AT Commands Reference Guide

&

Config Register Description

Rev. 3.4

KTSSYSTEME

Contents

1 Introduction

The KTS family of RFID readers can be controlled via the serial interface using some simple AT commands. Although part of the command set looks like the Hayes command set, in general there is no compatibility to the Hayes command set or the V.250 standard.

1.1 Usage and Disclosure Restrictions

License Agreements

The software described in this document is the property of KTS. It may only be used in accordance with the terms of an agreement between KTS and its licensee.

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High Risk Materials

Components, units, or third-party products used in the product described herein are NOT fault-tolerant and are NOT designed, manufactured, or intended for use as on-line control equipment in the following hazardous environments requiring fail-safe controls: the operation of Nuclear Facilities, Aircraft Navigation or Aircraft Communication Systems, Air Traffic Control, Life Support, or Weapons Systems ("High Risk Activities"). KTS and its supplier(s) specifically disclaim any expressed or implied warranty of fitness for such High Risk Activities.

1.2 Applicability Table

In general the AT commands are applicable to the components listed in the table below. In cases where some device or feature specific restrictions are existing they will be mentioned in the specific command description.

Product	Abbreviation	Firmware Versions
SRR1356 Short Range HF Reader	SRR	≥ 3.00
RFIDM1356 HF OEM Module	RFIDM	≥ 3.00
DTR1356 HF Desktop Reader	DTR	≥ 3.00
BTR1356 HF Bluetooth Reader	BTR	≥ 3.00

Feature	Description	Firmware Versions
FEATURE_14443	Enables all ISO 14443 related commands and scanning modes	≥ 3.00
FEATURE_HID	Enables the use of a reader with USB interface as HID (keyboard) device	≥ 3.00
FEATURE_CDC *1)	Enables the use of a reader with USB interface as CDC (serial) device	≥ 3.00

*1) This feature is required to operate any AT Command described in this document.

1.3 Scope

This document is supposed to provide a comprehensive listing as a reference for the complete set of AT commands supported by KTS devices mentioned in Applicability Table in Section 1.2.

1.4 Audience

Readers of this document should be familiar with KTS RFID readers and should also be able to establish a communication between a host and a RFID reader via RS232 or USB using a terminal application.

1.5 Document Organization

The AT commands are organized in three classes:

- Elementary Functions
- Tag Functions
- Reader Functions

1.6 Text Conventions

Danger – This information MUST be followed or catastrophic equipment failure or bodily injury may occur.

Caution or Warning – Alerts the user to important issues about the operation of the components. If these issues are not considered correctly the readers and end user equipment may fail or malfunction.

Advice or Information – Provides advice and suggestions that may be useful when integrating and operating the RFID readers.

Syntactical definitions:

<\r> Carriage return character with the default decimal value of 13. In case a terminal application is used for e.g. testing purposes. This character must be sent after pressing the "ENTER" key.

<...> Angle brackets enclose mandatory elements. The brackets must not appear in the command line.

[...] Square brackets enclose optional elements. The brackets must not appear in the command line.

RFU: "Reserved for further use". Do not overwrite values marked as RFU in the device registers.

2 Elementary Functions

Elementary functions comprise all basic AT commands which are intended to provide an easy access to all KTS RFID readers and a variety of tags available on the market. These commands are identical and mandatory for all KTS readers now and in the future.

2.1 AT+A

Command	Availability	See also
AT+A[,<AFI>]	All KTS RFID readers	AT+Inventory, AT+I

Description	Examples
Anti Collision Inventory Performs an inventory scan and returns the total amount of tags found and a list of unique IDs (UIDs), followed by the corresponding RSSI-values (for both receiver channels separately) for each tag. Each UID is 32, 56, 64 or 80 bit wide. The message is completed with OK. If an AFI value is specified and not zero any ISO15693 transponder will not respond which AFI (Application Family Identifier) value does not match the requested AFI. The AFI parameter is only available in FW 3.17 and higher.  **Caution:** Anti Collision Inventory scan can only be performed successfully if all automatic scan modes are disabled (AT+Scan=OFF). In all other cases ERROR will be returned! (See also: AT+Scan)	AT+A<\r> +TAGS=0<\r> OK<\r> AT+A<\r> +TAGS=3<\r> +UID=E00402000058913D,+RSSI=5/5<\r> +UID=10C58711,+RSSI=4/3<\r> +UID=E004020000514170,+RSSI=3/2<\r> OK<\r> AT+A,01<\r> +TAGS=1<\r> +UID=E004020000514170,+RSSI=3/2<\r> OK<\r>

2.2 AT+I

Command	Availability	See also
AT+I[,<AFI>]	All KTS RFID readers	AT+Inventory, AT+A

Description	Examples
Inventory Performs an inventory scan and returns a single unique ID (UID) of a tag followed by the corresponding RSSI values for the main and the auxiliary receiver channel. The UID may be 32, 56, 64 or 80 bit wide. Completed with OK. If an AFI value is specified and not zero any ISO15693 transponder will not respond which AFI (Application Family Identifier) value does not match the requested AFI. The AFI parameter is only available in FW 3.17 and higher. In case no tag is found only OK will be reported.  **Caution:** Inventory scan can only be performed successfully if all continuous scan modes are disabled (AT+Scan=OFF). In all other cases ERROR will be returned! (See also: AT+Scan)	AT+I<\r> +UID=E00402000058913D,+RSSI=5/5<\r> OK<\r> AT+I<\r> OK<\r> AT+I,01<\r> +UID= E004020000514170,+RSSI=3/2</r> OK<\r>

2.3 AT+Inventory

Command	Availability	See also
AT+Inventory[,<AFI>]	All KTS RFID readers	AT+I, AT+A

Description	Examples
Inventory Scan Performs an inventory scan and returns the total amount of tags found and a list of unique IDs (UIDs), followed by the corresponding RSSI-values (for both receiver channels separately) for each tag. Each UID is 32, 56, 64 or 80 bit wide. The message is completed with OK. If an AFI value is specified and not zero any ISO15693 transponder will not respond which AFI (Application Family Identifier) value does not match the requested AFI. The AFI parameter is only available in FW 3.17 and higher.  **Caution:** Inventory scan can only be performed successfully if all continuous scan modes are disabled (AT+Scan=OFF). In all other cases ERROR will be returned! (See also: AT+Scan)	AT+Inventory<\r> +TAGS=0<\r> OK<\r> AT+Inventory<\r> +TAGS=3<\r> +UID=E00402000058913D,+RSSI=5/5<\r> +UID=10C58711,+RSSI=4/3<\r> +UID=E004020000514170,+RSSI=3/2<\r> OK<\r> AT+ Inventory,01<\r> +TAGS=1<\r> +UID=E004020000514170,+RSSI=3/2<\r> OK<\r>

2.4 AT+ISOSEL

Command	Availability	See also
AT+ISOSEL=<ISO1>,<ISO2>,…	All KTS RFID readers	

Description	Examples
Select ISO Standard Enables the support for ISO standard(s) for inventory and scan functions. Following parameters can be chosen: **15** – ISO 15693 **14A** – ISO 14443A **14B** – ISO 14443B AT+ISOSEL? reports status of the actually enabled ISO standard.	AT+ISOSEL=15,14A<\r> OK<\r> AT+ISOSEL? <\r> +ISOSEL=15,14A<\r> OK<\r> AT+ISOSEL=14A<\r> ERROR=”Feature disabled. Cannot select ISO14443.”<\r>

Restrictions:
To enable ISO 14443 Tags the FEATURE_14443 is required to be enabled.

