Software Guide

Version 1.3

125kHz OEM

CONFIDENTIAL

Kronegger

Wireless Sensor Technologies

Kronegger GmbH

Parkring 1

A-8074 Grambach

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Introduction

Kronegger GmbH. provides customer support and optional design in services for properly integrating the products. Since we do not have full information on customer's applications or products, it is due to the customer to verify that the integrated products are suitable for the application intended and that no patents or intellectual property rights are infringed.

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1 Getting Started

This handbook applies to the reader firmware version:

TA 1.02.17

As factory default the data are transmitted at 115200, n, 8, 1 and no handshake. Two protocol modes are available. As default the binary protocol is used. To change the protocol type or the baud rate you have to configure the EEPROM (see EEPROM Memory Organization).

First of all you need a 125kHz P&P reader with an USB cable (Type A to mini B)

For the communication with the reader you have to download a virtual com-port driver (VCP) for the USB interface. Please check the following link for the latest version:

http://www.ftdichip.com/Drivers/VCP.htm

The driver will map the USB to a serial communication port. Install the driver and connect the reader. It will show “new hardware detected.” You can check your setup under System Setting/System/Hardware/Device Manager to find out which com-port had been assigned to your reader. Optionally you can change the com number in the advanced settings of the com-port.

For the communication with the reader you need the Reader Tool which is delivered with any Kronegger Reader. The Microsoft .NET Framework 2.0 (or any higher version) needs to be installed first in order to run the Reader Tool:

http://www.microsoft.com/downloads/details.aspx?familyid=0856EACB-4362-4B0D-8EDD-AAB15C5E04F5&displaylang=en

The Reader Tool needs no installation, simply start it and the reader will be selected automatically. Now you can communicate with your Mifare+ reader.

Step by Step:

- Download and install the FTDI driver
- Connect the Reader via the USB cable to the PC
- Download and install the Microsoft .NET Framework
- Start the Reader Tool
- Now you can communicate with the reader

2 Reader to Host Communication

2.1 ASCII Protocol

The ASCII Protocol is very easy to handle. You can use a simple terminal program to transmit the data. The data is transmitted as ASCII hexadecimal. The reader has no timeout for receiving data.

Note: No safety layer is supported (checksum is not available), so it is recommended to use the binary protocol for save data transmission!

Protocol structure

Data	End of Line
Various length	‘\r’ ‘\n’

Example: Get Version

Request:

Data	End of Line
'v'	‘\r’ ‘\n’

Response:

Data	End of Line
‘T’ ‘A’ ‘ ‘ ‘1’ ’.’ ‘0’ ‘2’ ‘.’0’ ‘0’	‘\r’ ‘\n’

2.2 Binary Protocol

This protocol was developed for industrial usage including synchronization and frame checking. A device driver is needed in order to use this protocol. Data is transmitted binary. The reader has no timeout for receiving data.

Protocol structure

STX	Station ID	Length	Data	BCC	ETX
1 Byte	1 Byte	1 Byte	various length	1 Byte	1 Byte

Example: Get Version

Request:

STX	Station ID	Length	Data	BCC	ETX
02h	FFh	01h	76h	88h	03h

Response:

STX	Station ID	Length	Data	BCC	ETX
02h	00h	0Ah	544120312E30322E3030 (HEX)	0Ch	03h

Data as string: "**TA 1.02.00**"

STX

Start of transmission (02h)

Station ID (Unique ID of the reader)

00h: reserved for the bus master.
FFh: Broadcast message. All devices will execute a command sent with broadcast.
01h-FEh: Valid station ID's for the reader. The reader will only progress a command if the received station ID either matches the station ID of the reader or is FFh.

Length (Data Length Indicator)

Denotes the length of the Data block.

Data

This part contains the command and data. The command values are the same as in ASCII protocol mode like ’s’ for select or 'x' for reset, whereas data is transmitted binary.

The length of the command block depends on the instruction.

BCC

The BCC is used to detect transmission errors. To calculate the BCC value all bits excluding STX and ETX are XOR-ed.

BCC= StationID XOR Length XOR $Data_0$ XOR … XOR $Data_N$

Example: BCC= 0xFF XOR 0x02 XOR 0x11 XOR 0x22 = 0xCE

BCC = 0xCE

ETX

ETX shows the end of the command (03h)

Remarks

If the reader receive a wrong command or frame (i.e. BCC wrong) or the Station ID does not match the internal ID of the reader, the command is not executed. The reader waits for the next valid frame.

