

Set of Commands for ARE K1 / RS232

Geschäftsführer | Managing Director
Reiner Wagner

Sitz der Gesellschaft | Headquarter
Ulm, Germany

Amtsgericht | Local Court
Ulm, Germany HRB 3423
USt-IdNr. DE 183095060
Steuer-Nr. | Tax No. 88001/11616

Bankverbindung | Banking account
Sparkasse Ulm
BLZ: 630 500 00 | Kto.-Nr.: 21072952
SWIFT Code: SOLADES1ULM
IBAN-Nr.: DE31 6305 0000 0021 0729 52

AEG Identifikationssysteme GmbH
Hörvelsinger Weg 47, D-89081 Ulm
P: +49 (0)731 140088-0
F: +49 (0)731 140088-9000
E-mail: info@aegid.de, www.aegid.de

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1 Introduction

The individual command set of a readers or decoders manufactured by AEG ID base on standardized command sets, that are specific to each class of readers/decoders. This standardized command sets are designated as ASB, which means AEG ID Standardized Command Set. The standardized command sets make it possible to use different hardware components (within a class of readers/decoders) without modification of the software application.

The command set of the ARE K1 is compatible to the ASB 1.0. Beyond it the ARE K1 RS232 is provided with a special command for self-diagnosis and extended parameter settings as well.

The difference between the command set of the ARE K1 and the ASB 1.0 is made quite clear at the relevant subjects in this description.

2 Modes of operating

Three basic modes of operating are defined:

- Operating mode 0 (continuous mode) - reader is automatically triggered
- Operating mode 1 (external mode) - reader is externally triggered
- Operating type 2 (command mode) - reader is triggered by serial interface

2.1 Change of Operating mode

The operation mode of the ARE K1 can be changed out of each operation mode using the MD command¹.

¹ this behaviour is not universally applicable at ASB 1.0

2.2 Operating mode 0 - continuous mode

When operating continuously the exciter is switched on permanently. The reading cycles are initiated periodically.

After an accomplished reading cycle the reading information is evaluated. After that data (either transponder number or NoRead code) is output to the serial interface.

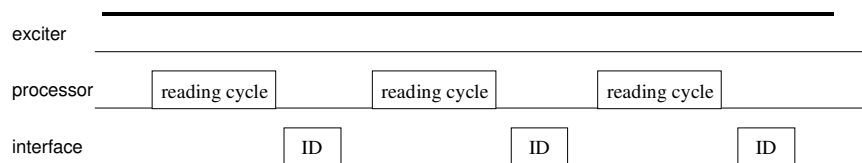


Figure 2.1: continuous operation

2.3 Operating mode 1 - running externally triggered

In operation mode 1 the exciter is turned off. As soon as the external triggered signal rises from logic 0 to 1, the exciter is started and a reading process is initiated.

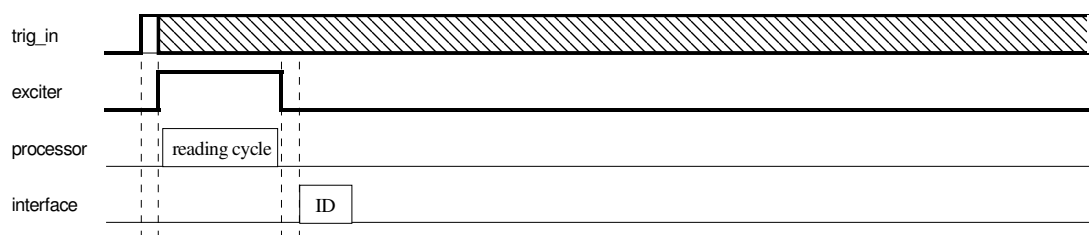


Figure 2.2: external triggering -limitation of the switch period through a successful reading

After a successful reading cycle, the exciter is turned off immediately (irrespective of the trigger signal). The next reading cycle starts at the next leading edge (0 to 1) of the trigger signal.

