OBID®
OBID i-scan® HF

MANUAL

ID ISC.MR102

Standard-Reader

from Firmware-Version 0.4 or higher

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FEIG ELECTRONIC

Note

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General information's regarding this manual

- 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).

Content

Revision History of documentation

Revi-sion	Date	Page	Description
0e	12.04.11		Initial version

Abbreviations

ADR	Address
ASK	Amplitude Shift Keying
CB	Config Block
CFG	Configuration Parameter Block
CRC	Cyclic Redundancy Check
DB	data block
DIP	Dual Inline Plastic
FIFO	First in First out
frq	Frequency
FSK	Frequency Shift Keying
h	Hour
Hz	Hertz
ID	Identification
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
TAB	Table
TR	Transponder
TS	Timeslot
UID	Unique Identifier (read only Serial Number)
WO	Write Only Access
WR	Write

1. Data Transmission between OBID i-*scan*® ID ISC.MR102 and Host

Different ways of data transmission between OBID i-*scan*® Readers and host (terminal, PC) are possible. The **ISO15693Host Commands** are used for the data exchange between Transponder and host, whereas the **Configuration Commands** and the **Control** serves 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:

	interface		
	asynchronous (RS232 / RS485)	**USB**	**LAN**
Configuration and control commands	●	●	●
ISO Host Commands	●	●	●
Scan-Mode	●	● (HID)	-
Notification Mode	-	-	●

1.1. Configuration Commands and Control Commands

This method of data transmission is used for Reader configuration and the diagnosis via the asynchronous interface or Ethernet Interface

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 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>

1.2. ISO15693 Host Commands

The ISO Host Commands provide the exchange of data between a host and Transponders 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. If the Transponder is removed from detection range of the Reader during a writing process, this will cause a loss of data.

The Reader distinguishes between three different modes:

Addressed mode:

Before reading or writing data in addressed mode, the UID of the Transponder has to be known. This is executed by sending the protocol "6.1.1. [0x01] Inventory If a Transponder is located within the detection range of the Reader at that time, it answers with its UID. For all following read- / write orders the Transponder must be addressed with its correct UID.

The following chart will show the necessary steps for the communication with a Transponder in addressed mode:

<table>
<tr><td>Host (Terminal / PC / ....)</td><td></td><td colspan="2">Reader</td></tr>
<tr><td rowspan="4">Inventory
to get the UID</td><td>→</td><td colspan="2">Transponder in antenna field ?</td></tr>
<tr><td></td><td>Yes</td><td>No</td></tr>
<tr><td>←</td><td>status /
number of Transponders / UID</td><td>status =
no Transponder</td></tr>
<tr><td>←</td><td colspan="2"></td></tr>
<tr><td rowspan="4">read data from Transponder with UID</td><td>→</td><td colspan="2">Transponder with
correct UID in antenna field ?</td></tr>
<tr><td></td><td>Yes</td><td>No</td></tr>
<tr><td>←</td><td>status /
Transponder read data</td><td>status =
no Transponder
in Reader field</td></tr>
<tr><td>←</td><td colspan="2"></td></tr>
<tr><td rowspan="4">write data to Transponder with UID</td><td>→</td><td colspan="2">Transponder with
correct UID in antenna field ?</td></tr>
<tr><td></td><td>Yes</td><td>No</td></tr>
<tr><td>←</td><td>OK status</td><td>status =
no Transponder
in Reader field</td></tr>
<tr><td>←</td><td colspan="2"></td></tr>
</table>

Non-addressed mode:

In non-addressed mode, it is not necessary to know the UID of the Transponder. This mode is useful-, if only one Transponder is located within the range of the Reader.

The following chart will show the necessary steps for the communication with a Transponder in non-addressed mode:

<table>
<tr><th>Host (Terminal / PC / ....)</th><th></th><th colspan="2">Reader</th></tr>
<tr><td rowspan="4">read data</td><td>→</td><td colspan="2">Transponder in antenna field ?</td></tr>
<tr><td></td><td>Yes</td><td>No</td></tr>
<tr><td>←</td><td>status / Transponder read data</td><td>status = no Trans-ponder in Reader field</td></tr>
<tr><td>←</td><td colspan="2"></td></tr>
<tr><td rowspan="4">write data</td><td>→</td><td colspan="2">Transponder in antenna field ?</td></tr>
<tr><td></td><td>Yes</td><td>No</td></tr>
<tr><td>←</td><td>OK status</td><td>status = no Trans-ponder in Reader field</td></tr>
<tr><td>←</td><td colspan="2"></td></tr>
</table>

Selected:

In this mode the Reader communicates only with the one, selected Transponder.