2.5 AT+Scan

Command	Availability	See also
AT+Scan=<Flag #1>,<Flag #2>, … AT+Scan?	All KTS RFID readers	

Description	Examples
Enable/Disable Continuous Scan	
Enables or disables the continuous scan mode of the RFID reader with the functionality according to the activated flags. Returns the status of the actually set flags.	AT+Scan=<\r> OK<\r> SCAN:+UID=E00402000018313E<\r> SCAN:-UID=E00402000018313E<\r>
Meaning of available flags: **AC** – Anti collision mode ("bulk reading"): Allows the simultaneous detection of several tags. **ANT** – For each listed tag the number of the antenna (or antennae) detecting the according tag is provided. On remove of a tag, the antenna which has detected the tag previously is provided. Set the MULTI flag to scan over all antennae. **RSSI** – Returns the RSSI value for the main and the auxiliary receiver channel for each detected tag. **SHORT** – Reports only the UID without any further information (not compatible with ANT, RSSI, DATA, TYPE). **DATA** – During each scan the content of the complete user data space of the tag is returned in binary format. **MULTI** – Performs a scan covering all antennae of a connected multiplexer. The antenna switching is performed automatically each time the previous antenna was scanned and reported for changes. **TYPE** – Reports the type of detected tags. Currently following types will be indicated: ISO15693, MIFARE 1k,MIFARE 4k, MIFARE PLUS, MIFARE DESFIRE. **OFF** – Stops the continuous scan and deletes all activated flags.	AT+Scan=AC,RSSI<\r> OK<\r> SCAN:+UID=E00402000018313E,+RSSI=7/6 <\r> SCAN:+UID=E00402000054913F,+RSSI=5/5 <\r> AT+Scan=AC,RSSI,DATA<\r> OK<\r> SCAN:+UID=E00402000018313E,+RSSI=5/5 , +DATA112=1234567abcdefghijklmnopqrst …<\r> AT+Scan=AC,RSSI,ANT,DATA<\r> OK<\r> SCAN:+UID=E00402000018313E,+RSSI=5/5 , +ANT=6,+DATA112=1234567…<\r> AT+Scan=SHORT<\r> OK<\r> E00402000018313E
AT+Scan? returns a list with all set flags.	
Advice 1:	

To enable an automatic scan mode which only reports single tags without further information, use **AT+Scan=** without flags!

AT+Scan=OFF<\r>
OK<\r>
SCAN:-UID=E004020000283F32<\r>

Advice 2:

If DATA and RSSI flags are used simultaneously the user memory content will be reported at initial discovery of a tag.

AT+Scan?<\r>
+SCAN=AC,RSSI<\r>
OK<\r>

3 Tag Functions

The class of tag functions comprises all AT commands designed for enhanced access to specific tag properties.

3.1 ISO 15693

3.1.1 AT+ISO15693

Command	Availability	See also
AT+ISO15693,<Frame>	All KTS RFID readers with FW 3.17 or higher	AT+ISO14443A, AT+ISO14443B

Description	Examples
Exchange an ISO15693 Frame Exchanges a ISO15693 command and response pair. This can be used to issue otherwise unimplemented commands to ISO15693 tags. <frame> consists of a sequence of bytes to be sent as a stream of 2 character hexadecimal values. SOF, EOF and CRC16 will be generated and shall not be included in <frame>	AT+ISO15693,022000<\r> +ISO15693=00E1400E01<\r> OK<\r> AT+ISO15693,022B00<\r> +ISO15693=000FC046DA7A000104E000011B0301<\r> OK<\r>

3.1.2 AT+LOCK

Command	Availability	See also
AT+LOCK ,[<UID>,]<Block> AT+LOCK[,<UID>]?	All KTS RFID readers with FW 3.17 or higher	

Description	Examples
Lock Block Sets the security settings of a specific block to write protected.	AT+LOCK,0<\r> OK<\r> AT+LOCK,E004015002CCB3B2,7<\r> OK<\r>

Caution:
<Block> must be in the range of 0 ≤ BC-1.
(See AT+S)

Some tags (e.g. TI Tag-It) require Option Flag to be set for proper operation. Use AT+OPTIONFLAG to set/unset or check the option flag status.

AT+LOCK,0<\r>
ERROR=”Block already locked”<\r>

AT+LOCK,200<\r>
ERROR<\r>

AT+LOCK?<\r>
+LOCK=10000001000000000000000000000<\r>
OK<\r>

Get Lock Status

Gets the security settings of all blocks on the tag as a list of ONEs (write protected) and ZEROs (no protection).

AT+LOCK? is not compatible with all ISO15693 tags.
E.g. TI Tag-It do not support this command.

3.1.3 AT+NDEF

Command	Availability	See also
AT+NDEF ,[<UID>,]<type>=<value>[,…]	All KTS RFID readers with FW 3.17 or higher	

Description	Examples
Write NDEF messages Formats and writes NDEF messages onto an ISO15693 transponder. This NDEF message can be of the types • URL The message represents an URI of the format **http://www**.<value>	AT+NDEF,URI=kts-systeme.de<\r> OK<\r> AT+NDEF, E004015002CCB3B2,URI=http://www.kts-systeme.de<\r> OK<\r>

- URI

  The message represents an URI of any format. <value> needs to be formatted properly including the protocol and other parameters

- TEL

  The message represents an URI of the format tel:<value>

- MIME

  The message represents a custom message of the MIME type specified in the first line of <value>. Lines are separated with \n (sent as text, not as special <\n> character)

AT+NDEF,TEL=+49555599110<\r>

OK<\r>

AT+NDEF,MIME=text/text\nHello World!<\r>

OK<\r>

Info:
NDEF messages can be used to trigger actions within an NDEF capable device. I.e. let an NDEF (NFC) compatible smart phone open a specific webpage.

3.1.4 AT+R, AT+r

Command	Availability	See also
AT+R,<Block> AT+R,<Block>[,<Block Count>] AT+R,[<UID>,]<Block>[,<Block Count>] AT+R?	All KTS RFID readers	AT+Read

Description

Read Single Block

Reads data from one specific block <Block> in the user data space of a tag. Returns the amount of data in the block (=BS) as **ASCII** value and the data itself in **binary** format.

Caution:
<Block> must be in the range of 0 ≤ BC-1.
(See AT+S)

Read Multiple Blocks

Reads data from several <Block Count> blocks in the user data space starting with block number <Block> and returns the number of delivered bytes (= <Block Count> × BS) as an **ASCII** value and the data itself in **binary format**.

Caution:
<Block> must be in the range of 0 ≤ BC-1.
<Block Count > must be in the range of 1 ≤ 31.

Examples

0				1				2	
0	1	2	3	4	5	6	7	8	…
I	N	F	O	B	L	C	K	!	…

AT+R,0<\r>
+DATA 4:INFO<\r>
OK<\r>

AT+R,0,2<\r>
+DATA 8:INFOBLCK<\r>
OK<\r>

AT+R,E004015002CCB3B2,0<\r>
+DATA 4:INFO<\r>
OK<\r>

Alternatively:
AT+r,0<\r>
+DATA 4:INFO<\r>
OK<\r>

AT+r,0,2<\r>
+DATA 8:INFOBLCK<\r>
OK<\r>

Detailed explanations:
In cases where <Block Count> is greater than BC, the data will be read from user data space starting at block number <Block> until block number BC-1 is reached and the collected data will be returned to the host.

