

## BLUEBOX Gen 2



## ADVANT RFID Devices



## User Manual

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## 1 Introduction

### 1.1 Commands for Transponder-IDs

There are 3 commands to retrieve transponder-IDs from the **BLUEBOX**:

- Inventory (retrieve transponders before the antenna)
- Data Request (retrieve filtered list)
- Queue Request (retrieve unfiltered list)

#### 1.1.1 Inventory

This command scans for transponders before the antennas. The result are the UUIDs (EPCs) of the discovered transponders. With passive RFID it is quite common, that a single inventory does not discover all transponder-IDs. Please use several inventory commands in succession to ensure that all transponders have been discovered.

The inventory command can be used parallel to automatic mode (Continuous Mode).

#### 1.1.2 Data Request

This command delivers transponder-IDs from the filtered list. If "Continuous Mode" (Automatic Mode) is active, this data is taken from the filtered list and immediately send. If the device is not in automatic mode, the device does an inventory and you receive the result of this action.

Filtered means:

- Transponder-IDs that have been discovered several times are combined together to a single entry.
- Transponder-IDs expire after a filter time and are deleted from the filtered list, this means this list can run empty.

The contents of the filtered list are automatically deleted after this command.

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### **1.1.3 Queue Data Request**

This command delivers the oldest transponder-ID from the unfiltered list.

Unfiltered means:

- Transponder-IDs that have been discovered several times are also stored several in the list.
- Transponder-IDs remain in the list. The list can contain up to 100 transponder-IDs.

The retrieved oldest entry from the unfiltered list is NOT deleted. It should be deleted with the delete command; otherwise the same entry will be delivered at next Queue Data Request.

## 2 Operation Modes

### 2.1 Manual Operation

The screenshot displays the BLUEBOX software interface. On the left, a sidebar titled 'Commands' lists various functions: Configuration (highlighted), RF Configuration, EPC C1G2 Configuration, IP Configuration, Profibus Configuration, Data Request, Queue Request, Output, Reader Status, Reflected Power, RF ON/OFF, ISO 18000-6C (expanded to show Inventory, Read, Write, Lock, and Kill). The main window is titled 'Configuration' and contains several settings:

- Address:** 255
- Baud rate:** 19200
- Data bits:** 8
- Stop bits:** 1
- Parity:** None
- Filter time:** 1 (with radio buttons for seconds and minutes, where seconds is selected)
- Flags:**
  - ☒ Buzzer activation on new tag event
  - ☐ Output 1 activation on tag present
  - ☐ Send antenna information
  - ☐ Send tag information
  - ☐ Spontaneous mode activation
  - ☐ Continuous mode triggered by input 1
  - ☐ Continuous mode activation

At the bottom of the configuration window are three buttons: 'Read' (highlighted), 'Write', and 'Default'.

Figure 2.1 BLUEBOX Show Screen Section: Configuration without automatic modes

If you need to request the tag UIDs now, you can either use the command "Inventory" or "Data Request". Though "Data Request" finds no data in the unfiltered list and none from automatic operation, it will send an "Inventory" command internally.

## 2.2 Automatic Mode, Continuous Mode, Auto-Read

The screenshot shows the BLUEBOX Configuration interface. On the left, a 'Commands' tree lists various settings, with 'Configuration' selected. The main 'Configuration' panel contains several dropdown menus and checkboxes. The 'Continuous mode activation' checkbox at the bottom is checked and highlighted with a red rectangular box. Other settings include Address (255), Baud rate (19200), Data bits (8), Stop bits (1), Parity (None), Filter time (1), and various flags like Buzzer activation and Continuous mode triggered by input 1.

Figure 2.2 BLUEBOX Show Screen Section: Configuration with automatic mode

The BLUEBOX now steadily executes „Inventory“ commands, detects transponders and stored their UID in the unfiltered list. This list can be retrieved with “Queue Data Request” or filtered with “Data Request”.

This screenshot shows the same BLUEBOX Configuration interface, but with the 'Filter time' dropdown menu highlighted by a red rectangular box. The 'Filter time' is set to '10' seconds. The 'Continuous mode activation' checkbox remains checked. The 'Commands' tree on the left is also visible, with 'Configuration' still selected.