Before reading or writing data in selected mode, the UID of the Transponder has to be known. This is executed by sending at first the protocol "6.1.1. [0x01] Inventory". In a second step the Transponder must be selected with the select command (see: 6.1.6. [0x25] Select) which must include its UID.

The following chart will show the necessary steps for the communication with a Transponder in selected mode:

Host (Terminal / PC / ....)		Reader	
Inventory to get the UID	→	Transponder in antenna field ?	
		Yes	No
	←	status / number of Trans- ponders / UID	status = no Transponder
	←		
select Transponder with UID	→	Transponder with the correct UID in antenna field ?	
		Yes	No
	←	status / Transponder read data	status = no Transponder in Reader field
	←		
read data	→	selected Transponder in antenna field ?	
		Yes	No
	←	status / Transponder read data	status = no Transponder in Reader field
	←		
write data	→	selected Transponder in antenna field ?	
		Yes	No
	←	OK status	status = no Transponder in Reader field
	←		

1.3. Scan Mode

In this operation-mode the Reader autonomously sends out data to the host as soon as a Transponder is within the detection range and valid data could be read.

In Scan Mode the contents of the message block (UID, data block) can be adapted to each user-application. Scan mode is available via the asynchronous Interface and the USB Interface.
If an USB-Reader is used in scan mode, the reader sends its data automatically over the HID interface of the operating system. In this case, you cannot catch the data with the FEUSB.DLL or any other libraries. The reader works like a USB keyboard.

The Reader starts the output of the protocol block as soon as all required data have been read correctly from the Transponder. If the number of transmitted user data is too large, only the maximal number of transmitted data will be sent plus the end character.

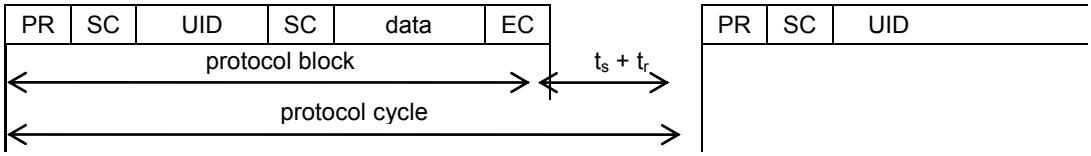
Scan-Mode via asynchronous interface:

The data will be sent out depending on their configuration according to the following scheme, the sequence of which cannot be changed.

Depending to the configuration and the number of Transponders in the detection range of the Reader the transmitted protocols have a different format.

Example 1:

One Transponder in detection range and UID and data block should be read:



Example 2:

3 Transponder in detection range only UID should be read:

PR	SC	UID1	EC	UID2	EC	UID3	EC

Example 3:

3 Transponder in detection range only data block should be read:

PR	SC	data1	EC	data2	EC	data3	EC

Example 4:

2 Transponder in detection range UID and data block should be read:

PR	SC	UID1	SC	data1	EC	UID2	SC	data2	EC

PR:	Com-Prefix (optional)	ts:	SCAN-LOCK-TIME
UID:	Serial-Number. (fix)	tr:	time to the next new Transponder reading
data:	data blocks (free programmable)		
SC	Separation character (optional)		
EC	End character (optional)		

Example 5:

COM-ADR	Separation Character	Header				UID	Separation Character	Data-Blocks	END Character		
COM-ADR	SEP-CHAR	USR1	USR2	USR3	USR4	UID	SEP-CHAR	DB	USR 1	USR 2	USR 3

Scan-Mode via USB-Interface (HID-Mode):

If an USB-Reader is set to Scan-Mode the reader works like a keyboard. The data will be transferred as USB Key Code.

If the number of transmitted user data is too large, only the maximal number of transmitted data will be sent plus the end character.

Note:

- ***If configuration protocols shall be sent to the Reader while the Scan-Mode is active, no Transponder should be within the detection range of the Reader during this time.***
- ***Only read operations are available with the Scan Mode or Notification Mode.***

2. Interface

The Reader ID ISC.MR102 is available with 4 different interface ports (RS232; RS485; USB; LAN). The protocol frame of this ports can be different. On the asynchronous serial interface the whole protocol frame is described in 2.2. Serial Data Format and Protocol Frames. The TCP/IP protocol frame is described below.

