U-  
RTC-G-  
BRA

**This manual is valid as of firmware version:**

Order Number	Hardware Version	Firmware Version
5426U	2	2.70E
5426U-FCC	2	2.70E
5426U-BRA	2	2.70E
5426U-RTC	2	2.70U
5426U-RTC-FCC	2	2.70U
5426U-RTC-BRA	2	2.70U
5427U	2	2.70E
5427U-FCC	2	2.70E
5427U-BRA	2	2.70E

Order Number	Hardware Version	Firmware Version
5428U	2	2.70E
5428U-FCC	2	2.70E
5428U-BRA	2	2.70E
5428U-RTC	2	2.70U
5428U-RTC-FCC	2	2.70U
5428U-RTC-BRA	2	2.70U
5426U-G	2	2.70E
5426U-G-FCC	2	2.70E
5426U-G-BRA	2	2.70E
5426U-RTC-G	2	2.70U
5426U-RTC-G-FCC	2	2.70U
5426U-RTC-G-BRA	2	2.70U
5427U-G	2	2.70E
5427U-G-BRA	2	2.70E
5427U-G-FC	2	2.70E
5428U-G	2	2.70E
5428U-G-FCC	2	2.70E
5428U-G-BRA	2	2.70E
5428U-RTC-G	2	2.70U
5428U-RTC-G-FCC	2	2.70U
5428U-RTC-G-BRA	2	2.70U
5526U	2	2.70E
5526U-FCC	2	2.70E
5526U-BRA	2	2.70E
5526U-RTC	2	2.70U
5526U-RTC-FCC	2	2.70U
5526U-RTC-BRA	2	2.70U
5527U	2	2.70E

Order Number	Hardware Version	Firmware Version
5527U-FCC	2	2.70E
5527U-BRA	2	2.70E
5528U	2	2.70E
5528U-FCC	2	2.70E
5528U-BRA	2	2.70E
5528U-RTC	2	2.70U
5528U-RTC-FCC	2	2.70U
5528U-RTC-BRA	2	2.70U
5526U-G	2	2.70E
5526U-G-FCC	2	2.70E
5526U-G-BRA	2	2.70E
5526U-RTC-G	2	2.70U
5526U-RTC-G-FCC	2	2.70U
5526U-RTC-G-BRA	2	2.70U
5527U-G	2	2.70E
5527U-G-FCC	2	2.70E
5527U-G-BRA	2	2.70E
5528U-G	2	2.70E
5528U-G-FCC	2	2.70E
5528U-G-BRA	2	2.70E
5528U-RTC-G	2	2.70U
5528U-RTC-G-FCC	2	2.70U
5528U-RTC-G-BRA	2	2.70U

**Hereinafter the product identification system:**

<b>5</b>	<b>x</b>	<b>2</b>	<b>y</b>	<b>U</b>	<b>-c</b>	<b>-opt1</b>	<b>-rrr</b>
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**Range**

**Interface**

**Color**

**Option #1**

**RF Region**

<b>Range</b>	4		Mid Range
	5		Long Range
<b>Interface:</b>	5	=	Serial + Ethernet 10-100M on Amphenol RJF
	6	=	Serial + Ethernet 10-100M on M12 cod. D
	7	=	Serial + data bus interface
	8	=	CAN bus + Ethernet 10-100M on M12 cod. D
<b>Color:</b>	Blank	=	Grey white (RAL 9002) case color
	-G	=	Grey (RAL 7045) case color
<b>Option #1:</b>	Blank	=	Without options
	-RTC	=	With Real Time Clock (RTC)
<b>RF Region:</b>	Blank	=	EU1 (865 MHz ... 868 MHz)
	-FCC	=	FCC (902 MHz ... 928 MHz)
	-BRA	=	Brazil (902 MHz ... 928 MHz)

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## 1 Introduction

The **BLUEBOX CX-AVI INDUSTRIAL UHF** hereinafter named **BLUEBOX** is an UHF read / write RFID device operating in the 840 MHz to 960 MHz frequency band and suitable for industrial application, it communicates with a 'host' system (typically a PC or a PLC) through a RS232 / RS485 serial line and a 10-100M Ethernet connection (items 5x26U-c-opt1-rrr). Versions with data bus (items 5x27U-c-rrr) or CAN bus (items 5x28U-c-opt1-rrr) are also available. The **BLUEBOX** acts as a joint through a set of commands between the host system and one or more RFID transponders (or tags) present near the antenna. The same 'master/slave' protocol is used for the communication between the host system ('master') and the **BLUEBOX** ('slave'), independently of the kind of connection (point to point, multipoint or Ethernet). Through these communication channels, it is also possible to configure the functional parameters and to upgrade the firmware, the 'BLUEBOX Show' software of the SDK is foreseen to explicate these operations. Furthermore the **BLUEBOX** is able to handle two digital outputs (relays) and two opto-isolated digital inputs. **BLUEBOX** is designed and developed to allow installation and maintenance experts to perform all power supply, communication and interfacing I/O connections without the need to open the device.



## 2 Technical Specifications

This section provides details on the technical specifications of the **BLUEBOX**.

### 2.1 Electrical Features

This section provides details on the electrical features of the **BLUEBOX**.

#### 2.1.1 Electrical Features 5426U-c-opt1-rrr

Power Supply	10 ... 36 Vdc or PoE IEEE802.3af-2003 Mode A
Power Rating	15W @RFout=27dBm
Operating Frequency	865 MHz ... 868 MHz
RF Transmit Power	Max 0.5W (27dBm) conducted
RF Receive Sensitivity	Max -85dBm
Antenna	Integrated
Reading Distance	8 mt <sup>1</sup>
Supported Transponders	ISO 18000-63 <sup>2</sup> (EPC Class-1 Gen-2 V2)
Communication Interface	Serial RS232 / RS485 Ethernet 10-100M
Service Interface	USB Virtual Com (on the board and not available on the external)
Digital Inputs	2 opto-isolated input, 10Vdc ... 36Vdc, Max current 20mA @24Vdc, debounce 16ms
Digital Outputs	2 outputs (relay), NO/NC contacts, Max 1A @30Vdc
Status Display	1 LED, Buzzer
Connections	3 M12 Connectors (5-poles A-coded male for power supply and serial interface, 12-poles A-coded female for I/O, 4-poles D-coded female for Ethernet interface)

<sup>1</sup> Reading distance depends on transponder type, antenna and environmental conditions.

<sup>2</sup> ISO 18000-6C became ISO 18000-63 in 2012 due to ISO naming rules that do not allow letters in standards names.

### 2.1.2 Electrical Features 5427U-c-rrr

Power Supply	10 ... 36 Vdc
Power Rating	15W @RFout=27dBm
Operating Frequency	865 MHz ... 868 MHz
RF Transmit Power	Max 0.5W (27dBm) conducted
RF Receive Sensitivity	Max -85dBm
Antenna	Integrated
Reading Distance	8 mt <sup>3</sup>
Supported Transponders	ISO 18000-63 <sup>4</sup> (EPC Class-1 Gen-2 V2)
Communication Interface	Serial RS232 / RS485 Data bus (Wiegand Data-0, Data-1)
Service Interface	USB Virtual Com (on the board and not available on the external)
Digital Inputs	2 opto-isolated input, 10Vdc ... 36Vdc, Max current 20mA @24Vdc, debounce 16ms
Digital Outputs	2 outputs (relay), NO/NC contacts, Max 1A @30Vdc
Status Display	1 LED, Buzzer
Connections	3 M12 Connectors (5-poles A-coded male for power supply and serial interface, 12-poles A-coded female for I/O, 5-poles A-coded female for data bus)

### 2.1.3 Electrical Features 5428U-c-opt1-rrr

Power Supply	10 ... 36 Vdc
Power Rating	15W @RFout=27dBm
Operating Frequency	865 MHz ... 868 MHz
RF Transmit Power	Max 0.5W (27dBm) conducted
RF Receive Sensitivity	Max -85dBm

<sup>3</sup> Reading distance depends on transponder type, antenna and environmental conditions.

<sup>4</sup> ISO 18000-6C became ISO 18000-63 in 2012 due to ISO naming rules that do not allow letters in standards names.

Antenna	Integrated
Reading Distance	8 mt <sup>5</sup>
Supported Transponders	ISO 18000-63 <sup>6</sup> (EPC Class-1 Gen-2 V2)
Communication Interface	CAN bus Ethernet 10-100M
Service Interface	USB Virtual Com (on the board and not available on the external)
Digital Inputs	2 opto-isolated input, 10Vdc ... 36Vdc, Max current 20mA @24Vdc, debounce 16ms
Digital Outputs	2 outputs (relay), NO/NC contacts, Max 1A @30Vdc
Status Display	1 LED, Buzzer
Connections	3 M12 Connectors (5-poles A-coded male for power supply and CAN bus, 12-poles A-coded female for I/O, 4-poles D-coded female for Ethernet)

#### 2.1.4 Electrical Features 5526U-c-opt1-rrr

Power Supply	10 ... 36 Vdc or PoE IEEE802.3af-2003 Mode A
Power Rating	15W @RFout=27dBm
Operating Frequency	865 MHz ... 868 MHz
RF Transmit Power	Max 0.5W (27dBm) conducted
RF Receive Sensitivity	Max -85dBm
Antenna	Integrated
Reading Distance	10 mt <sup>7</sup>
Supported Transponders	ISO 18000-63 <sup>8</sup> (EPC Class-1 Gen-2 V2)
Communication Interface	Serial RS232 / RS485 Ethernet 10-100M

<sup>5</sup> Reading distance depends on transponder type, antenna and environmental conditions.

<sup>6</sup> ISO 18000-6C became ISO 18000-63 in 2012 due to ISO naming rules that do not allow letters in standards names.

<sup>7</sup> Reading distance depends on transponder type, antenna and environmental conditions.

<sup>8</sup> ISO 18000-6C became ISO 18000-63 in 2012 due to ISO naming rules that do not allow letters in standards names.

Service Interface	USB Virtual Com (on the board and not available on the external)
Digital Inputs	2 opto-isolated input, 10Vdc ... 36Vdc, Max current 20mA @24Vdc, debounce 16ms
Digital Outputs	2 outputs (relay), NO/NC contacts, Max 1A @30Vdc
Status Display	1 LED, Buzzer
Connections	3 M12 Connectors (5-poles A-coded male for power supply and serial interface, 12-poles A-coded female for I/O, 4-poles D-coded female for Ethernet interface)

### 2.1.5 Electrical Features 5527U-c-rrr

Power Supply	10 ... 36 Vdc or
Power Rating	15W @RFout=27dBm
Operating Frequency	865 MHz ... 868 MHz
RF Transmit Power	Max 0.5W (27dBm) conducted
RF Receive Sensitivity	Max -85dBm
Antenna	Integrated
Reading Distance	10 m <sup>9</sup>
Supported Transponders	ISO 18000-63 <sup>10</sup> (EPC Class-1 Gen-2 V2)
Communication Interface	Serial RS232 / RS485 Data bus (Wiegand Data-0, Data-1)
Service Interface	USB Virtual Com (on the board and not available on the external)
Digital Inputs	2 opto-isolated input, 10Vdc ... 36Vdc, Max current 20mA @24Vdc, debounce 16ms
Digital Outputs	2 outputs (relay), NO/NC contacts, Max 1A @30Vdc
Status Display	1 LED, Buzzer

<sup>9</sup> Reading distance depends on transponder type, antenna and environmental conditions.

<sup>10</sup> ISO 18000-6C became ISO 18000-63 in 2012 due to ISO naming rules that do not allow letters in standards names.

## Connections

3 M12 Connectors (5-poles A-coded male for power supply and serial interface, 12-poles A-coded female for I/O, 5-poles A-coded female for data bus)

### 2.1.6 Electrical Features 5528U-c-opt1-rrr

Power Supply	10 ... 36 Vdc
Power Rating	15W @RFout=27dBm
Operating Frequency	865 MHz ... 868 MHz
RF Transmit Power	Max 0.5W (27dBm) conducted
RF Receive Sensitivity	Max -85dBm
Antenna	Integrated
Reading Distance	10 mt <sup>11</sup>
Supported Transponders	ISO 18000-63 <sup>12</sup> (EPC Class-1 Gen-2 V2)
Communication Interface	CAN bus Ethernet 10-100M
Service Interface	USB Virtual Com (on the board and not available on the external)
Digital Inputs	2 opto-isolated input, 10Vdc ... 36Vdc, Max current 20mA @24Vdc, debounce 16ms
Digital Outputs	2 outputs (relay), NO/NC contacts, Max 1A @30Vdc
Status Display	1 LED, Buzzer
Connections	3 M12 Connectors (5-poles A-coded male for power supply and CAN bus, 12-poles A-coded female for I/O, 4-poles D-coded female for Ethernet)

## 2.2 Mechanical Features

This section provides details on the mechanical features of the **BLUEBOX**.

<sup>11</sup> Reading distance depends on transponder type, antenna and environmental conditions.

<sup>12</sup> ISO 18000-6C became ISO 18000-63 in 2012 due to ISO naming rules that do not allow letters in standards names.

### 2.2.1 Mechanical Features 542yU-opt1-rrr

Dimensions	190 x 190 x 80 mm
Material	Die-cast aluminum, Plastic
Color	Grey white
Protection Class	IP65

### 2.2.2 Mechanical Features 542yU-G-opt1-rrr

Dimensions	190 x 190 x 80 mm
Material	Die-cast aluminum, Plastic
Color	Grey
Protection Class	IP65

### 2.2.3 Mechanical Features 552yU-opt1-rrr

Dimensions	308 x 308 x 85 mm
Material	Die-cast aluminum, Plastic
Color	Grey white
Protection Class	IP65

### 2.2.4 Mechanical Features 552yU-G-opt1-rrr

Dimensions	308 x 308 x 85 mm
Material	Die-cast aluminum, Plastic
Color	Grey white
Protection Class	IP65

## 2.3 Environmental Conditions

This section provides details on the environmental conditions of the **BLUEBOX**.

Operating Temperature	-20°C ... +55°C
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Storage Temperature	-40°C ... +85°C
Humidity	Up to 95%, non condensing

## 2.4 Reading Performance Tests

The table below shows the minimum RF channel allocation time with different inventory modes with no tags and with 1 tag in front of the antenna. The test has been with output power of 27dBm and a tag at a distance of 0.5mt from the antenna.

Inventory Mode	Time with No Tag	Time with 1 Tag
Fast Multi Tag	15ms	23ms
Fast Single Tag	15ms	18ms
Standard Multi Tag	15ms	25ms
Standard Single Tag	15ms	20ms

### 3 Operating Features

In 'continuous' mode the **BLUEBOX** is characterized by the coexistence of 2 'parallel' and asynchronous activities: the tag identification (inventory) and the communication with the 'host' system. The 'continuous' identification activity interacts with the communication activity through a buffer that contains the code of the last identified tags or that is empty indicating the absence of tags. Due to synchronization and filtering reasons, the buffer is handled for each identified tag by a parameter defined as 'hold time' (same as 'filter time' defined below, to be set in the range of 0 ... 99 seconds or 0 ... 99 minutes, default value 1 second) and allows to extend 'artificially' the presence of the tag after it leaves the antenna's influence area; this behavior is observable looking at the yellow led status that is 'on' indicating the presence of tags and also through the activation of the relay nr 1 (if its 'automatic' management is enabled by the flag defined in the general parameters). Through the command 'data request' it is possible to get the data contained in the buffer.

The **BLUEBOX** handles also a 100 elements FIFO queue which is combined with the 'filter time' general parameter (to be set in a range of 0 ... 99 seconds or 0 ... 99 minutes, default value 1 second) that prevents the queue saturation in case of a tag 'continuous' presence and a 1024 records in non volatile memory. The records stored in non volatile memory, like every other data stored in non volatile memory, are kept in memory even during a power off condition. The erase of the records is made by the communication software after the acquisition using an explicit command. After the erase command the records are not immediately removed from the **BLUEBOX** memory, but they will be overwritten with new records. For this reason, after the acquisition of the records, the **BLUEBOX** is ready to record its maximum number of records or to read again the acquired data (using special protocol commands). The records are stored in memory with the following data format.

Byte 0	Byte 1 ... 7	Byte 8	Byte 9 ... 126	Byte 127
Reserved	Timestamp	Tag's ID Length	Tag's ID	CRC

Where:

Timestamp	The detection timestamp. BCD coded with the following format yyyyMMddhhmmss. In case of no RTC or RTC error this field is filled with 0xFF bytes.
Tag's ID Length	The size of the tag's ID in bytes.
Tag's ID	The ID of the tag in the format <b>&lt;type&gt; &lt;ID&gt; &lt;RSSI&gt; &lt;antenna&gt; &lt;direction&gt;</b>



	<p>where:</p> <ul style="list-style-type: none"> <li>• &lt;type&gt;: Transponder type (<b>optional parameter present only if the tag type information flag in the general parameters is active</b>): <ul style="list-style-type: none"> <li>◦ 0x02: ISO 18000-63<sup>13</sup> (EPC Class-1 Gen-2).</li> </ul> </li> <li>• &lt;ID&gt;: ID of the tag (see tag's ID specifications).</li> <li>• &lt;RSSI&gt;: The detection tag's signal RSSI I and Q measured values in dB (<b>optional parameter present only if the RSSI information flag in the RF parameters is active</b>).</li> <li>• &lt;antenna&gt;: The detection antenna info (<b>optional parameter present only if the reading antenna information flag in the general parameters is active</b>): <ul style="list-style-type: none"> <li>◦ 0x01 -&gt; Antenna 1.</li> <li>◦ 0x02 -&gt; Antenna 2.</li> </ul> </li> <li>• &lt;direction&gt;: Gate crossing direction (<b>optional parameter present only if 'gate' mode is active</b>): <ul style="list-style-type: none"> <li>◦ 0x01 -&gt; Crossing from input 1 to input 2.</li> <li>◦ 0x02 -&gt; Crossing from input 2 to input 1</li> </ul> </li> </ul>
CRC	Block check character or checksum calculated as 'xor' of the previous characters.

When a tag is identified, the **BLUEBOX** verifies if it belongs to the list of read tags. If the tag do not belong to the list (it is defined as 'new'), its code will be inserted in the queue and in the database, a filter time assigned to the tag will be started and the buzzer will be activated for 0.5 seconds (if its 'automatic' management is enabled by the flag defined in the general parameters). Otherwise (the tag belong to the list of read tags), the **BLUEBOX** verifies if the relative filter time is expired. In this case (the filter time is expired), the tag is defined as 'new' and will be processed as described above, otherwise only the relative filter time will be rearmed. Through the command 'queue data request' and the relative 'ack', it is possible to get the data contained in the queue and unload it.



Buffer and FIFO queue will hold onto a maximum of 82 bytes of tag data. Once the 82 bytes of tag data limit is reached, the exceeded bytes will be discarded!

<sup>13</sup> ISO 18000-6C became ISO 18000-63 in 2012 due to ISO naming rules that do not allow letters in standards names.

In 'continuous' mode the **BLUEBOX** can be configured to obtain the behavior of a 'spontaneous' reader that will send a message on the RS232/RS485 serial line (if available) and/or on the Ethernet 10-100M channel (if available), as a TCP Server or TCP Client (optionally with HTTP POST messages), and/or data bus (if available) and/or CAN bus interface (if available). This feature is enabled (on) / disabled (off) by the switch 2 of the dip switch SW1 or via communication software.

- If configured and available an host can receive the 'spontaneous' message through the RS232/RS485 serial port. The 'spontaneous' message is sent only once and no ACK/NAK reply message is implemented, see the protocol manual for details. Do not use the 'spontaneous' message feature in a RS485 'multipoint' network to avoid communication errors due to unmanaged collisions on RS485 bus!
- If configured and available an host can connect the reader on the configured TCP server socket and wait for 'spontaneous' messages. The 'spontaneous' message is sent only once and no ACK/NAK reply message is implemented except of the normal TCP handshake mechanism, see the protocol manual for details.
- If configured and available an host can wait for an incoming TCP connection to receive the 'spontaneous' messages. The 'spontaneous' message is sent only once and no ACK/NAK reply message is implemented except of the normal TCP handshake mechanism, see the protocol manual for details. On a succesful connection there is a fixed inactivity timeout of 120 seconds.
- If configured and available an host can wait for incoming HTTP POST to receive 'spotaneous' messages. The 'spontaneous' message is sent only once. On a succesful connection there is a fixed inactivity timeout of 120 seconds.

These are the POST variables sent by **BLUEBOX**:

- **reader\_sn**: the **BLUEBOX** serial number.
- **mac\_address**: the **BLUEBOX** MAC address.
- **ip\_address**: the **BLUEBOX** IP address.
- **tag\_type**: the transponder type (**optional variable present only if the tag type information flag in the general parameters is active**):
  - 0x02: ISO 18000-63<sup>14</sup> (EPC Class-1 Gen-2).

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<sup>14</sup> ISO 18000-6C became ISO 18000-63 in 2012 due to ISO naming rules that do not allow letters in standards names.

- **tag\_id**: ID of the tag (see tag's ID specifications).
  - **rssi**: The detection tag's signal RSSI I and Q measured values in dB **(optional variable present only if the RSSI information flag in the RF parameters is active)**.
  - **antenna**: the detection antenna info **(optional variable present only if the reading antenna information flag in the general parameters is active)**:
    - 0x01 -> Antenna 1.
    - 0x02 -> Antenna 2
  - **direction**: the gate crossing direction **(optional variable present only if 'gate' mode is active)**:
    - 0x01 -> Crossing from input 1 to input 2.
    - 0x02 -> Crossing from input 2 to input 1.
  - **timestamp**: the detection timestamp. BCD coded with the following format yyyyMMddhhmmss. In case of no RTC or RTC error this field is filled with 0xFF bytes. **(optional variable present only if the timestamp information flag in the general parameters is active)**.
- If configured and available an host can wait for incoming 'spontaneous' messages through Wieagand interface. The 'spontaneous' message is sent only once and no ACK/NAK reply message is implemented except of the normal TCP handshake mechanism, see the protocol manual for details.
  - If configured and available an host can wait for incoming 'spontaneous' messages through CAN bus interface. The 'spontaneous' message is sent only once and no ACK/NAK reply message is implemented except of the normal CAN bus handshake mechanism, see the protocol manual for details.