If a reading cycle is not successful, the reading process is controlled by the state of the external trigger signal: further reading cycles are started as long as either a successful cycle has occurred or the external trigger signal is logic 0 again. In the latter case the identification NoRead code is output.

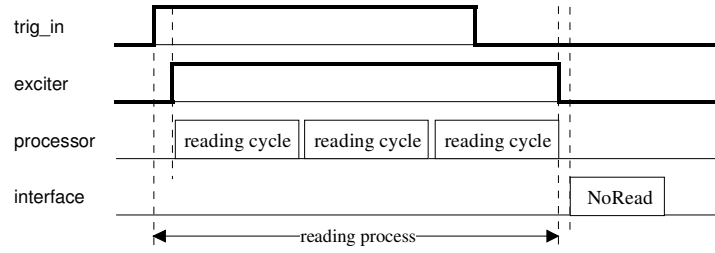


Figure 2.3: external triggering - limitation of the switch period through the Trig_In signal

Please note: In the course of the reading process no NoRead message will be output!

2.4 Operating mode 2 - reading triggered by the serial interface

In operating mode 2, the exciter is always turned off. Triggered by the command GT, the exciter is activated. After successful reading of a transponder number the exciter is turned off automatically.

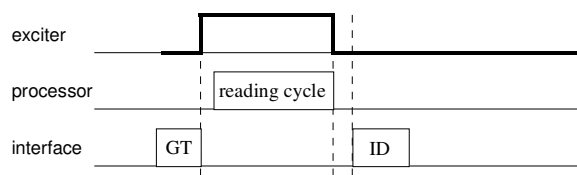


Figure 2.4: software triggered reading operation

If the first reading cycle yields no result (NoRead), the on-time of the exciter is limited by the parameter TOR (time out reader): Reading cycles are continuously started until either a transponder is read successfully or the time span corresponding to the value of the parameter TOR has expired. The reader will not interrupt the last running readout cycle. If no transponder number has been read, a NoRead is output.

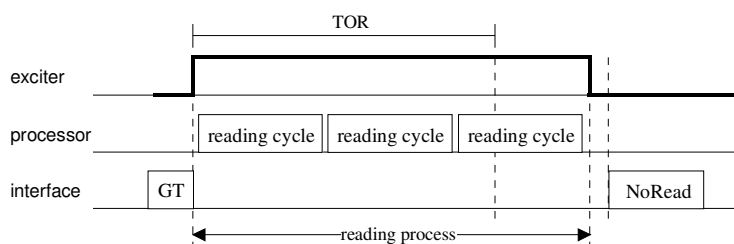


Figure 2.5: software triggered reading operation with TOR>0

Please note: Within the time span defined by the value of TOR no NoRead will be output on the interface!

3 Protocol format

The command set described in this chapter defines the transfer of data on the serial interface.

The commands consist of a command code and of a parameter value optionally. Commands are terminated by the control character <CR> (13H). The control character terminates the command line.

Command codes and parameters, that means all letters and numerical values, are principally transmitted as a sequence of ASCII characters (the value 255 (decimal) consequently as 32H, 35H, 35H; the command RST as 52H, 53H, 54H).

3.1 Echo function

The echo function can be switched on or off.

If the echo function is activated using the EC command, every signal sent to the reader is immediately sent back (echoed) after receipt. Thus the echo function can be used as life indication. If the reader is controlled by a terminal, the echo function should normally be activated.

If an echo function is not intended, e.g. in automation applications where the reader might be connected to an PLC, the echo function should be deactivated.

3.2 Entering of commands

The protocol format is as follows

command <SP> parameter <CR>

The space character <SP> separates the commands from the parameter value. The <CR> character terminates the command line.

For commands without parameter values (e.g. GT or RST) the <SP> character and parameter values are omitted. The command line is as short as this:

command <CR>.