2.1. Protocol Frames of TCP/IP protocol

If the Reader use 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 2.2. Serial Data Format and Protocol Frames is packaged as the data of a TCP/IP protocol frame. By using the FETCP.DLL you can easily extract or package the application data you receive from or you sent to the Reader.

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

2.2. Serial Data Format and Protocol Frames

The Reader ID ISC.MR102 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.

Protocol frame: Advanced Protocol-Length

Reader ← Host

1	2	3	4	5	(6...n-2)
STX (0x02)	MSB ALENGTH	LSB ALENGTH	COM-ADR	CONTROL-BYTE	(DATA)

n-1	n
LSB CRC16	MSB CRC16

Host ← Reader

1	2	3	4	5	6	(7...n-2)
STX (0x02)	MSB ALENGTH	LSB ALENGTH	COM-ADR	CONTROL-BYTE	STATUS	(DATA)

n-1	n
LSB CRC16	MSB CRC16

STX:

If the responded protocol of the Reader starts with the STX sign (0x02) the protocol frame is Advanced Protocol-Length. Then the protocol length 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 Byte)

Number of protocol bytes including LENGTH and CRC16.

COM-ADR:

0..254 address of device in bus mode

Note:

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

CONTROL-BYTE:

Defines the Command which the Reader should operate.

STATUS [1]**:**

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

DATA:

Is a optional data field with variable length. The number of DATA byte depend on the command. The data will be sent always as MSB first if the Reader is in the ISO-Host Command Mode.

CRC16:

Cyclic redundancy check of the protocol bytes from 1 to n-2, as specified by CCITT-CRC16

Polynom: $x^{16} + x^{12} + x^5 + 1$ (0x8408)

Start Value: 0xFFFF

Direction: Backward

[1] *see ANNEX D: Index of Status Bytes*

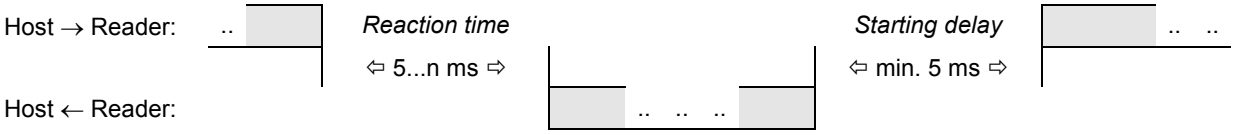
Data format:

Start bits:	1
Data bits:	8
Stop bits:	1
Parity:	even (default) odd none

Timing conditions:

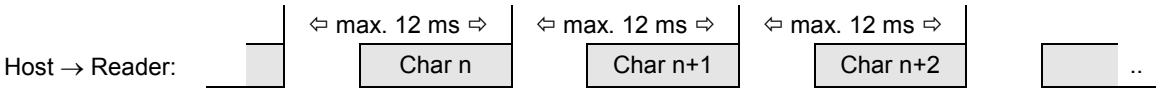
Starting delay:

Before sending a starting sign (length byte) of a protocol, there must be a delay of minimum 5 ms.



Data timeout:

Within one protocol, the characters have to follow each other in intervals of maximum 12 ms.