In case of a 'spontaneous' message send error, due to a connection or communication error, no further attempts will be made and the tag will be discarded!



**BLUEBOX** will hold onto a maximum of 10 tags when configured to use the 'spontaneous' message. Once the 10 tag limit is reached, the new tags will be discarded!

In 'continuous' mode the **BLUEBOX** can be configured to automatically connect to a data acquiring TCP server (optionally with HTTP POST messages).

- If configured and available an host can wait for an incoming TCP connection. On a succesful connection there is a fixed inactivity timeout of 120 seconds, the **BLUEBOX** first sends its serial number and then waits for incoming commands:

**SOH <add h> <add l> STX <sn 1 h> <sn 1 l> ... <sn i h> <sn i l> ... <sn 6 h> <sn 6 l> ETX <bcc> CR**

Where <sn 1 h> <sn 1 l> ... <sn 6 h> <sn 6 l> is the serial number of the device, it is a numeric code constituted by 12 digits, the bytes of the SN are BCD-coded and so every byte encodes 2 digits (see the protocol manual for details).

- If configured and available an host can wait for incoming HTTP POST to receive records messages. An ACK/NAK reply is implemented through the reception of the HTTP status OK message and in case of success the record is dequeued from the records database. On a succesful connection there is a fixed inactivity timeout of 120 seconds.

These are the POST variables sent by **BLUEBOX**:

- **reader\_sn**: the **BLUEBOX** serial number.
- **mac\_address**: the **BLUEBOX** MAC address.
- **ip\_address**: the **BLUEBOX** IP address.
- **tag\_type**: the transponder type (**optional variable present only if the tag type information flag in the general parameters is active**):
  - 0x02: ISO 18000-63<sup>15</sup> (EPC Class-1 Gen-2).
- **tag\_id**: ID of the tag (see tag's ID specifications).
- **rssi**: The detection tag's signal RSSI I and Q measured values in dB (**optional variable present only if the RSSI information flag in the RF parameters is active**).
- **antenna**: the detection antenna info (**optional variable present only if the reading antenna information flag in the general parameters is active**):
  - 0x01 -> Antenna 1.
  - 0x02 -> Antenna 2

<sup>15</sup> ISO 18000-6C became ISO 18000-63 in 2012 due to ISO naming rules that do not allow letters in standards names.

- **direction**: the gate crossing direction (**optional variable present only if 'gate' mode is active**):
  - 0x01 -> Crossing from input 1 to input 2.
  - 0x02 -> Crossing from input 2 to input 1.
- **timestamp**: the detection timestamp. BCD coded with the following format yyyyMMddhhmmss. In case of no RTC or RTC error this field is filled with 0xFF bytes.

The connection has an inactivity timeout of 120 seconds. The auto connection start event could be:

- Buffer mode: starts the auto connection when the set number of records is reached in the records database.
- Time mode: starts the auto connection on the timeout of the connection interval time if the records database contains one or more records.
- Buffer + time mode: hybrid mode, start the auto connection when the set number of records is reached in the records database or on the timeout of the connection interval time if the records database contains one or more records.

Two subsets of the 'continuous' mode are also defined:

- 'Trigger' mode: the activation and deactivation of the 'continuous' mode is triggered with inputs. The trigger could be level sensitive or edge sensitive depending on the 'extension time' setting (to be set in a range of 0 ... 99 seconds or 0 ... 99 minutes, default value 0 seconds).
- 'Gate' mode: the activation of the 'continuous' mode is triggered with the activation of an input. The deactivation of the 'continuous' mode is triggered with the activation of the other input but, the activation of the 'continuous' mode could also be extended with the 'extension time' (to be set in a range of 0 ... 99 seconds or 0 ... 99 minutes, default value 0 seconds). The crossing of the gate is managed with a maximum crossing 'gate time' (to be set in a range of 0 ... 99 seconds or 0 ... 99 minutes, default value 0 seconds) which deactivates the 'continuous' mode in case of no successful crossing of the gate within this time. Only with a successful crossing of the gate data (tag ID and gate crossing direction and optionally tag type and reading antenna) are save in buffer and FIFO.

The **BLUEBOX** allows the execution of 'on request' functions. During the execution of these functions, the 'continuous' identification activity will be suspended temporarily; the involved commands are relative to device configuration and tag read/write specific activities.

If not required, the 'continuous' identification activity can be disabled through flags defined in the general parameters. In this case, the **BLUEBOX** will only execute the 'on request' commands.

'Test' modes are also defined:


- 'RF Reading' test: in 'continuous' mode allows the user to easily and quickly test the read range of the reader with fast beeping (100ms) the buzzer for every identified tag. This 'test' mode is stored in non volatile memory and its status is kept at every reader restart and until it is disabled.
- 'RF Power' test: allows the user to easily and quickly test the minimum RF output power needed to read a tag in a fixed position. The reader sweeps from the minimum RF output power to maximum RF output power or until it finds a tag, increasing the RF power of 1 dB every 500ms with fixed Q selection algorithm and Q=0. It is an 'on request' function which temporarily suspends the 'continuous' mode.
- 'RF Sensitivity' test: allows the user to easily and quickly test the minimum RF input sensitivity needed to read a tag in a fixed position. The reader sweeps from the minimum RF input sensitivity to maximum RF input sensitivity or until it finds a tag, increasing the RF sensitivity of 1 dB every 500ms with fixed Q selection algorithm and Q=0. It is an 'on request' function which temporarily suspends the 'continuous' mode.
- Read Reflected Power: allows the user to read the reflected power of the antenna at a given frequency to check the antenna connection.
- Read RSSI: allows the user to read the signal strength received by the antenna at a given frequency to check the presence of external RF sources.

The **BLUEBOX** integrates an RF antenna tuning feature which allows the usage of the reader in many different environments and configurations. The auto antenna tuning is done at every power on and during normal operations of the reader based on RF tuning configuration parameters described in next sections.

### 3.1 General Parameters

This section provides details on the configurable general parameters of the **BLUEBOX**.

Parameter	Description	Range	Default
Device Address	Device address of the reader on serial interface.	000 ... 255	255

Parameter	Description	Range	Default
Baud Rate	Communication baud rate on serial interface.	1200 2400 4800 9600 19200 38400	19200
Data Bits	Data bits on serial interface.	7 8	8
Stop Bits	Stop bits on serial interface.	1 2	1
Parity	Parity on serial interface.	None Even Odd	None
Filter Time	Reading and tag queue management filter time.  Note that 0 setting is internally overwritten with 1 second.	0 ... 99 seconds 0 ... 99 minutes	1 sec
Buzzer Management	Buzzer management on 'new tag' event.	Disabled Enabled	Enabled
Output 1 Management	Output 1 activation on tag presence / new tag event.	Disabled Enabled	Disabled
Reading Antenna Information	To add the reading antenna information to the tag's code.	Disabled Enabled	Disabled
Transponder Type Information	To add the transponder type information in the tag's code.	Disabled Enabled	Disabled
Timestamp Information	To add the transponder detection timestamp information in the tag's code	Disabled Enabled	Disabled
'Spontaneous' Mode	Spontaneous mode activation. It is OR'ed with the dip switch SW1-2 setting.	Disabled Enabled	Disabled
Trigger 'Continuous' Mode with Inputs	'Continuous' mode activation management with inputs.	Disabled Enabled	Disabled
'Continuous' Mode	'Continuous' mode. If activated overrides the trigger 'continuous' mode with inputs setting.	Disabled Enabled	Enabled

The general parameters are managed through the 'Read RAM General Parameters' and 'Write ROM General Parameters' commands as described in

protocol technical manuals where the parameters 1...7 fields with default values are:

1	2	3	4	5	6	7
Device Address	Serial1	Serial2	0x00	0x00	Filter Time	Functional Flags
0xFF	0x48	0x10	0x00	0x00	0x01	0x80

Where:

Parameter	Description										
Device Address	Device address of the reader on serial interface in the range 0 ... 255.										
Serial1	Serial interface communication settings. <ul style="list-style-type: none"> <li>High nibble: baud rate:               <ul style="list-style-type: none"> <li>0x0: 1200 bps;</li> <li>0x1: 2400 bps;</li> <li>0x2: 4800 bps;</li> <li>0x3: 9600 bps;</li> <li>0x4: 19200 bps;</li> <li>0x5: 38400 bps.</li> </ul> </li> <li>Low nibble: data bits:               <ul style="list-style-type: none"> <li>0x7: 7 bits;</li> <li>0x8: 8 bits.</li> </ul> </li> </ul>										
Serial2	Serial interface communication settings. <ul style="list-style-type: none"> <li>High nibble: stop bits:               <ul style="list-style-type: none"> <li>0x1: 1 bits;</li> <li>0x2: 2 bits.</li> </ul> </li> <li>Low nibble: parity:               <ul style="list-style-type: none"> <li>0x0: None;</li> <li>0x1: Even;</li> <li>0x2: Odd.</li> </ul> </li> </ul>										
Filter Time	Reading management filter time (0 setting is internally overwritten with 1 second): <ul style="list-style-type: none"> <li>Decimal 0 ... 99 for time in seconds (0 ... 99 seconds);</li> <li>Decimal 100 ... 199 for time in minutes (0 ... 99 minutes).</li> </ul>										
Functional Flags	Flags. Single bits are dedicated to disable (0 value) or enable (1 value) functions: <table border="1"> <thead> <tr> <th>Bit</th><th>Description</th></tr> </thead> <tbody> <tr> <td>Bit 7</td><td>Automatic buzzer management</td></tr> <tr> <td>Bit 6</td><td>Automatic output 1 management</td></tr> <tr> <td>Bit 5</td><td>Reading antenna information</td></tr> <tr> <td>Bit 4</td><td>Transponder type information</td></tr> </tbody> </table>	Bit	Description	Bit 7	Automatic buzzer management	Bit 6	Automatic output 1 management	Bit 5	Reading antenna information	Bit 4	Transponder type information
Bit	Description										
Bit 7	Automatic buzzer management										
Bit 6	Automatic output 1 management										
Bit 5	Reading antenna information										
Bit 4	Transponder type information										







Parameter	Description
	Bit 3 'Spontaneous' mode
	Bit 2 Transponder detection timestamp information
	Bit 1 'Continuous' mode with inputs
	Bit 0 'Continuous' mode (0=enabled, 1=disabled).

## 3.2 Configuration Parameters

This section provides details on the configurable operational parameters of the **BLUEBOX**.

### 3.2.1 Ethernet Interface

This section provides details on the configurable Ethernet interface parameters of the **BLUEBOX**.

Parameter	Description	Range	Default
IP Address	IP address.  Note that this parameter become effective only after a reboot of the reader.	IPv4	192.168.4.200
Port	Communication port.  Note that this parameter become effective only after a reboot of the reader.	0 ... 65535	3000
Subnet	Subnet mask.  Note that this parameter become effective only after a reboot of the reader.	IPv4	255.255.255.0
Gateway	Gateway address.  Note that this parameter become effective only after a reboot of the reader.	IPv4	0.0.0.0

The Ethernet interface parameters are stored in configuration page nr. 0x80 and are managed through the 'Read RAM/ROM Configuration Parameters' and 'Write RAM/ROM Configuration Parameters' commands as described in protocol technical manuals where the parameters 1...14 fields with default values are:

1	2	3	4	5	6	7
PortH	PortL	IP0	IP1	IP2	IP3	Subnet0
0x0B	0xB8	0xC0	0xA8	0x04	0xC8	0xFF



8	9	10	11	12	13	14
Subnet1	Subnet2	Subnet3	Gateway0	Gateway1	Gateway2	Gateway3
0xFF	0xFF	0x00	0x00	0x00	0x00	0x00







Where:

Parameter	Description
IP0 ... IP3	IP address.
PortH	TCP communication port. MSB.
PortL	TCP communication port. LSB.
Subnet0 ... Subnet3	Subnet mask.
Gateway0 ... Gateway3	Gateway address.

### 3.2.2 Remote Server

This section provides details on the configurable remote server parameters of the **BLUEBOX**

Parameter	Description	Range	Default
IP Address	'Spontaneous' message remote server IP address. 0.0.0.0 to disable the 'spontaneous' message as TCP client.  Note that this parameter become effective only after a reboot of the reader.	IPv4	0.0.0.0
Port	'Spontaneous' message remote server TCP communication port. 0 to disable the 'spontaneous' message as TCP client, 80 or 8080 to enable the 'spontaneous' message with HTTP POST messages.  Note that this parameter become effective only after a reboot of the reader.	0 ... 65535	0

Parameter	Description	Range	Default
Connection Time	'Spontaneous' message remote server maximum connection time.  Note that this parameter become effective only after a reboot of the reader.	1 ... 99 seconds 1 ... 99 minutes	1 sec
HTTP POST Page	The 'spontaneous' message HTTP POST page.  Note that this parameter become effective only after a reboot of the reader.	240 chars null terminated string	""
Auto LAN IP Address	Auto connection remote server IP address. 0.0.0.0 to disable the auto connection.  Note that this parameter become effective only after a reboot of the reader.	IPv4	0.0.0.0
Auto LAN Port	Auto connection remote server communication port. 0 to disable the auto connection, 80 or 8080 to enable the auto connection with HTTP POST messages.  Note that this parameter become effective only after a reboot of the reader.	0 ... 65535	0
Auto LAN Connection Time	Auto connection remote server maximum connection time.  Note that this parameter become effective only after a reboot of the reader.	1 ... 99 seconds 1 ... 99 minutes	1 sec
Auto LAN HTTP POST Page	The auto connection HTTP POST page.  Note that this parameter become effective only after a reboot of the reader.	240 chars null terminated string	""

The remote server parameters are stored in configuration page nr. 0x81, 0xC1 and 0xC2 and are managed through the 'Read RAM/ROM Configuration Parameters' and 'Write RAM/ROM Configuration Parameters' commands as described in protocol technical manuals.

The parameters 1...14 fields with default values of page 0x81 are:

1	2	3	4	5	6	7
PortH	PortL	IP0	IP1	IP2	IP3	Connection Time
0x00	0x00	0x00	0x00	0x00	0x00	0x01

8	9	10	11	12	13	14
Auto LAN PortH	Auto LAN PortL	Auto LAN IP0	Auto LAN IP1	Auto LAN IP2	Auto LAN IP3	Auto LAN Connection Time
0x00	0x00	0x00	0x00	0x00	0x00	0x01

Where:

Parameter	Description
PortH	'Spontaneous' message remote server TCP communication port. MSB.
PortL	'Spontaneous' message remote server TCP communication port. LSB.
IP0 ... IP3	'Spontaneous' message remote server IP address.
Connection Time	'Spontaneous' message remote server maximum connection time: <ul style="list-style-type: none"> <li>Decimal 0 ... 99 for time in seconds (0 ... 99 seconds);</li> <li>Decimal 100 ... 199 for time in minutes (0 ... 99 minutes).</li> </ul>
Auto LAN PortH	Auto connection remote server TCP communication port. MSB.
Auto LAN PortL	Auto connection remote server TCP communication port. LSB.
Auto LAN IP0 ... Auto LAN IP3	Auto connection remote server IP address.
Auto LAN Connection Time	Auto connection remote server maximum connection time: <ul style="list-style-type: none"> <li>Decimal 0 ... 99 for time in seconds (0 ... 99 seconds);</li> <li>Decimal 100 ... 199 for time in minutes (0 ... 99 minutes).</li> </ul>

The parameters 1...240 fields with default values of page 0xC1 are:

1	2	...	...	...	6	7
HTTP POST Page 1	HTTP POST Page 2	...	...	...	HTTP POST Page 239	HTTP POST Page 240
0x00	0x00	0x00	0x00	0x00	0x00	0x00

Where:

Parameter	Description
HTTP POST Page	'Spontaneous' message HTTP POST page. Null terminated string with max length of 240 chars.

The parameters 1...240 fields with default values of page 0xC2 are:



1	2	...	...	...	6	7
Auto LAN HTTP POST Page 1	Auto LAN HTTP POST Page 2	...	...	...	Auto LAN HTTP POST Page 239	Auto LAN HTTP POST Page 240
0x00	0x00	0x00	0x00	0x00	0x00	0x00

Where:

Parameter	Description
Auto LAN HTTP POST Page	Auto connection HTTP POST page. Null terminated string with max length of 240 chars.

### 3.2.3 Auto Connection

This section provides details on the configurable auto connection parameters of the **BLUEBOX**

Parameter	Description	Range	Default
Buffer Threshold	The record buffer threshold. Starts the auto connection when the set number of records is reached. 0 disables the buffer mode.  Note that this parameter become effective only after a reboot of the reader.	0 ... 1024	0
Connection Interval	The connection interval. Starts the auto connection on timeout of this time interval. 0 disables the time mode.  Note that this parameter become effective only after a reboot of the reader.	0 ... 99 seconds 0 ... 99 minutes	0

The auto connection parameters are stored in configuration page nr. 0x0A and are managed through the 'Read RAM/ROM Configuration Parameters' and 'Write RAM/ROM Configuration Parameters' commands as described in protocol technical manuals where the parameters 1...7 fields with default values are:





1	2	3	4	5	6	7
Buffer Threshold H	Buffer Threshold L	Connection Interval	0x00	0x00	0x00	0x00
0x00	0x00	0x00	0x00	0x00	0x00	0x00

Where:

Parameter	Description
Buffer Threshold H	The record buffer threshold. MSB.
Buffer Threshold L	The record buffer threshold. LSB.
Connection Interval	The connection interval: <ul style="list-style-type: none"> <li>Decimal 0 ... 99 for time in seconds (0 ... 99 seconds);</li> <li>Decimal 100 ... 199 for time in minutes (0 ... 99 minutes).</li> </ul>

### 3.2.4 Data Bus Interface

This section provides details on the configurable data bus interface parameters of the **BLUEBOX**

Parameter	Description	Range	Default
Data Format	The data bus protocol data format.  Note that this parameter become effective only after a reboot of the reader.	Wiegand26 Wiegand34	Wiegand26
Pulse Width	The data bus interface wave pulse width.  Note that this parameter become effective only after a reboot of the reader.	50us 100us 400us	400us
Pulse Interval	The data bus interface wave pulse interval.  Note that this parameter become effective only after a reboot of the reader.	1ms 1.6ms 2ms	2ms
ID Start Address	The start address of the ID of the tag.  Note that this parameter become effective only after a reboot of the reader.	0 ... 255	0

The data bus interface parameters are stored in configuration page nr. 0x0C and are managed through the 'Read RAM/ROM Configuration Parameters' and 'Write

RAM/ROM Configuration Parameters' commands as described in protocol technical manuals where the parameters 1...7 fields with default values are:



1	2	3	4	5	6	7
Data Format	Wave Format	ID Start Address	0x00	0x00	0x00	0x00
0x00	0x22	0x00	0x00	0x00	0x00	0x00

Where:

Parameter	Description
Data Format	The data bus protocol data format: <ul style="list-style-type: none"> <li>• 0x00: Wiegand26;</li> <li>• 0x01: Wiegand34.</li> </ul>
Wave Format	The data bus interface wave pulse width and interval: <ul style="list-style-type: none"> <li>• High nibble: pulse width:             <ul style="list-style-type: none"> <li>○ 0x0: 50us;</li> <li>○ 0x1: 100us;</li> <li>○ 0x2: 400us.</li> </ul> </li> <li>• Low nibble: pulse interval:             <ul style="list-style-type: none"> <li>○ 0x0: 1ms;</li> <li>○ 0x1: 1.6ms;</li> <li>○ 0x2: 2ms.</li> </ul> </li> </ul>
ID Start Address	The start address of the ID of the tag.