The first access to the user data will be performed by means of the ISO15693 command *Read Multiple Blocks* (0x23). In cases where this approach fails the reader will fall back to several *Read Single Block* (0x20) commands until all required data is collected. This strategy does not affect the output format of the AT command!

AT+r,E004015002CCB3B2,0<\r>
+DATA 4:INFO<\r>
OK<\r>

AT+R?<\r>
+TAGS=2<\r>
+UID=E00402000058913D,+MEMSIZE=112<\r>
+UID=E00801CE2084565A,+MEMSIZE=2000<\r>
OK<\r>

Read Single/Multiple Block(s), addressed

Allows addressed access to a specific tag within a whole bunch of tags present in the reading area.

3.1.5 AT+Read

Command	Availability	See also
AT+Read,<Byte> AT+Read,<Byte>[,<Byte Count>] AT+Read,[<UID>,]<Byte>[,<Byte Count>] AT+Read?	All KTS RFID readers	AT+R, AT+r

Description

Read Data from Tag Memory

Reads data from the user data space of a tag. Returns the amount of collected data as **ASCII** value and the collected data itself in **binary** format. Also designed to determine the size of the user data space (MEMSIZE) in bytes.

Caution:
<Byte> must be in the range of
0 ≤ MEMSIZE-1.

<Byte Count > must be in the range of
1 ≤ MEMSIZE-1.

<UID> must be a valid tag UID of an ISO15693 tag. This optional parameter allows selective access to one specific tag within a whole bunch of tags.

Examples

0	1	2	3	4	5	6	7	8	…
I	N	F	O	B	L	C	K	!	…

AT+Read,0<\r>
+DATA 1:I<\r>
OK<\r>

AT+Read,1,3<\r>
+DATA 3:NFO<\r>
OK<\r>

AT+Read,0,9<\r>
+DATA 8:INFOBLCK!<\r>
OK<\r>

AT+Read,E00402000058913D,0,9<\r>
+DATA 8:INFOBLCK!<\r>
OK<\r>

AT+Read?<\r>
+TAGS=2<\r>
+UID=E00402000058913D,+MEMSIZE=112<\r>
+UID=E00801CE2084565A,+MEMSIZE=2000<\r>
OK<\r>

3.1.6 AT+S

Command	Availability	See also
AT+S AT+S[,<UID>]	All KTS RFID readers	

Description	Examples
Get System Information Reports a 64-Bit long unique ID, Data Storage Format Identifier (DSFI), Application Field Identifier (AFI), block count (BC) and block size (BS) of the user data space and some manufacturer specific data (IC) for ISO15693 compliant tags. In case no tag is found or the tag does not support the Get System Information-Command (0x2B) only ERROR will be reported.	AT+S<\r> +UID=E004015002CCB3B2,DSFID=00,AFI=00,BC=28,BS=4,IC=01<\r> OK<\r> AT+S,E004015002CCB3B2<\r> +UID=E004015002CCB3B2,DSFID=00,AFI=00,BC=28,BS=4,IC=01<\r> OK<\r> AT+S,E000000000000123<\r> ERROR<\r>

3.1.7 AT+W, AT+w

Command	Availability	See also
AT+W,<Block>,<Byte Count><\r><Data> AT+w,<Block>,<Byte Count><\r><Data> AT+W?	All KTS RFID readers	AT+Write

Description	Examples
Write Single Block Writes amount <Byte Count> of data <Data> into a single block with the number <Block> in the user data space of a tag.	AT+W0,4<\r>info OK<\r>

	Alternatively: AT+w0,4<\r>info OK<\r>
 **Caution:** <Block> must be in the range of 0 ≤ BC-1. <Block Count> must be equal to BS.	AT+W?<\r> +TAGS=2<\r> +UID=E00402000058913D,+MEMSIZE=112<\r> +UID=E00801CE2084565A,+MEMSIZE=2000<\r> OK<\r>

3.1.8 AT+Write

Command	Availability	See also
AT+Write,<Byte>,<Byte Count><\r><Data> AT+Write,[<UID>,]<Byte>,<Byte Count><\r><Data> AT+Write?	All KTS RFID readers	AT+W, AT+w

Description	Examples
Write Data to Tag Memory Writes data to the user data space of a tag. Also returns the size of the user data space (MEMSIZE) in bytes.	AT+Write,0,8<\r>abcd1234 OK<\r> AT+Write,E00402000058913D,0,8<\r>abcd1234 OK<\r>
 **Caution:** <Byte> must be in the range of 0 ≤ MEMSIZE-1.	AT+Write?<\r> +TAGS=2<\r> +UID=E00402000058913D,+MEMSIZE=112<\r> +UID=E00801CE2084565A,+MEMSIZE=2000<\r> OK<\r>

The number of bytes in the <Data> field must be equal to the parameter <Byte Count>.

<UID> must be a valid tag UID of a ISO15693 tag.

This optional parameter allows selective access to one specific tag within a whole bunch of tags.

3.1.9 AT+Write_Prepare

Command	Availability	See also
AT+Write_Prepare,<Byte>,<Byte Count><\r><Data> AT+Write_Prepare? AT+Write_Prepare,Clear	BTR	At+Write, AT+Write!

Description	Examples
Configure Data for Writing to Tag Memory	
Configures data which can be written into the tag memory in a separate action.	AT+Write_Prepare,0,5<\r>HALLO OK<\r>
Reads back prepared configuration.	AT+Write_Prepare?<\r> +PREPAREDDATA,0,5:HALLO<\r> OK<\r>
Clears current configuration.	AT+Write_Prepare,Clear<\r> OK<\r>

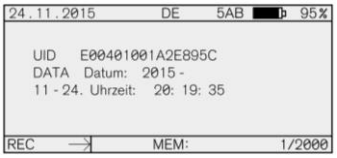
Caution:
<Byte> indicates the starting point.

The number of bytes in the <Data> field must be equal to the parameter <Byte Count>.

Info:
KTS Bluetooth Reader has the capability to write current date and current time into the tag memory. To do this use the variables <%FULLDATE%> and <%_TIME_%>.

The device serial number is accessible via <%SERIAL%>.

AT+Write_Prepare,0,36<\r> Datum: %FULLDATE%, Uhrzeit: %_TIME_%



3.1.10 AT+Write!

Command	Availability	See also
AT+Write!	BTR	AT+Write_Prepare

Description	Examples
Write pre-configured data into tag Writes the previously configured data (AT+Write_Prepare) into tag memory.	AT+Write!<\r> OK<\r>
This operation will fail if • there is no valid configuration, • tag has less memory than configuration requires, • configuration includes block number which are locked in current tag.	AT+Write!<\r> ERROR<\r>
Normally this operation is performed by pressing the Bluetooth Reader SCAN-button 3 times.	