2.3. CRC16 Calculation Algorithm

Polynom: $x^{16} + x^{12} + x^5 + 1$ ⇒ 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);
        }
}
```

3. Configuration Parameters (CFG)

The configuration memory of the Reader is organized in configuration blocks of 16 byte each. These are divided into 14 byte configuration parameters and a 2 byte CRC16 checksum. Each of these configuration blocks takes a number (CFG 0...CFG n).

Structure of a configuration block in Reader configuration memory and Reader EEPROM (CFG):

Byte	0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
Contents	PARAMETER														CRC16	

The parameters are stored in two different configuration memory locations:

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

Multiple configuration memory locations can be addressed by the value of the parameter CFG-ADR used in chapter 4. Protocols for Reader Configuration

CFG-ADR:

CFGn: memory-address of the required configuration block
LOC: specifies the location of the configuration block (RAM / EEPROM)
MODE: specifies one or all configuration blocks

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

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 error is found, the Reader goes into an error status "EE-Init-Mode" and sets the configuration block which is faulty to the default-values.

While the EE-Init-Mode is active, the LED blinks alternately red and green and the Reader answers external commands with the status "0x10 EEPROM Failure". The "EE-Init-Mode" can be exited now by a new reset (cold start or 5.3. [0x63] command**).** If after this the checksums of all data records are correct, the Reader shifts to the configured operation mode.

Notes:

- ***Malfunctions may occur if parameters are configured outside their described range or if unspecified parameters have been changed!***
- ***A firmware update resets the EEPROM to default settings and the Reader goes into the error status "EE-Init-mode".***

Structure of configuration parameter description.

Byte	0	1	2	.....n
contents	RAM-eff.	EEPROM-eff.	00 res	.....

not marked

Changing of this parameter becomes immediately effective after writing / saving this configuration block to RAM

gray marked

Changing of this parameter only becomes effective after writing / saving this configuration block to EEPROM and a Reader reset

marked with "00"

these bits or bytes are reserved for future extensions or for internal testing and manufacturing-functions. These bits or bytes and also any not described bits and bytes **must not be changed**, as this may cause faulty operation of the Reader.

3.1. CFG0: Passwords

The parameters of the CFG0 configuration block contain the identification codes to personalize the Reader for a user to prevent outside access to some features of the Reader. For security reasons data from this configuration block cannot be read from the host, they are “write-only”. Also the command 4.3. [0x83] Set Default Configuration isn’t available for this configuration block.

Byte	0	1	2	3	4	5	6
Contents	READER-ID				0x00	0x00	0x00
Default	0x00000000						

Byte	7	8	9	10	11	12	13
Contents	0x00	CFG_ACCESS				0x00	0x00
Default		0x00	0x00	0x00	0x00		

READER-ID:

Defines the password with which the host logs into the Reader for a read / write access to the configuration parameter blocks.

CFG_ACCESS:

Defines the Configuration blocks which are accessible only if the user has had a successful login to the Reader.

Byte:	8								9							
Bit:	1	2	3	4	5	6	7	8	1	2	3	4	5	6	7	8
CFG No.	0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15

Byte:	10								11							
Bit:	1	2	3	4	5	6	7	8	1	2	3	4	5	6	7	8
CFG_NO.	16	17	18	19	20	21	22-29	-	40-49	-	-	63	-	-	-	-

CFG_NO

The Bit in CFG_NO defines if the access to the configuration block is free or if the use should login to the Reader to get access to the configuration block.

b0 ⇒ Access if free

b1 ⇒ Access need a login

To change the READER-ID you must write to the CFG0 immediately after the Login to the Reader with the command 5.14. [0xA0] Reader-Login

Notes:

- ***A READER-ID = 0x00000000 disables the password function.***
- ***A read with the command [0x80] Read Configuration will always get '0x00000000'.***