### 3.2.5 CAN Bus Interface

This section provides details on the configurable CAN bus interface parameters of the **BLUEBOX**

Parameter	Description	Range	Default
Node ID	The CAN bus node ID of the reader.  Note that this parameter become effective only after a reboot of the reader.	See protocol technical manual	See protocol technical manual
Bitrate	The CAN bus bitrate.  Note that this parameter become effective only after a reboot of the reader.	See protocol technical manual	See protocol technical manual

The CAN bus interface parameters are stored in configuration page nr. 0x83 and are managed through the 'Read RAM/ROM Configuration Parameters' and 'Write RAM/ROM Configuration Parameters' commands as described in protocol technical manuals where the parameters 1...14 fields with default values are:

1	2	3	4	5	6	7
Network Address	Baud Rate	0x00	0x00	0x00	0x00	0x00
..	..	0x00	0x00	0x00	0x00	0x00

8	9	10	11	12	13	14
0x00	0x00	0x00	0x00	0x00	0x00	0x00
0x00	0x00	0x00	0x00	0x00	0x00	0x00

Where:








Parameter	Description
Network Address	The CAN bus network address of the reader.
Baud Rate	The CAN bus baud rate: <ul style="list-style-type: none"> <li>• 0x00: 10 kbit/s</li> <li>• 0x01: 20 kbit/s</li> <li>• 0x02: 50 kbit/s</li> <li>• 0x03: 100 kbit/s</li> <li>• 0x04: 125 kbit/s</li> <li>• 0x05: 250 kbit/s</li> <li>• 0x06: 500 kbit/s</li> <li>• 0x07: 800 kbit/s</li> <li>• 0x08: 1000 kbit/s</li> </ul>

### 3.2.6 Input / Output

This section provides details on the configurable input / output parameters of the **BLUEBOX**

Parameter	Description	Range	Default
Input 1 Mode	Input 1 activation / deactivation mode of the 'continuous' mode in 'trigger' mode.	0, 1, 2	1



Parameter	Description	Range	Default
	 Note that this parameter become effective only after a reboot of the reader.		
Input 2 Mode	Input 2 activation / deactivation mode of the 'continuous' mode in 'trigger' mode.  Note that this parameter become effective only after a reboot of the reader.	0, 1, 2	0
Extension Time	'Continuous' mode activation management with inputs extension time. <ul style="list-style-type: none"> <li>In 'trigger' mode, if =0 the trigger is level sensitive, otherwise it is edge sensitive and defines the 'continuous' mode activation time extension after the input change.</li> <li>In 'gate' mode this time defines the 'continuous' mode activation time extension after the crossing of the gate. It filters any input change until the end of this time.</li> </ul>  Note that this parameter become effective only after a reboot of the reader.	0 ... 99 seconds 0 ... 99 minutes	0
Gate Time	Maximum gate crossing time. If =0 the 'gate' mode is disabled, otherwise it is the maximum gate crossing time.  Note that this parameter become effective only after a reboot of the reader.	0 ... 99 seconds 0 ... 99 minutes	0
Debounce Time	The inputs debounce time.  Note that 0 setting is internally overwritten with 50ms.  Note that this parameter become effective only after a reboot of the reader.	0.00 ... 0.99 seconds 0.0 ... 9.9 seconds	0
Output 1 Time	The output 1 activation time with output 1 activation on tag presence / new tag event enabled. If =0 the output 1 is continuously activated with the tag presence, otherwise is activated with a new tag event for a time defined by this parameter.  Note that this parameter become effective only after a reboot of the reader.	0 ... 99 seconds 0 ... 99 minutes	0

Where the input mode range means

- 0: Disabled;
- 1: ON -> Activate antenna 1; OFF -> Deactivate antenna 1;
- 2: OFF -> Activate antenna 1; ON -> Deactivate antenna 1;

The input 1 and 2 modes combination allowed are

Input 1 Mode	Input 2 Mode
ON -> Activate antenna 1; OFF -> Deactivate antenna 1	Disabled
OFF -> Activate antenna 1; ON -> Deactivate antenna 1	Disabled
Disabled	ON -> Activate antenna 1; OFF -> Deactivate antenna 1
Disabled	OFF -> Activate antenna 1; ON -> Deactivate antenna 1

The input / output parameters are stored in configuration page nr. 0x05 and are managed through the 'Read RAM/ROM Configuration Parameters' and 'Write RAM/ROM Configuration Parameters' commands as described in protocol technical manuals where the parameters 1...7 fields with default values are:

1	2	3	4	5	6	7
Input1 Mode	Input2 Mode	Extension Time	Gate Time	Debounce Time	Output 1 Time	0x00
0x01	0x00	0x00	0x00	0x00	0x00	0x00





Where:


Parameter	Description
Input1 Mode	Input 1 activation / deactivation mode of the 'continuous' mode in 'trigger' mode: <ul style="list-style-type: none"> <li>0x00: Disabled</li> <li>0x01: ON -&gt; Activate antennas; OFF -&gt; Deactivate antennas</li> <li>0x02: OFF -&gt; Activate antennas; ON -&gt; Deactivate antennas</li> </ul>
Input2 Mode	Input 2 activation / deactivation mode of the 'continuous' mode in 'trigger' mode: <ul style="list-style-type: none"> <li>0x00: Disabled</li> <li>0x01: ON -&gt; Activate antennas; OFF -&gt; Deactivate antennas</li> <li>0x02: OFF -&gt; Activate antennas; ON -&gt; Deactivate antennas</li> </ul>
Extension Time	'Continuous' mode activation management with inputs extension time. <ul style="list-style-type: none"> <li>In 'trigger' mode, if =0 the trigger is level sensitive, otherwise it is edge sensitive and this time defines the 'continuous' mode activation time extension after the input change.</li> <li>In 'gate' mode it defines the 'continuous' mode activation time extension after the crossing of the gate.</li> </ul> And the values allowed are: <ul style="list-style-type: none"> <li>Decimal 0 ... 99 for time in seconds (0 ... 99 seconds);</li> <li>Decimal 100 ... 199 for time in minutes (0 ... 99 minutes).</li> </ul>

Parameter	Description
Gate Time	The maximum gate crossing time. If =0 the 'gate' mode is disabled, otherwise it is the maximum gate crossing time: <ul style="list-style-type: none"> <li>Decimal 0 ... 99 for time in seconds (0 ... 99 seconds);</li> <li>Decimal 100 ... 199 for time in minutes (0 ... 99 minutes).</li> </ul>
Debounce Time	The inputs anti-bounce time. 0 setting is internally overwritten with 50ms. <ul style="list-style-type: none"> <li>Decimal 0 ... 99 for time in mseconds (0 ... 990 mseconds)</li> <li>Decimal 100 ... 199 for time in seconds (0.0 ... 9.9 seconds)</li> </ul>
Output 1 Time	Output 1 activation time with output 1 activation on tag presence / new tag event enabled. If =0 the output 1 is continuously activated with the tag presence, otherwise is activated with a new tag event for a time defined by this parameter. <ul style="list-style-type: none"> <li>Decimal 0 ... 99 for time in seconds (0 ... 99 seconds);</li> <li>Decimal 100 ... 199 for time in minutes (0 ... 99 minutes).</li> </ul>

### 3.2.7 'Spontaneous' Message

This section provides details on the configurable 'spontaneous' message parameters of the **BLUEBOX**

Parameter	Description	Range	Default
Message on Serial Interface	'Spontaneous' message on serial interface activation/deactivation.  Note that this parameter become effective only after a reboot of the reader.	Disabled Enabled	Enabled
Message on Ethernet (TCP Server, TCP Client)	'Spontaneous' message on Ethernet (TCP server or TCP client, see the remote server parameters) interface activation/deactivation.  Note that this parameter become effective only after a reboot of the reader.	Disabled Enabled	Enabled
Message on Data Bus Interface	'Spontaneous' message on data bus interface activation/deactivation.  Note that this parameter become effective only after a reboot of the reader.	Disabled Enabled	Enabled
Message on CAN Bus	'Spontaneous' message on CAN bus interface activation/deactivation.  Note that this parameter become effective only after a reboot of the reader.	Disabled Enabled	Enabled
Format	The 'spontaneous' message format. <ul style="list-style-type: none"> <li>0: Message is sent with BlueBox protocol rules;</li> <li>1: Message is sent, without any control character, in dual char string form;</li> </ul>	0 1 2 3 4	0

Parameter	Description	Range	Default
	<ul style="list-style-type: none"> <li>2: Message is sent like in option 1 but at the end CR will be appended;</li> <li>3: Message is sent like in option 1 but at the end CR+LF will be appended.</li> <li>4: Message is sent, without any control character, in ASCII form. Non printable chars (0x20..0x7E) are replaced with `.` (0x2E).</li> <li>5: Message is sent like in option 4 but at the end CR will be appended.</li> <li>6: Message is sent like in option 4 but at the end CR+LF will be appended.</li> <li>7: Message is sent like in option 1 with an STX char at the begin of the message.</li> <li>8: Message is sent like in option 2 with an STX char at the begin of the message.</li> <li>9: Message is sent like in option 3 with an STX char at the begin of the message.</li> <li>10: Message is sent like in option 4 with an STX char at the begin of the message.</li> <li>11: Message is sent like in option 5 with an STX char at the begin of the message.</li> <li>12: Message is sent like in option 6 with an STX char at the begin of the message.</li> </ul>  Note that this parameter become effective only after a reboot of the reader.	5 6 7 8 9 10 11 12	
Encoding	The 'spontaneous' message encoding.	None Decimal	None

The 'spontaneous' message parameters are stored in configuration page nr. 0x09 and are managed through the 'Read RAM/ROM Configuration Parameters' and 'Write RAM/ROM Configuration Parameters' commands as described in protocol technical manuals where the parameters 1...7 fields with default values are:

1	2	3	4	5	6	7
0x00	Interface	Format	0x00	0x00	0x00	0x00
0x00	0x00	0x00	0x00	0x00	0x00	0x00






Where:







Parameter	Description
Interface	The interface where to send the 'spontaneous' message activation/deactivation. Single bits are dedicated to enable (0 value) or disable (1 value) an interface:

Parameter	Description																		
	<table> <tr> <th>Bit</th><th>Description</th></tr> <tr> <td>Bit 7</td><td>Not used</td></tr> <tr> <td>Bit 6</td><td>Not used</td></tr> <tr> <td>Bit 5</td><td>Bluetooth</td></tr> <tr> <td>Bit 4</td><td>CAN bus</td></tr> <tr> <td>Bit 3</td><td>Data bus</td></tr> <tr> <td>Bit 2</td><td>Not used</td></tr> <tr> <td>Bit 1</td><td>Ethernet (TCP server, TCP client);</td></tr> <tr> <td>Bit 0</td><td>Serial interface</td></tr> </table>	Bit	Description	Bit 7	Not used	Bit 6	Not used	Bit 5	Bluetooth	Bit 4	CAN bus	Bit 3	Data bus	Bit 2	Not used	Bit 1	Ethernet (TCP server, TCP client);	Bit 0	Serial interface
Bit	Description																		
Bit 7	Not used																		
Bit 6	Not used																		
Bit 5	Bluetooth																		
Bit 4	CAN bus																		
Bit 3	Data bus																		
Bit 2	Not used																		
Bit 1	Ethernet (TCP server, TCP client);																		
Bit 0	Serial interface																		
Format	<p>The 'spontaneous' message format:</p> <ul style="list-style-type: none"> <li>• 0x00: Message is sent with BlueBox protocol rules;</li> <li>• 0x01: Message is sent, without any control character, in dual char string form;</li> <li>• 0x02: Message is sent like in option 1 but at the end CR will be appended;</li> <li>• 0x03: Message is sent like in option 1 but at the end CR+LF will be appended.</li> <li>• 0x04: Message is sent, without any control character, in ASCII form. Non printable chars (0x20..0x7E) are replaced with `.` (0x2E).</li> <li>• 0x05: Message is sent like in option 4 but at the end CR will be appended.</li> <li>• 0x06: Message is sent like in option 4 but at the end CR+LF will be appended.</li> <li>• 0x07: Message is sent like in option 1 with an STX char at the begin of the message.</li> <li>• 0x08: Message is sent like in option 2 with an STX char at the begin of the message.</li> <li>• 0x09: Message is sent like in option 3 with an STX char at the begin of the message.</li> <li>• 0x0A: Message is sent like in option 4 with an STX char at the begin of the message.</li> <li>• 0x0B: Message is sent like in option 5 with an STX char at the begin of the message.</li> <li>• 0x0C: Message is sent like in option 6 with an STX char at the begin of the message.</li> </ul>																		
Encoding	<p>The 'spontaneous' message encoding:</p> <ul style="list-style-type: none"> <li>• 0x00: None;</li> <li>• 0x01: Decimal.</li> </ul>																		

### 3.2.8 RF and EPC C1G2 (Class-1 Gen-2)

This section provides details on the configurable RF and EPC C1G2 (Class-1 Gen-2) parameters of the **BLUEBOX**







Parameter	Description	Range	Default
RF Geographical Region	RF geographical region.  Note that ETSI, FCC and Brazil readers cannot be altered and only operate per the regulatory laws in USA/Canada, the European Union and Brazil.	EU1: ETSI FCC: FCC BRA: Brazil	EU1: ETSI FCC: FCC BRA: Brazil
RF Transmit Power	RF conducted transmit power in dBm.  Refer to country specific regulations for limitations. You, the user, are responsible to ensure operation with the correct RF settings and are solely responsible for any fines and other damages due to incorrect or non-compliant country/region settings.	(See the technical specifications section)	20 dBm
RF Receive Sensitivity	RF receive sensitivity in dBm.	(See the technical specifications section)	-76 dBm
RF Channel	RF channel.  Note that 0 value stands for default settings of the selected region.  Refer to country specific regulations for channel allocation within the band. You, the user, are responsible to ensure operation with the correct RF settings and are solely responsible for any fines and other damages due to incorrect or non-compliant country/region settings.	EU1: 0 ... 10 FCC: 0 ... 50 BRA: 0 ... 50	0
Antenna 1 Activation	Activation of antenna 1.	Disabled Enabled	Enabled
Antenna 2 Activation	Activation of antenna 2 (for devices with up to 2 antennas).	Disabled Enabled	Disabled
RF Channel Allocation Time	The maximum period of consecutive transmission on the same RF channel.  Note that 0 value stands for default settings of the selected region.	0.00 ... 0.99 seconds 0 ... 99 seconds	0

Parameter	Description	Range	Default
	 <p>Refer to country specific regulations for limitations. You, the user, are responsible to ensure operation with the correct RF settings and are solely responsible for any fines and other damages due to incorrect or non-compliant country/region settings.</p>		
RF Channel Pause Time	<p>The minimum time between two consecutive transmissions in the same RF channel.</p>  <p>Note that 0 value stands for default settings of the selected region.</p>  <p>Refer to country specific regulations for limitations. You, the user, are responsible to ensure operation with the correct RF settings and are solely responsible for any fines and other damages due to incorrect or non-compliant country/region settings.</p>	0.00 ... 0.99 seconds 0 ... 99 seconds	0
RF Chip Standby Mode	Activation / deactivation of the standby mode of the RF chip during RF off conditions to reduce power consumption and temperature increase.	Disabled Enabled	Enabled
RSSI Information	<p>The detection tag's signal RSSI I and Q measured values information.</p>  <p>Note that this parameter become effective only after a reboot of the reader.</p>	Disabled Enabled	Disabled
Max RSSI Information	<p>The detected tag's signal max RSSI I and Q measured values information.</p>  <p>Note that this parameter become effective only after a reboot of the reader.</p>	Disabled Enabled	Disabled
Tag Read Count Information	<p>The tag read count information.</p>  <p>Note that this parameter become effective only after a reboot of the reader.</p>	Disabled Enabled	Disabled

Hereinafter the configurable EPC C1G2 (Class-1 Generation-2) parameters of the **BLUEBOX**.

Parameter	Description	Range	Default
Inventory Mode	How the reader does an inventory in 'continuous' mode.	Fast Multi Tag Fast Single Tag Standard Multi Tag Standard Single Tag	Standard Multi Tag
R->T Link Frequency	R->T Link Frequency as defined in EPC Class 1 Generation 2 protocol.	40 kHz 160 kHz 256 kHz 320 kHz 640 kHz	160 kHz
R->T Bit Coding	R->T Bit coding as defined in EPC Class 1 Generation 2 protocol.	FM0 Miller 2 Miller 4 Miller 8	Miller 2
Q Selection Algorithm	The Q selection algorithm used for setting the slot-counter parameter as defined in EPC Class 1 Generation 2 protocol.	Dynamic Fixed	Dynamic
Q Value	The Q value used in fixed Q selection algorithm or the starting Q value used in dynamic Q selection algorithm as defined in EPC Class 1 Generation 2 protocol.	0 ... 15	3
Q Initial	The minimum allowed Q value in dynamic Q algorithm mode.	0 ... 15	0
Q Final	The maximum allowed Q value in dynamic Q algorithm mode.	0 ... 15	4
Q Adjust Rounds	The maximum Q adjust rounds in dynamic Q algorithm mode.	0 ... 5	3
Inventory Cycles	The inventory cycles in inventory command.	0 ... 5	3
Search Mode	How the reader singulates (select) tags in 'continuous' mode.	Dual Target Single Target	Dual Target
Session	The session used as defined in EPC Class 1 Generation 2 protocol.	S0 S1 S2 S3	S0
Target	The target used as defined in EPC Class 1 Generation 2 protocol.	A B	A
EPC size	The size of the recognized EPC in bytes. 0 means all EPC sizes,	0 ... 62	0



Parameter	Description	Range	Default
ReadAfterDetect Activation	Activation of the ReadAfterDetect mode in 'continuous' mode.  Note that this parameter become effective only after a reboot of the reader.	None TID Custom	None
ReadAfterDetect Password	The password to be used to access to tag's memory in ReadAfterDetect mode (Inventory Mode = Standard Single/Multi Tag with Custom Info). Use a '0' password if the access password is not requested.  Note that this parameter become effective only after a reboot of the reader.	0x00 0x00 0x00 0x00 ... 0xFF 0xFF 0xFF 0xFF	0x00 0x00 0x00 0x00
ReadAfterDetect Bank	The tag's memory bank to access in ReadAfterDetect mode (Inventory Mode = Standard Single/Multi Tag with Custom Info).  Note that this parameter become effective only after a reboot of the reader.	Reserved EPC TID User	Reserved
ReadAfterDetect Address	The tag's memory start address to access in the specified memory bank in ReadAfterDetect mode (Inventory Mode = Standard Single/Multi Tag with Custom Info).  Note that this parameter become effective only after a reboot of the reader.	0x00 0x00 0x00 0x00 ... 0xFF 0xFF 0xFF 0xFF	0x00 0x00 0x00 0x00
ReadAfterDetect Length	The number of tag's memory blocks (2-bytes length) to access in the specified memory bank in ReadAfterDetect mode (Inventory Mode = Standard Single/Multi Tag with Custom Info). In case of Reserved or User bank selected 0 means no tag's memory block access, in case of TID bank selected 0 means auto-length (class identifier, manufacturer identifier, serial number).  Note that this parameter become effective only after a reboot of the reader.	0 ... 255	0
ReadAfterDetect Info Flags	The tag's info (PC, EPC, CRC) to include in the tag's ID in ReadAfterDetect mode (Inventory Mode = Standard Single/Multi Tag with Custom Info).  Note that this parameter become effective only after a reboot of the reader.	PC, EPC, CRC	PC, EPC, CRC
Use AFI	To enable/disable the AFI (Application Family Identifier) management.	Disabled Enabled	Disabled
AFI	The AFI (Application Family Identifier) value.	0 ... 255	0

The RF and EPC C1G2 (Class-1 Generation-2) parameters are stored in configuration pages nr. 0x01, 0x02, 0x04 and 0x82 and are managed through the 'Read RAM/ROM Configuration Parameters' and 'Write RAM/ROM

Configuration Parameters' commands as described in protocol technical manuals.

The parameters 1...7 fields with default values of page 0x01 are:

1	2	3	4	5	6	7
RF Receive Sensitivity	Functional Flags	0x00	0x00	0x00	0x00	0x00
<b>0x4C</b>	<b>0x00</b>	<b>0x00</b>	<b>0x00</b>	<b>0x00</b>	<b>0x00</b>	<b>0x00</b>

Where:

Parameter	Description																		
RF Receive Sensitivity	Absolute value of the RF input sensitivity.																		
Functional Flags	<p>Functional flags. Single bits are dedicated to disable (0 value) or enable (1 value) functions:</p> <table> <tr> <th>Bit</th><th>Description</th></tr> <tr> <td>Bit 7</td><td>Not used</td></tr> <tr> <td>Bit 6</td><td>Not used</td></tr> <tr> <td>Bit 5</td><td>Not used</td></tr> <tr> <td>Bit 4</td><td>Not used</td></tr> <tr> <td>Bit 3</td><td>Max RSSI information</td></tr> <tr> <td>Bit 2</td><td>Tag read count information</td></tr> <tr> <td>Bit 1</td><td>RSSI information</td></tr> <tr> <td>Bit 0</td><td>To disable the RF chip standby mode (0=enabled, 1=disabled).</td></tr> </table>	Bit	Description	Bit 7	Not used	Bit 6	Not used	Bit 5	Not used	Bit 4	Not used	Bit 3	Max RSSI information	Bit 2	Tag read count information	Bit 1	RSSI information	Bit 0	To disable the RF chip standby mode (0=enabled, 1=disabled).
Bit	Description																		
Bit 7	Not used																		
Bit 6	Not used																		
Bit 5	Not used																		
Bit 4	Not used																		
Bit 3	Max RSSI information																		
Bit 2	Tag read count information																		
Bit 1	RSSI information																		
Bit 0	To disable the RF chip standby mode (0=enabled, 1=disabled).																		