3.3 Output format

Generally, every input terminated by <CR> is acknowledged by the reader. The following response protocols are different:

3.3.1 Command specific response

After a correct command without parameter value is sent to the reader, the reader answers using a format, which is specific for the submitted command. Example:

Command: GT <CR>

Output: transponder number <CR> or NoRead-code² <CR>

3.3.2 Response to a parameter change

After entering a valid command together with a parameter value, the system answers by sending the parameter value and <CR>. Example:

Command: MD <SP> 1 <CR>

Output: 1 <CR>

²see chapter 3.10.1

After entering an invalid parameter value, the system answers with the corresponding error code (see chapter 3.6).

3.3.3 Response to a parameter query

Parameter settings can be queried by sending the command without adding an parameter value. Example:

Command: MD <CR>

Output: 1 <CR>

3.4 Parameters

Generally a command comes with one parameter value at the most. Command code and parameter value are separated by SP>.

3.4.1 Set of parameters

The ARE K1 is provided with three independent sets of parameters:

- the set of parameters ex work
- the set of parameters specific to the application plus
- the actual set of parameters

The set of parameters ex work enclose all original reader settings. This set is stored in the EPROM and can't be changed. The set of parameters specific to the application is stored in an EEPROM. This set defines the configuration after a cold start. The actual set of parameters defines the actual function of the decoder. It is stored in the RAM.

All changes of the parameter values have an effect to the actual set of parameters only. This set is temporary, that means all values are lost after switching off the decoder. Using the VSAVE command (see chapter 4.19) the actual set can be stored permanently as set of parameters specific to the application. Then all values are loaded back automatically after a cold start.

3.5 Blank input line

If a single <CR> is input, the reader answers with a single <CR>. Example:

Command: <CR>

Output: <CR>

Please note: If echo mode is active, a single <CR> forces the reader to output <CR> <CR> (echo plus output).

3.6 Erroneous entering of commands - error codes

If a command is not entered correctly, the reader sends one of the following error codes:

Wrong command: <NAK> #00 <CR>

Wrong parameter: <NAK> #02 <CR>

3.7 Boot message

After booting the system (cold and warm start) the software version is output as described for the VER command (see chapter 4.17), if echo is active. If echo is disabled, no boot message will appear.

3.8 Use of capital letters

The standard operating system is not case-sensitive, that means capital- and small letters are treated the same.

3.9 Line feed

A line feed character <LF> is not sent by the decoder. If the decoder is controlled by a terminal, a line feed can be added by the terminal software (option: replace CR by CR LF at receipt).

3.10 Output format for the transponder number

The location of the transponder bits in the ASCII characters is shown in Table 3.1:

D38 ... D32	D31 ... D24	D23 ... D16	D15 ... D8	D7 ... D0
ASC9 ASC8	ASC7 ASC6	ASC5 ASC4	ASC3 ASC2	ASC1 ASC0

Table 3.1: data format of the transponder number

0 0 0 0 0 0	0 0 0 1 1 1 1	0 0 1 1 0 1 1 1	1 0 1 1 1 1 0 1	1 0 0 1 0 0 1 0
00H	1FH	37H	BDH	92H
30H 30H	31H 46H	33H 37H	42H 44H	39H 32H

Table 3.2: example of a transponder number

The transponder ID 001F37BD92 will be transmitted on the interface using the characters 30H, 30H, 31H, 46H, 33H, 37H, 42H, 44H, 39H, 32H and <CR>.

3.10.1 Output format for the NoRead information

An unsuccessful reading cycle is represented by the NoRead character sequence (see CN command in chapter 4.3). Normally the NoRead is coded by the number FFFFFFFF, which can never appear as transponder code.

Alternatively at the ARE K1 a NoRead information can be output using the error messages <NAK> #09 <CR>. For this the parameter value of CN has to be set to 2³.

3.10.2 Output of a reader number

For readers connected by a network the output of an individual reader identification is necessary, to assign a message with the belonging sender device. This identification can be made activating the RNR function (see chapter 4.14 - reader number). If the RNR function is active, each reader answer is preceded by a reader number and a space character as well (i.e 15 <SP>).