- ***A changed password becomes valid after a Reader reset.***
- ***The command 4.3. [0x83] Set Default Configuration don't change the CFG0 register if all configuration blocks are used.***
- ***The command 5.14. [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 or FEIG Electronic GmbH.***

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 5.14. [0xA0] Reader-Login can configuration parameters in the EEPROM of the Reader may be read and changed in the EEPROM of the Reader.

3.2. CFG1: Interface

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

Byte	0	1	2	3	4	5	6
Contents	COM-ADR	0x00	BAUD[1]	TRANS-FORM[1]	0x00	0x00	TR-RESPONSE-TIME
Default	0x00 *0x00*		0x08 *38400 Baud*	0x01 *e,8,1*			0x01

Byte	7	8	9	10	11	12	13
Contents	TR-RESPONSE-TIME	0x00	0x00	Protocol Mode	SCAN-INTERFACE	Interface	READER - MODE
Default	0x2C *1,5 sec.*				USB:0x02 RS232:0x00 RS485: 0x01	0x80	0x00

COM-ADR:

Bus address of the Reader (0 .. 254) for communication via the asynchronous interface, especially for applications with the RS485 interface.

Notes:

- ***Do not configure address 255!***
- ***Via the COM-Adr 255 in the send protocol, the Reader is able to be addressed at any time. It answers then with the configured address.***

BAUD[1]:

By means of this byte the baud rate of the asynchronous interface can be defined.

0x05: 4800 baud
0x06: 9600 baud
0x07: 19200 baud
0x08: 38400 baud
0x09: 57600 baud
0x0A: 115200 baud

Note:

- ***Changing of BAUD only becomes effective after writing / saving configuration block CFG1 to EEPROM and a reset of the Reader.***
- ***The Reader set the baud rate to 38400 baud, if the user set an invalid baud rate.***
- ***The baud rate is used for both interface port's (RS232 and RS484) of the ID ISC.MR102.***

[1] *A reasonableness check is performed by writing this parameter to the Reader. If an error occurs the Reader answers with STATUS = 0x11.*

TRANS-FORM[1]**:**

By means of this byte, several parameters for the data transmission format of the asynchronous interface can be defined.

Bit:	7	6	5	4	3	2	1	0
Function:	0	0	0	0	S	D	P	

P: Kind of Parity
- b00: no Parity
- b01: even Parity
- b10: odd Parity
- b11: **- do not use -**

D: Number of Data Bits
- b0: 8 Data Bits
- b1: **- do not use -**

S: Number of Stop Bits
- b0: 1 Stop Bit
- b1: **- do not use –**

Note:

- ***Changing of TRANS-FORM only becomes effective after writing / saving configuration block CFG1 to EEPROM and reset of the Reader.***
- ***Always 8 Data Bits and 1 Stop Bits should be used***

TR-RESPONSE-TIME:

By means of this parameter the maximum duration for the Transponder command can be defined.

The TR-RESPONSE-TIME starts after the Reader has received a new command. At the latest after the TR-RESPONSE-TIME elapsed the Reader will send an answer protocol. In this case, the current commands between Reader and Transponder are aborted. If this time is too short the Interface Status " 0x83 RF Communication Error" will appear.

	max. response duration
TR-RESPONSE-TIME	0...65535 * 5 ms

Note:

- ***TR-RESPONSE-TIME has no effect with the protocols for Reader Configuration and the protocols for Reader Control.***
- ***The TR-RESPONSE Time must be < "Block Timeout" in the Host COM-Port settings.***

[1] *A reasonableness check is performed by writing this parameter to the Reader. If an error occurs the Reader answers with STATUS = 0x11.*

Protocol Mode:

By setting of this parameter the Protocol Mode can be enabled

0x00: support of Advanced Protocol Mode (default)

0x01: support of Advanced and Standard Protocol Mode.

We recommend to use Advanced Protocol Mode!
See: 2.2. Serial Data Format and Protocol Frames

INTERFACE: (only for ID ISC.MR012-E)

By setting of this parameter the Network-Discovery can be enabled

0x00: Network-Discovery disabled.

0x80: Network-Discovery enabled.

The Network-Discovery is the functionality that allows to discover and to setup the network configuration of the FEIG-Network-Reader with UDP commands (UDP = User Data Protocol).

READER-MODE:

By means of this byte, the Reader mode can be defined.

Bit:	7	6	5	4	3	2	1	0
Function:	0	0	0	0	0	0	0	SCAN-E

SCAN-E:

b0: **ISO Host Mode** (see chapter 6. Protocols for ISO15693 Host Commands)
