MANUAL

ID MAX.U500i

UHF Vehicle Access Control System

Up from Firmware Version 01.00.00

H80210-2e-ID-B

Note

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General Information Regarding this Document

- If bits within one byte are filled with “-“, these bit spaces are reserved for future extensions or for internal testing and manufacturing functions. These bit spaces must not be changed, as this may cause faulty operation of the reader.
- The following figure formats are used:
  0…9: for decimal figures,
  0x00…0xFF for hexadecimal figures,
  b0…1 for binary figures.
- The hexadecimal value in brackets “[ ]” marks a control byte (command).

Contents

1 Safety Instructions

- The device may only be used for the intended purpose designed by the manufacturer.
- The manual should be conveniently kept available at all times for each user.
- Unauthorized changes and the use of spare parts and additional devices which have not been sold or recommended by the manufacturer may cause fire, electric shocks or injuries. Such unauthorized measures shall exclude any liability by the manufacturer.
- The liability-prescriptions of the manufacturer in the issue valid at the time of purchase are valid for the device. The manufacturer shall not be held legally responsible for inaccuracies, errors, or omissions in the manual or automatically set parameters for a device or for an incorrect application of a device.
- Repairs may only be executed by the manufacturer.
- Installation, operation and maintenance procedures should only be carried out by qualified personnel.
- Use of the device and its installation must be in accordance with national legal requirements and local electrical codes.
- When working on devices the valid safety regulations must be observed.
- Special advice for carriers of cardiac pacemakers:
  Although this device doesn't exceed the valid limits for electromagnetic fields you should keep a minimum distance of 25 cm between the device or the antenna and your cardiac pacemaker.

2 Revision History of Documentation

Revision	Date	Description
2e	05.03.2020	- Firmware V01.00.00 - New parameters for EPC Selection Masks - Some renamed parameters - Some updated parameters - Some updated default values
1e	25.07.2019	- New layout applied - Invalid parameters removed
0e	31.01.2018	Initial version

3 Abbreviations

ADR	Address
AFI	Application Family Identifier
ASK	Amplitude Shift Keying
CB	Config Block
CFG	Configuration Parameter Block
CRC	Cyclic Redundancy Check
DB	Data Block
DIP	Dual Inline Plastic
DRM	Dense Reader Mode
EOF	End of Frame
FIFO	First in First out
frq	Frequency
FSK	Frequency Shift Keying
FWI	Frame Waiting Time Integer
FWT	Frame Waiting Time
h	Hour
Hz	Hertz
ID	Identification
IDD	Identifier Data
IN	Input
LEN	Length
LOC	Location
LSB	Least Significant Byte
min	Minutes
ms	Milliseconds
MSB	Most Significant Byte
N	Number
OUT	Output
R/W	Read / Write Access
RD	Read
REL	Relay
RF	Radio Frequency
RSSI	Received Signal Strength Indicator
RTC	Real Time Clock
s / sec	Seconds
SOF	Start of Frame
TAB	Table
TR	Transponder
TS	Timeslot
UID	Unique Identifier (read-only Serial Number)
WO	Write Only Access
WR	Write

4 Performance Features of ID MAX.U500i

The vehicle access control system ID MAX.U500i is a self-sufficient complete system for vehicle access control. It can handle vehicles of all kind, e.g. cars, trucks and busses. The ID MAX.U500i can be used in a large number of applications where different vehicles access shall be granted to a restricted area for a longer time. This could be the case in parking areas of companies, agencies or car pools.

In this system, passive UHF transponders (without battery) are used for vehicle identification. These transponders can be placed e.g. in the middle of the windshield next to the rear-view mirror. Furthermore, passive UHF mount-on-metal transponders are available which are predestined for the use with utility vehicles.

The ID MAX.U500i is able to handle up to 9000 different vehicles and users. Additional time restrictions can be assigned to each user. Therefore 15 free configurable time zones are available. Also public holidays and vacation times can be integrated.

The scope of delivery includes the Windows software “my AXXESS Manager”. This software can be used to handle the user data and time restrictions in an easy way via PC. After programming the used data into the vehicle access control station ID MAX.U500i via a temporary network connection it is working offline as a standalone system.

The Windows software is suitable for network based access control systems and is based on a SQL database. The open source project is available free of charge in the FEIG ELECTRONIC download area.

In small applications without any restrictions of the access, new transponders can be introduced to the system by a so-called “Teach-in Mode”.

To ensure a reliable operation even under difficult environmental conditions 1 **internal and max. 1 additional external antenna** can be connected to the ID MAX.U500i. As an alternative, the connected antennas can also be used to cover **two lanes** next to each other. However, it is not possible to assign different users and time restrictions to different lanes covered by one system. One transponder that is registered in the database will have the same access rights on each lane.

To ensure a reliable operation of several systems or other UHF applications in one area and to operate the vehicle access control system in an economical and energy-saving way it is recommended to use the trigger feature: E.g. inductive loop detectors can be connected to a digital input of the system to start operation. Applicable inductive loop detectors and movement detectors are also developed and manufactured by FEIG ELECTRONIC GmbH and can be ordered optionally.

For connection to ID MAX.U500i several antennas are available allowing an optimal adaption to the individual requirements of each application. All antennas available from FEIG ELECTRONIC GmbH are circular polarized. Through the circular polarization an identification of transponders is possible in three different orientations.

5 Data Transmission between Host and Reader

Different ways of data transmission between the host (terminal, PC) and reader are possible. The Host Commands and the Auto Read Modes (Buffered Read Mode, Notification Mode, Scan Mode, Access Mode) are used for the data exchange between transponder and host, whereas the Configuration Commands and the Reader Control Commands serve for adapting the reader parameters to the individual range of applications. The following chart shows which method of data transmission is supported by which interface:

	Supported Interfaces
Config Commands	USB / LAN
Reader Control Commands	USB / LAN
Host Commands	USB / LAN
Buffered Read Mode	-
Scan Mode	-
Notification Mode	-
Access Mode	LAN

5.1 Configuration Commands and Control Commands

This method of data transmission is used for reader configuration and the diagnosis of the different hardware interfaces of the reader.

The reader configuration parameters will be stored in the reader memory. To store the current configuration during a power down of the reader, the reader configuration has to be stored in the EEPROM. After power up the reader then reads the configuration out of the EEPROM.

The reader control is immediately processed and the response from the reader contains status or data information of the control command.

<table>
<tr><th>Host (Terminal/PC/…)</th><th></th><th colspan="2">Reader</th></tr>
<tr><td rowspan="2">parameter / control command</td><td rowspan="2">→</td><td colspan="2">parameter received and stored / control command processed</td></tr>
<tr><td>Yes</td><td>No</td></tr>
<tr><td rowspan="2"></td><td>←</td><td>status / data</td><td rowspan="2">error status</td></tr>
<tr><td>←</td><td colspan="2"></td></tr>
</table>

5.2 Host Commands

The host commands provide the exchange of data between a host and a transponder via the reader as long as the transponder remains in the detection range of the reader.

ⓘ ***NOTE:***

During the writing of data on a transponder it must be ensured that the transponder is located within the detection range of the reader during the entire process. Removing the transponder from the detection range of the reader during a writing process will cause data loss.

5.3 Access Mode

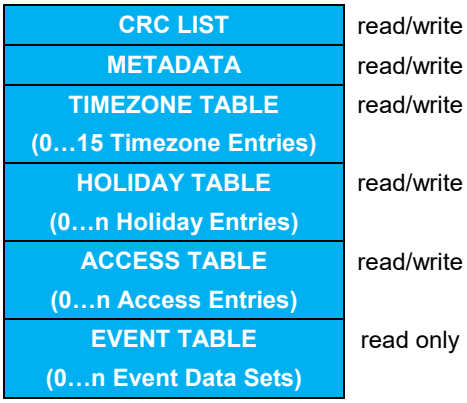
The following chapters describe the access control functionality of the ID MAX.U500i.

5.4 The Access Data Structure

By using the Access Mode the ID MAX.U500i reads data from transponders which get inside the antenna field self-initiated **and** permits or denies access by verifying the received transponder data with internal data.

The conditions by which the ID MAX.U500i decides offline are defined in a couple of tables (MAX data) with a flexible structure which are described in the following chapters. The MAX data can be loaded into the ID MAX.U500i as described in chapter The Access Mode Procedure (see page 156).

The MAX data are stored internally in the following structure:



5.4.1 CRC List

The CRC list contains CRC data for internal verification. The structure is described with the command [0x02] End Update (see page 160).

5.4.2 Metadata

The metadata contains general information concerning the timezone table, holiday table and access table. By these parameters the memory segments are defined.

METADATA:

Field	Description / Value	Length
TABLE-VERSION	Defines the table version. Only version 0x00 is defined.	2
TIMEZONE-ENTRIES	Defines the number of valide timezone entries inside the timezone table. The maximum value is 15.	1
HOLIDAY-ENTRIES	Defines the number of valid holiday entries inside the holiday table. The maximum value is 255.	1
ACCESS-ENTRIES	Defines the number of access entries inside the access table. The maximum number depends on the IDD-LENGTH, the HOLIDAY-ENTRIES and the TIMEZONE-ENTRIES.	2
IDD-LENGTH	Defines the length (number of bytes) of the Identifier Data used inside the access tale. If transponder serial numbers (UID) shall be used in the access table, the IDD-LENGTH has to be configured to the maximum expected transponder serial number. Recommended value of IDD-LENGTH: 12.	1
IDD-FORMAT	Defines the IDD format for the PC. (For internal use with SDK only.)	1
-	Reserved	8

5.4.3 Timezone Table

The timezone table is a list of timezone entries to permit access during the user defined timezone. The entries are callable by their index, starting with 0. The timezone table index 15 is not user definable and permits permanent access.

Timezone Table Index	
0…14	user defined TIMEZONE ENTRY
15	permits permanent access

TIMEZONE TABLE ENTRY:

A timezone table entry consists of the bytes shown in the following table.

Field	Description / Value	Length
STARTDATE OF VALIDITY	Defines the start date for possible access. **Byte 1**: STARTDAY OF VALIDITY (1…31) **Byte 2**: STARTMONTH OF VALIDITY (1…12) **Byte 3**: STARTYEAR OF VALIDITY (00…99)	3
ENDDATE OF VALIDITY	Defines the end date for possible access. **Byte 1**: ENDDAY OF VALIDITY (1…31) **Byte 2**: ENDMONTH OF VALIDITY (1…12) **Byte 3**: ENDYEAR OF VALIDITY (00…99)	3
DAYS OF VALIDITY	Defines the weekdays for possible access. **Bit 0**: Sunday **Bit 1**: Monday **Bit 2**: Tuesday **Bit 3**: Wednesday **Bit 4**: Thursday **Bit 5**: Friday **Bit 6**: Saturday For all bits: b0: Access denied for specific weekday b1: Access permitted for specific weekday	1
STARTTIME OF VALIDITY	Defines the daily start time for possible access. **Byte 1**: STARTHOUR OF VALIDITY (0…23) **Byte 2**: STARTMINUTE OF VALIDITY (0…59)	2
ENDTIME OF VALIDITY	Defines the daily end time for possible access. **Byte 1**: ENDHOUR OF VALIDITY (0…23) **Byte 2**: ENDMINUTE OF VALIDITY (0…59)	2

ⓘ ***NOTE:***

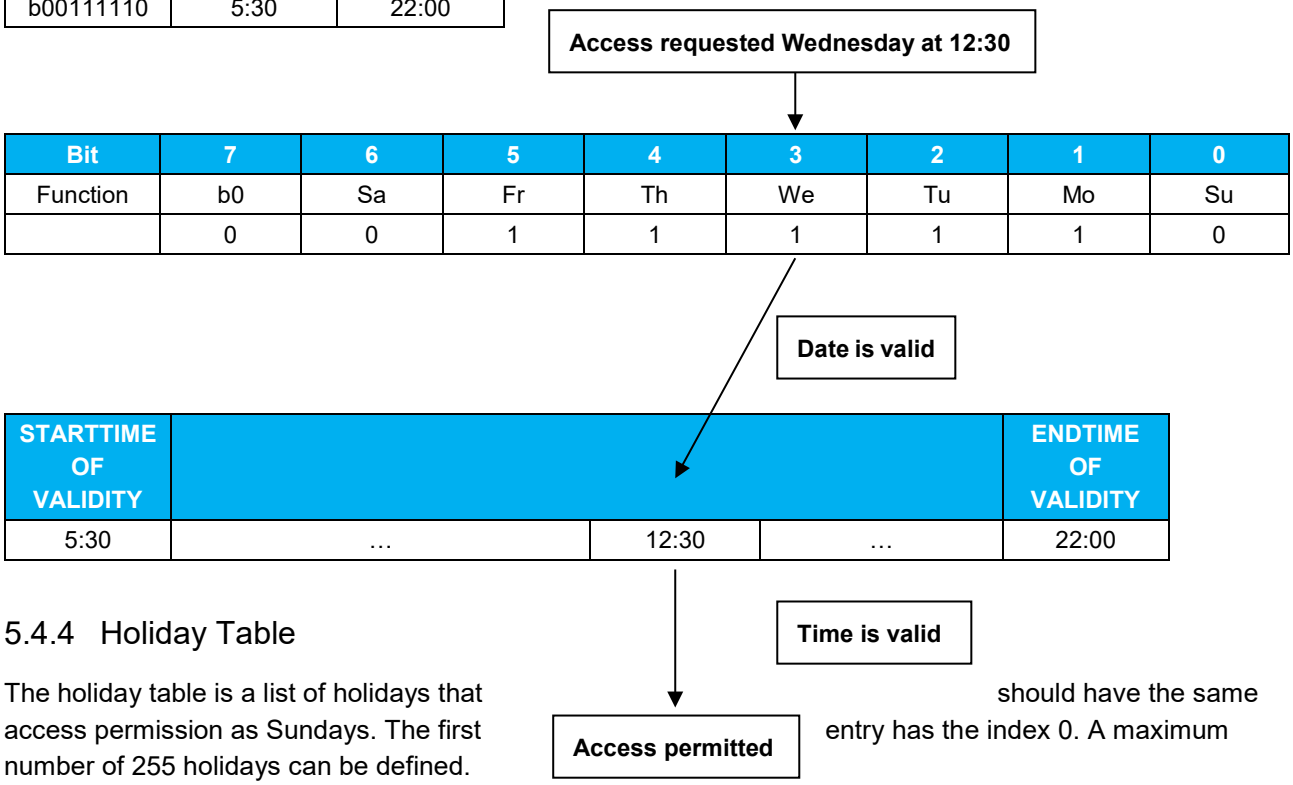
A value of 0xFF in any byte of the time zone entry is treaded as don't care for the specific field.

Example:

Today is Wednesday. The actual time is 12:30. The following timezone entry is assigned to and IDD in the access table equal to a serial number read by a reader.

TIMEZONE TABLE ENTRY:

1	2	2
DAYS OF VALIDITY	STARTTIME OF VALIDITY	EDNTIME OF VALIDITY
b00111110	5:30	22:00



5.4.4 Holiday Table

The holiday table is a list of holidays that should have the same access permission as Sundays. The first entry has the index 0. A maximum number of 255 holidays can be defined.

Field	Description / Value	Length
DAY OF HOLIDAY	Defines the day of the holiday (1…31).	1
MONTH OF HOLIDAY	Defines the month of the holiday (1…12).	1
YEAR OF HOLIDAY	Defines the year of the holiday (00…99).	1

5.4.5 Access Table

The access table is a list of access entries to permit access for a user defined Identifier Data during the selected timezones. It is possible to add up to 65535 access entries.

Field	Description / Value	Length
IDD	Serial number of data blocks used for Identifier Data (max. 64 bytes – LSB first).	IDD-LENGTH
Timezones	Each of the 16 bits represents an index into the timezone table. To permit access during a specified time the bit must be set. If bit 15 is set, permanent access is permitted.	2
APB	Antipassback bit. b0: Entry allowed b1: Entry not allowed	1

ⓘ ***NOTE:***

- ***All Identifier Data must have the length defined by IDD-LENGTH in the metadata.***
- ***The length of data blocks read from the transponder must be equal to the IDD-LENGTH in the metadata.***
- ***The access table has to be sorted by the Identifier Data, starting with the lowest value. Therefore the Identifier Data is interpreted as unsorted numeric data.***
- ***It is possible to use the serial number or data blocks as Identifier Data.***
- ***If multiple timezone table indices are selected, access is permitted if at least one timezone table index is valid.***

Example:

MAX data with 2 timezone entries, 4 access entries and an IDD-LENGTH of 12 is present in the reader. The access table contains the following access entries:

ACCESS TABLE:

Byte	0…11							12+13	14
Content	IDD							Timezones	Reserved
	0x00	0x00	0x00	0x70	0x15	…	0xEF	b1000000000000000	
	0x00	0x00	0x00	0x90	0x9B	…	0xCA	b1000000000000000	
	0x80	0x25	0xEF	0xE1	0xAD	…	0x04	b0000000000000011	
	0x80	0x29	0xBE	0x25	0x46	…	0x04	b0000000000000011	

5.4.6 Event Table

The event table contains the event data sets. The structure is described with the command [0x05] Read Table (see page 163).

6 Interface

The ID MAX.U500i has 2 interface ports (Ethernet and USB). The protocol frames of these ports can be different. The protocol frames are described in the following chapters.

6.1 Protocol Frames of TCP/IP Protocol

If the reader uses the Ethernet interface, the data is packaged in a TCP/IP protocol frame. This means the whole data format and protocol frame, which is described in the following chapter, is packaged as the data of a TCP/IP protocol frame.

If you use the TCP/IP protocol please be aware that the data packaged in the TCP/IP frame is transferred with the **Advanced Protocol Frame** as described below.

The Ethernet socket on the reader side uses the **keep-alive option** for detecting interrupted connections. The default parameters for the keep-alive option are initialized as listed in the table:

Parameter	Value	Note
Idle time	5 seconds	Every 5 seconds the reader sends a keep-alive probe which has to be acknowledged by the client.
Repeat count	2	If a keep-alive probe is not acknowledged, the reader repeats the probe only two times with an interval of 5 seconds.
Interval	5 seconds	

If the 15 second time span has lapsed and no keep-alive probe response is obtained from the client, the connection is closed and the client application must enable a new connection. The keep-alive parameters can be modified in the configuration pages for LAN and WLAN. This keep-alive option should not be mistaken with the keep-alive message for the Notification Mode.

6.2 Serial Data Format and Protocol Frames

The ID MAX.U500i can be configured by different interfaces and data may be written on transponders or read from transponders. The communication between reader and connected host (terminal, PC, etc.) is executed by means of fixed protocols. The used protocol is intended for data bus use and is equipped with a bus address. During data transfer via the asynchronous interface the reader supplies the required data or a status byte. The reply contains the transmitted control byte.

There is no reply from the reader if there is a protocol frame failure.

Advanced Protocol Frame:

This frame is recommended for all new applications where RFID readers with Advanced Protocol Frame support are used. The Advanced Protocol Frame can transfer up to 65535 byte per frame and uses a clear defined STX character.

REQUEST-DATA

1	1	1	1	1	(X)	1	1
STX 0x02	MSB LENGTH	LSB LENGTH	COM-ADR	CONTROL BYTE	(DATA)	LSB CRC16	MSB CRC16

RESPONSE-DATA

1	1	1	1	1	1	(X)	1	1
STX 0x02	MSB LENGTH	LSB LENGTH	COM-ADR	CONTROL BYTE	STATUS	(DATA)	LSB CRC16	MSB CRC16

STX:

If the response protocol of the reader starts with the STX sign (0x02) the protocol includes more than 255 bytes. The protocol length then is defined by the 2 byte parameter ALENGTH.

ALENGTH (n = 8…65535):

Number of protocol bytes including STX, ALENGTH and CRC16.

LENGTH (n = 6…255): Standard Protocol Length (up to 255 bytes)

Number of protocol bytes including LENGTH and CRC16.

COM-ADR:

Address of the device in bus mode (0…254).

ⓘ ***NOTE:***

The reader can be addressed via COM-ADR 255 at any time!

CONTROL-BYTE:

Defines the command which the reader should operate.

STATUS:

Includes the status message or protocol data from or to the reader.

DATA:

Is an optional data field with variable length. The number of DATA bytes depends on the command. The data will always be sent as MSB first if the reader is in the Host Command Mode.

CRC16:

Cyclic redundancy check of the protocol bytes from 1 to n-2, as specified by CCITT-CRC16.
Polynomial: x16 + x12 + x5 + 1 (0x8408)
Start Value: 0xFFFF
Direction: backwards

ⓘ ***NOTE:***

- ***In this document only the REQUEST-DATA and the RESPONSE-DATA block is documented for each command without the protocol frame.***
- ***Optional parameters are documented inside of round brackets: "(optional)".***
- ***The reader only supports the advanced protocol frame.***

6.3 CRC16 Calculation Algorithm

Polynomial: x16 + x12 + x5 + 1 ⇒ CRC_POLYNOM = 0x8408;

Start Value: 0xFFFF ⇒ CRC_PRESET = 0xFFFF;

C-Example:

```
unsigned int crc = CRC_PRESET;

for (i = 0, I < cnt, i++)  // cnt = number of protocol bytes without CRC
{
  crc ^= DATA[i];
  for (j = 0; j < 8; j++)
  {
    if (crc & 0x0001)
      crc = (crc >> 1) ^ CRC_POLYNOM;
    else
      crc = (crc >> 1);
  }
}
```

7 Configuration Parameters

The configuration memory of the reader is organized in configuration blocks of 16 bytes each. These are divided into 14-byte configuration parameters and a 2-byte CRC16 checksum. Each of these configuration blocks takes a number (CFG0–CFGn).

Name	Start Byte	Number of Bytes	Description
PARAMETER	0	14	Configuration parameters of the reader.
CRC16	14	2	Cyclic redundancy check

The configuration parameters are read and written by the commands 0x80 and 0x81. In the following, the different configuration parameters are examined individually. All unspecified parameter bytes are described with the value 0.

The parameters are stored in two different memory locations

- Reader RAM
- Backup EEPROM (used for storing parameters over power down)

Multiple configuration memory locations can be addressed by the value of the parameter CFG-ADR used in the protocols for reader configuration.

CFG-ADR

Bit	7	6	5	4	3	2	1	0
Function	LOC	MODE	CFGn: Address of configuration block					

Field	Description / Value
CFGn	Specifies the memory address of the required configuration block.
MODE	Specifies one or all configuration blocks.
LOC	Specifies the location of the configuration block (RAM/EEPROM).

The EEPROM configuration blocks are protected by a 16-bit CRC checksum. The examination of these checksums is executed after each reset of the reader. If a checksum is found, the reader goes into the error status “EE-Init-Mode” and sets the configuration block, which is faulty, to the default values.

While “EE-Init-Mode” is active, the LED blinks alternately red and green and the reader answers external commands with the status “0x01 EEPROM Faulure”. The “EE-Init-Mode” can be exited now by a reset (cold start, [0x63] Soft Reset (see page 94) or [0x64] Hard Reset (see page 95). If after this the checksums of all data records are correct, the reader switches to the configured operation mode.

ⓘ ***NOTE:***

- ***Malfunctions may occur if parameters are configured without their described range or if unspecified parameters have been changed.***
- ***A downgrade of the firmware will result in a complete reset of the EEPROM. All parameters will be reset to factory default.***

Structure of the Parameter Description

Parameter Short name	Logical Name Long name			
Location				
Configuration Page Number	Start Byte Number	Number of Bytes Number or n/a*	Start Bit Number or n/a**	Number of Bits Number or n/a**
Possible Values List of values		Default Value Value	Unit Physical unit	Reset Required Soft, Hard or None***
Description Explains the purpose of the parameter.				

*** "n/a" is set here if a parameter refers only to certain bits and not to the complete byte.**

**** "n/a" is set here if a parameter refers to the complete byte and not only to certain bits.**

***** If "None" is set, the parameter will become effective immediately. No reset is needed.**
If "Soft" or "Hard" are set, the cell will be marked gray to indicate that a reset is necessary for the parameter to become effective. These parameters can only be reset by the [0x83] Reset Configuration command with MODE ≠ ALL and specified block address (see "[0x83] Reset Configuration", page 91).

7.1 CFG0: Passwords

The parameters of the CFG0 configuration block contain the password to prevent unauthorized access to the configuration blocks and the specification which of the configuration blocks is accessible without password. For security reasons data from this configuration block cannot be read from the host, it is “write-only”. Also the command [0x83] Reset Configuration (see page 91) isn’t available for this configuration block.

Page Summary

IDX	Field	Description / Value
0–3	READER-PASSWORD	Defines the reader password.
4–7	-	Reserved
8–11	CFG-ACCESS X	Defines whether the configuration blocks are accessible.
12–13	-	Reserved

Parameter	Logical Name
READER-PASSWORD	AccessProtection.Password

Location

Configuration Page	Start Byte	Number of Bytes	Start Bit	Number of Bits
0	0	4	n/a	n/a
Possible Values		**Default Value**	**Unit**	**Reset Required**
0x00000000...0xFFFFFFFF		0x00000000	-	Hard

Description

Defines the password with which the host logs into the reader to get read/write access to the configuration parameter blocks.

Parameter	Logical Name
CFG-ACCESSX	AccessProtection.Lock_CFGX

Location

Configuration Page	Start Byte	Number of Bytes	Start Bit	Number of Bits
0	see *Table 1*	1	see *Table 1*	1
Possible Values		**Default Value**	**Unit**	**Reset Required**
b0: Access is free b1: Access needs a login		b0	-	None

Description

Definition whether the configuration blocks are accessible with or without login to the reader.

Byte	8								9							
Bit	0	1	2	3	4	5	6	8	0	1	2	3	4	5	6	7
CFG No.	0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
Byte	**10**								**11**							
Bit	0	1	2	3	4	5	6	7	0	1	2	3	4	5	6	7
CFG No.	16	17	18	19	20	21	22-29	30-39	40-49	50-59	60-62	63				

Table 1

Config Protection

By means of config protection, the access to the configuration parameters stored within the reader is protected by a 32-bit password, the READER-ID. This means that only after a login with a valid READER-ID with the command [0xA0] Reader Login (see page 112) configuration parameters in the EEPROM of the reader may be read and changed.

ⓘ ***NOTE:***

- ***A READER-ID = 0x00000000 disables the password function.***
- ***If the READER-ID is not set to 0x00000000, the configuration page CFG0 is automatically read protected.***
- ***A read with the command [0x80] Read Configuration (see page 88) will always get 0x00000000.***
- ***To change the READER-ID you must write to the CFG0 configuration page immediately after the login to the reader with the command [0xA0] Reader Login (see page 112).***
- ***A changed password becomes valid after a [0x64] Hard Reset (see page 95).***
- ***The commands [0x81] Write Configuration (see page 90) and [0x83] Reset Configuration (see page 91) don't change the CFG0 register if all configuration blocks are used. Also access protected configuration pages will not be influenced by these commands.***
- ***The command [0xA0] Reader Login is used to enable configuration data access.***
- ***It is possible to disable the READER-ID with an activation code, if the READER-ID is unknown. The activation code must be ordered by your supplier of FEIG ELECTRONIC GmbH.***

7.2 CFG1: Interface

The parameters of the CFG1 configuration block contain the data communication settings.

Page Summary

IDX	Field	Description / Value
0–5	-	Reserved
6–7	TR-RESPONSE-TIME	Defines the max. duration for the transponder command.
8–11	-	Reserved
12	INTERFACES	Enables or disables communication ports.
13	READER-MODE	Defines the mode of the reader.

Parameter	Logical Name
TR-RESPONSE-TIME	AirInterface.TimeLimit

Location

Configuration Page	Start Byte	Number of Bytes	Start Bit	Number of Bits
1	6	2	n/a	n/a
Possible Values		**Default Value**	**Unit**	**Reset Required**
0...65535		200	x 5 ms	None

Description

Defines the maximum duration for the transponder command. It starts after the reader has received a new command. At the latest after the TR-RESPONSE-TIME has elapsed the reader will send an answer protocol. In this case, current commands between reader and transponder are aborted. If the time is too short

ⓘ ***NOTE:***

- ***The TR-RESPONSE-TIME must be less than "Block Timeout" in the host interface settings.***
- ***The TR-RESPONSE-TIME has no effect on the Protocols for Reader Configuration and the Protocols for Reader Control.***
- ***See "Index of Status Bytes", page 169.***

Parameter	Logical Name
INTERFACES	HostInterface.Interfaces

Location

Configuration Page	Start Byte	Number of Bytes	Start Bit	Number of Bits
1	12	1	n/a	n/a
Possible Values		**Default Value**	**Unit**	**Reset Required**
Bit 7: Discovery		b10000000	-	None

Description

Flags for enabling additional communication ports. USB and LAN are always enabled and cannot be disabled.