The parameters 1...7 fields with default values of page 0x02 are:

1	2	3	4	5	6	7
RF Geograph. Region	RF Transmit Power	RF Channel	Antennas Activation	EPC C1G2	RF Maximum Allocation Time	RF Minimum Pause Time
<b>0x02</b>	<b>0x14</b>	<b>0x00</b>	<b>0x01</b>	<b>0x30</b>	<b>0x00</b>	<b>0x00</b>


Where:



Parameter	Description																		
RF Geographical Region	RF geographical region: <ul style="list-style-type: none"> <li>0x01: North America (FCC compliant);</li> <li>0x02: Europe (ETSI compliant);</li> <li>0x03: Brazil (FCC subset compliant).</li> </ul>																		
RF Transmit Power	RF conducted transmit power.																		
RF Channel	RF channel. Channel 0 stands for default settings of the selected region.																		
Antennas Activation	<p>A byte whose bits are dedicated to disable (0 value) or enable (1 value) the antennas to use:</p> <table> <tr> <th>Bit</th><th>Description</th></tr> <tr> <td>Bit 7</td><td>Not used</td></tr> <tr> <td>Bit 6</td><td>Not used</td></tr> <tr> <td>Bit 5</td><td>Not used</td></tr> <tr> <td>Bit 4</td><td>Not used</td></tr> <tr> <td>Bit 3</td><td>Not used</td></tr> <tr> <td>Bit 2</td><td>Not used</td></tr> <tr> <td>Bit 1</td><td>Not used</td></tr> <tr> <td>Bit 0</td><td>Antenna 1</td></tr> </table>	Bit	Description	Bit 7	Not used	Bit 6	Not used	Bit 5	Not used	Bit 4	Not used	Bit 3	Not used	Bit 2	Not used	Bit 1	Not used	Bit 0	Antenna 1
Bit	Description																		
Bit 7	Not used																		
Bit 6	Not used																		
Bit 5	Not used																		
Bit 4	Not used																		
Bit 3	Not used																		
Bit 2	Not used																		
Bit 1	Not used																		
Bit 0	Antenna 1																		
EPC C1G2	<p>A byte whose bits are dedicated to manage Q value and session/target parameters:</p> <table> <tr> <th>Bit</th><th>Description</th></tr> <tr> <td>Bit 7 ... 4</td><td>Q value in fixed Q selection algorithm or starting Q value in dynamic Q selection algorithm, as defined EPC Class 1 Generation 2 protocol (0x0=0 ... 0xF=15)</td></tr> <tr> <td>Bit 3 ... 2</td><td>Session as defined in EPC Class 1 Generation 2 protocol (00b=S0, 01b=S1, 10b=S2, 11b=S3)</td></tr> <tr> <td>Bit 1</td><td>Q selection algorithm (0=dynamic, 1=fixed);</td></tr> <tr> <td>Bit 0</td><td>Target as defined in EPC Class 1 Generation 2 protocol (0=A, 1=B)</td></tr> </table>	Bit	Description	Bit 7 ... 4	Q value in fixed Q selection algorithm or starting Q value in dynamic Q selection algorithm, as defined EPC Class 1 Generation 2 protocol (0x0=0 ... 0xF=15)	Bit 3 ... 2	Session as defined in EPC Class 1 Generation 2 protocol (00b=S0, 01b=S1, 10b=S2, 11b=S3)	Bit 1	Q selection algorithm (0=dynamic, 1=fixed);	Bit 0	Target as defined in EPC Class 1 Generation 2 protocol (0=A, 1=B)								
Bit	Description																		
Bit 7 ... 4	Q value in fixed Q selection algorithm or starting Q value in dynamic Q selection algorithm, as defined EPC Class 1 Generation 2 protocol (0x0=0 ... 0xF=15)																		
Bit 3 ... 2	Session as defined in EPC Class 1 Generation 2 protocol (00b=S0, 01b=S1, 10b=S2, 11b=S3)																		
Bit 1	Q selection algorithm (0=dynamic, 1=fixed);																		
Bit 0	Target as defined in EPC Class 1 Generation 2 protocol (0=A, 1=B)																		
RF Maximum Allocation Time	<p>The maximum period of consecutive transmission on the same RF channel. 0 stands for default settings of the selected region. The allowed values are:</p> <ul style="list-style-type: none"> <li>Decimal 0 ... 99 for time in mseconds (0 ... 990 mseconds);</li> <li>Decimal 100 ... 199 for time in seconds (0 ... 99 seconds).</li> </ul>																		
RF Minimum Pause Time	<p>The minimum time between two consecutive transmission in the same RF channel. 0 stands for default settings of the selected region. The allowed values are:</p> <ul style="list-style-type: none"> <li>Decimal 0 ... 99 for time in mseconds (0 ... 990 mseconds);</li> <li>Decimal 100 ... 199 for time in seconds (0 ... 99 seconds).</li> </ul>																		

The parameters 1...7 fields with default values of page 0x04 are:

1	2	3	4	5	6	7
Inventory Mode	R->T Link Frequency	R->T Bit Coding	0x00	EPC Size	Use AFI	AFI
0x02	0x02	0x01	0x00	0x00	0x00	0x00

Where:

Parameter	Description												
Inventory Mode	A byte whose bits are dedicated to manage the inventory mode, the search mode and the ReadAfterDetect info activation parameters:												
	<table><tr><th>Bit</th><th>Description</th></tr><tr><td>Bit 7</td><td>Not used</td></tr><tr><td>Bit 6</td><td>Search mode (how the reader singulates tags in 'continuous' mode):<ul style="list-style-type: none"><li>0b: Dual Target (the reader singulates tags in both A and B states)</li><li>1b: Single Target (the reader singulates only tags that are in A state)</li></ul></td></tr><tr><td>Bit 5</td><td>Activation of the ReadAfterDetect with custom info as defined in ReadAfterDetect Password, Bank, Address, Length and EPC Info parameters (0b=OFF, 1b=ON)</td></tr><tr><td>Bit 4</td><td>Activation of the ReadAfterDetect with auto TID info (0b=OFF, 1b=ON)</td></tr><tr><td>Bit 3 ... 0</td><td>Inventory mode (how the reader does an inventory in 'continuous' mode):<ul style="list-style-type: none"><li>0x0: Fast Multi Tag: Inventory mode that does not take the tag to the Opened but to the Acknowledged state. This inventory mode is not as secure as the standard mode, but it is faster</li><li>0x1: Fast Single Tag: The same inventory mode like the Fast Multi Tag, but with the slot count of 1. This has the effect that no anticollision procedure is performed</li><li>0x2: Standard Multi Tag: Inventory mode like defined in the EPC C1G2 standard</li><li>0x4: Standard Single Tag: The same inventory mode like the Standard Multi Tag, but with the slot count of 1. This has the effect that no anticollision procedure is performed</li></ul></td></tr></table>	Bit	Description	Bit 7	Not used	Bit 6	Search mode (how the reader singulates tags in 'continuous' mode): <ul style="list-style-type: none"><li>0b: Dual Target (the reader singulates tags in both A and B states)</li><li>1b: Single Target (the reader singulates only tags that are in A state)</li></ul>	Bit 5	Activation of the ReadAfterDetect with custom info as defined in ReadAfterDetect Password, Bank, Address, Length and EPC Info parameters (0b=OFF, 1b=ON)	Bit 4	Activation of the ReadAfterDetect with auto TID info (0b=OFF, 1b=ON)	Bit 3 ... 0	Inventory mode (how the reader does an inventory in 'continuous' mode): <ul style="list-style-type: none"><li>0x0: Fast Multi Tag: Inventory mode that does not take the tag to the Opened but to the Acknowledged state. This inventory mode is not as secure as the standard mode, but it is faster</li><li>0x1: Fast Single Tag: The same inventory mode like the Fast Multi Tag, but with the slot count of 1. This has the effect that no anticollision procedure is performed</li><li>0x2: Standard Multi Tag: Inventory mode like defined in the EPC C1G2 standard</li><li>0x4: Standard Single Tag: The same inventory mode like the Standard Multi Tag, but with the slot count of 1. This has the effect that no anticollision procedure is performed</li></ul>
	Bit	Description											
	Bit 7	Not used											
	Bit 6	Search mode (how the reader singulates tags in 'continuous' mode): <ul style="list-style-type: none"><li>0b: Dual Target (the reader singulates tags in both A and B states)</li><li>1b: Single Target (the reader singulates only tags that are in A state)</li></ul>											
	Bit 5	Activation of the ReadAfterDetect with custom info as defined in ReadAfterDetect Password, Bank, Address, Length and EPC Info parameters (0b=OFF, 1b=ON)											
	Bit 4	Activation of the ReadAfterDetect with auto TID info (0b=OFF, 1b=ON)											
	Bit 3 ... 0	Inventory mode (how the reader does an inventory in 'continuous' mode): <ul style="list-style-type: none"><li>0x0: Fast Multi Tag: Inventory mode that does not take the tag to the Opened but to the Acknowledged state. This inventory mode is not as secure as the standard mode, but it is faster</li><li>0x1: Fast Single Tag: The same inventory mode like the Fast Multi Tag, but with the slot count of 1. This has the effect that no anticollision procedure is performed</li><li>0x2: Standard Multi Tag: Inventory mode like defined in the EPC C1G2 standard</li><li>0x4: Standard Single Tag: The same inventory mode like the Standard Multi Tag, but with the slot count of 1. This has the effect that no anticollision procedure is performed</li></ul>											
	 Note that allowed values are:												
	<table><tr><th>Inventory Mode</th><th>ReadAfterDetect with Custom Info</th><th>ReadAfterDetect with Auto TID</th><th>Search Mode</th></tr><tr><td>Fast Multi Tag, Fast Single Tag</td><td>Disabled</td><td>Disabled</td><td>Dual Target, Single Target</td></tr></table>	Inventory Mode	ReadAfterDetect with Custom Info	ReadAfterDetect with Auto TID	Search Mode	Fast Multi Tag, Fast Single Tag	Disabled	Disabled	Dual Target, Single Target				
Inventory Mode	ReadAfterDetect with Custom Info	ReadAfterDetect with Auto TID	Search Mode										
Fast Multi Tag, Fast Single Tag	Disabled	Disabled	Dual Target, Single Target										

Parameter	Description																		
	<table><tr><td>Standard Multi Tag, Standard Single Tag</td><td>Disabled</td><td>Disabled</td><td>Dual Target, Single Target</td></tr><tr><td>Standard Multi Tag, Standard Single Tag</td><td>Disabled</td><td>Enabled</td><td>Dual Target, Single Target</td></tr><tr><td>Standard Multi Tag, Standard Single Tag</td><td>Enabled</td><td>Disabled</td><td>Dual Target, Single Target</td></tr></table>	Standard Multi Tag, Standard Single Tag	Disabled	Disabled	Dual Target, Single Target	Standard Multi Tag, Standard Single Tag	Disabled	Enabled	Dual Target, Single Target	Standard Multi Tag, Standard Single Tag	Enabled	Disabled	Dual Target, Single Target						
Standard Multi Tag, Standard Single Tag	Disabled	Disabled	Dual Target, Single Target																
Standard Multi Tag, Standard Single Tag	Disabled	Enabled	Dual Target, Single Target																
Standard Multi Tag, Standard Single Tag	Enabled	Disabled	Dual Target, Single Target																
R->T Link Frequency	<p>R-&gt;T link frequency:</p> <ul style="list-style-type: none"><li>• 0x00: 40 kHz;</li><li>• 0x02: 160 kHz;</li><li>• 0x04: 256 kHz;</li><li>• 0x05: 320 kHz;</li><li>• 0x06: 640 kHz.</li></ul>																		
R->T Bit Coding	<p>R-&gt;T bit coding:</p> <ul style="list-style-type: none"><li>• 0x00: FM0;</li><li>• 0x01: Miller 2;</li><li>• 0x02: Milller 4;</li><li>• 0x03: Miller 8.</li></ul> <p> Note that allowed values are:</p> <table><tr><th>R-&gt;T Link Frequency</th><th>R-&gt;T Bit Coding</th></tr><tr><td>40 kHz</td><td>FM0, Miller 2, Miller 4, Miller 8</td></tr><tr><td>160 kHz</td><td>FM0, Miller 2, Miller 4, Miller 8</td></tr><tr><td>256 kHz</td><td>Miller 4, Miller 8</td></tr><tr><td>320 kHz</td><td>Miller 4, Miller 8</td></tr><tr><td>640 kHz</td><td>Miller 4, Miller 8</td></tr></table> <p> DRM (Dense Reader Mode):</p> <table><tr><th>R-&gt;T Link Frequency</th><th>R-&gt;T Bit Coding</th></tr><tr><td>256 kHz</td><td>Miller 4, Miller 8</td></tr><tr><td>320 kHz</td><td>Miller 4, Miller 8</td></tr></table>	R->T Link Frequency	R->T Bit Coding	40 kHz	FM0, Miller 2, Miller 4, Miller 8	160 kHz	FM0, Miller 2, Miller 4, Miller 8	256 kHz	Miller 4, Miller 8	320 kHz	Miller 4, Miller 8	640 kHz	Miller 4, Miller 8	R->T Link Frequency	R->T Bit Coding	256 kHz	Miller 4, Miller 8	320 kHz	Miller 4, Miller 8
R->T Link Frequency	R->T Bit Coding																		
40 kHz	FM0, Miller 2, Miller 4, Miller 8																		
160 kHz	FM0, Miller 2, Miller 4, Miller 8																		
256 kHz	Miller 4, Miller 8																		
320 kHz	Miller 4, Miller 8																		
640 kHz	Miller 4, Miller 8																		
R->T Link Frequency	R->T Bit Coding																		
256 kHz	Miller 4, Miller 8																		
320 kHz	Miller 4, Miller 8																		
EPC Size	The size of the recognized EPC in bytes. 0 means all EPC sizes.																		
Use AFI	To enable/disable the AFI (Application Family Identifier) management: <ul style="list-style-type: none"><li>• 0x00: Disabled;</li><li>• 0x01: Enabled.</li></ul>																		
AFI	The AFI (Application Family Identifier) value.																		

The parameters 1...14 fields with default values of page 0x82 are:

1	2	3	4	5	6	7
ReadAfterDetect Password0	ReadAfterDetect Password1	ReadAfterDetect Password2	ReadAfterDetect Password3	ReadAfterDetect Bank	ReadAfterDetect Address0	ReadAfterDetect Address1
0x00	0x00	0x00	0x00	0x00	0x00	0x00

8	9	10	11	12	13	14
ReadAfterDetect Address2	ReadAfterDetect Address3	ReadAfterDetect Length	ReadAfterDetect Info Flags	Q	Q Adjust Rounds	Inventory Cycles
0x00	0x00	0x00	0x03	0x05	0x03	0x03




Where:

Parameter	Description								
ReadAfterDetect Password0 ... ReadAfterDetect Password3	The password to be used to access to tag's memory in ReadAfterDetect mode. Use a '0' password if the access password is not requested.								
ReadAfterDetect Bank	The tag's memory bank to access in ReadAfterDetect mode: <ul style="list-style-type: none"> <li>• 0x00: Reserved;</li> <li>• 0x01: EPC;</li> <li>• 0x02: TID;</li> <li>• 0x03: User.</li> </ul>								
ReadAfterDetect Address0 ... ReadAfterDetect Address3	The tag's memory start address to access in the specified memory bank in ReadAfterDetect mode.								
ReadAfterDetect Length	The number of tag's memory blocks (2-bytes length) to access in the specified memory bank in ReadAfterDetect mode. In case of Reserved or User bank selected, 0 means no tag's memory block access; in case of TID bank selected, 0 means auto-length (class identifier, manufacturer identifier, serial number).								
ReadAfterDetect Info Flags	The tag's info (PC, EPC, CRC) to include in the tag's ID in ReadAfterDetect mode. A byte whose bits are dedicated to disable (0 value) or enable (1 value) functions: <table border="1"> <thead> <tr> <th>Bit</th><th>Description</th></tr> </thead> <tbody> <tr> <td>Bit 7</td><td>Not used</td></tr> <tr> <td>Bit 6</td><td>Not used</td></tr> <tr> <td>Bit 5</td><td>Not used</td></tr> </tbody> </table>	Bit	Description	Bit 7	Not used	Bit 6	Not used	Bit 5	Not used
Bit	Description								
Bit 7	Not used								
Bit 6	Not used								
Bit 5	Not used								

Parameter	Description
	Bit 4 Not used
	Bit 3 Not used
	Bit 2 CRC field
	Bit 1 EPC field
	Bit 0 PC field
Q	Minimum and maximum Q value to be used in dynamic Q selection algorithm: <ul style="list-style-type: none"> <li>High nibble: minimum Q value (0x0 ... 0xF);</li> <li>Low nibble: maximum Q value (0x0 ... 0xF).</li> </ul>
Q Adjust Rounds	Maximum Q adjust rounds in dynamic Q selection algorithm.
Inventory Cycles	The inventory cycles in inventory command.

### 3.2.9 Dynamic RF Transmit Power

This section provides details on the configurable dynamic RF transmit power management parameters of the **BLUEBOX**

Parametro	+	Range	Default
Mode	How the reader manages the power in 'continuous' mode.  Note that this parameter become effective only after a reboot of the reader.	Off Up Up/down	Off
Power Step	The power step in dynamic power management mode activated.  Note that this parameter become effective only after a reboot of the reader.	1 ... 5 dB 10 ... 500 mW	1 dB
Time Step	The time step in dynamic power management mode activated.  Note that this parameter become effective only after a reboot of the reader.	0.1 ... 9.9 seconds	1.0 sec

The dynamic RF transmit power management parameters are stored in configuration page nr. 0x07 and are managed through the 'Read RAM/ROM Configuration Parameters' and 'Write RAM/ROM Configuration Parameters' commands as described in protocol technical manuals where the parameters 1...7 fields with default values are:

**1**
**2**
**3**
**4**
**5**
**6**
**7**

Mode	Power Step	Time Step	0x00	0x00	0x00	0x00
0x00	0x01	0x0A	0x00	0x00	0x00	0x00

Where:

Parameter	Description
Mode	Dynamic power management activation / deactivation in 'continuous' mode: <ul style="list-style-type: none"> <li>0x00: Off;</li> <li>0x01: Up, only increase power by power step every time step;</li> <li>0x02: Up / Down, increase power and then decrease it by power step every time step.</li> </ul>
Power Step	Power step: <ul style="list-style-type: none"> <li>0x01 ... 0x05 for power step in dB (1 ... 5 dB);</li> <li>0x81 ... 0xB2 for power step in mW x 10 (10 ... 500 mW).</li> </ul>
Time Step	Time step: <ul style="list-style-type: none"> <li>Decimal 1 ... 99 for time in ms x 100 (0.1 ... 9.9 seconds).</li> </ul>

### 3.2.10 RF Antenna Tuning

This section provides details on the configurable RF antenna tuning management parameters of the **BLUEBOX**

Parameter	Description	Range	Default
Max Tune Steps	The maximum runtime RF antenna tune steps. 0 to disable the runtime RF antenna tuning.	0 ... 250	15
Max Tune Frequency Hops	The maximum RF frequency hops on the same RF frequency before RF antenna tuning.	0 ... 250	15
Min Tune Frequency Hops	The minimum RF frequency hops on different RF frequency after RF antenna tuning.	0 ... 250	15
Tune Hysteresis Index	The runtime RF antenna tune hysteresis index of measured reflected power.	10% ... 50%	30%

The RF antenna tuning parameters are stored in configuration page nr. 0x0D and are managed through the 'Read RAM/ROM Configuration Parameters' and 'Write RAM/ROM Configuration Parameters' commands as described in protocol technical manuals where the parameters 1...7 fields with default values are:

1	2	3	4	5	6	7
---	---	---	---	---	---	---



Max Tune Steps	Max Tune Frequency Hops	Min Tune Frequency Hops	Tune Hysteresis Index	0x00	0x00	0x00
<b>0x64</b>	<b>0x0F</b>	<b>0x0F</b>	<b>0x1E</b>	<b>0x00</b>	<b>0x00</b>	<b>0x00</b>

Where:

Parameter	Description
Max Tune Steps	The maximum runtime RF antenna tune steps. 0 to disable the runtime RF antenna tuning.
Max Tune Frequency Hops	The maximum RF frequency hops on the same RF frequency before RF antenna tuning.
Min Tune Frequency Hops	The minimum RF frequency hops on different RF frequency after RF antenna tuning.
Tune Hysteresis Index	The runtime RF antenna tune hysteresis index of measured reflected power.

### 3.3 Device Status

The information about the current status of the **BLUEBOX** shall be read with the 'Read Device Status' command as described in protocol technical manuals where the status bytes 1 and 2 have the following meaning.

Status Byte	Description																		
Status Byte 1	Byte whose bits have the following meaning: <table> <tr> <th>Bit</th><th>Description</th></tr> <tr> <td>Bit 7</td><td>Not used</td></tr> <tr> <td>Bit 6</td><td>Not used</td></tr> <tr> <td>Bit 5</td><td>RF status (0=off, 1=on)</td></tr> <tr> <td>Bit 4</td><td>'Continuous' mode (1=enabled)</td></tr> <tr> <td>Bit 3</td><td>Not used</td></tr> <tr> <td>Bit 2</td><td>Not used</td></tr> <tr> <td>Bit 1</td><td>Output 2 status (1=activated)</td></tr> <tr> <td>Bit 0</td><td>Output 1 status (1=activated)</td></tr> </table>	Bit	Description	Bit 7	Not used	Bit 6	Not used	Bit 5	RF status (0=off, 1=on)	Bit 4	'Continuous' mode (1=enabled)	Bit 3	Not used	Bit 2	Not used	Bit 1	Output 2 status (1=activated)	Bit 0	Output 1 status (1=activated)
Bit	Description																		
Bit 7	Not used																		
Bit 6	Not used																		
Bit 5	RF status (0=off, 1=on)																		
Bit 4	'Continuous' mode (1=enabled)																		
Bit 3	Not used																		
Bit 2	Not used																		
Bit 1	Output 2 status (1=activated)																		
Bit 0	Output 1 status (1=activated)																		
Status Byte 2	Byte whose bits have the following meaning:																		

Status Byte	Description	
	<b>Bit</b>	<b>Description</b>
	Bit 7	Dip switch SW1-4 (1=closed)
	Bit 6	Dip switch SW1-3 (1=closed)
	Bit 5	Dip switch SW1-2 (1=closed)
	Bit 4	Dip switch SW1-1 (1=closed)
	Bit 3	Not used
	Bit 2	Not used
	Bit 1	Input 2 status (1=activated)
	Bit 0	Input 1 status (1=activated)

## 4 Device Startup

During the startup phase, it is possible to configure through the serial line (if available) the communication parameters of the **BLUEBOX** sending the following message (with the default communication settings 19200, n, 8, 1):

**STX '2' 'F' <addn h> <addn l> <bdr> <bit> <stop> <par> ETX <bcc> CR**

Where:

STX	Start of Text (0x02)
'2' 'F'	Command code.
<add h> <add l>	New address to be set. ASCII encoded byte.
<bdr>	Serial interface baud rate. ASCII character: <ul style="list-style-type: none"> <li>'0' -&gt; 1200 bps;</li> <li>'1' -&gt; 2400 bps;</li> <li>'2' -&gt; 4800 bps;</li> <li>'3' -&gt; 9600 bps;</li> <li>'4' -&gt; 19200 bps;</li> <li>'5' -&gt; 38400 bps;</li> <li>'6' -&gt; 57600 bps;</li> <li>'7' -&gt; 115200 bps.</li> </ul>
<bit>	Serial interface data bits. ASCII character: <ul style="list-style-type: none"> <li>'7' -&gt; 7 bits;</li> <li>'8' -&gt; 8 bits.</li> </ul>
<stop>	Serial interface stop bits. ASCII character: <ul style="list-style-type: none"> <li>'1' -&gt; 1 bit;</li> <li>'2' -&gt; 2 bits.</li> </ul>
<par>	Serial interface parity. ASCII character: <ul style="list-style-type: none"> <li>'0' -&gt; None;</li> <li>'1' -&gt; Even;</li> <li>'2' -&gt; Odd.</li> </ul>
ETX	End of Text (0x03)
<bcc>	Block check character or checksum calculated as 'xor' of the previous characters starting from STX applying the following rule: if <bcc> = STX or <bcc> = CR, then <bcc> := <bcc>+1 (increment of 1).