The reader module answers in the same telegram format, with the ID-field set to 0.

The answer of the Binary protocol is different to the ASCII protocol.

3 Device Configuration

The reader devices have flags to configure their behavior. The flags are stored in the EEPROM. Only during the start up phase the reader accept changes of the flags. Thus after any changes in the EEPROM the reader device needs to be restarted.

3.1 EEPROM memory organization

Register	Description
00h...04h	RFU
05h…09h	RFU
0Ah	Station ID
0Bh	Protocol Configuration Register
0Ch	Baud Rate Configuration Register
0Dh	RFU
0Eh	Operation Mode Register
0Fh	Second Settings Register
10h	RFU
11h	RFU
12h	RFU
13h	RFU
14h	RFU
15h	RFU
16h	EM4x02 Settings 1
17h	RFU
18h	HITAG1 Settings 1
19h	HITAGS Settings 1
1Ah	HITAG2 Settings 1
1Bh	RFU
1Ch…1Fh	RFU
20h	HTRC110 CFG Page 1 and Page 0 settings 1 for EM4x02
21h	HTRC110 CFG Page 3 and Page 2 settings 1 for EM4x02
22h	HTRC110 CFG Page 1 and Page 0 settings 1 for HITAG1
23h	HTRC110 CFG Page 3 and Page 2

	settings 1 for HITAG1
24h	HTRC110 CFG Page 1 and Page 0 settings 1 for HITAGS
25h	HTRC110 CFG Page 3 and Page 2 settings 1 for HITAGS
26h	HTRC110 CFG Page 1 and Page 0 settings 1 for HITAG2
27h	HTRC110 CFG Page 3 and Page 2 settings 1 for HITAG2
28h…35h	RFU
36h	EM4x02 Settings 2
37h	RFU
38h	HITAG1 Settings 2
39h	HITAGS Settings 2
3Ah	HITAG2 Settings 2
3Bh..3F	RFU
40h	HTRC110 CFG Page 1 and Page 0 settings 2 for EM4x02
41h	HTRC110 CFG Page 3 and Page 2 settings 2 for EM4x02
42h	HTRC110 CFG Page 1 and Page 0 settings 2 for HITAG1
43h	HTRC110 CFG Page 3 and Page 2 settings 2 for HITAG1
44h	HTRC110 CFG Page 1 and Page 0 settings 2 for HITAGS
45h	HTRC110 CFG Page 3 and Page 2 settings 2 for HITAGS
46h	HTRC110 CFG Page 1 and Page 0 settings 2 for HITAG2
47h	HTRC110 CFG Page 3 and Page 2 settings 2 for HITAG2
80h	Default Factory Settings
81h…EFh	RFU

3.2 Station ID Register (0Ah)

The Station ID is used in binary mode to address a specific device. The Station ID has the range of 01h to FEh and can be freely changed. The value 00h is reserved for the bus master.

3.3 Protocol Configuration Register (0Bh)

This register specifies the general behavior of the reader device.

Default value is 06h (Binary protocol and extended ID).

Baud rate register							
Bit7	**Bit6**	**Bit5**	**Bit4**	**Bit3**	**Bit2**	**Bit1**	**Bit0**
RFU	RFU	RFU	RFU	RFU	ExtID	Protocol	Autostart

3.3.1 Auto Start (default 0)

If set the reader device will start up in continuous read automatically. Auto start has only effect in ASCII protocol mode.

3.3.2 Protocol mode (default 1)

If set the reader device uses the binary protocol mode. Otherwise the ASCII protocol is enabled.

3.3.3 Extended ID (default 1)

This bit has only effect to the select command ('s'). If enabled and a tag was selected then the reader devices generates an additional information about the tag type. Byte 0 of the returned UID contains this information. The UID starts at byte 1.

Tag Type	Extened ID
EM 4x02	**55h**
HITAG 1	**49h**
HITAG 2	**48h**
HITAG S-32	**69h**
HITAG S-56	**6Ah**
HITAG S-48	**6Bh**

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3.4 Baud Rate Control Register (0Ch)

This register defines the speed of the communication between the reader and the host.
Default value is 04h (115200 Baud).

