

Flowchart TBEN-S2-2RFID-4DXP

Author: Hendrik Schnabel

Version: 1.4 (english)

Date: 29.09.2017

Contents

1. Mapping (HF compact*).....	2
1.1. Input Mapping	2
1.2. Output Mapping	3
2. Overview of the commands	4
3. Flowcharts	5
3.1. General: executing commands	5
3.2. Command: „Read“ (0x0002)	6
3.3. Command: „Write“ (0x0004).....	7
3.4. Password protection	8
3.5. Bus Mode – Command „Read“	10
4. Code examples CODESYS V3.....	11
4.1. Read 4 Byte User Memory	11
4.2. Write 4 Byte User Memory	12
4.3. Password protection	13
4. Error Codes	15
5. Appendix.....	16

1. Mapping (HF compact*)

1.1. Input Mapping

Byte no.		Bit							
PROFINET	Modbus EtherNet/ IP	7	6	5	4	3	2	1	0
0	0	Response code (RESC)							
1	1	BUSY	ERROR	Response code (RESC)					
2	2	Loop counter for rapid processing (RCNT)							
3	3	reserved							
4	4	TNC1	TRE1	PNS1	XD1	TP1			
5	5								
6	6	Length (LEN)							
7	7								
8	8	Error code (ERRC)							
9	9								
10	10	Tag counter (TCNT)							
11	11								
12	24	Read data Byte 0							
13	25	Read data Byte 1							
14	26	Read data Byte 2							
15	27	Read data Byte 3							
16	28	Read data Byte 4							
17	29	Read data Byte 5							
18	30	Read data Byte 6							
19	31	Read data Byte 7							
...							
139	151	Read data Byte 127							

Designation	Meaning
Response code (RESC)	Display of the last command executed
BUSY	0: Execution of a command completed. 1: The system is currently executing a command.
Error (ERROR)	0: The last command was executed successfully. 1: An error occurred, during command execution.
Loop counter for rapid processing (RCNT)	Output of the command code requested by the loop counter
Read/write head not connected (TNC1)	0: Read/write head expected by the system connected (HF bus mode: Read/write head to XCVR1) 1: Read/write head expected by the system not connected
Read/write head error message (TRE1)	0: No fault 1: Error message of the read/write head (HF bus mode: Read/write head to XCVR1)
Parameter not supported by read/write head (PNS1)	0: No fault 1: Parameter not supported by read/write head (HF bus mode: Read/write head to XCVR1)
Read/write head switched off (XD1)	0: Read/write head on 1: Read/write head off (HF bus mode: Read/write head to XCVR1)
Tag within the detection range (TP1)	0: No tag in detection range of read/write head 1: Tag in detection range of read/write head
Length (LEN)	Display of length of the read or written data
Error code (ERRC)	Display of the specific error code, if the error bit (ERROR) is set.
Tag counter (TCNT)	Display of the detected tags. With HF multi-tag applications and UHF only tags are counted that are read with an Inventory command. In HF single-tag applications all tags are counted that are detected by the read/write head. The tag counter is reset by the following commands: <ul style="list-style-type: none"> Inventory (exception: single tag applications) Continuous mode Continuous presence sensing mode Reset

1.2. Output Mapping

Byte no.	Bit	
PROFINET	Modbus EtherNet/ IP	7 6 5 4 3 2 1 0
0	0	Command code (CMDC)
1	1	
2	2	Loop counter for rapid processing (LCNT)
3	3	Memory area (DOM) – only available with UHF applications
4	4	Start address (ADDR)
5	5	
6	6	
7	7	
8	8	Length (LEN)
9	9	
10	10	Length UID/EPC (SQUID)
11	11	reserved
12	24	Write data Byte 0
13	25	Write data Byte 1
14	26	Write data Byte 2
15	27	Write data Byte 3
16	28	Write data Byte 4
17	29	Write data Byte 5
18	30	Write data Byte 6
19	31	Write data Byte 7
...
139	151	Write data Byte 127

Designation	Meaning
Command code (CMDC)	Enter the command code
Loop counter for rapid processing (LCNT)	Loop counter for repeated processing of a command 0: Loop counter off
Memory area (DOM) – only useful for UHF applications (with HF applications the setting has no effect)	0: Kill password 1: EPC 2: TID 3: USER area 4: Access password 5: PC (size of EPC)
Start address (ADDR) in bytes	Enter of the address where a command is to be sent (e.g. memory area of a tag)
Length (LEN) in bytes	Enter the length of the data to be read or written
Length UID/EPC (SQUID) in bytes	Inventory command: 0: Transfer the actual length (bytes) of the transferred UID or EPC with an inventory. > 0 in HF applications: ▪ 8: Return message 8 bytes UID ▪ 1...7: Return message of an abbreviated UID. ▪ > 8: Error message > 0 in UHF applications: EPC abbreviated to the defined length. -1: NEXT mode (only available in HF applications): An HF tag is always only read, written or protected if the UID is different to the UID of the last read or written tag. Other commands: Enter UID or EPC size in bytes, if a particular tag is read, written or protected. The UID or EPC must be defined in the write data (start byte: 0). The function of the length of the UID/EPC depends on the command used. 0: No entry of a UID/EPC for executing the command. Only one tag can be located in the detection range of the read/write head. > 0: EPC length of the tag to be read, written or protected if an EPC is present in the write data. -1: NEXT mode: A tag is always only read, written or protected if the UID/EPC is different to the UID/EPC of the last read or written tag.
Timeout (TOUT)	Time in ms in which one command is to be executed. If a command is not executed within the entered time, the device outputs an error message. 0: No timeout, command stays active until it is executed 1: Command is executed once (if there is already a tag in the detection range) > 1...65535: Time in ms