Bit	7	6	5	4	3	2	1	0
Function	Discovery	-	-	-	-	-	-	-
Default	b1: Enabled	-	-	-	-	-	-	-

Table 2

ⓘ ***NOTE:***

- ***Via the COM-ADR 255 in the send protocol, the reader is able to be addressed at any time. It then answers with the configured address.***
- ***[0x64] Hard Reset (see page 95)***

Parameter	Logical Name
READER-MODE	OperatingMode.Mode

Location

Configuration Page	Start Byte	Number of Bytes	Start Bit	Number of Bits
1	13	1	n/a	n/a

Possible Values	Default Value	Unit	Reset Required
0x00: Host Mode 0xA0: Access Mode	0xA0	-	Soft

Description

Defines the mode of the reader.

7.3 CFG2: Input/Output

The parameters of the CFG2 configuration block contain the digital input and output settings.

Page Summary

IDX	Field	Description / Value
0–1	IDLE-MODE	Defines the status of REL1+2 and OUT1+2 in idle mode.
2–3	ACTIVE-STATE	Allocates flashing frequency to an output.
4	IN-ACTIVE	Determines if an output is active with a closed or open contact.
5	-	Reserved
6–7	REL1-TIME	Defines the holding time of REL1.
8–9	OUT1-TIME	Defines the holding time of OUT1.
10–11	REL2-TIME	Defines the holding time of REL2.
12	-	Reserved
13	OUT2-TIME	Defines the holding time of OUT2.

Parameter	Logical Name
IDLE-MODE-Rel1	DigitalIO.Relay.No1.IdleMode

Location

Configuration Page	Start Byte	Number of Bytes	Start Bit	Number of Bits
2	0	n/a	6	2

Possible Values	Default Value	Unit	Reset Required
0: UNCHANGED 1: ON 2: OFF 3: FLASH	2	-	None

Description

Defines the status of the signal emitter (REL1) during the idle mode.

Parameter	Logical Name
IDLE-MODE-Rel2	DigitalIO.Relay.No2.IdleMode

Location

Configuration Page	Start Byte	Number of Bytes	Start Bit	Number of Bits
2	0	1	0	2

Possible Values	Default Value	Unit	Reset Required
0: UNCHANGED 1: ON 2: OFF 3: FLASH	0	-	None

Description

Defines the status of the signal emitter (REL2) during the idle mode.

Parameter	Logical Name
IDLE-MODE-Out1	DigitalIO.Output.No1.IdleMode

Location

Configuration Page	Start Byte	Number of Bytes	Start Bit	Number of Bits
2	0	1	2	2

Possible Values	Default Value	Unit	Reset Required
0: UNCHANGED 1: ON 2: OFF 3: FLASH	2	-	None

Description

Defines the status of the signal emitter (OUT1) during the idle mode.

Parameter	Logical Name
IDLE-MODE-Out2	DigitalIO.Output.No2.IdleMode

Location

Configuration Page	Start Byte	Number of Bytes	Start Bit	Number of Bits
2	0	1	4	2

Possible Values	Default Value	Unit	Reset Required
0: UNCHANGED 1: ON 2: OFF 3: FLASH	2	-	None

Description

Defines the status of the signal emitter (OUT2) during the idle mode.

Parameter	Logical Name
ACTIVE-STATE-REL1	DigitalIO.Relay.No1.ActiveState

Location

Configuration Page	Start Byte	Number of Bytes	Start Bit	Number of Bits
2	2	n/a	6	2

Possible Values	Default Value	Unit	Reset Required
b00: No flash b01: 4 Hz b10: 2 Hz b11: 1 Hz	b00	-	n/a

Description

Allocates its own flashing frequency to each output.

Parameter	Logical Name
ACTIVE-STATE-Rel2	DigitalIO.Relay.No2.ActiveState

Location

Configuration Page	Start Byte	Number of Bytes	Start Bit	Number of Bits
2	2	n/a	0	2

Possible Values	Default Value	Unit	Reset Required
b00: No flash b01: 4 Hz b10: 2 Hz b11: 1 Hz	b00	-	n/a

Description

Allocates its own flashing frequency to each output.

Parameter	Logical Name
ACTIVE-STATE-Out1	DigitalIO.Output.No1.ActiveState

Location

Configuration Page	Start Byte	Number of Bytes	Start Bit	Number of Bits
2	2	n/a	2	2

Possible Values	Default Value	Unit	Reset Required
b00: No flash b01: 4 Hz b10: 2 Hz b11: 1 Hz	b00	-	n/a

Description

Allocates its own flashing frequency to each output.

Parameter	Logical Name
ACTIVE-STATE-Out2	DigitalIO.Output.No2.ActiveState

Location

Configuration Page	Start Byte	Number of Bytes	Start Bit	Number of Bits
2	2	n/a	4	2

Possible Values	Default Value	Unit	Reset Required
b00: No flash b01: 4 Hz b10: 2 Hz b11: 1 Hz	b00	-	n/a

Description

Allocates its own flashing frequency to each output.

Parameter	Logical Name
IN-ACTIVE-IN1	DigitalIO.Input.No1.Mode

Location

Configuration Page	Start Byte	Number of Bytes	Start Bit	Number of Bits
2	4	n/a	0	1
Possible Values		**Default Value**	**Unit**	**Reset Required**
0: active close 1: active open		0	-	None
Description				
Determines if the input is active with the closed or the open contact.				

Parameter	Logical Name
IN-ACTIVE-IN2	DigitalIO.Input.No2.Mode

Location

Configuration Page	Start Byte	Number of Bytes	Start Bit	Number of Bits
2	4	1	1	1
Possible Values		**Default Value**	**Unit**	**Reset Required**
0: active close 1: active open		0	-	None
Description				
Determines if the input is active with the closed or the open contact.				

Parameter	Logical Name
REL1-TIME	DigitalIO.Relay.No1.SettlingTime

Location

Configuration Page	Start Byte	Number of Bytes	Start Bit	Number of Bits
2	6	2	0	n/a
Possible Values		**Default Value**	**Unit**	**Reset Required**
0...65535		0	x 100 ms	None
Description				
Defines the holding time of the digital output REL1. If the reader receives a valid transponder response, the relay is activated for the value in REL1-TIME. If REL1-TIME is zero, the function is disabled. If idle mode for REL1 is on or flash, the relay goes low (off).				

Parameter	Logical Name
REL2-TIME	DigitalIO.Relay.No2.SettlingTime

Location

Configuration Page	Start Byte	Number of Bytes	Start Bit	Number of Bits
2	10	2	n/a	n/a
Possible Values		**Default Value**	**Unit**	**Reset Required**
0...65535		0	x 100 ms	None

Description

Defines the holding time of the digital output REL2. If the reader receives a valid transponder response, the relay is activated for the value in REL2-TIME.
If REL2-TIME is zero, the function is disabled.
If idle mode for REL2 is on or flash, the relay goes low (off).

Parameter	Logical Name
OUT1-TIME	DigitalIO.Output.No1.SettlingTime

Location

Configuration Page	Start Byte	Number of Bytes	Start Bit	Number of Bits
2	8	2	0	0
Possible Values		**Default Value**	**Unit**	**Reset Required**
0...65535		0	x 100 ms	None

Description

Defines the holding time of the digital output OUT1. If the reader receives a valid transponder response, the relay is activated for the value in OUT1-TIME.
If OUT1-TIME is zero, the function is disabled.
If idle mode for OUT1 is on or flash, the relay goes low (off).

Parameter	Logical Name
OUT2-TIME	DigitalIO.Output.No2.SettlingTime

Location

Configuration Page	Start Byte	Number of Bytes	Start Bit	Number of Bits
2	13	1	0	0
Possible Values		**Default Value**	**Unit**	**Reset Required**
0...255		0	x 100 ms	None

Description

Defines the holding time of the digital output OUT2. If the reader receives a valid transponder response, the relay is activated for the value in OUT2-TIME.
If OUT2-TIME is zero, the function is disabled.
If idle mode for OUT2 is on or flash, the relay goes low (off).

ⓘ ***NOTE:***

Auto Read Modes (reading of serial number and data):
If the serial number was read OK and the data not, no data set will be transferred, but the assigned RELx and/or the OUTx will be active.

7.4 CFG3: RF Interface

The parameters of the CFG3 configuration block contain global transponder drivers and reader settings.

Page Summary

IDX	Field	Description / Value
0–1	-	Reserved
2	RF-POWER-ANT1	Defines the RF output power for antenna 1.
3	REG	Defines the region specific behavior according RF regulations.
4–7	-	Reserved
8–9	FREQ-US	Defines the reader specific frequency.
10	-	Reserved
11	NR-PREFERRED-CHN	Number of channels used by the EU reader.
12–13	PREFERRED-CHN	Defines the preferred channels used by the EU reader.

Parameter	Logical Name
RF-POWER-ANT1	AirInterface.Antenna.UHF.No1.OutputPower

Location

Configuration Page	Start Byte	Number of Bytes	Start Bit	Number of Bits
3	2	1	0	6

Possible Values	Default Value	Unit	Reset Required
16: 0.1 W 17: 0.2 W 18: 0.3 W 19: 0.4 W 20: 0.5 W 21: 0.6 W 22: 0.7 W 23: 0.8 W	23	-	Soft

Description

Defines the RF output power for antenna 1. The output power for antenna 2 can be configured in CFG20: RF Parameter.
If region = Morocco, the max. output power is 0.5 W.

CFG20: RF Parameter (see page 64)

Parameter	Logical Name
REGULATION	AirInterface.Region.UHF.Regulation

Location

Configuration Page	Start Byte	Number of Bytes	Start Bit	Number of Bits
3	3	1	n/a	n/a

Possible Values	Default Value	Unit	Reset Required
0x04: FCC: America 0x14: FCC: China 0x24: FCC: Australia/New Zealand 0x34: FCC: Brazil 0x44: FCC: Israel 0x54: FCC: Japan 0x64: FCC: Malaysia 0xFF: FCC: Unknown 0x06: EU: Europe 0x16: EU: Asia/Arabia 0x26: EU: Russia 0x36: EU: Africa 0x46: EU: India 0x56: EU: Morocco 0xFE: EU: Unknown	0x06 (EU) 0x04 (FCC)	-	Soft

Description

Defines the region specific behavior according to the RF regulations. For a detailed description of the individual countries' affiliation to the regions and their frequency bands, please refer to the annex.

ⓘ ***NOTE:***

- ***The region settings are not affected by the command [0x83] Reset Configuration (see page 91).***
- ***If region = EU, only EU frequencies can be set. If region = FCC, only FCC frequencies can be set.***
- ***If region = [0xFE] "Unknown EU" or region = [0xFF] "Unknown FCC", please contact your supplier to setup the correct frequency configuration.***

Parameter	Logical Name
FCC-LOWER-CHANNEL	AirInterface.Region.UHF.FCC.Channel.LowerChannel

Location

Configuration Page	Start Byte	Number of Bytes	Start Bit	Number of Bits
3	9	n/a	0	6

Possible Values	Default Value	Unit	Reset Required
1: 902.75 MHz 2: 903.25 MHz 3: 903.75 MHz 4: 904.25 MHz 5: 904.75 MHz 6: 905.25 MHz 7: 905.75 MHz 8: 906.25 MHz 9: 906.75 MHz 10: 907.25 MHz 11: 907.75 MHz 12: 908.25 MHz 13: 908.75 MHz 14: 909.25 MHz 15: 909.75 MHz 16: 910.25 MHz 17: 910.75 MHz 18: 911.25 MHz 19: 911.75 MHz 20: 912.25 MHz 21: 912.75 MHz 22: 913.25 MHz 23: 913.75 MHz 24: 914.25 MHz 25: 914.75 MHz 26: 915.25 MHz 27: 915.75 MHz 28: 916.25 MHz 29: 916.75 MHz 30: 917.25 MHz 31: 917.75 MHz 32: 918.25 MHz 33: 918.75 MHz 34: 919.25 MHz 35: 919.75 MHz 36: 920.25 MHz 37: 920.75 MHz 38: 921.25 MHz 39: 921.75 MHz 40: 922.25 MHz 41: 922.75 MHz 42: 923.25 MHz 43: 923.75 MHz 44: 924.25 MHz	1	-	None

Possible Values	Default Value	Unit	Reset Required
45: 924.75 MHz 46: 925.25 MHz 47: 925.75 MHz 48: 926.25 MHz 49: 926.75 MHz 50: 927.25 MHz	1	-	None

Description

Defines the reader specific lower limit frequency. These settings are only applicable for FCC readers and if region [0xFF] "Unknown FCC" is selected.

Parameter	Logical Name
FCC-UPPER-CHANNEL	AirInterface.Region.UHF.FCC.Channel.UpperChannel

Location

Configuration Page	Start Byte	Number of Bytes	Start Bit	Number of Bits
3	8	n/a	0	6

Possible Values	Default Value	Unit	Reset Required
1: 902.75 MHz 2: 903.25 MHz 3: 903.75 MHz 4: 904.25 MHz 5: 904.75 MHz 6: 905.25 MHz 7: 905.75 MHz 8: 906.25 MHz 9: 906.75 MHz 10: 907.25 MHz 11: 907.75 MHz 12: 908.25 MHz 13: 908.75 MHz 14: 909.25 MHz 15: 909.75 MHz 16: 910.25 MHz 17: 910.75 MHz 18: 911.25 MHz 19: 911.75 MHz 20: 912.25 MHz 21: 912.75 MHz 22: 913.25 MHz 23: 913.75 MHz 24: 914.25 MHz 25: 914.75 MHz 26: 915.25 MHz 27: 915.75 MHz 28: 916.25 MHz 29: 916.75 MHz 30: 917.25 MHz 31: 917.75 MHz 32: 918.25 MHz 33: 918.75 MHz 34: 919.25 MHz 35: 919.75 MHz 36: 920.25 MHz	0	-	None

37: 920.75 MHz 38: 921.25 MHz 39: 921.75 MHz 40: 922.25 MHz 41: 922.75 MHz 42: 923.25 MHz 43: 923.75 MHz 44: 924.25 MHz 45: 924.75 MHz 46: 925.25 MHz 47: 925.75 MHz 48: 926.25 MHz 49: 926.75 MHz 50: 927.25 MHz			
Description Defines the reader specific upper limit frequency. These settings are only applicable for FCC readers and if region [0xFF] "Unknown FCC" is selected.			

Parameter	Logical Name
NR-PREFERRED-CHN	AirInterface.Region.UHF.EU.Channel.EN302208_4_ChannelPlan.PreferredChannels.NoOfChannels

Location

Configuration Page	Start Byte	Number of Bytes	Start Bit	Number of Bits
3	11	1	n/a	n/a

Possible Values	Default Value	Unit	Reset Required
1: 1 channel 2: 2 channels 3: 3 channels 4: 4 channels	2	-	None

Description

Number of channels used by the European reader. These settings are only applicable for EU readers and if region [0xFE] "Unknown EU" is selected.

Parameter	Logical Name
PREFERRED-CHN1	AirInterface.Region.UHF.EU.Channel.EN302208_4_ChannelPlan.PreferredChannels.ChannelNo1

Location

Configuration Page	Start Byte	Number of Bytes	Start Bit	Number of Bits
3	12	n/a	4	4

Possible Values	Default Value	Unit	Reset Required
4: 865.7 MHz 7: 866.3 MHz 10: 866.9 MHz 13: 867.5 MHz	0	-	None

Description

Defines the preferred channels used by the European reader. These settings are only applicable for EU readers and if region [0xFE] "Unknown EU" is selected.

Parameter	Logical Name
PREFERRED-CHN2	AirInterface.Region.UHF.EU.Channel.EN302208_4_ChannelPlan.PreferredChannels.ChannelNo2

Location

Configuration Page	Start Byte	Number of Bytes	Start Bit	Number of Bits
3	12	n/a	0	4

Possible Values	Default Value	Unit	Reset Required
4: 865.7 MHz 7: 866.3 MHz 10: 866.9 MHz 13: 867.5 MHz	0	-	None

Description

Defines the preferred channels used by the European reader. These settings are only applicable for EU readers and if region [0xFE] "Unknown EU" is selected.

Parameter	Logical Name
PREFERRED-CHN3	AirInterface.Region.UHF.EU.Channel.EN302208_4_ChannelPlan.PreferredChannels.ChannelNo3

Location

Configuration Page	Start Byte	Number of Bytes	Start Bit	Number of Bits
3	13	n/a	4	4

Possible Values	Default Value	Unit	Reset Required
4: 865.7 MHz 7: 866.3 MHz 10: 866.9 MHz 13: 867.5 MHz	0	-	None

Description

Defines the preferred channels used by the European reader. These settings are only applicable for EU readers and if region [0xFE] "Unknown EU" is selected.

Parameter	Logical Name
PREFERRED-CHN4	AirInterface.Region.UHF.EU.Channel.EN302208_4_ChannelPlan.PreferredChannels.ChannelNo4

Location

Configuration Page	Start Byte	Number of Bytes	Start Bit	Number of Bits
3	13	n/a	0	4

Possible Values	Default Value	Unit	Reset Required
4: 865.7 MHz 7: 866.3 MHz 10: 866.9 MHz 13: 867.5 MHz	0	-	None

Description

Defines the preferred channels used by the European reader. These settings are only applicable for EU readers and if region [0xFE] "Unknown EU" is selected.

7.5 CFG4: Transponder Parameters

The parameters of the CFG4 configuration block general transponder settings.

Page Summary

IDX	Field	Description / Value
0–9	-	Reserved
10	TAG-AUTHENT	Defines if automatic tag authentication is performed.
11	WR-OPTION	Defines the number of blocks to be written by one write command.
12	IDDT	Defines in which way the reader interprets and displays the IDDT.
13	TID-LENGTH	Defines the length of the TID.

Parameter	Logical Name
TAG-AUTHENT	Transponder.UHF.EPC_Class1Gen2.Miscellaneous.TagAuthent

Location

Configuration Page	Start Byte	Number of Bytes	Start Bit	Number of Bits
4	10	1	n/a	n/a

Possible Values	Default Value	Unit	Reset Required
0x00: No access / Tag authentication disabled 0x01: Tag authentication with access password 0x02: TAM1 authentication with Key 0 0x03: TAM2 authentication with Key 1 0x05: TAM1 authentication with Key 1 0x06: TAM2 authentication with Key 0	0x01	-	None

Description

Defines if an automatic tag authentication is performed. Only if the tag authentication was successful, the data exchange between reader and transponder can be successfully executed.

see "[0xAD] Write Reader Authentication Key", page 114

see "[0xA3] Write AES Reader Keys", page 113

ⓘ ***NOTE:***

- ***Only one authentication mode is possible at a time.***
- ***To store the access password in the reader [0xAD] Write Reader Authentication Key (see page 114)***
- ***To store Key 0 or 1 in the reader see "[0xA3] Write AES Reader Keys", page 113***
- ***If the authentication was not successful, STATUS = 0x08 (“Authent Error”) will be sent in ISO Host Mode.***
- ***In the Auto Read Modes it is only possible to read non-encrypted data blocks from the tag if authentication is done by the reader.***
- ***In the Auto Read Modes it is not possible to read additional data blocks from the tag if authentication is done by the host. The tag’s serial number is transmitted in the regular way. The challenge – 80 bits random number, generated by the reader – and the encrypted tag response are transmitted as data.***
- ***Some tags (e.g. NXP UCODE DNA) contain only one AES key (Key 0) for authentication.***

Parameter	Logical Name
WR-OPTION	Transponder.UHF.EPC_Class1Gen2.Miscellaneous.WriteOption

Location

Configuration Page	Start Byte	Number of Bytes	Start Bit	Number of Bits
4	11	1	n/a	n/a

Possible Values	Default Value	Unit	Reset Required
0x01: 1 Block 0x02: 2 Blocks 0x03: 3 Blocks 0x04: 4 Blocks 0x05: 5 Blocks 0x06: 6 Blocks 0x07: 7 Blocks 0x08: 8 Blocks 0x09: 9 Blocks 0x0A: 10 Blocks 0x0B: 11 Blocks 0x0C: 12 Blocks 0x0D: 13 Blocks 0x0E: 14 Blocks 0x0F: 15 Blocks 0x10: 16 Blocks	0x01	-	None

Description

Defines the number of blocks to be written by one write command. By default information issued by the [0x24] Write Multiple Blocks command are written in blocks.

[0xB0] [0x24] Write Multiple Blocks (see page 124)

ⓘ ***NOTE:***

- ***The number of blocks to be written at once is depending on the used transponder chip. Please check the number of supported blocks in the datasheet.***
- ***If a command [0xB0] [0x24] Write Multiple Blocks (see page 124) with the configured settings failed, the reader will automatically retry the write command with the number of blocks set to 1.***

Parameter	Logical Name
IDDT	Transponder.Miscellaneous.IdentifierInterpretationMode

Location

Configuration Page	Start Byte	Number of Bytes	Start Bit	Number of Bits
4	12	1	n/a	n/a

Possible Values	Default Value	Unit	Reset Required
0x00: EPC 0x02: EPC and TID	0x00	-	None

Description

Defines in which way the reader interprets and displays the identifier data read during the inventory process by using the [0x01] Inventory command or in Buffered Read Mode. If IDDT is 0x02 then only the TID must be used to address commands (e.g. read, write,...) to the tag.

Parameter	Logical Name
TID-LENGTH	Transponder.Miscellaneous.TIDLength

Location

Configuration Page	Start Byte	Number of Bytes	Start Bit	Number of Bits
4	13	1	n/a	n/a

Possible Values	Default Value	Unit	Reset Required
0x00: automatic Mode 0x20: 32-Bits 0x40: 64-Bits 0x60: 96-Bits	0x00	-	None

Description

Defines the length of the TID to be expected when IDDT consists of EPC and TID. If the TID-LENGTH is 0x00, the reader will automatically add the complete content of the TID memory bank.

7.6 CFG5: Anticollision

The parameters of the CFG5 configuration block contain anticollision settings.

Page Summary

IDX	Field	Description / Value
0–9	-	Reserved
10	SESSION	Defines which session of an EPC transponder will be used.
11	ANTICOLLISION	(De-)Activates the Anticollision Mode.
12–13	-	Reserved

Parameter	Logical Name
SESSION	Transponder.UHF.EPC_Class1Gen2.Anticollision.Session

Location

Configuration Page	Start Byte	Number of Bytes	Start Bit	Number of Bits
5	10	n/a	0	2

Possible Values	Default Value	Unit	Reset Required
b00: Session 0 (Persistence Reset Time is always 0) b01: Session 1 (Persistence Reset Time as configured, but max. 1 s) b10: Session 2 (Persistence Reset Time as configured) b11: Session 3 (Persistence Reset Time as configured)	b01	-	None

Description

Defines which session of EPC Class 1 Gen 2 transponder will be used in the Inventory command.

Parameter	Logical Name
ANTICOLLISION	Transponder.Anticollision.Enable

Location

Configuration Page	Start Byte	Number of Bytes	Start Bit	Number of Bits
5	11	n/a	2	1

Possible Values	Default Value	Unit	Reset Required
b0: Disabled (No anticollision procedure for transponders inside the antenna field) b1: Enabled (Anticollision procedure for transponders inside the antenna field)	b1	-	None

Description

Activates the Anticollision Mode in which the reader automatically sets transponder specific communication parameters. If the Anticollision Mode is disabled, the reader forces a query (with Q = 0), ACK, Req-RN sequence and sets the tag in the open/secured state.

7.7 CFG8: Entry / Exit

The parameters of configuration block CFG8 contain the settings for the traffic light and the buzzer that can be assigned to the digital outputs.

IDX	Field	Description / Value
0	IDLE-STATE	Defines the color of the traffic light in idle mode.
1	ACCESS-STATE	Defines the color that signalizes if a transponder has access or not.
2	ACTIVATION-TIME	Defines the activation time for the traffic light.
3	SIG-ANT-ASSIGN	Defines antennas for signalization.
4	BUZZER	Enables the buzzer, if access was granted.
5–10	-	Reserved
11	APB-ANT-ASSIGN	Defines entry and exit for the antipassback function.
12	REENTRY-TIME	Defines from which time an access is possible again.
13	-	Reserved

Parameter	Logical Name
TL-IDLE-STATE	DigitalIO.Signaler.TrafficLight.IdleState

Location

Configuration Page	Start Byte	Number of Bytes	Start Bit	Number of Bits
8	0	n/a	0	2

Possible Values	Default Value	Unit	Reset Required
b00: Off b01: Green On b10: Red On b11: Blue On	b00	-	None

Description

Defines the status of the traffic lights during the idle mode.

Parameter	Logical Name
TL-ACCESS-STATE	DigitalIO.Signaler.TrafficLight.AccessState

Location

Configuration Page	Start Byte	Number of Bytes	Start Bit	Number of Bits
8	1	n/a	0	2

Possible Values	Default Value	Unit	Reset Required
b00: Off b01: Green On b10: Red On b11: Blue On	b00	-	None

Description

Defines the color the reader uses to signalize that a transponder has been read and has access.

Parameter	Logical Name
TL-ACCESS-DENIED-STATE	DigitalIO.Signaler.TrafficLight.AccessDeniedState

Location

Configuration Page	Start Byte	Number of Bytes	Start Bit	Number of Bits
8	1	1	4	2

Possible Values	Default Value	Unit	Reset Required
b00: Off b01: Green On b10: Red On b11: Blue On	b00	-	None

Description

Defines the color the reader uses to signalize that a transponder could not be read or the access was denied.

ⓘ ***NOTE:***

Please note that in some vehicles RFID transponders may already be installed by the manufacturer or other system provider. These transponders could be recognized as invalid by the reader and indicated as such by the traffic light.

Parameter	Logical Name
TL-ACCESS-FLASH	DigitalIO.Signaler.TrafficLight.AccessFlash

Location

Configuration Page	Start Byte	Number of Bytes	Start Bit	Number of Bits
8	1	n/a	2	2

Possible Values	Default Value	Unit	Reset Required
b00: No Flash b01: 4 Hz b10: 2 Hz b11: 1 Hz	b00	-	None

Description

Defines the flashing frequency the reader uses to signalize that a transponder has been read.

Parameter	Logical Name
TL-ACCESS-DENIED-FLASH	DigitalIO.Signaler.TrafficLight.AccessDeniedFlash

Location

Configuration Page	Start Byte	Number of Bytes	Start Bit	Number of Bits
8	1	1	6	2

Possible Values	Default Value	Unit	Reset Required
b00: No Flash b01: 4 Hz b10: 2 Hz b11: 1 Hz	b00	-	None

Description

Defines the flashing frequency the reader uses to signalize that a transponder could not be read or was not authorized.

Parameter	Logical Name
TL-ACTIVATION-TIME	DigitalIO.Signaler.TrafficLight.ActivationTime

Location

Configuration Page	Start Byte	Number of Bytes	Start Bit	Number of Bits
8	2	1	n/a	n/a
Possible Values		**Default Value**	**Unit**	**Reset Required**
0...255		0	s	None
Description				
Defines the holding time of the lights				

Parameter	Logical Name
SIG-ANT-ASSIGN	DigitalIO.Signaler.TrafficLight.ReadEventActivation.AntennaNo

Location

Configuration Page	Start Byte	Number of Bytes	Start Bit	Number of Bits
8	3	n/a	0	2
Possible Values		**Default Value**	**Unit**	**Reset Required**
b01: Signalization, if read from ANT1 b10: Signalization, if read from ANT2 b11: Signalization, if read from ANT1 or ANT2		b01	-	None
Description				
Specifies which antenna should be signaled. This setting is only valid if anti-passback is deactivated.				

Parameter	Logical Name
BUZZER-ACCESS-STATE	DigitalIO.Signaler.Buzzer.AccessState

Location

Configuration Page	Start Byte	Number of Bytes	Start Bit	Number of Bits
8	4	n/a	0	1
Possible Values		**Default Value**	**Unit**	**Reset Required**
b0: Buzzer disabled b1: Buzzer enabled		b0	-	None
Description				
This parameter is used to signal whether a transponder has been read, whereby the buzzer is active for 1 second.				

Parameter	Logical Name
APB-ANT-ASSIGN	OperatingMode.AccessMode.Antipassback.Mode

Location

Configuration Page	Start Byte	Number of Bytes	Start Bit	Number of Bits
8	11	1	0	2

Possible Values	Default Value	Unit	Reset Required
b00: Disabled b01: Enabled with Antenna 1 as Exit b10: Enabled with Antenna 2 as Exit	b00	-	None

Description

Defines entry and exit for the antipassback function.

ⓘ ***NOTE:***

If all antennas are set as entry, the antipassback function is disabled.

Parameter	Logical Name
REENTRY-TIME	OperatingMode.AccessMode.Antipassback.TimeOfDayForLockClearing

Location

Configuration Page	Start Byte	Number of Bytes	Start Bit	Number of Bits
8	12	2	0	0

Possible Values	Default Value	Unit	Reset Required
0...65535	0	x 100ms	None

Description

Defines the time in hours and minutes from which a re-entry is possible again.

ⓘ ***NOTE:***

The antipassback function is only possible if two antennas are enabled.

7.8 CFG9: Input/Output II (Assignment – Output to Antenna Read Event)

The configuration block CFG9 contains the parameters for the Input/Output II.