Baud rate register							
Bit7	**Bit6**	**Bit5**	**Bit4**	**Bit3**	**Bit2**	**Bit1**	**Bit0**
RFU	RFU	RFU	RFU	RFU	BS2	BS1	BS0

This register defines the baud rate of the reader device.

BS2	**BS1**	**BS0**	**Baud rate**
0	0	0	9600 baud
0	0	1	19200 baud
0	1	0	38400 baud
0	1	1	57600 baud
1	0	0	115200 baud (default)
1	0	1	4800 baud
1	1	0	1200 baud
1	1	1	RFU

3.5 Operation Mode Register (0Eh)

The operation mode register defines which tag types the reader supports. This register allows fast tag recognition because only defined tag types are requested.

If the bit is set, the specified tag type is supported.

Default value is FFh.

Operation Mode Register							
Bit7	**Bit6**	**Bit5**	**Bit4**	**Bit3**	**Bit2**	**Bit1**	**Bit0**
RFU	RFU	RFU	HITAG2	HITAG 1	HITAG S	RFU	EM4x02

3.6 Second Settings Register (0Fh)

The second settings register allows the usage of an alternative HTRC110 setting for each tag type. If a bit is set to '1' a select command invokes the FW to do a select with the settings 1. If no tag could be detected the settings 2 of this tag type are loaded and the sequence will be repeated.

This slows down the speed of the select operation.

Default value is FFh.

Second Setting Register							
Bit7	**Bit6**	**Bit5**	**Bit4**	**Bit3**	**Bit2**	**Bit1**	**Bit0**
RFU	RFU	RFU	HITAG2	HITAG 1	HITAG S	RFU	EM4x02

3.7 EM 4x02 Settings 1 (16h)

Each tag has its own Gain and Sampling Time set up. It can be adjusted to gain better reading results for each tag type. As default the values are set to operate best with the Plug and Play board. Wrong settings might cause unexpected behavior of the reader module.

EM 4x02 Settings							
Bit7	**Bit6**	**Bit5**	**Bit4**	**Bit3**	**Bit2**	**Bit1**	**Bit0**
Gain		Sampling Time					

3.8 HITAG1 Settings 1 (18h)

Hitag 1 Settings							
Bit7	**Bit6**	**Bit5**	**Bit4**	**Bit3**	**Bit2**	**Bit1**	**Bit0**
Gain		Sampling Time					

3.9 HITAGS Settings 1 (19h)

Hitag S Settings							
Bit7	**Bit6**	**Bit5**	**Bit4**	**Bit3**	**Bit2**	**Bit1**	**Bit0**
Gain		Sampling Time					

3.10 HITAG2 Settings 1 (1Ah)

HITAG2 Settings							
Bit7	**Bit6**	**Bit5**	**Bit4**	**Bit3**	**Bit2**	**Bit1**	**Bit0**
Gain		Sampling Time					

3.11 HTRC110 CFG Page Settings 1 for EM4x02 (20h / 21h)

These registers contain the HTRC110 Reader Settings 1 for the EM4x02 tag. Each register holds 2 configuration pages of the reader chip.

The Gain0 and Gain1 bit within the configuration Page0 of the HTRC110 is mapped to the EM4x02 Settings register located at address 16h. Write operation to those bits are ignored. Read operation will always return 0.

HTRC 110 CFG Page 1 and Page 0 (20h)							
Bit7	**Bit6**	**Bit5**	**Bit4**	**Bit3**	**Bit2**	**Bit1**	**Bit0**
PD_MODE	PD	HYSTERESIS	TXDIS	RFU	RFU	FILTERH	FILTERL

HTRC 110 CFG Page 3 and Page 2 (21h)							
Bit7	**Bit6**	**Bit5**	**Bit4**	**Bit3**	**Bit2**	**Bit1**	**Bit0**
DIPSL1	DISSMA RTCOMP	FSEL1	FSEL0	THRESE T	ACQAMP	FREEZ1	FREEZ0

3.12 HTRC110 CFG Page Settings for HITAG1 (22h / 23h)

These registers contain the HTRC110 Reader Settings 1 for the HITAG1 tag. Each register holds 2 configuration pages of the reader chip.