4 Command set specification

4.1 ALGO

Algo defines the type of chip used.

Input format: ALGO <SP> Parameter <CR>

Parameter value	Function
1	Trovan read only
2	PSK

output (example): 1 <CR>

note: After correct parameter setting, Algo defines chip type used.

4.2 BD

The BD command enables the change of the baud rate.

³ not compatible down to ASB 1.0

Input format: BD <SP> Parameter <CR>

Parameter value	Function
0	4800 baud
1	9600 baud
<u>2⁴</u>	<u>19200 baud</u>
3	38400 baud

output (example): 2 <CR>

note: The settings are effective after a warm start using the RST command.

4.3 CID

With CID=1 **only the first** of in succession identical transponder numbers is output on the serial interface. The possibly following identical transponder numbers are suppressed, as long as no new valid transponder number is received, processed and output. NoReads do not influence the data filtering

input format: CID <SP> parameter <CR>

Parameter	Function
<u>0</u>	<u>no filter function</u>
1	suppression of repeatedly read IDs

output (example): 0 <CR>

Example: A, B, C are specific different transponder numbers, N is NoRead:

Sequence of reading cycles	Output sequence after filtering with CN=0 and CID=1	Output sequence after filtering with CN=1 and CID=1
N, N,,N, A, A, A,A, N,N,	N, N,,N, A, N, N,	A
N. N, N, A, A, A, N, A, A, B, A, C, C, C,	N. N, N, A, N, B, A, C,	A, B, A, C
N, N, B, B, B, B, B, N, N, N, B, B, B, B, N, N, ...	N, N, B, N, N, N, N, N, ...	B
N, N, N, B, B, B, B, B, N, B, B, B, B, N, N, N, ...	N, N, N, B, N, N, N, N, ...	B

Table 4.1: example for the effect of the CID function

annotation: The internal reference number is cleared at the following conditions:

- after a cold start
- after a warm start

⁴ default values are underlined

- after entering the command line CID <SP> 1 <CR>

This causes that the next transponder code is output definitely.

caution:

The filter function CID picks up the results of the complete reading cycles, while the parameter NID proceeds from the results of single readings! The filter function CID has effect on the serial interface only. The digital output QR1 is not effected by CID.

4.4 CN

The CN parameter defines the type of NoRead output.

input format: CN <SP> parameter <CR>

Parameter	Function
0	<u>issue NoReads on serial interface using FFFFFFFF</u>
1	suppress NoReads on serial interface
2	issue NoReads on serial interface using <NAK> #09 <CR> ⁵

output (example): 0 <CR>

4.5 DIAG

A self-diagnosis is executed. An antenna test is included.

input format: DIAG <CR>

function: A test of the antenna is executed . After this either the message <NAK> #99 <CR> (o.k.) is output on the interface or the message <NAK> #10 <CR> (antenna failure).

annotation: With an antenna failure the Error-LED is set.

⁵ parameter value 2 is not compatible down to ASB 1.0

4.6 EC

The EC parameter changes of the echo function setting.

input format: EC <SP> parameter <CR>

Parameter	Function
0	echo on
<u>1</u>	<u>echo off</u>

output (example): 0 <CR>

4.7 GT

The reading command code is GT. For details to this function see chapter 2.

input format: GT <CR>

output: Dependent of the parameter settings and the actual antenna input signal, three different responses are possible in operating mode 2:

- Transponder number, e.g. 001F37BD92 <CR>
- NoRead, e.g. FFFFFFFF <CR>
- <CR> as command acknowledge, if a filter function is active, which cut the transponder code or the NoRead result.

annotation: In mode 2 the GT command triggers a reading process.
In mode 1 the GT command is effective too⁶.
In mode 0 the GT command has no effect.