3.1.11 AT+WriteAFI

Command	Availability	See also
AT+WriteAFI,[<UID>,]<AFI>	All KTS RFID readers with FW 3.17 or higher	AT+A, AT+Inventory

Description	Examples
Write AFI Field of Tag Writes the Application Family Identifier (AFI) on the tag. The card will only respond to inventory requests on AT+I, AT+A or AT+Inventory if the inventory is issued with an AFI equal to the written value or if the inventory is issued with an AFI of 0.	AT+WriteAFI,0<\r> OK<\r> AT+WriteAFI,01<\r> OK<\r> AT+WriteAFI,E004020000514170,01 OK<\r>

3.1.12 AT+OPTIONFLAG

Command	Availability	See also
AT+OPTIONFLAG=<1/0> AT+OPTIONFLAG?	All KTS RFID readers with FW 3.18 or higher	

Description	Examples
Use Option Flag Some tags require option flag to be set to ensure correct write and lock operation. Use this command to set/unset the option flag temporarily.  **Info:** For permanent setting check Bit 0 in Register 6.	AT+OPTIONFLAG=1<\r> OK<\r> AT+OPTIONFLAG?<\r> +OPTIONFLAG=0<\r> OK<\r> AT+WriteAFI,E004020000514170,01 OK<\r>

3.2 ISO 14443

3.2.1 AT+Deselect

Command	Availability	See also
AT+Deselect	All KTS RFID readers Requires FEATURE_14443	AT+Select, AT+Transceive

Description	Examples
Deselect Tag Deselects and closes an open tag for communication on the ISO14443-4 protocol level.	AT+Deselect<\r> OK<\r> AT+Deselect<\r> ERROR=”Feature disabled. Cannot use ISO14443 commands.”<\r>

3.2.2 AT+Select

Command	Availability	See also
AT+Select AT+Select,<UID>	All KTS RFID readers Requires FEATURE_14443	AT+Deselect, AT+Transceive

Description	Examples
Select Tag Selects and opens a tag for communication on the ISO14443-4 protocol level.	AT+Select<\r> OK<\r> AT+Select,10C58711<\r> OK<\r> AT+Select<\r> ERROR=”Feature disabled. Cannot use ISO14443 commands.”<\r>

Compatibility:
Not all ISO 14443 tags are ISO14443-4 compatible. I.e. the

- Mifare – Classic
- Mifare – Ultralight

do not implement all required ISO 14443-4 commands.

3.2.3 AT+Transceive

Command	Availability	See also
AT+Transceive,<data>	All KTS RFID readers Requires FEATURE_14443	AT+Select, AT+Deselect

Description	Examples
Transceive protocol level data Sends and receives data to a selected tag through the protocol level using **ISO14443A** protocol.	AT+Transceive,00A4000000<\r> +TRANSCEIVE=9000<\r> OK<\r> AT+Transceive,00A4000000<\r> ERROR=”Feature disabled. Cannot use ISO14443 commands.”<\r>

Info:
The data format exchanged on the protocol level is tag dependent. It is common to use ISO 7816 compatible APDUs providing a smartcard interface.

Compatibility:
Not all ISO 14443 tags are ISO14443-4 compatible. I.e. the

- Mifare – Classic
- Mifare – Ultralight

do not implement all required ISO 14443-4 commands.

3.2.4 AT+TransceiveB

Command	Availability	See also
AT+TransceiveB,<data>	All KTS RFID readers Requires FEATURE_14443	AT+Select, AT+Deselect, AT+Transceive

Description	Examples
Transceive protocol level data Sends and receives data to a selected tag through the protocol level using **ISO14443B** protocol.	AT+TransceiveB,00A4000000<\r> +TRANSCEIVE=9000<\r> OK<\r> AT+TransceiveB,00A4000000<\r> ERROR="Feature disabled. Cannot use ISO14443 commands."<\r>
 **Info:** The data format exchanged on the protocol level is tag dependent. It is common to use ISO 7816 compatible APDUs providing a smartcard interface. **Compatibility:** Not all ISO 14443 tags are ISO14443-4 compatible. I.e. the • Mifare – Classic • Mifare – Ultralight do not implement all required ISO 14443-4 commands.	

3.2.5 AT+DESFIRE

Command	Availability	See also
AT+DESFIRE,<data>	All KTS RFID readers Requires FEATURE_14443 with FW 3.17 or higher	AT+Select, AT+Deselect AT+Transceive

Description	Examples
Transceive DESfire protocol level data	AT+DESFIRE,6A<\r> +DESFIRE=020000<\r>

Sends and receives data to a selected tag through the DESfire protocol. Including requesting additional frames and concatenating them as a single response.	OK<\r> AT+DESFIRE,6A<\r> ERROR=”Feature disabled. Cannot use ISO14443 commands.”<\r>

Info:
Some DESfire commands require additional calculations and data before requesting the additional frame – i.e. calculating the response to authorization requests. These commands can only be issued correctly when using the AT+Transceive command.

3.2.6 AT+DESFIRE_FREEMEM

Command	Availability	See also
AT+DESFIRE_FREEMEM	All KTS RFID readers Requires FEATURE_14443 with FW 3.17 or higher	

Description	Examples
Receive Version Information Gets the memory space left available on a DESfire EV1 card.	AT+DESFIRE_FREEMEM<\r> 4160 Bytes free<\r>

Info:
The available memory might be more as the total memory reported by AT+DESFIRE_VERSION AT+DESFIRE_FREEMEM is more accurate.

3.2.7 AT+DESFIRE_GETAIDS

Command	Availability	See also
AT+DESFIRE_GETAIDS	All KTS RFID readers Requires FEATURE_14443 with FW 3.17 or higher	

Description	Examples
Get Application Identifier Get a list of application identifier (AIDs) on the DESfire EV1 transponder. There might be up to 28 AIDs in the list.	AT+DESFIRE_GETAIDS<\r> 2 Applications:<\r> +AID 010203<\r> +AID 020304<\r> OK<\r>

3.2.8 AT+DESFIRE_GETFIDS

Command	Availability	See also
AT+DESFIRE_GETFIDS	All KTS RFID readers Requires FEATURE_14443 with FW 3.17 or higher	

Description	Examples
Get File Identifier Get a list of file IDs on the DESfire EV1 transponder under the currently selected application. There might be up to 31 FIDs in the list.	AT+DESFIRE_GETFIDS<\r> 1 Files:<\r> +FID 01 – Data file, 80 Bytes<\r> OK<\r>

3.2.9 AT+DESFIRE_SELECTAID

Command	Availability	See also
AT+DESFIRE_SELECTAID,<AID>	All KTS RFID readers Requires FEATURE_14443 with FW 3.17 or higher	

Description	Examples

Select application	AT+DESFIRE_SELECTAID,010203<\r> OK<\r>
Selects the application <AID> and makes it the current application.	