CR

Carriage Return (0x0D)

If the **BLUEBOX** is able to execute the command, it answers with:

**STX '2' 'F' '0' '0' <bcc> CR**

Where:

STX	Start of Text (0x02)
'2' 'F'	Command code.
'0' '0'	Status code.
<bcc>	Block check character or checksum calculated as 'xor' of the previous characters starting from STX applying the following rule: if <bcc> = STX or <bcc> = CR, then <bcc> := <bcc>+1 (increment of 1).
CR	Carriage Return (0x0D)

The 'BLUEBOX Serial Config' program is provided to explicate these operations.

## 5 'BLUEBOX Serial Config' Software

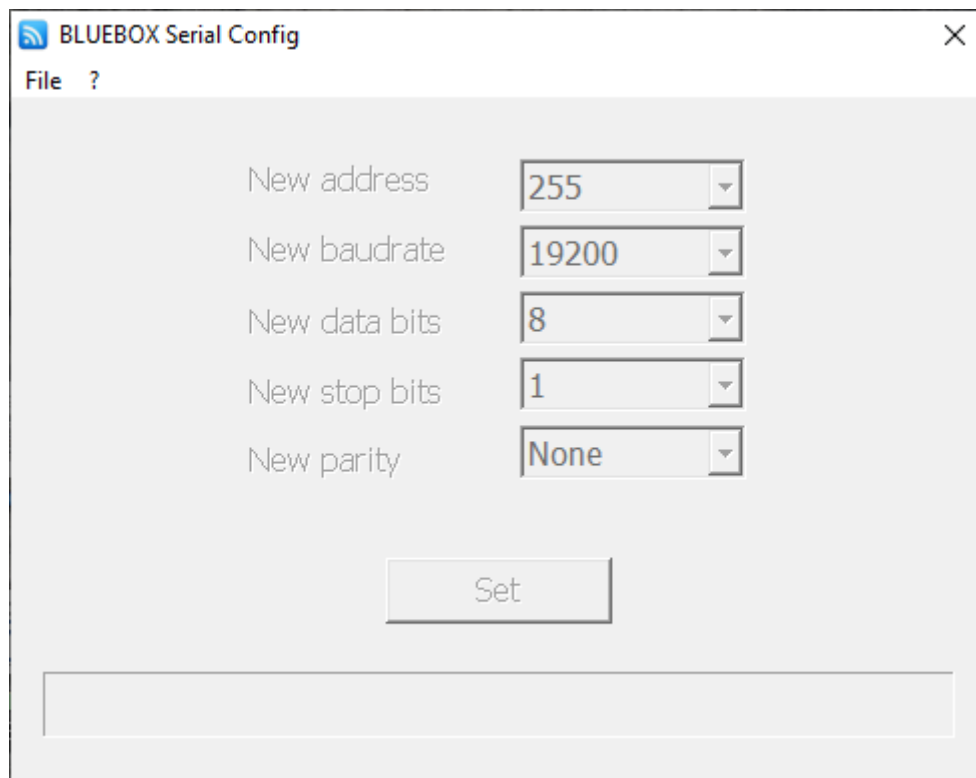
This section provides details on the 'BLUEBOX Serial Config' software.

### 5.1 Software Startup

Double click on the 'BLUEBOX Serial Config' icon to start the software.



At software startup the following screenshot is shown

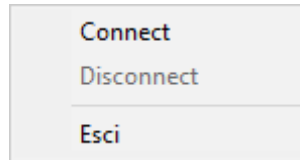


### 5.2 Menu

At the top of the software there is the menu bar.

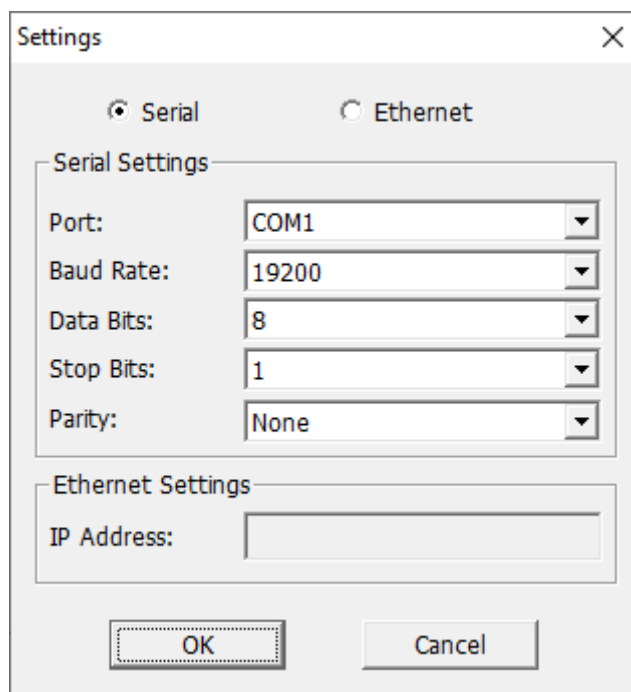


### 5.2.1 File Menu



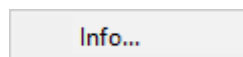
The File menu allows to select one of the following operations:

- Connect: to open the connection with the reader.



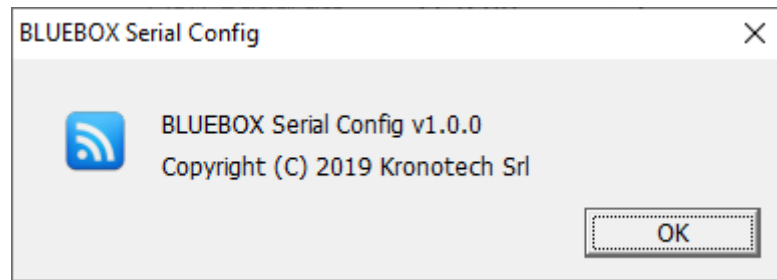
- Disconnect: to close the connection with the reader.
- Exit: to close the software.

### 5.2.2 Info Menu



The Info menu allows to select one of the following operations:

- About: to show the software info.



### 5.3 Software Usage

To set the communication parameters of the reader, first open the connection with the reader, then select the address to set from 0 to 255 and the serial settings and then click the Set button and power on the reader. A progress bar shows the communication progress. At the end a message box shows the status of the operation.

## 6 Installation

### 6.1 General Instructions

- Several devices installed next to each other interfere if they are not correctly configured.
- When mounting several nearby adhere to the minimum distances between them.
- Installing a device in or on metal reduces the read and write distance.
- Keep the device away from direct sunlight, high humidity, extreme temperatures, and sources of electromagnetic interference. Any combination of these conditions might degrade performance or shorten the life of the device.
- Connect the device using a suitable cable as defined in electrical connections section.
- Power the device using a suitable external power supply as defined in electrical connections section. The boot sequence begins in either case when power is supplied to the device. This sequence typically completes within 60 seconds. After the boot sequence finishes, the device accepts commands, not before. The LED on the device alerts you to the status as defined in status indications section.

### 6.2 Notes on Tag Mounting

- For installation in and on metal tags provided for this purpose must be used.
- The tag must be placed in the reading area of the device antenna. The angle of aperture and the operating distance must be adhered to.
- The orientation of the device antenna axis must correspond with the axis of the tag for best performance.

### 6.3 Avoiding Interference

The device usually operates without any interference caused by radio communication if it is



- use as intended;
- correctly installed.



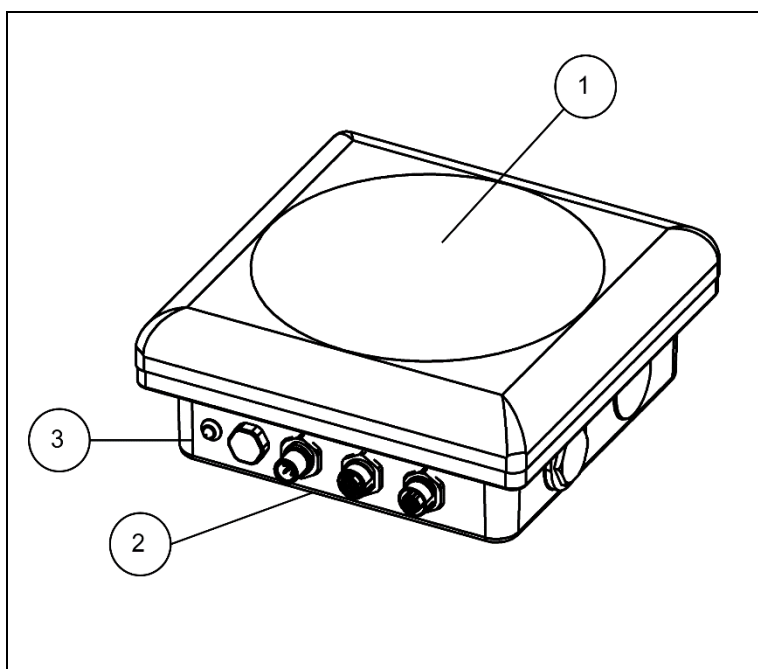
The operation free of radio disturbance cannot be guaranteed for each application.

If the device causes radio disturbance in an application, the following instructions will help:

- Realign the receiving antenna.
- Change the position of the antenna.
- Increase the distance between the device and the antenna.
- Change the power supply of the device.
- Contact the support of the manufacturer.

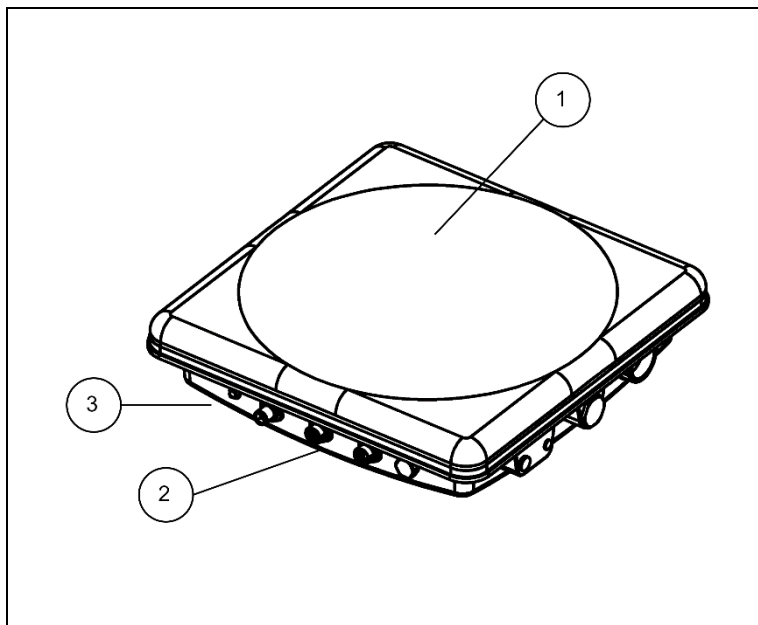
## 6.4 Mechanical Design

### 6.4.1 Mechanical Design 542yU-c-opt1-rrr



1. Sensing face (antenna)
2. Electrical connections
3. Status indications

### 6.4.2 Mechanical Design 552yU-c-opt1-rrr

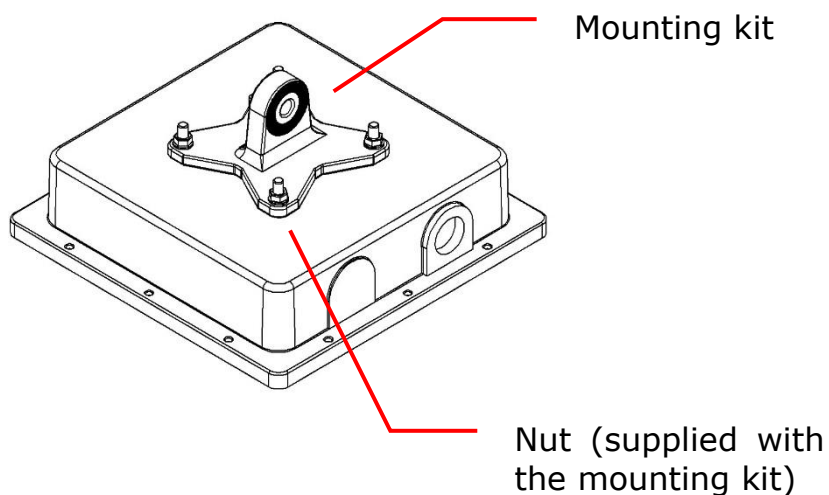


- 1. Sensing face (antenna)
- 2. Electrical connections
- 3. Status indications

## 6.5 Fixing

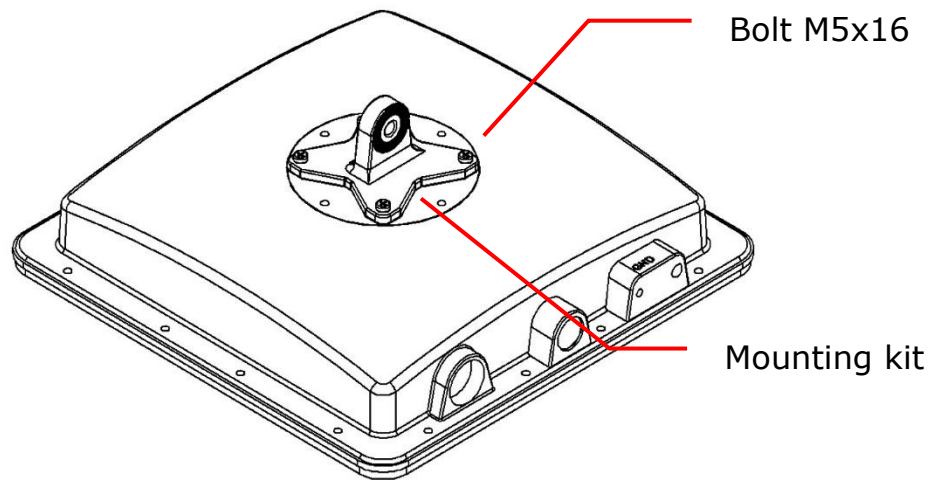
### 6.5.1 Fixing 542y-c-opt1-rrr

Fix the enclosure to a support (wall, column, ..) using the 4 screws on the bottom of the enclosure with M5 nuts. A mounting kit (9924U) is also available.



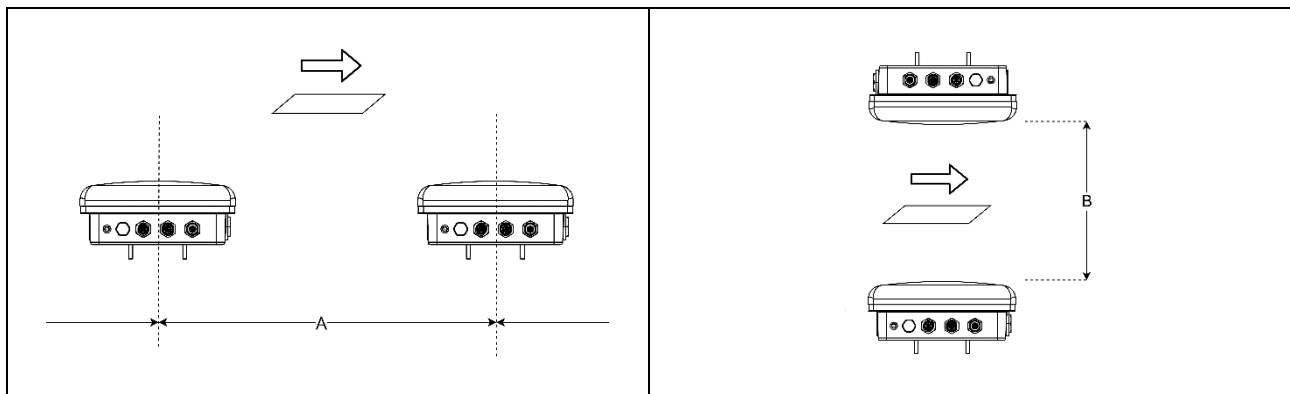
### 6.5.2 Fixing 552y-c-opt1-rrr

Fix the enclosure to a support (wall, column, ..) using the 4 screws on the bottom of the enclosure with with M5x16 bolts. A mounting kit (9924U) is also available.



## 6.6 Mounting Distances

### 6.6.1 Mounting Distances 542y-opt1-rrr



#### Operating Mode

#### Distance Side (A)

#### Distance Front (B)

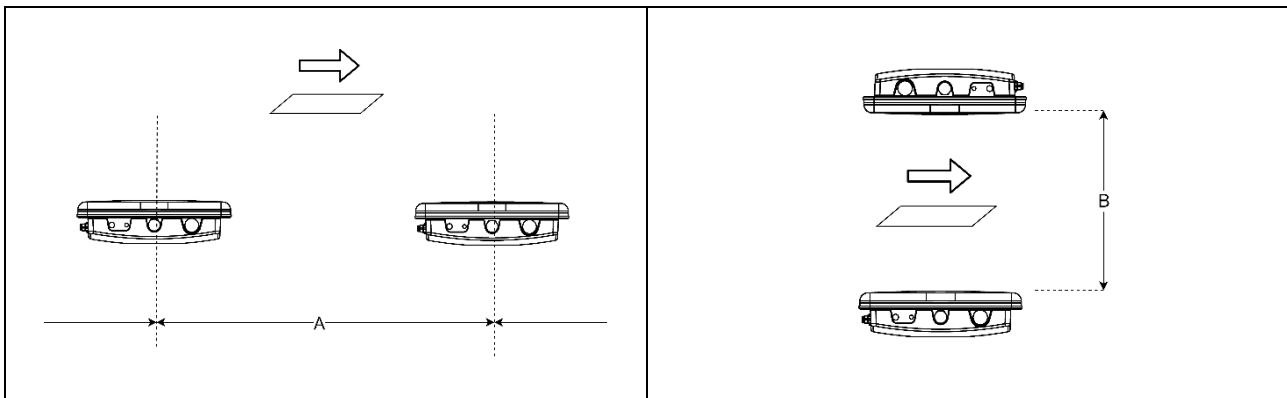
Reading and writing at  
100% transmitter power  
(simultaneous operation)

> 6.0mt

> 10.0mt

Operating Mode	Distance Side (A)	Distance Front (B)
Reading and writing at 100% transmitter power (alternating operation)	> 1.0mt	> 1.0mt

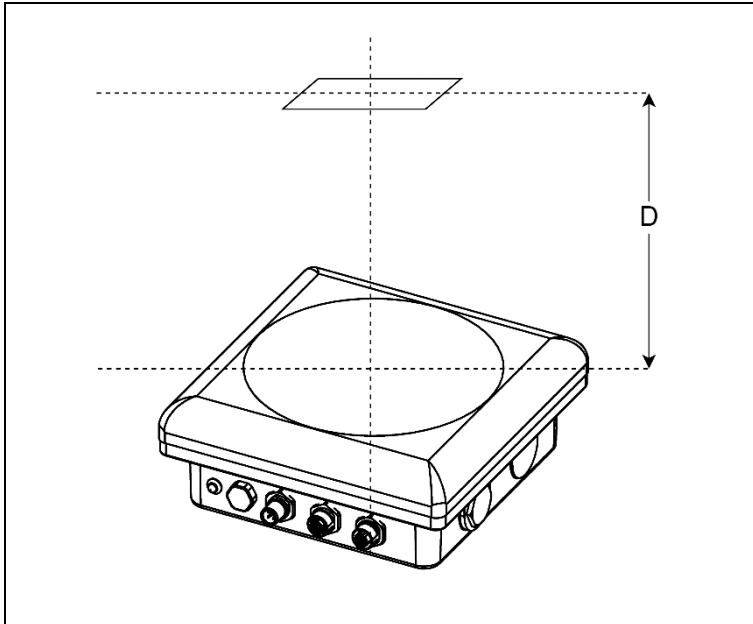
### 6.6.2 Mounting Distances 552y-opt1-rrr



Operating Mode	Distance Side (A)	Distance Front (B)
Reading and writing at 100% transmitter power (simultaneous operation)	> 10.0mt	> 18.0mt
Reading and writing at 100% transmitter power (alternating operation)	> 1.0mt	> 1.0mt

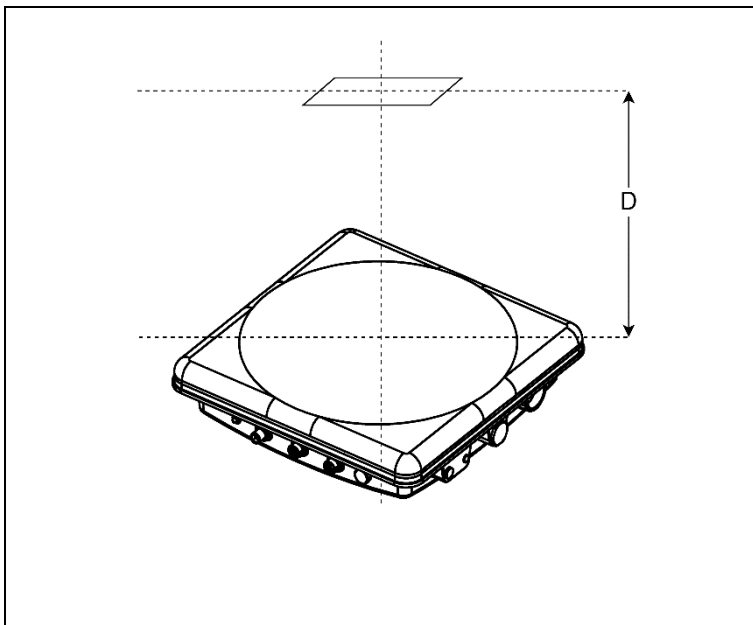
## 6.7 Positioning of the Tags

### 6.7.1 Positioning of the Tags 542y-opt1-rrr



- Align the tag on the antenna central axis.
- See the tag datasheet for the distance D.