4.8 INIT

With INIT a warm start with default values is executed.

input format: INIT <CR>

output: Version number <CR> if EC=1, otherwise <CR> only

course:

⁶ not compatible down to ASB 1.0

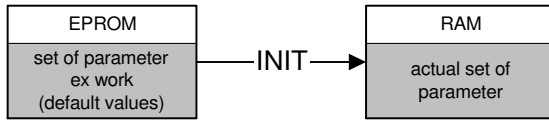


Figure 4.1: function of INIT

4.9 MD

The command MD changes the operating mode.

input format: MD <SP> parameter <CR>

Parameter	Function
0	continuous operation
1	externally triggered
<u>2</u>	<u>triggered via serial interface</u>

output(example): 0 <CR>

4.10 NID

NID specifies the number of identical transponder numbers, which have to appear for the result "successful reading" within a reading cycle. In the setting NID = 1, two successive readings have to show the same transponder number.

input format: NID <SP> parameter <CR>

Parameter	Function
0	one out of one (no effect)
<u>1</u>	<u>two out of two</u>

output (example): 1 <CR>

Sequence of readings	Length of the reading cycle	Result of the reading cycle
NoRead	1 reading	NoRead
0000125ED1, 0000125ED1	2 readings	0000125ED1
0000125ED1, 0000126ED1	2 readings	NoRead

table 4.2: example for a reading cycle with NID=1

4.11 NRD

For improvement of the signal to noise ratio, a number of telegrams can be superimposed. The number of superimpositions is determined by the value NRD.

input format: NRD <SP> parameter <CR>

Parameter	Function
0	no superimposition - evaluation of one telegram only
<u>1</u>	<u>superimposition of 2 telegrams</u>
2	superimposition of 4 telegrams

output (example): 1 <CR>

4.12 QR1

The command QR1 changes the parameters of the digital port QR1.

input format: QR1 <SP> parameter <CR>

Parameter	Function
0	port turned off
1	port turned on
<u>2</u>	<u>port controlled by previous reading process</u>

output (example): 0 <CR>

4.13 QN1

The command QN1 changes the parameters for the digital port QN1.

input format: QN1 <SP> parameter <CR>

Parameter	Function
0	port turned off
1	port turned on
<u>2</u>	<u>port controlled by previous reading process</u>

output (example): 0 <CR>

4.14 RNR

Setting RNR not to 0 activates the RNR function. Then each reader answer is preceded by a reader number and a space character as well (i.e. 15 <SP>).

input format: RNR <SP> parameter <CR>

Parameter	Function
0	<u>RNR function not active</u>
1 ... 9	the one-digit reader number and <SP> is preceded to each reader answer
10 ... 99	the two-digit reader number and <SP> is preceded to each reader answer

output (example): 99 <CR> after entering RNR 99 <CR>
NAK#02 <CR> after entering RNR 1A <CR>

4.15 RST

With RST a warm start is executed. All changed parameter values (i.e. BD) become effective. The relays and error LEDs are cleared.

input format: RST <CR>

output: Version number <CR> if EC=1, otherwise <CR> is output only

4.16 TOR

Timeout for the reader. TOR is used in operation mode 2 as maximum gating time for a reading process (see chapter 2.4). The length of the maximum gating time results from the equation $\text{gating_time} = \text{TOR} * \text{TB}$.

The time constant TB (Time Base) has always the default value 100ms.

input format: TOR <SP> parameter <CR>

Parameter ⁷	Function
0	limits the reading process duration to exactly one reading cycle
1	Tmax = 100ms
2	Tmax = 200ms
...	
<u>5</u>	<u>Tmax = 500ms</u>
...	
255	Tmax = 25,5s

output (example): 2 <CR>, this means 200ms.

4.17 VER

The command VER outputs the software version of the reader. The software version is permanently stored in the program memory together with the firmware.

input format: VER <CR>

output: AEG <SP> ID <SP> - <SP> V1.4E <CR>

4.18 VS

The command VS lists all current parameter settings.

input format: VS <CR>

output (example): EC <SP> 0 <CR>
BD <SP> 2 <CR>
MD <SP> 2 <CR>
.....