Page Summary

IDX	Field	Description / Value
0	OUTPUT1-AE	Defines which antenna activates output 1.
1	OUTPUT2-AE	Defines which antenna activates output 2.
2–6	-	Reserved
7	RELAY1-AE	Defines which antenna activates relay 1.
8	RELAY2-AE	Defines which antenna activates relay 2.
9–13	-	Reserved

Parameter	Logical Name
OUTPUT1-AE	DigitalIO.Output.No1.ReadEventActivation.AntennaNo

Location

Configuration Page	Start Byte	Number of Bytes	Start Bit	Number of Bits
9	0	1	0	0
Possible Values		**Default Value**	**Unit**	**Reset Required**
Bit 0: Antenna 1 Bit 1: Antenna 2		0	-	None

Description

Defines which antenna activates output 1 if a transponder has been detected.

Parameter	Logical Name
OUTPUT2-AE	DigitalIO.Output.No2.ReadEventActivation.AntennaNo

Location

Configuration Page	Start Byte	Number of Bytes	Start Bit	Number of Bits
9	1	1	0	0
Possible Values		**Default Value**	**Unit**	**Reset Required**
Bit 0: Antenna 1 Bit 1: Antenna 2		0	-	None

Description

Defines which antenna activates output 2 if a transponder has been detected.

Parameter	Logical Name
RELAY1-AE	DigitalIO.Relay.No1.ReadEventActivation.AntennaNo

Location

Configuration Page	Start Byte	Number of Bytes	Start Bit	Number of Bits
9	7	1	n/a	n/a
Possible Values		**Default Value**	**Unit**	**Reset Required**
Bit 0: Antenna 1 Bit 1: Antenna 2		0	-	None

Description

Defines which antenna activates relay 1 if a transponder has been detected.

Parameter	Logical Name
RELAY2-AE	DigitalIO.Relay.No2.ReadEventActivation.AntennaNo

Location

Configuration Page	Start Byte	Number of Bytes	Start Bit	Number of Bits
9	8	1	0	0

Possible Values	Default Value	Unit	Reset Required
Bit 0: Antenna 1 Bit 1: Antenna 2	0	-	None

Description

Defines which antenna activates relay 2 if a transponder has been read.

7.9 CFG10: Trigger

The configuration blocks contain parameters for the trigger configuration.

Page Summary

IDX	Field	Description / Value
0	TRIGGER-MODE	Enables the trigger and defines its settings.
1	TRIGGER-USE	Defines whether an input is used as trigger.
2–3	TRIGGER1-HOLD-TIME	Defines the time the reader performs inventory commands.
4–5	TRIGGER2-HOLD-TIME	Defines the time the reader performs inventory commands.
6–11	-	Reserved
12	TL-MODE	Deactivates the trigger function of the digital inputs and allows the control of the traffic light via digital input IN1.
13	-	Reserved

TRIGGER-MODE

Bit	7	6	5	4	3	2	1	0
Function	TRIGGER	-	TRIGGER-CONDITION	-	-	-	-	UNLIMITED-VALID-TIME
Default	0	0	0	0	0	0	0	0

Parameter	Logical Name
TRIGGER	OperatingMode.AccessMode.Trigger.Enable

Location

Configuration Page	Start Byte	Number of Bytes	Start Bit	Number of Bits
10	0	n/a	7	1

Possible Values	Default Value	Unit	Reset Required
b0: Trigger disabled b1: Trigger enabled	b0	-	None

Description

Defines the period in which the reader performs tag commands and holds the RF power active. The time the RF field stays on is depending on the combination of the TRIGGER-CONDITION and the TRIGGER-HOLD-TIME.

ⓘ ***NOTE:***

If Trigger is enabled and not activated by the external switch, the RF field will be switched off.

Parameter	Logical Name
TRIGGER-CONDITION	OperatingMode.AccessMode.Trigger.Condition

Location

Configuration Page	Start Byte	Number of Bytes	Start Bit	Number of Bits
10	0	1	5	1

Possible Values	Default Value	Unit	Reset Required
b0: Level triggered b1: Edge triggered	b0	-	None

Description

Defines the condition on which the RF field will be switched on and the Trigger Hold Time starts.

Parameter	Logical Name
UNLIMITED-VALID-TIME	OperatingMode.AccessMode.Trigger.Enable_UnlimitTransponderValidTime

Location

Configuration Page	Start Byte	Number of Bytes	Start Bit	Number of Bits
10	0	n/a	0	1

Possible Values	Default Value	Unit	Reset Required
0: Valid Time is limited to one Trigger Period 1: Valid Time is applicable for more than one Trigger Period	0	-	None

Description

Defines the length of the Valid Time of a transponder.

Parameter	Logical Name
TRIGGER-USE1	OperatingMode.AccessMode.Trigger.Source.Input.No1.TriggerUse

Location

Configuration Page	Start Byte	Number of Bytes	Start Bit	Number of Bits
10	1	n/a	0	2

Possible Values	Default Value	Unit	Reset Required
b00: Trigger not used b01: Start Trigger b10: Stop Trigger b11: Start or Stop Trigger	b00	-	None

Description

Defines if the input is used as a trigger or not.

Parameter	Logical Name
TRIGGER-USE2	OperatingMode.AccessMode.Trigger.Source.Input.No2.TriggerUse

Location

Configuration Page	Start Byte	Number of Bytes	Start Bit	Number of Bits
10	1	n/a	2	2

Possible Values	Default Value	Unit	Reset Required
b00: Trigger not used b01: Start Trigger b10: Stop Trigger b11: Start or Stop Trigger	b00	-	None

Description

Defines if the input is used as a trigger or not.

Parameter	Logical Name
TRIGGER-1-HOLD-TIME	OperatingMode.AccessMode.Trigger.Source.Input.No1.HoldTime

Location

Configuration Page	Start Byte	Number of Bytes	Start Bit	Number of Bits
10	2	2	0	0
Possible Values		**Default Value**	**Unit**	**Reset Required**
1...65535		5	x 100 ms	None

Description

Defines the period in which the reader performs tag commands and holds the RF power active. The time the RF field stays on is depending on the combination of the TRIGGER-CONDITION and the TRIGGER-HOLD-TIME.

Parameter	Logical Name
TRIGGER-2-HOLD-TIME	OperatingMode.AccessMode.Trigger.Source.Input.No2.HoldTime

Location

Configuration Page	Start Byte	Number of Bytes	Start Bit	Number of Bits
10	4	2	0	0
Possible Values		**Default Value**	**Unit**	**Reset Required**
1...65535		5	x 100 ms	None

Description

Defines the period in which the reader performs tag commands and holds the RF power active. The time the RF field stays on is depending on the combination of the TRIGGER-CONDITION and the TRIGGER-HOLD-TIME.

Parameter	Logical Name
TL-CONTROL	DigitalIO.Signaler.TrafficLight.Mode

Location

Configuration Page	Start Byte	Number of Bytes	Start Bit	Number of Bits
10	12	n/a	0	1
Possible Values		**Default Value**	**Unit**	**Reset Required**
b0: Traffic light acts automatically as defined in CFG8. b1: Traffic light is controlled via the digital input IN1.		b0	-	None

Description

A HIGH signal on digital input IN1 switch on the traffic light as defined in CFG8 for ACCESS-STATE.
A LOW signal on digital input IN1 activates the idle color of the traffic light as defined in CFG8 for TRAFFIC-LIGHT-IDLE-STATE.

7.10 CFG11: Read Mode – Read Data

The parameters of this CFG configuration block contain settings for Auto Read Modes. To enable an Auto Read Mode (Buffered Read Mode, Scan Mode, Notification Mode, Access Mode), the according bit in the READER-MODE register of the configuration block CFG1: Interface (see page 27) must be set. It is useful to enable “Anticollision Select Mode” in CFG5: Anticollision (see page 43) if there is a large or unknown number of transponders in the antenna field. The Auto Read Modes can be used with the Antenna Multiplex Mode, the parameters for this function have to be configured in CFG15: Antenna Multiplexing (see page 61).

Page Summary

IDX	Field	Description / Value
0	TR-DATA1	Contains configuration flags for event layout.
1	TR-DATA2	Contains configuration flags for event layout.
2	TR-DATA3	Contains configuration flags for event layout.
3	BANK-NR	Defines the format of the bank number.
4–5	DB-ADR	Address of the first data block.
6–7	-	Reserved
8–9	DB-N	Defines the number of data blocks.
10–13	-	Reserved

Parameter	Logical Name
IDD	OperatingMode.AccessMode.DataSelector.UID

Location

Configuration Page	Start Byte	Number of Bytes	Start Bit	Number of Bits
11	0	n/a	0	1
Possible Values		**Default Value**	**Unit**	**Reset Required**
b0: Disabled b1: Enabled		b1	-	Soft
Description				
Defines whether the IDD (EPC or EPC+TID) will be stored and transferred.				

Parameter	Logical Name
DB	OperatingMode.AccessMode.DataSelector.Data

Location

Configuration Page	Start Byte	Number of Bytes	Start Bit	Number of Bits
11	0	n/a	1	1
Possible Values		**Default Value**	**Unit**	**Reset Required**
		b0	-	Soft
Description				
Defines whether data blocks will be stored and transferred or not.				

Parameter	Logical Name
BYTE-ORDER-DB	OperatingMode.AccessMode.DataSource.ByteOrderOfData

Location

Configuration Page	Start Byte	Number of Bytes	Start Bit	Number of Bits
11	0	n/a	3	1

Possible Values	Default Value	Unit	Reset Required
0: MSB first 1: LSB first	0	-	Soft

Description

Defines the byte order within frame.

Parameter	Logical Name
BANK-NR	OperatingMode.AccessMode.DataSource.BankNo

Location

Configuration Page	Start Byte	Number of Bytes	Start Bit	Number of Bits
11	3	n/a	0	2

Possible Values	Default Value	Unit	Reset Required
b00: reserved b01: EPC memory bank b10: TID memory bank b11: User memory bank	b01	-	None

Description

Defines the format of the BANK-NR.

ⓘ ***NOTE:***

- ***If Data for Tag Authentication and Decryption by Host is enabled, the transmitted data is according to the settings of the parameter TAG-AUTHENT in CFG4: Transponder Parameters (see page 40). If only an authentication shall be executed, DB-N shall be set to "0".***
- ***If Data for Tag Authentication and Decryption by Host is enabled and authentication with TAM2 is selected in CFG4, the block size for DB-ADR and DB-N is 64 bits. Otherwise the block size is 16 bits.***
- ***If Data for Tag Authentication and Decryption by Host is enabled and authentication with TAM2 is selected in CFG4, maximum 2 data blocks (128 bits) can be read from the transponder.***
- ***If Data for Tag Authentication and Decryption by Host is enabled, the settings for D-START and D-LGT are ignored by the reader.***
- ***If Data for Tag Authentication and Decryption by Host is enabled and data blocks shall be read from the tag, data is transmitted in the following format:***
  >>>customer defined data<<<,>>>Challenge (80 bits random number generated by the reader)<<<,>>>encrypted tag response<<<

Parameter	Logical Name
DB-ADR	OperatingMode.AccessMode.DataSource.FirstDataBlock

Location

Configuration Page	Start Byte	Number of Bytes	Start Bit	Number of Bits
11	4	2	n/a	n/a

Possible Values	Default Value	Unit	Reset Required
0...65535	0	-	Soft

Description

Address of the first data block.

Parameter	Logical Name
DB-N	OperatingMode.AccessMode.DataSource.NoOfDataBlocks

Location

Configuration Page	Start Byte	Number of Bytes	Start Bit	Number of Bits
11	8	2	n/a	n/a

Possible Values	Default Value	Unit	Reset Required
0...65535	1	-	Soft

Description

Number of data blocks

7.11 CFG12: Read Mode – Filter

Page Summary

IDX	Field	Description / Value
0–1	VALID-TIME	Period of time in which the transponder will not be reported a second time.
2–5	TR-ID	Contains transponder identification settings.
6	IN-EV-FLT	Defines whether input events will be notified.
7	ST-EV-FLT	Defines input event settings for Buffered Read Mode and Notification Mode.
8–13	-	Reserved

Parameter	Logical Name
VALID-TIME	OperatingMode.AccessMode.Filter.TransponderValidTime

Location

Configuration Page	Start Byte	Number of Bytes	Start Bit	Number of Bits
12	0	2	0	0
Possible Values		**Default Value**	**Unit**	**Reset Required**
0...65535		55	x 100 ms	Soft

Description

Defines the period of time during which a transponder will not be reported a second time.

CFG12: Read Mode – Filter (see page 56)

Parameter	Logical Name
TR-ID-SOURCE	OperatingMode.Miscellaneous.TransponderIdentification.Source

Location

Configuration Page	Start Byte	Number of Bytes	Start Bit	Number of Bits
12	2	1	n/a	n/a
Possible Values		**Default Value**	**Unit**	**Reset Required**
0: Datablock 1: Serial Number		1	-	Soft

Description

Sets the data source for transponder identification.

Parameter	Logical Name
TR-ID-DB-ADR	OperatingMode.Miscellaneous.TransponderIdentification.DataBlockNo

Location

Configuration Page	Start Byte	Number of Bytes	Start Bit	Number of Bits
12	3	2	n/a	n/a
Possible Values		**Default Value**	**Unit**	**Reset Required**
0...65535		0	-	Soft

Description

Sets the address of the data block for transponder identification. If the data source is set to "b1 = serial number" in TR-ID-SOURCE, TR-ID-DB-ADR will be ignored.

Parameter	Logical Name
TR-ID-DB-N	OperatingMode.Miscellaneous.TransponderIdentification.NoOfDataBlocks

Location

Configuration Page	Start Byte	Number of Bytes	Start Bit	Number of Bits
12	5	1	n/a	n/a

Possible Values	Default Value	Unit	Reset Required
0...255	0	-	Soft

Description

Sets the number of data blocks to be read for transponder identification. If the data source is set to "b1 = serial number" in TR-ID-SOURCE, TR-ID-DB-N will be ignored. If the TR-ID-SOURCE "data block" is used instead of "serial number", it is also necessary to enable and configure the reading of data blocks in CFG11 Read Mode - Read Data.

ⓘ ***NOTE:***

- ***Changing of TR-ID only becomes effective after writing configuration blocks CFG12 to EEPROM and a [0x63] Soft Reset (see page 94).***
- ***The address TR-ID-DB-ADR must be in the range of the selected data blocks:***

  DB-ADR ≤ TR-ID-DB-ADR ≤ DB-ADR + DB-N – 1.
- ***If the TR-ID-SOURCE "data block" is used instead of "serial number", it is also necessary to enable and configure the reading of data blocks in CFG11: Read Mode – Read Data (see page 53).***

7.12 CFG14: Access Control

The parameters of the CFG14 configuration block contain access control settings.

IDX	Field	Description / Value
0	-	Reserved
1	EVENT-NOTI	Defines if the notification of events is enabled.
2	-	Reserved
3	EVENT-LAYOUT	Defines which data will be notified in events.
4–9	-	Reserved
10	OUT1-REL1-ACTIVATION-TIME	Defines the duration during which permitted access on output 1 and relay 1 will be displayed.
11	OUT2-REL2-ACTIVATION-TIME	Defines the duration during which permitted access on output 2 and relay 2 will be displayed.
12	-	Reserved
13	IN-ANT-ASSIGN	Defines which digital input activates which antenna when the trigger function is used.

Parameter	Logical Name
EVENT-NOTI-EN	OperatingMode.AccessMode.Filter.Enable_EventNotification

Location

Configuration Page	Start Byte	Number of Bytes	Start Bit	Number of Bits
14	1	n/a	0	1
Possible Values		**Default Value**	**Unit**	**Reset Required**
b0 or b1		b0	-	None

Description

Defines if the notification of events is enabled (b1) or disabled (b0).

Parameter	Logical Name
IDD-SET	OperatingMode.AccessMode.Transmission.DataLayout.IDD

Location

Configuration Page	Start Byte	Number of Bytes	Start Bit	Number of Bits
14	3	n/a	0	1
Possible Values		**Default Value**	**Unit**	**Reset Required**
b0 or b1		b0	-	None

Description

Defines if the Identifier Data Set is present (b1) or absent (b0) in the structure of an event record.

Parameter	Logical Name
TIME-STAMP	OperatingMode.AccessMode.Transmission.DataLayout.TimeStamp

Location

Configuration Page	Start Byte	Number of Bytes	Start Bit	Number of Bits
14	3	n/a	1	1
Possible Values		**Default Value**	**Unit**	**Reset Required**
b0 or b1		b0	-	None

Description

Defines if the time stamp data set is present (b1) or absent (b0) in the structure of an event record.

Parameter	Logical Name
EVENT-STATUS	OperatingMode.AccessMode.Transmission.DataLayout.Status

Location

Configuration Page	Start Byte	Number of Bytes	Start Bit	Number of Bits
14	3	n/a	2	1
Possible Values		**Default Value**	**Unit**	**Reset Required**
b0 or b1		b0	-	None

Description

Defines if the event status data set is present (b1) or absent (b0) in the structure of an event record.

Parameter	Logical Name
INPUT-STATUS	OperatingMode.AccessMode.Transmission.DataLayout.Input

Location

Configuration Page	Start Byte	Number of Bytes	Start Bit	Number of Bits
14	3	n/a	3	1
Possible Values		**Default Value**	**Unit**	**Reset Required**
b0 or b1		b0	-	None

Description

Defines if the input status data set is present (b1) or absent (b0) in the structure of an event record.

Parameter	Logical Name
ANT-NR	OperatingMode.AccessMode.Transmission.DataLayout.AntennaNo

Location

Configuration Page	Start Byte	Number of Bytes	Start Bit	Number of Bits
14	3	n/a	4	1
Possible Values		**Default Value**	**Unit**	**Reset Required**
b0 or b1		b1	-	None

Description

Defines if the antenna number data set is present (b1) or absent (b0) in the structure of an event record.

Parameter	Logical Name
OUT1-REL1-ACTIVATION-TIME	DigitalIO.Output.No1.AccessMode.AccessActiveTime

Location

Configuration Page	Start Byte	Number of Bytes	Start Bit	Number of Bits
14	10	1	n/a	n/a
Possible Values		**Default Value**	**Unit**	**Reset Required**
0...255		20	* 100 ms	None

Description

Defines the duration in 100 ms increments the reader signalizes permitted access on the digital output and relay 1.

Parameter	Logical Name
OUT2-REL2-ACTIVATION-TIME	DigitalIO.Output.No2.AccessMode.AccessActiveTime

Location

Configuration Page	Start Byte	Number of Bytes	Start Bit	Number of Bits
14	11	1	n/a	n/a
Possible Values		**Default Value**	**Unit**	**Reset Required**
0...255		20	-	None

Description

Defines the duration on 100 ms increments the reader signalizes permitted access on the digital output 2 and relay 2.

Parameter	Logical Name
IN-ANT-ASSIGN	OperatingMode.AccessMode.Trigger.Source.Input.AntennaAssignment

Location

Configuration Page	Start Byte	Number of Bytes	Start Bit	Number of Bits
14	13	n/a	0	1
Possible Values		**Default Value**	**Unit**	**Reset Required**
b0: All antennas b1: IN1 activates ANT1, IN2 activates ANT2		b0	-	None

Description

Defines the assignment between inputs and antennas.

7.13 CFG15: Antenna Multiplexing

The parameters in CFG15 are used to configure the multiplexing of antennas in Auto Read Modes.

Page Summary

IDX	Field	Description / Value
0	MUX-MODE	Activates or deactivates multiplexing.
1	ANT-OUT-INT	Defines the antennas that are used for internal multiplexing.
2–13	-	Reserved

Parameter	Logical Name
MUX-MODE	AirInterface.Multiplexer.Enable

Location

Configuration Page	Start Byte	Number of Bytes	Start Bit	Number of Bits
15	0	n/a	0	1
Possible Values		**Default Value**	**Unit**	**Reset Required**
b0: Disabled b1: Enabled		b1	-	None
Description				
Activates or deactivates multiplexing				

Parameter	Logical Name
ANT-OUT-INT	AirInterface.Multiplexer.UHF.Internal.SelectedAntennas

Location

Configuration Page	Start Byte	Number of Bytes	Start Bit	Number of Bits
15	1	n/a	3	4
Possible Values		**Default Value**	**Unit**	**Reset Required**
see *Table 3*		0	-	None
Description				
Defines the antennas which are used for the internal multiplexing.				

Bit	7	6	5	4	3	2	1	0
Function	-	-	-	ANT2	ANT1	-	0	0
Default	0	0	0	0	0	-	-	-

Table 3

Example:

Reader shall read on antenna 1 and antenna 2:

ANT-OUT-INT = b11

7.14 CFG16: Persistence Reset

The parameters in CFG16 are used to configure the reader reset timing of the persistence flags of the transponders. The timing for reset of the persistence flags is used by the reader in all reader modes.

Page Summary

IDX	Field	Description / Value
0	PERSISTENCE-MODE	Defines whether all antenna ports act as one reading point.
1	-	Reserved
2–3	PER-RESET-TIME-ANT1	Defines the time, which determines the reset of the transponder persistence flags.
4–5	PER-RESET-TIME-ANT2	Defines the time, which determines the reset of the transponder persistence flags.
6–13	-	Reserved

Parameter	Logical Name
PERSISTENCE-MODE	Transponder.PersistenceReset.Mode

Location

Configuration Page	Start Byte	Number of Bytes	Start Bit	Number of Bits
16	0	n/a	0	1

Possible Values	Default Value	Unit	Reset Required
0: All antenna ports act as one reading point (time 1 is used) 1: Each antenna port act as a reading point (individual time)	0	-	None

Description

Defines whether all antenna ports of the reader act as one reading point respectively one signal source or if each antenna acts as a single reading point respectively acts as one independent signal source. This parameter is only applicable in the Access Mode.

Parameter	Logical Name
PER-RESET-TIME-ANT1	Transponder.PersistenceReset.Antenna.No1.PersistenceResetTime

Location

Configuration Page	Start Byte	Number of Bytes	Start Bit	Number of Bits
16	2	2	0	0

Possible Values	Default Value	Unit	Reset Required
0...65535	40	x 5 ms	None

Description

Specifies a time which determines the reset of the transponder persistence flags by the reader. The timer PER-RESET-TIME-ANT1 starts after the reader gets a response at the related antenna port. After this time has expired the reader sends a persistence reset command to the transponders at the related antenna port.
Timer ticks = 5 ms
Max. timer value = 65534 [0xFFFE] * 5 ms = 5,46 min
The value 65535 [0xFFFF] indicates that no persistence reset is performed by the reader.

Parameter	Logical Name
PER-RESET-TIME-ANT2	Transponder.PersistenceReset.Antenna.No2.PersistenceResetTime

Location

Configuration Page	Start Byte	Number of Bytes	Start Bit	Number of Bits
16	4	2	0	0

Possible Values	Default Value	Unit	Reset Required
0...65535	40	x 5 ms	None

Description

Specifies a time which determines the reset of the transponder persistence flags by the reader. The timer PER-RESET-TIME-ANT2 starts after the reader gets a response at the related antenna port. After this time has expired the reader sends a persistence reset command to the transponders at the related antenna port.
Timer ticks = 5 ms
Max. timer value = 65534 [0xFFFE] * 5 ms = 5,46 min
The value 65535 [0xFFFF] indicates that no persistence reset is performed by the reader.

7.15 CFG20: RF Parameter

The parameters of the CFG20 configuration block contain the receiver settings.

Page Summary

IDX	Field	Description / Value
0	RSSI-FILTER-ANT1	Defines the RSSI filter level for antenna 1.
1	RSSI-FILTER-ANT2	Defines the RSSI filter level for antenna 2.
2–9	-	Reserved
10	RF-POWER-ANT2	Defines the RF output power for antenna 2.
11–13	-	Reserved

Parameter	Logical Name
RSSI-FILTER-ANT1	AirInterface.Antenna.UHF.No1.RSSIFilter

Location

Configuration Page	Start Byte	Number of Bytes	Start Bit	Number of Bits
20	0	1	n/a	n/a
Possible Values		**Default Value**	**Unit**	**Reset Required**
0...255		0	-dBm	None

Description

Defines the RSSI filter level. Setting the value to '0' disables the filter.

Parameter	Logical Name
RSSI-FILTER-ANT2	AirInterface.Antenna.UHF.No2.RSSIFilter

Location

Configuration Page	Start Byte	Number of Bytes	Start Bit	Number of Bits
20	1	1	n/a	n/a
Possible Values		**Default Value**	**Unit**	**Reset Required**
0...255		0	-dBm	None

Description

Defines the RSSI filter level. Setting the value to 0 disables the filter.

Parameter	Logical Name
RF-POWER-ANT2	AirInterface.Antenna.UHF.No2.OutputPower

Location

Configuration Page	Start Byte	Number of Bytes	Start Bit	Number of Bits
20	10	n/a	0	6

Possible Values	Default Value	Unit	Reset Required
16: 0.1 W 17: 0.2 W 18: 0.3 W 19: 0.4 W 20: 0.5 W 21: 0.6 W 22: 0.7 W 23: 0.8 W 24: 0.9 W 25: 1.0 W	25	-	None

Description

Defines the RF output power for antenna 2.
If region = Morocco, the max. output power is 0.5 W.

CFG3: RF Interface (see page 34)

ⓘ ***NOTE:***

- ***Only transponders whose received signal strength is above the defined filter level will be displayed.***
- ***Typically a transponder on the surface of the antenna is responding with a signal strength below -15 dBm.***
- ***It is recommended to configure the Persistence Reset Mode in see "CFG16: Persistence Reset", page 62 to the value "b1 = every antenna acts as a reading point". In that way it can be ensured that a transponder which e.g. was first detected on antenna 1 below the RSSI filter level will be displayed when it is read by another antenna above the defined threshold.***
- ***Further details about the RSSI filtering can be found in the separate Application Note N11101-xe-ID-B.pdf.***

7.16 CFG22-27: Selection Masks for EPC Gen 2

The configuration blocks CFG22-27 hold 3 selection masks for selection of EPC Gen 2 transponders. The table below shows which configuration block holds which mask. The reader starts to select tags with mask 1 and sends further selection commands with mask 2 and 2 if these masks are enabled.

Mask Number	Configuration Blocks
1	CFG22/23
2	CFG24/25
3	CFG26/27

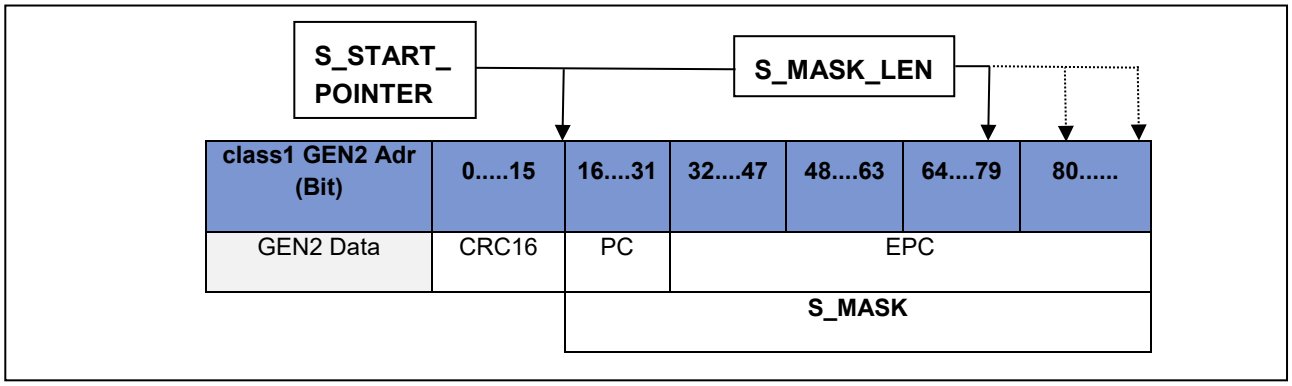
Each selection mask has a format as shown below.

Page Summary (even)

IDX	Field	Description / Value
0	S-MASK-LEN	Defines the length of the mask in bits. If S-MASK-LEN is “0” the selection mask is disabled.
1	S-MODE	**Defines options of the selection mask. See** S-MODE.
2–3	S-START-POINTER	Defines the memory bit address on which the bit string oft the mask is compared to the transponder memory.
4–6	S-MASK-MSB	Most significant bit of the selection mask.
7–13	S-MASK	Contains the first part of the bit string that the transponder compares against the memory location.

Page Summary (odd)

IDX	Field	Description / Value
0–13	S-MASK	Contains the second part of the bit string that the transponder compares against the memory location.