Figure 2.3 BLUEBOX Show Screen Section: Configuration of Filter Time

If you use „Data Request“ to retrieve the filtered list, you will receive transponder-IDs that have been discovered during the last 10 seconds.

## 2.3 Automatic Telegram Transmission (Spontaneous Mode)

The screenshot shows the BLUEBOX configuration interface. On the left, a 'Commands' tree lists various settings, with 'Configuration' selected. The main area is titled 'Configuration' and contains several settings:

- Address: 255
- Baud rate: 19200
- Data bits: 8
- Stop bits: 1
- Parity: None
- Filter time: 1 (seconds)
- Flags:
  - ☒ Buzzer activation on new tag event
  - ☐ Output 1 activation on tag present
  - ☐ Send antenna information
  - ☐ Send tag information
  - ☒ Spontaneous mode activation
  - ☐ Continuous mode triggered by input 1
  - ☒ Continuous mode activation

At the bottom, there are three buttons: 'Read', 'Write', and 'Default'. The 'Spontaneous mode activation' and 'Continuous mode activation' checkboxes are highlighted with red boxes.

Figure 2.4 BLUEBOX Show Screen Section: Automatic operation and automatic telegram transmission

The BLUEBOX now steadily executes „Inventory“ commands, detects transponders and stored their UID in the unfiltered list. Furthermore, every newly discovered transponder ID will automatically be sent to your software.

If you use "Spontaneous Mode" without "Continuous Mode", you will get no automatic information on new transponders. So this combination is of no use.



## 2.4 Examples

Before an entry (e.g. a barrier) trucks stop. The trucks trigger a sensor (light barrier, radar sensor, inductive loop, etc.).

- No automatic operation, send several "Inventory" commands to discover the transponder UIDs.

Trucks should be discovered while driving by.

- Automatic operation and automatic telegram transmission (Continuous mode + Spontaneous mode). Transponder UIDs are automatically sent to your software. If this is not desired =>
- Automatic operation with several seconds of filter time (Continuous mode + 3 ... 10 sec Filter time), thereby you will request the filtered list with "Data Request" regularly. Please pay attention that your request cycle must be shorter than the filter time. Otherwise you will lose transponder UIDs. In you request every 4 seconds the filter time should be at least 5 seconds.

### 3 The Commands in Detail

#### 3.1 Data Request

##### 3.1.1 Command from PC/PLC to BLUEBOX

Byte #	Number of Bytes	Transmit Data	Value	Description
0	1	01	SOH	Start of Header, Start of Telegram
1...2	2	46 46	FF (255)	Device Address
3	1	05	ENQ	Command Code, Enquiry
4	1	05	05	BCC
5	1	0D (CR)	0D (CR)	Carriage Return, End of Telegram

6 Bytes in total

##### 3.1.2 Replies from the BLUEBOX

###### Reply from BLUEBOX to PC/PLC in case of error

Byte #	Number of Bytes	Transmit Data	Value	Description
0	1	01	SOH	Start of Header, Start of Telegram
1...2	2	46 46	FF (255)	Device Address
3	1	16	NAK	Not Acknowledgement – Command Error
4	1	05	05	BCC
5	1	0D (CR)	0D (CR)	Carriage Return, End of Telegram

6 Bytes in total

### Reply from BLUEBOX to PC/PLC in case of an empty list

Byte #	Number of Bytes	Transmit Data	Value	Description
0	1	01	SOH	Start of Header, Start of Telegram
1...2	2	46 46	FF (255)	Device Address
3	1	02	STX	Start of Text
4..13	10	30 30 30 30 30 30 30 30 30 30	00000 00000 00	10 ASCII characters "0"
14	1	03 (ETX)	03 (ETX)	End of Text
15	1	05	05	BCC
16	1	0D (CR)	0D (CR)	Carriage Return, End of Telegram

17 Bytes in total

### Reply from BLUEBOX to PC/PLC with one Transponder ID

Byte #	Number of Bytes	Transmit Data	Value	Description
0	1	01	SOH	Start of Header, Start of Telegram
1...2	2	46 46	FF (255)	Device Address
3	1	02	STX	Start of Text
4...27	24	37 46 33 34 41 30 35 31 31 44 37 43 42 38 30 39 31 37 43 38 30 34 39 34	7F 34 A0 51 1D 7C B8 09 17 C8 04 94	Transponder-ID (the examples shows a 12 Bytes EPC)
30	1	03 (ETX)	03 (ETX)	End of Text
31	1	05	05	BCC
32	1	0D (CR)	0D (CR)	Carriage Return, End of Telegram

The grey range is repeated for each transponder UID. Each of this data field is separated with an "-" (ASCII character 0x2D) from the following data field carrying a transponder UID.