4.19 VSAVE

All operating parameters temporarily stored are saved permanently using VSAVE.

input format: VSAVE <CR>

output: ok <CR> oder error message

course:

⁷ values > 9 are not compatible down to ASB 1.0

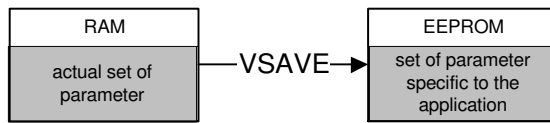


figure 4.2: function of VSAVE

function: While storing the parameter values the EEPROM is tested by „write and verify“. On EEPROM-error the message <NAK> #03 <CR> is transmitted.

5 Description of hardware near functions

5.1 Cold start

After a cold start the system is initialized using the parameter values out of the EEPROM. The indicating elements (relays / LEDs) are cleared.

5.2 Interface to the master

The serial interface permits communication between the reader and a master (e.g. terminal or PC). The basic configuration of the interface is 19200baud and 8N1 (8 bit, no parity and 1 stop bit). With the command BD the reader can be set to a different baud rate. Changing the data format (8 data bits, no parity, 1 start- and stop bit) is not possible. The same applies to hardware-handshaking, e.g. Xon/Xoff or RTS/CTS.

5.3 Digital trigger input

For the operating mode 1 - externally triggered - a digital input channel is required. The following logical function is defined:

5.3.1 Logical level

If the digital input is open (not connected), then it is in the logical state zero (0). By feeding the defined input voltage the digital input has one-level (1).

5.3.2 Timing characteristics

When triggered externally, the first reading process is initiated by a change from 0 to 1 (leading edge) - see chapter 2.3.

5.4 Digital trigger outputs

Two specified digital outputs are defined as follows:

Output	Function
QR1	trigger output - transponder read (Q READ)
QN1	trigger output - NoRead (Q NoREAD)

Table 5.1: definition of the digital output channels

5.4.1 Logical level

At rest all digital outputs are logical 0. This means the rest contact is closed and the working contact is open.

5.4.2 Logical function

The logical function of the digital outputs is determined by the particular parameter setting. If QR1 = 2 resp. QN1 = 2, the logical function is defined as follows:

After cold- and warm start all trigger outputs are set to logical zero. After processing the reading result, the corresponding output is set to logical 1 according to Table 5.1. If both trigger outputs QR1 and QN1 are set to parameter value 2, therefore only one of the trigger outputs can be at logical 1 at a time.

The result of each reading cycle is displayed at the corresponding digital output until the end of the next reading process.

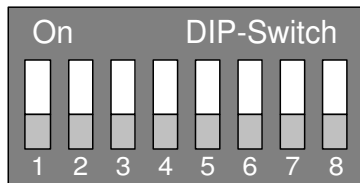
The data filtering functions for the serial interface (e.g. CN - suppression of the NoRead output or CID) do not influence on the digital outputs.

5.5 Indicating elements (LEDs)

LED1:	on when antenna is operated
LED2:	on when last read was not successful
LED3:	on when last read was a success
LED4:	on as long as the digital input is high
LED5:	on when a hardware error was detected
LED6:	flashing as long as the reader is powered and the microprocessor is working properly
LED7:	on as long as commands were received on the RS 232 interface
LED8:	on as long as information is transmitted from the RS.232 interface
LED9:	not used

5.6 DIP-switches

In normal condion (ex work) all DIP-switches are set OFF (down).



If switch 1 is in position ON, the default values (see chapter 3 - firmware) are loaded out of the EPROM at a cold start (when reader is put in operation).

DIP-switches 2 ... 8 have no function.