S-MODE

Bit	7	6	5	4	3	2	1	0
Function	0	0	0	0	S-LOGIC	S-NOT	S-BANK	

Field	Description / Value
S-BANK	Defines whether the mask applies to EPC, TID or user memory. b00: Reserved b01: EPC memory bank b10: TID memory bank b11: User memory bank
S-NOT	Defines whether negation is enabled. b0: Negation is disabled. b1: Negation is enabled.
S-LOGIC	Defines the logic function of the masks. b0: “OR” operation b1: “AND” operation

ⓘ ***NOTE:***

- ***S-LOGIC is only available for the second and third selection mask in CFG24 and CFG26.***
- ***If a selection mask is set to the EPC memory bank, the start address should be 0x10 or higher. The first 16 bits are CRC16.***

Parameter	Logical Name
EPC-MASK1-LEN	Transponder.UHF.EPC_Class1Gen2.SelectionMask.No1.MaskLength

Location

Configuration Page	Start Byte	Number of Bytes	Start Bit	Number of Bits
22	0	1	n/a	n/a
Possible Values		**Default Value**	**Unit**	**Reset Required**
0...192		0	-	None
Description				
Defines the length of mask 1 in bits.				

Parameter	Logical Name
EPC-MASK1-BANK-NR	Transponder.UHF.EPC_Class1Gen2.SelectionMask.No1.BankNo

Location

Configuration Page	Start Byte	Number of Bytes	Start Bit	Number of Bits
22	1	n/a	0	2
Possible Values		**Default Value**	**Unit**	**Reset Required**
b01: EPC memory bank b10: TID memory bank b11: User memory bank		b01	-	None
Description				
Defines whether mask 1 applies to EPC, TID or user memory.				

Parameter	Logical Name
EPC-MASK1-NEGATION	Transponder.UHF.EPC_Class1Gen2.SelectionMask.No1.Negation

Location

Configuration Page	Start Byte	Number of Bytes	Start Bit	Number of Bits
22	1	n/a	2	1
Possible Values		**Default Value**	**Unit**	**Reset Required**
b0: No negation b1: Negation		b0	-	None
Description				
Defines if negated selection is enabled for mask 1.				

Parameter	Logical Name
EPC-MASK1-FIRST-BIT	Transponder.UHF.EPC_Class1Gen2.SelectionMask.No1.FirstBit

Location

Configuration Page	Start Byte	Number of Bytes	Start Bit	Number of Bits
22	2	2	n/a	n/a
Possible Values		**Default Value**	**Unit**	**Reset Required**
0...65535		16	-	None
Description				
Defines the memory bit address on which the bit string of mask 1 is compared to the memory of the tag.				

Parameter	Logical Name
EPC-MASK1	Transponder.UHF.EPC_Class1Gen2.SelectionMask.No1.Mask

Location

Configuration Page	Start Byte	Number of Bytes	Start Bit	Number of Bits
22	4	24	n/a	n/a
Possible Values		**Default Value**	**Unit**	**Reset Required**
0x00000000000000000000000000000000000000000000000...0xFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFF		0x00000000000000000000000000000000000000000000000	-	None
Description				
Contains the bit string that the tag compares against the memory location.				

Parameter	Logical Name
EPC-MASK2-LEN	Transponder.UHF.EPC_Class1Gen2.SelectionMask.No2.MaskLength

Location

Configuration Page	Start Byte	Number of Bytes	Start Bit	Number of Bits
24	0	1	n/a	n/a
Possible Values		**Default Value**	**Unit**	**Reset Required**
0...192		0	-	None
Description				
Defines the length of mask 2 in bits.				

Parameter	Logical Name
EPC-MASK2-BANK-NR	Transponder.UHF.EPC_Class1Gen2.SelectionMask.No2.BankNo

Location

Configuration Page	Start Byte	Number of Bytes	Start Bit	Number of Bits
24	1	n/a	0	2

Possible Values	Default Value	Unit	Reset Required
b01: EPC memory bank b10: TID memory bank b11: User memory bank	b01	-	None

Description

Defines whether mask 2 applies to EPC, TID or user memory.

Parameter	Logical Name
EPC-MASK2-NEGATION	Transponder.UHF.EPC_Class1Gen2.SelectionMask.No2.Negation

Location

Configuration Page	Start Byte	Number of Bytes	Start Bit	Number of Bits
24	1	n/a	2	1

Possible Values	Default Value	Unit	Reset Required
b0: No negation b1: Negation	b0	-	None

Description

Defines if negated selection is enabled for mask 2.

Parameter	Logical Name
EPC-MASK2-LOGIC	Transponder.UHF.EPC_Class1Gen2.SelectionMask.No2.Logic

Location

Configuration Page	Start Byte	Number of Bytes	Start Bit	Number of Bits
24	1	n/a	3	1

Possible Values	Default Value	Unit	Reset Required
0: OR operation 1: AND operation	0	-	None

Description

Defines the logic function of mask 2.

Parameter	Logical Name
EPC-MASK2-FIRST-BIT	Transponder.UHF.EPC_Class1Gen2.SelectionMask.No2.FirstBit

Location

Configuration Page	Start Byte	Number of Bytes	Start Bit	Number of Bits
24	2	2	n/a	n/a
Possible Values		**Default Value**	**Unit**	**Reset Required**
0...65535		16	-	None

Description

Defines the memory bit address on which the bit string of mask 2 is compared to the memory of the tag.

Parameter	Logical Name
EPC-MASK2	Transponder.UHF.EPC_Class1Gen2.SelectionMask.No2.Mask

Location

Configuration Page	Start Byte	Number of Bytes	Start Bit	Number of Bits
24	4	24	n/a	n/a
Possible Values		**Default Value**	**Unit**	**Reset Required**
0x00000000000000000000000000000000000000000000000000...0xFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFF		0x00000000000000000000000000000000000000000000000	-	None

Description

Contains the bit string that the tag compares against the memory location.

Parameter	Logical Name
EPC-MASK3-LEN	Transponder.UHF.EPC_Class1Gen2.SelectionMask.No3.MaskLength

Location

Configuration Page	Start Byte	Number of Bytes	Start Bit	Number of Bits
26	0	1	n/a	n/a
Possible Values		**Default Value**	**Unit**	**Reset Required**
0...192		0	-	None

Description

Defines the length of mask 3 in bits.

Parameter	Logical Name
EPC-MASK3-BANK-NR	Transponder.UHF.EPC_Class1Gen2.SelectionMask.No3.BankNo

Location

Configuration Page	Start Byte	Number of Bytes	Start Bit	Number of Bits
26	1	n/a	0	2

Possible Values	Default Value	Unit	Reset Required
b01: EPC memory bank b10: TID memory bank b11: User memory bank	b01	-	None

Description

Defines whether mask 3 applies to EPC, TID or user memory.

Parameter	Logical Name
EPC-MASK3-NEGATION	Transponder.UHF.EPC_Class1Gen2.SelectionMask.No3.Negation

Location

Configuration Page	Start Byte	Number of Bytes	Start Bit	Number of Bits
26	1	n/a	2	1

Possible Values	Default Value	Unit	Reset Required
b0: No negation b1: Negation	b0	-	None

Description

Defines if negated selection is enabled for mask 3.

Parameter	Logical Name
EPC-MASK3-LOGIC	Transponder.UHF.EPC_Class1Gen2.SelectionMask.No3.Logic

Location

Configuration Page	Start Byte	Number of Bytes	Start Bit	Number of Bits
26	1	n/a	3	1

Possible Values	Default Value	Unit	Reset Required
0: OR operation 1: AND operation	0	-	None

Description

Defines the logic function of mask 3.

Parameter	Logical Name
EPC-MASK3-FIRST-BIT	Transponder.UHF.EPC_Class1Gen2.SelectionMask.No3.FirstBit

Location

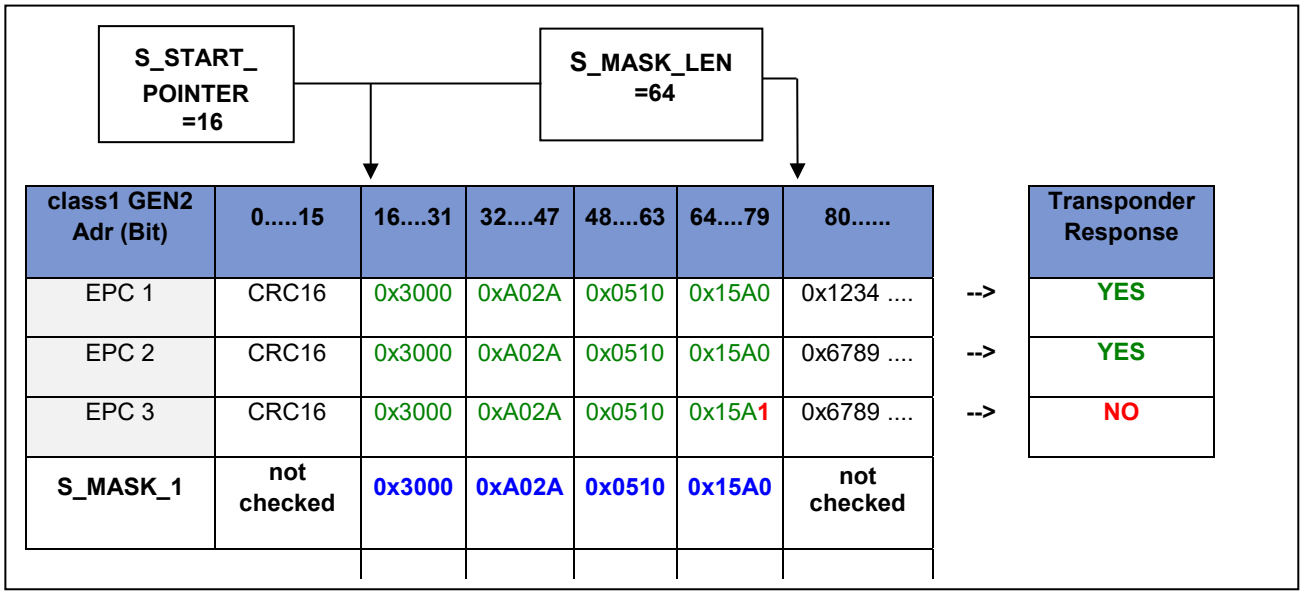
Configuration Page	Start Byte	Number of Bytes	Start Bit	Number of Bits
26	2	2	n/a	n/a
Possible Values		**Default Value**	**Unit**	**Reset Required**
0...65535		16	-	None
Description				
Defines the memory bit address on which the bit string of mask 3 is compared to the memory of the tag.				

Parameter	Logical Name
EPC-MASK3	Transponder.UHF.EPC_Class1Gen2.SelectionMask.No3.Mask

Location

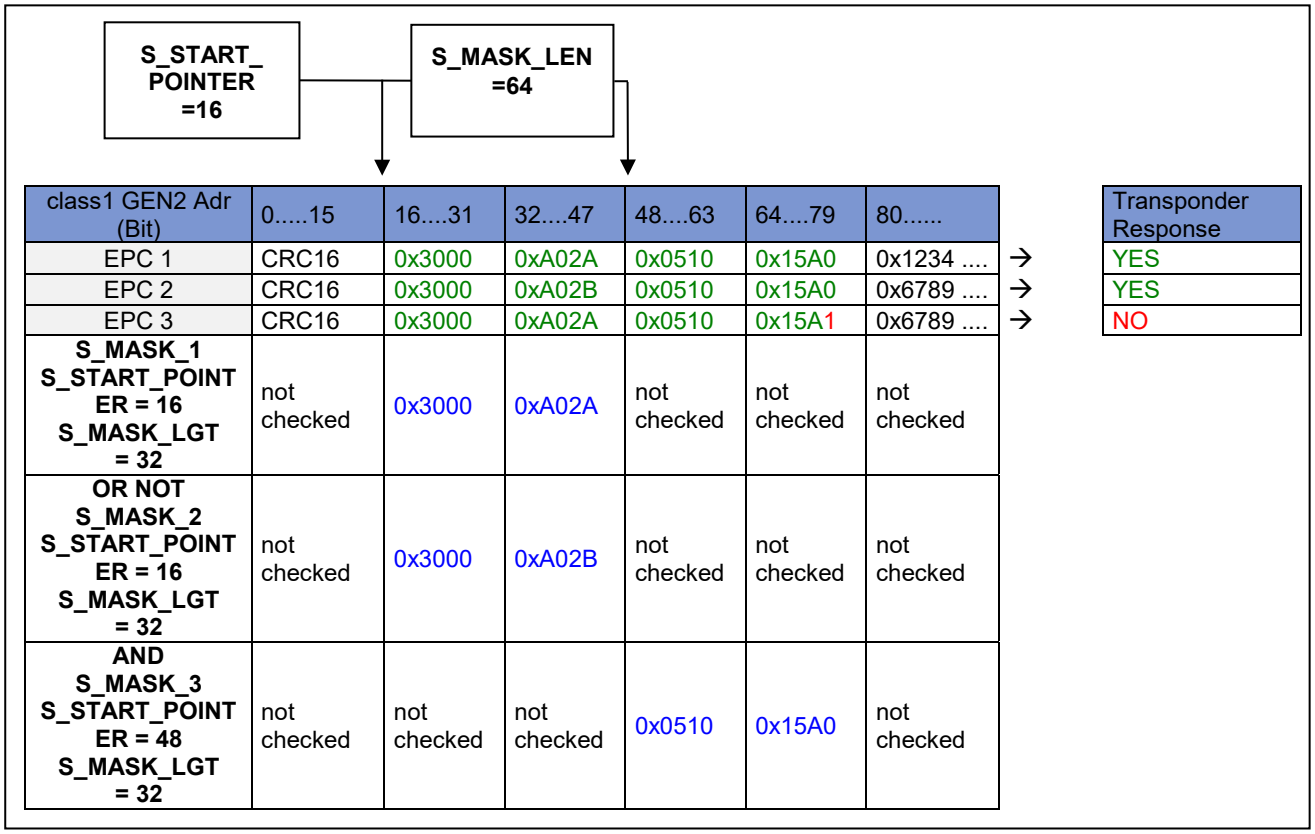
Configuration Page	Start Byte	Number of Bytes	Start Bit	Number of Bits
26	4	24	n/a	n/a
Possible Values		**Default Value**	**Unit**	**Reset Required**
0x00000000000000000000000000000000000000000000000...0xFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFF		0x000000000000000000000000000000000000000000000000	-	None
Description				
Contains the bit string that the tag compares against the memory location.				

Example 1:



class1 GEN2 Adr (Bit)	0.....15	16....31	32....47	48....63	64....79	80.....		Transponder Response
EPC 1	CRC16	0x3000	0xA02A	0x0510	0x15A0	0x1234	-->	YES
EPC 2	CRC16	0x3000	0xA02A	0x0510	0x15A0	0x6789	-->	YES
EPC 3	CRC16	0x3000	0xA02A	0x0510	0x15A1	0x6789	-->	NO
S_MASK_1	**not checked**	**0x3000**	**0xA02A**	**0x0510**	**0x15A0**	**not checked**		

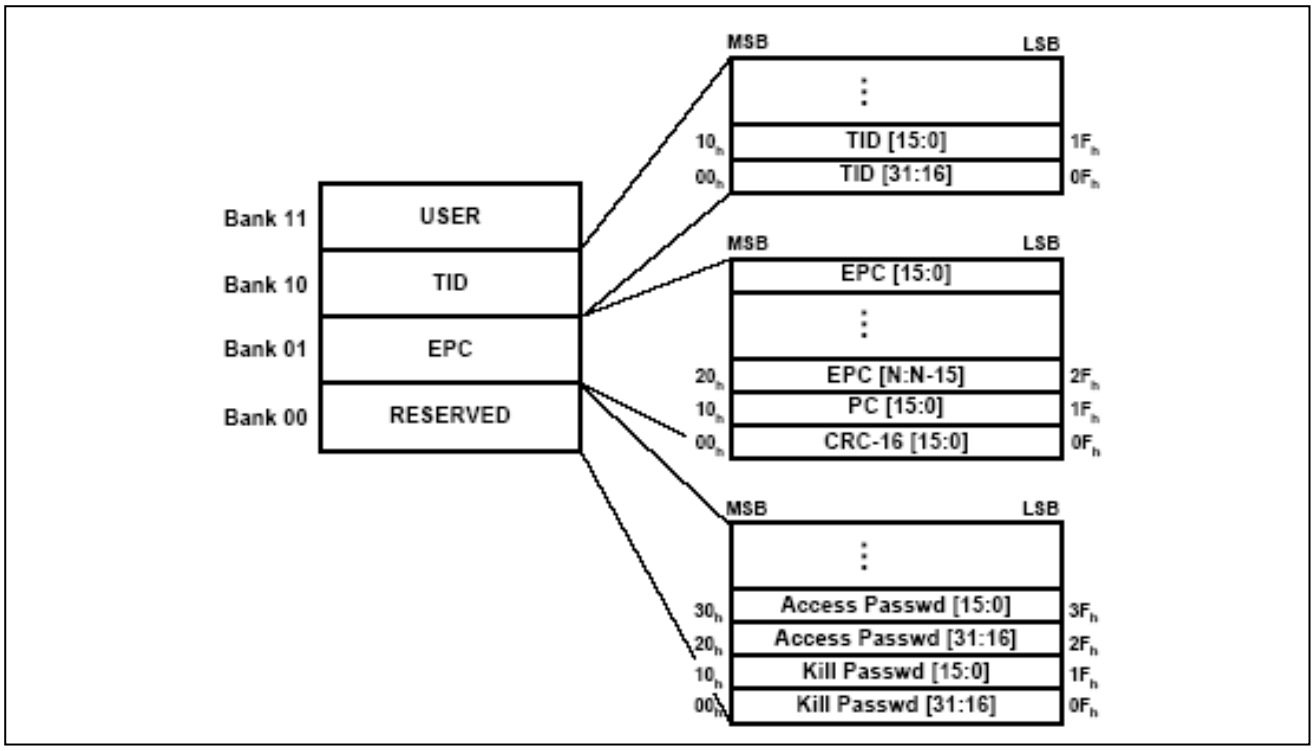
Example 2:



class1 GEN2 Adr (Bit)	0.....15	16....31	32....47	48....63	64....79	80.....		Transponder Response
EPC 1	CRC16	0x3000	0xA02A	0x0510	0x15A0	0x1234	→	YES
EPC 2	CRC16	0x3000	0xA02B	0x0510	0x15A0	0x6789	→	YES
EPC 3	CRC16	0x3000	0xA02A	0x0510	0x15A1	0x6789	→	NO
S_MASK_1 S_START_POINT ER = 16 S_MASK_LGT = 32	not checked	0x3000	0xA02A	not checked	not checked	not checked		
OR NOT S_MASK_2 S_START_POINT ER = 16 S_MASK_LGT = 32	not checked	0x3000	0xA02B	not checked	not checked	not checked		
AND S_MASK_3 S_START_POINT ER = 48 S_MASK_LGT = 32	not checked	not checked	not checked	0x0510	0x15A0	not checked		

The compare starts always with mask1, mask2 and finishes with mask3. An AND-operation has no priority over an OR-operation.

EPC class GEN2 Memory specification: Source: EPCglobal



7.17 CFG33–34: LAN Hostname

The configuration blocks 33-34 contain the LAN hostname.

CFG33:

IDX	Field	Description / Value
0	LENGTH	Defines the length of the LAN hostname.
1–13	LAN-HOSTNAME	Defines the LAN hostname.

CFG34:

IDX	Field	Description / Value
0–13	LAN-HOSTNAME	Defines the LAN hostname.

Parameter	Logical Name
HOSTNAME-LENGTH	HostInterface.LAN.Hostname.Length

Location

Configuration Page	Start Byte	Number of Bytes	Start Bit	Number of Bits
33	0	1	n/a	n/a
Possible Values		**Default Value**	**Unit**	**Reset Required**
0...27		0	-	None
Description				
Defines the length of the LAN hostname.				

ⓘ ***NOTE:***

- ***The LAN hostname can have a maximum length of 27 bytes.***
- ***If the length is "0", the reader automatically sets the hostname to "Reader name + MAC address".***

Parameter	Logical Name
LAN-HOSTNAME	HostInterface.LAN.Hostname.Name

Location

Configuration Page	Start Byte	Number of Bytes	Start Bit	Number of Bits
33	1	27	n/a	n/a
Possible Values		**Default Value**	**Unit**	**Reset Required**
		MAX.U500i-"MAC address"	-	None
Description				
Defines the LAN hostname.				

7.18 CFG40: LAN Settings, Part 1

The configuration block CFG40 contains the configuration of the IP address and the port number.

IDX	Field	Description / Value
0–3	IP-ADDRESS-LAN	Defines the LAN IP address.
4–7	-	Reserved
8–9	IP-PORT-NUMBER-LAN	Defines the LAN port number.
10–13	-	Reserved

Parameter	Logical Name
IP-ADDRESS-LAN	HostInterface.LAN.IPv4.IPAddress

Location

Configuration Page	Start Byte	Number of Bytes	Start Bit	Number of Bits
40	0	4	n/a	n/a
Possible Values		Default Value	Unit	Reset Required
		192.168.10.10	-	Hard

Description

Defines the IP address for wired LAN connection. Changing of this parameter only becomes effective after writing/saving this configuration block to EEPROM and a [0x64] System Reset.

Parameter	Logical Name
IP-PORT-NUMBER-LAN	HostInterface.LAN.PortNumber

Location

Configuration Page	Start Byte	Number of Bytes	Start Bit	Number of Bits
40	8	2	n/a	n/a
Possible Values		Default Value	Unit	Reset Required
0...65535		10001	-	Hard

Description

Defines the port number for wired LAN connection. Changing of this parameter only becomes effective after writing/saving this configuration block to EEPROM and a [0x64] System Reset.

7.19 CFG41: LAN Settings, Part 2

The configuration block CFG41 contains the configuration of the Subnet Mask and other LAN options.

IDX	Field	Description / Value
0–3	SUBNET-MASK-LAN	Defines the LAN subnet mask.
4	LAN-OPTIONS	Defines further LAN options.
5	KEEP-CNT	Specifies the max. number of retransmissions.
6–9	GW-ADDRESS-LAN	Defines the LAN gateway address.
10–11	-	Reserved
12–13	KEEP-ALIVE	Defines keep-alive options.

ⓘ ***NOTE:***

- ***The command has no effect on this setting.***
- ***Changing of this parameter only becomes effective after writing this configuration block to EEPROM and a .***

Parameter	Logical Name
SUBNET-MASK-LAN	HostInterface.LAN.IPv4.SubnetMask

Location

Configuration Page	Start Byte	Number of Bytes	Start Bit	Number of Bits
41	0	4	n/a	n/a
Possible Values		Default Value	Unit	Reset Required
		255.255.0.0	-	Hard

Description

Defines the subnet mask for wired TCP/IP connection. Changing of this parameter only becomes effective after writing/saving this configuration block to EEPROM and a [0x64] System Reset of the RF Controller.

Parameter	Logical Name
KEEP-ALIVE	HostInterface.LAN.Keepalive.Enable

Location

Configuration Page	Start Byte	Number of Bytes	Start Bit	Number of Bits
41	4	n/a	0	1
Possible Values		Default Value	Unit	Reset Required
b0: Keep-Alive option disabled b1: Keep-Alive option enabled		b0	-	Soft

Description

Enables or disables the Keep-Alive option.

Parameter	Logical Name
DISABLE-AUTO-NEGOTIATION	HostInterface.LAN.Autonegotiation.Disable

Location

Configuration Page	Start Byte	Number of Bytes	Start Bit	Number of Bits
41	4	n/a	3	1

Possible Values	Default Value	Unit	Reset Required
b0: Auto-Negotiation enabled b1: Auto-Negotiation disabled	b0	-	Soft

Description

Disables or re-enables Auto-Negotiation.

Parameter	Logical Name
HOSTNAME	HostInterface.LAN.Hostname.Enable

Location

Configuration Page	Start Byte	Number of Bytes	Start Bit	Number of Bits
41	4	n/a	4	1

Possible Values	Default Value	Unit	Reset Required
b0: Hostname option disabled b1: Hostname option enabled	b0	-	Soft

Description

Enables or disables the Hostname option.

Parameter	Logical Name
DUPLEX	HostInterface.LAN.Autonegotiation.Duplex

Location

Configuration Page	Start Byte	Number of Bytes	Start Bit	Number of Bits
41	4	n/a	5	1

Possible Values	Default Value	Unit	Reset Required
0x00: Half Duplex 0x01: Full Duplex	0x00	-	Soft

Description

Defines whether half duplex or full duplex is used for data transmission if auto-negotiation is disabled.

Parameter	Logical Name
SPEED	HostInterface.LAN.Autonegotiation.Speed

Location

Configuration Page	Start Byte	Number of Bytes	Start Bit	Number of Bits
41	4	n/a	6	1

Possible Values	Default Value	Unit	Reset Required
0x00: 10 MBit 0x01: 100 MBit	0x00	-	Soft

Description

Defines the speed of the data transmission if auto-negotiation is disabled.

Parameter	Logical Name
DHCP	HostInterface.LAN.IPv4.Enable_DHCP

Location

Configuration Page	Start Byte	Number of Bytes	Start Bit	Number of Bits
41	4	n/a	7	1
Possible Values		**Default Value**	**Unit**	**Reset Required**
b0: DHCP client disabled b1: DHCP client enabled		b0	-	Soft

Description

Enables or disables the DHCP client.

Parameter	Logical Name
KEEP-CNT	HostInterface.LAN.Keepalive.RetransmissionCount

Location

Configuration Page	Start Byte	Number of Bytes	Start Bit	Number of Bits
41	5	1	n/a	n/a
Possible Values		**Default Value**	**Unit**	**Reset Required**
1...255		2	-	Soft

Description

Specifies the maximum number of retransmissions. This is the number of times that the reader re-transmits a keep-alive packet to the host to check for connectivity.

Parameter	Logical Name
GW-ADDRESS-LAN	HostInterface.LAN.IPv4.GatewayAddress

Location

Configuration Page	Start Byte	Number of Bytes	Start Bit	Number of Bits
41	6	4	n/a	n/a
Possible Values		**Default Value**	**Unit**	**Reset Required**
		0.0.0.0	-	Soft

Description

Defines the gateway address for TCP/IP connection. Changing of this parameter only becomes effective after writing/saving this configuration block to EEPROM and a [0x64] System Reset of the RF Controller.

Parameter	Logical Name
KEEP-ALIVE-IDLE-TIME	HostInterface.LAN.Keepalive.IdleTime

Location

Configuration Page	Start Byte	Number of Bytes	Start Bit	Number of Bits
41	10	2	n/a	n/a
Possible Values		**Default Value**	**Unit**	**Reset Required**
1...65535		2	s	Soft

Description

Defines the idle time of the keep-alive notification.

Parameter	Logical Name
KEEP-INTERVAL	HostInterface.LAN.Keepalive.IntervalTime

Location

Configuration Page	Start Byte	Number of Bytes	Start Bit	Number of Bits
41	12	2	n/a	n/a

Possible Values	Default Value	Unit	Reset Required
1...65535	5	s	Soft

Description

Sets the Keep-Alive interval. This is the polling frequency used to determine if a keep-alive exchange is needed. This interval is used when the connection failed.

ⓘ ***NOTE:***

- ***The command [0x83] Reset Configuration (see page 91) has no effect on this setting.***
- ***Changing of this parameter only becomes effective after writing this configuration block to EEPROM and a [0x64] Hard Reset (see page 95).***

7.20 CFG47: Summer/Winter Time

The parameters of the CFG47 configuration block contain settings for summer/winter time change-over.

IDX	Field	Description / Value
0–7	-	Reserved
8	WDAY	Defines the day of the week when the change should occur.
9	SMONTH	Defines the starting month for daylight saving time.
10	SDAY-BGN	Defines the type of changeover depending on WDAY-BGN.
11	SDAY-END	Defines the type of changeover depending on WDAY-END.
12	SHOUR	Defines the time of day when the changeover should occur.
13	MIN-STEP	Defines the difference by which the clock time deviates from winter to summer time.

ⓘ ***NOTE:***

SHOUR-END and SHOUR-BGN refer to standard time (winter time). If the end of daylight saving time needs to for example 3:00 and the clock has to be set back by 1 hour, SHOUR-END should be defined as =2:00. To have the change-over occur on Saturday at 23:59, the change-over time must be configured for Sunday at 00:00.

For no change, set all parameters to 0x00.

Parameter	Logical Name
WDAY	

Location

Configuration Page	Start Byte	Number of Bytes	Start Bit	Number of Bits
47	8	1	n/a	n/a

Possible Values	Default Value	Unit	Reset Required
0: Changeover time is defined by SMONTH. 1: Sunday 2: Monday 3: Tuesday 4: Wednesday 5: Thursday 6: Friday 7: Saturday	0x11 (Sunday)	-	None

Description

Together with SDAY_BGN and SDAY-END, defines the day of the week or date when the respective change should occur. The parameter consists of the two subparameters WDAY-BGN (Bits 0-3) and WDAY-END (Bits 4-7), which define the start and end day (see Possible Values).
For example start day Saturday and end day Friday result in the hex value 0x67.

Parameter	Logical Name
SMONTH	

Location

Configuration Page	Start Byte	Number of Bytes	Start Bit	Number of Bits
47	9	1	n/a	n/a

Possible Values	Default Value	Unit	Reset Required
0: Change disabled 1: January 2: February 3: March 4: April 5: May 6: June 7: July 8: August 9: September 10: October 11: November 12: December	0xA3 (March-October)	-	None

Description

Defines the starting month for daylight saving time. The parameter consists of the two subparameters SMONTH-BGN (Bits 0-3) and SMONTH-END (Bits 4-7), which define the start and end month (see Possible Values).
For example start month March and end month October result in the hex value 0xA3.