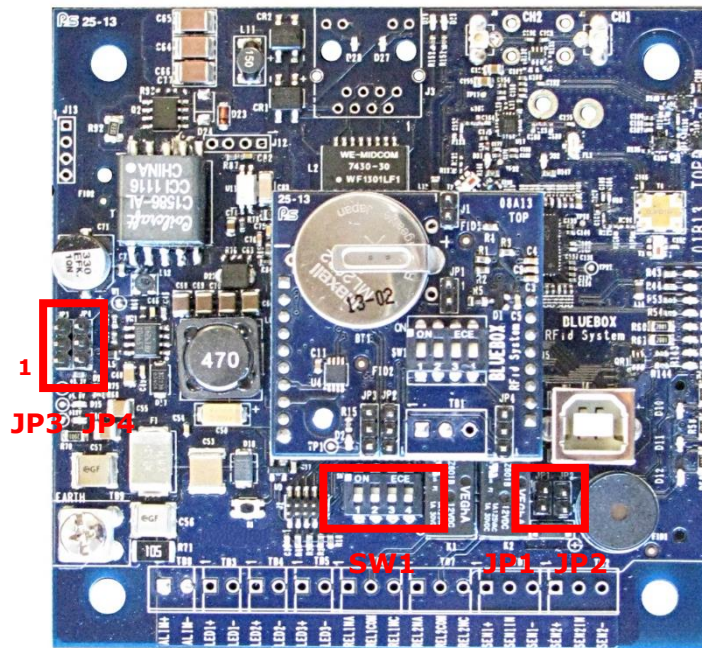
### 6.7.2 Positioning of the Tags 552y-opt1-rrr



- Align the tag on the antenna central axis.
- See the tag datasheet for the distance D.

## 7 Hardware Settings

### 7.1 Main Board



#### SW1

<b>Dip 1</b>	On: force 255, 19200, 8, n, 1.
<b>Dip 2</b>	On: enables 'spontaneous' mode (see spontaneous configuration).
<b>Dip 3</b>	Not used.
<b>Dip 4</b>	Not used.

#### JP1

<b>Open</b>	Positive reference of inputs 1 and 2 not internally connected.
<b>Close</b>	Positive reference of inputs 1 and 2 internally connected to +PWR.

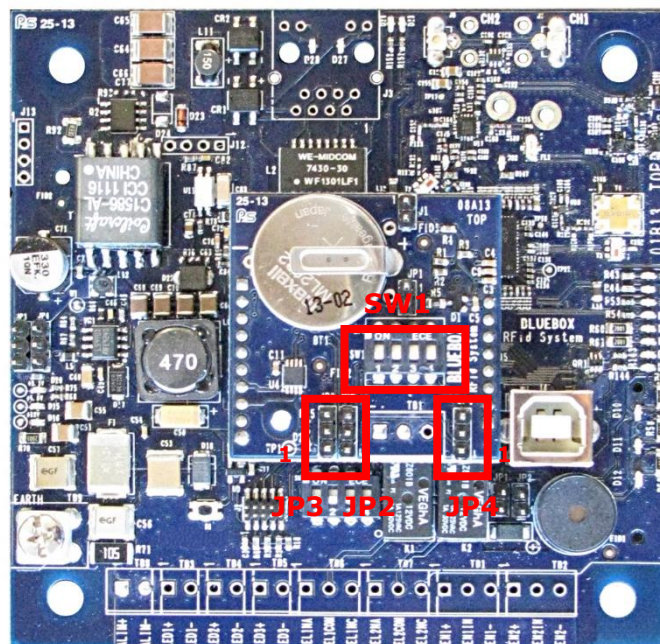
#### JP2

<b>Open</b>	Negative reference of inputs 1 and 2 not internally connected.
<b>Close</b>	Negative reference of inputs 1 and 2 internally connected to -PWR.

### JP3 and JP4

<b>1-2</b>	External power supply.
<b>2-3</b>	Power over Ethernet (PoE) IEEE 802.3af.

## 7.2 Serial Interface Board



### SW1

<b>Dip 1</b>	On: RS485 fail-safe resistor connected to +5V.
<b>Dip 2</b>	On: RS485 fail-safe resistor connected to GND.
<b>Dip 3</b>	On: RS485 120Ω line termination resistor connected.
<b>Dip 4</b>	Not used.

### JP2, JP3 and JP4

**1-2**

RS232 interface.

**2-3**

RS485 interface.



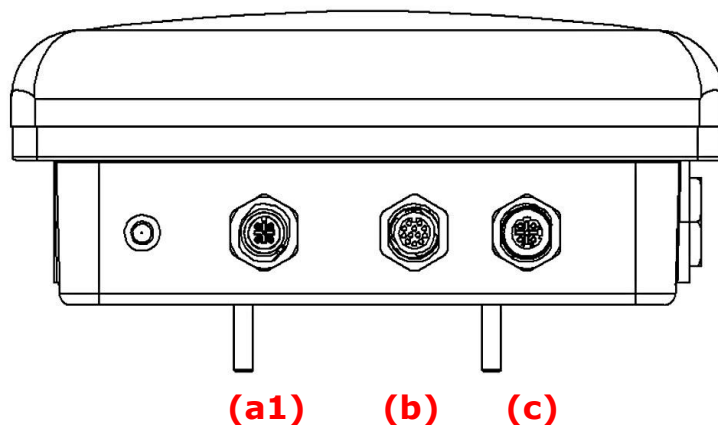
## 8 Electrical Connections



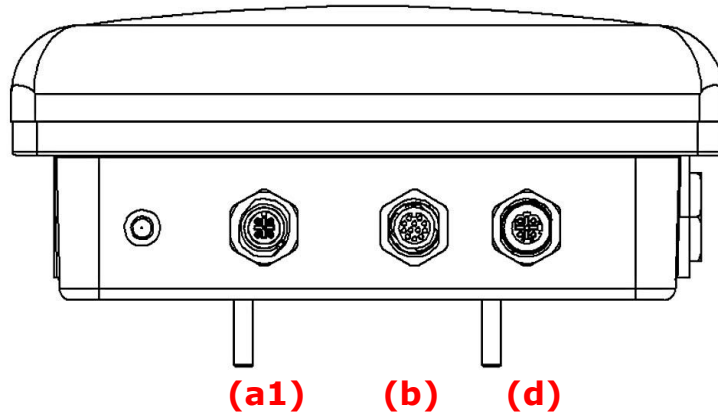
- The device must be connected by a skilled qualified person.
- Device of protection class III.
- Electric supply via SELV circuits only.
- Disconnect power before connecting the device.
- The IP rating indicated in the data sheet is only guaranteed if the M12 connectors are firmly screwed.
- The device can be damaged by insufficiently tightened M12 connectors.
- Screw the M12 connector to the device applying 1 to 1.5 Nm.

### 8.1 Wiring

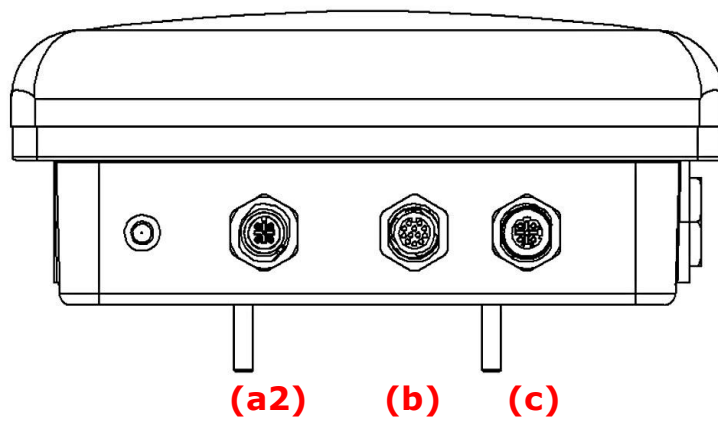
#### 8.1.1 Wiring 5426U-c-opt1-rrr



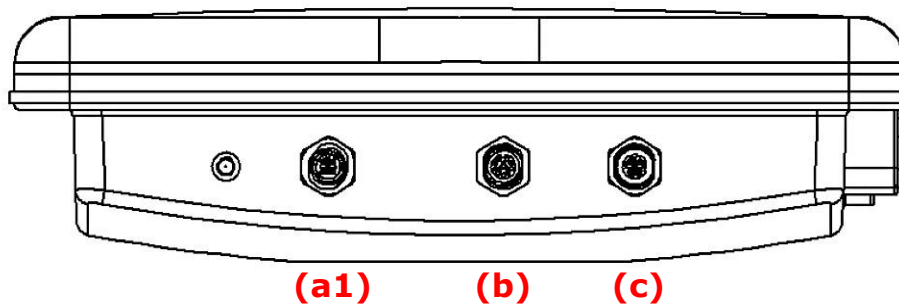
### 8.1.2 Wiring 5427U-c-rrr



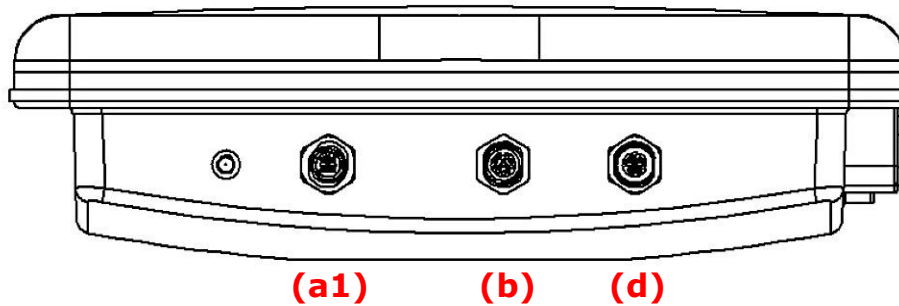
### 8.1.3 Wiring 5428U-c-opt1-rrr



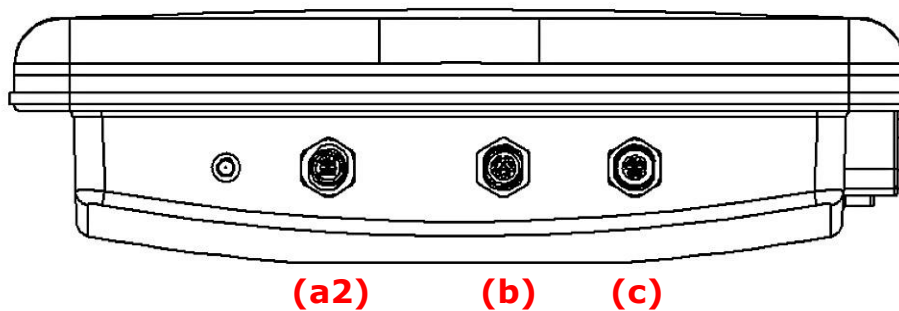
### 8.1.4 Wiring 5526U-c-opt1-rrr



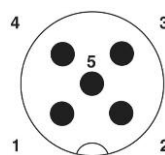
### 8.1.5 Wiring 5527U-c-rrr



### 8.1.6 Wiring 5528U-c-opt1-rrr



## 8.2 Power Supply and Serial Line Connection (a1)



5-poles M12 A-coded male connector

Pin	No	Min	Typical	Max	Description
+ PWR	1	10Vdc	12/24Vdc	36Vdc	DC power supply
RS232-TXD RS485-RT+	2				RS232 connection (to host) RS485 connection (positive)
- PWR	3				DC power supply return path

Pin	No	Min	Typical	Max	Description
RS232- RXD RS485-RT-	4				RS232 connection (from host) RS485 connection (negative)
PE	5				Protected Earth



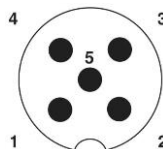
To ensure interference-free operation, the device must be connected to an earth potential free from external voltage.

Hereinafter a cross reference table between connection pin number and the color of the wires of a standard open ended cable.

Pin	No	Wire Cable Color
+ PWR	1	Brown
RS232- TXD RS485- RT+	2	White
- PWR	3	Blue
RS232- RXD RS485-RT-	4	Black
PE	5	Grey

The shield of the cable should be left unconnected.

### 8.3 Power Supply and CAN Bus Connection (a2)



5-poles M12 A-coded male connector

Pin	No	Min	Typical	Max	Description
PE	1				Protected Earth

Pin	No	Min	Typical	Max	Description
+ PWR	2	10Vdc	12/24Vdc	36Vdc	DC power supply
- PWR	3				DC power supply return path
CAN H	4				CAN bus connection (CAN H)
CAN L	5				CAN connection (CAN L)



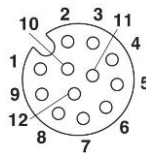
To ensure interference-free operation, the device must be connected to an earth potential free from external voltage.

Hereinafter a cross reference table between connection pin number and the color of the wires of a standard open ended cable.

Pin	No	Wire Cable Color
PE	1	Brown
+ PWR	2	White
- PWR	3	Blue
CAN H	4	Black
CAN L	5	Grey

The shield of the cable should be left unconnected.

#### 8.4 Input / Output Connection (b)



12-poles M2 A-coded female connector

Pin	No	Min	Typical	Max	Description
IN1 +	1				Input 1 connection, positive reference
IN1	2		12Vdc/24Vdc (10mA/20mA)		Input 1 connection

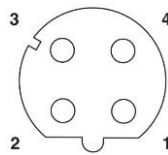
Pin	No	Min	Typical	Max	Description
IN2 +	3				Input 2 connection, positive reference (same as input 1)
IN2	4		12Vdc/24Vdc (10mA/20mA)		Input 2 connection
OUT1 NO	5			1A@30Vdc	Relay 1 NO contact connection
OUT1 COM	6				Relay 1 COM contact connection
OUT2 NO	7			1A@30Vdc	Relay 2 NO contact connection
OUT2 COM	8				Relay 2 COM contact connection
OUT2 NC	9			1A@30Vdc	Relay 2 NC contact connection
IN1 -	10				Input 1 connection, negative reference
IN2 -	11				Input 2 connection, negative reference (same as input 1)
OUT1 NC	12			1A@30Vdc	Relay 1 NC contact connection

Hereinafter a cross reference table between connection pin number and the color of the wires of a standard open ended cable.

Pin	No	Color
IN1 +	1	Brown
IN1	2	Blue
IN2 +	3	White
IN2	4	Green
OUT1 NO	5	Pink
OUT1 COM	6	Yellow
OUT2 NO	7	Black
OUT2 COM	8	Grey
OUT2 NC	9	Red
IN1 -	10	Purple

Pin	No	Color
IN2 -	11	Grey/Pink
OUT1 NC	12	Red/Blue

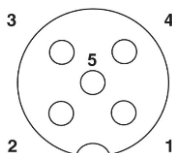
## 8.5 Ethernet Interface Connection (c)



4-poles M12 D-coded female connector

Pin	No	Min	Typical	Max	Description
TX+	1				Transmit data + / DC Power -
RX+	2				Receive data + / DC Power +
TX-	3				Transmit data - / DC Power -
RX-	4				Receive data - / DC Power +

## 8.6 Data Bus Interface Connection (d)



5-poles M12 A-coded female connector

Pin	No	Min	Typical	Max	Description
+PWR	1	4.75Vdc	5Vdc	5.25Vdc	DC power supply
N.C.	2				Not connected
-PWR	3				DC power supply return path
DATA-0	4				Wiegand interface DATA-0 line
DATA-1	5				Wiegand interface DATA-1 line

Hereinafter a cross reference table between connection pin number and the color of the wires of a standard open ended cable.

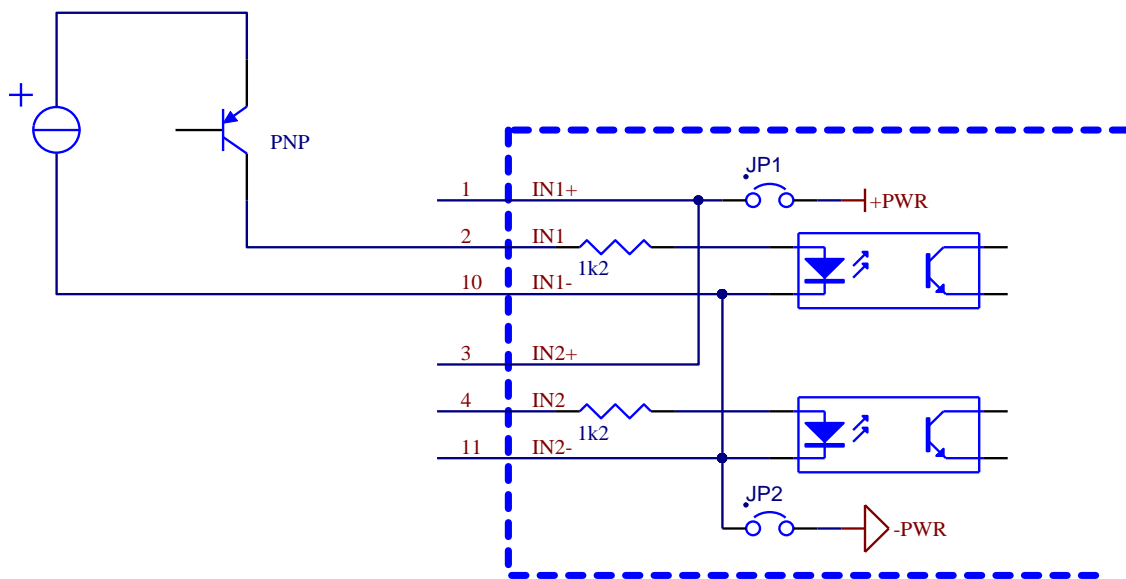
Pin	No	Wire Cable Color
+PWR	1	Brown
N.C.	2	White
-PWR	3	Blue
DATA-0	4	Black
DATA-1	5	Grey



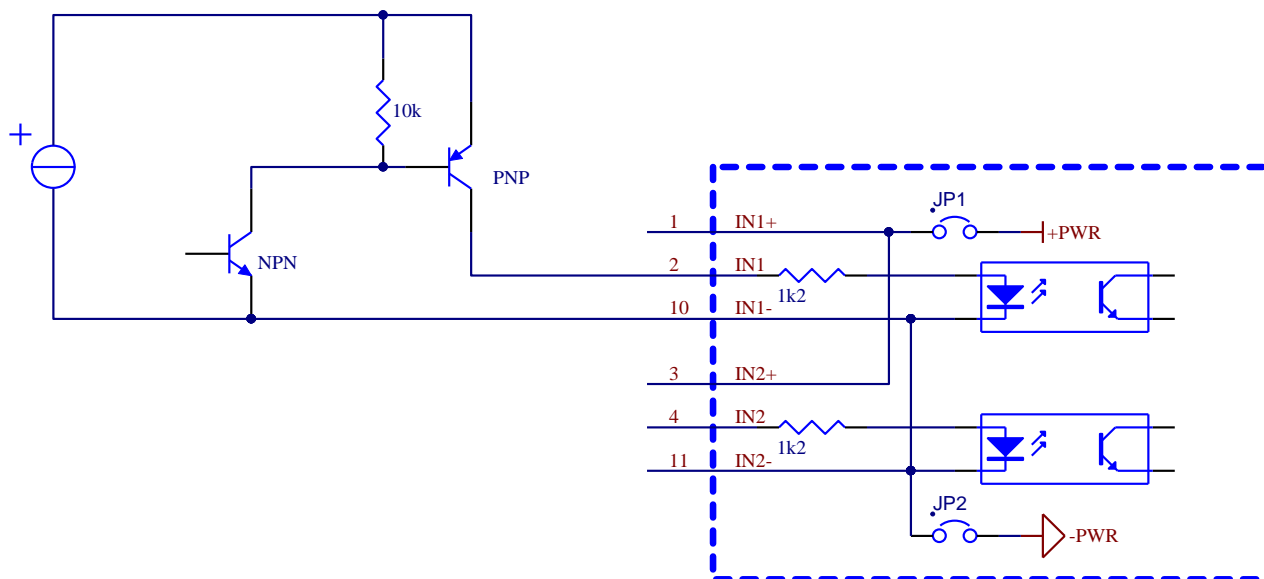
## 9 Wiring Examples

This section provides details on the I/O wiring of the **BLUEBOX**.