3.2.10 AT+DESFIRE_VERSION

Command	**Availability**	**See also**
AT+DESFIRE_VERSION	All KTS RFID readers Requires FEATURE_14443 with FW 3.17 or higher	

Description	**Examples**
Receive Version Information Gets the version information as reported by a DESfire EV1 card.	AT+DESFIRE_VERSION<\r> NXP Smart MX, 1.01 8192 Bytes<\r>

3.2.11 AT+ISO14443A

Command	**Availability**	**See also**
AT+ISO14443A,<Frame>	All KTS RFID readers with FW 3.17 or higher Requires FEATURE_14443	AT+ISO15693, AT+ISO14443B

Description	**Examples**
Exchange an ISO14443A Frame Exchanges a ISO14443A command and response pair. This can be used to issue otherwise unimplemented commands to ISO14443A tags. <frame> consists of a sequence of bytes to be sent as a stream of 2 character hexadecimal values. SOF, EOF and CRC16 will be generated and shall not be included in <frame> Only valid for ISO14443A tags.	AT+ISO14443A,026A<\r> +ISO14443A=02000160C2 <\r> OK<\r>

3.2.12 AT+ISO14443B

Command	Availability	See also
AT+ISO14443B,<Frame>	All KTS RFID readers with FW 3.17 or higher Requires FEATURE_14443	AT+ISO15693, AT+ISO14443A

Description	Examples
Exchange an ISO14443B Frame Exchanges a ISO14443B command and response pair. This can be used to issue otherwise unimplemented commands to ISO14443B tags. <frame> consists of a sequence of bytes to be sent as a stream of 2 character hexadecimal values. SOF, EOF and CRC16 will be generated and shall not be included in <frame> Only valid for ISO14443B tags.	AT+ISO14443B,0200A4000000<\r> +ISO14443B=029000 <\r> OK<\r>

3.2.13 AT+NDEF

Command	Availability	See also
AT+NDEF ,[<UID>,]<type>=<value>[,…]	BTR	

Description	Examples
Write NDEF messages Formats and writes NDEF messages onto a Mifare NTAG transponder. This NDEF message can be of the types • URL The message represents an URI of the format **http://www**.<value> • URI The message represents an URI of any format. <value> needs to be formatted properly including the protocol and other parameters	AT+NDEF,URI=kts-systeme.de<\r> OK<\r> AT+NDEF, E004015002CCB3B2,URI=http://www.kts-systeme.de<\r> OK<\r> AT+NDEF,TEL=+49555599110<\r> OK<\r> AT+NDEF,MIME=text/text\nHello World!<\r>

- TEL

  The message represents an URI of the format tel:<value>

- MIME

  The message represents a custom message of the MIME type specified in the first line of <value>. Lines are separated with \n (sent as text, not as special <\n> character)

OK<\r>

Info:
NDEF messages can be used to trigger actions within an NDEF capable device. I.e. let an NDEF (NFC) compatible smart phone open a specific webpage.

Only BTR1356 currently supports NTAG transponders.

4 Reader Functions

The class of reader functions contains all commands which are designed for configuration and maintenance of the KTS RFID readers. Some of the commands are not supported by all readers. Some may also cause damage if they are not used in the proper way!

4.1 ATI

Command	Availability	See also
ATI	All KTS RFID readers	

Description	Examples
Product Information Returns product and firmware information.	ATI<\r> KTS GmbH - RFID HF USB (CDC) ShortRange Reader<\r> FW 3.05, Build 22, May 22 2012, 10:36:58<\r> S/N 03081136<\r> OK<\r>

4.2 ATE

Command	Availability	See also
ATE	All KTS RFID readers	

Description	Examples
Echo Enables (1) and disables (0) echo. When enabled all typed characters will be forwarded to the console. This function is intended for test purposes and not needed for normal operation.	ATE1<\r> OK<\r> ATE0<\r> OK<\r>

4.3 ATS

Command	Availability	See also
ATS<duration>	BTR	

Description	Examples
Sound Creates a sound with the duration of <duration> ms.	ATS250<\r> OK<\r>

4.4 ATZ

Command	Availability	See also
ATZ[<delay>]	All KTS RFID readers	

Description	Examples
Reset Performs a hardware reset of the component. Either instantly (no parameter) or after a delay of <delay> ms.	ATZ<\r> OK<\r> ATZ1000<\r> OK<\r>

4.5 AT+RF

Command	Availability	See also
AT+RF=<0|1>	All KTS RFID readers	
AT+RF?		

Description	Examples
Enable/Disable RF Field. Enables or disables the RF field. Returns the status of the RF field.	AT+RF=1<\r> OK<\r> AT+RF?<\r> +RF=1<\r> OK<\r>

4.6 AT+P

Command	Availability	See also
AT+P=<1|2>	All KTS RFID readers	
AT+P?		

Description	Examples
Select Output Power Selects the RF output power: **1** – Half (~ 100mW) **2** – Full (~ 200mW) RFID Reader with an additional amplifier might allow a greater output power range: **1** – ~ 100mW **2** – ~ 200mW **3** – ~ 300mW … **10** – ~ 1000mW	AT+P=1<\r> OK<\r> AT+P?<\r> +RFPOWER=1<\r> OK<\r>

...
40 – ~ 4000mW

AT+P? returns the currently set output power value.

Caution:
The selection of the output power directly influences the output impedance of the RFID ASIC. Since the matching network remains fix, the output power mentioned above does not necessarily correspond to the power delivered to the antenna!

4.7 AT+WriteDisplay

Command	Availability	See also
AT+WriteDisplay=<string>	BTR	

Description	Examples
Writes text string on BTR Display Displays a string on the Bluetooth Reader display. Use <\n> to carry out a carriage return.	AT+WriteDisplay= HALLO \n WORLD! <\r> OK<\r>

4.8 AT+TIME

Command	Availability	See also
AT+TIME	BTR	

Description	Examples
Set Time and Date Initializes the real time clock with given values. Reads back the values.	AT+TIME=2015-07-28T00:15:00<\r> OK<\r>

	AT+TIME? +TIME=2015-07-28T00:15:00<\r> OK<\r>

4.9 AT+ANT

Command	Availability	See also
AT+ANT=<xx> AT+ANT?	RFID OEM Module + Mux,	

Description	Examples
Antenna Selection If the reader is used in conjunction with an antenna multiplexer this command allows the selection of the active antenna output. It returns also the number of the currently activated antenna and the total amount of antennae presently available.	AT+ANT=8<\r> OK<\r> AT+ANT?<\r> +ANT=8/16<\r> OK<\r>

4.10 AT+LED

Command	Availability	See also
AT+LED=<xx>	RFID OEM Module + Mux,	

Description	Examples
LED Control If the reader is used in conjunction with an antenna multiplexer and the antenna multiplexer has additional LEDs to indicate the operation state this command allows switching on and off the corresponding LED.	AT+LED=8<\r> OK<\r>

4.11 AT+PC_FUEL_CUR

Command	Availability	See also
AT+PC_FUEL_CUR	BTR	AT+PC_FUEL_VOLT, AT+PC_FUEL_PERCENT, AT+PC_FUEL_CAP

Description	Examples
Battery Current Displays currently flowing battery current in mA. Positive values indicate charging, negative values indicate discharging.	AT+PC_FUEL_CUR<\r> +PC_FUEL_CUR=+432 OK<\r>

4.12 AT+PC_FUEL_VOLT

Command	Availability	See also
AT+PC_FUEL_VOLT	BTR	AT+PC_FUEL_CUR, AT+PC_FUEL_PERCENT, AT+PC_FUEL_CAP

Description	Examples
Battery Voltage Displays battery voltage in mV.	AT+PC_FUEL_VOLT<\r> +PC_FUEL_VOLT=4120 OK<\r>

4.13 AT+PC_FUEL_PERCENT

Command	Availability	See also
AT+PC_FUEL_PERCENT	BTR	AT+PC_FUEL_CUR, AT+PC_FUEL_VOLT, AT+PC_FUEL_CAP