### Reply from BLUEBOX to PC/PLC with two Transponder IDs

Byte #	Number of Bytes	Transmit Data	Value	Description
0	1	01	SOH	Start of Header, Start of Telegram
1...2	2	46 46	FF (255)	Device Address
3	1	02	STX	Start of Text
4...7	4	33 30 30 30	0x3000	PC (Protocol Control, taken from EPC memory bank)
8...31	24	37 46 33 34 41 30 35 31 31 44 37 43 42 38 30 39 31 37 43 38 30 34 39 34	0x7F 34 A0 51 1D 7C B8 09 17 C8 04 94	Transponder-ID (the examples shows a 12 Bytes EPC)
32...35	4	43-42-39-39	0xCB99	EPC CRC (taken from EPC memory bank)
36	1	2D	,-'	Separator
37...40	4	33 30 30 30	0x3000	PC (Protocol Control, taken from EPC memory bank)
41...64	24	37 46 33 34 31 44 37 43 42 38 30 39 31 37 43 38 30 34 39 34 41 30 35 31	0x7F 34 1D 7C B8 09 17 C8 04 94 A0 51	Transponder-ID (the examples shows a 12 Bytes EPC)
65...68	4	43-42-39-39	0xCB99	EPC CRC (taken from EPC memory bank)
69	1	03 (ETX)	03 (ETX)	End of Text
70	1	05	05	BCC
71	1	0D (CR)	0D (CR)	Carriage Return, End of Telegram

## Reply from BLUEBOX to PC/PLC with one Transponder ID and configured transmission of transponder type and antenna number

Byte #	Number of Bytes	Transmit Data	Value	Description
0	1	01	SOH	Start of Header, Start of Telegram
1...2	2	46 46	FF (255)	Device Address
3	1	02	STX	Start of Text
4...5	2	30 32	02	Transponder Type, ASCII coded hex number: <ul style="list-style-type: none"> <li>• 0x01: ISO 18000-6B</li> <li>• 0x02: ISO 18000-6C (EPC Class-1Generation-2).</li> </ul>
6...9	4	33 30 30 30	0x3000	PC (Protocol Control, taken from EPC memory bank)
10...33	24	37 46 33 34 41 30 35 31 31 44 37 43 42 38 30 39 31 37 43 38 30 34 39 34	0x7F 34 A0 51 1D 7C B8 09 17 C8 04 94	Transponder-ID (the examples shows a 12 Bytes EPC)
34...37	4	43-42-39-39	0xCB99	EPC CRC (taken from EPC memory bank)
38	1	30		Padding
39	1	31		Antenna number, ASCII character: <ul style="list-style-type: none"> <li>• '1' -&gt; Antenna 1</li> <li>• '2' -&gt; Antenna 2</li> <li>• '3' -&gt; Antenna 3</li> <li>• '4' -&gt; Antenna 4</li> </ul>
40	1	03 (ETX)	03 (ETX)	End of Text
41	1	05	05	BCC
42	1	0D (CR)	0D (CR)	Carriage Return, End of Telegram

The grey range is repeated for each transponder UID. Each of this data field is separated with an "-" (ASCII character 0x2D) from the following data field carrying a transponder UID.

## 3.2 Queue Data Request

This command gives a single transponder-ID per request. So in order to get the complete list, repeat this command followed by a delete command (ACK) until the reply indicates an empty list.