** The shown I/O Mapping is only valid for the **HF compact** operation mode!*

2. Overview of the commands

Command	Command code		possible for				
	hex.	dec.	HF Compact	HF Advanced	HF Bus mode	UHF Compact	UHF Advanced
Idle mode	0x0000	0	✓	✓	✓	✓	✓
Inventory	0x0001	1	✓	✓	✓	✓	✓
Quick inventory	0x2001	8193	✓	✓	✓	✓	✓
Read	0x0002	2	✓	✓	✓	✓	✓
Quick read	0x2002	8194	✓	✓	✓	✓	✓
Write	0x0004	4	✓	✓	✓	✓	✓
Quick write	0x2004	8196	✓	✓	✓	✓	✓
Writing with validation	0x0008	8	✓	✓	✓	✓	✓
Continuous mode	0x0010	16	–	✓*	–	–	✓
Read data from the buffer (Continuous mode)	0x0011	17	–	✓	–	–	✓
Read data from the buffer with quick order processing (Continuous mode)	0x2011	8209	–	✓	–	–	✓
Continuous presence sensing mode	0x0020	32	–	–	–	–	✓
End Continuous (presence sensing) mode	0x0012	18	–	✓*	–	–	✓
Read/write head identification	0x0041	65	✓	✓	✓	✓	✓
Switch off HF read/write head	0x0040	64	✓	✓	✓	–	–
Tune HF read/write head	0x0080	128	✓	✓	✓	–	–
HF read/write head address query	0x0070	112	–	–	✓	–	–
Set HF read/write head address	0x0071	113	–	–	✓	–	–
Direct read/write heads command	0x0060	96	✓	✓	✓	✓	✓
Direct read/write head command with rapid command processing	0x2060	8288	✓	✓	✓	✓	✓
Set tag password	0x0102	258	✓**	✓**	✓**	✓	✓
Set tag password with rapid command processing	0x2102	8450	✓**	✓**	✓**	✓	✓
Set read/write head password	0x0100	256	✓**	✓**	✓**	✓	✓
Reset read/write head password	0x0101	257	✓**	✓**	✓**	✓	✓
Set tag protection	0x0103	259	✓**	✓**	✓**	✓	✓
Set tag protection with rapid command processing	0x2103	8451	✓**	✓**	✓**	✓	✓
HF tag protection status query	0x0104	260	✓**	✓**	✓**	–	–
Set permanent lock (Lock)	0x0105	261	✓	✓	✓	✓	✓
Set permanent lock (Lock) with rapid command processing	0x2105	8453	✓	✓	✓	✓	✓
Tag info	0x0050	80	✓	✓	✓	✓	✓
Tag info with rapid command processing	0x2050	8272	✓	✓	✓	✓	✓
Deactivate UHF tag irrevocably (kill)	0x0200	512	–	–	–	✓	✓
Deactivate UHF tag irrevocably (kill) with rapid command processing	0x2200	8704	–	–	–	✓	✓
Restore UHF read/write head settings	0x1000	4096	–	–	–	✓	✓
Backup of settings of the UHF read/write head	0x1001	4097	–	–	–	✓	✓
Reset	0x8000	32768	✓	✓	✓	✓	✓