Description	Examples
Battery charge level in % Displays current battery charge level in %.	AT+PC_FUEL_PERCENT<\r> +PC_FUEL_PERCENT=88 OK<\r>

4.14 AT+PC_FUEL_CAP

Command	Availability	See also
AT+PC_FUEL_CAP	BTR	AT+PC_FUEL_CUR, AT+PC_FUEL_VOLT, AT+PC_FUEL_PERCENT

Description	Examples
Current Battery Capacity in mAh Displays current battery capacity in mAh.	AT+PC_FUEL_CAP<\r> +PC_FUEL_CAP=1960 OK<\r>

4.15 AT+PC_FUEL_REMAIN_TIME

Command	Availability	See also
AT+PC_FUEL_REMAIN_TIME	BTR	AT+PC_FUEL_CUR, AT+PC_FUEL_VOLT, AT+PC_FUEL_PERCENT, AT+PC_FUEL_CAP

Description	Examples
Time-To-Full / Time-To-Empty	

During charging positive values indicate Time-To-Full in Minutes. During operation negative values show Time-To-Empty in Minutes.	AT+PC_FUEL_REMAIN_TIME<\r> +PC_FUEL_REMAIN_TIME=106 OK<\r>

4.16 AT+MEM_Write

Command	Availability	See also
AT+MEM_Write=<ON/OFF> AT+MEM_Write?	BTR	AT+MEM_Clear, AT+MEM_Mode

Description	Examples
Activates data logging Activates data logging into internal memory. Active data logging is indicated by "REC" symbol in lower left corner of the display. The log memory can record up to 2000 entries per file.	AT+MEM_Write=ON<\r> OK<\r> AT+MEM_Write?<\r> +MEM_Write=ON<\r> OK<\r>

Caution:
When data has been logged (i.e. MEM shows value >0) do not forget to switch the logging off again to be able to get the data from the disk! When a file was written correctly a reminder message will appear on the screen.

Caution:
When the Bluetooth Reader is connected via USB logging cannot be disabled and a warning message will appear! In this case simply disconnect the USB cable and try switching off logging again.

Info:
For the definition of the log data format use Registers 128 - 191 (decimal) or simply use Tag2Image.

4.17 AT+MEM_Clear

Command	Availability	See also
AT+MEM_Clear	BTR	AT+MEM_Write, AT+MEM_Mode

Description	Examples
Clears log memory Clears actually collected data in memory. Only data stored in memory will be deleted. If logging has been completed and files have been created the files will remain unchanged. Use the disk drive to delete the files.	AT+MEM_Clear<\r> OK<\r>

4.18 AT+MEM_Mode

Command	Availability	See also
AT+MEM_Mode=<1/2> AT+MEM_Mode?	BTR	AT+MEM_Write, AT+MEM_Clear

Description	Examples
Changes / Reports the log mode Influences the behaviour of the reader when memory is full: **Log Mode 1:** Data will be discarded when memory is full. **Log Mode 2:** Oldest data will be overwritten.	AT+MEM_Mode=1<\r> OK<\r> AT+MEM_Mode?<\r> +MEMMODE=1<\r> OK<\r>

4.19 AT+Shutdown

Command	Availability	See also
AT+Shutdown	BTR	

Description	Examples
Switches off the entire device	

4.20 AT+FlashUpdate!

Command	Availability	See also
AT+FlashUpdate!	All KTS RFID readers	Application Note: "AN001 – KTS RFID Reader Flash Update"

Description	Examples
Flash Update Initiates firmware update.	AT+FlashUpdate!<\r> OK<\r>

4.21 AT+FACTORYRESET

Command	Availability	See also
AT+FACTORYRESET	BTR1356	

Description	Examples
Reset to Factory Settings Resets all register settings to default values stored in <RFID_READER>\Config\FACTORY.RST	AT+FACTORYRESET<\r> OK<\r>

4.22 AT+Config

Command	Availability	See also
AT+Config,<address>=<value> AT+Config,<address>?	All KTS RFID readers	Chapter 5: Registers

Description	Examples
Reads and Writes Config Register Values <address> is a decimal value. <value> is a HEX value.	

5 Config Register Description

Config registers allow the user to define the start-up behavior of device.

Be careful when changing register values! Some changes may cause permanent damage to the device!

5.1 Register 00: SRR1356 Interface Mode

Function: Configuration of the reader interface for SRR1356 products

Default: **SRR = 0x01**

B7	B6	B5	B4	B3	B2	B1	B0
CCID ENABLE	HID ENABLE	UART ENABLE	USB ENABLE / USB CODE				
Enable/Disable CCID mode	Enable/Disable HID mode, check registers 0x80 – 0x9f for further HID settings	Enable/Disable UART mode, check register 0x01 for further UART settings	Enable/Disable USB mode, 0x1f: USB disabled, 0x00 – 0x0f: USB device code (0x01=SRR, 0x04=BTR) All other values: RFU				

Caution: Changing this register might render the reader unresponsive. Change this register with intense care. To avoid unintended changes to this register it is password protected. Append “,iamreallysure” to the config command to set this register.

Info: The HID Enable bit is additionally protected by the FEATURE_HID and will report an error if set without this feature.

Info: The interface settings for the BTR1356 Bluetooth Reader are defined in register 27.

5.2 Register 01: UART Configuration

Function: Configuration of the UART interface

Default: **RFID OEM = 0x05, SRR = 0x05, BTR=0x85**

B7	B6	B5	B4	B3	B2	B1	B0
RFU	STOP BITS	PARITY		BAUD RATE			
	0: 1 stop bit 1: 2 stop bits	0: none 1: odd 2: even 3: RFU		0: 4800 baud 1: 9600 baud 2: 19200 baud 3: 38400 baud 4: 57600 baud 5: 115200 baud ≥6: RFU			

Info: This configuration is not applied on the virtual UART (USB-CDC).

5.3 Register 02: RF Power & Modulation Control

Function: Configuration of the output power and the modulation depth

Default: **SRR = 0x04, RFIDM = 0x00, BTR = 0x00**

B7	B6	B5	B4	B3	B2	B1	B0
AMP MOD	MODULATION ISO14443B		MODULATION ISO14443A		TRF POWER	MODULATION ISO15693	
The modulation is generated by an external amplifier	0: OOK 1: ASK 10% 2: ASK 22% 3: ASK 30%		0: OOK 1: ASK 10% 2: ASK 22% 3: ASK 30%		0: half 1: full	0: OOK 1: ASK 10% 2: ASK 22% 3: ASK 30%	

5.4 Register 03: External Amplifier Output Power Control

Function: Configuration of the output power generated by an external power amplifier

Default: **SRR = 0x00, RFIDM = 0x00, BTR = 0x00**

B7	B6	B5	B4	B3	B2	B1	B0
RF output power level generated by an external power amplifier							

0x00: 0W (or disabled) – 0xff: 25.5W (or max power available) (0.1W/digit)

5.5 Register 04: Scan Mode Flags 1

Function: Configuration of the flags for the default scan mode

Default: **SRR = 0x13, RFIDM = 0x13, BTR = 0x01**

B7	B6	B5	B4	B3	B2	B1	B0
DATA	SHORT	ANT	RSSI	RFU	TYPE	AC	ENABLE AUTO SCAN

Info: The meaning of the fields is described in section 0 AT+Scan.