### 3.2.1 Command from PC/PLC to BLUEBOX

Byte #	Number of Bytes	Transmit Data	Value	Description
0	1	01	SOH	Start of Header, Start of Telegram
1...2	2	46 46	FF (255)	Device Address
3	1	16	SYN	Command Code
4	1	05	05	BCC
5	1	0D (CR)	0D (CR)	Carriage Return, End of Telegram

6 Bytes in total

### 3.2.2 Replies from the BLUEBOX

#### Reply from BLUEBOX to PC/PLC in case of error

Byte #	Number of Bytes	Transmit Data	Value	Description
0	1	01	SOH	Start of Header, Start of Telegram
1...2	2	46 46	FF (255)	Device Address
3	1	16	NAK	Not Acknowledgement – Command Error
4	1	05	05	BCC
5	1	0D (CR)	0D (CR)	Carriage Return, End of Telegram

6 Bytes in total

#### Reply from BLUEBOX to PC/PLC in case of an empty list

Byte #	Number of Bytes	Transmit Data	Value	Description
0	1	01	SOH	Start of Header, Start of Telegram
1...2	2	46 46	FF (255)	Device Address
3	1	02	STX	Start of Text
4..13	10	30 30 30 30 30 30 30 30 30 30	00000 00000 00	10 ASCII characters "0"
14	1	03 (ETX)	03 (ETX)	End of Text
15	1	05	05	BCC
16	1	0D (CR)	0D (CR)	Carriage Return, End of Telegram

17 Bytes in total

### Reply from BLUEBOX to PC/PLC with one Transponder ID

Byte #	Number of Bytes	Transmit Data	Value	Description
0	1	01	SOH	Start of Header, Start of Telegram
1...2	2	46 46	FF (255)	Device Address
3	1	02	STX	Start of Text
4...7	4	33 30 30 30	0x3000	PC (Protocol Control, taken from EPC memory bank)
8...31	24	37 46 33 34 41 30 35 31 31 44 37 43 42 38 30 39 31 37 43 38 30 34 39 34	0x7F 34 A0 51 1D 7C B8 09 17 C8 04 94	Transponder-ID (the examples shows a 12 Bytes EPC)
32...35	4	43-42-39-39	0xCB99	EPC CRC (taken from EPC memory bank)
36	1	03 (ETX)	03 (ETX)	End of Text
31	1	05	05	BCC
38	1	0D (CR)	0D (CR)	Carriage Return, End of Telegram

### Reply from BLUEBOX to PC/PLC with one Transponder ID and configured transmission of transponder type and antenna number

Byte #	Number of Bytes	Transmit Data	Value	Description
0	1	01	SOH	Start of Header, Start of Telegram
1...2	2	46 46	FF (255)	Device Address
3	1	02	STX	Start of Text
4...5	2	30 32	02	Transponder Type, ASCII coded hex number: <ul style="list-style-type: none"> <li>• 0x01: ISO 18000-6B</li> <li>• 0x02: ISO 18000-6C (EPC Class-1Generation-2).</li> </ul>
6...9	4	33 30 30 30	0x3000	PC (Protocol Control, taken from EPC memory bank)
10...33	24	37 46 33 34 41 30 35 31 31 44 37 43 42 38 30 39 31 37 43 38 30 34 39 34	0x7F 34 A0 51 1D 7C B8 09 17 C8 04 94	Transponder-ID (the examples shows a 12 Bytes EPC)
34...37	4	43-42-39-39	0xCB99	EPC CRC (taken from EPC memory bank)
38	1	30		Padding
39	1	31		Antenna number, ASCII character: <ul style="list-style-type: none"> <li>• '1' -&gt; Antenna 1</li> <li>• '2' -&gt; Antenna 2</li> <li>• '3' -&gt; Antenna 3</li> <li>• '4' -&gt; Antenna 4</li> </ul>
34	1	03 (ETX)	03 (ETX)	End of Text
35	1	05	05	BCC
36	1	0D (CR)	0D (CR)	Carriage Return, End of Telegram

### 3.2.3 Delete Unfiltered List

After having received the transponder-IDs you should delete the entry from the unfiltered list; otherwise the same entry will be delivered at next Queue Data Request.

#### Command from PC/PLC to BLUEBOX

Byte #	Number of Bytes	Transmit Data	Value	Description
0	1	01	SOH	Start of Header, Start of Telegram
1...2	2	46 46	FF (255)	Device Address
3	1	06	ACK	Acknowledgement
4	1	05	05	BCC
5	1	0D (CR)	0D (CR)	Carriage Return, End of Telegram

*6 Bytes in total*



### 3.3 Inventory

Here is the special command to detect ISO18000-6C compatible transponders. In practice you won't use any other transponder types now.