6 Appendix

6.1 Glossary

Telegram:	Sequence of 64 data bits transferred from the transponder to the reader.
Superimposition:	Number of superimposed telegrams for an improved signal to noise ratio adjusted by the parameter NRD.
Reading:	Interval of several telegrams, whose number is fixed by NRD. The result of a reading is a transponder number or NoRead. In contrast to the reading process a reading does not appear at an external interface, that means the result is processed within the reading algorithm only.
NoRead:	If it is not possible to determine a transponder number (no header, wrong parity, ...), then the reader operates for the next internal operations with the transponder number FF FFFF FFFF (Hex) as NoRead information.
NID:	This parameter sets the number of readings with identical transponder number, which have to appear within one reading cycle for the result "successful reading cycle".
Reading cycle:	Interval of several readings. The maximum length of intervals is fixed by the values of NRD and NID. A reading cycle is successful if within the reading cycle the number of readings specified by NID yields the same result.
Reading process:	Interval of several readings. A reading process is started with occurrence of the trigger condition. The reading process is either terminated by occurrence of a successful reading cycle or through a break (time out, falling edge of the external trigger signal) ⁸ . At the end of a reading process appears always a result on the interface ⁹ .

6.2 list of control characters

Steuerzeichen	Hexcode	Bezeichnung	Funktion
SP	20H	space character	separates commands from parameters
CR	0DH	carriage return	terminates command line
NAK	15H	negative acknowledge	error code
#	23H	number sign	error number
DEL	7FH	delete	change of operation mode after a cold start

table 6.1: List of the control symbols used

⁸ In operating mode 0 is a reading process equal to a reading cycle.

⁹ The result will not appear when a data filter suppresses the result (e.g. NoRead suppression).

6.3 List of error messages

error number	function	error-LED
#00	command code not known, wrong code	no
#01	stack-error (under- / overflow)	no
#02	parameter value not valid	no
#03	error in EEPROM	no
#04	function not supportet	no
#05	reserved	no
#06	reserved	no
#07	reserved	no
#08	reserved	no
#09	kein Code gelesen (NoRead)	no
#10	antenna error	yes
#99	system o.k. (DIAG state messages)	no

Table 6.2: List of error messages

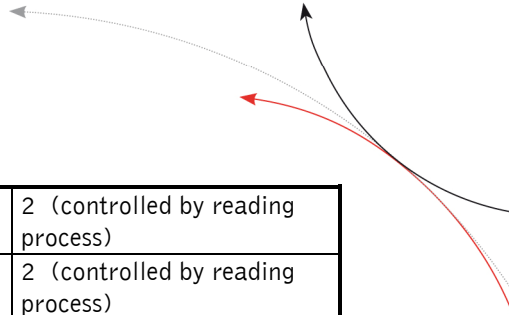
6.4 List of system commands

command-code	function	action on interface	Compability with ASB1.0
DIAG	diagnosis / state of the reader	state or error message	no
GT	read transponder (get tag)	transponder number	yes
INIT	load basic configuration	boot message / <CR>	yes
RST	warm start	boot message / <CR>	yes
VER	Output version number	version number	yes
VS	Output of all parameter values	List of parameters	yes
VSAVE	store current configuration	ok	yes

Table 6.3: List of system commands

6.5 List of parameters and default values

com-mand-code	function	universally defined parameters (ASB 1.0)	valid pa-rameter values for ARE K1	default-values
MD	mode of operation	0 .. 2	0 .. 2	2 (triggered by interface)
BD	baud rate	0 .. 3	0 .. 3	2 (19200baud)
EC	echo	0, 1	0, 1	0 (off)
CN	suppression of NoRead	0, 1	0 .. 2	0 (output FFFFFFFFFF)
CID	filter function for multiply read IDs	0, 1	0, 1	0 (filter off)
NID	number of identical IDs per reading cycle	0 , 1	0 , 1	1 (two out of two)
NRD	superimposition of telegrams	0 .. 2	0 .. 2	1 (two telegrams)
RNR	reader identification number	-	0 .. 9, 10.. 99	0 (not active)



QN1	digital output QN1	0 .. 2	0 .. 2	2 (controlled by reading process)
QR1	digital output QR1	0 .. 2	0 .. 2	2 (controlled by reading process)
TOR	timeout parameter for unsuccessful reading	0...9	0...255	5 (500ms)

Table 6.4: List of parameters