The Gain0 and Gain1 bit within the configuration Page0 of the HTRC110 is mapped to the HITAG1 Settings register located at address 18h. Write operation to those bits are ignored. Read operation will always return 0.

HTRC 110 CFG Page 1 and Page 0 (22h)							
Bit7	**Bit6**	**Bit5**	**Bit4**	**Bit3**	**Bit2**	**Bit1**	**Bit0**
PD_MOD E	PD	HYSTER ESIS	TXDIS	RFU	RFU	FILTERH	FILTERL

HTRC 110 CFG Page 3 and Page 2 (23h)							
Bit7	**Bit6**	**Bit5**	**Bit4**	**Bit3**	**Bit2**	**Bit1**	**Bit0**
DIPSL1	DISSMA RTCOMP	FSEL1	FSEL0	THRESE T	ACQAMP	FREEZ1	FREEZ0

3.13 HTRC110 CFG Page Settings for HITAGS (24h / 25h)

These registers contain the HTRC110 Reader Settings 1 for the HITAGS tag. Each register holds 2 configuration pages of the reader chip.

The Gain0 and Gain1 bit within the configuration Page0 of the HTRC110 is mapped to the HITAGS Settings register located at address 19h. Write operation to those bits are ignored. Read operation will always return 0.

HTRC 110 CFG Page 1 and Page 0 (24h)							
Bit7	**Bit6**	**Bit5**	**Bit4**	**Bit3**	**Bit2**	**Bit1**	**Bit0**

PD_MODE	PD	HYSTERESIS	TXDIS	RFU	RFU	FILTERH	FILTERL

HTRC 110 CFG Page 3 and Page 2 (25h)							
Bit7	**Bit6**	**Bit5**	**Bit4**	**Bit3**	**Bit2**	**Bit1**	**Bit0**
DIPSL1	DISSMARTCOMP	FSEL1	FSEL0	THRESET	ACQAMP	FREEZ1	FREEZ0

3.14 HTRC110 CFG Page Settings for HITAG2 (26h / 27h)

These registers contain the HTRC110 Reader Settings 1 for the HITAG2 tag. Each register holds 2 configuration pages of the reader chip.

The Gain0 and Gain1 bit within the configuration Page0 of the HTRC110 is mapped to the HITAG2 Settings register located at address 1Ah. Write operation to those bits are ignored. Read operation will always return 0.

HTRC 110 CFG Page 1 and Page 0 (26h)							
Bit7	**Bit6**	**Bit5**	**Bit4**	**Bit3**	**Bit2**	**Bit1**	**Bit0**
PD_MODE	PD	HYSTERESIS	TXDIS	RFU	RFU	FILTERH	FILTERL

HTRC 110 CFG Page 3 and Page 2 (27h)							
Bit7	**Bit6**	**Bit5**	**Bit4**	**Bit3**	**Bit2**	**Bit1**	**Bit0**
DIPSL1	DISSMARTCOMP	FSEL1	FSEL0	THRESET	ACQAMP	FREEZ1	FREEZ0

3.15 EM 4x02 Settings 2 (36h)

The EM 4x02 Settings 2 register contains an additional setting which can be used when enabling the corresponding bit in the Second Settings Register (0Fh).

Reading distance can be optimized by losing speed performance.

EM 4x02 Settings 2							
Bit7	**Bit6**	**Bit5**	**Bit4**	**Bit3**	**Bit2**	**Bit1**	**Bit0**
Gain		Sampling Time					

3.16 HITAG1 Settings 2 (38h)

Hitag 1 Settings 2							
Bit7	**Bit6**	**Bit5**	**Bit4**	**Bit3**	**Bit2**	**Bit1**	**Bit0**
Gain		Sampling Time					

3.17 HITAGS Settings 2 (39h)

Hitag S Settings 2							
Bit7	**Bit6**	**Bit5**	**Bit4**	**Bit3**	**Bit2**	**Bit1**	**Bit0**
Gain		Sampling Time					

3.18 HITAG2 Settings 2 (3Ah)

HITAG2 Settings 2							
Bit7	**Bit6**	**Bit5**	**Bit4**	**Bit3**	**Bit2**	**Bit1**	**Bit0**
Gain		Sampling Time					

3.19 HTRC110 CFG Page Settings 2 for EM4x02 (40h / 41h)

These registers contain the HTRC110 Reader Settings 2 for the EM4x02 tag. Each register holds 2 configuration pages of the reader chip.