Parameter	Logical Name
SDAY-BGN	

Location

Configuration Page	Start Byte	Number of Bytes	Start Bit	Number of Bits
47	10	1	n/a	n/a

Possible Values	Default Value	Unit	Reset Required
1...31	25	-	None

Description

Defines the type of changeover depending on WDAY_BGN.

Parameter	Logical Name
SDAY-END	

Location

Configuration Page	Start Byte	Number of Bytes	Start Bit	Number of Bits
47	11	1	n/a	n/a

Possible Values	Default Value	Unit	Reset Required
1...31	25	-	None

Description

Defines the type of changeover depending on WDAY-END. If WDAY-END > 0, it is a weekday changeover, meaning it occurs on the weekday defined by WDAY-END which lies between the days SDAY-BGN and SDAY-END + 6. For example: To have the changeover take place on the last Sunday of a month having 31 days, set WDAY-END = 1 and SDAY-END = 25 (31-6). The changeover then takes place on the Sunday which occurs between the 25th and 31st of the month defined by SMONTH. To have the changeover occur for example on the first Friday of a month, set WDAY = 6 and SDAY = 1.

Parameter	Logical Name
SHOUR	

Location

Configuration Page	Start Byte	Number of Bytes	Start Bit	Number of Bits
47	12	1	n/a	n/a

Possible Values	Default Value	Unit	Reset Required
0: Midnight 1: 01:00 / 1 am 2: 02:00 / 2am 3: 03:00 / 3 am 4: 04:00 / 4 am 5: 05:00 / 5 am 6: 06:00 / 6 am 7: 07:00 / 7 am 8: 08:00 / 8 am 9: 09:00 / 9 am 10: 10:00 / 10 am 11: 11:00 / 11 am 12: 12:00 / 12 pm 13: 13:00 / 1 pm 14: 14:00 / 2 pm 15: 15:00 / 3 pm	0x22 (2:00 / 2 am)	-	None

Description

Defines the time of day in full hours between midnight (0) and 15:00 (15) when the changeover should occur.
The bits 0-3 define the start hour, the bits 4-7 define the end hour.

Parameter	Logical Name
MIN-STEP	

Location

Configuration Page	Start Byte	Number of Bytes	Start Bit	Number of Bits
47	13	1	n/a	n/a

Possible Values	Default Value	Unit	Reset Required
0...127	60	min	None

Description

Defines the difference by which the clock time deviates from winter to summer time. The parameters consists of the two sub parameters SIGN and MIN-INC. SIGN specifies the sign for the minute increments: 1 = "-", 0 = "+".
MIN-INC defines the number of minutes by which the clock time deviates in DST mode from standard time. The value range is 0..127.

7.21 CFG49: Notification Channel

The configuration block CFG49 contains settings for the Notification in Access Mode.

IDX	Field	Description / Value
0	MODE	Defines the mode of the notification.
1–3	-	Reserved
4	KEEP-ALIVE	Defines whether a keep-alive notification is enabled.
5–6	KEEP-ALIVE-TIME	Defines the cycle time of the keep-alive notification.
7–10	DEST-IP-ADDRESS	Defines the IP address of the destination server.
11–12	DEST-IP-PORT	Defines the port number of the destination server.
13	HOLD-TIME	Defines the connection hold time.

Parameter	Logical Name
KEEP-ALIVE-EN	OperatingMode.AccessMode.Transmission.KeepAlive.Enable

Location

Configuration Page	Start Byte	Number of Bytes	Start Bit	Number of Bits
49	4	n/a	0	1
Possible Values		**Default Value**	**Unit**	**Reset Required**
b0: Disabled b1: Enabled		b0	-	None

Description

Defines whether the keep-alive notification is enabled or disabled.

Parameter	Logical Name
KEEP-ALIVE-TIME	OperatingMode.AccessMode.Transmission.KeepAlive.IntervalTime

Location

Configuration Page	Start Byte	Number of Bytes	Start Bit	Number of Bits
49	5	2	n/a	n/a
Possible Values		**Default Value**	**Unit**	**Reset Required**
0...65535		600	s	None

Description

Defines the cycle time keep-alive notification.

Parameter	Logical Name
DEST-IP-ADDRESS	OperatingMode.AccessMode.Transmission.Destination.IPv4.IPAddress

Location

Configuration Page	Start Byte	Number of Bytes	Start Bit	Number of Bits
49	7	4	n/a	n/a
Possible Values		**Default Value**	**Unit**	**Reset Required**
		0.0.0.0	-	None

Description

Defines the IP address of the destination server.

Parameter	Logical Name
DEST-IP-PORT-NUMBER	OperatingMode.AccessMode.Transmission.Destination.PortNumber

Location

Configuration Page	Start Byte	Number of Bytes	Start Bit	Number of Bits
49	11	2	0	0
Possible Values		**Default Value**	**Unit**	**Reset Required**
0...65535		0	-	None

Description

Defines the port number of the destination server.

Parameter	Logical Name
HOLD-TIME	OperatingMode.AccessMode.Transmission.Destination.ConnectionHoldTime

Location

Configuration Page	Start Byte	Number of Bytes	Start Bit	Number of Bits
49	13	1	n/a	n/a
Possible Values		**Default Value**	**Unit**	**Reset Required**
0...255		1	s	None

Description

Defines the connection hold time.

7.22 CFG63: Customer Parameters

The configuration block CFG63 is used for customer parameters. Any kind of customer hex data can be stored in this EEPROM or RAM memory area.

Page Summary

IDX	Field	Description / Value
0–13	-	Reserved

[0x63] Soft Reset (see page 94)

8 Protocols for Reader Configuration

Via the protocols for reader configuration, the reader may be adapted to individual conditions of application within wide limits.

8.1 [0x80] Read Configuration

By using the command [0x80] Read Configuration the actual configuration of the reader can be detected. In order to do this, the configuration is read in blocks of 14 bytes each and addressed by CFGn in the byte CFG-ADR.

Summary REQUEST-PAYLOAD

Field	Description / Value	Length
COMMAND	0x80: Read Configuration	1
CFG-ADR	Address of the configuration block.	1

Summary RESPONSE-PAYLOAD

Field	Description / Value	Length
COMMAND	0x80: Read Configuration	1
STATUS	Status message from the reader	1
CFG-REC	Configuration block read from the address CFG-ADR.	14

Details REQUEST-PAYLOAD

Field	Description / Value
COMMAND	0x80: Read Configuration
CFG-ADR	Controls the command. For the defined flags see CFG-ADR.

CFG-ADR

Bit	7	6	5	4	3	2	1	0
Function	LOCATION	0	CFGn					

Field	Description / Value
CFGn	Defines the memory address of the configuration block.
LOCATION	Specifies the location of the configuration block. b0: RAM b1: EEPROM

Details RESPONSE-PAYLOAD

Field	Description / Value
COMMAND	0x80: Read Configuration
STATUS	Status message from the reader
CFG-REC	14 bytes configuration block read from address CFGn in CFG-ADR.

ⓘ ***NOTE:***

A [0x80] Read Configuration command from EEPROM with reserved configuration blocks will cause status code 0x15.

8.2 [0x81] Write Configuration

The configuration of the reader can be changed by means of the Write Configuration command. In order to do this, the configuration memory is written to with 14 bytes long blocks and addressed by CFGn in the byte CFG-ADR. The description of parameters can be taken from chapter Configuration Parameters (see page 23).

Summary REQUEST-PAYLOAD

Field	Description / Value	Length
COMMAND	0x81: Write Configuration	1
CFG-ADR	Address of the configuration block	1
CFG-REC	Configuration block to be written to the address CFG-ADR.	14

Summary RESPONSE-PAYLOAD

Field	Description / Value	Length
COMMAND	0x81: Write Configuration	1
STATUS	Status message from the reader.	1

Details REQUEST-PAYLOAD

Field	Description / Value
COMMAND	0x81: Write Configuration
CFG-ADR	Controls the command. For the defined flags see CFG-ADR.
CFG-REC	14 bytes configuration block to be written to address CFGn in CFG-ADR.

CFG-ADR

Bit	7	6	5	4	3	2	1	0
Function	LOCATION	0	CFGn					

Field	Description / Value
CFGn	Defines the memory address of the configuration block.
LOCATION	Specifies the location of the configuration block. b0: RAM b1: EEPROM

NOTE:

A [0x81] Write Configuration command to EEPROM with reserved configuration blocks will cause status code 0x16.

8.3 [0x83] Reset Configuration

Using the command [0x83] Reset Configuration each configuration block can be reset to the manufacturer's setting.

Summary REQUEST-PAYLOAD

Field	Description / Value	Length
COMMAND	0x83: Reset Configuration	1
CFG-ADR	Address of the configuration block	1

Summary RESPONSE-PAYLOAD

Field	Description / Value	Length
COMMAND	0x83: Reset Configuration	1
STATUS	Status message from the reader	1

Details REQUEST-PAYLOAD

Field	Description / Value
COMMAND	0x83: Reset Configuration
CFG-ADR	Controls the command. For the defined flags see CFG-ADR.

CFG-ADR

Bit	7	6	5	4	3	2	1	0
Function	LOCATION	MODE	CFGn					

Field	Description / Value
CFGn	Defines the memory address of the configuration block.
MODE	Specifies which part of the configuration will be reset. "b1: all"" refers only to those configuration parameters for which the value "None" is noted in "Reset Required". b0: Configuration block specified by CFGn b1: All configuration blocks
LOCATION	Specifies the location of the configuration block. b0: RAM b1: EEPROM

ⓘ ***NOTE:***

A [0x83] Reset Configuration command with reserved configuration blocks will cause status code 0x16.

8.4 [0x87] Set System Time and Date

The command [0x87] Set System Time and Date sets the internal system timer and the date.

Summary REQUEST-PAYLOAD

Field	Description / Value	Length
COMMAND	0x87: Set System Time and Date	1
CENTURY	Defines the century (first two digits of the year): 0–99	1
YEAR	Defines the year (last two digits of the year): 0–99	1
MONTH	Defines the month: 1–12	1
DAY	Defines the day: 1–31	1
TIME ZONE	Defines the time zone: 0–23	1
H	Defines the hour: 0–23	1
MIN	Defines the minute: 0–59	1
MS	Defines the millisecond: 0–59999	2

Summary RESPONSE-PAYLOAD

Field	Description / Value	Length
COMMAND	0x87: Set System Time and Date	1
STATUS	Status message from the reader	1

8.5 [0x88] Get System Time and Date

The command [0x88] Get System Time and Date reads the internal system timer and the date.

Summary REQUEST-PAYLOAD

Field	Description / Value	Length
COMMAND	0x88: Get System Time and Date	1

Summary RESPONSE-PAYLOAD

Field	Description / Value	Length
COMMAND	0x88: Get System Time and Date	1
STATUS	Status message from the reader	1
CENTURY	Defines the century (first two digits of the year): 0–99	1
YEAR	Defines the year (last two digits of the year): 0–99	1
MONTH	Defines the month: 1–12	1
DAY	Defines the day: 1–31	1
TIME ZONE	Defines the time zone: 0–23	1
H	Defines the hour: 0–23	1
MIN	Defines the minute: 0–59	1
MS	Defines the millisecond: 0–59999	2

9 Protocols for Reader Control

9.1 [0x63] Soft Reset

This command allows you to perform a soft reset, which resets the RF controller of the reader.

Summary REQUEST-PAYLOAD

Field	Description / Value	Length
COMMAND	0x63: Soft Reset	1

Summary RESPONSE-PAYLOAD

Field	Description / Value	Length
COMMAND	0x63: Soft Reset	1
STATUS	Status message from the reader	1

ⓘ ***NOTE:***

- ***The RF field will be switched off after a [0x63] Soft Reset command.***
- ***Commands issued after a [0x63] Soft Reset command must be delayed with at least 500 ms, otherwise the reader will not respond.***

9.2 [0x64] Hard Reset

This protocol allows you to perform a hard reset, which is equivalent to a system reboot.

Summary REQUEST-PAYLOAD

Field	Description / Value	Length
COMMAND	0x64: Hard Reset	1
MODE	Defines the controller, which will be reset.	1

Summary RESPONSE-PAYLOAD

Field	Description / Value	Length
COMMAND	0x64: Hard Reset	1
STATUS	Status message from the reader	1

Details REQUEST-PAYLOAD

Field	Description / Value
COMMAND	0x64: Hard Reset
MODE	Defines the controller, which will be reset. For the defined flags see MODE.

MODE

Bit	7	6	5	4	3	2	1	0
Function	0	0	Anti-passback	0	0	0	0	RF Controller

Field	Description / Value
RF Controller	Specifies if the controller will be reset. b0: Do not reset controller b1: Reset controller
Antipassback	Specifies if the Antipassback function will be cleared. b0: Do not clear Antibassback b1: Clear Antipassback

ⓘ **NOTE (only for Mode 0x00)**

- ***The RF field will be switched off after an [0x64] Hard Reset command.***
- ***The communication interface will be reset.***

9.3 [0x66] Get Reader Info

This protocol allows you to determine the currently installed firmware version, its type and the types of transponders which are supported by the firmware as well as some other hard- and firmware options of the reader. Also the Device-ID can be determined.

Summary REQUEST-PAYLOAD

Field	Description / Value	Length
COMMAND	0x66: Get Reader Info	1
MODE	Defines what type of information is requested.	1

Summary RESPONSE-PAYLOAD

Field	Description / Value	Length
COMMAND	0x66: Get Reader Info	1
STATUS	Status message from the reader	1
DATA	Depending on the requested MODE parameter, the response has a different structure including different information and length.	N

Details REQUEST-PAYLOAD

Field	Description / Value
COMMAND	0x66: Get Reader Info
MODE	Depending on the value of the MODE parameter, the reader response has a different structure including different information. 0x00: RF Controller Firmware 0x05: Bootloader Firmware 0x10: Hardware Information 0x15: RF Stack Firmware 0x40: CFG information for read 0x41: CFG information for write 0x50: LAN information MAC 0x51: LAN information IP address 0x52: LAN information netmask 0x53: LAN information gateway address 0x60: I/O Capabilities 0x80: Device ID (information is required for firmware upgrades) 0xFF: All

9.3.1 MODE 0x00 (RF Controller Firmware)

Field	Description / Value	Length
COMMAND	0x66: Get Reader Info	1
STATUS	Status message from the reader	1
SW-REV	Version of the firmware. Forms the first two digits of the three digits firmware number (e.g. **02**.**10**.00).	2
D-REV	Revision status of the firmware. Forms the last digit of the three digits firmware number. ".00" indicates that the firmware is released, whereas ≥".129" indicates that the firmware is a release candidate (e.g. 02.10.**00**).	1
HW-TYPE	Displays information about the hardware version.	1
SW-TYPE	Type of RFC reader firmware. 0x5F: ID LRU500i family (95)	1
TR-TYPE	Displays the transponders supported by the RFC software.	2
RX-BUF	RX-BUF is the maximum receive buffer size of the reader. If a protocol from the host exceeds the RX-BUF size the reader responds with "0x81 PROTOCOL LENGTH ERROR".	2
TX-BUF	TX-BUF is the maximum transmit buffer size of the reader. The host has to take in to account that a response protocol of the reader can have this length.	2
-	Reserved (always 0x00 0x00)	2
RDR-REV	Revision of the reader	1
RDR-ASSEMBLY	Assembly of the reader: 0x01: LRU500i-BD 0x02: LRU500i-PoE 0x03: MAX.U500i	1

9.3.2 MODE 0x05 (Bootloader Firmware)

Field	Description / Value	Length
COMMAND	0x66: Get Reader Info	1
STATUS	Status message from the reader	1
SW-REV	Version of the bootloader firmware	2

9.3.3 MODE 0x10 (Hardware Information)

Field	Description / Value	Length
COMMAND	0x66: Get Reader Info	1
STATUS	Status message from the reader	1
HW-INFO	internal use	2
D-HW	internal use	2
A-HW	internal use	2
FREQUENCY	Flags for supported frequencies. See FREQUENCY	1
PORT-TYPE	Flags for supported communication ports. See PORT-TYPE	1
Reserved	-	3

FREQUENCY

Bit	7	6	5	4	3	2	1	0
Function	HF	UHF	0	0	0	LOCK	FCC	EU

Field	Description / Value
EU	b0: EU frequencies not supported b1: EU frequencies supported
FCC	b0: FCC frequencies not supported b1: FCC frequencies supported
LOCK	b0: Region is not locked b1: Region is locked
UHF	b0: UHF not supported b1: UHF supported
HF	b0: HF not supported b1: HF supported

PORT-TYPE

Bit	7	6	5	4	3	2	1	0
Function	DISC	0	BT	USB	WLAN	LAN	RS4xx	RS232

Field	Description / Value
RS232	b0: RS232 not supported b1: RS232 supported
RS4xx	b0: RS4xx not supported b1: RS4xx supported
LAN	b0: LAN not supported b1: LAN supported
WLAN	b0: WLAN not supported b1: WLAN supported
USB	b0: USB not supported b1: USB supported
BT	b0: Bluetooth not supported b1: Bluetooth supported
DISC	b0: Discovery not supported b1: Discovery supported

9.3.4 MODE 0x15 (RF Stack Firmware)

Field	Description / Value	Length
COMMAND	0x66: Get Reader Info	1
STATUS	Status message from the reader	1
SW-REV	Version of the firmware (e.g. 01.00)	2

9.3.5 MODE 0x40/0x41 (CFG Information for Read/Write)

Field	Description / Value	Length
COMMAND	0x66: Get Reader Info	1
STATUS	Status message from the reader	1
NR-OF-PAGES	Defines the number of the readable/writeable configuration pages.	2
PERMISSION	See PERMISSION	8

PERMISSION

Byte	**7**							
Bit	7	6	5	4	3	2	1	0
CFG-NO	0	1	2	3	4	5	6	7
Byte	**8**							
Bit	7	6	5	4	3	2	1	0
CFG-NO	8	9	10	11	12	13	14	15
Byte	**9**							
Bit	7	6	5	4	3	2	1	0
CFG-NO	16	17	18	19	20	21	22	23
Byte	**10**							
Bit	7	6	5	4	3	2	1	0
CFG-NO	24	25	26	27	28	29	30	31
Byte	**11**							
Bit	7	6	5	4	3	2	1	0
CFG-NO	32	33	34	35	36	37	38	39
Byte	**12**							
Bit	7	6	5	4	3	2	1	0
CFG-NO	40	41	42	43	44	45	46	47
Byte	**13**							
Bit	7	6	5	4	3	2	1	0
CFG-NO	48	49	50	51	52	53	54	55
Byte	**14**							
Bit	7	6	5	4	3	2	1	0
CFG-NO	56	57	58	59	60	61	62	63

9.3.6 MODE 0x50–0x53 (LAN Information)

Field	Description / Value	Length
COMMAND	0x66: Get Reader Info	1
STATUS	Status message from the reader	1
FLAGS	Indicates additional settings, see FLAGS.	1
DATA	0x50: 6 byte MAC 0x51: IPv4 4 byte IP address 0x52: IPv4 4 byte netmask 0x53: IPv4 4 byte gateway address	X

FLAGS

Bit	7	6	5	4	3	2	1	0
Function	-	-	DHCP v4	-	Disabled v4	-	Supported v4	-

Field	Description / Value
Supported v4	b0: not supported b1: supported
Disabled v4	b0: not supported b1: supported
DHCP v4	b0: not supported b1: supported

9.3.7 MODE 0x60 (I/O Capabilities)

Field	Description / Value	Length
COMMAND	0x66: Get Reader Info	1
STATUS	Status message from the reader	1
NR-OF-INPUTS	Indicates the number of available inputs.	1
NR-OF-OUTPUTS	Indicates the number of available outputs.	1
NR-OF-RELAYS	Indicates the number of available relays.	1

9.3.8 MODE 0x80 (Device Information)

Field	Description / Value	Length
0x66	Get Reader Info command	1
STATUS	Status message from the reader	1
DEV-ID	Individual device identifier of the reader	4
Custom-L	Indicates which customer firmware is licensed on the reader.	4
FW-L	Indicates which firmware is licensed on the reader.	2
TR-DRV-L	Indicates which transponder drivers are licensed on the reader.	2
FNC-L	Indicates which optional functions are licensed on the reader.	2
Reserved	-	2

9.3.9 MODE 0xFF (All)

Field	Description / Value	Length	
COMMAND	0x66: Get Reader Info	1	
STATUS	Status message from the reader	1	
DATASETS	Indicates the number of data sets.	1	
MODE	Indicates the mode.	1	repeated DATASETS times
DATA	Data record according to the definition in the previous sections. Any data record is always 30 bytes long. Unused bytes must be filled with 0x00.	30	

9.4 [0x69] RF Reset

The RF field of the reader antenna can be switched off for about t_{rf} **= 15 ms** by the command [0x69] RF Reset.

Summary REQUEST-PAYLOAD

Field	Description / Value	Length
COMMAND	0x69: RF Reset	1

Summary RESPONSE-PAYLOAD

Field	Description / Value	Length
COMMAND	0x69: RF Reset	1
STATUS	Status message from the reader	1

ⓘ ***NOTE:***

The response will be sent after the command [0x69] RF Reset was completed.

9.5 [0x6A] RF Output On/Off

The command [0x6A] RF Output On/Off switches the RF field of the reader antenna on and off.

If the reader works in Auto Read Mode (independent if the multiplexer is used or not), the RF communication can be interrupted by transmitting RF Off and continued with RF On. After RF Off the reader accepts every host command and the RF communication is handled on the last selected antenna. For selecting a specific antenna without continuing the Auto Read Mode, the option flag “HM” must be set.

Switching of antenna is also possible in Auto Read Mode, if multiplexer is disabled.

Summary REQUEST-PAYLOAD

Field	Description / Value	Length
COMMAND	0x6A: RF Output On/Off	1
RF-OUTPUT	Sets one of two antenna outputs.	1

Summary RESPONSE-PAYLOAD

Field	Description / Value	Length
COMMAND	0x6A: RF Output On/Off	1
STATUS	Status message from the reader	1

Field	Description / Value	Length
COMMAND	0x6A: Get Reader Info	1
RF-OUTPUT	Sets one of two antenna outputs. See RF-OUTPUT.	1

RF-OUTPUT

Bit	7	6	5	4	3	2	1	0
Function	HM	0	0	0	Antenna Output			

Field	Description / Value
Antenna Output	Set one RF output active or RF power off. b00: RF off b01: RF power on antenna output 1 b10: RF power on antenna output 2
HM	Maintain Host Mode (only for Auto Reade Mode). b0: Auto Read Mode is continued if antenna output > 0. b1: Host Mode is maintained and antenna output is selected if > 0.

ⓘ ***NOTE:***

In case of sending the command [0x6A] RF Output On/Off with antenna output = b000, the reader sends a command to reset the persistence flags of the transponder.

9.6 [0x6E] Reader Diagnostic

The command [0x6E] Read Diagnostic performs several hardware diagnostics on the reader.

Summary REQUEST-PAYLOAD

Field	Description / Value	Length
COMMAND	0x6E: Reader Diagnostic	1
MODE	Defines what type of diagnostic is requested. See MODE.	1

MODE

0x01: RF Warning

0x04: EEPROM Failure

0x06: MAX Status

0x09: Hardware Switches

0x20: Wrong Firmware

0xFF: All

Summary RESPONSE-PAYLOAD

Field	Description / Value	Length
COMMAND	0x6E: Reader Diagnostic	1
STATUS	Status message from the reader	1
DATA	Depending on the requested MODE parameter, the response has a different structure including different information and length.	N

Details REQUEST-PAYLOAD

Field	Description / Value
COMMAND	0x6E: Reader Diagnostic
MODE	0x01: RF Warning 0x03: Multiplexer Status 0x04: EEPROM Failure 0x05: Flags A 0xFF: All

Details RESPONSE-PAYLOAD

9.6.1 MODE 0x01 (RF Warning)

Field	Description / Value	Length
COMMAND	0x6E: Reader Diagnostic	1
STATUS	Status message from the reader	1
FLAGS A	Bit 4: RF Power Control Bit 5: TEMP-WARN Bit 7: TEMP-ALARM	1
FLAGS B	Bit 0: |Z| </> Ant1 Bit 1: |Z| </> Ant2	1

Error Conditions FLAGS A and B:

Error	Set Condition	Clear Condition	RF Power	LED 5
RF Power Control	RF power out of control range	• configured power to high • check cable	ON	
TEMP-WARN	temp ≥ warning level ≥ 100 °C	• temp < warning level	ON	
TEMP-ALARM	temp ≥ alarm level ≥ 105 °C	• CPU reset	OFF	ON
<|Z|>	absolute impedance value << or >> 50 Ω	• check cable • check antenna matching	ON	

9.6.2 MODE 0x06 (MAX Status)

Field	Description / Value	Length
COMMAND	0x6E: Reader Diagnostic	1
STATUS	Status message from the reader	1
ERROR-FLAGS	**Indicates several error flags. See** ERROR-FLAGS.	2

ERROR-FLAGS

Bit	15	14	13	12	11	10	9	8
Function	Table Overflow	0	0	0	0	0	0	0
Bit	**7**	**6**	**5**	**4**	**3**	**2**	**1**	**0**
Function	TABLE-UPDATE-BUSY	IDD-LEN-MIS-MATCH	0	ACCESS Table	HOLIDAY Table	TIME-ZONE	META-DATA	RTC

Field	Description / Value
RTC	Indicates an invalid time of the internal real-time clock. It is necessary to set the RTC. See "[0x87] Set System Time and Date", page 92.
METADATA	Indicates a CRC error in the stored METADATA table. The MAX tables have to be updated. See "The Access Mode Procedure", page 156.
TIMEZONE	Indicates a CRC error in the stored TIMEZONE table. The MAX tables have to be updated. See "MAX Table Transfer to ID MAX.U500i", page 156.
HOLIDAY Table	Indicates a CRC error in the stored HOLIDAY table. The MAX tables have to be updated. See "MAX Table Transfer to ID MAX.U500i", page 156.
ACCESS Table	Indicates a CRC error in the stored ACCESS table. The MAX tables have to be updated. See "MAX Table Transfer to ID MAX.U500i", page 156.
IDD-LEN-MISMATCH	Is set if the number of bytes read from a transponder doesn't match with the IDD-LENGTH configured in METADATA for the access table. In case of a data block, the number of bytes read from the transponder doesn't match to the IDD-LENGTH. In case of a serial number (UID), the transponder serial number exceeds the IDD-LENGTH.
TABLE-UPDATE-BUSY	Is set if the event occurs during a table update. This means the command [0x1F][0x01] Start Update has initiated an update but the update was not finished with the command [0xF1][0x02] End Update.
Table Overflow	Indicates that a table overflow occurred.

9.6.3 MODE 0x09 (Hardware Switches)

Field	Description / Value	Length
COMMAND	0x6E: Reader Diagnostic	1
STATUS	Status message from the reader	1
DIP	**Position of the dip switches to check if a configuration is loaded.** **See** DIP.	1
Reserved	-	1
SETTINGS	Indicates several settings. See SETTINGS.	1
Reserved	-	13

DIP

Bit	7	6	5	4	3	2	1	0
Function	0	0	0	0	DIP4	DIP3	DIP2	DIP1

Field	Description / Value
DIP1	b0: DIP off b1: DIP on
DIP2	b0: DIP off b1: DIP on
DIP3	b0: DIP off b1: DIP on
DIP4	b0: DIP off b1: DIP on

SETTINGS

Bit	7	6	5	4	3	2	1	0
Function	0	0	0	0	0	0	POE-DET	OPEN-DET

Field	Description / Value
OPEN-DET	Indicates if the reader has been opened. b0: Reader not opened b1: Reader opened
POE-DET	Indicates the reader's power source. b0: powered via power supply b1: powered via PoE

9.6.4 MODE 0x20 (Wrong Firmware)

Field	Description / Value	Length
COMMAND	0x6E: Reader Diagnostic	1
STATUS	Status message from the reader	1
DATA	ASCII string with a description of the error.	1

9.6.5 MODE 0xFF (All)

Field	Description / Value	Length	
COMMAND	0x6E: Reader Diagnostic	1	
STATUS	Status message from the reader	1	
DATASETS	Number of data sets	1	
MODE	Indicates the mode.	1	repeated DATASETS times
DATA	Data record according to the definition in the previous sections. The data record is always 30 bytes long. Unused bytes must be filled with 0x00.	30	

9.7 [0x72] Set Output

The command [0x72] Set Output serves temporary limited or unlimited activation of the outputs of the reader.

Each output takes the state defined by the byte “OUTx-mode” for the period of time (“OUT-TIME”) included in the protocol. The flashing frequency is defined by the byte “OUTx-frq”. Via this protocol the outputs can be switched on or off for the indicated period of time. If the reader receives a [0x72] Set Output command, all times that have been active until then are being overwritten by the new times included in the protocol if they are > 0.