5.6 Register 05: Scan Mode Flags 2

Function: Configuration of the flags for the default scan mode

Default: **All = 0x20**

B7	B6	B5	B4	B3	B2	B1	B0
ISO14443B	ISO14443A	ISO15693	RFU	RFU	RFU	RFU	MULTI ANTENNA

B0 activates automatic scanning over all present antennae.

B5, B6, B7 activate the detection of corresponding ISO standard tags.

Info:
Be sure to set the appropriate modulation depth when dealing with ISO14443A&B tags!

5.7 Register 06: Option Flag & BTR1356 Configuration 1

Function: Defines some BTR1356 specific functions. Handles OPTION FLAG on write operation for all readers.

Default: **SRR = 0x01, RFIDM = 0x01, BTR = 0xE1**

B7	B6	B5	B4	B3	B2	B1	B0
SHOW STANDARD	SHOW DATE	BT MODE	FAST START-UP	MEM HEX	DISABLE BT & DISPLAY	TURN OFF AFTER 1. TAG	OPTION FLAG
If enabled indicates activated RFID standard: 5 = ISO15693 A = ISO14443A B = ISO14443B	If enabled show current date in upper left corner of the display	1: Always stay connected 0: drop connection (iOS-mode)	Disable Info Display during start-up sequence	Show memory content as HEX values	Disable Bluetooth and Display Updates	Turn off Scanning after first transponder is detected	Use OPTION FLAG on write operations. **Applicable to all products!**

Setting **B1** to 0 allows the user to scan several tags while RF field is activated. The activation time is defined in register 07.

Info:
OPTION FLAG is required by some tags (e.g. TI Tag-It) for correct execution of write and lock commands.

Info:
Setting **B5** to 1 is useful when working with iOS devices. iOS devices allow only one keyboard to be present at the same time. Dropping Bluetooth connection when nothing needs to be transferred makes the iOS display keyboard appear again.

Info:
Consider that re-establishing BT connection takes approx. 1s. So this operation mode results in generally slower response time!

Info:
Use Register 05 to activate standards.

5.8 Register 07: Scan On-Time Control

Function: Defines the scan activation duration.

Default: **SRR = 0x00, RFIDM = 0x00, BTR = 0x0A**

B7	B6	B5	B4	B3	B2	B1	B0
Scan On-Time after pressing Scan button in 270ms units							

0x00: Scan permanently until the scan button is pressed again
>0x00: Switch off field after defined scan On-Time

5.9 Register 08: Scan LED On-Time Control

Function: Defines the scan indication LED activation duration

Default: **SRR = 0x00, RFIDM = 0x00, BTR = 0x00**

B7	B6	B5	B4	B3	B2	B1	B0
Scan LED On-Time after pressing Scan button in 270ms units							

0x00: LED On-Time is synchronized with Scan On-Time

5.10 Register 09: BTR1356 Configuration Register 2

Function: Defines some BTR1356 specific functions.

Default: **SRR = 0x00, RFIDM = 0x00, BTR = 0x60**

B7	B6	B5	B4	B3	B2	B1	B0
SHORT LOG NAME	POWER SAVE ON REC	DISPLAY START-UP PIC	SCAN BUTTON STATE 3	SCAN BUTTON STATE 2	SCAN BUTTON STATE 1	RFU	DATA OUTPUT FORMAT
Use short log names: LOG_xxxx.log instead of ddmmyy\hhmmss.log	Automatic shutdown after predefined duration of inactivity even when data logging is enabled!	Display Start-Up picture when Clear Display Interval expires, check Register 26 value	Permanently disable third state of the Scan Button Indication: LED toggles between 20% and 100%	Permanently disable second state of the Scan Button Indication: LED 100%	Permanently disable first state of the Scan Button Indication: LED 20%		0: Binary 1: HEX

Info:
If no write data is pre-configured stage 3 of the scan button will be skipped independently from the setting in Bit 4!
Setting Bit 4 to 1 permanently disables writing capability.

5.11 Register 10: Antenna Multiplexer Control

Function: Configuration of the antenna multiplexing mode

Default: **0x00**

B7	B6	B5	B4	B3	B2	B1	B0
RFU	RFU	RFU	RFU	RFU	RFU	INVERSE LOGIC	ENABLE MUX
						0: Antenna switch = active high 1: Antenna switch = active low	0: Antenna Multiplexer disabled 1: Antenna Multiplexer enabled

5.12 Register 11: Antenna Multiplexer Physical Ports

Function: Defines the number of physically connected antenna multiplexer ports

Default: **0x00**

B7	B6	B5	B4	B3	B2	B1	B0
Number of physically connected multiplexer ports							

5.13 Register 12: Antenna Multiplexer Logical Ports

Function: Defines the number of logical antenna multiplexer ports

Default: **0x00**

B7	B6	B5	B4	B3	B2	B1	B0
Number of logical multiplexer ports							

5.14 Register 13: LED Multiplexer Control

Function: Configuration of the LEDs for corresponding antennae

Default: 0x00

B7	B6	B5	B4	B3	B2	B1	B0
RFU	RFU	RFU	RFU	RFU	LED SYNC	INVERSE LOGIC	ENABLE LED MUX
					Sync LEDs settings with antenna settings	0: Port LEDs = active high 1: Port LEDs = active low	0: Port LEDs disabled 1: Port LEDs enabled

5.15 Register 14: LED Multiplexer Physical Ports

Function: Defines the number of physically connected LEDs

Default: 0x00

B7	B6	B5	B4	B3	B2	B1	B0
Number of physically connected LEDs							

5.16 Register 15: LED Multiplexer Logical Ports

Function: Defines the number of logical multiplexer LEDs

Default: 0x00

B7	B6	B5	B4	B3	B2	B1	B0
Number of logical multiplexer LEDs							

5.17 Register 16: BTR1356 Configuration Register 3

Function: Defines some BTR1356 specific functions.

Default: **SRR = 0x00, RFIDM = 0x00, BTR = 0x0A**

B7	B6	B5	B4	B3	B2	B1	B0
OVERRIDE HID	MEM MODE	ENABLE LOG	RESERVED	LED BRIGHTNESS			
Override HID Settings and output UID<\r> only	0: MEM Mode Discard data when memory is full 1: MEM Mode Overwrite oldest data	Enable data logging	Do not modify!	Configures the LED brightness in 10% steps.			

This register is evaluated during start-up only!

5.18 Register 17: Bluetooth HID Keyboard Language

Function: Defines the keyboard language on Blueooth HID interface

Default: **0x00**

B7	B6	B5	B4	B3	B2	B1	B0
Bluetooth HID keyboard language							

0x00: English (indicated with EN)
0x01: German (indicated with DE)
0x02: French (indicated with FR)
0x03: Multi language: Notifications are displayed simultaneously in English and German, keyboard language is English.