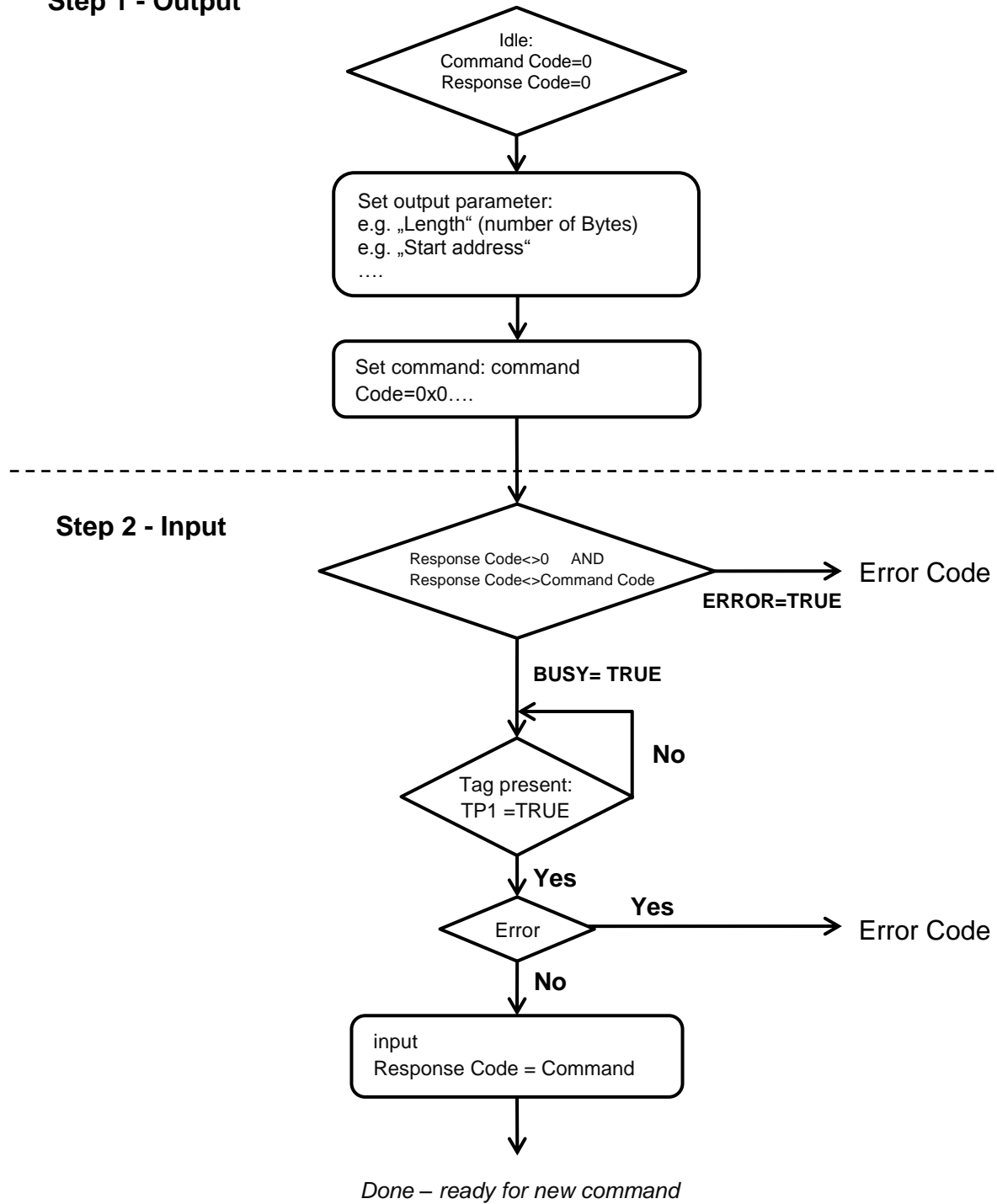
* With automatic detection of the tag type, Continuous mode supports the inventory command only.