Summary REQUEST-PAYLOAD

Field	Description / Value	Length
COMMAND	0x72: Set Output	1
MODE	Must always be 0x01.	1
OUT-N	Defines the number of output records.	1
OUT-NR	Defines type and number of the output.	1
OUT-S	Defines the status of the output during the time defined in OUT-TIME.	1
OUT-TIME	Defines if the outputs are activated permanently or limited for a certain time..	2

Summary RESPONSE-PAYLOAD

Field	Description / Value	Length
COMMAND	0x72: Set Output	1
STATUS	Status message from the reader	1

Details REQUEST-PAYLOAD

Field	Description / Value	
COMMAND	0x72: Set Output	
MODE	0x01: Enables LED, digital outputs, buzzer and relays.	
OUT-N	Defines the number of output records.	
OUT-NR	Defines the type and the number of the output.	repeated OUT-N times
OUT-S	Defines the status of the output during the time defined in OUT-TIME and provides the possibility to allocate its own flashing frequency to each output.	
OUT-TIME	By the defined values the outputs can be activated temporarily limited or unlimited. Exceptions are the values 0 and 65535 (0xFFFF). 0x0001: 1 * 100 ms = 100 ms 0xFFFE: 65534 * 100 ms = 1:49:13 h 0xFFFF: continuously active	

OUT-NR

Bit	7	6	5	4	3	2	1	0
Function	OUT-Type			0	OUT-Number			

OUT-S

Bit	7	6	5	4	3	2	1	0
Function	0	0	0	0	OUT-Frq		OUT-Mode	

Signaler	OUT-Type	OUT-Number
LED green	b001	1
LED red	b001	2
LED blue	b001	3
Digital Outputs	b000	1
Buzzer	b010	1
Relays	b100	1

Signaler Status	OUT-Frq	OUT-Mode
unchanged	-	b00
on	-	b01
off	-	b10
Frequency 1 Hz	b11	b11
Frequency 2 Hz	b10	b11
Frequency 4 Hz	b01	b11
Frequency 8 Hz	b00	b11

ⓘ ***NOTE:***

If the trigger is enabled in Access Mode the input IN1,2 isn't available for common use.

9.8 [0x74] Get Input

With this protocol the actual status of the digital inputs IN1 and IN2 can be determined at any time.

Summary REQUEST-PAYLOAD

Field	Description / Value	Length
COMMAND	0x74: Get Input	1

Summary RESPONSE-PAYLOAD

Field	Description / Value	Length
COMMAND	0x74: Get Input	1
STATUS	Status message from the reader	1
INPUTS	States of the digital inputs.	1

Details RESPONSE-PAYLOAD

Field	Description / Value	Length
COMMAND	0x6E: Reader Diagnostic	1
STATUS	Status message from the reader	1
INPUTS	States of the digital inputs. See INPUTS.	1

INPUTS

Bit	7	6	5	4	3	2	1	0
Function	0	0	0	0	0	0	IN2	IN1

Field	Description / Value
IN1	b0: Digital input inactive b1: Digital input active
IN2	b0: Digital input inactive b1: Digital input active

9.9 [0x8D] Lock Region

This command locks the region in CFG3. After using this command it is no longer possible to change the region.

Summary REQUEST-PAYLOAD

Field	Description / Value	Length
COMMAND	0x8D: Lock Region	1

Summary RESPONSE-PAYLOAD

Field	Description / Value	Length
COMMAND	0x8D: Lock Region	1
STATUS	Status message from the reader	1

ⓘ ***NOTE:***

To change the region after a lock, please contact FEIG ELECTRONIC GmbH.

9.10 [0xA0] Reader Login

The command [0xA0] Reader Login must be executed after every power-up or a [0x64] Hard Reset command, if access to the configuration parameters is desired.

Summary REQUEST-PAYLOAD

Field	Description / Value	Length
COMMAND	0xA0: Reader Login	1
READER-PASSWORD	Protects the configuration parameters from any read and write access.	4

Summary RESPONSE-PAYLOAD

Field	Description / Value	Length
COMMAND	0xA0: Reader Login	1
STATUS	Status message from the reader	1

ⓘ ***NOTE:***

- ***A [0xA0] Reader Login command with wrong READER-ID causes a "Logout".***
- ***A "Logout" can be performed via the command [0x63] Soft Reset (see page 94).***

9.11 [0xA3] Write AES Reader Keys

The keys which are required by the reader in order to authenticate itself to an AES encrypted transponder (e.g. UCODE DNA) will be stored in the reader by this command, Only if the keys of the reader and the transponder correspond, the data exchange between reader and transponder can be successfully executed.

Summary REQUEST-PAYLOAD

Field	Description / Value	Length
COMMAND	0xA3: Write AES Reader Keys	1
MODE	Specifies the location for storing the key.	1
READER-KEY-INDEX	Address where the key is stored.	1
AUTH-MODE	Defines the authentication mode.	1
KEY-LEN	Defines the length of the key.	1
KEY	Key for authentication	KEY-LEN

Summary RESPONSE-PAYLOAD

Field	Description / Value	Length
COMMAND	0xA3: Write AES Reader Keys	1
STATUS	Status message from the reader	1

Details REQUEST-PAYLOAD

Field	Description / Value	Length
COMMAND	0xA3: Write AES Reader Keys	1
MODE	See LOCATION.	1
READER-KEY-INDEX	Address where the key is stored in the reader. Possible values: 0 or 1.	1
AUTH-MODE	Defines the authentication mode which will be performed by the reader with this key: **AUTH-MODE** **Authentication Method** **KEY-LEN** 5 AES 16 bytes	1
KEY-LEN	Defines the length of the following key (fix 16 bytes).	1
KEY	Key which has to be used for authentication.	KEY-LEN

LOCATION

Bit	7	6	5	4	3	2	1	0
Function	0	0	0	0	0	0	0	LOCATION

Field	Description / Value
LOCATION	Specifies the location where the key is to be stored in the reader. b0: RAM After the power supply was interrupted the key has to be loaded once again into the RAM. This option is recommended if the reader is used in a public place, where anybody could take the reader away easily. b1: EEPROM The key can be used also after the supply power has been interrupted. This option can be used if the reader is used in a secured place.

9.12 [0xAD] Write Reader Authentication Key

The key which is required by the reader in order to authenticate to a transponder with the access password will be stored in the reader by this command. Only if the key of the reader and the transponder correspond, the data exchange between reader and transponder can be successfully executed.

See "CFG4: Transponder Parameters", page 40.

The key which is required by the reader in order to authenticate to a transponder with the access password will be stored in the reader by this command. Only if the key of the reader and the transponder correspond, the data exchange between reader and transponder can be successfully executed.

Summary REQUEST-PAYLOAD

Field	Description / Value	Length
COMMAND	0xAD: Write Reader Authentication Key	1
MODE	Specifies the location for storing the key.	1
KEY-TYPE	Defines the key type to be written.	1
KEY-LEN	Defines the length of the key.	1
KEY	Key for authentication	KEY-LEN

Summary RESPONSE-PAYLOAD

Field	Description / Value	Length
COMMAND	0xAD: Write Reader Authentication Key	1
STATUS	Status message from the reader	1

Details REQUEST-PAYLOAD

Field	Description / Value	Length
COMMAND	0xAD: Write Reader Authentication Key	1
MODE	See LOCATION.	1
KEY-TYPE	Defines the key type to be written. 0x03 = EPC Class 1 Gen 2 Access Password for Transponder Authentication (see see "CFG4: Transponder Parameters", page 40)	1
KEY-LEN	Defines the length of the following key (fix 4 bytes).	1
KEY	Key which has to be used for authentication.	KEY-LEN

LOCATION

Bit	7	6	5	4	3	2	1	0
Function	0	0	0	0	0	0	0	LOCATION

Field	Description / Value
LOCATION	Specifies the location where the key is to be stored in the reader. b0: RAM After the power supply was interrupted the key has to be loaded once again into the RAM. This option is recommended if the reader is used in a public place, where anybody could take the reader away easily. b1: EEPROM The key can be used also after the supply power has been interrupted. This option can be used if the reader is used in a secured place.

10 Host Commands for Transponder Communication

The Host Commands can be used to access the transponders.

[0xB0] ISO Host Commands	[0xB3] Host Commands for EPC Transponders
[0x01] Inventory	[0x0A] Select
[0x23] Read Multiple Blocks	[0x18] Kill
[0x24] Write Multiple Blocks	[0x22] Lock
	[0x25] BlockPermalock
	[0x26] Read Permalock Status
	[0x30] Untraceable
	[0x31] Authenticate
	[0x32] Challenge
	[0x33] ReadBuffer

10.1 [0xB0] ISO Host Commands

This command set sends RF commands to the transponder.

Summary REQUEST-PAYLOAD

Field	Description / Value	Length
COMMAND	Command	1
REQUEST-DATA	Command specific request with variable length.	N

Summary RESPONSE-PAYLOAD

Field	Description / Value	Length
COMMAND	Command	1
STATUS	Status message from the reader	1
RESPONSE-DATA	Command specific response with variable length.	N

ⓘ ***NOTE:***

- ***Data is only transferred if STATUS = 0x00, 0x83, 0x94 or 0x95.***
- ***These commands are not available if Auto Read Modes are active.***

10.1.1 [0xB0] [0x01] Inventory

The command [0xB0][0x01] Inventory reads the IDD (Identifier Data) of all transponders inside the antenna field. The IDD can be UID or EPC.

Summary REQUEST-PAYLOAD

Field	Description / Value	Length
COMMAND	0xB0: ISO Host Command	1
SUB-COMMAND	0x01: Inventory	1
MODE	Defines the mode of the command.	1
(ANT-SEL)	Defines the corresponding bits of antenna where the reader starts an inventory. ANT-SEL will only be transmitted if bit “ANT” is set in “MODE”.	(1)

Summary RESPONSE-PAYLOAD

Field	Description / Value	Length	
COMMAND	0xB0: ISO Host Command	1	
STATUS	Status message from the reader	1	
DATA-SETS	Number of transponder data sets to be transferred in this response.	1	
TR-TYPE	Transponder type according Annex A	1	repeated DATA-SETS times
RESPONSE-DATA	Response data, depending on the transponder type.	N	
(ANT-CNT)	Number of antennas where the transponder was read.	(1)	
(ANT-NR)	Number of the antenna.	(1)	repeated ANT-CNT
(ANT-STATUS)	RF communication status	(1)	
(RSSI)	Received Signal Strength Indication in dBm	(1)	
(PHASE-ANGLE)	RF phase angle of a transponder.	(2)	
(Reserved)	Always 0x00 0x00	(2)	

Details REQUEST-PAYLOAD

MODE

Defines the mode of the command.

Bit	7	6	5	4	3	2	1	0
Function	MORE	0	0	ANT	0	0	0	0

Field	Description / Value
MORE	This bit can be used to read out the whole IDDs after the reader has signaled more data sets with status “0x94”. b0: New inventory requested The reader carries out a new inquiry, which transponders are in the detection range. b1: More data requested The reader response contains the IDDs, which are not transferred with the last response because of the status “0x94”.
ANT	b0: Requested without antenna number b1: Requested with antenna number (ANT-SEL)

ANT-SEL

Defines the corresponding bits of antenna where the reader starts an inventory. ANT-SEL will only be transmitted if bit “ANT” is set in “MODE”.

Bit	7	6	5	4	3	2	1	0
Function	ANT8	ANT7	ANT6	ANT5	ANT4	ANT3	ANT2	ANT1

Field	Description / Value
ANTx	b0: No reading on this antenna output b1: Reading on this antenna output

Details RESPONSE-PAYLOAD if ANT = 0

Field	Description / Value	Length	
COMMAND	0xB0: ISO Host Command	1	
STATUS	Status message from the reader	1	
DATASETS	Number of transponder data sets transferred in this reader response.	1	
TR-TYPE	Transponder type according Annex A.	1	repeated DATASETS times
RESPONSE-DATA	Response data, depending on the transponder type. For the specific response data, see chapters 2.6 to 2.19.	N	

Details RESPONSE-PAYLOAD if ANT = 1

Field	Description / Value	Length		
COMMAND	0xB0: ISO Host Command	1		
STATUS	Status message from the reader	1		
DATASETS	Number of transponder data sets transferred in this reader response.	1		
FLAGS	Defines which data set will be sent. See FLAGS.	1	repeated DATASETS times	
TR-TYPE	Transponder Type according ANNEX A.	1		
RESPONSE-DATA	Response data, depending on the transponder type. For the specific response data, see chapters 2.6 to 2.19.	N		
ANT-CNT	Number of antennas where the transponder was read.	1		
ANT-NR	Number of the antenna.	1		ANT-CNT times
ANT-STATUS	RF communication status: Can be “0x00” (OK) or “0x83” (RF communication error).	1		
RSSI	Received Signal Strength Indication in dBm	1		
PHASE-ANGLE	RF phase angle of a transponder. The corresponding angle can be calculated as: PHASE-ANGLE * 360° / 4096	2		
Reserved	Always 0x00 0x00	2		

FLAGS

Bit	7	6	5	4	3	2	1	0
Function	0	0	0	ANT	0	0	0	IDD

Field	Description / Value
IDD	b0: IDD will not be sent b1: IDD will be sent
ANT	b0: antenna information will not be sent b1: antenna information will be sent (ANT-CNT, AN-NR, ANT-STATUS, RSSI)

RESPONSE-DATA for EPC Class 1 Gen 2 (TR-TYPE = 0x84)

Field	Description / Value	Length
IDDT	Identifier Data Type. Defines the type of the IDD. 0 = EPC 2 = EPC + TID	1
IDD-LEN	Identifier Data Length. Defines the length of the IDD in bytes.	1
IDD	Identifier data of the transponder.	IDD-LEN

10.1.2 [0xB0] [0x23] Read Multiple Blocks

This command reads one or more data blocks. The supported host commands depend on the different UHF transponder types.

Summary REQUEST-PAYLOAD

Field	Description / Value	Length
COMMAND	0xB0: ISO Host Command	1
SUB-COMMAND	0x23: Read Multiple Blocks	1
MODE	Defines the mode of the command.	1
(IDD-LEN)	Optional parameter that defines the length of the following IDD.	(1)
(IDD)	Read-only serial number	(IDD-LEN)
(BANK)	Memory bank of the transponder	(1)
(A-PW-LEN)	Length of the access password	(1)
(A-PW)	Access password	(A-PW-LEN)
DB-ADR	First block number to be read	1 or 2
DB-N	Number of data blocks to be read.	1

Summary RESPONSE-PAYLOAD

Field	Description / Value	Length
COMMAND	0xB0: ISO Host Command	1
STATUS	Status message from the reader	1
DATA	Depending on the requested MODE parameter, the response has a different structure including different information and length.	N

Details REQUEST-PAYLOAD

Field	Description / Value	Length
COMMAND	0xB0: ISO Host Command	1
SUB-COMMAND	0x23: Read Multiple Blocks	1
MODE	Defines the mode of the command. See MODE.	1
(IDD-LEN)	Optional parameter that defines the length of the following IDD field.	(1)
(IDD)	Read-only serial number of the transponder The IDD is required only in the addressed mode.	(IDD-LEN)
(BANK)	Memory bank of the transponder, which will be accessed by the reader. See BANK.	(1)
(A-PW-LEN)	Length of the access password	(1)
(A-PW)	Access password that is used to access the secured state of the tag.	(A-PW-LEN)
DB-ADR	First block number to be read. The first block can be any value between 0 and 255 or 0 and 65535. The length depends on EXT-ADR in MODE.	1 or 2
DB-N	Number of data blocks to be read from the transponder, starting at DB-ADR. The maximum number of DB-N is 128 bytes.	1

MODE

Bit	7	6	5	4	3	2	1	0
Function	0	READ-COMPLETE-BANK	EXT-ADR	IDD-LF	0	ADR		

Field	Description / Value
ADR	b0: non-addressed mode b1: addressed mode
IDD-LF	Must be set to 1-
EXT-ADR	If this bit is set, the command includes extended address fields. b0: transponder memory addressing is done by the 1 byte DB-ADR field b1: transponder memory addressing is done by BANK and 2 bytes DB-ADR field
READ-COMPLETE-BANK	If this bit is set, the reader automatically reads out all blocks of the selected memory bank, starting from DB-ADR. If DB-ADR is “0” the complete content of the memory bank will be read. b0: read range defined by DB-ADR and DB-N b1: read out all blocks, starting at DB-ADR

BANK

Bit	7	6	5	4	3	2	1	0
Function	A-FLAG	0	0	0	0	0	BANK-NR	

Field	Description / Value
BANK-NR	For EPC Class 1 Gen 2 transponders BANK-NR is defined as follows: b00: reserved b01: EPC memory bank b10: TID memory bank b11: user memory bank
A-FLAG	Defines whether the reader tries to read an EPC Class 1 Gen 2 tag in secured state and a password is contained in the protocol. b0: protocol contains no access password b1: protocol contains password length and access password

DETAILS RESPONSE-PAYLOAD

STATUS = 0x00

Field	Description / Value	Length	
COMMAND	0xB0: ISO Host Command	1	
STATUS	Status message from the reader	1	
DB-N	Number of data blocks	1	
DB-SIZE	Always 0x02	1	
Reserved	Always 0x00	1	DB-N
DB	Requested data blocks	2	

STATUS = 0x95

Field	Description / Value	Length
COMMAND	0xB0: ISO Host Command	1
STATUS	Status message from the reader	1
TAG-ERROR	See "Transponder Error Codes", page **Fehler! Textmarke nicht definiert.**.	1

10.1.3 [0xB0] [0x24] Write Multiple Blocks

This command writes one or more data blocks.

Summary REQUEST-PAYLOAD

Field	Description / Value	Length
COMMAND	0xB0: ISO Host Command	1
SUB-COMMAND	0x24: Write Multiple Blocks	1
MODE	Defines the mode of the command.	1
(IDD-LEN)	Optional parameter that defines the length of the following IDD.	(1)
(IDD)	Read-only serial number	(IDD-LEN)
(BANK)	Memory bank of the transponder	(1)
(A-PW-LEN)	Length of the access password	(1)
(A-PW)	Access password	(A-PW-LEN)
DB-ADR	First block number to be written	1 or 2
DB-N	Number of data blocks to be written	1
DB-SIZE	Size of one data block in bytes	1
DB	Data of the data block to be written to the transponder.	2 * DB-N

Summary RESPONSE-PAYLOAD

Field	Description / Value	Length
COMMAND	0xB0: ISO Host Command	1
STATUS	Status message from the reader	1
DATA	Depending on the requested MODE parameter, the response has a different structure including different information and length.	N

Details REQUEST-PAYLOAD

Field	Description / Value	Length
COMMAND	0xB0: ISO Host Command	1
SUB-COMMAND	0x24: Write Multiple Blocks	1
MODE	Defines the mode of the command. See MODE.	1
(IDD-LEN)	Optional parameter that defines the length of the following IDD field.	(1)
(IDD)	Read-only serial number of the transponder The IDD is required only in the addressed mode.	(IDD-LEN)
(BANK)	Memory bank of the transponder, which will be accessed by the reader. See BANK.	(1)
(A-PW-LEN)	Length of the access password	(1)
(A-PW)	Access password that is used to access the secured state of the tag.	(A-PW-LEN)
DB-ADR	First block number to be written. The first block can be any value between 0 and 255 or 0 and 65535. The length depends on EXT-ADR in MODE.	1 or 2
DB-N	Number of data blocks to be written to the transponder, starting at DB-ADR. The maximum number of DB-N is 128 bytes.	1
DB-SIZE	Size of one data block in bytes	1
DB	Data of the data block to be written to the transponder.	2 * DB-N

MODE

Bit	7	6	5	4	3	2	1	0
Function	0	0	EXT-ADR	IDD-LF	0	ADR		

Field	Description / Value
ADR	b0: non-addressed mode b1: addressed mode
IDD-LF	Must be set to 1.
EXT-ADR	If this bit is set, the command includes extended address fields. b0: transponder memory addressing is done by the 1 byte DB-ADR field b1: transponder memory addressing is done by BANK and 2 bytes DB-ADR field

BANK

Bit	7	6	5	4	3	2	1	0
Function	A-FLAG	0	0	0	0	0	BANK-NR	

Field	Description / Value
BANK-NR	For EPC Class 1 Gen 2 transponders BANK-NR is defined as follows: b00: reserved b01: EPC memory bank b10: TID memory bank b11: user memory bank
A-FLAG	Defines whether the reader tries to read an EPC Class 1 Gen 2 tag in secured state and a password is contained in the protocol. b0: protocol contains no access password b1: protocol contains password length and access password

DETAILS RESPONSE PAYLOAD

STATUS = 0x03

Field	Description / Value	Length
COMMAND	0xB0: ISO Host Command	1
STATUS	Status message from the reader	1
DB-ADR-E	Block number where the error occurred.	1 (2)

STATUS = 0x95

Field	Description / Value	Length
COMMAND	0xB0: ISO Host Command	1
STATUS	Status message from the reader	1
TAG-ERROR	See "Transponder Error Codes", page **Fehler! Textmarke nicht definiert.**.	1
DB-ADR-E	Block number where the error occurred.	1 (2)

10.2 [0xB3] Host Commands for EPC Transponders

This command set sends special commands to EPC transponders.

Summary REQUEST-PAYLOAD

Field	Description / Value	Length
COMMAND	Command	1
PARAMETER	Command specific request with variable length.	N

Summary RESPONSE-PAYLOAD

Field	Description / Value	Length
COMMAND	Command	1
STATUS	Status message from the reader	1
RESPONSE-DATA	Command specific response with variable length.	N

ⓘ ***NOTE:***

Data is only transferred if STATUS = 0x00, 0x83, 0x94 or 0x95.

10.2.1 [0xB3] [0x0A] Select

This command selects a tag sub-population based on user defined criteria.

Summary REQUEST-PAYLOAD

Field	Description / Value	Length
COMMAND	0xB3: EPC Host Command	1
SUB-COMMAND	0x0A: Select	1
MODE	Defines the mode of the command.	1
TARGET	Indicates which flag of a tag is modified by the command.	1
ACTION	Defines the tag behavior.	1
MEM-BANK	Specifies how a tag applies MASK.	1
POINTER	Specifies a starting bit address for MASK comparison.	4
MASK-LENGTH	Defines the length of MASK in bits.	1
MASK	Bit string that is compared by a tag.	(MASK-LENGTH+7) / 8
Reserved	-	1

Summary RESPONSE-PAYLOAD

Field	Description / Value	Length
COMMAND	0xB3: EPC Host Command	1
STATUS	Status message from the reader	1

Details REQUEST-PAYLOAD

<table>
<tr><th>Field</th><th>Description / Value</th><th>Length</th></tr>
<tr><td>COMMAND</td><td>0xB3: EPC Host Command</td><td>1</td></tr>
<tr><td>SUB-COMMAND</td><td>0x0A: Select</td><td>1</td></tr>
<tr><td>MODE</td><td>Defines the mode of the command. Bit 0–7 are set to “0”.</td><td>1</td></tr>
<tr><td>TARGET</td><td>Indicates which flag of a tag is modified by the command.
0x00: inventoried flag (S0)
0x01: inventoried flag (S1)
0x02: inventoried flag (S2)
0x03: inventoried flag (S3)
0x04: SL flag</td><td>1</td></tr>
<tr><td>ACTION</td><td>Defines the tag behavior, in which matching and not matching tags assert or de-assert SL or set their inventoried flag to A or B.
<table>
<tr><th>Action</th><th>Tag Matching</th><th>Tag Not Matching</th></tr>
<tr><td>0x00</td><td>assert SL or inventoried → A</td><td>de-assert SL or inventoried → B</td></tr>
<tr><td>0x01</td><td>assert SL or inventoried → A</td><td>do nothing</td></tr>
<tr><td>0x02</td><td>do nothing</td><td>de-assert SL or inventoried → B</td></tr>
<tr><td>0x03</td><td>negate SL or (A → B, B → A)</td><td>do nothing</td></tr>
<tr><td>0x04</td><td>de-assert SL or inventoried → B</td><td>assert SL or inventoried → A</td></tr>
<tr><td>0x05</td><td>de-assert SL or inventoried → B</td><td>do nothing</td></tr>
<tr><td>0x06</td><td>do nothing</td><td>assert SL or inventoried → A</td></tr>
<tr><td>0x07</td><td>do nothing</td><td>negate SL or (A → B, B → A)</td></tr>
</table></td><td>1</td></tr>
<tr><td>MEM-BANK</td><td>Specifies how a tag applies MASK.
0x00: FileType
0x01: EPC
0x02: TID
0x03: File_0 (user)</td><td>1</td></tr>
<tr><td>POINTER</td><td>Specifies a starting bit address for MASK comparison (0…65535).</td><td>4</td></tr>
<tr><td>MASK-LENGTH</td><td>Specifies the length of MASK in bits (0…255).</td><td>1</td></tr>
<tr><td>MASK</td><td>Bit string that a tag compares to a memory location that begins at POINTER and ends MASK-LENGTH bits later. The maximum number of bytes for the mask is 32.</td><td>(MASK-LENGTH+ 7) / 8</td></tr>
<tr><td>Reserved</td><td>-</td><td>1</td></tr>
</table>

10.2.2 [0xB3] [0x18] Kill

This command writes one or more data blocks which cause the transponder to never respond to any command afterwards. The kill password K-PW has to contain the kill code. A kill password “all zero” will have no effect on the transponder.

Summary REQUEST-PAYLOAD

Field	Description / Value	Length
COMMAND	0xB3: EPC Host Command	1
SUB-COMMAND	0x18: Kill	1
MODE	Defines the mode of the command.	1
(IDD-LEN)	Optional parameter that defines the length of the IDD field.	(1)
(IDD)	Read-only serial number of the transponder	(IDD-LEN)
K-PW-LEN	Length of the kill password	1
K-PW	Kill password	K-PW-LEN
(RECOM Bits)	Recommissioning bits according to EPC global description.	(1)

Summary RESPONSE-PAYLOAD

Field	Description / Value	Length
COMMAND	0xB3: EPC Host Command	1
STATUS	Status message from the reader	1

Details REQUEST-PAYLOAD

Field	Description / Value	Length
COMMAND	0xB3: EPC Host Command	1
SUB-COMMAND	0x18: Kill	1
MODE	Defines the mode of the command. See MODE.	1
(IDD-LEN)	Optional parameter that defines the length of the following IDD field. It depends on the setting of IDD-LF (see MODE).	(1)
(IDD)	Read-only serial number of the transponder. The IDD is required only in the addressed mode.	(IDD-LEN)
K-PW-LEN	Length of the kill password	1
K-PW	Kill password with length K-PW-LEN = 4.	K-PW-LEN
(RECOM Bits)	Recommissioning bits according to EPC global description. See RECOM Bits.	(1)

MODE

Bit	7	6	5	4	3	2	1	0
Function	0	0	0	IDD-LF	RECOM	ADR		

Field	Description / Value
ADR	b0: non-addressed mode b1: addressed mode
RECOM	Defines if the recommissioning bits will be inserted into the protocol. b0: no recommissioning bits inserted b1: recommissioning bits inserted
IDD-LF	Must be set to 1.

RECOM Bits

Bit	7	6	5	4	3	2	1	0
Function	0	0	0	0	0	Asserted 3SB	Asserted 2SB	Asserted LSB

Field	Description / Value
Asserted LSB	b0: not selected b1: selected
Asserted 2SB	b0: not selected b1: selected
Asserted 3SB	b0: not selected b1: selected

ⓘ ***NOTE:***

Only one RECOM bit may be set at a time!

Details RESPONSE-PAYLOAD with STATUS = 0x95

Field	Description / Value	Length
COMMAND	0xB3: EPC Host Command	1
STATUS	Status message from the reader	1

TAG-ERROR	See "Transponder Error Codes", page **Fehler! Textmarke nicht definiert.**.	1

10.2.3 [0xB3] [0x22] Lock

This command locks different memory portions of a transponder.

Summary REQUEST-PAYLOAD

Field	Description / Value	Length
COMMAND	0xB3: EPC Host Command	1
SUB-COMMAND	0x22: Lock	1
MODE	Defines the mode of the command.	1
(IDD-LEN)	Optional parameter that defines the length of the IDD field.	(1)
(IDD)	Read-only serial number of the transponder	(IDD-LEN)
TR-TYPE	Type of transponder	1
LOCK-LEN	Length of LOCK-DATA field	1
LOCK-DATA	Lock data, which will be written to the tag.	LOCK-LEN
A-PW-LEN	Length of access password	1
A-PW	Access password	A-PW-LEN

Summary RESPONSE-PAYLOAD

Field	Description / Value	Length
COMMAND	0x22: Lock	1
STATUS	Status message from the reader	1

Details REQUEST-PAYLOAD

Field	Description / Value	Length
COMMAND	0xB3: EPC Host Command	1
SUB-COMMAND	0x22: Lock	1
MODE	Defines the mode of the command. See MODE.	1
(IDD-LEN)	Optional parameter that defines the length of the following IDD field.	(1)
(IDD)	Read-only serial number of the transponder The IDD is required only in the addressed mode.	(IDD-LEN)
TR-TYPE	**Annex A: Type of transponder. See "Codes of Transponder Types** ", page 168.	1
LOCK-LEN	Length of LOCK-DATA field. Is always = 3.	1
LOCK-DATA	Lock data, which will be written to the tag. See EPC Class 1 Gen 2 standard.	LOCK-LEN
A-PW-LEN	Length of the access password	1
A-PW	Access password that is used to access the secured state of the tag.	A-PW-LEN

MODE

Bit	7	6	5	4	3	2	1	0
Function	0	0	0	IDD-LF	0	ADR		

Field	Description / Value
ADR	b0: non-addressed mode b1: addressed mode
IDD-LF	Must be set to 1.