A PNP output connected to the **BLUEBOX** digital input 1:






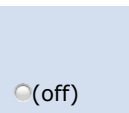
An NPN output connected to the **BLUEBOX** digital input 1:



## 10 Status Indications

The **BLUEBOX** uses one LED. The following tables provides the indicator states and flash rates.

LED State	Description
On	The indicator is constantly on
Off	The indicator is constantly off
Blinking	The indicator turns on and off with a frequency of 2 Hz: on for 250 ms, followed by off for 250 ms
Slow Blink	The indicator turns on and off with a frequency of 1 Hz: on for 500 ms, followed by off for 500 ms

LED	Color	State	Meaning
<b>SYSTEM</b>	 (yellow)	Blinking	<ul style="list-style-type: none"> <li>Antenna active, no tag detected in 'continuous' mode.</li> </ul>
	 (yellow)	Slow Blink	<ul style="list-style-type: none"> <li>Antenna not active in 'continuous' mode.</li> </ul>
	 (yellow)	On	<ul style="list-style-type: none"> <li>Antenna active, tag detected in 'continuous' mode.</li> <li>System initialization.</li> </ul>
	 (off)	Off	<ul style="list-style-type: none"> <li>Power supply for the device is missing.</li> <li>Hardware defect.</li> <li>System upgrade.</li> </ul>

### Buzzer:

- The buzzer is activated for 0.5 seconds at the end of the initialization phase in case of no hardware defects detected, otherwise 3 short beeps (0.25 seconds) shall signal an hardware defect.
- During normal operation, if the 'automatic' management of the buzzer is enabled by the flag defined in the general parameters, the buzzer is activated for 0.5 seconds at every identification of a 'new' tag.

- During normal operation, if the RF test mode is enabled, the buzzer is activated for 50ms at every identification of a tag.
- During firmware upgrade procedure, the buzzer is activated for 0.25 seconds at the end of the file download in case of no file errors detected, otherwise 5 short beeps (0.15 seconds) shall signal an error

## 11 Antenna

The **BLUEBOX** is available with internal antenna directly integrated on the device cover.

The read range of an RFID system always depends on various factors like antenna size, transponder size, transponder IC type, orientation between transponder and reader antenna, position of the transponder versus the reader antenna, noise environment, metallic environment, etc. Therefore all data about read ranges can only be typical values measured under laboratory conditions. In real live applications the read range may differ from the data mentioned in the datasheet.

## **12 Maintenance, Repair and Disposal**

If used correctly, no maintenance and repair measures are necessary

- The device must only be repaired by the manufacturer.
- After use dispose of the device in an environmentally friendly way in accordance with the applicable national regulations.
- Keep the device free from soiling.
- Do not open the device.

## 13 Regulatory Compliance

This section gives information on the **BLUEBOX** regulatory compliance.

### 13.1 CE Compliance

The **BLUEBOX** is in conformity with the relevant Union harmonisation legislation:

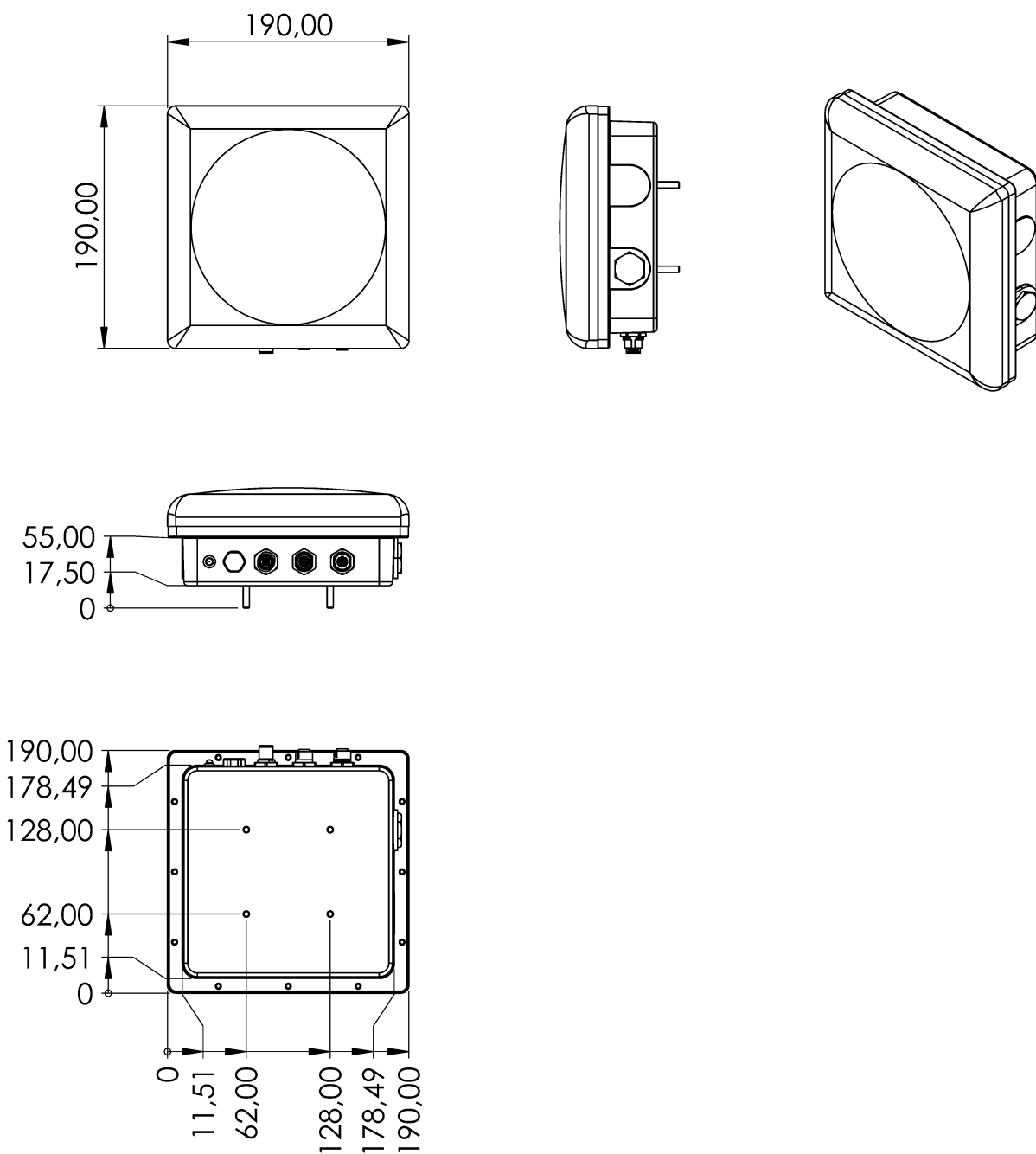
- **2014/53/EU** relating to the making available on the market of radio equipment
- **2014/30/EU** relating to electromagnetic compatibility
- **1999/519/EMC** on the limitation of exposure of the general public to electromagnetic fields

References to the relevant harmonised standards used or references to the other technical specifications in relation to which conformity is declared:

- Safety of Information Technology Equipment
  - EN 62368-1:2014 + AC:2015
- Limitation of human exposure to electromagnetic fields from devices operating in the frequency range 0 Hz to 300 GHz, used in Electronic Article Surveillance (EAS), Radio Frequency Identification (RFID) and similar applications
  - EN 50364:2010
- Electromagnetic Compatibility standard for radio equipment and services
  - EN 301 489-1 V1.9.2
  - EN 301 489-3 V1.6.1
- Radio Frequency Identification Equipment operating in the band 865 MHz to 868 MHz with power levels up to 2 W and in the band 915 MHz to 921 MHz with power levels up to 4 W
  - EN 302 208 V3.1.1
- Degrees of protection provided by enclosures (IP Code)
  - EN 60529:1992 + A2:2013

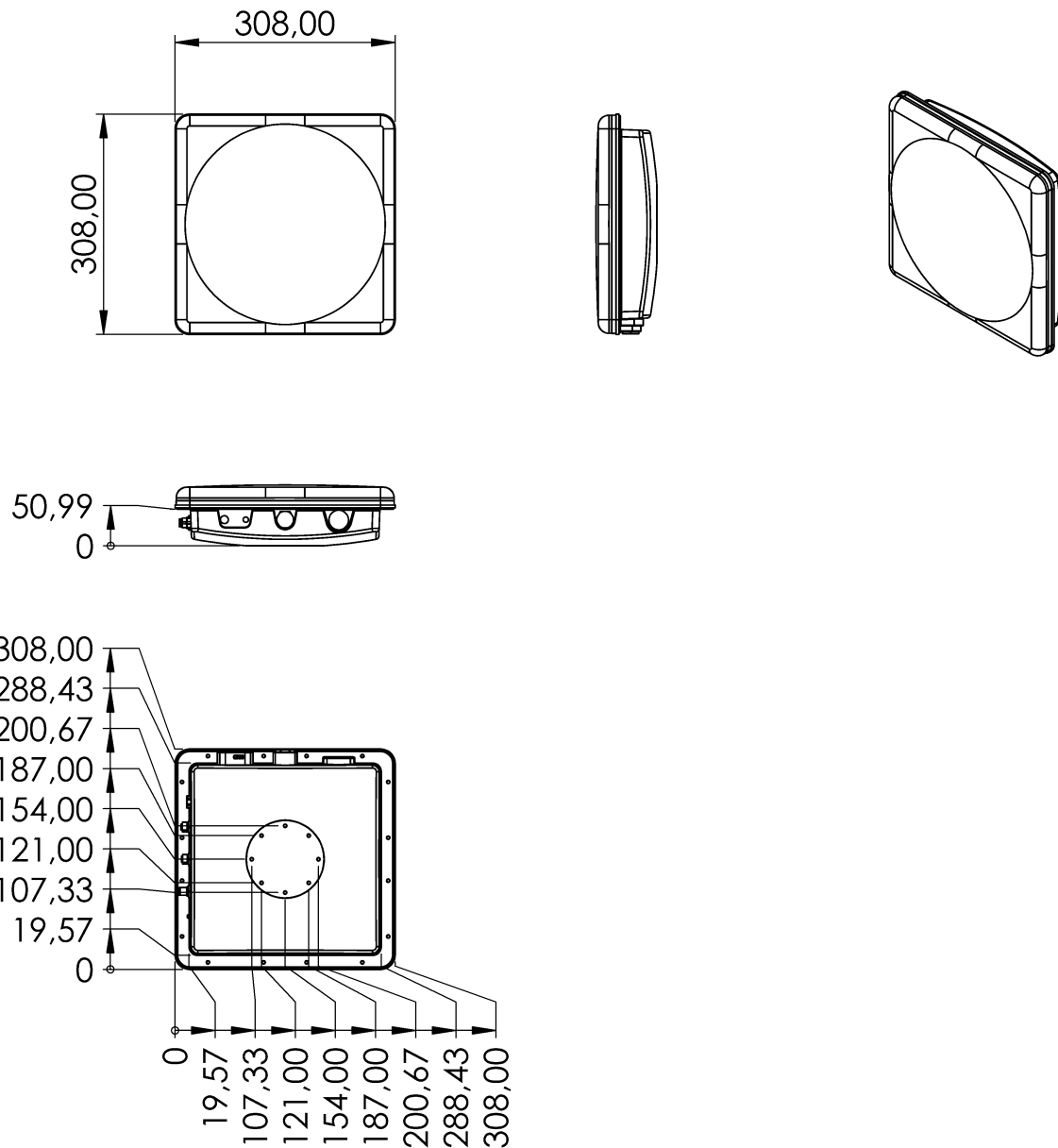
## 14 Mechanical Drawings

### 14.1 Mechanical Drawings 542y-c-opt1-rrr



Dimensions in mm.

## 14.2 Mechanical Drawings 552y-c-opt1-rrr



Dimensions in mm.



## 15 Document Revision History

Date	Revision	Description
10/02/15	1.00	First release.
01/04/15	1.01	<p>Updated the firmware version reference in the first page.</p> <p>Added the grey version of the 5426U and 5426U-RTC, and added the 5526U, 5526U-RTC, 5526U-G and 5526U-RTC-G readers, in sections 1, 2, 6, 8, 9 and 10.</p> <p>Corrected the operating frequency in section 2.</p> <p>Corrected the protection class in section 2.</p> <p>Added a warning on RF region settings in section 3.4.</p> <p>Added warnings instead of notes in sections 4.1, 4.2, 4.3, 4.6, 4.7 and 4.8 and appendix B.</p> <p>Added the .inf file as appendix C.</p> <p>Added the driver installation guide on Windows 8 OS as appendix D.</p>
23/06/15	1.02	<p>Added the RF sensitivity parameter in RF parameters section (section 3.4) and RF parameters commands management (sections 4.6 and 4.15).</p> <p>Moved Q value and Session in EPC C1G2 (Class-1 Generation-2) parameters section (section 3.5).</p> <p>Added the RS232 DB-9 – M12 connections description (appendix C).</p>
26/10/15	1.03	<p>Changed the firmware version reference in the first page.</p> <p>Added the RF sensitivity parameter in technical specification table (section 2).</p> <p>Added the ReadAfterDetect configuration parameters description in section 3.5 and EPC C1G2 #2 configuration page management commands (section 4.8 and 4.18).</p>
17/05/16	1.04	<p>Changed the firmware version reference in the first page.</p> <p>Added the PoE IEEE 802.3af-2003 Mode A and Mode B specifications in section 2.</p> <p>Added the 'trigger' mode and 'gate' mode description in section 3, and related parameters in subsections 3.x.</p> <p>Changed the I/O parameters programming and reading descriptions due to new added features (sections 4.9 and 4.19).</p> <p>Added the direction info in data request, queue request and spontaneous message descriptions (sections 4.26, 4.27 and 4.38.1).</p>

Date	Revision	Description
		Corrected the M12 Ethernet connection description in section 6.
03/06/16	1.05	<p>Changed the firmware version reference in the first page</p> <p>Added the output 1 activation time description in sections 3.1 and 3.4.</p> <p>Changes in general and I/O parameters configuration commands (sections 4.2, 4.7, 4.11 and 4.16).</p> <p>Added the antennas auto tuning command (section 4.38).</p>
19/09/16	1.06	<p>Added the reader's firmware versions object of this manual.</p> <p>Added the Wiegand interface management (section 2, section 3 and section 5).</p> <p>Changes in the technical specification formatting (section 2).</p> <p>Added the operating features and description of the configurable parameters (section 3).</p> <p>Added the test modes description and auto antenna tuning description in section 3.</p> <p>Deleted the communication protocol section.</p> <p>Deleted the supported transponders appendix.</p>
18/11/16	1.07	Corrected the RS485 connections description in the connection sections (both Ethernet and Wiegand versions).
23/11/16	1.08	<p>Updated the reader's firmware versions object of this manual.</p> <p>Added the RF chip standby mode in RF parameters in section 3.1.6.</p>
25/11/16	1.09	<p>Updated the reader's firmware versions object of this manual.</p> <p>Added the ReadAfterDetect with custom info activation in EPC C1G2 parameters in section 3.1.6.</p> <p>Added the ReadAfterDetect with auto TID info activation in EPC C1G2 parameters in section 3.1.6.</p> <p>Added the search mode in EPC C1G2 parameters in section 3.1.6.</p> <p>Update the inventory mode range in EPC C1G2 parameters in section 3.1.6.</p>

Date	Revision	Description
14/04/17	1.10	<p>Updated the reader's firmware versions object of this manual in preface section.</p> <p>Added the ordering code detail in preface section.</p> <p>Changed the technical specifications section (section 2) formatting.</p> <p>Corrections in operating features section (section 3).</p> <p>Added a warning to changed configuration parameters that become effective only after a device reset.</p> <p>Changed the connections section (section 5) formatting.</p> <p>Changed the status indications section (section 7) formatting.</p> <p>Changed the installation section (section 9) formatting.</p>
12/05/17	1.11	<p>Added CAN bus readers object of this manual in preface section.</p> <p>Updated the reader's firmware versions object of this manual in preface section.</p> <p>Added CAN bus readers technical specifications (section 2.1.3 and 2.1.6).</p> <p>Added the CAN bus interface configuration parameters description (section 3.2.4).</p> <p>Corrected the default Q final value in RF and EPC C1G2 configuration parameters description (section 3.2.7).</p> <p>Changed the connections section (section 5) formatting.</p> <p>Added CAN bus readers connection specifications (section 5).</p>
12/07/17	1.12	<p>Updated the reader's firmware versions object of this manual in preface section.</p> <p>Added the 'spontaneous' message activation on Wiegand interface and/or CAN bus interface description in operating features.</p> <p>Added the selection of CAN bus interface as 'spontaneous' message interface in 'spontaneous' message configuration.</p> <p>Corrected the selection of Wiegand interface as 'spontaneous' message interface in 'spontaneous' message configuration.</p> <p>Added the device status.</p>
15/01/18	1.13	<p>Added the CX EL indication the title of this manual.</p> <p>Updated the reader's firmware versions object of this manual in preface section.</p>

Date	Revision	Description
		<p>Added the transponder detection timestamp description and configuration in operating features section.</p> <p>Added the database description in operating features section.</p> <p>Added the RF sensitivity test, read reflected power and read RSSI test modes description in operating features section.</p>
13/03/18	1.14	<p>Updated the reader's firmware versions object of this manual in preface section.</p> <p>Increased the maximum configurable RF output power to 30dBm.</p> <p>Added the RF antenna tuning configuration parameters description.</p>
14/03/18	1.15	<p>Corrected the default maximum tune steps in RF antenna tuning configuration.</p>
28/05/18	1.16	<p>Updated the reader's firmware versions object of this manual in preface section.</p> <p>Corrected the record max size in bytes in operating features section.</p> <p>Added warnings in 'spontaneous' message management in operating features.</p> <p>Improved the description of 'spontaneous' message management in operating features, also added the HTTP POST description.</p> <p>Improved the description of records database management in operating features.</p> <p>Added the auto connection feature description in operating features and auto connection configuration parameters description.</p> <p>Corrected the IP configuration parameters description.</p> <p>Added the auto connection server settings and HTTP POST pages in remote server configuration parameters.</p>
09/10/18	1.17	<p>Updated the reader's firmware versions object of this manual in preface section.</p> <p>Added the RSSI info in records and HTTP POST messages description.</p> <p>Minor changes in general and configuration parameters.</p> <p>Added the RSSI info activation flag in RF configuration.</p> <p>Added the AFI management in EPC C1G2 configuration.</p> <p>Minor changes in status indications.</p>

Date	Revision	Description
18/10/18	1.18	<p>Updated the reader's firmware versions object of this manual in preface section.</p> <p>Added the 'spontaneous' message format field in 'spontaneous' message configuration parameters.</p> <p>Reduced the max configurable conducted power to 27dBm and added the max radiated power of 33dBm ERP.</p> <p>Added the tag read count info activation flag in RF configuration.</p> <p>Corrections in operating features and configuration parameters.</p> <p>Added the regulatory compliance section.</p>
11/01/19	1.19	<p>Updated the company name/logo and BLUEBOX logo.</p> <p>Updated the reader's firmware versions object of this manual.</p> <p>Changed description in 'spontaneous' message format field in spontaneous message configuration.</p> <p>Added ASCII mode setup for the 'spontaneous' message format field in spontaneous message configuration.</p> <p>Added the max RSSI info activation flag in RF configuration.</p>
01/02/19	1.20	<p>Updated the reader's firmware versions object of this manual.</p> <p>Added the Brazil RF region support in RF configuration and in regions of operation appendix.</p> <p>Minor changes and corrections in the configuration parameters.</p> <p>Moved the plans of frequencies from RF configuration section to regions of operations appendix.</p> <p>Moved the power requirements from antennas section to regions of operations appendix.</p> <p>Updated the .inf file to new version.</p>
05/02/19	1.21	<p>Move the tag data bytes limit warning from RF configuration parameters to operating features section.</p>
15/02/19	1.22	<p>Corrected the continuous mode triggered by inputs and timestamp info activation flags position in flags field in general parameters.</p>
25/02/19	1.23	<p>Updated the reader's firmware versions object of this manual.</p>

Date	Revision	Description
		Changed the input extension time 94ehaviour in gate mode in input/output configuration parameters.
20/05/19	1.24	Updated the reader's firmware versions object of this manual. Corrected and updated the buzzer behavior description in signalling section.
27/05/19	1.25	Corrections in technical specifications. Corrections in operating features. Corrections in configuration parameters descriptions. Corrections in dip switch description section.
02/09/19	1.26	Updated the reader's firmware versions object of this manual. Changes and document fixes in all sections.
10/12/19	1.27	Updated the reader's firmware versions object of this manual and minor changes in device descriptions. Replaced ISO 18000-6C with ISO 18000-63. ISO 18000-6C became ISO 18000-63 in 2012 due to ISO naming rules that do not allow letters in standards names. Minor changes in operating features and general and configuration parameters. Added the device startup and 'BLUEBOX Serial Config' software sections.
02/07/20	1.28	Updated the reader's description object of this manual. Updated the reader's firmware versions object of this manual. Changes in the operating features and general and configuration parameters. Added the STX + dual char string format setup selection (STX + dual char string, STX + dual char string + CR, STX + dual char string + CRLF) in spontaneous message configuration parameters. Added the STX + ASCII string format setup selection (STX + ASCII string, STX + ASCII string + CR, STX + ASCII string + CRLF) in spontaneous message configuration parameters. Added the message encoding selection (None, Decimal) in spontaneous message configuration parameters. Updated the installation section.