** The command is supported by the TW-R...-M-B146 tags only.

3. Flowcharts

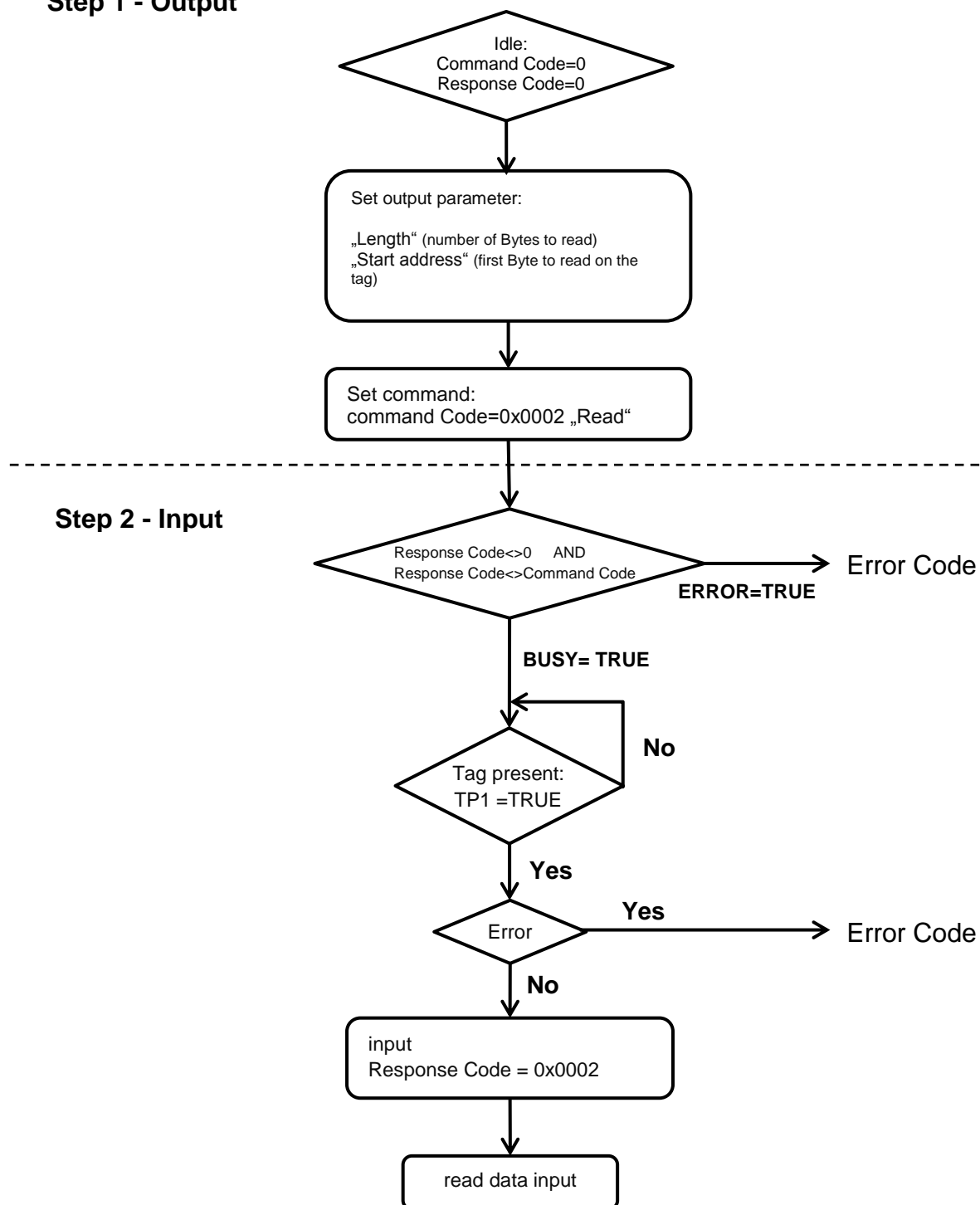
3.1. General: executing commands

Step 1 - Output



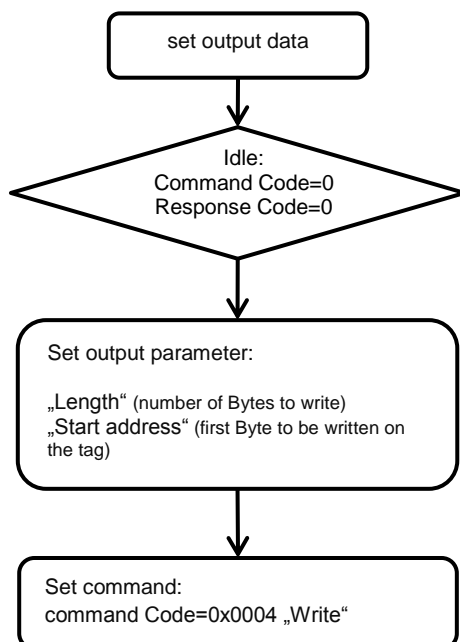
3.2. Command: „Read“ (0x0002)