Details RESPONSE-PAYLOAD with STATUS = 0x95

Field	Description / Value	Length
COMMAND	0xB3: EPC Host Command	1
STATUS	Status message from the reader	1
TAG-ERROR	See "Transponder Error Codes", page **Fehler! Textmarke nicht definiert.**.	1

10.2.4 [0xB3] [0x25] BlockPermalock

This command permalocks one or more blocks of the user memory of an EPC transponder. The block size of the permalock section is vendor-defined. Only tags in the secured state execute a [0xB3][0x25] Block Permalock command.

Summary REQUEST-PAYLOAD

Field	Description / Value	Length
COMMAND	0xB3: EPC Host Command	1
SUB-COMMAND	0x25: BlockPermalock	1
MODE	Defines the mode of the command.	1
(IDD-LEN)	Optional parameter that defines the length of the IDD field.	(1)
(IDD)	Read-only serial number of the transponder	(IDD-LEN)
BANK	Memory bank of the transponder	1
(A-PW-LEN)	Length of access password	(1)
(A-PW)	Access password	(A-PW-LEN)
BLOCK-PTR	Starting address for MASK	2
BLOCK-RANGE	Range of MASK	1
MASK	Defines which block sections are permalocked.	2 * BLOCK-RANGE

Summary RESPONSE-PAYLOAD

Field	Description / Value	Length
COMMAND	0xB3: EPC Host Command	1
STATUS	Status message from the reader	1

Details REQUEST-PAYLOAD

Field	Description / Value	Length
COMMAND	0xB3: EPC Host Command	1
SUB-COMMAND	0x25: BlockPermalock	1
MODE	Defines the mode of the command. See MODE.	1
(IDD-LEN)	Optional parameter that defines the length of the following IDD field.	(1)
(IDD)	Read-only serial number of the transponder The IDD is required only in the addressed mode.	(IDD-LEN)
BANK	Memory bank of the transponder, which will be accessed by the reader. See BANK.	1
(A-PW-LEN)	Length of the access password	(1)
(A-PW)	Access password that is used to access the secured state of the tag.	(A-PW-LEN)
BLOCK-PTR	Specifies the starting address for MASK in units of 16 block sections.	2
BLOCK-RANGE	Specifies the range of MASK, starting at BLOCK-PTR and ending (16 * BLOCK-RANGE – 1) block sections later.	1
MASK	Defines which block sections of a tag are permalocked. The tag interprets each bit as follows: MASK bit = 0: retain the current permalock setting MASK bit = 1: permalock the corresponding memory block section The mask bits are ordered from lower-order section to higher (the leading MASK bit refers to the first block section).	2 * BLOCK-RANGE

MODE

Bit	7	6	5	4	3	2	1	0
Function	0	0	EXT-ADR	IDD-LF	0	ADR		

Field	Description / Value
ADR	b0: non-addressed mode b1: addressed mode
IDD-LF	Must be set to 1.
EXT-ADR	Must be set to 1.

BANK

Bit	7	6	5	4	3	2	1	0
Function	A-FLAG	0	0	0	0	0	BANK-NR	

Field	Description / Value
BANK-NR	For EPC Class 1 Gen 2 transponders BANK-NR is defined as follows: b00: reserved b01: EPC memory bank b10: TID memory bank b11: user memory bank
A-FLAG	Defines whether the reader tries to read an EPC Class 1 Gen 2 tag in secured state and a password is contained in the protocol. b0: protocol contains no access password b1: protocol contains password length and access password

Details RESPONSE-PAYLOAD with STATUS = 0x95

Field	Description / Value	Length
COMMAND	0xB3: EPC Host Command	1
STATUS	Status message from the reader	1
TAG-ERROR	See "Transponder Error Codes", page **Fehler! Textmarke nicht definiert.**.	1

Example:

Permalock block section 1-2:

BLOCK-PTR = 0x0000
BLOCK-RANGE = 0x01
MASK = 0 1 1 0 0000 0000 0000 = 0x6000
block section 2
block section 1

10.2.5 [0xB3] [0x26] Read Permalock Status

This command reads the permalock status of the user memory of an EPC transponder. Only tags in the secured state execute a [0xB3][0x26] Read Permalock Status command.

Summary REQUEST-PAYLOAD

Field	Description / Value	Length
COMMAND	0xB3: EPC Host Command	1
SUB-COMMAND	0x26: Read Permalock Status	1
MODE	Defines the mode of the command.	1
(IDD-LEN)	Optional parameter that defines the length of the IDD field.	(1)
(IDD)	Read-only serial number of the transponder	(IDD-LEN)
BANK	Memory bank of the transponder	1
(A-PW-LEN)	Length of access password	(1)
(A-PW)	Access password	(A-PW-LEN)
BLOCK-PTR	Starting address for MASK	2
BLOCK-RANGE	Range of MASK	1

Summary RESPONSE-PAYLOAD

Field	Description / Value	Length
COMMAND	0xB3: EPC Host Command	1
STATUS	Status message from the reader	1

Details REQUEST-PAYLOAD

Field	Description / Value	Length
COMMAND	0xB3: EPC Host Command	1
SUB-COMMAND	0x26: Read Permalock Status	1
MODE	Defines the mode of the command. See MODE.	1
(IDD-LEN)	Optional parameter that defines the length of the following IDD field.	(1)
(IDD)	Read-only serial number of the transponder The IDD is required only in the addressed mode.	(IDD-LEN)
BANK	Memory bank of the transponder, which will be accessed by the reader. See BANK.	1
(A-PW-LEN)	Length of the access password	(1)
(A-PW)	Access password that is used to access the secured state of the tag.	(A-PW-LEN)
BLOCK-PTR	Specifies the starting address for MASK in units of 16 block sections.	2
BLOCK-RANGE	Specifies the range of MASK, starting at BLOCK-PTR and ending (16 * BLOCK-RANGE – 1) block sections later.	1

MODE

Bit	7	6	5	4	3	2	1	0
Function	0	0	EXT-ADR	IDD-LF	0	ADR		

Field	Description / Value
ADR	b0: non-addressed mode b1: addressed mode
IDD-LF	Must be set to 1.
EXT-ADR	Must be set to 1.

BANK

Bit	7	6	5	4	3	2	1	0
Function	A-FLAG	0	0	0	0	0	BANK-NR	

Field	Description / Value
BANK-NR	For EPC Class 1 Gen 2 transponders BANK-NR is defined as follows: b00: reserved b01: EPC memory bank b10: TID memory bank b11: user memory bank
A-FLAG	Defines whether the reader tries to read an EPC Class 1 Gen 2 tag in secured state and a password is contained in the protocol. b0: protocol contains no access password b1: protocol contains password length and access password

Details RESPONSE-PAYLOAD

STATUS = 0x00

Field	Description / Value	Length
COMMAND	0xB3: EPC Host Command	1
STATUS	Status message from the reader	1
PERMALOCK-STATUS	Requested permalock status bits for the selected range.	2 * BLOCK-RANGE

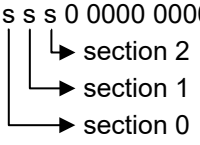
STATUS = 0x95

Field	Description / Value	Length
COMMAND	0xB3: EPC Host Command	1
STATUS	Status message from the reader	1
TAG-ERROR	See "Transponder Error Codes", page **Fehler! Textmarke nicht definiert.**.	1

Example:

Read block permalock section 0 to 2.

BLOCK-PTR = 0x0000
BLOCK-RANGE = 0x01
Response of permalock bits (PERMALOCK-STATUS)
s s s 0 0000 0000 0000



10.2.6 [0xB3] [0x30] Untraceable

This command hides parts of the tag's TID, EPC and/or user memory.

Summary REQUEST-PAYLOAD

Field	Description / Value	Length
COMMAND	0xB3: EPC Host Command	1
SUB-COMMAND	0x30: Untraceable	1
MODE	Defines the mode of the command.	1
(IDD-LEN)	Optional parameter that defines the length of the IDD field.	(1)
(IDD)	Read-only serial number of the transponder	(IDD-LEN)
(BANK)	Memory bank of the transponder	(1)
(A-PW-LEN)	Length of access password	(1)
(A-PW)	Access password	(A-PW-LEN)
U-FLAG	Untraceable indicator	1
HIDE	Defines which parts of the memory shall be hidden.	2
RANGE	Defines the operating range.	1

Summary RESPONSE-PAYLOAD

Field	Description / Value	Length
COMMAND	0xB3: EPC Host Command	1
STATUS	Status message from the reader	1

Details REQUEST-PAYLOAD

Field	Description / Value	Length
COMMAND	0xB3: EPC Host Command	1
SUB-COMMAND	0x30: Untraceable	1
MODE	Defines the mode of the command. See MODE.	1
(IDD-LEN)	Optional parameter that defines the length of the following IDD field.	(1)
(IDD)	Read-only serial number of the transponder The IDD is required only in the addressed mode.	(IDD-LEN)
(BANK)	Memory bank of the transponder, which will be accessed by the reader. See BANK.	(1)
(A-PW-LEN)	Length of the access password	(1)
(A-PW)	Access password that is used to access the secured state of the tag.	(A-PW-LEN)
U-FLAG	Untraceable indicator. Should be set to 0.	1
HIDE	Defines which parts of the memory shall be hidden. See HIDE.	2
RANGE	Defines the operating range. b00: normal b01: toggle temporarily b10: reduced b11: reserved	1

MODE

Bit	7	6	5	4	3	2	1	0
Function	0	0	EXT-ADR	IDD-LF	0	ADR		

Field	Description / Value
ADR	b0: non-addressed mode b1: addressed mode
IDD-LF	Must be set to 1.
EXT-ADR	If this bit is set, the command includes extended address fields. b0: transponder memory addressing is done by the 1 byte DB-ADR field b1: transponder memory addressing is done by BANK and 2 bytes DB-ADR field

BANK

Bit	7	6	5	4	3	2	1	0
Function	A-FLAG	0	0	0	0	0	0	0

Field	Description / Value
A-FLAG	Defines whether the reader tries to read an EPC Class 1 Gen 2 tag in secured state and a password is contained in the protocol. b0: protocol contains no access password b1: protocol contains password length and access password

HIDE

Bit	7	6	5	4	3	2	1	0
Function	0	0	0	0	0	HIDE-TID		HIDE-USER
Bit	**15**	**14**	**13**	**12**	**11**	**10**	**9**	**8**
Function	0	0	HIDE-EPC	NEW-EPC-LEN				

Field	Description / Value
HIDE-USER	Specifies whether a tag untraceably hides user memory. b0: view user memory b1: hide user memory
HIDE-TID	Specifies whether a tag untraceably hides parts of the TID memory. b00: view TID memory b01: hide some b10: hide all b11: reserved
NEW-EPC-LEN	Specifies a new EPC length field.
HIDE-EPC	Specifies whether a tag untraceably hides parts of the EPC memory. b0: show memory above EPC b1: hide memory above EPC

Details RESPONSE-PAYLOAD with STATUS = 0x95

Field	Description / Value	Length
COMMAND	0xB3: EPC Host Command	1
STATUS	Status message from the reader	1
TAG-ERROR	See "Transponder Error Codes", page **Fehler! Textmarke nicht definiert.**.	1

10.2.7 [0xB3] [0x31] Authenticate

This command performs tag, reader or mutual authentication. If the key location (bit KEY-LOC in byte AUTH-MODE) is set to “1”, the relevant keys are stored in the host system. The host has to generate the challenge (80 bits random number) and has to transmit the number to the reader. The reader’s response to the host system consists of the encrypted tag response. With knowledge of the relevant keys the host system decrypts the transmitted data and authenticates the transponder.

Summary REQUEST-PAYLOAD

Field	Description / Value	Length
COMMAND	0xB3: EPC Host Command	1
SUB-COMMAND	0x31: Authenticate	1
MODE	Defines the mode of the command.	1
(IDD-LEN)	Optional parameter that defines the length of the IDD field.	(1)
(IDD)	Read-only serial number of the transponder	(IDD-LEN)
BANK	Memory bank of the transponder	1
(A-PW-LEN)	Length of access password	(1)
(A-PW)	Access password	(A-PW-LEN)
AUTH-MODE	Defines the format of the request and the response,	1
CSI	Crypto Suite Identifier	1
(CRYPTO-TIME)	Crypto execution time in ms	(1)
MSG-LEN	Length of the message in bytes	2
MSG	Message defined by the crypto suite	MSG-LEN

Summary RESPONSE-PAYLOAD

Field	Description / Value	Length
COMMAND	0xB3: EPC Host Command	1
STATUS	Status message from the reader	1

Details REQUEST-PAYLOAD

Field	Description / Value	Length
COMMAND	0xB3: EPC Host Command	1
SUB-COMMAND	0x31: Authenticate	1
MODE	Defines the mode of the command. See MODE.	1
(IDD-LEN)	Optional parameter that defines the length of the following IDD field.	(1)
(IDD)	Read-only serial number of the transponder The IDD is required only in the addressed mode.	(IDD-LEN)
BANK	Memory bank of the transponder, which will be accessed by the reader. See BANK.	1
(A-PW-LEN)	Length of the access password	(1)
(A-PW)	Access password that is used to access the secured state of the tag.	(A-PW-LEN)
AUTH-MODE	Defines the format of the request and the response. See AUTH-MODE.	1
CSI	Crypto Suite Identifier **CSI** / **Part** / **Crypto Suite** 0x00 ISO/IEC 29167–10 AES128 0x01 ISO/IEC 29167–11 PRESENT 80 0x02 ISO/IEC 29167–12 ECC-DH 0x03 ISO/IEC 29167–13 GRAIN 128 0x04 ISO/IEC 29167–14 AES128-OFB 0x05 ISO/IEC 29167–15 XOR 0x06 ISO/IEC 29167–16 ECSDA-ECDH 0x07 ISO/IEC 29167–17 GPS 0x08 ISO/IEC 29167–18 Humming Bird 2 0x09 ISO/IEC 29167–19 RAMON only with KEY-LOC = b1	1
(CRYPTO-TIME)	Crypto execution time in ms	(1)
MSG-LEN	Length of the message in bytes	2
MSG	Message defined by the crypto suite specified by the CSI.	MSG-LEN

MODE

Bit	7	6	5	4	3	2	1	0
Function	0	0	EXT-ADR	IDD-LF	0	ADR		

Field	Description / Value
ADR	b0: non-addressed mode b1: addressed mode
IDD-LF	Must be set to 1.
EXT-ADR	If this bit is set, the command includes extended address fields. b0: transponder memory addressing is done by the 1 byte DB-ADR field b1: transponder memory addressing is done by BANK and 2 bytes DB-ADR field

BANK

Bit	7	6	5	4	3	2	1	0
Function	A-FLAG	0	0	0	0	0	0	0

Field	Description / Value
A-FLAG	Defines whether the reader tries to read an EPC Class 1 Gen 2 tag in secured state and a password is contained in the protocol. b0: protocol contains no access password b1: protocol contains password length and access password

AUTH-MODE

Bit	7	6	5	4	3	2	1	0
Function	KEY-LOC	0	0	0	0	CRYPTO-FLAG	0	0

Field	Description / Value
CRYPTO-FLAG	If this bit is set, the protocol contains the crypto execution time. b0: no crypto execution time in protocol b1: crypto execution time in protocol
KEY-LOC	Defines the location where the keys are stored and authentication is done. b0: reader. b1: host system

Details RESPONSE PAYLOAD with
STATUS = 0x00 for key management in the reader (KEY-LOC = b0)

Field	Description / Value	Length
COMMAND	0xB3: EPC Host Command	1
STATUS	Status message from the reader	1
DATA-LEN	Number of bits	2
DATA	Requested decrypted data	(DATA-LEN + 7) / 8

STATUS = 0x00 for key management in the host system (KEY-LOC = b1)

Field	Description / Value	Length
COMMAND	0xB3: EPC Host Command	1
STATUS	Status message from the reader	1
DATA-LEN	Number of bits	2
CRYPTOGRAPHIC-RESPONSE	Requested encrypted data	(DATA-LEN + 7) / 8

STATUS = 0x95

Field	Description / Value	Length
COMMAND	0xB3: EPC Host Command	1
STATUS	Status message from the reader	1
TAG-ERROR	See "Transponder Error Codes", page **Fehler! Textmarke nicht definiert.**.	1

10.2.7.1 Message TAM1

Send interrogator challenge and request tag authentication response.

Message TAM1 Format

Field	Description / Value	Length
MSG-CMD	**Defines the authentication method and custom data. See** MSG-CMD.	1
KEY-ID	Defines which key is used for TAM1. See KEY-ID.	1
(CHALLENGE)	80-bit random challenge that the interrogator has generated for use in TAM1. **Only necessary when authentication is done by the host system (KEY-LOC = b1).**	(10)

MSG-CMD

Bit	7	6	5	4	3	2	1	0
Function	Authentication Method		Custom Data	TAM1-RFU				

Field	Description / Value
TAM1-RFU	b00000: reserved
Custom Data	b0: no custom data requested b1: custom data requested
Authentication Method	b00: specifies the use of TAM

KEY-ID

Bit	7	6	5	4	3	2	1	0
Function	0	0	0	0	0	KEY-TYPE		

Field	Description / Value
KEY-TYPE	b0: Key 0 is used b1: Key 1 is used

10.2.7.2 Message TAM2

Sends interrogator challenge and requests tag authentication response with custom data.

Message TAM2 Format

Field	Description / Value	Length
MSG-CMD	Defines the authentication method and custom data and block size. See MSG-CMD.	1
KEY-ID	Defines which key is used for TAM2. See KEY-ID.	1
(CHALLENGE)	80-bit random challenge that the interrogator has generated for use in TAM1. **Only necessary when authentication is done by the host system (KEY-LOC = b1).**	(10)
TAM2-PARAMETER	Defines the parameters for TAM2. See TAM2-PARAMETER.	3

MSG-CMD

Bit	7	6	5	4	3	2	1	0
Function	Authentication Method		Custom Data	TAM2-RFU				

Field	Description / Value
TAM2-RFU	b0000: reserved
Custom Data	b0: no custom data requested b1: custom data requested
Authentication Method	b00: specifies the use of TAM

KEY-ID

Bit	7	6	5	4	3	2	1	0
Function	BLOCK-COUNT				0	KEY-TYPE		

Field	Description / Value
KEY-TYPE	b0: Key 0 is used b1: Key 1 is used

TAM2-PARAMETER

Bit	7	6	5	4	3	2	1	0
Function					PROT-MODE			
Bit	**15**	**14**	**13**	**12**	**11**	**10**	**9**	**8**
Function	OFFSET							
Bit	**23**	**22**	**21**	**20**	**19**	**18**	**17**	**16**
Function	PROFILE				OFFSET			

Field	Description / Value
PROT-MODE	Defines the operation mode that shall be used to process the custom data. **PROT-MODE** **Description** 0x00 Plaintext 0x01 CBC 0x02 CMAC 0x03 CBC + CMAC
BLOCK-COUNT	Defines the size of the customer data as a number of 64-bit blocks (4 memory blocks). One memory block has 16 bits. Size = (BLOCKCOUNT + 1) * 64. For UCODE DNA tags the minimum value is 0x00 (4 memory blocks), whereas the maximum value is 0x01 (8 memory blocks).
OFFSET	Defines the start address of the custom data block. The UCODE DNA tag is divided in 64-bit blocks (4 memory blocks). The minimum value is 0x0000. The maximum value is (number of blocks / 4) – 1. For 192 memory blocks (3k user memory): 47 (0x2F) 64-bit blocks.
PROFILE	Defines the memory profile for the addition of custom data. 0x00: EPC memory bank 0x01: TID memory bank 0x02: user memory bank

10.2.8 [0xB3] [0x32] Challenge

This command allows an interrogator to instruct multiple tags to simultaneously yet independently precompute and store a cryptographic value. No response is sent from a tag on a [0xB3][0x32] Challenge command.

Summary REQUEST-PAYLOAD

Field	Description / Value	Length
COMMAND	0xB3: EPC Host Command	1
SUB-COMMAND	0x32: Challenge	1
MODE	Defines the mode of the command.	1
AUTH-MODE	Defines the format of the request and the response,	1
CSI	Crypto Suite Identifier	1
(CRYPTO-TIME)	Crypto execution time in ms	(1)
MSG-LEN	Length of the message in bytes	2
MSG	Message defined by the crypto suite	MSG-LEN

Summary RESPONSE-PAYLOAD

Field	Description / Value	Length
COMMAND	0xB3: EPC Host Command	1
STATUS	Status message from the reader	1

Details REQUEST-PAYLOAD

Field	Description / Value	Length
COMMAND	0xB3: EPC Host Command	1
SUB-COMMAND	0x32: Challenge	1
MODE	Defines the mode of the command. See MODE.	1
AUTH-MODE	Defines the format of the request and the response. See AUTH-MODE.	1
CSI	Crypto Suite Identifier **CSI** / **Part** / **Crypto Suite** 0x00 ISO/IEC 29167–10 AES128 0x01 ISO/IEC 29167–11 PRESENT 80 0x02 ISO/IEC 29167–12 ECC-DH 0x03 ISO/IEC 29167–13 GRAIN 128 0x04 ISO/IEC 29167–14 AES128-OFB 0x05 ISO/IEC 29167–15 XOR 0x06 ISO/IEC 29167–16 ECSDA-ECDH 0x07 ISO/IEC 29167–17 GPS 0x08 ISO/IEC 29167–18 Humming Bird 2 0x09 ISO/IEC 29167–19 RAMON only with KEY-LOC = b1	1
(CRYPTO-TIME)	Crypto execution time in ms	(1)
MSG-LEN	Length of the message in bytes	2
MSG	Message defined by the crypto suite specified by the CSI.	MSG-LEN

MODE

Bit	7	6	5	4	3	2	1	0
Function	0	0	0	0	0	ADR		

Field	Description / Value
ADR	b0: non-addressed mode (must be set) b1: addressed mode

AUTH-MODE

Bit	7	6	5	4	3	2	1	0
Function	0	0	0	0	0	CRYPTO-FLAG	0	0

Field	Description / Value
CRYPTO-FLAG	If this bit is set, the protocol contains the crypto execution time. b0: no crypto execution time in protocol b1: crypto execution time in protocol

ⓘ ***NOTE:***

Only non-addressed mode is supported.

Send interrogator challenge and request tag authentication response.

Message TAM1 format

Field	Description / Value	Length
MSG-CMD	Defines the authentication method and custom data. See MSG-CMD.	1
KEY-ID	Defines which key is used for TAM1. See **KEY-ID**.	1
(CHALLENGE)	80-bit random challenge that the interrogator has generated for use in TAM1.	(10)

MSG-CMD

Bit	7	6	5	4	3	2	1	0
Function	Authentication Method		Custom Data	TAM1-RFU				

Field	Description / Value
TAM1-RFU	b00000: reserved
Custom Data	b0: no custom data requested b1: custom data requested
Authentication Method	b00: specifies the use of TAM

KEY-ID

Bit	7	6	5	4	3	2	1	0
Function	0	0	0	0	0	KEY-TYPE		

Field	Description / Value
KEY-TYPE	b0: Key 0 is used b1: Key 1 is used

Sends interrogator challenge and requests tag authentication response with custom data.

Message TAM2 format

Field	Description / Value	Length
MSG-CMD	Defines the authentication method and custom data and block size. See MSG-CMD.	1
KEY-ID	Defines which key is used for TAM2. See KEY-ID.	1
(CHALLENGE)	80-bit random challenge that the interrogator has generated for use in TAM2.	(10)
TAM2-PARAMETER	Defines the parameters for TAM2. See TAM2-PARAMETER.	3

MSG-CMD

Bit	7	6	5	4	3	2	1	0
Function	Authentication Method		Custom Data	TAM2-RFU				

Field	Description / Value
TAM2-RFU	b0000: reserved
Custom Data	b0: no custom data requested b1: custom data requested
Authentication Method	b00: specifies the use of TAM

KEY-ID

Bit	7	6	5	4	3	2	1	0
Function	BLOCK-COUNT				0	KEY-TYPE		

Field	Description / Value
KEY-TYPE	b0: Key 0 is used b1: Key 1 is used

TAM2-PARAMETER

Bit	7	6	5	4	3	2	1	0
Function					PROT-MODE			
Bit	**15**	**14**	**13**	**12**	**11**	**10**	**9**	**8**
Function	OFFSET							
Bit	**23**	**22**	**21**	**20**	**19**	**18**	**17**	**16**
Function	PROFILE				OFFSET			

Field	Description / Value
PROT-MODE	Defines the operation mode that shall be used to process the custom data. **PROT-MODE** **Description** 0x00 Plaintext 0x01 CBC 0x02 CMAC 0x03 CBC + CMAC
BLOCK-COUNT	Defines the size of the customer data as a number of 64-bit blocks (4 memory blocks). One memory block has 16 bits. Size = (BLOCKCOUNT + 1) * 64. For UCODE DNA tags the minimum value is 0x00 (4 memory blocks), whereas the maximum value is 0x01 (8 memory blocks).
OFFSET	Defines the start address of the custom data block. The UCODE DNA tag is divided in 64-bit blocks (4 memory blocks). The minimum value is 0x0000. The maximum value is (number of blocks / 4) – 1. For 192 memory blocks (3k user memory): 47 (0x2F) 64-bit blocks.
PROFILE	Defines the memory profile for the addition of custom data. 0x00: EPC memory bank 0x01: TID memory bank 0x02: user memory bank

10.2.9 [0xB3] [0x33] Read Buffer

This command allows to read data stored in a tag response buffer.

Summary REQUEST-PAYLOAD

Field	Description / Value	Length
COMMAND	0xB3: EPC Host Command	1
SUB-COMMAND	0x33: Read Buffer	1
MODE	Defines the mode of the command.	1
(IDD-LEN)	Optional parameter that defines the length of the IDD field.	(1)
(IDD)	Read-only serial number of the transponder	(IDD-LEN)
BANK	Memory bank of the transponder	1
(A-PW-LEN)	Length of access password	(1)
(A-PW)	Access password	(A-PW-LEN)
START-ADR	Defines the starting address.	2
NB	Number of bits to read.	2

Summary RESPONSE-PAYLOAD

Field	Description / Value	Length
COMMAND	0xB3: EPC Host Command	1
STATUS	Status message from the reader	1

Details REQUEST-PAYLOAD

Field	Description / Value	Length
COMMAND	0xB3: EPC Host Command	1
SUB-COMMAND	0x30: Untraceable	1
MODE	Defines the mode of the command. See MODE.	1
(IDD-LEN)	Optional parameter that defines the length of the following IDD field.	(1)
(IDD)	Read-only serial number of the transponder The IDD is required only in the addressed mode.	(IDD-LEN)
BANK	Memory bank of the transponder, which will be accessed by the reader. See BANK.	1
(A-PW-LEN)	Length of the access password	(1)
(A-PW)	Access password that is used to access the secured state of the tag.	(A-PW-LEN)
START-ADR	Defines the starting address for reading the buffer.	2
NB	Number of bits to read. If NB = 0 the complete buffer will be read.	2

MODE

Bit	7	6	5	4	3	2	1	0
Function	0	0	EXT-ADR	IDD-LF	0	ADR		

Field	Description / Value
ADR	b0: non-addressed mode b1: addressed mode
IDD-LF	Must be set to 1.
EXT-ADR	If this bit is set, the command includes extended address fields. b0: transponder memory addressing is done by the 1 byte DB-ADR field b1: transponder memory addressing is done by BANK and 2 bytes DB-ADR field

BANK

Bit	7	6	5	4	3	2	1	0
Function	A-FLAG	0	0	0	0	0	0	0

Field	Description / Value
A-FLAG	Defines whether the reader tries to read an EPC Class 1 Gen 2 tag in secured state and a password is contained in the protocol. b0: protocol contains no access password b1: protocol contains password length and access password

Details RESPONSE-PAYLOAD with STATUS = 0x00

Field	Description / Value	Length
COMMAND	0xB3: EPC Host Command	1
STATUS	Status message from the reader	1
DATA-LEN	Number of bits	2
DATA	Requested data	(DATA-LEN + 7) / 8

STATUS = 0x95

Field	Description / Value	Length
COMMAND	0xB3: EPC Host Command	1
STATUS	Status message from the reader	1
TAG-ERROR	See "Transponder Error Codes", page **Fehler! Textmarke nicht definiert.**.	1

10.3 Supported Host Commands for Transponder Communication

10.3.1 EPC Class 1 Gen 2

The command codes listed in the following table support the various transponder commands and operations that are available for each transponder type.