5.19 Register 18: Bluetooth HID Keystroke Delay

Function: Defines the Bluetooth HID keystroke delay

Default: **0x00**

B7	B6	B5	B4	B3	B2	B1	B0
Bluetooth HID keystroke delay in ms							

0x00: default = 10ms

5.20 Register 19: Bluetooth HID Connection Timeout & Fixed MAC

Function: Defines the Bluetooth HID connection timeout

Default: **0x00**

B7	B6	B5	B4	B3	B2	B1	B0
BT FIXED MAC	Bluetooth HID connection timeout in ms						

Define fix remote MAC address for Bluetooth Connection, remote MAC address is stored in register 20 - 25

0x00: default = 3000ms

5.21 Register 20 - 25: Bluetooth HID fixed MAC

Function: Defines fixed remote MAC address for Bluetooth Connection

Default: **0x00**

B7	B6	B5	B4	B3	B2	B1	B0
MAC Address Byte							

Register 20: Bluetooth remote MAC Byte 0
Register 21: Bluetooth remote MAC Byte 1
Register 22: Bluetooth remote MAC Byte 2
Register 23: Bluetooth remote MAC Byte 3
Register 24: Bluetooth remote MAC Byte 4
Register 25: Bluetooth remote MAC Byte 5

5.22 Register 26: Display Clear Interval

Function: Defines the display clear interval after transponder has been removed

Default: **0x00**

B7	B6	B5	B4	B3	B2	B1	B0
Display Clear Interval after Transponder Remove in seconds							

0x00: default = 5s
0xFF: never clear display

5.23 Register 27: BTR1356 Configuration Register 4

Function: Defines some BTR1356 specific functions.

Default: **0x00**

B7	B6	B5	B4	B3	B2	B1	B0
RFU				AUTO SAVE LOG	DISABLE LOG BUTTON	INTERFACE SETTING	
				Auto save to logfile if 90% of temporary log space is consumed and saving is possible	Disables the possibility to toggle the data logging using the power button	0x00: USB CDC+MSD / BT HID 0x01: USB CDC+MSD / BT CDC (Serial Port) 0x02: USB HID / BT CDC (Serial Port)	

Info:
When **B2** is set and data logging is enabled (Reg 16, B5 is set), pressing the log button (power button) saves the temporary logged data into file system and clears the log memory.

5.24 Register 28: RFU

Function: Reserved for further use

Default: **n.a.**

B7	B6	B5	B4	B3	B2	B1	B0
RFU							

5.25 Register 29: Inactive Shutdown Delay

Function: Defines the auto-shutdown delay

Default: **0x00**

B7	B6	B5	B4	B3	B2	B1	B0
Auto-Shutdown delay after [xx] minutes of inactivity							

0x00: default = 5 minutes
0xFF: for legacy reasons = 5 minutes

5.26 Register 30 - 127: RFU

Function: Reserved for further use

Default: n.a.

B7	B6	B5	B4	B3	B2	B1	B0
RFU							

5.27 Register 128 - 191: HID Output Control

All USB enabled KTS RFID Reader can be used as a HID Device (Boot Keyboard).
The HID Mode allows the user to customize the keystrokes sent to the USB Host when a tag is detected.

Info:
The USB Short Range Reader SRR1356 implement an english key layout to access most of the ASCII characters. If the host is set to use a keyboard with a different language setting some ASCII characters will be mapped to a different keystroke. I.e. the ASCII ‘z’ will be mapped as ‘y’ on a german keyboard setting.

Info:
The Bluetooth Reader BTR1356 device allow the user to choose between 3 keyboard languages (Register 17)

The HID Output Control Registers are a set of 16 parameter blocks designing the format of the output. Each parameter block consists of 2 config register (an Even and an Odd) defining the type of the block and one 12 bit parameter.

5.27.1 Even HID output control

Function: Defines an output format parameter block when used in HID mode

Default: 0x00

B7	B6	B5	B4	B3	B2	B1	B0
Blocktype				Parameter high			

- Undefined block (0)
- UID block(1)
- Start-of-memory block (2)
- End-of-memory, hexadecimal block (3)
- End-of-memory, direct block (4)
- Separator block (5)

Highest 4 bits of the 12 bits wide block parameter

- String out of string pool (7)
- End block (15)

5.27.2 Odd HID output control

Function: Defines an output format parameter block when used in HID mode

Default: 0x00

B7	B6	B5	B4	B3	B2	B1	B0
Parameter low							

Lowest 8 bits of the 12 bits wide block parameter

Beginning with the first parameter block the output is defined. If the first block is an undefined block (0), the default output format <UID><\r> is used. Otherwise each block appends to the output

The block type selects which keystrokes are sent to the USB host.

1. UID block, Parameter: ignored
   The UID is passed as keyboard strokes.
2. Start-of-memory block, Parameter: Memory address in bytes
   No output is generated. The start of a memory output is prepared.
3. End-of-memory block, hexadecimal, Parameter: Memory end address, last byte to output
   The memory from memory start address to the end address is passed as keystrokes representing the hexadecimal values (i.e. ‘010203040506’)
4. End-of-memory block, direct, Parameter: Memory address of the last byte to output
   The memory from memory start address to the end address is passed as keystrokes for the memory stored ASCII character.
5. Separator block, Parameter: Character (ACSII code number) used as separator
   Sends a single keystroke for the specified ASCII character
7. String out of string pool, Parameter: String index.
   The string pool is stored in <RFID_READER>\CONFIG\STRPOOL.TXT with following format
   [string index] = String
   e.g.
   [0] = Test string No 1
   [1] = Test string No 2

Info:
Maximum number of strings is limited to 256.

Info:
The variables %FULLDATE% representing current date, %_TIME_% indicating current device time and %SERIAL% (device serial number) may also be used in the string definition!

15. End block, Parameter: ignored

5.27.3 Example Output Configuration

Address	Odd/Even	Value	Keystrokes
0x80	Even	0x10	
0x81	Odd	0x00	E00402000058913D
0x82	Even	0x50	
0x83	Odd	0x09	<\t>
0x84	Even	0x20	
0x85	Odd	0x00	
0x86	Even	0x30	
0x87	Odd	0x02	414243
0x88	Even	0x50	
0x89	Odd	0x44	,
0x8A	Even	0x20	
0x8B	Odd	0x00	
0x8C	Even	0x40	
0x8D	Odd	0x02	ABC
0x8E	Even	0x50	
0x8F	Odd	0x0D	<\r>
0x90	Even	0xF0	
0x91	Odd	0x00	

6 Document History

Version	FW ≥	Date	List of changes	Author
1.0	1.0	18.06.2010	Initial release	GrK
1.0.1	1.0	24.06.2010	spelling erros removed	GrK,MiM
1.1	1.1	30.10.2010	new functions	GrK,TeS
1.5	2.0	31.01.2011	new functions and updates added (ISO14443A)	GrK,TeS
1.6	2.15	20.03.2011	parameter update	GrK,TeS
2.0	3.00	30.11.2011	new functions added (ISO14443B)	TeS,MiM
2.1	3.00	12.02.2012	new functions added (HID)	TeS,MiM
2.2	3.05	24.06.2012	parameter update	TeS,MiM
2.3	3.05	16.08.2012	spelling errors removed	TeS,MiM
2.4	3.17	20.04.2015	new functions added, parameters of AT+I, AT+A and AT+Inventory added, example for AT+A corrected	TeS,MiM
3.0	3.18	20.11.2015	Removed discontinued products, added functions for BTR1356, Option Flag added	GrK
3.1	3.18	06.12.2015	Scan Button Stages added	GrK
3.2	3.18	14.12.2015	Short log names	GrK
3.3	3.18/4.10	27.01.2016	- Added Reset to factory settings - Added Bluetooth Serial Mode - Added String pool	GrK
3.4	4.21	04.04.2018	Register 29 added: Variable shutdown time	GrK