Step 1 - Output

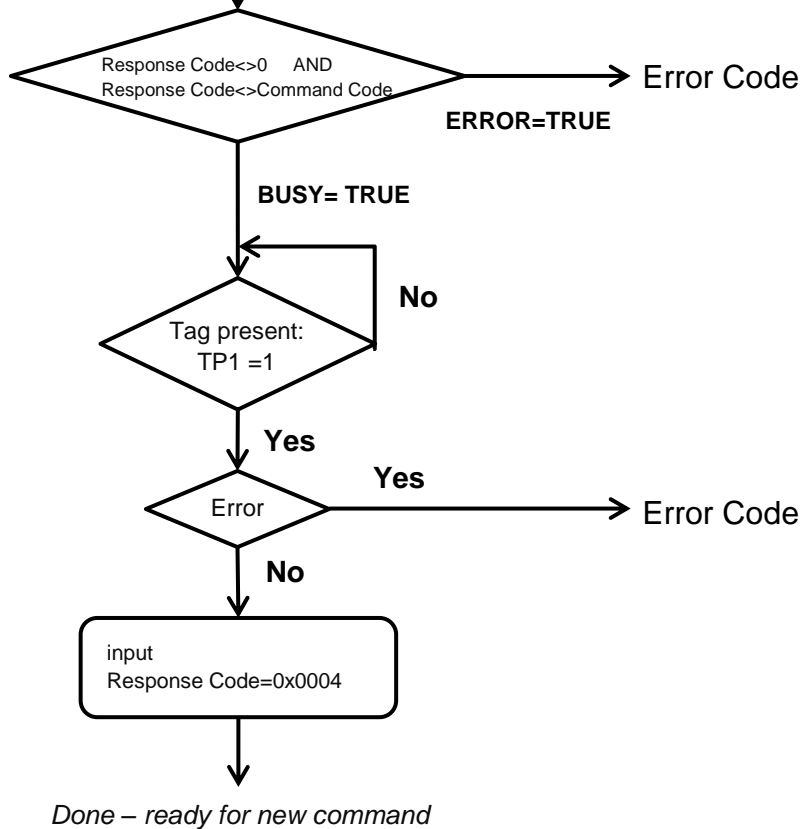


3.3. Command: „Write“ (0x0004)

Step 1 - Output



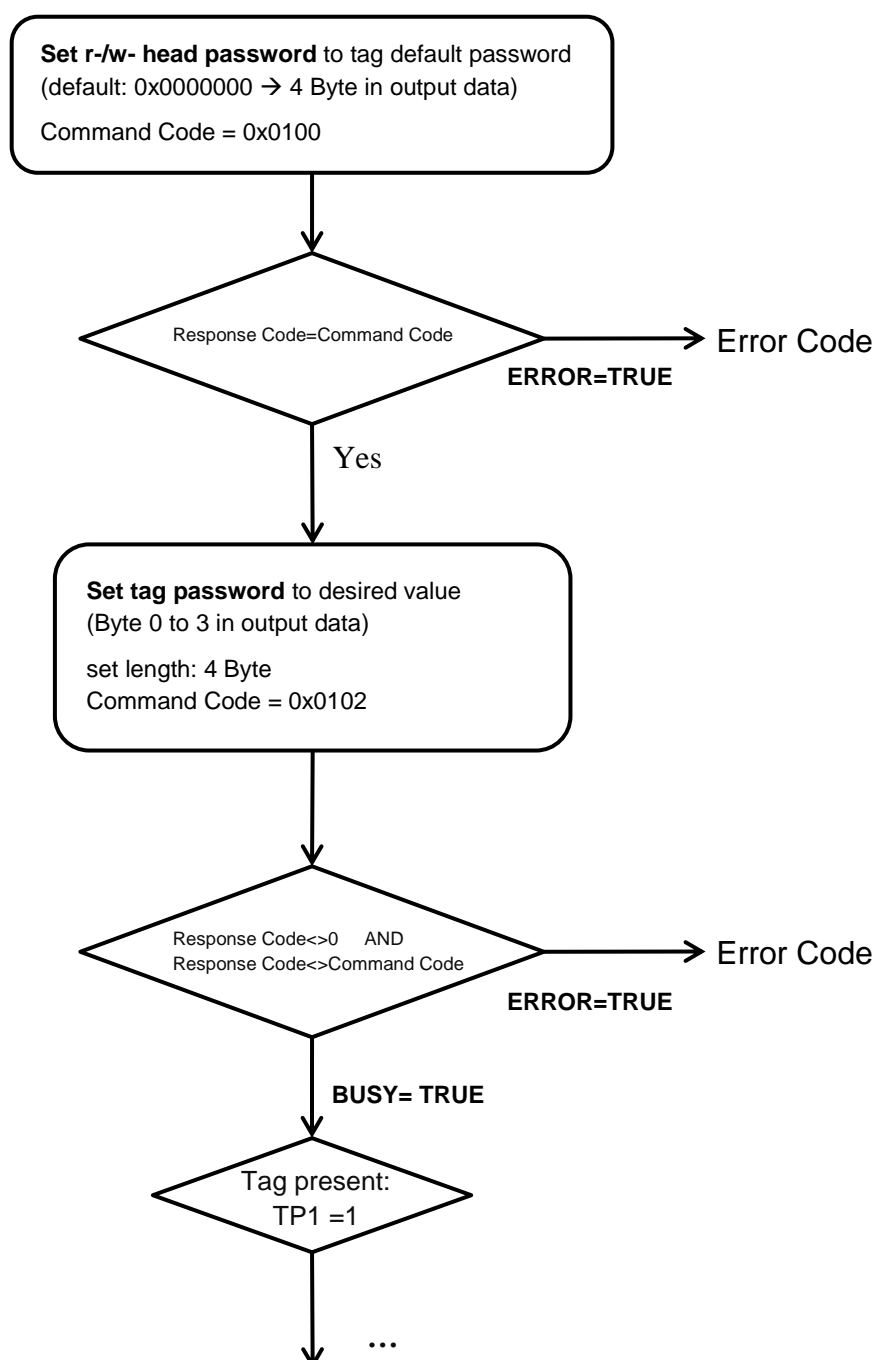
Step 2 - Input

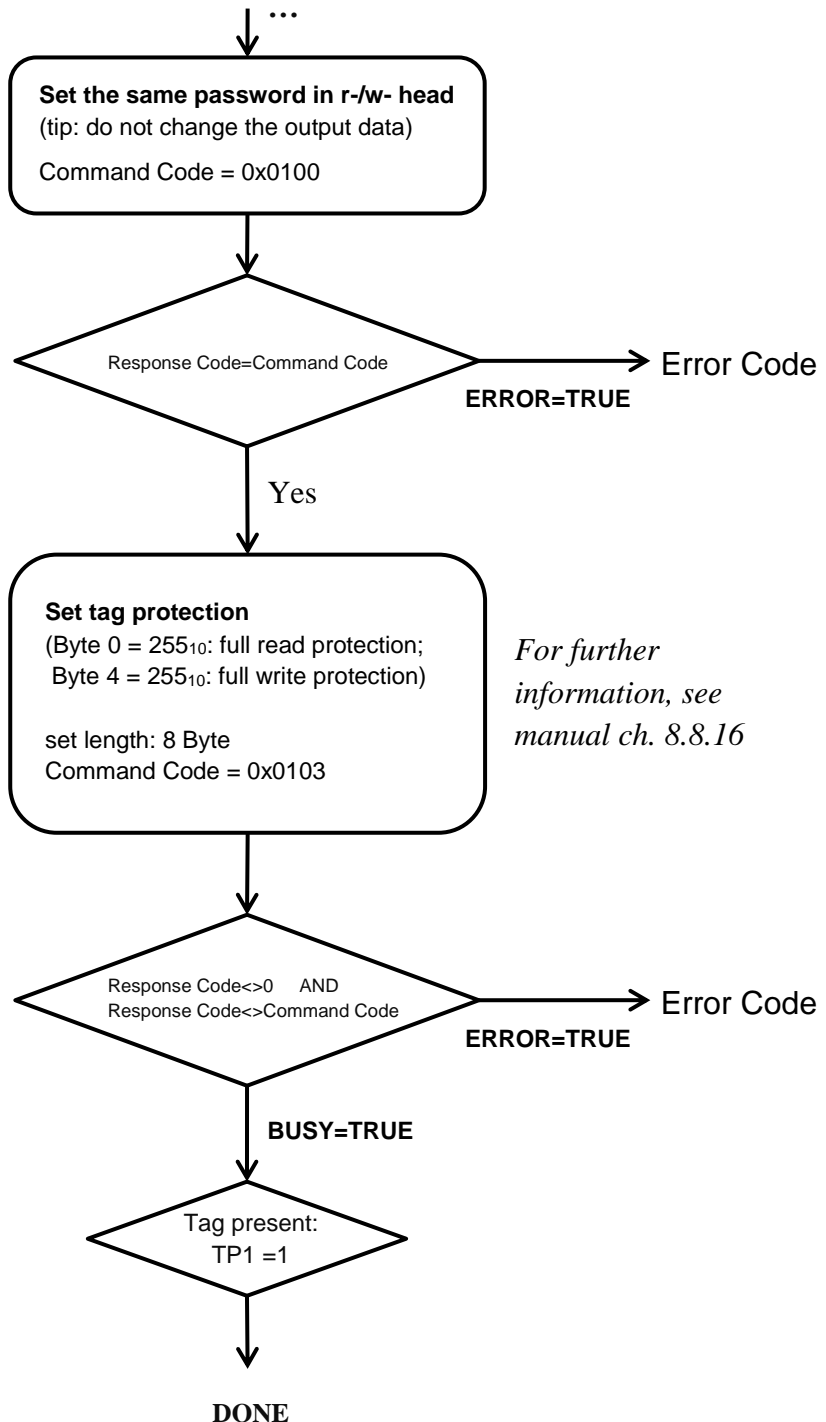


3.4. Password protection

Parameterization:

- operation mode: HF compact/extended/bus mode
- supported tagtype: chip: EM4233SLIC (supported tags: e.g. TW-R10-M-B146, see data sheet...)





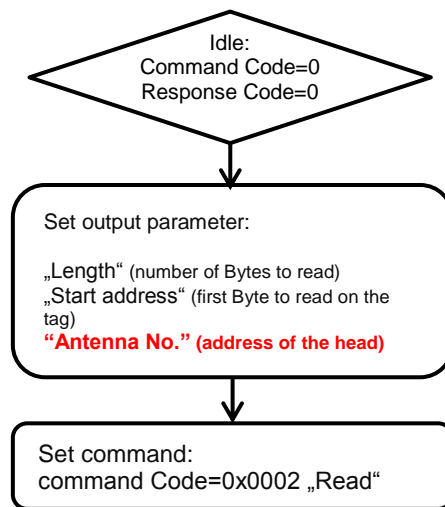
Note: the UID cannot be protected with a password. After setting a password, the inventory command will still work as before.

Note: In case of executing, a read command with an invalid password, the read data input will stay empty. In case of a write command, the data of output will not be written in the tag.