The Gain0 and Gain1 bit within the configuration Page0 of the HTRC110 is mapped to the EM4x02 Settings register located at address 36h. Write operation to those bits are ignored. Read operation will always return 0.

HTRC 110 CFG Page 1 and Page 0 (40h)							
Bit7	**Bit6**	**Bit5**	**Bit4**	**Bit3**	**Bit2**	**Bit1**	**Bit0**
PD_MODE	PD	HYSTERESIS	TXDIS	RFU	RFU	FILTERH	FILTERL

HTRC 110 CFG Page 3 and Page 2 (41h)							
Bit7	**Bit6**	**Bit5**	**Bit4**	**Bit3**	**Bit2**	**Bit1**	**Bit0**
DIPSL1	DISSMARTCOMP	FSEL1	FSEL0	THRESET	ACQAMP	FREEZ1	FREEZ0

3.20 HTRC110 CFG Page Settings 2 for HITAG1 (42h / 43h)

These registers contain the HTRC110 Reader Settings 2 for the HITAG1 tag. Each register holds 2 configuration pages of the reader chip.

The Gain0 and Gain1 bit within the configuration Page0 of the HTRC110 is mapped to the HITAG1 Settings register located at address 38h. Write operation to those bits are ignored. Read operation will always return 0.

HTRC 110 CFG Page 1 and Page 0 (42h)							
Bit7	**Bit6**	**Bit5**	**Bit4**	**Bit3**	**Bit2**	**Bit1**	**Bit0**
PD_MODE	PD	HYSTERESIS	TXDIS	RFU	RFU	FILTERH	FILTERL

HTRC 110 CFG Page 3 and Page 2 (43h)							
Bit7	**Bit6**	**Bit5**	**Bit4**	**Bit3**	**Bit2**	**Bit1**	**Bit0**
DIPSL1	DISSMARTCOMP	FSEL1	FSEL0	THRESET	ACQAMP	FREEZ1	FREEZ0

3.21 HTRC110 CFG Page Settings 2 for HITAGS (44h / 45h)

These registers contain the HTRC110 Reader Settings 2 for the HITAGS tag. Each register

holds 2 configuration pages of the reader chip.

The Gain0 and Gain1 bit within the configuration Page0 of the HTRC110 is mapped to the HITAGS Settings register located at address 39h. Write operation to those bits are ignored. Read operation will always return 0.

HTRC 110 CFG Page 1 and Page 0 (44h)							
Bit7	**Bit6**	**Bit5**	**Bit4**	**Bit3**	**Bit2**	**Bit1**	**Bit0**
PD_MODE	PD	HYSTERESIS	TXDIS	RFU	RFU	FILTERH	FILTERL

HTRC 110 CFG Page 3 and Page 2 (45h)							
Bit7	**Bit6**	**Bit5**	**Bit4**	**Bit3**	**Bit2**	**Bit1**	**Bit0**
DIPSL1	DISSMARTCOMP	FSEL1	FSEL0	THRESET	ACQAMP	FREEZ1	FREEZ0

3.22 HTRC110 CFG Page Settings 2 for HITAG2 (46h / 47h)

These registers contain the HTRC110 Reader Settings 2 for the HITAG2 tag. Each register holds 2 configuration pages of the reader chip.

The Gain0 and Gain1 bit within the configuration Page0 of the HTRC110 is mapped to the HITAG2 Settings register located at address 3Ah. Write operation to those bits are ignored. Read operation will always return 0.

HTRC 110 CFG Page 1 and Page 0 (46h)							
Bit7	**Bit6**	**Bit5**	**Bit4**	**Bit3**	**Bit2**	**Bit1**	**Bit0**
PD_MODE	PD	HYSTERESIS	TXDIS	RFU	RFU	FILTERH	FILTERL

HTRC 110 CFG Page 3 and Page 2 (47h)							
Bit7	**Bit6**	**Bit5**	**Bit4**	**Bit3**	**Bit2**	**Bit1**	**Bit0**
DIPSL1	DISSMARTCOMP	FSEL1	FSEL0	THRESET	ACQAMP	FREEZ1	FREEZ0

3.23 EEPROM factory Settings

To invoke a reset to the factory settings the user has to write the value FFh to the EEPROMs address 80h. After a reboot of the system all predefined values are restored in the EEPROM.

4 Instruction Set

Following table describes all commands of the reader device. Each command returns an answer to the host. Exceptions are mentioned explicitly. The green LED is acknowledging a successfully executed command. The red LED indicates an error.

4.1 Overview

Command	Description
'c'	Continuous read
‘dr’/’dg’/’dn’	Set LED (only binary mode)
‘g’	Get ID
‘l’	Login
‘oX’	Set tag type
‘o+X’	Include tag type
‘o-X’	Exclude tag type
'poff '/'pon'	Antenna power off/on
‘pr’/’pw’	R/W user ports
'r'/'rb'	Read block
'rp/re'	Read EEPROM register
's'	Select
'v'	Get version
'w'/'wb'	Write block
'wp'	Write EEPROM register
'x'	Reset
‘y’	Field reset
'h'	Change HTRC110 settings

4.2 Error codes

Error Code	Description
'?'	Unknown command
‘C’	CRC error
'F'	General failure
'N'	No tag in the field
'O'	Operation mode failure
'R'	Out of range
'X'	Permission denied

4.3 Commands

4.3.1 Continuous Read

After start executing this command the character ‘C’ (43h) is returned as handshake. The reader device reads and displays the serial number of a tag continuously until the tag leaves the field. This commands stops if any character is sent to the reader module. The reader module returns the character ‘S’ (53h).

The reader supports different tag types. The response data length depends on the tag type.

Request structure

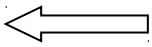
Data
Command
‘c’ (1 byte)

Response structure

Data	Description
‘C’	The reader enters the Continuous Read mode
UID	Serial number of the tag
‘S’	The reader aborted Continuous Read mode

Example Communication:

Host	Direction	Reader	Description
‘c’	→		The host try to start the continuous read mode
	←	‘C’	The reader start the continuous read mode
	←	48 58 73 8F 10	A TAG enters the field, the UID will be returned continuously
‘v’	→		The host try to stop the continuous read mode
	←	‘S‘	The reader stops the continuous read mode
‘v’	→		The host try to get the version of the reader

		“TA 1.02.00“	The reader returns its version

4.3.2 Set LED

This command controls the LED. If the LED flag is set the automatic LED is deactivated. The user can set the state of the LED manually.

Request structure

Data
Command
'dg' (2 byte)
'dr' (2 byte)
'dn' (2 byte)

Example: Switch LED green on, LED red off

Request:

Data	Description
'dg'	Command (2 byte)

Response:

Data	Description
'DG'	Status (2 byte)

Example: Switch LED red on, LED green off

Request:

Data	Description
'dr'	Command (2 byte)

Response:

Data	Description

'DR'	Status (2 byte)

Example: Switch LED green off, LED red off

Request:

Data	Description
'dn'	Command (2 byte)

Response:

Data	Description
'DN'	Status (2 byte)

4.3.3 Get Station ID

This command requests the station ID.

Request structure

Data
Command
'g' (byte)

Example: Get Station ID

Request:

Data	Description
'g'	Command (1 byte)

Response:

Data	Description
'01'	Status (2 byte)

4.3.4 Set tag type

This command switches the reader to a specific tag type. The continuous read function will speed up because only this tag type is recognized. These changes are not stored into the EEPROM. After a reset the reader starts as defined in the startup configuration.

Request structure

Data
Command
'o' + tag type (2 byte)

Example: Set reader to HITAG 2 tags

Request:

Data	Description
'o' + H	Command + HITAG 2 (2 byte)

Response:

Data	Description
'O' + H	Command + requested tag type (2 byte)

4.3.5 Include tag type

This command includes a specific tag type to the reader device.

Request structure

Data
Command
'o+' + tag type (3 byte)

Example: Set reader to HITAG 2 tags

Request:

Data	Description
'o+' + U	Command + HITAG S (3 byte)

Response:

Data	Description
'O+' + U	Command + included tag type (3 byte)

4.3.6 Exclude tag type

This command excludes a specific tag type to the reader device.

Request structure

Data
Command
'o+' + tag type (3 byte)

Example: Set reader to HITAG 2 tags

Request:

Data	Description
'o+' + D	Command + EM4x02 (3 byte)

Response:

Data	Description
'O+' + D	Command + excluded tag type (3 byte)

4.3.7 Tag Type characters

Note: The tag type characters are case sensitive!

Tag type characters	Description
'A'	All Tag types
'U'	EM4x02
'I'	HITAG 1
'H'	HITAG 2
'D'	HITAG S

4.3.8 Antenna Power off/on

This command controls the antenna power.

Request structure

Data
Command
‘p’ ’o’ ’n’ (3byte)
'p’ ’o’ ’f’ ’f' (4byte)

Example: Switch antenna power off

Request:

Data	Description
'p’ ’o’ ’f’ ’f'	Command (4byte)

Response:

Data	Description
'P'	Status (1byte) – successfully executed command

Example: Switch antenna power on

Request:

Data	Description
'p’ ’o’ ’n'	Command (3 byte)

Response:

Data	Description
'P'	Status (1byte) – successfully executed command

Power off

Power consumption is decreasing. All tags in the antenna field are powered off and reset.

Power on

The field of the reader is powered up.

4.3.9 Read/Write User Port

This command will set or read the state of the User port of the OEM reader device. The port can be set either as output or as input.

Request structure:

Data	
Command	**State**
'pr' (2 byte)	N/A
'pw' (2 byte)	(1 byte)

Example: Set User Port as output/high

Request:

Data	Description
'pw' 01	Command (2byte) State (1 byte)

Response:

Data	Description
01	State (1 byte)

Example: Read state of User Port

Request:

Data	Description
'pr'	Command (2byte)

Response:

4.3.10 Read Block

This command reads a data block on a card. Size of returned data depends on the used tag. A valid block address depends on the present tag.

Request structure:

Data	
Command	**Address**
'r' (1 byte)	XX (1 byte)
'r' 'b' (2 byte)	XX (1 byte)

Example: Read block 05 (HITAG2)

Request:

Data	Description
'r' 'b' 05	Command (2 byte) Address (1 byte)

Response:

Data	Description
01 23 45 67	Value (4 byte)

4.3.11 Read EEPROM

Reads the internal reader EEPROM. It contains all startup parameters and the device ID. Changes of the startup settings will only be taken into effect after a reset of the device.

Request structure:

Data

Command	Address
'r' 'p' (2 byte)	(1 byte)

Example: Read EEPROM Address 05

Request:

Data	Description
'r' 'e' 05	Command (2 byte) Address (1 byte)

Response:

Data	Description
FE	Value (1 byte)

4.3.12 Select

This command selects a single TAG in the antenna field. It can only be used in single tag mode. In case of success the command returns the UID of the selected card.

For EM4x02 Tags an additional parameter can be added. This parameter forces the FW to a N times reading and comparison of the UID.

Default value is 2 if the parameter is omitted. If the parameter is set to 0 a single read will be performed. The multiple reading is limited with 10.

Request structure:

Data
Command
's' ['val'](1 byte + 1 byte optional)

Example: Select TAG in field

Request:

Data	Description
's'	Command (1 byte)

Response:

Data	Description
48 58 73 8F 10	UID (various length)

Example: Select TAG in field (EM4x02 tripple reading)

Request:

Data	Description
's' 03	Command (1 byte) + parameter (1byte)

Response:

Data	Description
48 58 73 8F 10	UID (various length)

4.3.13 Get version

This command returns the current version of the reader module.

Request structure:

Data
Command
'v' (1 byte)

Example: Get Version of Reader

Request:

Data	Description
'v'	Command (1 byte)

Response:

Data	Description
54 41 20 31 2E 30 32 2E 30 30	Firmware Version (10 byte)

4.3.14 Write Block

This command writes data to a block of a memory card.

Request structure:

Data		
Command	**Address**	**Value**
'w' (1 byte)	(1 byte)	(various length)
'w' 'b' (2 byte)	(1 byte)	(various length)

Example: Write block 07 (HITAG2)

Request:

Data	Description
'w' 'b' 07 11 22 33 44	Command (2 byte) Address (1 byte) Value (4 byte)

Response:

Data	Description
11 22 33 44	Value (4 byte)

4.3.15 Write Reader EEPROM

Writes to the internal reader EEPROM. It contains all sstartup parameters. Changes of the startup settings will only be taken into effect after a reset of the device.

Request structure:

Data		
Command	**Address**	**Value**
'w' 'p' (2 byte)	(1 byte)	(1 byte)

Example: Write value 01 to EEPROM address 05

Request:

Data	Description
'w' 'p' 05 01	Command (2 byte) Address (1 byte) Value (1 byte)

Response:

Data	Description
01	Value (1 byte)

4.3.16 Reset

This command executes a power on (software) reset. New configuration settings will be loaded. This command will reset the reader module as well as all tags in the antenna field. The reader strts according the startup settings.

Request structure:

Data
Command
‘x’ (1 byte)

Example: Reset Reader

Request:

Data	Description
'x'	Command (1 byte)

Response:

Data	Description
none	N/A

4.3.17 Change HTRC110 settings

This command changes the HTRC110 settings. It contains the tag types and the config pages (which include for example GAIN, FILTERH, FILTERL, PD_MODE, THRESET,...) and the Phase.

Request structure:

Data
Command
'h' (6 bytes)

Example: Reset Reader

Request:

Data	Description
'h' 01 03 02 03 03 00	Command (1 byte) Tag Type (1 Byte) Config Pages (4 Bytes) Phase (1 Byte)

Response:

Data	Description
00	Successful

5 Tags

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6 Frequently Asked Questions

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7 Appendix A: Integration Checklist

The delivered products will work only with proper integration (software, cabling, antenna design, power supply etc.). Integrating the product into an application requires special experience, professional skills and involves usual technical risks. It is due to the integrator to verify that the integrated products are suitable for the application intended, that they comply with applicable laws and that no patents or intellectual property rights are infringed.

For using the products, the checklist below is recommended as a first step. Depending on the application additional checks will be needed.

Stability of hardware	✓ Was the printed circuit board layout and schematic verified by independent engineers? Was it compared with the guidelines and example schematics in our handbooks? ✓ Are the capacitors used for the antenna circuit drift free (f.e. NP0)? ✓ Did you make sure power supply variations, interference, aging, temperature variations, component drift of the antenna circuit will be in a tolerable range? Will this make sure sub sequential damage can be avoided? ✓ Did you make sure operating conditions are not marginal but rather rugged? ✓ Where all tests performed over the full operating range and if needed beyond? ✓ Did you test reading performance within the full reading range, with all tag types and with all operating states of the tags?
Stability of software	✓ Was testing and implementation of the software performed by independent engineers? ✓ Are the return codes to all commands evaluated? ✓ Was the software systematically tested? ✓ Did you apply sufficient test coverage over all operating states? ✓ Where all tag types under all operating conditions included in the tests? ✓ Did the tests include operations at the margins (like on the reading boundary, interrupted reading)?
Production	✓ Is there a 100% final test in place? ✓ Good to have: Does the test also quantify performance (reading range, reading holes)? Is this performance tracked?
Operational Stability	✓ Is there a maintenance and service concept in place if needed?
Regulations, applicable law	✓ Does the application comply with applicable laws? ✓ Does the complete unit comply with applicable radio laws? ✓ Are there no export restrictions applicable?
Patents and intellectual property rights	✓ Will there be license fees to third parties requested when using special functions or applications? If yes, had that been settled? ✓ Did you make sure there are not any patents that might get infringed by the application or by using special functions? ✓ Did you make sure the application is not protected by copyright laws? ✓ Did you make sure the application does not infringe intellectual property of third parties?
Sub sequential damage	✓ What is the consequence of malfunction? I this acceptable? ✓ Did you make sure malfunction will not cause excessive sub sequential damage? ✓ Did you make sure it can not cause loss of life or health? ✓ Did you make sure it can not cause environmental damage?

If there is any negative answer it is mandatory for the integrator to fix it.

8 Appendix B: Comparison with similar Protocols

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9 Appendix C: Release Notes

Version History

Date	Revision number	Notes
28th February 2011	Version 1.0	Initial version
10th October 2011	Version 1.1	Command description updated
14th August 2012	Version 1.2	EEPROM memory organization updated HTRC110 Settings added
17th January 2013	Version 1.3	Second Settings Register added EEPROM memory organization updated HTRC110 Settings 2 added Multiple UID reading on EM4x02 Tags with the select command