#### 3.3.1 Command from PC/PLC to BLUEBOX

Byte #	Number of Bytes	Transmit Data	Value	Description
0	1	01	SOH	Start of Header, Start of Telegram
1...2	2	46 46	FF (255)	Device Address
3	1	02	STX	Start of Text
4...5	2	31 38	18	Command Code
6	1	03 (ETX)	03 (ETX)	End of Text
7	1	05	05	BCC
8	1	0D (CR)	0D (CR)	Carriage Return, End of Telegram

9 Bytes in total

#### 3.3.2 Replies from the BLUEBOX

##### Reply from BLUEBOX to PC/PLC in case of error

Byte #	Number of Bytes	Transmit Data	Value	Description
0	1	01	SOH	Start of Header, Start of Telegram
1...2	2	46 46	FF (255)	Device Address
3	1	16	NAK	Not Acknowledgement – Command Error
4	1	05	05	BCC
5	1	0D (CR)	0D (CR)	Carriage Return, End of Telegram

6 Bytes in total

##### Reply from BLUEBOX to PC/PLC in case of error "no transponder found"

Byte #	Number of Bytes	Transmit Data	Value	Description
0	1	01	SOH	Start of Header, Start of Telegram
1...2	2	46 46	FF (255)	Device Address
3	1	02	STX	Start of Text
4...5	2	31 38	18	Command Code
6...7	2	30 31	01	Error Code: No Tag
8	1	03 (ETX)	03 (ETX)	End of Text
9	1	05	05	BCC
10	1	0D (CR)	0D (CR)	Carriage Return, End of Telegram

11 Bytes in total

### Reply from BLUEBOX to PC/PLC in case of "transmit error"

Byte #	Number of Bytes	Transmit Data	Value	Description
0	1	01	SOH	Start of Header, Start of Telegram
1...2	2	46 46	FF (255)	Device Address
3	1	02	STX	Start of Text
4...5	2	31 38	18	Command Code
6...7	2	30 32	02	Error Code: Transmit Error
8	1	03 (ETX)	03 (ETX)	End of Text
9	1	05	05	BCC
10	1	0D (CR)	0D (CR)	Carriage Return, End of Telegram

11 Bytes in total

### Reply from BLUEBOX to PC/PLC with 1 transponder ID found on antenna 1 with "transmission error"

Byte #	Number of Bytes	Transmit Data	Value	Description
0	1	01	SOH	Start of Header
1...2	2	46 46	FF (255)	Device Address
3	1	02	STX	Start of Text
4...5	2	31 38	18	Command code
6...7	2	30 30	0	Status 0 = OK
8...11	4	33-30-30-30	0x3000	PC (Protocol Control, taken from EPC memory bank)
12...35	24	37 46 33 34 41 30 35 31 31 44 37 43 42 38 30 39 31 37 43 38 30 34 39 34	0x7F 34 A0 51 1D 7C B8 09 17 C8 04 94	Transponder-ID (the examples shows a 12 Bytes EPC)
36...39	4	43-42-39-39	0xCB99	EPC CRC (taken from EPC memory bank)
40	1	30		Padding
41	1	31		Antenna number, ASCII character: <ul style="list-style-type: none"> <li>'1' -&gt; Antenna 1</li> <li>'2' -&gt; Antenna 2</li> <li>'3' -&gt; Antenna 3</li> <li>'4' -&gt; Antenna 4</li> </ul>
42	1	03 (ETX)	03 (ETX)	End of Text
43	1	05	05	BCC
44	1	0D (CR)	0D (CR)	Carriage Return, End of Telegram

45 Bytes in total

The PC is described in detail in the document "EPC C1G2 v1.2.0" in chapter "6.3.2.1.2.2 Protocol-control (PC) word (StoredPC and PackedPC)"

## 4 Appendix A – Utilized ASCII Characters

SOH	01h (0x01)
STX	02h (0x02)
ETX	03h (0x03)
EOT	04h (0x04)
ENQ	05h (0x05)
ACK	06h (0x06)
NAK	15h (0x15)
SYN	16h (0x16)
CR	0Dh (0x0D)
'0'...'9'	30h ...39h (0x30 ... 0x39)
'A'...'F'	41h ...46h (0x41 ... 0x46)
<..>	30h ...39h (0x30 ... 0x39), 41h ...46h (0x41 ... 0x46)
<bcc>	Checksum

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