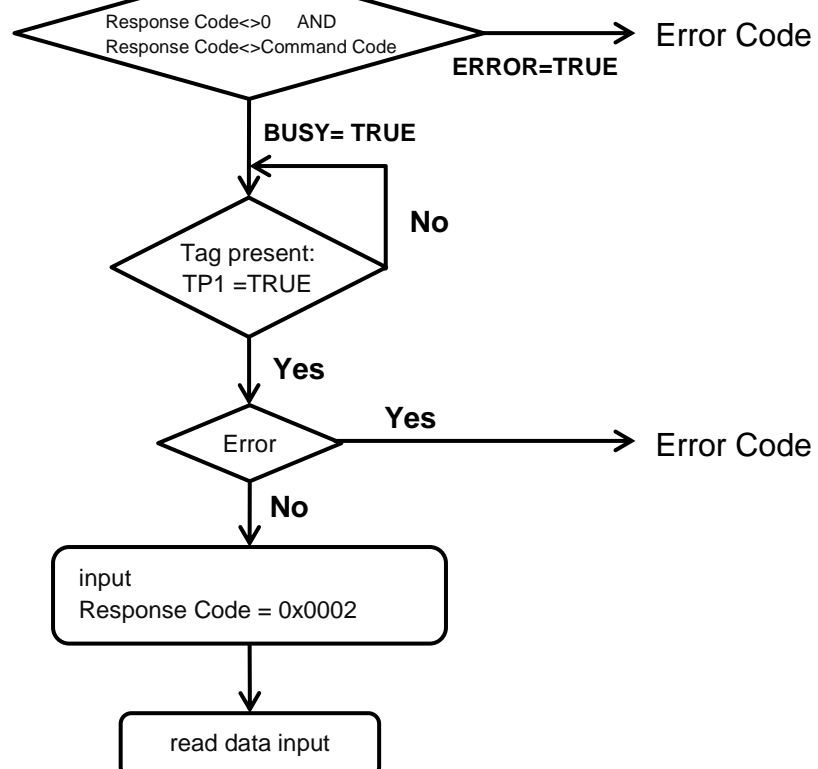
3.5. Bus Mode – Command „Read“

Note: Executing commands in the bus mode are similar to the HF compact/extended mode. The additional parameter that has to be set is the **“Antenna No.”** (see “bus mode” mapping in manual ch. 8.3).

Step 1 - Output



Step 2 - Input



4. Code examples CODESYS V3

4.1. Read 4 Byte User Memory

Variables

```

VAR
    xtrigger                : BOOL;
    arbReadData              : ARRAY OF [0...3] BYTE;

    // channel output
    wCh0_CMDC                AT %QW0          : WORD;          // command code – CHECK QW address!
    dwCh0_ADDR               AT %QDW2        : DWORD;          // start address – CHECK QW address!
    wCh0_LEN                 AT %QW4          : WORD;          // Length – CHECK QW address!

    //channel input
    wCh0_RESC                AT %IW0          : WORD;          // Response code - CHECK IW address!
    xCh0_Error               : BOOL;          // Error-Bit
    xCh0_Busy                : BOOL;          // Busy-Bit
END_VAR

```

```

xCh0_Busy := wCh0_RESC.15;          // Extract Busy Bit
xCh0_Error := wCh0_RESC.14;        // Extract Error Bit

```

```

CASE istance OF
    0:    IF xtrigger THEN
            wCh0_LEN:=4;
            wCh0_ADDR:=16#00000000;
            wCh0_CMDC:=16#0002;
            istance:=1;
        END_IF

    1:    IF NOT xCh0_Busy THEN
            istance:=2;
        ELSIF xCh0_Error THEN
            istance:=10;
        END_IF

    2:    IF wCh0_RESC = wCh0_CMDC THEN    /**
            arbReadData[0]:=IB16;
            arbReadData[1]:=IB17;
            arbReadData[2]:=IB18;
            arbReadData[3]:=IB19;
            wCh0_CMDC:=16#0000;
        END_IF

    10:   ELSIF xCh0_Error THEN            /**
            istance:=0;
            wCh0_CMDC:=16#0000;
        END_IF
END_CASE

```

Additional:

* if istance=2 please check the read data input, the user memory is shown until new command will be send
 ** if istance=10 please check the error code

4.2. Write 4 Byte User Memory

Variables

VAR

xtrigger	:	BOOL;	
arbWriteData	:	ARRAY OF [0...3] BYTE;	
// channel output			
wCh0_CMDC	AT %QW0	: WORD;	// command code – CHECK QW address!
dwCh0_ADDR	AT %QDW2	: DWORD;	// start address – CHECK QW address!
wCh0_LEN	AT %QW4	: WORD;	// Length – CHECK QW address!
//channel input			
wCh0_RESC	AT %IW0	: WORD;	// Response code - CHECK IW address!
xCh0_Error	:	BOOL;	// Error-Bit
xCh0_Busy	:	BOOL;	// Busy-Bit

END_VAR

```
xCh0_Busy := wCh0_RESC.15;           // Extract Busy Bit
xCh0_Error := wCh0_RESC.14;         // Extract Error Bit
```

CASE istate OF

```
0*:    IF xtrigger THEN
        wCh0_LEN:=4;
        wCh0_ADDR:=16#00000000;
        %QB16:=arbWriteData[0];
        %QB17:=arbWriteData[1];
        %QB18:=arbWriteData[2];
        %QB19:=arbWriteData[3];
        wCh0_CMDC:=16#0004;
        istate:=1;
      END_IF

1:     IF NOT xCh0_Busy THEN
        istate:=2;
      ELSIF xCh0_Error THEN
        istate:=10;
      END_IF

2:     IF wCh0_RESC = wCh0_CMDC THEN  /**
        wCh0_CMDC:=16#0000;
      END_IF

10**:  ELS_IF xCh0_Error THEN          /**
        wCh0_CMDC:=16#0000;
        istate:=0;
      END_IF
```