Memory Organization:

Number of blocks	vendor specific
Block size	2 bytes

Command Code	Function	Mode	
		non-addressed	addressed
[0xB0] [0x01]	Inventory	-	-
[0xB0] [0x23]	Read Multiple Blocks	✓	✓
[0xB0] [0x24]	Write Multiple Blocks	✓	✓
[0xB0] [0x0A]	Select	✓	-
[0xB3] [0x18]	Kill	✓	✓
[0xB3] [0x22]	Lock	✓	✓
[0xB3] [0x25]	Block Permalock	✓	✓
[0xB3] [0x26]	Read Permalock Status	✓	✓
[0xB3] [0x30]	Untraceable	✓	✓
[0xB3] [0x31]	Authenticate	✓	✓
[0xB3] [0x32]	Challenge	✓	-
[0xB3] [0x33]	ReadBuffer	✓	✓

10.4 The Access Mode Procedure

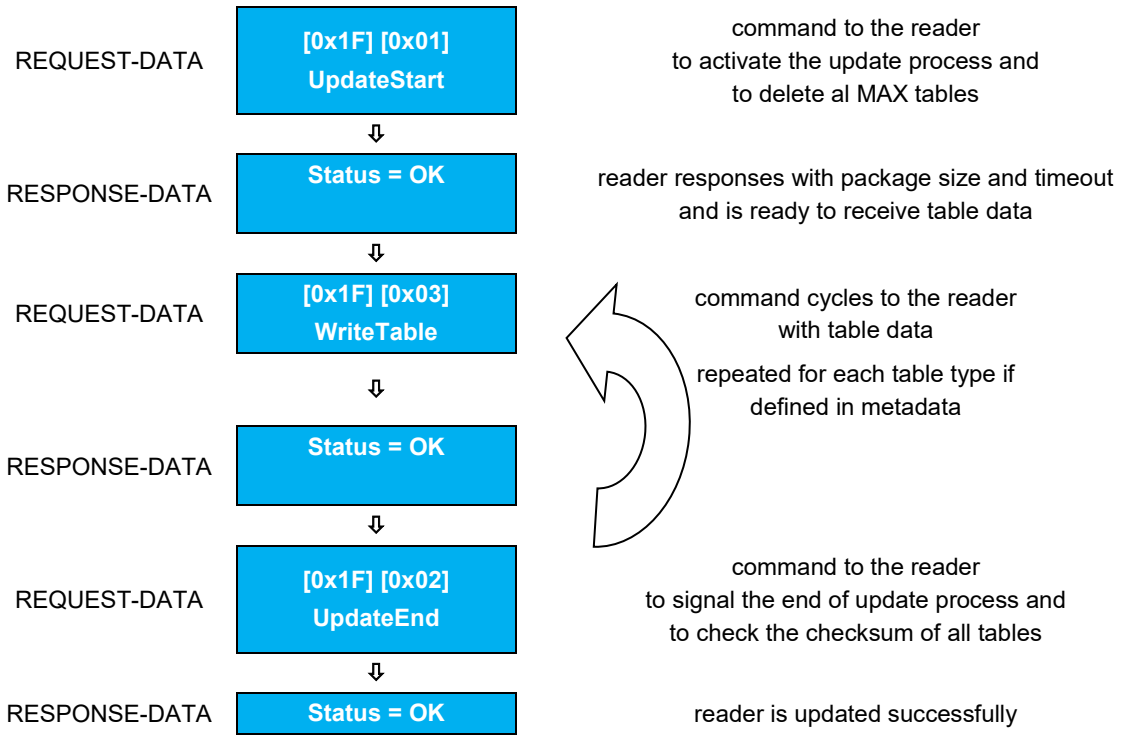
To exchange access data with the reader the MAX Data Exchange Protocol is used. This protocol is defined for block oriented exchange between the ID MAX.U500i and a host system.

10.4.1 MAX Table Transfer to ID MAX.U500i

One purpose of the MAX Data Exchange Protocol is the update of access data by programming all tables described in chapter The Access Data Structure (see page 15) into the ID MAX.U500i.

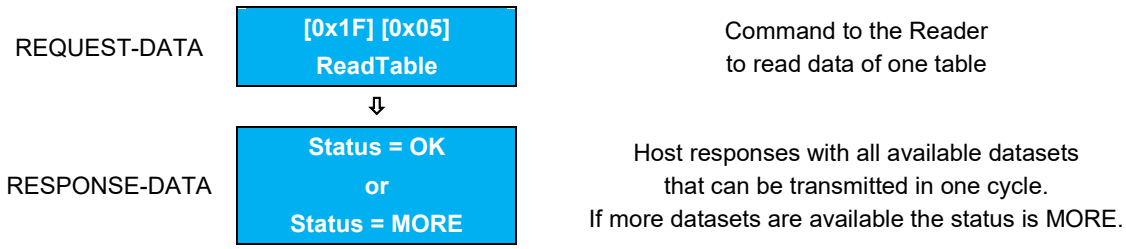
1. Therefor the host has to start with the command [0x01] Start Update (see page 158). If the ID MAX.U500i replies “OK” **all internal stored MAX tables and the event tables are deleted**.
2. Afterwards **the host has to load each table which is defined by metadata** by using the command [0x03] Write Table (see page 162) into the ID MAX.U500i.
3. To finalize the update process the command [0x02] End Update (see page 160) has to be sent.

The figure below illustrates the update procedure of all tables:



10.4.2 Read Table Data

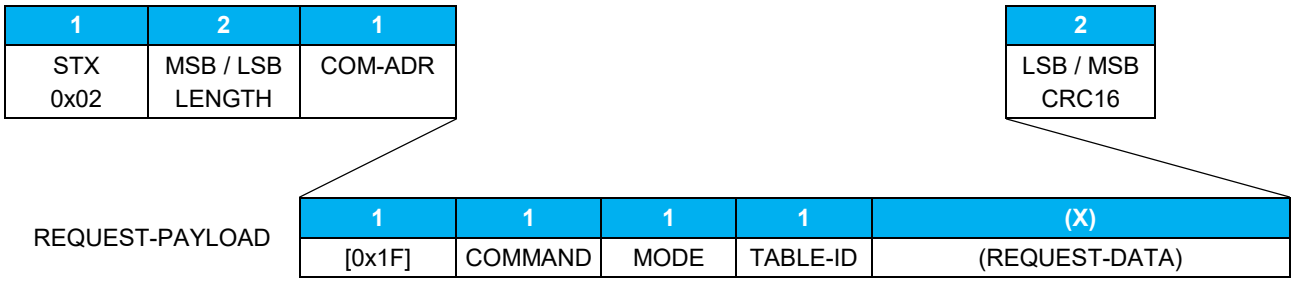
Another purpose is the reading of table data. A single table can be read by using the command [0x05] Read Table (see page 163). The figure below illustrates this procedure:



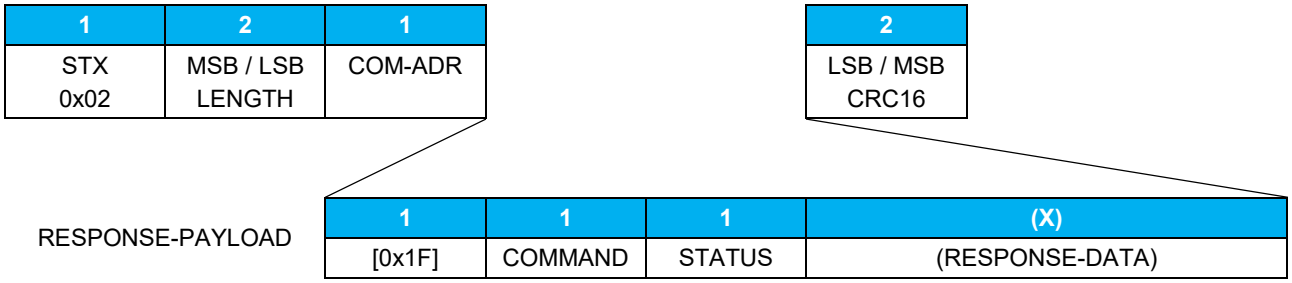
10.5 [0x1F] MAX Data Exchange Protocol

This protocol allows exchanging MAX data with the reader.

REQUEST PROTOCOL



RESPONSE PROTOCOL



Details REQUEST-PAYLOAD

Field	Description / Value	Length
[0x1F]	Command group?	1
COMMAND	Controls the command. The following commands are defined: 0x01: UpdateStart 0x02: UpdateEnd 0x03: WriteTable 0x04: ReadTable 0x06: Notify	1
MODE	**Controls the transfer. For the defined flags see** MODE.	1
TABLE-ID	Identifier of the table. The following tables are defined: 0x00: CRC list 0x01: Metadata 0x02: Timezone table 0x03: Holiday table 0x04: Access table 0x05: Event table	1
DATA	Data to transfer as specified in the following chapters.	N

MODE

Bit	7	6	5	4	3	2	1	0
Function	MORE	0	0	0	0	0	0	0

Field	Description / Value
MORE	b0: No following entry for this table existing.. b1: Following entry for this table existing. The number of table entries must be equal to the number specified in the metadata.

Details RESPONSE-PAYLOAD

Field	Description / Value	Length
[0x1F]	Command group?	1
COMMAND	Controls the command.	1
STATUS	Status message from the reader.	1
(DATA)	Data to transfer as specified in the following chapters.	(N)

ⓘ ***NOTE:***

- ***In this document only the REQUEST-PAYLOAD and the RESPONSE-PAYLOAD blocks without the protocol frame are documented for each command.***
- ***Optional parameters are documented in round brackets: "(optional)".***

10.5.1 [0x01] Start Update

This command activates the update table process and therefore must be the first command in the command sequence. With this command the internal event table is deleted if the responded status from the reader is "OK".

Summary REQUEST-PAYLOAD

Field	Description / Value	Length
COMMAND	0x01: Start Update	1
METADATA	Contains general information concerning timezone table, holiday table and access table.	16

Summary RESPONSE-PAYLOAD

Field	Description / Value	Length
COMMAND	0x01: Start Update	1
STATUS	Status message from the reader	1
PACKET-LEN	Indicates the maximum packet length accepted by the reader.	2
MAX-TIMEOUT	Maximum time which might be needed by the reader for responding.	2

Details REQUEST-PAYLOAD

Field	Description / Value
COMMAND	0x01: Start Update
METADATA	Contains general information concerning timezone table, holiday table and access table. For the values see "Metadata", page 16

Details RESPONSE-PAYLOAD

Field	Description / Value	Length
COMMAND	0x01: Start Update	1
STATUS	Status message from the reader	1
PACKET-LEN	Indicates the maximum packet length in bytes, which will be accepted by the reader for the MAX Data Exchange Protocol.	2
MAX-TIMEOUT	Displays the maximum time in milliseconds, which might be needed by the reader for responding to MAX Data Exchange Protocol requests.	2

10.5.2 [0x02] End Update

This command initiates the end of the update table process and must be the last command in the command sequence. The protocol transfers the CRC of each table and the reader compares them with the internal calculated CRC. If any error in a table is detected, the dedicated flag in the response byte “CRC-FLAGS” is set.

Summary REQUEST-PAYLOAD

Field	Description / Value	Length
COMMAND	0x02: End Update	1
CRC-List	Contains the CRC of each table.	8

Summary RESPONSE-PAYLOAD

Field	Description / Value	Length
COMMAND	0x02: End Update	1
STATUS	Status message from the reader	1
CRC-FLAGS	Contains the CRC flags of which each represents a table error.	1

Details REQUEST-PAYLOAD

Field	Description / Value
COMMAND	0x2: End Update
CRC-List	Contains the CRC of each table: 2 bytes CRC of metadata 2 bytes CRC of timezone table 2 bytes CRC of holiday table 2 bytes CRC of access table

Details RESPONSE-PAYLOAD

Field	Description / Value	Length
COMMAND	0x02: Read Buffer	1
STATUS	Status message from the reader	1
CRC-FLAGS	**Contains the CRC flags of which each represents a table error. The bit number correlates with the table ID. See** CRC-FLAGS.	1

CRC-FLAGS

Bit	7	6	5	4	3	2	1	0
Function	0	0	0	ACCESS	HOLIDAY	TIME-ZONE	META-DATA	0

Field	Description / Value
METADATA	b0: No table error in metadata table b1: Table error in metadata table
TIMEZONE	b0: No table error in timezone table b1: Table error in timezone error
HOLIDAY	b0: No table error in holiday table b1: Table error in holiday table
ACCESS	b0: No table error in access table b1: Table error in access table

ⓘ ***NOTE:***

- ***Cyclic redundancy check of table data, as specified by CCITT-CRC16:***
  Polynomial: 0x1021 ($x^{16} + x^{12} + x^5 + 1$ normal)
  Start Value: 0xFFFF
- ***CRC of METADATA is calculated over METADATA in command [0x01] Start Update (see page 158).***
- ***CRC of TIMEZONE-TABLE, HOLIDAY-TABLE and ACCESS-TABLE is calculated over the TABLE RECORDS transferred with the command [0x03] Write Table (see page 162).***

10.5.3 [0x03] Write Table

This command transfers data to the reader in one or multiple steps. Multiple steps for one table must be signaled with the MORE flag in the MODE byte. The last protocol for each table must not have set the MORE flag.

Summary REQUEST-PAYLOAD

Field	Description / Value	Length	
COMMAND	0x03: Write Table	1	
MODE	Controls the command	1	
TABLE-ID	Identifier of the table	1	
DATA-SETS	Number of records in the protocol	2	
DATA-SIZE	Number of bytes in each record	1	
TABLE-RECORD	Data structure according to the table record specification of each table.	DATA-SIZE	repeated DATA-SETS times

Summary RESPONSE-PAYLOAD

Field	Description / Value	Length
COMMAND	0x03: Write Table	1
STATUS	Status message from the reader	1

Details REQUEST-PAYLOAD

Field	Description / Value	
COMMAND	0x03: Write Table	
MODE	Controls the command. See "[0x1F] MAX Data Exchange Protocol", page 157.	
TABLE-ID	See "[0x1F] MAX Data Exchange Protocol", page 157. Only table ID 0x02, 0x03 or 0x04 are possible for the [0x03] Write Table command.	
DATA-SETS	Number of records in the protocol	
DATA-SIZE	Number of bytes in each record	
TABLE-RECORD	Data structure according to the table record specification of each table (see "The Access Data Structure", page 15).	repeated DATA-SETS times

10.5.4 [0x05] Read Table

This command is used to read table data from the reader. If multiple steps are necessary, the reader signals this with the status “MORE”. The command is used to read MAX table data stored in the reader and to read the event buffer initiated by the host.

Summary REQUEST-PAYLOAD

Field	Description / Value	Length
COMMAND	0x05: Read Table	1
TABLE-ID	Identifier of the table.	1
REQ-INFO	Contains information of requested data depending on the TABLE-ID.	2

Summary RESPONSE-PAYLOAD

Field	Description / Value	Length	
COMMAND	0x05: Read Table	1	
STATUS	Status message from the reader	1	
DATA-SETS	Number of records in the protocol	2	
DATA-SIZE	Number of bytes in each record	1	
TABLE-RECORD	Data structure according to the table record specification of each table.	DATA-SIZE	repeated DATA-SETS times

Details REQUEST-PAYLOAD

Field	Description / Value
COMMAND	0x05: Read Table
TABLE-ID	Identifier of the table. See "[0x1F] MAX Data Exchange Protocol", page 157.
REQ-INFO	Contains information if requested data depending on the TABLE-ID. Table-ID / Table / REQ-INFO 0x00 / CRC List / 0x00 0x00 0x01 / Metadata / 0x00 0x00 0x02 / Timezone Table / TABLE-IDX 0x03 / Holiday Table / TABLE-IDX 0x04 / Access Table / TABLE-IDX 0x05 / Event Table / EVENT-COUNT **TABLE-IDX**: Index of the first table record, which shall be transferred. If more records are available, the reader responds with stauts 0x94 (MORE). Remaining records can be read with the new read table command. The new TABLE-IDX for the next iteration can be calculated with the formula TABLE-IDXnew = TABLE-IDXold + DATA-SETS whereby DATA-SETS has to be taken from the last reader response. If TABLE-IDX is out of range, the reader responds with status 0x11 (PARAMETER RANGE ERROR). **EVENT-COUNT**: Number of data sets to be transferred from the event table. **Event records, which are read once, are automatically deleted from the event table.** If the event table does not contain any record, the reader responds with status 0x92 (NO VALID DATA). If the event table does not contain the requested number of records, the reader responds with all available records. If more records are available, the reader responds with status 0x94 (MORE). Remaining records can be read with the new read table command.

Details RESPONSE-PAYLOAD

Field	Description / Value	Length	
COMMAND	0x05: Read Table	1	
STATUS	Status message from the reader	1	
DATA-SETS	Number of records in the protocol	2	
DATA-SIZE	Number of bytes in each record	1	
TABLE-RECORD	Data structure according to the table record specification of each table. See "The Access Data Structure", page 15.	DATA-SIZE	repeated DATA-SETS times

10.5.5 [0x06] Notify Event

This command transfer event records to a host. It can be used for host initiated data transfer by using the command [0x05] Read Table (see page 163).

Summary NOTIFICATION-DATA (sent by the reader)

Field	Description / Value	Length	
COMMAND	0x06: Notify Event	1	
DATA-LAYOUT	Defines the layout of all event records included in this command.	1	
DATA-SETS	Number of event records following in the command.	2	
REC-LEN	Number of bytes of the following data structure EVENT-RECORD.	2	
EVENT-ID	Indicates the reason why the following EVENT-RECORD was recorded.	1	repeated DATA-SETS times
EVENT-RECORD	Event record sent by the reader.	REC-LEN	

Summary ACKNOWLEDGE-DATA (sent by the host)

Field	Description / Value	Length
COMMAND	0x06: Notify Event	1
STATUS	Status message from the reader	1
ACTION	Indicates the permission status of the event.	1

Details REQUEST-PAYLOAD

Field	Description / Value	
COMMAND	0x06: Notify Event	
DATA-LAYOUT	Defines the layout of all event records included in this command. Each flag indicates if the corresponding data element is included in the event record. See DATA-LAYOUT.	
DATA-SETS	Number of event records following in this command.	
REC-LEN	Number of bytes of the following data structure EVENT-RECORD, including 2 bytes for REC-LEN.	
EVENT-ID	Indicates the reason why the following EVENT-RECORD was recorded. 0x01: Access event This event is triggered if the reader has decided about the permission to the transmitted IDD. This event is also triggered if the reader has read an IDD.	repeated DATA-SETS times
EVET-RECORD	Event record sent by the reader. Depending on the DATA-LAYOUT an event record may have different length and content. For a detailed description of the structure see EVENT-RECORD.	

DATA-LAYOUT

Bit	7	6	5	4	3	2	1	0
Function	0	0	0	ANT-NR	INPUT	EVENT-STATUS	TIME-STAMP	IDD-SET

Field	Description / Value
IDD-SET	b0: IDD-SET is not included in the event record. b1: IDD-SET is included in the event record.
TIME-STAMP	b0: Internal system time and date are not included in the event record. b1: Internal system time and date are included in the event record.
EVENT-STATUS	b0: Access action and error flags are not included in the event record. b1: Access action and error flags are included in the event record.
INPUT	b0: Input status is not included in the event record. b1: Input status is included in the event record.
ANT-NR	b0: Antenna number is not included in the event record. b1: Antenna number is included in the event record.

EVENT-RECORD

Field	Description / Value	Length
IDD-SET	Includes the recorded IDD which has triggered the event. DATA-LAYOUT: xxxx xxx1 It consists of 1 byte IDD-LEN (0: IDD field is empty; 1…64: length of the following IDD) and the IDD (max. 64 bytes) if the IDD-LEN is else than zero.	N
TIME-STAMP	DATA-LAYOUT: xxxx xx1x 1 byte DAY (1…31) 1 byte MONTH (1…12) 1 byte YEAR (0…99) 1 byte HOUR (0…23) 1 byte MINUTE (0…59) 1 byte SECOND (0…59)	6
ACTION	Indicates the permission status of the event. See ACTION. DATA-LAYOUT: xxxx x1xx	1
ERROR-FLAGS	Each flag represents an error. Further details are described in [0x6E] Reader Diagnostic (see page 104) Mode 0x06 MAX status. DATA-LAYOUT: xxxx x1xx	2
INPUT	Indicates the status of the digital inputs. See INPUT. DATA-LAYOUT: xxxx 1xxx	1
ANT-NR	Indicates on which antenna the transponder was read. See ANT-NR.	1

ACTION

Bit	7	6	5	4	3	2	1	0
Function	0	0	0	0	0	0	ACCESS	

Field	Description / Value
ACCESS	b00: Access was denied (antenna LED lights violet) b01: Access was permitted (antenna LDE lights blue) b10: Parameter mismatch (antenna LED lights orange) b11: Access was denied because of APB rule (antenna LED lights violet)

INPUT

Bit	7	6	5	4	3	2	1	0
Function	0	0	0	0	0	0	IN2	IN1

Field	Description / Value
IN1	b0: Indicates that the digital input is currently active. b1: Indicates that the digital input is currently inactive.
IN2	b0: Indicates that the digital input is currently active. b1: Indicates that the digital input is currently inactive.

ANT-NR

Bit	7	6	5	4	3	2	1	0
Function	0	0	0	0	0	0	ANT2	ANT1

Field	Description / Value
ANT1	b0: No tag was read. b1: Tag was read on this antenna.
ANT2	b0: No tag was read. b1: Tag was read on this antenna.

Details RESPONSE-PAYLOAD

Field	Description / Value	Length
COMMAND	0x22: Read Buffer	1
STATUS	Status message from the reader	1
ACTION	Indicates the permission status of the event. See ACTION. DATA-LAYOUT: xxxx x1xx	1

ACTION

Bit	7	6	5	4	3	2	1	0
Function	0	0	0	0	0	0	ACCESS	

Field	Description / Value
ACCESS	b00: Access was denied (antenna LED lights violet) b01: Access was permitted (antenna LDE lights blue) b10: Parameter mismatch (antenna LED lights orange) b11: Access was denied because of APB rule (antenna LED lights violet)

ANNEX

Annex B: Codes of Transponder Types

Value	Transponder Type	Supported by ID MAX.U500i
0x00	NXP I-Code1	-
0x01	Texas Instruments Tag-it	-
0x03	ISO 15693	-
0x04	ISO 14443A	-
0x05	ISO 14443B	-
0x06	NXP I-Code EPC	-
0x08	Jewel	-
0x09	ISO 18000-3M3	-
0x0A	STMicroelectronics SR176	-
0x0B	STMicroelectronics SRIxx (SRI512, SRIX512, SRI4K, SRIX4K)	-
0x0D	FeliCa	-
0x0E	Keyboard (no tag)	-
0x10	Calypso Innovatron (14443B)	-
0x11	ASK CTx (CTS256B. CTS512B, CTM512B)	-
0x84	EPC Class 1 Gen 2 / ISO 18000-6-C	x
0xC2	Barcode	-
0xFF	“free”	-

Annex C: Codes of Identifier Data Types (IDDT)

Value	IDDT
0x00	EPC
0x02	EPC + TID

The information will be sent by performing the command [0xB0] [0x01] Inventory (see page 118) or by using an Auto Read Mode if available.

Annex D: Index of Status Bytes

Hex value	General
0x00	**OK**: • data / parameters have been read or stored without error • control command has been executed successfully

Hex value	Transponder Status
0x01	**No Transponder**: • No transponder is located within the detection range of the reader • The transponder in the detection range has been switched to mute • The communication between reader and transponder has been interfered and the reader is not able to read the transponder anymore
0x02	**Data False**: • CRC16 data error at received data
0x03	**Write Error**: Negative plausibility check of the written data: • Attempt to write on a read-only storing area • Too much distance between transponder and reader antenna • Attempt to write in a noisy area
0x04	**Address Error**: The required data are outside of the logical or physical transponder address area: • The address is beyond the max. address space of the transponder • The address is beyond the configured address space of the transponder
0x05	**Wrong Transponder Type**: This command is not applicable at the transponder: • Attempt to write on or read from a transponder • A special command is not applicable to the transponder

Hex value	Parameter Status
0x10	**EEPROM Failure**: • The EEPROM of the reader is not able to be written on • Before writing onto the EEPROM a faulty checksum of parameters has been detected
0x11	**Parameter Range Error**: • The value range of the parameters was exceeded
0x13	**Login Request**: • Configuration access without having logged in to the reader before
0x14	**Login Error**: • Login attempt with wrong password
0x15	**Read Protect**: • The configuration block is reserved for future use
0x16	**Write Protect**: • The configuration block is reserved for future use
0x17	**Firmware Activation Required**: • The firmware must be activated first using ISOStart demo program and the command “Set Firmware Upgrade”. The upgrade code must be ordered from FEIG Electronic. 1. Read the Device-ID using the command [0x66] Get Reader Info (see page 96) (Mode 0x80). 2. Send the Device-ID and the serial number of the reader to FEIG Electronic. 3. Write the upgrade code into the reader using the command [0x5F] Set Firmware Upgrade.

Hex value	Interface Status
0x80	**Unknown Command**: • The reader does not support the selected function
0x81	**Length Error**: • Command is too short or too long
0x82	**Command Not Available**: • Reader is set to a wrong mode • Command is not supported
0x83	**RF Communication Error**: This error indicates that there is an error in communication between the transponder and the reader. Reason for this can be that the collision handling algorithm was not continued until no collision is detected. The break can have following reasons: • TR-RESPONSE-TIME in CFG1: Interface (see page 27) is too short • Transponder is in the limit reading range • Too much noise in the antenna field
0x84	**RF Warning**: Detailed status information can be read with the command [0x6E] Reader Diagnostic (see page 104). • The antenna configuration is not correct. Check the antenna cables and the antenna matching. • The environment is too noisy. • The RF power does not have the configured value.
0x92	**No Valid Data**: • There is no valid data in the Buffered Read Mode or Access Mode • There is no transponder in the antenna field • The VALID-TIME (CFG11: Read Mode – Read Data (see page 53)) has not elapsed for transponders in the antenna field
0x93	**Data Buffer Overflow**: • A data buffer overflow occurred
0x94	**More Data**: • There are more transponder data sets requested than the response protocol can transfer at once
0x95	**Tag Error**: • A tag error code was sent from the transponder. The tag error code is shown in the following byte. Tag errors are listed in Transponder Error Codes (see page **Fehler! Textmarke nicht definiert.**).

Annex E: Codes of Reader Types

No.	Reader Type
31	ID ISC.M02
33	ID ISC.M02M8
43	ID ISC.LR2500-B
44	ID ISC-LR2500-A
45	ID ISC.LR1002
50	ID ISC-MU02
54	ID ISC.MRU102
60	ID ISC.PRH101
61	ID ISC.PRH101-U (USB-Version)
62	ID ISC.PRHD102
63	ID ISC.PRH102
64	ID ISC.PRH200
71	ID ISC.PRH100-U (USB-Version)
76	ID ISC.MR101
77	ID ISC.MR102
78	ID ISC.MR101-U
80	ID CPR.M02
81	ID CPR.02
82	ID CPR40-30-Ux (USB-Version)
83	ID CPR40.0x-Ax / -Cx (RS232 Interface)
84	ID CPR50
85	ID CPR44
86	ID CPR30
89	ID CPR46
91	ID ISC.LRU1002
94	ID ISC.LRU3000
100	ID MAX50
101	ID MAX.U1002
114	ID CPR74
130	ID ISC ANT.U500/270-GA
131	ID ISC ANT.U500/270-DM
140	ID HyWEAR compact
351	ID LRU500i-BD
607	ID LRU500i-PoE
863	ID MAX.U500i

Annex F: Transponder Error Codes

Hex Value	Response Error Code Definition
0x01	Not supported: The tag does not support the specified parameters or feature.
0x02	Insufficient privileges: The interrogator did not authenticate itself with sufficient privileges for the tag to perform the operation.
0x03	Memory overrun: The specified memory location does not exist or the EPC length field is not supported by the tag.
0x04	Memory locked: The specified memory location is locked and/or permalocked and is either not writeable or not readable.
0x05	Crypto suite error: Catch-all for errors specified by the cryptographic suite.
0x06	Command not encapsulated: The interrogator did not encapsulate the command in an AuthComm or SecureComm as required.
0x07	ResponseBuffer overflow: The operation failed because the ResponseBuffer overflowed.
0x08	Security timeout: The command failed because the tag is in a security timeout.
0x0B	Insufficient power: The tag has insufficient power to perform the memory-write option
0x0F	Non-specific error: The tag does not support error-specific codes.
0x00	Other error: “Catch-all” for errors not covered by other codes.
all others	Reserved for future use.