This bit combination activates the ISO15693 Host Mode. If the ISO15693 Host Mode is enabled the ISO15693 Host commands will be available

b1: **Scan Mode**
This bit activates the Scan Mode. If the Scan Mode is enabled there are no ISO15693 Host commands available

3.3. CFG2: Inputs / Outputs general

Via the following parameters the operation mode of the LED and the buzzer can be configured at any time. One byte each is reserved for the active and mute position, by means of which the individual operation modes according to the schedule below may be adjusted. In addition to this, for the active- and mute position different flashing frequencies of the LED may be defined. So, the LED may be used as an operation indicator.

Byte	0	1	2	3	4	5	6
Contents	0x00	0x00	0x00	IDLE-STATE	IDLE-FLASH	0x00	0x00
Default				0xA9	0x00		

Byte	7	8	9	10	11	12	13
Contents	ACTIV-STATE	ACTIV-FLASH	ACTIV-GRN-TIME	ACTIV-RED-TIME	0x00	0x00	0x00
Default	0x26	0x00	0x0A	0x0A			
			1 sec.	*1 sec.*	*1 sec.*		

Note:

- ***The Readers dispose of a two colored LED (red / green). The color orange can be obtained by combining both basic colors red and green.***

Colors

LED Color:	red	green
red	1	0
green	0	1
orange	1	1

IDLE-STATE / ACTIVE-STATE

One byte each for idle- and tag-detect state is used to set the operation mode of the signal transmitter.

Bit:	7	6	5	4	3	2	1	0
Function:	Startup LED	0	0		RED		GRN	

GRN / RED

Bit Combination	Signal device
b00	unchanged
b01	on
b10	off
b11	flashing

Startup LED (only idle state)

When this option is selected, the Reader will switch the LEDs on for two seconds to indicate that the Reader is ready after the Reader is supplied with power. If the Reader is reset by software, only both LEDs switch on for 2 seconds.

IDLE-FLASH / ACTIV-FLASH:

By means of the two bytes "IDLE-FLASH" and "ACTIV-FLASH" the signal transmitter may be provided with a flashing frequency for idle and active position.

Bit:	7	6	5	4	3	2	1	0
Function:	0		0		RED		GRN	

Bit combination	flashing frequency
b11	1 Hz
b10	2 Hz
b01	4 Hz
b00	8 Hz

ACTIV-xxx-TIME

If a Transponder was detected, the transmitter and the duration can be set by the bytes ACTIV-STATE and ACTIV-FLASH. Each signal transmitter (LED) may be activated temporarily limited.

Signal transmitter	**time range**
ACTIV-GRN-TIME	0...255 x 100 ms
ACTIV-RED-TIME	0...255 x 100 ms

3.4. CFG3: RF-Interface

The parameters of the CFG3 configuration block contain global Transponder drivers and Reader settings.

Byte	0	1	2	3	4	5	6
Contents	TAG-DRV[1]		0x00	0x80	0x00	0x00	0x00
Default	0x0009						

Byte	7	8	9	10	11	12	13
Contents	0x00	0x00	0x00	0x00	0x00	0x00	FU_COM
Default							0x00

TAG-DRV[1]:

Defines the Transponder types that are operated by the Reader.

Byte:	0								1							
Bit:	15	14	13	12	11	10	9	8	7	6	5	4	3	2	1	0
Driver	0	0	0	0	0	0	0	0	0	0	0	0	**D**	0	0	**A**

b0 ⇒ Driver for the Transponder type is inactive

b1 ⇒ Driver for the Transponder type is active

A: ***(Transponder.Driver.HF.ICode1)***
Driver for I-Code 1

D: ***(Transponder.Driver.HF.ISO_15693)***
Driver for ISO15693

In principle, only those Transponder drivers should be active that are used in the actual application. Thus, the reaction time of the Reader for Transponder read- / write-operations is reduced and the danger of a parasitic Transponder access is minimized.

FU-COM:

Defines if the Reader itself try to controls a function unit in the RF Line.

Bit:	7	6	5	4	3	2	1	0
Function	DC ON /OFF	0	0	0	0	0	0	0

DC ON/OFF

defines whether the Reader provides DC voltage on the antenna output for an external LED, e.g. for ID ISC.ANTS370/270-A. (See also Mounting Instruction)

b0 disabled

b1 enabled

[1] *A reasonableness check is performed by writing this parameter to the Reader. If an error occurs the Reader answers with STATUS = [0x11].*

3.5. CFG4: Transponder Parameters

The parameters of the CFG4 configuration block contain general Transponder settings.

Byte	0	1	2	3	4	5	6
Contents	ICODE-MODE	0x00	0x00	0x00	ISO 15693 MODE	ISO 15693 AFI	ISO15693 OPTION
Default	0x01				0x0B	0x00	0x00

Byte	7	8	9	10	11	12	13
Contents	ISO-CMD-OPTION	0x00	0x00	0x00	0x00	0x00	ISO-blocksize
Default	0x03						0x04

ICODE-MODE: (only I-Code 1 Transponders)