Date	Revision	Description
		<p>Added safety informations in electrical connections section.</p> <p>Added the maintenance, repair and disposal section.</p> <p>Format and document fixes in all sections.</p>
08/01/21	1.29	<p>Corrected the 'continuous mode' activation with inputs extension time description in input / output configuration parameters.</p>

## A. Regions of Operation

The **BLUEBOX** reader has been designed to work in various regions with differing frequency requirements. This document covers operation in North America, Brazil and Europe.

### A.1. Operation in Europe

For European operation, the **BLUEBOX** reader supports the frequency plan listed in the table below and is compliant with the ratified ETSI EN 302-208 specification V.3.1.0. This specification states that no listen-before-talk is performed, the maximum continuous transmit time on a channel is four seconds, and the reader enforces the 100 ms off time before reusing the same channel. In some applications (i.e. conveyor systems) it may be necessary for interrogators to transmit while tags are not present. To accommodate such requirements, the device shall include within interrogators a means to minimize the overall length of transmission commensurate with the application. This may include the provision of trigger mechanisms within interrogators to initiate transmissions.

RF Channel	Frequency [MHz]
4	865.7
7	866.3
10	866.9
14	867.5



According to ETSI EN 302208-1 only channels 4, 7, 10 and 13 (internal numerated as 1, 4, 7 and 10) could be used at high power! Other RF channels are present only for test purposes and should not be used in normal operation!

European regulations describe radiating power limits in relation to dipole antenna and ERP (Efficient Radiating Power) is used as a measure. The maximum RF output power is defined by the antenna gain, the half power beam width and the cable attenuation on the reader - antenna connection. For antennas with a half power beam width of up to 70° a power of  $P_{ERP,max} = 2W$  ERP is allowed. For other half power beam widths a reduced power of  $P_{ERP,max} = 0.5W$  ERP. The maximum **BLUEBOX** RF output power is defined as:

$$P_{C,max} = P_{ERP,max} - G_{IC} + 5.15 + C_L$$



Where:

$P_{C,max}$	Maximum RF output power in dBm
$P_{ERP,max}$	Maximum ERP power of the antenna in dBm
$G_{IC}$	Circular antenna gain in dBic
$C_L$	Cable loss in dB

## A.2. Operation in North America

The FCC specifies frequency hopping across the North American spectrum allocated to UHF RFID (902–928 MHz, with hopping occurring between 902.75–927.25 MHz in 500 KHz steps). This specification states that no listen-before-talk is performed, the maximum continuous transmit time on a channel is 0.4 seconds.

RF Channel	Frequency [MHz]
1	902.75
2	903.25
3	903.75
...	...
49	926.75
50	927.25



Other RF channels and single channel selection are present only for test purposes and should not be used in normal operation!

FCC regulations describe the radiating power limits in relation to isotropic antenna and EIRP (Efficient Isotropic Radiating Power) is used as a measure. The maximum RF output power is defined by the antenna gain, the half power beam width and the cable attenuation on the reader - antenna connection. A power of  $P_{EIRP,max} = 36\text{dBm}$  EIRP subject to a maximum conducted power of allowance of 30dBm at the antenna connector is allowed. The maximum **BLUEBOX** RF output power is defined as:

$$P_{C,max} = P_{EIRP,max} - G_{IC} - 2.15 + 5.15 + C_L$$

Where:

$P_{C,max}$	Maximum RF output power in dBm
$P_{ERP,max}$	Maximum ERP power of the antenna in dBm
$G_{IC}$	Circular antenna gain in dBic
$C_L$	Cable loss in dB

### A.3. Operation in Brazil

The **BLUEBOX** operates over a subset of the FCC North American spectrum (902–928 MHz, with specific frequency and channel usage dictated by regulations of each country. Frequency hopping spread spectrum (FHSS) is used. No listen-before-talk is performed, the maximum continuous transmit time on a channel is 0.4 seconds.

RF Channel	Frequency [MHz]
1	902.75
2	903.25
3	903.75
4	904.25
5	904.75
6	905.25
7	905.75
8	906.25
9	906.75
10	907.25
26	915.25
27	915.75
28	916.25

RF Channel	Frequency [MHz]
29	916.75
30	917.25
31	917.75
32	918.25
33	918.75
34	919.25
35	919.75
36	920.25
37	920.75
38	921.25
39	921.75
40	922.25
41	922.75
42	923.25
43	923.75
44	924.25
45	924.75
46	925.25
47	925.75
48	926.25
49	926.75
50	927.25



Other RF channels and single channel selection are present only for test purposes and should not be used in normal operation!

Brazil regulations describe the radiating power limits in relation to isotropic antenna and EIRP (Efficient Isotropic Radiating Power) is used as a measure. The maximum RF output power is defined by the antenna gain, the half power beam width and the cable attenuation on the reader - antenna connection. A power of  $P_{\text{EIRP,max}} = 36\text{dBm}$  EIRP subject to a maximum conducted power of allowance of  $30\text{dBm}$  at the antenna connector is allowed. The maximum **BLUEBOX** RF output power is defined as:

$$P_{\text{C,max}} = P_{\text{EIRP,max}} - G_{\text{IC}} - 2.15 + 5.15 + C_{\text{L}}$$

Where:

$P_{\text{C,max}}$	Maximum RF output power in dBm
$P_{\text{ERP,max}}$	Maximum ERP power of the antenna in dBm
$G_{\text{IC}}$	Circular antenna gain in dBic
$C_{\text{L}}$	Cable loss in dB

## B. RS232 DB9 to M12 Connection

RS232 DB-9			RS232 M12	
Pin	Description		Pin	Description
2	RXD	<-->	2	TXD
3	TXD	<-->	4	RXD
5	GND	<-->	3	GND

## C. .inf File

```

;-----
; Communication Device Class driver installation file
;
; Version 2.0.0.0 - 11/01/2019
;   - New company name.
;   - Removed FH1000 device.
;
;-----

[Version]
Signature="$Windows NT$"
Class=Ports
ClassGuid={4D36E978-E325-11CE-BFC1-08002BE10318}
Provider=%Kronotech%
DriverVer=11/01/2019,2.0.0.0

[Manufacturer]
%Kronotech%=DeviceList,ntamd64

[DeviceList]
%BLUEBOXCXUHF%=Reader, USB\VID_c251&PID_0001
%BLUEBOXCXEUHF%=Reader, USB\VID_c251&PID_0002
%BB2DESKTOPv2%=Reader, USB\VID_28AD&PID_0004&MI_00
%PANELREADER22%=Reader, USB\VID_c251&PID_0003&MI_00

[DeviceList.ntamd64]
%BLUEBOXCXUHF%=Reader, USB\VID_c251&PID_0001
%BLUEBOXCXEUHF%=Reader, USB\VID_c251&PID_0002
%BB2DESKTOPv2%=Reader, USB\VID_28AD&PID_0004&MI_00
%PANELREADER22%=Reader, USB\VID_c251&PID_0003&MI_00

;-----
; Installation
;-----

```

```
[Reader]
include=mdmcpq.inf
CopyFiles=FakeModemCopyFileSection
AddReg=Reader.AddReg

[Reader.AddReg]
HKR,,DevLoader,,*ntkern
HKR,,NTMPDriver,,usbser.sys
HKR,,EnumPropPages32,,"MsPorts.dll,SerialPortPropPageProvider"

[Reader.Services]
AddService=usbser, 0x00000002, DriverService

[DriverService]
DisplayName=%DRIVER.SVC%
ServiceType=1
StartType=3
ErrorControl=1
ServiceBinary=%12%\usbser.sys

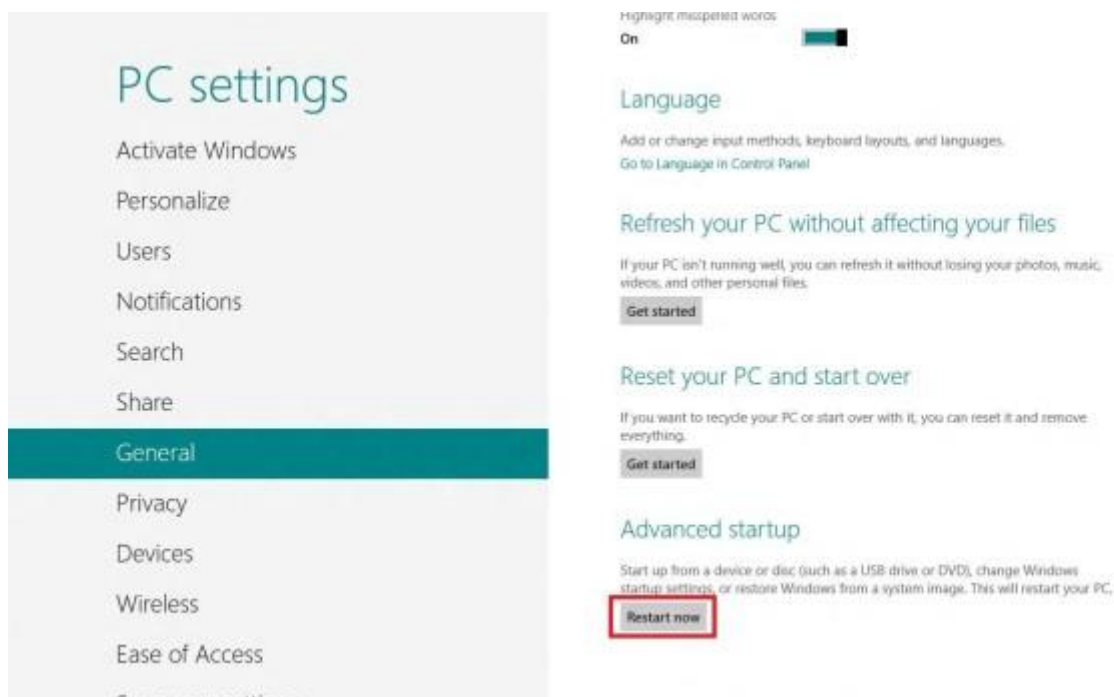
;-----
; String Definitions
;-----

[Strings]
Kronotech      = "Kronotech Srl"
DRIVER.SVC     = "BLUEBOX USB VCom Driver"
BLUEBOXCXUHF   = "BLUEBOX CX UHF USB VCom Port"
BLUEBOXCXEUHF = "BLUEBOX CX E UHF USB VCom Port"
BB2DESKTOPv2  = "BLUEBOX Gen2 DESKTOP USB VCom Port"
PANELREADER22 = "BLUEBOX Panel Reader 22 USB VCom Port"
```

## D. Driver Install on Windows 8 OS

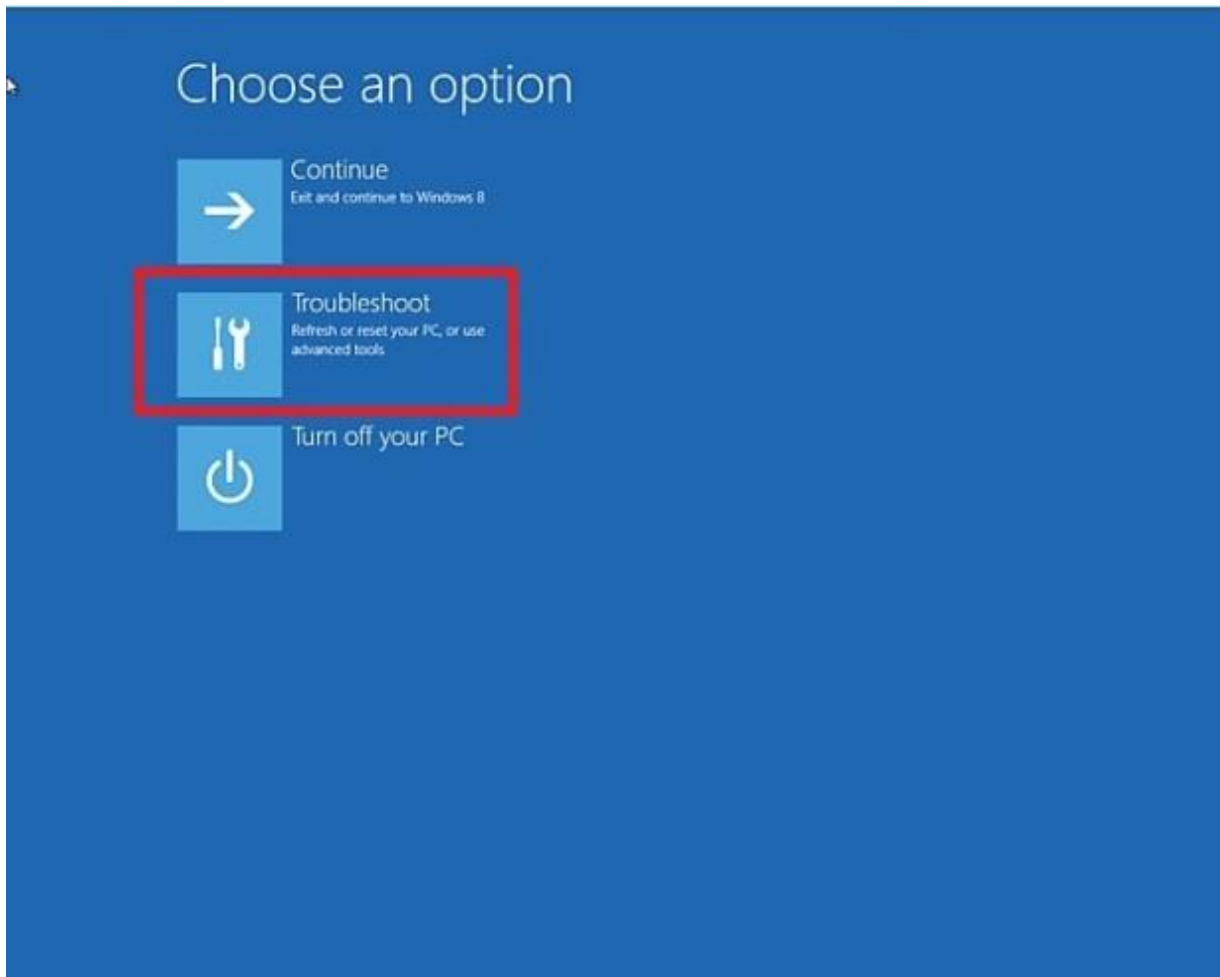
Windows 8 does not allow installing drivers that are not signed by Microsoft. Below is described how to de-activate the driver signing check.

- 1) First, select "**Settings**" on the right side of your screen:
- 2) Select "**Change PC Settings**":
- 3) Navigate to "**General**" settings and then scroll down to "**Advanced Startup**". Click on "**Restart**":

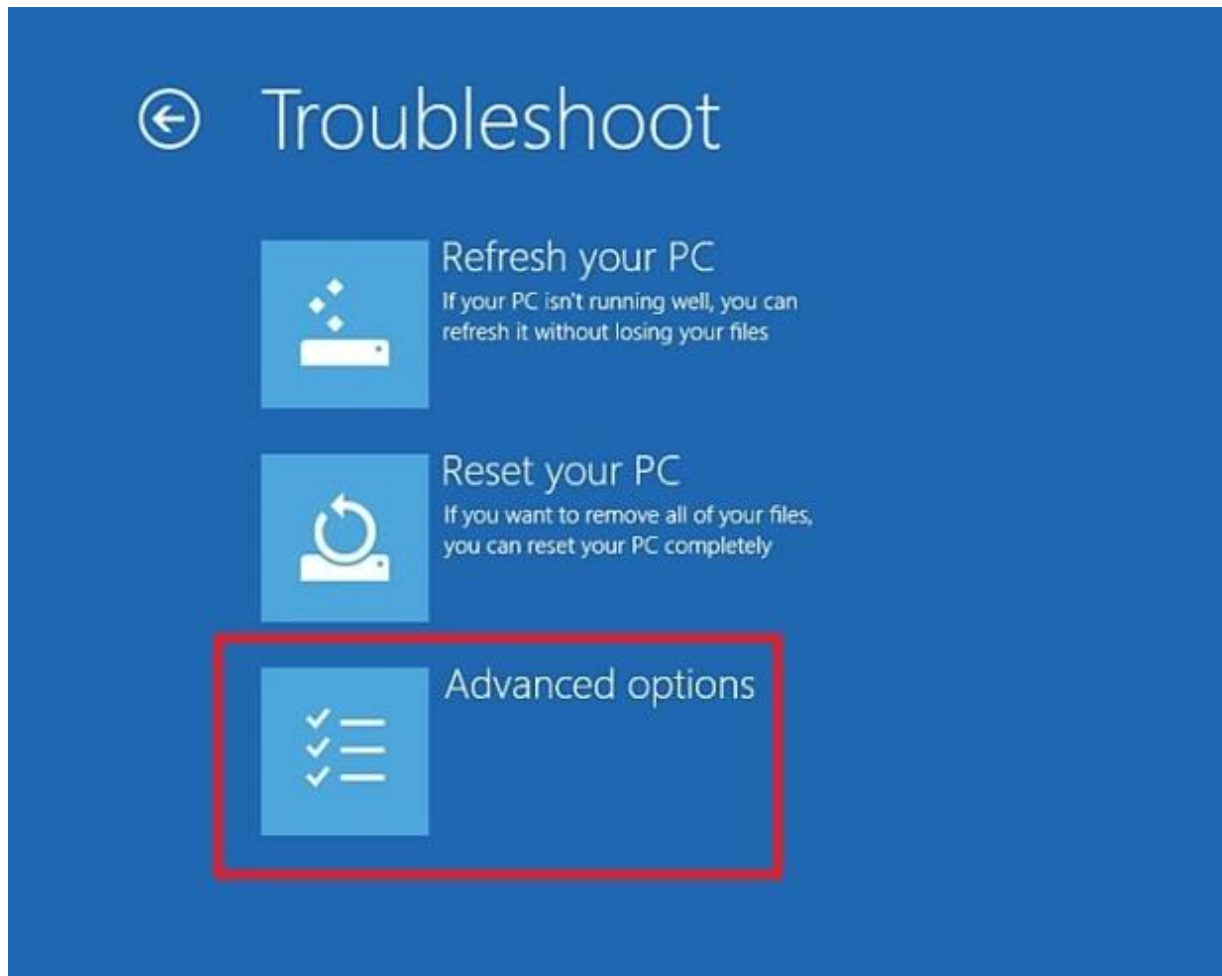


- 4) After that, Click on "**Troubleshoot**":

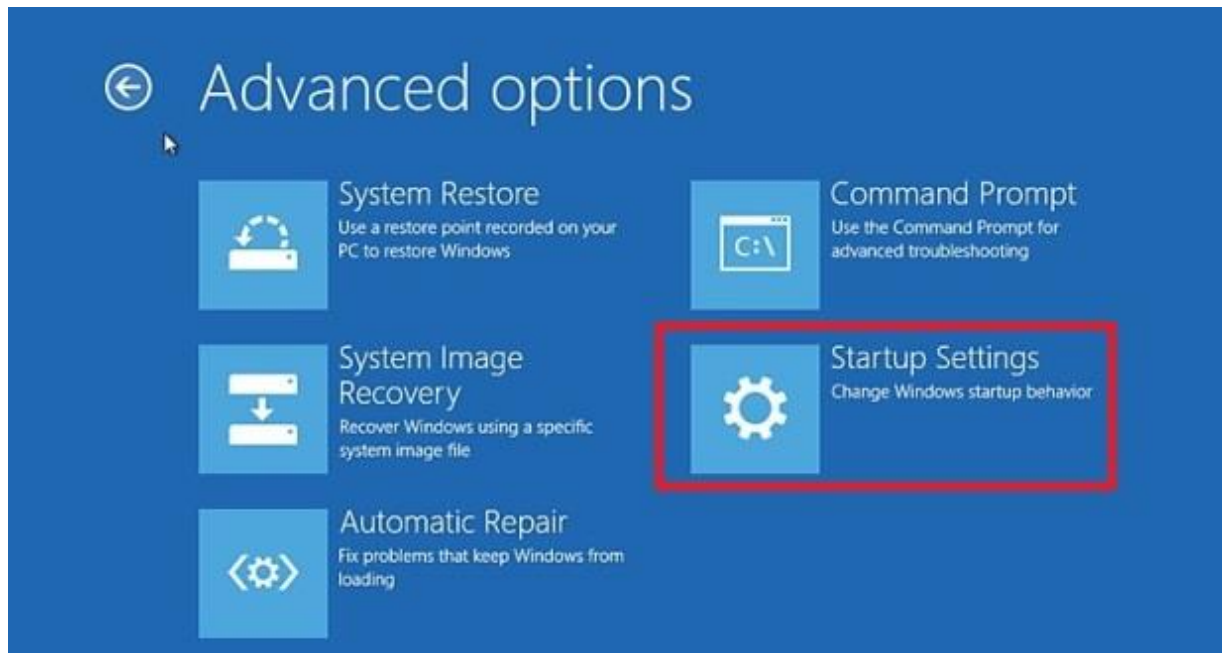




5) On the next screen, choose "**Advanced Options**":



6) Then click on "**Startup Settings**":



7) Then click on the "**Restart**" button:



8) After your computer reboots, another screen will appear where you will be asked to press a number to choose an option. So press **7** or **F7**:

# Startup Settings

Press a number to choose from the options below:

Use number keys or functions keys F1-F9.

- 1) Enable debugging
- 2) Enable boot logging
- 3) Enable low-resolution video
- 4) Enable Safe Mode
- 5) Enable Safe Mode with Networking
- 6) Enable Safe Mode with Command Prompt
- 7) Disable driver signature enforcement
- 8) Disable early launch anti-malware protection
- 9) Disable automatic restart after failure

Press F10 for more options

Press Enter to return to your operating system

- 9) When you install the driver, this prompt will appear on screen. Select **"Install this driver software anyway"**:

