

TELEGRAM LISTING

**RFI341-1503**  
**Radio Frequency Interrogator**  
**(13.56 MHz)**



**Software Versions**

Device	Function	Version
RFI341-1503	DSP Firmware	V 1.3.x
RFI341-1503	ARM7 Firmware	V 0.24

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## Abbreviations used

<b>ACK</b>	<b>A</b> cknowledge (positive confirmation; control character in data transfer of the RFI341-1503)
<b>AFI</b>	<b>A</b> pplication <b>F</b> amily Identifier (in transponder memory)
<b>ASK</b>	<b>A</b> mplitude <b>S</b> hift <b>K</b> eying (digital modulation type)
<b>DSFID</b>	<b>D</b> ata <b>S</b> torage <b>F</b> ormat <b>I</b> dentifier (for transponder memory)
<b>ESC</b>	<b>E</b> scape (control character in data transfer of the RFI341-1503)
<b>EXT</b>	<b>E</b> nd of <b>T</b> ext (control character in data transfer of the RFI341-1503)
<b>FSK</b>	<b>F</b> requency <b>S</b> hift <b>K</b> eying (digital form of frequency modulation)
<b>HF</b>	<b>H</b> igh <b>F</b> requency
<b>IC</b>	<b>I</b> ntegrated <b>C</b> ircuit
<b>NAK</b>	<b>N</b> ot <b>A</b> cknowledge (negative confirmation; control character in data transfer of the RFI341-1503)
<b>POR</b>	<b>P</b> ower- <b>O</b> n- <b>R</b> eset (resetting the RFI341-1503 to the last permanently-saved settings once the power supply has been switch on)
<b>RF</b>	<b>R</b> adio <b>F</b> requency
<b>RFI</b>	<b>R</b> adio <b>F</b> requency <b>I</b> nterrogator
<b>RFID</b>	<b>R</b> adio <b>F</b> requency <b>I</b> dentification
<b>RFU</b>	<b>R</b> eserved further use
<b>STX</b>	<b>S</b> tart of <b>T</b> ext (control character in data transfer of the RFI341-1503)
<b>SWR</b>	<b>S</b> tanding <b>W</b> ave <b>R</b> atio
<b>SYN</b>	<b>S</b> ynchronous idle (error; control character in data transfer of the RFI341-1503)
<b>UID</b>	<b>U</b> nique <b>I</b> dentifier (unique, manufacturer-specific transponder serial number)

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# 1 About this document

## 1.1 Purpose

The telegram listing describes the data interface of the RFID interrogator RFI341-1503. It explains the underlying protocol formats of the RFI341-1503 as well as the available commands and their meaning.

## 1.2 Target audience

The telegram listing is aimed at technical personnel who integrate and configure the RFI341-1503 in a user system.

## 1.3 Information content

The telegram listing contains information about using the RFI341-1503 firmware by means of commands. The assembly, electrical installation, and commissioning procedures for the RFI341-1503, however, are described in *RFI341-1503 Operating Instructions* (no. 8011235).

For further information about RFID technology and how to use it, contact the Auto Ident division at SICK AG. Internet address: [www.sick.com](http://www.sick.com).

## 1.4 Symbols used

The following formatting methods are used in the syntax descriptions:

- Control characters are indicated by **bold** letters in a special font. For example, **ACK** represents the character output via the serial data interface with the value 06h (hexadecimal 6).
- String constants are indicated by inverted commas (e.g. "1000").
- Variable parameters are enclosed with "<" and ">", whereby each of the enclosed characters corresponds to a character to be transmitted. The meaning of the characters is explained after the corresponding syntax description. Values that do not necessarily exist (e.g. data received depending on the request parameters) are enclosed by square parentheses[ ].
- The characters "{" and "}" are used for special values (e.g. checksums).

Some information in this document is specially highlighted:

### NOTICE

#### Notice!

A notice protects the RFI341-1503 against damage or warns of the consequences of executing a function that cannot be undone.

- Always read notices carefully and observe them at all times.

*Reference* Italics indicate that more detailed information is available in another document.

**Important** This important note indicate special features or characteristics.

**Recommendation** Recommendations help you carry out certain procedures more effectively.

**Default setting** This indicates a section listing factory default settings.

## 2 Controlling the RFI341-1503

### 2.1 Command structures

The RFI341-1503 features a wide range of commands that can be used for configuration and control purposes.

The commands can be divided into the following two main groups:

- Settings
- Functions

#### 2.1.1 Settings

The settings allow the user to configure the RFI341-1503. They relate to the data interface, protocol, and radio interface as well as filter options for performing inventories for transponders.

### NOTICE

#### Configuration loss!

The RFI341-1503 initially stores new settings in its temporary working memory (RAM). When the power supply is switched off, the settings are lost if they have not been stored in the permanent memory (EEPROM).

- To save the new settings so that they are applied when the system is next booted up, save the configuration permanently in the RFI341-1503 by means of command E002. See [Chapter 8.2.3, Page 30](#).

#### Requesting settings / data

All the current settings can be read from the RFI341-1503 memory. Transponder data can also be called up from the memory.

#### 2.1.2 Functions

The RFI341-1503 supports commands that enable it to read data from the transponder, inventory the transponders that have been detected, or execute higher-level functions (e.g. controlled read operations), for example.

### 2.2 Restart (cold start)

When a system is restarted (also known as "reset" or "POR" (power-on-reset)), the RFI341-1503 is reinitialized when the power supply is switched on again after having been switched off for a short time. When the power supply is switched off, the data (e.g. an inventory list) in the temporary working memory (RAM) is lost while the device settings in the permanent memory (EEPROM) are retained. The RFI341-1503 does not copy all settings to its execution routines until it has been restarted (cold start) (see the notes in the relevant sections).

## 3 General protocol format

The structure of the STX/ETX protocol can be changed as required. The standard STX/ETX mode uses a checksum that is suffixed to **ETX** and control characters (e.g. **NAK**) that are prefixed to the response from the RFI341-1503. The function for transferring the control characters and checksum can be deactivated.

### 3.1 General structure of commands and responses

Commands (settings or requests) and responses that have been transferred are always enclosed by the control characters **STX** and **ETX**; only ASCII characters can appear between these control characters. Numerical values (parameters) are transferred in the form of ASCII strings that represent a hexadecimal value.

Data transfer in standard mode can be completed by means of a XOR checksum suffixed to the control character **ETX**.

When delivered, the RFI341-1503 uses STX and EXT framing as standard (default setting). If necessary, the checksum and the control characters must be enabled additionally. Data transfer can be extended with an additional checksum suffix.

In addition, control characters can be used in a response of the RFI341-1503 upfront the STX character.

For a description of how to define the control characters, see [Chapter 11.2, Page 98](#). For a description of how to calculate the checksum, see [Chapter 11.1, Page 98](#).

**Important** All characters in a data string are always transferred without any spaces between the individual elements (i.e. as a single, continuous data string). In the telegram listing, the spaces simply allow for greater clarity when showing the data strings.

### 3.2 Sample request in standard STX/ETX mode

A request comprises (in this order) the control character **STX**, a four-digit function number, the data (parameters), the control character **ETX**:

**STX** <function number> [data] **ETX**

In the following example, the oscillator is switched on for maintenance purposes. The following data is transmitted to the RFI341-1503:

**STX** "F000" <vv> **ETX**

In this case, "vv" is a parameter that can be "00" or "01" and, therefore, specifies the required switching status of the oscillator. Throughout this text, the following notation is used to describe request formats:

**Host -> RFI341-1503**

<b>STX</b> "F000" <vv> <b>ETX</b>
-----------------------------------

vv	Required switching operation for the oscillator 00: Switch off 01: Switch on
----	--

In this example, therefore, the following must be transmitted to the RFI341-1503:

**STX** "F000" "01" **ETX**

### 3.3 Direct responses from the RFI341-1503 to the host

The responses transmitted from the RFI341-1503 are structured in almost the same way as the commands transmitted from the host to the RFI341-1503.

**STX** <function number> [data] **ETX** (commands transmitted from the host)

The only difference is that, in standard STX-ETX mode, an additional control character is prefixed to the response block as confirmation. The entire block, therefore, appears as follows:

**ACK STX** <function number> [data] **ETX**

or

**SYN STX** <function number> <error number> **ETX**

In the event of a *positive response*, the RFI341-1503 transmits the ACK immediately. The rest of the response is transmitted later because it can take some time to process the request in the RFI341-1503.

In the event of a *negative response (error)*, the RFI341-1503 returns the error number in the response as a parameter. A negative response can only occur when the syntax of the request is correct but, for example, a parameter contains an impermissible value or the requested function is not supported by the RFI341-1503. In the case of errors that cannot be specified in any greater detail, the RFI341-1503 only returns a **NAK**. For a list of possible error codes (error numbers), see [Table 11-2, Page 99](#).

In the example above, the positive response has the following format:

**RFI341-1503 -> Host**

<b>STX "F000" ETX</b>	
-	No return data

### 3.4 General error message from the RFI341-1503 to the host

In the event of a general transfer error, the RFI341-1503 returns the control character **NAK** after a set period (timeout).

### 3.5 Error messages and function termination

A negative response from the RFI341-1503 has the following format:

**RFI341-1503 -> Host (after an error occurs)**

<b>STX &lt;ffff&gt; &lt;ee&gt; ETX</b>
--

ffff	Function number of the request that triggered the error message
ee	Error code (2 characters that together create a 1-byte error number)

For a list of error codes, see [Table 11-2, Page 99](#).

If the use of the control characters (**SYN**, **ACK**, **NAK**) is deactivated, the following substitute rule applies in order to comply as far as possible with the STX/ETX protocol.

Response type	When control characters are used	When control characters are not used
Command executed	<b>ACK STX "1001" ETX</b>	<b>STX "1001" ETX</b>
Classified error message	<b>SYN STX "100103" ETX</b>	<b>STX "000003" ETX</b>
Unclassified error message	<b>NAK</b>	<b>STX "0000" ETX</b>

Request type	When control characters are used	When control characters are not used
Interruption of a running function	<b>ESC</b>	<b>STX BRK ETX</b>

### 3.6 Activating/deactivating the function for transferring the checksum

The use of a checksum in the protocol is an additional security criterion for identifying transfer errors. It is not required in secure environments (i.e. where the data cable is not parallel to electrical power cables, for example). The algorithm for calculating the checksum can be found in [Chapter 11.1, Page 98](#).

**Requesting the current setting (command 1001 <24>):**

**Host -> RFI341-1503**

<b>STX "1001" &lt;24&gt; ETX</b>
----------------------------------

RFI341-1503

RFI341-1503 -> Host

**STX "1001" <vvvv> ETX**

vvvv	Use of the checksum: 0000: checksum is not used 0001: checksum is used
------	--

Activating/deactivating the function for transferring the checksum  
(command 1011 <24> ...):

**NOTICE**

Configuration loss!

To ensure that the changes become effective, proceed as follows:.

- Save the settings permanently by means of command E002 ([Chapter 8.2.3, Page 30](#)).
- Restart the RFI341-1503.

Host -> RFI341-1503

**STX "1011" <24> <vvvv> ETX**

vvvv	Use of the checksum: 0000: checksum is not used 0001: checksum is used
------	--

RFI341-1503 -> Host

**STX "1011" ETX**

### 3.7 Activating/deactivating the function for transferring the control characters

In standard mode, the response issued by the RFI341-1503 to commands begins with a control character prefixed to the **STX**. This control character can be used to determine whether or not the request was successful. If the RFI341-1503 is to be connected to field bus modules, this control character is unhelpful and can, therefore, be deactivated. The transfer mode is stored in the system settings.

**Requesting the current setting (command 1010 <25>):**

Host -> RFI341-1503

```
STX "1010" <25> ETX
```

RFI341-1503 -> Host

```
STX "1010" <vvvv> ETX
```

vvv

Use of the control characters:  
0000: ACK, SYN, and NAK are not used  
0001: ACK, SYN, and NAK are used

**Activating/deactivating the function for transferring the control characters (command 1011 <25> ...):**

## NOTICE

**Configuration loss!**

To ensure that the changes become effective, proceed as follows:

- Save the settings permanently by means of command E002 ([Chapter 8.2.3, Page 30](#)).
- Restart the RFI341-1503.

Host -> RFI341-1503

```
STX "1011" <25> <vvvv> ETX
```

vvv

Use of the control characters:  
0000: ACK, SYN, and NAK are not used  
0001: ACK, SYN, and NAK are used

RFI341-1503 -> Host

```
STX "1011" ETX
```

## 4 RFID technology (supported protocols)

### 4.1 Supported commands and IC protocols

The RFI341-1503 can communicate with transponder ICs that are compatible with the standard ISO/IEC 15693 (ISO 18000-3 mode 1). All commands are designed to control the RFI341-1503 and use certain IC transponder functions defined in the ISO standard.

**Important** Additional transponder ICs for I-CODE, TAG-IT etc. are only supported upon request.

#### 4.1.1 ISO 15693 /ISO 18000-3 mode 1

- ISO 15693 (all sections), identification cards
- Contactless integrated circuit(s) cards
- Vicinity cards (cards that communicate across a certain distance)
- ISO/IEC 18000-3, automatic identification and data capture techniques for time management

#### 4.1.2 Philips/NXP I code 1

The Philips/NXP I code 1 transponder IC is a proprietary transponder and, as such, does not comply with any ISO standard. For more information about the IC and how it can be used, see the Philips/NXP IC data sheet.

**Important** The I code 1 transponder usually has a 512 bit memory divided into 16 blocks of 32 bits. The first four blocks (0 ... 3) are reserved for UID, write protection, and special functions. Block 4 can be used as a free user data memory and for the Application Family Identifier (AFI). For this reason, measures must be taken to ensure that this block is only used as required when the special areas are not to be used.

## 5 Default host settings

If any host hasn't set the current data interface type in the RFI341-1503 by command, the RFI341-1503 outputs results to the default host when running autonomously.

### 5.1 Requesting the current default host (command 102A <16>):

Host -> RFI341-1503

```
STX "102A" <16> ETX
```

RFI341-1503 -> Host

```
STX "102A" <vvvv> ETX
```

vvv	0002h: serial data interface (RS 232) 0005h: TCP/IP
-----	--

### 5.2 Setting the default host (command 102B <16> ...):

#### NOTICE

##### Configuration loss!

To ensure that the changes become effective, proceed as follows:

- Save the settings permanently by means of command E002 ([Chapter 8.2.3, Page 30](#)).
- Restart the RFI341-1503.

Host -> RFI341-1503

```
STX "102B" <16> <vvvv> ETX
```

vvv	0002h: serial data interface (RS 232) 0005h: TCP/IP
-----	--

RFI341-1503 -> Host

```
STX "102B" ETX
```

## 6 RS-232 data interface settings

The RFI341-1503 is equipped with an RS-232 data interface. The default RFI341-1503 settings can be read and changed with the following commands. Users can either change settings directly via the system settings (see *below*) or change the baud rate by means of the appropriate function, which means the settings are only activated when a valid confirmation with a new baud rate is provided.

### 6.1 Baud rate

#### 6.1.1 Requesting the current baud rate (command 1010 <03>):

The current baud rate is stored in the system settings.

**Default setting** 9,600 Bd

**Host -> RFI341-1503**

```
STX "1010" <03> ETX
```

**RFI341-1503 -> Host**

```
STX "1010" <vvvv> ETX
```

vvv	04B0h: 1,200 Bd 0960h: 2,400 Bd 12C0h: 4,800 Bd 2580h: 9,600 Bd 4B00h: 19,200 Bd 9600h: 38,400 Bd E100h: 57,600 Bd FFFFh: 115,200 Bd
-----	---

6.1.2 Setting the baud rate (command 1011 <03> ...)

**NOTICE**

**Configuration loss!**

To ensure that the changes become effective, proceed as follows:

- Save the settings permanently by means of command E002 ([Chapter 8.2.3, Page 30](#)).
- Restart the RFI341-1503.

**Important** If you choose a setting that is not supported by the RFI341-1503, this can cause problems. For this reason, you are advised to change the baud rate by means of the "Change baud rate" function (command 1003) and then carry out a test. See [Chapter 6.1.3, Page 19](#).

**Host -> RFI341-1503**

```
STX "1011" <03> <vvvv> ETX
```

vvv	04B0h: 1,200 Bd 0960h: 2,400 Bd 12C0h: 4,800 Bd 2580h: 9,600 Bd 4B00h: 19,200 Bd 9600h: 38,400 Bd E100h: 57,600 Bd FFFFh: 115,200 Bd
-----	---

**RFI341-1503 -> Host**

```
STX "1011" ETX
```

RFI341-1503

### 6.1.3 "Change baud rate" function (command 1003 ...)

This function can be used to set the data transfer rate of the RFI341-1503 and then carry out a test to ensure that the data interface is functioning properly. An error message is output if an impermissible baud rate is set.

Once a new baud rate has been set, the data interface must be tested with the new baud rate **within 10 seconds** (see command 1002, [Chapter 6.1.4, Page 20](#)). If this is not carried out, the RFI341-1503 is automatically restarted by means of a reset (warm start).

Within this time (i.e. until the interface test has been successfully completed), the act of triggering any other function or using the interface also causes the RFI341-1503 to restart.

**Baud rate changes initiated with command 1003 are not permanent and are lost when the RFI341-1503 is switched off.**

**Important** To change the baud rate permanently, use command 1011 ([Chapter 6.1.2, Page 18](#)) and save the new values permanently by means of command E002 ([Chapter 8.2.3, Page 30](#)).

#### Host -> RFI341-1503

STX "1003 <bbbb> ETX	
bbbb	04B0h: 1,200 Bd 0960h: 2,400 Bd 12C0h: 4,800 Bd 2580h: 9,600 Bd 4B00h: 19,200 Bd 9600h: 38,400 Bd E100h: 57,600 Bd FFFFh: 115,200 Bd

#### RFI341-1503 -> Host

STX "1003" ETX	
-	No return data

#### 6.1.4 Testing the serial data interface (command 1002)

This command allows the data transfer rate of the RFI341-1503 to be changed temporarily with command 1003 ([Chapter 6.1.3, Page 19](#)) and completes the change.

##### Host -> RFI341-1503

STX "1002" ETX	
-	No command parameters

##### RFI341-1503 -> Host

STX "1002" ETX	
-	No return data

RFI341-1503

## 6.2 Data interface timeout

A timeout can be set for the data interface.

**Default setting** 01F4 (= 5150 ms).

### 6.2.1 Requesting the current setting (command 1010 <04>):

Host -> RFI341-1503

```
STX "1010" <04> ETX
```

RFI341-1503 -> Host

```
STX "1010" <vvvv> ETX
```

### 6.2.2 Setting the timeout (command 1011 <04> ...):

## NOTICE

#### Configuration loss!

To ensure that the changes become effective, proceed as follows.:

- Save the settings permanently by means of command E002 ([Chapter 8.2.3, Page 30](#)).
- Restart the RFI341-1503.

Host -> RFI341-1503

```
STX "1011" <04> <vvvv> ETX
```

vvv	Timeout duration (unit: 10 ms): 01F4: 5150 ms
-----	--

RFI341-1503 -> Host

```
STX "1011" <vvvv> ETX
```

# 7 Ethernet data interface settings

## 7.1 Requesting the current Ethernet configuration (command 102A <kk>)

This command is used to request each the current setting of the IP address, the subnet mask or the standard gateway of the RFI341-1503.

**Default setting** TCP Port: 0835h (numerical: 2101)  
DHCP: 093Ah

Host -> RFI341-1503

STX "102A" <kk> ETX

kk	0Eh: IP address, 1st part 0Fh: IP address, 2nd part 10h: subnet mask, 1st part 11h: subnet mask, 2nd part 12h: standard gateway, 1st part 13h: standard gateway, 2nd part 14h: TCP port 15h: DHCP, get IP address automatically
----	--

RFI341-1503 -> Host

STX "102A" <vvvv> ETX

vvvv	0000h ...FFFFh: 000.000. ... 255.255.
------	---------------------------------------

## 7.2 Setting the Ethernet configuration (command 102B <kk> <vvvv>)

This command is used to set each the IP address, the subnet mask or the standard gateway of the RFI341-1503.

### NOTICE

#### Configuration loss!

To ensure that the changes become effective, proceed as follows:.

- Save the settings permanently by means of command E002 ([Chapter 8.2.3, Page 30](#)).
- Restart the RFI341-1503.

#### Host -> RFI341-1503

**STX "102B" <kk> <vvvv> ETX**

kk	0Eh: IP address, 1st part 0Fh: IP address, 2nd part 10h: subnet mask, 1st part 11h: subnet mask, 2nd part 12h: standard gateway, 1st part 13h: standard gateway, 2nd part 14h: TCP port 15h: DHCP, get IP address automatically
vvvv	0000h ...FFFh: 000.000. ... 255.255.

#### RFI341-1503 -> Host

**STX "102B" ETX**

#### Example 1:

Setting the IP address to 192.168.0.1.

Numerical	192.	168.	0.	1
Hex	C0	A8	00	01
	1st part		2nd part	

If the host sends the 1st part (192.168.) to the RFI341-1503:

**STX 102B0EC0A8 ETX**

the RFI341-1503 responds with:

**STX 102B ETX**

If the host sends the 2nd part (0.1) to the RFI341-1503:

**STX 102B0F0001 ETX**

the RFI341-1503 responds with:

**STX 102B ETX**

*Example 2:*

Setting the subnet mask to 255.255.0.0.

Numerical	255.	255.	0.	0
Hex	FF	FF	00	00
	1st part		2nd part	

If the host sends the 1st part (255.255.) to the RFI341-1503:

**STX 102B10FFFF ETX**

the RFI341-1503 responds with:

**STX 102B ETX**

If the host sends the 2nd part (0.0) to the RFI341-1503:

**STX 102B110000 ETX**

the RFI341-1503 responds with:

**STX 102B ETX**

RFI341-1503

## 8 System settings

### 8.1 Command line buffer

The RFI341-1503 allows a function to be defined in a command line buffer. Depending on the setting, the RFI341-1503 executes the defined function automatically once it has been restarted ([Chapter 8.1.4, Page 28](#)) or once it has been triggered by the protocol ([Chapter 8.1.3, Page 27](#)).

#### 8.1.1 Requesting the current content of the command line buffer (command 1020)

Host -> RFI341-1503

```
STX "1020" ETX
```

RFI341-1503 -> Host

```
STX "1020" [ <cccc> [ <c> [ <...> ] ] ] ETX
```

cccc	Current content of the command line buffer
------	--

*Example:*

The "triggered read UID" function is stored in the command memory.

A software command is used as the start condition and a timer value is used as the stop condition (0004).

The data is output when the stop condition is fulfilled (i.e. the timer value is reached).

The RFI341-1503 responds to the following request...

```
STX 1020 ETX
```

...with:

```
STX 10207002410004 ETX
```

8.1.2 Writing the command to the command line buffer (command 1021)

This command can be used to write a command to the command line buffer.

**NOTICE**

**Configuration loss!**

To ensure that the changes become effective, proceed as follows:.

- Save the settings permanently by means of command E002 ([Chapter 8.2.3, Page 30](#)).
- Restart the RFI341-1503.

**Host -> RFI341-1503**

```
STX "1021" [ <cccc> [ <c> [ <...> ] ] ] ETX
```

cccc	New command (incl. all the required parameters) to save in the command line buffer
------	--

**RFI341-1503 -> Host**

```
STX "1021" ETX
```

*Example:*

The "triggered read UID" function is stored in the command memory.

A software command is used as the start condition and a timer value is used as the stop condition (0004).

The data is output when the stop condition is fulfilled.

The RFI341-1503 responds to the following storage sequence...

```
STX 10217002410004 ETX
```

...with:

```
STX 1021 ETX
```

RFI341-1503

### 8.1.3 Starting the command in the command line buffer via protocol (command 1022)

The trigger function starts the command currently stored in the command line buffer of the RFI341-1503 via protocol. This function is designed for test purposes to ensure that the buffer is correctly configured.

Host -> RFI341-1503

STX "1022" ETX
----------------

RFI341-1503 -> Host

STX "1022" <rrrr...> ETX
--------------------------

rrrr...	Response to the command in the command line buffer
---------	--

*Example:*

The "triggered read UID" function is stored in the command memory.

A software command is used as the start condition and a timer value is used as the stop condition (0004).

The data is output when the stop condition is fulfilled (i.e. the timer value is reached).

The RFI341-1503 responds cyclically to the following request...

**STX 1022 ETX**

(one transponder in the field + UID (16 hex characters), default settings):

**STX 6C21000190130C07000104E0 ETX**

until the transponder is removed from the field.

As soon as the transponder is no longer within the reading field, the RFI341-1503 transmits the following message:

**STX 6C210000 ETX**

**8.1.4 Starting the command in the command line buffer automatically after power-on**

This command is used to trigger the command currently stored in the command line buffer of the RFI341-1503 automatically when the device is switched on. This function allows the RFI341-1503 to be switched to a status in which control via an external host is not required (stand-alone system).

**Requesting the current setting (command 1010 <1C>):**

Host -> RFI341-1503

```
STX "1010" <1C> ETX
```

RFI341-1503 -> Host

```
STX "1010" <vvvv> ETX
```

vvv	see below
-----	-----------

**Setting the execution mode (command 1011 ...):**

Host -> RFI341-1503

```
STX "1011" <vvvv> ETX
```

vvv	<p>Execution mode:</p> <p>0000: RFI341-1503 does not execute the command stored in the command line buffer automatically when the device is switched on.</p> <p>0001: RFI341-1503 executes the command only once when the device is switched on.</p> <p>0002: RFI341-1503 executes the command repeatedly as soon as the device is switched on.</p> <p>As soon as data is transmitted via the serial data interface, automatic execution is interrupted and is not reactivated until the device is next restarted.</p> <p><b>Important:</b> To ensure that the first command is processed correctly, it is best to transmit an ESC (or "BRK") followed by the actual command.</p>
-----	---

RFI341-1503 -> Host

```
STX "1011" ETX
```

RFI341-1503

## 8.2 Memory

The following commands control how data is stored in the non-volatile memory of the RFI341-1503 (i.e. in the flash or EEPROM memory). All the settings that can be made by the user are stored in the non-volatile memory. The E00X commands affect all settings (global, service, and transponder specific).

The default values are listed in [Table 11-3, Page 100](#).

### 8.2.1 Restoring the default settings (command E000)

This command restores the factory settings for all transponder-independent system parameters.

Host -> RFI341-1503

STX "E000" ETX	
----------------	--

-	No command parameters
---	-----------------------

RFI341-1503 -> Host

STX "E000" ETX	
----------------	--

-	No return data
---	----------------

### 8.2.2 Restoring the application-specific settings (command E001)

This command resets all the transponder-independent system parameters to the application-specific values last stored with command E002.

Host -> RFI341-1503

STX "E001" ETX	
----------------	--

-	No command parameters
---	-----------------------

RFI341-1503 -> Host

STX "E001" ETX	
----------------	--

-	No return data
---	----------------

### 8.2.3 Storing the current settings permanently (command E002)

This command saves all the settings (transponder-independent and dependent system settings) in the non-volatile memory of the RFI341-1503. When the device is switched on and when the "Reset system" function is executed ([Chapter 10.1.1, Page 51](#)), these settings are activated automatically.

#### Host -> RFI341-1503

STX "E002" ETX	
-	No command parameters

#### RFI341-1503 -> Host

STX "E002" ETX	
-	No return data

## 9 ISO/IEC 15963/HF settings

### 9.1 AFI settings

A filter function can be used to determine the transponder IDs (UID: **U**nique **I**dentifier). Certain ISO/IEC transponders support the AFI (**A**pplication **F**amily Identifier) for this purpose. If this is set in the RFI341-1503, only the transponders whose AFI matches the current setting are including in the inventory process.

#### 9.1.1 Requesting the current setting (command 1C30 <05>):

A byte value that can be used as a filter when the transponders are inventorised can be stored in the RFI341-1503. If the value is set to "0000", the "Use of AFI" function is deactivated. Numerical values are represented as unsigned 16-bit hexadecimal numbers.

Host -> RFI341-1503

```
STX "1C30" <05> ETX
```

RFI341-1503 -> Host

```
STX "1C30" <vvvv> ETX
```

vvvv	Use of the AFI: 0000: AFI deactivated 0001 ... 00FFh: AFI activated as filter
------	---

*Example:*

AFI byte set to 01h.

The RFI341-1503 responds to the following request...

```
STX 1C3005 ETX
```

...with:

```
STX 1C300001 ETX
```

### 9.1.2 Activating/deactivating use of the AFI (command 1C31 ...)

Host -> RFI341-1503

**STX "1C31" <vvvv> ETX**

vvv	Use of the AFI: 0000: AFI deactivated 0001 ... 00FFh: AFI activated as filter
c	51h where vvv = 0001 54h where vvv = 0000

RFI341-1503 -> Host

**STX "1C31" ETX**

## 9.2 DSFID settings

Along with their UID, ISO 15693 transponders transmit a DSFID byte (**Data Storage Format Identifier**). Users can specify whether the DSFID is transferred to the host, which DSFID is used as a filter, and how the filter is to function.

If the filter function is activated, only transponder IDs whose DSFIDs match the set value are output. This generally applies to the response to command 6C21 and, in the event of a positive result, response 7002. Command 7005 also takes into account the DSFID filter when the data is read and when it is output via the RFI341-1503.

**Important** Command 7005: like the transponder ID, the value 00h is entered as the DSFID during a non-addressed read operation.

### 9.2.1 Activating/deactivating DSFID output

Requesting the status of the DSFID output (command 1C30 <1B>):

Host -> RFI341-1503

```
STX "1C30" <1B> ETX
```

RFI341-1503 -> Host

```
STX "1C30" <vvvv> ETX
```

vvv	Status of DSFID output: 0000: DSFID not output 0001: DSFID output
-----	---

Setting the status of the DSFID output (command 1C31 <1B>):

Host -> RFI341-1503

```
STX "1C31" <1B> <vvvv> ETX
```

vvv	Status of DSFID output: 0000: DSFID not output 0001: DSFID output
-----	---

RFI341-1503 -> Host

```
STX "1C31" ETX
```

*Example:* DSFID output activated

The RFI341-1503 responds to the following request...

```
STX 6C21 ETX
```

...with:

```
STX 6C210001A5B32D24000007E000 ETX
```

*Example:* DSFID output deactivated

The RFI341-1503 responds to the following request...

**STX 6C21 ETX**

...with:

**STX 6C210001A5B32D24000007E0 ETX**

RFI341-1503

**9.2.2 Requesting/setting the DSFID filter value**

Requesting the current setting (command 1C30 &lt;1C&gt;):

Host -&gt; RFI341-1503

STX "1C30" <1C> ETX
---------------------

RFI341-1503 -&gt; Host

STX "1C30" <vvvv> ETX
-----------------------

vvvv	Set value of the DSFID filter: (0000h ... 00FFh)
------	---

Setting the value (command 1C31 &lt;1C&gt; ...):

Host -&gt; RFI341-1503

STX "1C31" <1C> <vvvv> ETX
----------------------------

vvvv	DSFID filter value to be set (0000h ... 00FFh)
------	---

RFI341-1503 -&gt; Host

STX "1C31" <vvvv> ETX
-----------------------

### 9.2.3 Activating/deactivating the DSFID filter

Requesting the current status of the DSFID filter (command 1C30 <1D>):

Host -> RFI341-1503

```
STX "1C30" <1D> ETX
```

RFI341-1503 -> Host

```
STX "1C30" <vvvv> ETX
```

vvv	<p>Switch for the DSFID filter:</p> <p>0000h: DSFID filter off</p> <p>0001h: DSFID filter on. The RFI341-1503 outputs the data of the transponders whose IDs match the set value (ISO_DSFD_FILTER).</p> <p>0002h: DSFID filter on. The RFI341-1503 filters the data of the transponders whose IDs match the set value (ISO_DSFD_FILTER). Instead the RFI341-1503 outputs the data of the transponders whose IDs don't match the set value.</p>
-----	--

Setting the status of the DSFID filter (command 1C31 <1D> ...):

Host -> RFI341-1503

```
STX "1C31" <1D> <vvvv> ETX
```

vvv	<p>Switch for the DSFID filter:</p> <p>0000h: DSFID filter off</p> <p>0001h: DSFID filter on. The RFI341-1503 outputs the data of the transponders whose IDs match the set value (ISO_DSFD_FILTER).</p> <p>0002h: DSFID filter on. The RFI341-1503 filters the data of the transponders whose IDs match the set value (ISO_DSFD_FILTER). Instead of the filtered data the RFI341-1503 outputs the data of the transponders whose IDs don't match the set value.</p>
-----	---

RFI341-1503 -> Host

```
STX "1C31" ETX
```



## 9.4 HF transmitter power

The HF transmitter power of the RFI341-1503 is variable. It can be set to reduce the maximum write/read distance or suppress unwanted interference provided that the device is not required to operate at full transmitter power. It is important to remember that the range is not proportional to the transmitter power.

The following table provides examples of the reading ranges achieved with the RFA331 antenna as a function of the transmitter power with a card-size ISO transponder:

Transmitter power	Reading range
4 W	≤ 62 cm
2 W	≤ 56 cm
1 W	≤ 46 cm
700 mW	≤ 42 cm

Tab. 9-1: Reading ranges of the RFI341-1503 with antenna RFA331

### 9.4.1 Requesting the current transmitter power (command 1010 <02>):

Host -> RFI341-1503

```
STX "1010" <02> ETX
```

RFI341-1503 -> Host

```
STX "1010" <vvvv> ETX
```

vvv	Transmitter power: 0001: 700 mW 0002: 1 W 0003: 2 W 0004: 4 W
-----	---

### 9.4.2 Setting the transmitter power (command 1011 <02> ...)

Host -> RFI341-1503

```
STX "1011" <02> <vvvv> ETX
```

vvv	Transmitter power: 0001: 700 mW 0002: 1 W 0003: 4 W 0004: 4 W
-----	---

RFI341-1503 -> Host

```
STX "1011" ETX
```

RFI341-1503

## 9.5 HF modulation type

The HF modulation type of the RFI341-1503 is variable. It can be set to reduce unwanted interference. In high-interference environments, FSK should be used; in interference-free environments, however, ASK is somewhat better.

**Default setting** FSK

### 9.5.1 Requesting the current modulation type (command 1C30 <02>)

Host -> RFI341-1503

```
STX "1C30" <02> ETX
```

RFI341-1503 -> Host

```
STX "1C30" <vvvv> ETX
```

vvvv	HF modulation type: 0000: ASK 0001: FSK
------	---

### 9.5.2 Setting the modulation type (command 1C31 <02> ...)

Host -> RFI341-1503

```
STX "1C31" <02> <vvvv> ETX
```

vvvv	HF modulation type: 0000: ASK 0001: FSK
------	---

RFI341-1503 -> Host

```
STX "1C31" ETX
```

## 9.6 HF data rate (tag-to-RFI341-1503)

The HF data rate from the transponder to the RFI341-1503 is variable. A lower data rate is beneficial with respect to the spectrum and can, therefore, help in applications subject to stricter guidelines (FCC) by reducing the reading rate.

**Default setting** 26.4 kBd

### 9.6.1 Requesting the current HF data rate (tag-to-RFI341-1503) (command 1C30 <03>)

Host -> RFI341-1503

```
STX "1C30" <03> ETX
```

RFI341-1503 -> Host

```
STX "1C30" <vvvv> ETX
```

vvv	HF data rate (tag-to-RFI341-1503): 0000: low (1.6 kBd) 0001: high (26.4 kBd)
-----	--

### 9.6.2 Setting the HF data rate (tag-to-RFI341-1503) (command 1C31 <03> ...)

Host -> RFI341-1503

```
STX "1C31" <03> <vvvv> ETX
```

vvv	HF data rate (tag-to-RFI341-1503): 0000: low (1.6 kBd) 0001: high (26.4 kBd)
-----	--

RFI341-1503 -> Host

```
STX "1C31" ETX
```

RFI341-1503

## 9.7 HF data rate (RFI341-1503-to-tag)

The HF data rate from the RFI341-1503 to the transponder is variable. A lower data rate reduces the noise spectrum and is, therefore, beneficial in applications subject to stricter guidelines while, at the same time, reducing the writing range.

### 9.7.1 Requesting the current HF data rate (RFI341-1503-to-tag) (command 1010 <08>)

Host -> RFI341-1503

```
STX "1010" <08> ETX
```

RFI341-1503 -> Host

```
STX "1010" <vvvv> ETX
```

vvv	HF data rate (RFI341-1503-to-tag): 0000: low (1.6 kBd) 0001: high (26.4 kBd)
-----	--

### 9.7.2 Setting the HF data rate (RFI341-1503-to-tag) (command 1011 <08>)

Host -> RFI341-1503

```
STX "1011" <08> <vvvv> ETX
```

vvv	HF data rate (RFI341-1503-to-tag): 0000: low (1.6 kBd) 0001: high (26.4 kBd)
-----	--

RFI341-1503 -> Host

```
STX "1011" ETX
```

### 9.8 HF write procedure

In accordance with ISO/IEC 15693, two different write procedures are possible. Provided that no high-level write command is used, measures must be taken to ensure that the write procedure used is supported by the current transponder IC.

#### 9.8.1 Requesting the current write procedure (command 1C30 <04>)

Host -> RFI341-1503

```
STX "1C30" <04> ETX
```

RFI341-1503 -> Host

```
STX "1C30" <vvvv> ETX
```

vvv	Write procedure: 0000: without trigger (e.g. for Philips/NXP SL2) 0001: with trigger (e.g. TI for tag IT)
-----	---

#### 9.8.2 Setting the write procedure (command 1C31 <04> ...)

Host -> RFI341-1503

```
STX "1C31" <04> <vvvv> ETX
```

vvv	Write procedure: 0000: without trigger (e.g. for Philips/NXP SL2) 0001: with trigger (e.g. TI for tag IT)
-----	---

RFI341-1503 -> Host

```
STX "1C31" ETX
```

RFI341-1503

**9.8.3 Write security (read-after-write)**

The RFI341-1503 can verify by means of an automatic check whether data was successfully written to the transponder (read-after-write). This check can take a long time, however, and can be deactivated if necessary.

**Requesting the current status of the check mode (command 1010 <07>):**

**Host -> RFI341-1503**

```
STX "1010" <07> ETX
```

**RFI341-1503 -> Host**

```
STX "1010" <vvvv> ETX
```

vvvv	Check mode for write security: 0000: check mode off 0001: check mode on
------	---

**Activating/deactivating check mode (command 1011 <07> ...):**

**Host -> RFI341-1503**

```
STX "1011" <07> <vvvv> ETX
```

vvvv	Check mode for write security: 0000: check mode off 0001: check mode on
------	---

**RFI341-1503 -> Host**

```
STX "1011" ETX
```

## 9.9 Transferring the block security status of the transponder

When the RFI341-1503 attempts to gain read-access to the user data memory of the transponder, the system can automatically indicate whether the memory is write protected, for example. It can take a long time to transfer this security information, however, which is why this function can be deactivated.

**Requesting the current block security status (command 1C30 <06>):**

Host -> RFI341-1503

```
STX "1C30" <06> ETX
```

RFI341-1503 -> Host

```
STX "1C30" <vvvv> ETX
```

vvv	Block security status: 0000: Security information is not transferred to the RFI341-1503 0001: Security information is transferred to the RFI341-1503
-----	--

**Activating/deactivating the function for transferring the block security status (command 1C31 <06> ...):**

Host -> RFI341-1503

```
STX "1C31" <06> <vvvv> ETX
```

vvv	Block security status: 0000: Security information is not transferred to the RFI341-1503 0001: Security information is transferred to the RFI341-1503
-----	--

RFI341-1503 -> Host

```
STX "1C31" ETX
```

*Example:*

Block 0 (in "normal, not addressed" mode) of a transponder is read.  
Command 4C20 is used for this purpose.

**STX 4C2000nn ETX**

a) Security information is transferred:

**STX 4C200y0031323334 ETX**

b) Security information is not transferred:

**STX 4C200y31323334 ETX**

## 9.10 Repeat cycles during read/write operation

To increase the reliability of a read/write operation the numbers of repeat cycles could be set. If an access to a transponder will be done this value defines how often the RFI341-1503 should try an operation with an individual block before an error will be send. Especially in multiple block read/write operations this will increase the performance.

### 9.10.1 Requesting the current number of repeat cycles (command 1C30 <08>):

Host -> RFI341-1503

```
STX "1C30" <08> ETX
```

RFI341-1503 -> Host

```
STX "1C30" <vvvv> ETX
```

vvv	Repeat cycles during read operation: 0001: 1 cycle 0002: 2 cycles ... FFFF: x cycles
-----	--

### 9.10.2 Setting the number of repeat cycles (command 1C31 <08> ...):

Host -> RFI341-1503

```
STX "1C31" <08> <vvvv> ETX
```

vvv	Repeat cycles during read operation: 0001: 1 cycle 0002: 2 cycles ... FFFF: x cycles
-----	--

RFI341-1503 -> Host

```
STX "1C31" ETX
```

## 9.11 UID output format

The documentation does not explicitly state in which format the UID is to be output on the data interface. For this reason, it may be the case that some applications use a format that outputs the header byte (E0) at the start while other applications output it at the end.

### 9.11.1 Requesting the current output format (command 1C30 <09>)

Host -> RFI341-1503

```
STX "1C30" <09> ETX
```

RFI341-1503 -> Host

```
STX "1C30" <vvvv> ETX
```

vvv	UID output format: 0000: output xxxxxxxxxxxxE0 0001: output E0xxxxxxxxxxxx
-----	--

### 9.11.2 Setting the output format (command 1C31 <09> ...)

Host -> RFI341-1503

```
STX "1C31" <09> <vvvv> ETX
```

vvv	UID output format: 0000: output xxxxxxxxxxxxE0 0001: output E0xxxxxxxxxxxx
-----	--

RFI341-1503 -> Host

```
STX "1C31" ETX
```

RFI341-1503

## 9.12 HF reset for transponders

A setting can be made that initiates an HF reset for all the transponders in the field **either before or after** an inventory. This ensures that the transponders do not remain in "quiet mode" ("mute") and, therefore, are included in the inventory.

This mode is deactivated in the advanced trigger mode function 7005 when the option "carrier remain on" is chosen.

### 9.12.1 Requesting the current status of the HF reset

#### a) HF reset BEFORE the inventory (command 1C30 <0E>)

Host -> RFI341-1503

```
STX "1C30" <0E> ETX
```

RFI341-1503 -> Host

```
STX "1C30" <vvvv> ETX
```

vvv	HF reset: 0000: no HF reset 0001: HF reset
-----	--

#### b) HF reset AFTER the inventory (command 1C30 <0F>)

Host -> RFI341-1503

```
STX "1C30" <0F> ETX
```

RFI341-1503 -> Host

```
STX "1C30" <vvvv> ETX
```

vvv	HF reset: 0000: no HF reset 0001: HF reset
-----	--

**9.12.2 Activating/deactivating the HF reset****a) HF reset BEFORE the inventory (command 1C31 <0E> ...)**

Host -&gt; RFI341-1503

**STX "1C31" <0E> <vvvv> ETX**

vvv	HF reset: 0000: no HF reset 0001: HF reset
-----	--

RFI341-1503 -&gt; Host

**STX "1C31" ETX****b) HF reset AFTER the inventory (command 1C31 <0F>...)**

Host -&gt; RFI341-1503

**STX "1C31" <0F> <vvvv> ETX**

vvv	HF reset: 0000: no HF reset 0001: HF reset
-----	--

RFI341-1503 -&gt; Host

**STX "1C31" ETX**

RFI341-1503

### 9.13 Number of reading time slots (inventory)

In accordance with the ISO standard, users can choose either one reading time slot or 16 reading time slots. It is recommended that one reading time slot be used when:

- A quick check is to be carried out to determine whether transponders are located in the field (if just one transponder is located in the field, the checksum is correct and the UID can be read). If more than one transponder is located in the field, this is indicated in the error message.
- Only one transponder is located in the field (speed).

#### 9.13.1 Requesting the current number of reading time slots (command 1C30 <10>)

Host -> RFI341-1503

```
STX "1C30" <10> ETX
```

RFI341-1503 -> Host

```
STX "1C30" <vvvv> ETX
```

vvvv	Number of reading time slots: 0000: 16 time slots 0001: 1 time slot
------	---

#### 9.13.2 Setting the number of reading time slots (command 1C31 <10> ...)

Host -> RFI341-1503

```
STX "1C31" <10> <vvvv> ETX
```

vvvv	Number of reading time slots: 0000: 16 time slots 0001: 1 time slot
------	---

RFI341-1503 -> Host

```
STX "1C31" ETX
```

## 9.14 Delayed HF carrier switch-off

A delayed HF carrier switch-off is designed to ensure that a transponder can absorb enough power to carry out the first transaction.

If the background function 7002 is used, this setting is ignored and the carrier is switched off as soon as the stop condition is fulfilled.

### 9.14.1 Requesting the current HF carrier switch-off mode (command 1010 <06>)

Host -> RFI341-1503

```
STX "1010" <06> ETX
```

RFI341-1503 -> Host

```
STX "1010" <vvvv> ETX
```

vvv	Switch-off mode: Waiting time (unit: 100 ms) 0000: no switch-off 0005: 500 ms default setting FFFFh: maximum value
-----	--

### 9.14.2 Setting the HF carrier switch-off mode (command 1011 <06> ...)

Host -> RFI341-1503

```
STX "1011" <06> <vvvv> ETX
```

vvv	Switch-off mode: Waiting time (unit: 100 ms) 0000: no switch-off 0005: 500 ms default setting FFFFh: maximum value
-----	--

RFI341-1503 -> Host

```
STX "1011" ETX
```

RFI341-1503

## 10 Functions

### 10.1 RFI341-1503

A number of functions are supported that have a direct effect on the RFI341-1503.

#### 10.1.1 Software reset (reset RFI341-1503), command 1000

This command switches the RFI341-1503 to the status that prevails when it is switched on (application-specific parameter values last saved permanently with command E002; default setting for initial commissioning). The RFI341-1503 is restarted (warm start) without the power supply being switched off. Since the restart takes a certain amount of time, confirmation is received some time later depending on the configured RFI341-1503. During the restart, the parameter values of the serial data interface are reset to the values last saved permanently with command E002.

Host -> RFI341-1503

```
STX "1000" ETX
```

RFI341-1503 -> Host

```
STX "1000" <sss> "X" "/" <vv> <ww> "/"<m>
[ <m> [...] ] [ "/" <s>[ <s> [...] ] ] ETX
```

sss	System designation "RFI341-1503"
vv	Version number (main version)
ww	Version number (sub-version)
m	Full module name
s	Software features

Example:

RFIX/0077/RFI341-1503 (0077 = firmware version)

**10.1.2 Querying the version number (command 1001)**

This command queries the system designations of the RFI341-1503 as well as the hardware and software version numbers (see "Reset" command, [Chapter 10.1.1, Page 51](#)).

Host -> RFI341-1503

<b>STX "1001" ETX</b>
-----------------------

-	No command parameters
---	-----------------------

RFI341-1503 -> Host (new format)

<b>STX "1001" &lt;sss&gt; "X" "/" &lt;vv&gt; &lt;ww&gt; "/"&lt;m&gt; [ &lt;m&gt; [...] ] [ "/" &lt;s&gt;[ &lt;s&gt; [...] ] ] ETX</b>
---

sss	System designation "RFI341-1503"
vv	Version number (main version)
ww	Version number (sub-version)
m	Full module name
s	Software features

RFI341-1503

**10.1.3 Heartbeat**

To enable a failure of the RFI341-1503 to be identified more quickly, the "triggered" functions are equipped with a heartbeat function. Whenever the stop condition is not fulfilled, the RFI341-1503 transmits the heartbeat specified below via the data interface at regular intervals.

**RFI341-1503 -> Host**

**Triggered Inventory:**

```
STX "7002H" ETX
```

or

**Triggered Read:**

```
STX "7005H" ETX
```

**Requesting the current heartbeat status (command 1010 <26>):**

**Host -> RFI341-1503**

```
STX "1010" <26> ETX
```

**RFI341-1503 -> Host**

```
STX "1010" <vvvv> ETX
```

vvvv	<p><b>Heartbeat:</b></p> <p>0000: RFI341-1503 does not transmit heartbeat</p> <p>xxxx: RFI341-1503 transmits heartbeat.</p> <p>Instead of an actual time value, polling of the start condition is used as a counting unit. All 256 checks of the trigger condition form one unit. A heartbeat value of 001Ah, therefore, means that one heartbeat is output by the RFI341-1503 every <math>26 \times 256 = 6656</math> checks. This value corresponds to an output rate of roughly one second.</p>
------	--

Setting the heartbeat status (command 1011 <26> ...):

## NOTICE

### Configuration loss!

To ensure that the changes become effective, proceed as follows:

- Save the settings permanently by means of command E002 ([Chapter 8.2.3, Page 30](#)).
- Restart the RFI341-1503.

Host -> RFI341-1503

```
STX "1011" <26> <vvvv> ETX
```

vvv	<p>Heartbeat:</p> <p>0000: RFI341-1503 does not transmit heartbeat</p> <p>xxxx: RFI341-1503 transmits heartbeat</p> <p>Instead of an actual time value, polling of the start condition is used as a counting unit. All 256 checks of the trigger condition form one unit. A heartbeat value of 001Ah, therefore, means that one heartbeat is output by the RFI341-1503 every <math>26 \times 256 = 6656</math> checks. This value corresponds to an output rate of roughly one second.</p>
-----	--

RFI341-1503 -> Host

```
STX "1011" ETX
```

Example:

The RFI341-1503 is switched to the status of the triggered UID read (STX 7002440004 ETX).

The start condition is input 1 and the stop condition is the time.

The heartbeat is set to one second (STX 101126001A ETX)

The following message is output cyclically until the trigger is initiated.

**Case A) Function "7002"**

```
STX 7002H ETX
```

...

```
STX 7002 ETX
```

```
STX 6C210001 AA507D08000104E0 ETX
```

```
STX 7002H ETX
```

...

**Case B) Function "7005"**

```
STX 7005H ETX
```

...

```
STX 7005 ETX
```

```
STX User data ETX
```

```
STX 7005H ETX
```

...

RFI341-1503

## 10.2 Digital switching inputs/outputs

The RFI341-1503 is equipped with two digital switching inputs and two digital switching outputs. Commands can be issued to read the status of the inputs manually and set the status of the outputs.

In conjunction with specific functions (triggered read), the inputs can also trigger actions automatically.

The outputs can be switched automatically depending on the result. The automatic output settings can be found in [Chapter 11.7, Page 104](#).

### 10.2.1 Requesting the switching status of the inputs (command 2004)

This command returns the current signal statuses of the two digital switching inputs. The status of the first input is returned in the least-significant bit, which is followed by the status of the second input.

Host -> RFI341-1503

```
STX "2004" ETX
```

RFI341-1503 -> Host

```
STX "2004" <pp> ETX
```

pp	Current status of the two switching inputs (8 bit, hexadecimal)
----	---

Possible statuses		
E2	E1	pp
0	0	00h
0	1	01h
1	0	02h
1	1	03h
1 = ON, 0 = OFF		

### 10.2.2 Reporting changes to the switching statuses of the inputs automatically (command 7002 <00> <0000>)

The RFI341-1503 uses this function to check whether the inputs have changed and, if so, reports this to the higher-level host. The function was designed to reduce traffic on the data interface (which would be necessary if the status had to be queried continuously).

The RFI341-1503 transmits a status confirmation if the command contains option code 00h and, therefore, the status of the inputs is to be queried. The status confirmation is transmitted twice at the following times:

- Directly after initialization
- Once the stop condition has been fulfilled (when the input status changes or when the counter for the selected timer reaches zero)

Host -> RFI341-1503

STX "7002" <00> <0000> ETX
----------------------------

RFI341-1503 -> Host

STX "7002" <ss> ETX
---------------------

ss	Signal status at the digital inputs
----	-------------------------------------

Possible statuses		
E2	E1	pp
0	0	00h
0	1	01h
1	0	02h
1	1	03h
1 = ON, 0 = OFF		

RFI341-1503

**10.2.3 Setting the statuses of the switching outputs (command 7001 ...)**

This command defines the current signal statuses of the digital switching outputs of the RFI341-1503.

**Host -> RFI341-1503**

```
STX "7001" <oo> <pp> ET
```

oo	The "Option" parameter must be set to <b>00h</b> (all the other values are reserved for future use). Option 01h is reserved for controlling the multiplexer.
pp	New status (binary) of the switching outputs

Possible statuses		
Out 2	Out 1	pp
0	0	00h
0	1	01h
1	0	02h
1	1	03h

1 = ON, 0 = OFF

**RFI341-1503 -> Host**

```
STX "7001" ETX
```

### 10.2.4 Assigning the "Good Read" function to switching output 1

If the functions for result-controlled output are used ([Chapter 11.7, Page 104](#)), switching output 1 of the RFI341-1503 can be set automatically for a freely-definable period of time depending on the result. The following switching criterion applies: **at least one valid transponder** can be processed and output within the reading time slot.

Requesting the current assignment status "Good Read" (command **1010 <15>**):

Host -> RFI341-1503

```
STX "1010" <15> ETX
```

RFI341-1503 -> Host

```
STX "1010" <vvvv> ETX
```

vvvv	Good Read: 0000: Good Read off 0001 ... FFFF: Good Read on Time (unit: ms) coded in hex (100 ms = 0068h)
------	---

Activating/deactivating the Good Read assignment (command **1011 <15> ...**):

Host -> RFI341-1503

```
STX "1011" <15> <vvvv> ETX
```

vvvv	Good Read: 0000: Good Read off 0001 ... FFFF: Good Read on Time (unit: ms) coded in hex (100 ms = 0068h)
------	---

RFI341-1503 -> Host

```
STX "1011" ETX
```

RFI341-1503

**10.2.5 Assigning the "No Read" function to switching output 2**

If the functions for result-controlled output are used ([Chapter 11.7, Page 104](#)), switching output 2 of the RFI341-1503 can be set automatically for a freely-definable period of time depending on the result. The following switching criterion applies: **no valid transponder** can be processed and output within the reading time slot.

**Requesting the current "No Read" assignment (command 1010 <29>):**

**Host -> RFI341-1503**

```
STX "1010" <29> ETX
```

**RFI341-1503 -> Host**

```
STX "1010" <vvvv> ETX
```

vvvv	No Read: 0000: No Read off 0001 ... FFFF: No Read on Time (unit: ms) coded in hex (100 ms = 0068h)
------	---

**Activating/deactivating the "No Read" assignment (command 1011 <29>):**

**Host -> RFI341-1503**

```
STX "1011" <29> <vvvv> ETX
```

vvvv	No Read: 0000: No Read off 0001 ... FFFF: No Read on Time (unit: ms) coded in hex (100 ms = 0068h)
------	---

**RFI341-1503 -> Host**

```
STX "1011" ETX
```

### 10.3 Antenna Multiplexer

#### 10.3.1 Requesting the multiplexer status (command 7006)

This function signals if a multiplexer is identified at the Mux-Control port.

Host -> RFI341-1503

STX "7006" ETX
----------------

-	No command parameters
---	-----------------------

RFI341-1503 -> Host

STX "7006" <s> ETX
--------------------

s	y: Mux present n: Mux not present
---	--------------------------------------

RFI341-1503

**10.3.2 Selecting the active antenna output (command 7001 ...)**

This function is used to activate one of the four antenna outputs of the RFI341-1503 if a multiplexer is integrated.

**Host -> RFI341-1503**

```
STX "7001" <oo> <pp> ETX
```

oo	The parameter "Option" must be set to <b>01h</b> .
pp	New status (binary) of the antenna outputs

Possible statuses				
Ant 1	Ant 2	Ant 3	Ant 4	pp
1	0	0	0	00h
0	1	0	0	02h
0	0	1	0	04h
0	0	0	1	08h

1 = ON, 0 = OFF

**RFI341-1503 -> Host**

```
STX "7001" ETX
```

**10.3.3 Requesting the port sequence (command 2020)**

This command is used to obtain one specified step of the current port sequence which is stored in the reader. Usually, the port sequence consists of two or more steps. The port sequence is used by the RFI341-1503's port sequencer, which can be used to e.g. autonomously control an external antenna multiplexer.

**Host -> RFI341-1503**

```
STX "2020" <iiii> ETX
```

iiii	Index of the 64 bit port sequence step to retrieve, beginning with 0000
------	---

**RFI341-1503 -> Host**

```
STX "2020" <axbxxxxxcccxxx> ETX
```

a	Defines an action that shall be done in this sequence step: 1: Switch antenna 4: Change transmit power 9: Switch antenna and change transmit power
b	Defines the output power steps: 1: 700 mW 2: 1 W 3: 2 W 4: 4 W
ccc	Defines the antenna: 0001: Antenna 1 0002: Antenna 2 0004: Antenna 3 0008: Antenna 4
x	x is reserved for further use and is to be set to 0 (zero)

**10.3.4 Editing the port sequence (command 2021)**

This function is used to edit a single step of the RFI341-1503's port sequence. Please see the "Request Port Sequence" command ("2020") for more information on the port sequence structure ([Chapter 10.3.3, Page 62](#)). The sequence length, which is kept in the system settings (GLS\_PORTSEQ\_LEN), will be automatically adapted to the given index, so it is necessary to submit the single port sequence steps in their natural order.

**Host -> RFI341-1503**

```
STX "2021" <iiii> <axbxxxxccccxxx> ETX
```

iiii	Index of the 64 bit port sequence step to set, beginning with 0000
a	Defines an action that shall be done in this sequence step: 1: Switch antenna 4: Change transmit power 9: Switch antenna and change transmit power
b	Defines the output power steps: 1: 700 mW 2: 1 W 3: 2 W 4: 4 W
cccc	Defines the antenna: 0001: Antenna 1 0002: Antenna 2 0004: Antenna 3 0008: Antenna 4
x	x is reserved for further use and is to be set to 0 (zero)

**RFI341-1503 -> Host**

```
STX "2021" ETX
```

-	No return data
---	----------------

*Example:*

Request:

Sequence 0000 (antenna 1, power 2W)

**STX 2021 0000 9030000000010000 ETX**

Sequence 0001 (antenna 2, power 4W)

**STX 2021 0001 9040000000020000 ETX**

**10.3.5 Requesting the current port sequencer step (command 2022)**

This command is used to obtain the current step number of the RFI341-1503's port sequencer.

Host -> RFI341-1503

<b>STX "2022" ETX</b>	
-	No command parameters

RFI341-1503 -> Host

<b>STX "2022" &lt;ssss&gt; ETX</b>	
ssss	Current step number of port sequencer

**10.3.6 Setting the port sequencer step (command 2023)**

This command is used to set the RFI341-1503's port sequencer to a specific step number.

Host -> RFI341-1503

<b>STX "2023" &lt;ssss&gt; ETX</b>	
ssss	New step number for port sequencer

RFI341-1503 -> Host

<b>STX "2023" ETX</b>	
-	No return data

RFI341-1503

**10.3.7 Iterating the port sequencer step (command 2024)**

This command is used to externally switch the RFI341-1503's port sequencer to its next step.

**Host -> RFI341-1503**

<b>STX "2024" ETX</b>
-----------------------

-	No command parameters
---	-----------------------

**RFI341-1503 -> Host**

<b>STX "2024" &lt;ssss&gt; ETX</b>
------------------------------------

ssss	Current step number of port sequencer
------	---------------------------------------

**10.3.8 Requesting the current antenna multiplexer mode (command 1010 ...)**

This function is used to obtain the current multiplexer mode.

Host -> RFI341-1503

<b>STX "1010" 1D ETX</b>
--------------------------

-	No command parameters
---	-----------------------

RFI341-1503 -> Host

<b>STX "1010" 1D &lt;iiii&gt; ETX</b>
---------------------------------------

iiii	Mux mode: 0000: Mux disabled 0001: Mux in step mode 0002: Mux in automatic mode
------	--

**10.3.9 Setting the antenna multiplexer mode (command 1011 1D)**

This function is used to set the multiplexer mode.

Host -> RFI341-1503

<b>STX "1011" 1D &lt;iiii&gt; ETX</b>
---------------------------------------

iiii	Mux mode: 0000: Mux disabled 0001: Mux in step mode 0002: Mux in automatic mode
------	--

RFI341-1503 -> Host

<b>STX "1011" ETX</b>
-----------------------

-	No return data
---	----------------

RFI341-1503

**10.3.10 Requesting the used numbers of sequences (command 1010 1E)**

This function is used to read how many sequences are used for the mux.

Host -> RFI341-1503

<b>STX "1010" 1E ETX</b>	
-	No command parameters

RFI341-1503 -> Host

<b>STX "1010" 1E &lt;iiii&gt; ETX</b>	
iiii	Number of sequences. 0000: all sequences set are in use

**10.3.11 Selecting numbers of sequences (command 1011 1E)**

This function is used to enable a number of sequences.

Host -> RFI341-1503

<b>STX "1011" 1E &lt;iiii&gt; ETX</b>	
iiii	Number of sequences. 0000: all sequences are set

RFI341-1503 -> Host

<b>STX "1011" ETX</b>	
-	No return data

## 10.4 Maintenance

To facilitate the work carried out by service personnel, the RFI341-1503 supports a number of useful servicing commands. The servicing commands can be used to directly influence internal RFI341-1503 functions. These internal functions are designed to control the hardware, which is otherwise carried out automatically by the RFI341-1503 in standard mode. The servicing commands enable these functions to be performed manually.

### 10.4.1 Activating/deactivating the HF carrier signal (command F000 ...)

This function switches the oscillator (and, in turn, the HF carrier signal) of the RFI341-1503 on or off.

**Important** Write/read functions may change the status set by this function.

#### Host -> RFI341-1503

<b>STX "F000" &lt;zz&gt; ETX</b>
----------------------------------

zz	Required switching operation for the oscillator: 00: Switch off 01: Switch on
----	---

#### RFI341-1503 -> Host

<b>STX "F000" ETX</b>
-----------------------

-	No return data
---	----------------

### 10.4.2 Triggering the HF reset (command F001)

This command switches off the HF carrier signal of the RFI341-1503 for a predefined period. Once this period has elapsed, all the transponders in the radiation field carry out an internal switch-on sequence (transponder re-initialization).

#### Host -> RFI341-1503

<b>STX "F001" ETX</b>
-----------------------

-	No command parameters
---	-----------------------

#### RFI341-1503 -> Host

<b>STX "F001" ETX</b>
-----------------------

-	No return data
---	----------------

RFI341-1503

**10.4.3 Standing wave measurement (command 1014)**

This command starts a standing wave measurement. Using this measurement the RFI341-1503 determines whether the antenna is adapted to the respective application.

A SWR against 1 is ideal.

**Host -> RFI341-1503**

<b>STX "1014" ETX</b>	
-	No command parameters

**RFI341-1503 -> Host**

<b>STX "1014" &lt;aaaa&gt; &lt;bbbb&gt; &lt;cccc&gt;ETX</b>	
aaaa	Forward transmit energy
bbbb	Respond receiving energy
cccc	Standing wave radio

*Example:*

## 1. Without antenna

<b>STX "1014" &lt;0B8B0B8B6442&gt; ETX</b>	
0B8Bh	2955 mW TX energy forward and backward
SWR of 6442	> 25

## 2. With antenna

<b>STX "1014" &lt;0FF000050487&gt; ETX</b>	
0FF0h	4080 mW TX
0005h	80 mW RX
0487h	1.1 SWR

## 10.5 Basic transponder functions to ISO/IEC15693

The RFI341-1503 was designed in such a way that all the commands in the standard system are supported. To make it as easy as possible for users to operate the device, the main algorithms (e.g. for inventoring transponders) are executed in internal routines, which means that users just receive the results. The time consuming process of studying the ISO/IEC standards and developing a separate inventory strategy is, therefore, not necessary.

### 10.5.1 Selecting the transponder (select/activate), (command 6C12 ...)

This command switches a single transponder to the status "selected". As soon as a transponder has been selected, there is no need to repeatedly transfer the address when subsequent actions are carried out. This function is useful when a number of actions are to be carried out consecutively because the address does not need to be transferred with each consecutive command, thereby saving time.

**Important** To ensure that this function can be executed in conjunction with other commands, it is important that the HF field of the RFI341-1503 remains switched on for the duration of the operations. See [Chapter 10.4.1, Page 68](#).

#### Host -> RFI341-1503

STX "6C12" <uuuuuuuuuuuuuuuu> ETX
-----------------------------------

uuuuuuuuuuuuuuuu	UID (64 bit) in reverse byte sequence
------------------	---------------------------------------

#### RFI341-1503 -> Host

STX "6C12" <s> ETX
--------------------

s	For the status code, see <a href="#">Table 11-5, Page 103</a> .
---	---

#### Example:

A transponder is to be read in "selected" mode. The UID is known.

1. Switch on HF field: **STX F00001 ETX**  
Response: ...
2. Select transponder: **STX 6c12926E1608000104E0 ETX**  
Response: ...
3. Read block 00: **STX 4C120000s ETX**  
Response:  
**STX 4C120y0031323334 ETX**  
(transfer of security information activated)

RFI341-1503

**10.5.2 Reading the transponder data (low-level, one block), (command 4C10 ...)**

This command reads an individual user data block from an ISO 15693 transponder. If the relevant ISO setting is active, the block security information is also returned. See [Chapter 10.5.16, Page 83](#).

A parameter has been defined in the ISO/IEC-15693 settings that specifies the number of repeat cycles. This value is defaulted to one cycle.

Host -> RFI341-1503

```
STX "4C10" <bb> <a> [ <uuuuuuuuuuuuuuuuuu> ] ETX
```

bb	Block number
a	Addressing type used: n: not addressed a: addressed s: selected
uuuuuuuuuuuuuuuuuu	UID (64 bit) in reverse byte sequence

RFI341-1503 -> Host

```
STX "4C10" <s> <f> [ [ <pp> ]<dd> [ <dd> [ ... ] ] ] ETX
```

s	For the status code, see <a href="#">Table 11-5, Page 103</a> .
f	Data flag: n: no data to follow y: data to follow
pp	Protection/security information (optional)
dd	Transponder data (user data)

*Example:*

Read block 00 in non-addressed mode.  
Block security information is not transferred.

Request:

**STX 4C100n ETX**

Response from RFI341-1503:

**STX 4C100y31323334 ETX**

**10.5.3 Reading the transponder data (high-level, one block), (command 4C20 ...)**

This command is more powerful than the equivalent low-level command ([Chapter 10.5.2, Page 71](#)) because it first determines the manufacturer code of the transponder and then transmits the appropriate transponder command. This can be necessary in certain cases because some transponders may not support the standard read command.

In "loop" mode, the RFI341-1503 makes repeated read attempts until the specified user data block has been successfully read. In "loop, ISO only" mode, the pre-determination procedure is skipped, which boosts performance. Execution of the command can be terminated, that is, it returns an incomplete result when the RFI341-1503 transmits or receives data via the serial data interface in the status "Exception running".

A parameter has been defined in the ISO/IEC 15693 settings that defines the number of repeat cycles. This value is defaulted to one cycle.

**Host -> RFI341-1503**

```
STX "4C20" <bb> <m> <a> [ <uuuuuuuuuuuuuuuu> ] ETX
```

bb	Block number
m	Mode: n: normal l: loop i: loop, ISO only
a	Addressing type used: n: not addressed a: addressed s: selected
uuuuuuuuuuuuuuuu	UID (64 Bit) in reverse byte sequence

**RFI341-1503 -> Host**

```
STX "4C20" <s> <f> [ [ <pp> ] <dd> [ <dd> [ ... ] ] ] ETX
```

s	For the status code, see <a href="#">Table 11-5, Page 103</a> .
f	Data flag: n: no data to follow y: data to follow
pp	Protection/security data (optional)
dd	Transponder data (user data)

*Example:*

Read block 00 in non-addressed mode.

Block security data is **not** transferred.

Request:

**STX 4C2000nn ETX**

Response from RFI341-1503:

**STX 4C200y31323334 ETX**

RFI341-1503

**10.5.4 Reading the transponder data (more than one block), (commando 4C12 ...)**

This command reads more than one user data block from an ISO 15693 transponder in one run. If the relevant ISO setting is active, the security information for each block is also returned. See [Chapter 10.5.16, Page 83](#).

**Host -> RFI341-1503**

```
STX "4C12" <bb> <cc> <a> [ <uuuuuuuuuuuuuuuu> ] ETX
```

bb	Number of the first block to be read
cc	Number of blocks to be read minus 1
a	Addressing type used: n: not addressed a: addressed s: selected
uuuuuuuuuuuuuuuu	UID (64 bit) in reverse byte sequence

**RFI341-1503 -> Host**

```
STX "4C12" <s> <f> [[ <pp> ]<dd> [ <dd> [ ... ] ] ]  
[[ <pp> ] <dd> [ <dd> [ ... ] ] ] [ ... ] ETX
```

s	For the status code, see <a href="#">Table 11-5, Page 103</a> .
f	Data flag: n: no data to follow y: data to follow
pp	Protection/security information (optional)
dd	Transponder data (user data)

*Example:*

Read block 00 to block 01 in addressed mode.  
Block security information is transferred.

Request:

```
STX 4C120001a5D263307000104E0 ETX
```

Response from RFI341-1503:

```
STX 4C120y00313233340035363738 ETX
```

### 10.5.5 Multiple Block read in ASCII and HEX format (command 7007...)

This command activates the read of several blocks in advanced mode.

The RFI341-1503 first verify whether the tag supports this mode and in case he doesn't, the function will be internal simulated. Data can be either reported in HEX or ASCII style. The max number of read approaches per block will be defined by the command described in [Chapter 9.10, Page 45](#).

Host -> RFI341-1503

```
STX "7007" <bb> <cc> <f> <a> [ <iiiiiiiiiiiiiiii> ] ETX
```

bb	Number of the first block to be read
cc	Number of blocks to be read minus 1
f	Format data need to be sent from the RFI341-1503: a: ASCII h: hex
a	Addressing type used: n: not addressed a: addressed s: selected
iiiiiiiiiiiiiiii	UID (64 bit) in reverse byte sequence

RFI341-1503 -> Host

```
STX "7007" <s> <f> [ [ <pp> ] <dd> [ <dd> [ ... ] ] ]  
[[ <pp> ] <dd> [ <dd> [ ... ] ] ] [ ... ] ETX
```

s	Status: 0: OK other values: error
f	Data flag: n: no data to follow y: data to follow
pp	Protection/security information (optional)
dd	Transponder data (user data)

Example:

Command:

```
STX 7007 00 01a n ETX
```

The first two block will be read and the data will be send in ASCII format.

If the content of the first blocks is "SICK2008" the result will be...

Response from RFI341-1503:

```
STX 7007 0y SICK2008 ETX
```

RFI341-1503

**10.5.6 Writing the data to the transponder (low-level, one block), (command 5C10 ...)**

This command writes a single user data block to an ISO 15693 transponder. It is important to ensure that the data transmitted is compatible with the transponder block size and that the settings for the transponder radio interface are compatible with the write procedure of the transponder being used. This "Philips/NXP" write procedure is very fast but requires that users know beforehand which transponder types are located in the field.

**Default setting** "Philips/NXP" write procedure

**Host -> RFI341-1503**

```
STX "5C10" <bb> <a> [ <uuuuuuuuuuuuuuuu> ] <dd> [ <dd> [ ... ] ] ETX
```

bb	Block number
a	Addressing type used: n: not addressed a: addressed s: selected
uuuuuuuuuuuuuuuu	UID (64 bit) in reverse byte sequence
dd	Data to be written, length depends on the block size

**RFI341-1503 -> Host**

```
STX "5C10" <s> ETX
```

s	For the status code, see <a href="#">Table 11-5, Page 103</a> .
---	---

*Example:*

Write block 00 in addressed mode.  
Since a Philips/NXP transponder is being used, a write procedure without trigger mode is selected.

Data **33333333**

Command:

```
STX 5C1000a5D263307000104E033333333 ETX
```

Response from RFI341-1503:

```
STX 5C100 ETX
```

**10.5.7 Writing the data to the transponder (high-level, one block), (command 5C20 ...)**

This command is more powerful than the equivalent low-level command ([Chapter 10.5.6, Page 75](#)) because it first determines the manufacturer code of the transponder and then uses the write procedure that is compatible with the transponder.

**Host -> RFI341-1503**

```
STX "5C20" <bb> <a> [ <uuuuuuuuuuuuuuuu> ] <dd> [ <dd> [ ... ] ] ETX
```

bb	Block number
a	Addressing type used: n: not addressed a: addressed s: selected
uuuuuuuuuuuuuuuu	UID (64 bit) in reverse byte sequence
dd	User data to be written, length depends on the block size

**RFI341-1503 -> Host**

```
STX "5C20" <s> ETX
```

s	For the status code, see <a href="#">Table 11-5, Page 103</a> .
---	---

*Example:*

Write block 01 in addressed mode.

The write procedure is adapted to the transponder type.

Data **44444444**

Command:

```
STX 5C2001a5D263307000104E044444444 ETX
```

Response from RFI341-1503:

```
STX 5C200 ETX
```

**10.5.8 Multiple Block write in ASCII and HEX format (command 7008...)**

This command enable the write of several blocks in advanced mode.

The RFI341-1503 first verify whether the tag supports this mode and in case he doesn't, the function will be internal simulised. Data can be either transmitted in ASCII or HEX style. The max number of write approaches per block will be defined by the command described under [Chapter 9.10, Page 45](#).

**Host -> RFI341-1503**

```
STX "7008" <bb> <cc> <f> <a> [ <iiiiiiiiiiiiiiii> ] <data> ETX
```

bb	Number of the first block to be write
cc	Number of blocks to be write minus 1
f	Format data need to be sent to the RFI341-1503: a: ASCII h: hex
a	Addressing type used: n: not addressed a: addressed s: selected
iiiiiiiiiiiiiiii	UID (64 bit) in reverse byte sequence
data	Data in ASCII or hex format

**RFI341-1503 -> Host**

```
STX "7008" <a> <s> [ <s> [ <s>... ] ] ETX
```

a	Status over all blocks: 0: result positive over all blocks 1: a number of info will follow that enable to figure out to which block the write failed
s	Status of individual blocks (only in case write failed): 0: OK other: error

*Example:*

Command:

```
STX 7008 00 01a n SICK2008 ETX
```

The first two block will be write in ASCII format.

Response from RFI341-1503:

```
STX 7008 0 ETX
```

**10.5.9 Requesting transponder system information (command 4C16 ...)**

This command returns the system information for an ISO 15693 transponder.

The info flags specify which fields are transmitted from the transponder to the host after the UID:

- Bit 0 set: DSFID supported; DSFID byte is transmitted
- Bit 1 set: AFI supported; AFI byte is transmitted
- Bit 2 set: memory capacity specifications are transmitted
- Bit 3 set: IC reference byte is transmitted

Host -> RFI341-1503

```
STX "4C16" <a> [ <uuuuuuuuuuuuuuuuuu> ] ETX
```

a	Addressing type used: n: not addressed a: addressed s: selected
uuuuuuuuuuuuuuuuuu	UID (64 bit) in reverse byte sequence

RFI341-1503 -> Host

```
STX "4C16" <s> <f> [ <ii> <uuuuuuuuuuuuuuuuuu>  
[ <dd> ] [ <aa> ] [ <nn> <bb> ] [ <rr> ] ] ETX
```

s	For the status code, see <a href="#">Table 11-5, Page 103</a> .
f	Data flag: n: no data to follow y: data to follow
ii	Info flag byte
uuuuuuuuuuuuuuuuuu	UID (64 bit) in reverse byte sequence
dd	DSFID byte
aa	AFI byte
nn	Number of available blocks minus 1
bb	Number of bytes per block minus 1
rr	IC reference byte

Example:

Determine system information for a Philips/NXP SL2 transponder in non-addressed mode:

Request:

```
STX 4C16n ETX
```

Response from RFI341-1503:

```
STX 4C160Y0F5D263307000104E000001B0301 ETX
```

**10.5.10 Reading the AFI byte of the transponder**

The AFI byte can be determined by requesting the transponder system information. See [Chapter 10.5.9, Page 78](#).

**10.5.11 Writing the AFI byte to the transponder (command 5C16 ...)**

This command changes the AFI byte (Application Family Identifier) of an ISO-15693 transponder. The AFI byte can be used as a filter function. If an AFI is used for the inventory, only transponders whose AFI matches the set AFI are included in the inventory process.

**Important** When AFIs are used, either they must match the structures defined in the standards or the transponders must be arranged in a closed circuit. If there is a chance that a transponder might leave the closed circuit, AFIs that comply with international standards must be used. See [Table 11-9, Page 106](#).

The write procedure must be compatible with the write procedure supported by the transponder.

**Host -> RFI341-1503**

```
STX "5C16" <bb> <a> [ <uuuuuuuuuuuuuuuu> ] ETX
```

bb	AFI byte
a	Addressing type used: n: not addressed a: addressed s: selected
uuuuuuuuuuuuuuuu	UID (64 bit) in reverse byte sequence

**RFI341-1503 -> Host**

```
STX "5C16" <s> ETX
```

s	For the status code, see <a href="#">Table 11-5, Page 103</a> .
---	---

*Example:*

A transponder is to be used in item management. The AFI byte should be assigned the value "90h" in accordance with the AFI coding table.

Command:

```
STX 5C1690n ETX
```

Response from RFI341-1503:

```
STX 5C160 ETX
```

10.5.12 Activating write protection for the AFI byte of the transponder  
(command 6C16 ... )

**NOTICE**

**Permanent lock!**

This command permanently locks the AFI byte of the ISO 15693 transponder.

The lock cannot be canceled.

Host -> RFI341-1503

STX "6C16" <a> [ <uuuuuuuuuuuuuuuuuu> ] ETX

a	Addressing type used: n: not addressed a: addressed s: selected
uuuuuuuuuuuuuuuuuu	UID (64 bit) in reverse byte sequence

RFI341-1503 -> Host

STX "6C16" <s> ETX

s	For the status code, see <a href="#">Table 11-5, Page 103</a> .
---	---

RFI341-1503

**10.5.13 Reading the DSFID byte of the transponder**

The RFI341-1503 outputs the DSFID with the UID provided that the DSFID output function has been activated (see [Chapter 11.5 ISO settings, Page 102](#)).

If the RFI341-1503 has identified a transponder and output the UID, the DSFID follows the UID.

*Example:*

DSFID output activated

Request:

**STX 6C21 ETX**

Response from RFI341-1503:

**STX 6C2100015D263307000104E000 ETX**

**10.5.14 Writing the DSFID byte to the transponder (command 5C17 ...)**

This command changes the DSFID byte of an ISO 15693 transponder.

**Host -> RFI341-1503**

**STX "5C17" <bb> <a> [ <uuuuuuuuuuuuuuuuuu> ] ETX**

bb	DSFID byte
a	Addressing type used: n: not addressed a: addressed s: selected
uuuuuuuuuuuuuuuuuu	UID (64 bit) in reverse byte sequence

**RFI341-1503 -> Host**

**STX "5C17" <s> ETX**

s	For the status code, see <a href="#">Table 11-5, Page 103</a> .
---	---

**10.5.15 Activating write protection for the DSFID byte of the transponder  
(command 6C17 ...)**

**NOTICE**

**Permanent lock!**

This command permanently locks the DFSID byte of an ISO 15693 transponder.

**The lock cannot be canceled.**

Host -> RFI341-1503

**STX "6C17" <a> [ <uuuuuuuuuuuuuuuuuu> ] ETX**

a	Addressing type used: n: not addressed a: addressed s: selected
uuuuuuuuuuuuuuuuuu	UID (64 bit) in reverse byte sequence

RFI341-1503 -> Host

**STX "6C17" <s> ETX**

s	For the status code, see <a href="#">Table 11-5, Page 103</a> .
---	---

RFI341-1503

**10.5.16 Reading the block security status of the transponder (command 4C18 ...)**

This command determines the block security status of an ISO 15693 transponder. Unlike the read functions, this function allows users to query the status of more than one block simultaneously.

**Host -> RFI341-1503**

**STX "4C18" <bb> <cc> <a> [ <uuuuuuuuuuuuuuuu> ] ETX**

bb	Number of the first block to be read
cc	Number of blocks to be read minus 1
a	Addressing type used: n: not addressed a: addressed s: selected
uuuuuuuuuuuuuuuu	UID (64 bit) in reverse byte sequence

**RFI341-1503 -> Host**

**STX "4C18" <s> <f> [ <pp> [ <pp> [ ... ] ] ] ETX**

s	For the status code, see <a href="#">Table 11-5, Page 103</a> .
f	Data flag: n: no data to follow y: data to follow
pp	Protection/security information: 00: no write protection 01: write protection activated 10: reserved for future use 11: reserved for future use

*Example:*

A check is carried out to determine whether blocks 00 and 01 are write protected.

Request:

**STX 4C180001a5D263307000104E0 ETX**

Response from the RFI341-1503:

**STX 4C180Y0000 ETX**

00 and 01 are not write protected (lock bit not set)

10.5.17 Activating write protection for individual transponder blocks (low-level), (command 6C14 ...)

**NOTICE**

**Permanent lock!**

This command locks an individual ISO 15693 transponder data block permanently.

**The lock cannot be canceled.**

**Important** Ensure that the correct write procedure for the transponder being used has been activated (see [Chapter 11.5 ISO settings, Page 102](#)).

Host -> RFI341-1503

```
STX "6C14" <bb> <a> [ <uuuuuuuuuuuuuuuu> ] ETX
```

bb	Number of the block to be locked
a	Addressing type used: n: not addressed a: addressed s: selected
uuuuuuuuuuuuuuuu	UID (64 bit) in reverse byte sequence

RFI341-1503 -> Host

```
STX "6C14" <s> ETX
```

s	For the status code, see <a href="#">Table 11-5, Page 103</a> .
---	---

RFI341-1503

**10.5.18 Activating write protection for individual transponder blocks (high-level), (command 6C24 ...)**

This command is more powerful than the equivalent low-level command ([Chapter 10.5.17, Page 84](#)) because it first determines the manufacturer code of the transponder and then uses the appropriate write procedure. This is sometimes necessary because some transponders may not support the standard lock command.

**NOTICE**

**Permanent lock!**

This command locks an individual ISO 15693 transponder data block permanently. **The lock cannot be canceled.**

Host -> RFI341-1503

```
STX "6C24" <bb> <a> [ <uuuuuuuuuuuuuuuuuu> ] ETX
```

bb	Number of the block to be locked
a	Addressing type used: n: not addressed a: addressed s: selected
uuuuuuuuuuuuuuuuuu	UID (64 bit) in reverse byte sequence

RFI341-1503 -> Host

```
STX "6C24" <s> ETX
```

s	For the status code, see <a href="#">Table 11-5, Page 103</a> .
---	---

**10.5.19 Setting the transponder to "quiet" status (command 6C18)**

This command sets the ISO 15693 transponder to "quiet". The transponder can then no longer respond to any command (with the exception of "Transponder reset to ready" and "Select transponder") until an HF reset is carried out. See also the transponder state diagram to ISO/IEC 15693.

**Important** Note that the transponder only remains in the "quiet" status until it receives a POR. The POR is triggered when the transponder leaves the field or an HF field reset is carried out. To suppress the automatic HF reset, the HF field should be switched on permanently before the command is issued.

**Host -> RFI341-1503**

**STX "6C18" <uuuuuuuuuuuuuuuu> ETX**

uuuuuuuuuuuuuuuu	UID (64 bit) in reverse byte sequence
------------------	---------------------------------------

**RFI341-1503 -> Host**

**STX "6C18" ETX**

-	No return data
---	----------------

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**10.5.20 Switching the transponder to "Ready" mode (command 6C1A ...)**

This command (reset-to-ready) switches one or all of the transponders in the field from "quiet" to "ready" without an HF field reset needing to be carried out. See also the transponder state diagram to ISO/IEC 15693.

**Host -> RFI341-1503s**

```
STX "6C1A" <a> [ <uuuuuuuuuuuuuuuu> ] ETX
```

a	Addressing type used: n: not addressed a: addressed s: selected
uuuuuuuuuuuuuuuu	UID (64 bit) in reverse byte sequence

**RFI341-1503 -> Host**

```
STX "6C1A" <s> ETX
```

s	For the status code, see <a href="#">Table 11-5, Page 103</a> .
---	---

**10.5.21 Searching for transponders in the field (tag detect), (command 4C2A)**

This command makes repeated attempts to query an inventory. The unique feature of this function is that the inventory is only carried out in a single reading time slot until a transponder has been detected. This command does not support the anti-collision function. Execution of the command can be interrupted, that is, it returns an incomplete result when the RFI341-1503 transmits or receives data via the serial interface in the status "Execution running".

Host -> RFI341-1503

<b>STX "4C2A" ETX</b>
-----------------------

-	No command parameters
---	-----------------------

RFI341-1503 -> Host

<b>STX "4C2A" &lt;s&gt; &lt;f&gt; [ &lt;dd&gt; &lt;uuuuuuuuuuuuuuuu&gt; ] ETX</b>
---

s	For the status code, see <a href="#">Table 11-5, Page 103</a> .
f	Data flag: n: no data to follow y: data to follow
dd	Transfer the DSFID byte (transfer cannot be deactivated)
uuuuuuuuuuuuuuuu	UID (64 bit) in reverse byte sequence

*Example:*

The "Tag detect" function is activated.

Command:

**STX 4C2A ETX**

Case a)

Since no transponder is located in the field, the RFI341-1503 first responds with the **ACK** character.

As soon as a transponder enters the field, the RFI341-1503 responds with:

**STX 4C2A0y005D263307000104E0 ETX**

Case b)

Two transponders are located in the reading field. By changing the system parameters, the RFI341-1503 attempts to determine the most powerful transponder.

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**10.5.22 Determining the transponder inventory list (Search for UID), (command 6C20 ...)**

This command creates a list of all the transponders currently located in the reading field and stores their serial numbers (UIDs) in the working memory of the RFI341-1503.

- In "single" mode, the UID list (if one exists) is deleted.
- In "cumulative" mode, the content of the existing list is retained and is extended to include newly-detected transponders. Execution of the command can be interrupted, that is, it returns an incomplete result when the RFI341-1503 transmits or receives data via the serial interface in the status "Execution running".

In both cases, the RFI341-1503 reports as a result how many transponder IDs (UIDs) have been found. The request to transfer the individual transponder IDs (UIDs) must be issued separately.

A parameter has been defined in the ISO/IEC 15693 settings that specifies the number of repeat cycles. This value is defaulted to one cycle.

**Important** The operating instructions for the RFI341-1503 contain a diagram (*Chapter "Technical Data"*) that shows how many transponder IDs (UIDs) of the RFI341-1503 can be determined over what period. Approx. 50 transponder UIDs per second can be used as a guide value here.

**Host -> RFI341-1503**

<b>STX "6C20" &lt;m&gt; ETX</b>
---------------------------------

m	Mode: s: single with HF reset S: single c: cumulative with HF reset C: cumulative
---	---

**RFI341-1503 -> Host**

<b>STX "6C20" &lt;ee&gt; &lt;ssss&gt; ETX</b>
---

ee	Binary-coded error/warning information: 00h: OK 01h: List overflow 02h: Overflow of collision queue 08h: Warning: some transponders may not have been detected.
ssss	Current length of the list (number of transponders in the list)

**10.5.23 Requesting the transponder inventory list (Get UID), (command 6C21)**

This command returns all the transponder serial numbers (UIDs) in the current RFI341-1503 inventory list that was generated with the function "Determine inventory list" ([Chapter 10.5.22, Page 89](#)).

**Important** It takes a long time for the UIDs to be transferred via the RS-232 data interface. Note that choosing a baud rate for the data interface that is too slow does not compromise system performance.

**Host -> RFI341-1503**

<b>STX "6C21" ETX</b>
-----------------------

-	No command parameters
---	-----------------------

**RFI341-1503 -> Host**

<b>STX "6C21" &lt;ssss&gt; [ &lt;uuuuuuuuuuuuuuuuuu&gt; &lt;dd&gt; [ ... ] ] ETX</b>
--

ssss	Current length of the list (number of transponders in the list)
uuuuuuuuuuuuuuuuuu	UID (64 bit) in reverse byte sequence
dd	DSFID (if output is activated)

*Example:*

Case 1)

Two transponders that were determined previously with command 6C20 are located in the field.

Request:

**STX 6C21 ETX**

Response from RFI341-1503:

**STX 6C210002AA507D08000104E005D263307000104E0 ETX**

Case 2)

The command was issued but the buffer does not contain any data.

Response from RFI341-1503:

**STX 6C210000 ETX**

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**10.5.24 Deleting the transponder inventory list (empty UID buffer), (command 1018)**

This command deletes all the data in the UID buffer of the RFI341-1503. This must be carried out if the transponder UIDs were determined in "cumulative" mode.

**Host -> RFI341-1503**

STX "1018" ETX	
----------------	--

-	No command parameters
---	-----------------------

**RFI341-1503 -> Host**

STX "1018" ETX	
----------------	--

-	No return data
---	----------------

## 10.6 Result-controlled transponder functions (triggered)

The RFI341-1503 can execute functions automatically depending on the status (start condition). This means that the RFI341-1503 can be used as a stand-alone system. Once configured, it no longer needs to be controlled by a higher-level system. Data is determined and transferred to the host in accordance with the setting.

Start and stop conditions can be defined for all result-controlled functions (see [Chapter 11.7, Page 104](#)).

The command as well as digital switching inputs 1 and 2 can be used as the start function (START).

The switching inputs or a user-defined time constant can be used as a stop criterion (STOP).

The time at which data is output can also be configured. Intermediate results (i.e. those obtained before the stop condition is fulfilled) can be transferred or the complete set of results can be transferred when the stop condition is fulfilled.

### 10.6.1 Determining the transponder inventory list (UIDs) (command 7002 ...)

Depending on certain predefined start/stop parameters, this command generates one or more ISO-15693-compatible arbitration cycles until the predefined stop condition is fulfilled. When the stop condition is fulfilled, the remainder of the last cycle is completed. The start and stop conditions are specified in the option key table (see [Chapter 11.7, Page 104](#)).

To ensure optimum performance, "cumulative" mode is used internally. This means that once the HF reset has been initiated, the field remains switched on and all the transponders that have already been read remain set to "quiet" mode. An HF reset is not carried out again until "Triggered Inventory" (or similar command) is next issued.

Processing can be interrupted at any time by means of an ESC character (1Bh), which is transmitted to the RFI341-1503 via the serial data interface. In this case, RFI341-1503 transmits the standard response (see below).

This also terminates the automatic repetition of the command (if this is active) (operating mode 3x or 4x).

#### Host -> RFI341-1503

STX "7002" <oo> <ttt> ETX	
---------------------------	--

oo	Option key ( <a href="#">Chapter 11.7, Page 104</a> )
ttt	Duration (unit: 100 ms)

Two different responses are possible:

#### 1. Standard response

The RFI341-1503 transmits the standard response when it has processed the command in full or if processing was interrupted. The next command can then be executed (option keys 1x and 2x).

#### RFI341-1503 -> Host

STX "7002" ETX
----------------

RFI341-1503

## 2. Response with UID list

A number of arbitration cycles are carried out for all parameters (except for those with option code "00") in a standard application environment. To minimize traffic via the data interface, the RFI341-1503 does not transmit a response via the data interface. As soon as the RFI341-1503 has detected a transponder ID (UID), it transmits the following:

- Either a preliminary list of the UIDs detected in the previous arbitration cycles (option code in the command was 1x or 3x hexadecimal)
- Or the list of **all** the UIDs detected before the stop condition was fulfilled. (option code in the command was 2x or 4x)

Under normal circumstances, the command "Request transponder inventory list" is used to create the list of transponder IDs ([Chapter 10.5.23, Page 90](#)).

To prevent misunderstandings, the function described here is used in the same way.

### RFI341-1503 -> Host

```
STX "6C21" <cc> <iiiiiiiiiiiiii> <dd> [...] ETX
```

cc	Number of transponder IDs (UIDs) detected
iiiiiiiiiiiiii	Individual transponder ID (UIDs)
dd	DSFID byte (if output is activated)

Under normal circumstances, each transponder ID (UID) is transferred just once. Since the command "Get inventory" is issued internally to output the results, the result also contains its function number. A standard response is issued to complete the process (see above).

#### Example:

The RFI341-1503 is used in conveyor technology. To detect a failure of the RFI341-1503, the device is to output a sign of life (heartbeat) every second. A green LED is to light up on the device for one second when at least one transponder has been found within the reading time slot. If no transponder is detected, a no-read output is switched for 2 seconds. The reading slot is activated via switching input 1 and switched off after 0.5 seconds. The data is output when the stop condition is fulfilled.

#### Configuring the RFI341-1503:

Heartbeat: **STX 101126001A ETX**

Good read: **STX 10111503E8 ETX**

No read: **STX 10112907D0 ETX**

String buffer set with command 7002, 44h as the option key for function in loop, data output at the end of the reading time window, start condition via switching input 1 and stop condition via time:

**STX 10217002440005 ETX**

Activating stand-alone operation:

**STX 10111C0001 ETX**

#### Saving the settings:

**STX E002 ETX**

#### Result:

After POR, the following is output:

**STX 7002H ETX** Cyclic signaling of the heartbeat until start condition is fulfilled

**STX 7002H ETX**

**STX 6C210001 AA507D08000104E0 ETX**

Output the UID(s), set the good-read output

**STX 7002 ETX**

### 10.6.2 "Triggered read" function

The "triggered read" function determines data from one or more of the transponders located in the reading field on an event-controlled basis and, depending on the configuration (sorting etc.), outputs it accordingly via the serial data interface. To carry out a triggered read, the following steps must be carried out:

- Define the output string (start, stop, separators, etc.)
- Define the no-read message (if required)
- Define the HF field setting (HF reset)
- Check whether inventoring needs to be carried out (inventory, no inventory, single shot)
- Define the reading area (start/stop block)
- Output behavior and repeat function (direct output, repeated processing (loop), etc.)
- Define functions for the reading time slot (start condition)
- Define interruption criterion for the reading time slot (stop condition)

Other recommended options:

- Set a heartbeat signal
- Automatic switching of the good-read and no-read outputs

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**a) Defining the control characters for parameterized output (command 7003 ...)**

This command configures the fields "Start character", "Check character", and "End character" for the format string used by the "Triggered read" function to output data. These are three, user-defined fields that can be used for a different function at any time. A response which the RFI341-1503 is to output if no result is available ("no read") can also be defined. To enable non-printable characters to be output, the character (strings) are converted to hex format. The maximum length of the replacement string is 16 hex values (i.e. 32 hex digits). Hex code 00h is reserved and cannot be used.

**Host -> RFI341-1503**

```
STX "7003" <d> [ <rr> <rr> ... ] ETX
```

d	Format characters: S: Start character C: Check character E: End character N: Output string for "no read"
rr	Replacement string for format characters (hex); max. 16 bytes.

**RFI341-1503 -> Host**

```
STX "7003" ETX
```

*Example:*

The data output is to be enclosed with the usual start and stop characters. For this reason, the characters S=[02h], E=[03h] and, as a separator, C=[3B] are to be used.

If no data is found within the reading time slot, a no-read string comprising N=[024E4F205203] = STX No R ETX is to be transmitted.

Commands:

```
STX 7003S02 ETX
```

```
STX 7003E03 ETX
```

```
STX 7003C3B ETX
```

```
STX 7003N024E4F205203 ETX
```

**b) Configuring the output string "string builder" (command 7004 ...)**

This command is used to configure the output format string for the "triggered read" function. The format string comprises defined format characters that are replaced by real data when output. Due to the hardware being used, the maximum length of the format string for the RFI341-1503 is  $128 + 8 = 136$  format characters whereby, for example, a maximum of 16 blocks can be output as a hex dump and 8 characters are available for a protocol frame. Depending on the platform, this limitation may not be required.

**Host -> RFI341-1503**

```
STX "7004" <c ... > ETX
```

c	Format characters: S: Start character (see command 7003) C: Check character (see command 7003) E: End character (see command 7003) U: UID of the transponder (for non-addressed reading: 0000000000000000) A: Single ASCII character, equates to 8 bits of the transponder data. Non-printable characters are replaced by spaces to ensure that the protocol remains consistent. H: Single hex digit, equates to 4 bits of the transponder data. B: STX/ETX-BCC (binary-coded checksum) x: Control character to discard 4 bits of the transponder data
---	---

**RFI341-1503 -> Host**

```
STX "7004" ETX
```

*Example:*

The output for a transponder is to comprise STX, UID, separator, one block in ASCII and ETX.

Command:

```
STX 7004 SUCAAAAE ETX
```

Two transponders are read.

"SICK" appears in block 0 of transponder 1; "1234" appears in block 0 of transponder 2.

The RFI341-1503 outputs its response:

```
STX UID;SICK ETX
```

```
STX UID;1234 ETX
```

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**c) Configuring and executing the "triggered read" function (command 7005 ...)**

The "triggered read" function can read not only the transponder ID but also the user data for the transponder and output this by means of a configurable format string (see [the previous section, page 96](#)). If the format string is longer than the data buffer, the string is wrapped at the end.

Due to the internal buffer size of the RFI341-1503, only a maximum of 32 transponders can be processed in anti-collision mode. To ensure that the buffer memory is freed up again as quickly as possible, the content is deleted as soon as it has been transferred to the host. This means that repeats can occur in option modes 1x and 3x (output of intermediate results) if the transponder is located in the field for more than one reading operation because a comparison with the buffer can no longer take place once the data has been deleted. Whether or not repeats actually occur, however, also depends on the mode (ISO 15693 or I code 1) as well as the relevant parameters controlling HF behavior and anti-collision.

As soon as at least one transponder has been successfully read, the RFI341-1503 transfers either a partial result (parameters 1x and 3x) immediately after the corresponding cycle or the entire list (parameters 2x and 4x) once the stop condition has been fulfilled.

The output corresponds to the format string that was configured with command 7004. If no format string has been set, the RFI341-1503 outputs the following data:

- If the data was successfully read: data set as an ASCII string
- "No read": no feedback

**Host -> RFI341-1503**

```
STX "7005" <mm> <h> <a> <bb> <cc> <oo> <ttt> ETX
```

mm	Mode: 00: ISO/IEC 15693 01: I code 1
h	HF behavior: 0: The HF field remains switched on permanently (globally-configured automatic carrier shutdown remains active). 1: The HF field is switched on with the start trigger and switched off immediately with the stop trigger (globally-configured automatic carrier shutdown is bypassed). 2: The HF field remains switched on; an HF reset takes place prior to each anti-collision command.
a	Anti-collision mode: 0: No anti-collision; read is non-addressed 1: Anti-collision in single-slot mode; detected transponder is read in addressed mode 2: Complete anti-collision; each transponder detected is read in addressed mode
bb	First block to be read
cc	Number of blocks to be read minus 1 (max. 0fh, i.e. 16 blocks)
oo	Option key (see <a href="#">Chapter 11.7, Page 104</a> )
ttt	Time parameter (unit: 100 ms)

**RFI341-1503 -> Host**

```
STX "7005" ETX
```

## 11 Appendix

### 11.1 Calculating the checksum

The checksum is created by totaling all the characters (including the first control character and the **ETX**) by means of bit-serial exclusive OR operation (XOR sum). This begins with the sum value zero. If the control characters are enabled, an additional control character is prefixed to the **STX** as confirmation if the RFI341-1503 issues a response (**ACK** for a positive confirmation or **SYN** for an error message).

The checksum is calculated as follows:

**Example: switch on oscillator**

Character	Value	Arithmetic operation	Checksum		Result
			00h		
<b>STX</b>	02h	XOR	00h	⇒	02h
'F'	46h	XOR	02h	⇒	44h
'0'	30h	XOR	44h	⇒	74h
'0'	30h	XOR	74h	⇒	44h
'0'	30h	XOR	44h	⇒	74h
'0'	30h	XOR	74h	⇒	44h
'1'	31h	XOR	44h	⇒	75h
<b>EXT</b>	03h	XOR	75h	⇒	76h
			76h		

### 11.2 Definition of the control characters

The control characters are defined as follows:

Name	Value (hexadecimal)	Description
<b>STX</b>	02h	Start of transmission
<b>EXT</b>	03h	End of transmission
<b>ACK</b>	06h	Positive confirmation (Acknowledge)
<b>NAK</b>	15h	Negative confirmation (No Acknowledge)
<b>SYN</b>	16h	Error
<b>ESC</b>	1Bh	Interrupt

Tab. 11-1: Definition of the control characters

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### 11.3 Error codes

The following table lists all the possible error codes and their meanings:

Error code	Meaning
"01"	General system error
"02"	Impermissible function number (command)
"03"	Function is not supported
"04"	Syntax error in parameter
"05"	Impermissible parameter value
"06"	No log data available
"08"	RFI341-1503 in status "Execution running"
"10"	Error writing to/reading a transponder
"12"	Error when function was executed

Tab. 11-2: Meaning of the error codes

### 11.4 RFI341-1503 system settings

The RFI341-1503 system settings can be queried with command 1010 and changed with command 1011. The following settings are currently defined:

(N/S = numeric/switch, default = factory setting)

Key	Alias	N/S	Default	Meaning
01h	GLS_ANTENNA	N	0001h	Active antenna port, key is only used for one installed antenna multiplexer.
02h	GLS_POWER	N	0004h	Approximate magnitude (in W) of the HF power on the antenna. Permissible values: from 0001 to 0004
03h	GLS_SER_BAUD	N	2580h	Bit rate (115,200 bit/s = FFFFh, see <a href="#">Chapter 6.1, Page 17</a> , change not effective until after the RFI341-1503 has been reset (restarted))
04h	GLS_SER_TIMEOUT	N	0032h	Timeout period (unit: 10 ms) of the serial data interface
05h		S	0000	(Reserved for future use)
06h		N	0005h	Waiting time (unit: 100 ms) before the carrier signal is automatically switched off. Designed to ensure that a transponder can absorb enough power to carry out the first transaction. If the background function 7002 is used, this setting is ignored and the carrier is switched off as soon as the stop condition is fulfilled.
07h	GLS_VERIFY_MODE	S	0001	Verify mode. When activated, the result of a number of operations (e.g. write and stop) is verified by means of the command "Read back after write".
08h	GLS_FAST_MODE	S	0001	Fast transfer of transponder data (from the RFI341-1503 to the transponder)
09h	RFU			(Reserved for future use)
0Ah	RFU			(Reserved for future use)
0Bh	GLS_INT_ENABLE	S	0001	Interrupt mode active. In this mode, certain functions can be interrupted. They can be interrupted by sending the required data via the serial data interface; it is recommended, however, that a single ESC character be used for this purpose. <b>If functions are used for result control, the switch must not be set to 0000.</b>
0Ch		S	0000	Text for start message (same as the response to "Reset" (restart)) 0000 = no message 0001 = Text "ACK RFI341-1503"
0Dh	RFU			(Reserved for future use)
0Eh	RFU	N	03E8h	(Reserved for future use)
0Fh	RFU	N	0001h	(Reserved for future use)
10h	RFU	N	0000h	(Reserved for future use)
11h	RFU			(Reserved for future use)
12h	RFU			(Reserved for future use)

Tab. 11-3: RFI341-1503 system settings

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Key	Alias	N/S	Default	Meaning
13h	GLS_INV_RESET	S	0001	HF reset for commando "Generate inventory list" is set to "0001".
24h	GLS_STXETX_CHK	S	0001	0001 = STX/ETX checksum is expected upon receipt and attached when transmitted.
25h	GLS_STXETX_FRAME	S	0001	0001= responses are classified with ACK, SYN, or NAK.
26h	GLS_HEARTBEAT	S	0000	0000 = deactivated 0001 = cycle polling interval

Tab. 11-3: RFI341-1503 system settings (Cont.)

## 11.5 ISO settings

The RFI341-1503 interrogator supports the setting options listed below.

The settings can be queried with commando 1C30 and changed with command 1C31.

(N/S = numeric/switch, default = factory setting)

Key	Alias	N/S	Default	Meaning
01h	ISOS_MOD_DEPTH	S	0002	Modulation depth (0000 = 20%; 0001 = 20 to 100%; 0002 = 100 %)
02h	ISOS_SUB_CARRIER	S	0001	Modulation type of responses (0000 = ASK, 0001 = FSK). In high-interference environ- ments, FSK should be used; in interference- free environments, ASK is somewhat better.
03h	ISOS_DATA_RATE	S	0001	Data rate of the responses (0000 = low; 0001 = high)
04h	ISOS_WRITE_TRIG	S	0000	Use "trigger" mode during write operation. Com- mando 5C20 (write single block, high-level command) can also be used.
05h	ISOS_AFI	N	0000h	AFI byte for inventory list (0000: ignore)
06h	ISOS_READ_SEC	S	0000	Return security information during read opera- tion. In the default setting, security information is not returned. If the lock bit information is to be transmitted along with the block data, this setting must be "0001".
07h	RFU	S	0001	Must always be set to "0000". (Reserved for future use)
08h	ISOS_RETRIES	N	0001h	To improve the reliability of reading, the stan- dard read commands 4C10 and 4C12 as well as the inventory command 6C20 are repeated as often as this setting specifies.
09h	ISOS_ISOS_ID_SWAP	S	0000	Interpret ISO UIDs in reverse byte sequence. Default setting: "0000" (reverse byte sequence)
0Ah	RFU	N	010Ch	RFU (reserved for future use)
0Bh	RFU	N	0120h	RFU (reserved for future use)
0Ch	RFU	N	00C0h	RFU (reserved for future use)
0Dh	RFU	N	0064h	RFU (reserved for future use)
0Eh	ISOS_INV_RESET_S	S	0000	Carry out an HF reset at the start when the inventory command is issued. The HF reset must be activated in the system settings for this purpose ( <a href="#">Chapter 11.3, Page 99</a> , key: 13 h).
0Fh	ISOS_INV_RESET_E	S	0001	Carry out an HF reset at the end when the inventory command is issued.
10h	ISOS_FAST_INV	S	0001	Execute the inventory command in one single reading time slot.
11h	ISOS_WRITE_PREC	N	0000h	Write the relevant delay-time counter for the low data rate.

Tab. 11-4: System settings supported by the RFI341-1503 interrogator (to ISO 15693)

## 11.6 Status codes and data flags

For each reading time slot of a response, certain commands return a status code comprising a single character. This enables the host software to respond to the data from the RFI341-1503 in different ways (evaluate, ignore, retry, etc.).

Code	Alias	Meaning
0h	STAT_OK	OK, no error
1h	STAT_NO_LABEL	No transponder detected
2h	STAT_COLL_CRC	Collision or checksum error
3h	STAT_COLL_WEAK	Slight collision
6h	STAT_PROTECTED	Transponder is write protected
7h	STA_FAILED	Write/lock not possible due to insufficient power supply
8h	STAT_NO_BLOCK	Requested block does not exist
9h	STAT_GEN_ERROR	Error in transponder command / parameter
Ah	STAT_GEN_ERROR	Error not specified in greater detail
Bh	STAT_VER_ERROR	Data error detected in verify operation

Tab. 11-5: General status codes and data flags of the RFI341-1503

A "data flag" is also used to inform the host software of whether or not data has been transmitted (which is the case once a block has been read in the current time slot, for example). For this reason, do not transfer unnecessary, empty data as placeholders in order to speed up the serial transfer to the host.

Value	Meaning
"y"	Yes, data has been transmitted
"n"	No, the reading time slot does not contain any data due to an error (see status code)

## 11.7 Result-controlled settings (start/stop/output)

The table below defines the conditions for the start, stop, output, and repeat functions for the result-controlled functions (e.g. command 7002, 7005).

The start and stop conditions are defined via the option key. The option key comprises two hex digits (xyh). The first digit (x) describes the operating mode ([Tab. 11-6](#)) and the second digit (y) acts as a trigger parameter ([Tab. 11-7](#)).

The following operating modes are currently available:

Option key	Operating mode
1y	As soon as intermediate results are available, these are output by the RFI341-1503. The command is executed once.
2y	The RFI341-1503 does not output results until after the stop condition has been fulfilled. The command is executed once.
3y	As soon as intermediate results are available, these are output by the RFI341-1503. The command is triggered again after completion.
4y	The RFI341-1503 does not output results until after the stop condition has been fulfilled. The command is triggered again after completion.

Tab. 11-6: Option key "x" for operating modes when inventory list is queried (command 7002)

Option key	Parameter <sup>3)</sup>	Start condition <sup>8)</sup>	Stop condition <sup>7)</sup>
x0 <sup>4)</sup>	Time <sup>2)</sup>	Immediate	Edge change with T1 or T2
x1	Time <sup>1)</sup>	Immediate	Timer to zero <sup>5)</sup>
x2	Time <sup>2)</sup>	Immediate	T1 rising edge or timer elapsed <sup>5)</sup>
x3	Time <sup>2)</sup>	Immediate	T2 rising edge or timer elapsed <sup>5)</sup>
x4	Time <sup>1)</sup>	T1 rising edge	Timer to zero <sup>5)</sup>
x5	Time <sup>1)</sup>	T1 rising edge	T1 falling edge or timer elapsed <sup>5)</sup>
x6	Time <sup>2)</sup>	T1 rising edge	T2 rising edge or timer elapsed <sup>5)</sup>
x7	Time <sup>2)</sup>	T2 rising edge	Timer to zero <sup>5)</sup>
x8	Time <sup>2)</sup>	T2 rising edge	T1 rising edge or timer elapsed <sup>5)</sup>
x9	Time <sup>2)</sup>	T2 rising edge	T2 falling edge or timer elapsed <sup>5)</sup>

1) When t = 0, the command is ignored.  
2) When t = 0, the time is not taken into account. This means that execution of the command can only be stopped by the stop condition.  
3) The time elapsed or the stop condition (depending on which occurs first) is taken into account.  
4) Once the command has been received and executed, the RFI341-1503 transmits the current status code.  
5) After each arbitration cycle, the data is transmitted and a new arbitration cycle is started; this is repeated until the stop condition is fulfilled.  
6) Arbitration cycles are carried out and the ID numbers written to the memory of the RFI341-1503 until the stop condition is fulfilled. As soon as the stop condition is fulfilled, the RFI341-1503 transmits the ID numbers to the host.  
7) The process is interrupted as soon as the stop condition is fulfilled and the current arbitration cycle is complete.  
8) The start is executed immediately if the start condition is fulfilled when the background command is issued. The host can interrupt the process at any time by sending any character.

Tab. 11-7: Option key "y" for trigger parameters when inventory list is queried (command 7002)

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11.8 ASCII code table

ASCII hex	ASCII dec	Character
00	0	NUL
01	1	SOH^A
02	2	STX^B
03	3	ETX^C
04	4	EOT^D
05	5	ENQ^E
06	6	ACK^F
07	7	BEL^G
08	8	BS^H
09	9	HT^I
0A	10	LF^J
0B	11	VT^K
0C	12	FF^L
0D	13	CR^M
0E	14	SO^N
0F	15	SI^O
10	16	DLE^P
11	17	DC1^Q
12	18	DC2^R
13	19	DC3^S
14	20	DC4^T
15	21	NAC^U
16	22	SYN^V
17	23	ETB^W
18	24	CAN^X
19	25	EM^Y
1A	26	SUB^Z
1B	27	ESC
1C	28	FS
1D	29	GS
1E	30	RS
1F	31	US

ASCII hex	ASCII dec	Character
20	32	SP
21	33	!
22	34	"
23	35	#
24	36	\$
25	37	%
26	38	&
27	38	'
28	40	(
29	41	)
2A	42	*
2B	43	+
2C	44	,
2D	45	-
2E	46	.
2F	47	/
30	48	0
31	49	1
32	50	2
33	51	3
34	52	4
35	53	5
36	54	6
37	55	7
38	56	8
39	57	9
3A	58	:
3B	59	;
3C	60	<
3D	61	=
3E	62	>
3F	63	?

ASCII hex	ASCII dec	Character
40	64	@
41	65	A
42	66	B
43	67	C
44	68	D
45	69	E
46	70	F
47	71	G
48	72	H
49	73	I
4A	74	J
4B	75	K
4C	76	L
4D	77	M
4E	78	N
4F	79	O
50	80	P
51	81	Q
52	82	R
53	83	S
54	84	T
55	85	U
56	86	V
57	87	W
58	88	X
59	89	Y
5A	90	Z
5B	91	[
5C	92	\
5D	93	]
5E	94	^
5F	95	_

ASCII hex	ASCII dec	Character
60	96	`
61	97	a
62	98	b
63	99	c
64	100	d
65	101	e
66	102	f
67	103	g
68	104	h
69	105	i
6A	106	j
6B	107	k
6C	108	l
6D	109	m
6E	110	n
6F	111	o
70	112	p
71	113	q
72	114	r
73	115	s
74	116	t
75	117	u
76	118	v
77	119	w
78	120	x
79	121	y
7A	122	z
7B	123	{
7C	124	
7D	125	}
7E	126	~
7F	127	▲

Tab. 11-8: Code table: hex ASCII/dec ASCII

## 11.9 AFI table

AFI High-order half byte	AFI Low-order half byte	Meaning VICCs response to:	Example/comment
0	0	All families and sub-families	No suitable pre-selection
X	0	All sub-families of family X	Many suitable pre-selection options
X	Y	Y only. Sub-family of family X	
0	Y	Protected sub-family Y only	
1	0, Y	Transportation	Mass transport, bus, airline
2	0, Y	Finance	IEP, banking, trade
3	0, Y	Identification	Access control
4	0, Y	Telecommunications	Public telephone network, GSM
5	0, Y	Medicine	
6	0, Y	Multimedia	Internet services
7	0, Y	Games	
8	0, Y	Data storage	Mobile files
9	0, Y	Management	
A	0, Y	Express package service	
B	0, Y	Postal services	
C	0, Y	Airline baggage	
D	0, Y		
E	0, Y		
F	0, Y		

Tab. 11-9: AFI coding

## 11.10 Firmware version history

Version	Commands
V 1.2.10	Initial version with basic set of commands
V 1.3.x	New commands: 7007 7008

Tab. 11-10: Firmware version history

RFI341-1503

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