END_CASE

Additional:

* before executing the write-command, set the bytes in the write output data
 ** if istate=10 please check the error code

4.3. Password protection

Variables

```

VAR
    xtrigger                                : BOOL;

    // channel output
    wCh0_CMDC                             AT %QW0      : WORD;      // command code – CHECK QW address!
    dwCh0_ADDR                             AT %QDW2     : DWORD;     // start address – CHECK QW address!
    wCh0_LEN                               AT %QW4      : WORD;      // Length – CHECK QW address!

    //channel input
    wCh0_RESC                             AT %IW0      : WORD;      // Response code - CHECK IW address!
    xCh0_Error                             : BOOL;      // Error-Bit
    xCh0_Busy                             : BOOL;      // Busy-Bit
END_VAR

```

```

xCh0_Busy := wCh0_RESC.15;                // Extract Busy Bit
xCh0_Error := wCh0_RESC.14;              // Extract Error Bit

```

```

CASE istance OF
    // * additional comment 1
    0:    IF xtrigger THEN
            wCh0_LEN:=4;
            wCh0_CMDC:=16#0100;
            istance:=1;
        END_IF

    1:    IF wCh0_RESC =wCh0_CMDC THEN
            istance:=2;
        ELSIF xCh0_Error THEN
            istance:=10**;
        END_IF

    2:    IF istance=2 THEN
            // set preferred password in the first 4 Bytes in the write data output
            wCh0_CMDC:=0x0102;
            istance:=3;
        END_IF

    3:    IF NOT xBusy AND wCh0_RESC =wCh0_CMDC THEN
            istance:=4;
        ELSE
            istance:=10**;
        END_IF
END_CASE

```

Additional:

** before executing the “set head password” command, set the first 4 bytes (32 bit) in the write output data to the default password (0x0000)*

*** if istance=10 please check the error code and execute a reset*

```
4:      IF istate=4 THEN
          // set preferred password in the head
          wCh0_CMDC:=0x0100;
          istate:=5;
      END_IF

5:      IF wCh0_RESC_BE=wCh0_CMDC THEN
          istate:=6;
      ELSE
          istate:=10**;
```

```
      END_IF

6:      IF istate=6 THEN
          // set read/write protection in the tag
          // write data output first Byte := 25510: full read protection
          // write data output fourth Byte := 25510: full write protection
          wCh0_Len:=8;
          wCh0_CMDC:=0x0103;
          istate:=7;
      END_IF

7:      IF NOT xBusy AND wCh0_RESC_BE=wCh0_CMDC THEN
          // DONE!
          istate:=0;
          wCh0_CMDC:=16#0000;
      ELSE
          istate:=10**;
```

```
      END_IF

10:     IF xCh0_Error THEN                                /**
          istate:=0;
          wCh0_CMDC:=16#0000;
      END_IF
```

4. Error Codes

Error code (hex)	Error code (dec)	Meaning
0x8000	32768	Channel not active
0x8001	32769	Read/write head not connected
0x8002	32770	Memory full
0x8003	32771	Block size of the tag not supported
0x8004	32772	Length larger than the size of the read fragment
0x8005	32773	Length larger than the size of the write fragment
0x8100	33024	Parameter undefined
0x8101	33025	"Operating mode" outside of the permissible range
0x8102	33026	"Tag type" parameter outside of the permissible range
0x8103	33027	"Operating mode" parameter in Continuous mode outside of the permissible range
0x8104	33028	"Length" parameter in Continuous mode outside of the permissible range
0x8105	33029	Size of the write fragment outside of the permissible range
0x8106	33030	Size of the read fragment outside of the permissible range
0x8107	33021	"Bridging time" parameter outside of the permissible range
0x8108	33022	"Address" parameter in Continuous mode outside of the permissible range
0x8109	33023	No read/write head selected
0x8200	33280	Command code unknown
0x8201	33281	Command not supported
0x8202	33282	Command not supported in HF applications
0x8203	33283	Command not supported in UHF applications
0x8204	33284	Command for multitag application with automatic tag detection not supported
0x8205	33285	Command for applications with automatic tag detection not supported
0x8206	33286	Command only supported for applications with automatic tag detection
0x8207	33287	Command not supported for multitag application
0x8208	33288	Command not supported in HF bus mode
0x8209	33289	"Length" parameter outside of the permissible range
0x820A	33290	Address outside of the permissible range
0x820B	33291	Length and address outside of the permissible range
0x820C	33292	No tag found
0x820D	33293	Timeout
0x820E	33294	Next command not supported in multitag mode
0x820F	33295	Length of the UID outside of the permissible range
0x8210	33296	Length outside of the tag specification
0x8211	33297	Address outside of the tag specification

Note: More error codes see manual ch. 9.6.

5. Appendix

Manual:

http://pdb2.turck.de/repo/media/_en/Anlagen/d500064.pdf

GSDML:

<http://pdb2.turck.de/en/DE/products/00000018000299840004003a>