Bit:	7	6	5	4	3	2	1	0
Function	0	0	0	0	0	0	0	FAST

FAST ***(Transponder.HF.ICode1.LinkRate.FastMode)***

b1 Fast Mode (1 / 1)

ISO 15693 MODE:

Bit:	7	6	5	4	3	2	1	0
Function	0	0	AFI	NO-TS	DATA-RATE	SUB-CARRIER	MOD	DATA CODING

DATACODING

b0 **- do not use -**

b1 Fast Mode (1 / 4)

MOD

b0 **- do not use -**

b1 10%

SUB-CARRIER

b0 ASK (one sub-carrier)

b1 **- do not use -**

DATA-RATE

b0 **- do not use -**

b1 high

NO-TS

b0 16 timeslots
b1 1 timeslot

Note:

Anticollison (reading of more than one transponder at the same time) is possible with-1- and 16-timeslots

ISO 15693 AFI: ***(Transponder.HF.ISO_15693.SelectionMask.AFI1)***

Application Family Identifier to select a Transponder

b0 Disabled
b1 Enabled

ISO 15693 OPTION:

Bit:	7	6	5	4	3	2	1	0
Function	0	0	0	0	WR-OPTION		0	0

WR-OPTION:

b00: automatically set
b10: Tag Option = 0
b11: Tag Option = 1

Note:

- ***If WR-OPTION is automatically set, the Reader sets the WR-OPTION to 0, if the ISO15693 Host Command is in non-addressed mode***

ISO-CMD-OPTION: (only ISO15693 Transponder driver)

Bit:	7	6	5	4	3	2	1	0
Function	0	0	0	0	0	0	BREAK	

BREAK ***(Transponder.HF.ISO_15693.Miscellaneous.CommandBreak)***

b11 Complete timeslot length at “NO Transponder”

ISO-Blocksize:

Bit:	7	6	5	4	3	2	1	0
Function	Read Mode		Blocksize	DB-Blocksize				

DB-Blocksize:

Defines the block size of an ISO-transponder which is not listed in the MFR-table (see: 6.3. Supported ISO15693 Host commands for ISO15693 Transponders) or if the transponder is used in the non-addressed mode.

Range: 0x01 ... 0x1F
A value of 0x00 will be automatically set to a block size of 4byte.

Blocksize:

b0: Automatic (If transponder is known)
b1: Manuel (As specified in DB-Blocksize)

Read Mode:

b00: Automatic Mode (If transponder is known)
b01 Single Read
b10 Multiple Read

3.6. CFG5: Anticollision

The parameters of the CFG5 configuration block contain anticollision settings.

Byte	0	1	2	3	4	5	6
Contents	TIMESLOTS[1]	0x00	0x00	0x00	0x00	0x00	0x00
Default	0x30						

Byte	7	8	9	10	11	12	13
Contents	0x00	0x00	0x00	0x00	Anticollision	0x00	0x00
Default				0x04			

TIMESLOTS[1]: (only I-Code 1 Transponders)

Number of timeslots with which Transponders will be read.

Bit:	7	6	5	4	3	2	1	0
Function	0	MAX-TS			0	MIN-TS		

MIN-TS:

Minimum number of timeslots.

MAX-TS:

Maximum number of timeslots.

MIN-TS / MAX-TS	Number of Timeslots
b011	16
b010	8
b001	4
b000	1

Each I-Code 1 Transponder responds in a chosen timeslot. Choosing too much timeslots compared to the number of Transponders in the antenna field means that only a small number of Transponders can be selected at one time. On the other hand are too many timeslots is very time consuming. The optimum number of timeslots is about twice the number of Transponders expected in the antenna field at the same time.

The Reader calculates the expected number of Transponders and sets the corresponding number of timeslots between MIN-TS and MAX-TS. To set up a fixed timeslot, both MIN-TS and MAX-TS must contain the value of the desired timeslot.

Anticollison: (ISO15693 / I-Code 1 Transponders)

b0: anticollision disabled

b1: anticollision enabled

[1] *A reasonableness check is performed by writing this parameter to the Reader. If an error occurs the Reader answers with STATUS = 0x11.*

3.7. CFG6: Customer Command Option Bytes

Byte	0	1	2	3	4	5	6
Contents	0x00	**EM**	**FUJITSU**	**Infineon**	**KSW**	0x00	**NXP**
Default		0x00	0x00	0x00	0x00	0x00	0x00

Byte	7	8	9	10	11	12	13
Contents	**ST**	0x00	**TI**	0x00	0x00	0x00	0x00
Default	0x00	0x00	0x00	0x00	0x00	0x00	0x00

Note:

There are application notes available from FEIG ELECTRONIC GmbH for the description of the customer commands.

It is also recommended to read the transponder specification from the according transponder manufacturer.

3.8. CFG7 - 10: Reserved

The configuration block CFG7-10 are reserved for future use.

Byte	0	1	2	3	4	5	6
Contents	0x00	0x00	0x00	0x00	0x00	0x00	0x00

Default

Byte	7	8	9	10	11	12	13
Contents	0x00	0x00	0x00	0x00	0x00	0x00	0x00

Default

3.9. CFG11 Read Mode Data

The parameters of the CFG11 configuration block contain Scan Mode settings.

Byte	0	1	2	3	4	5	6
Contents	TR-DATA	0x00	TR-DATA-3	0x00	DB-ADR		0x00
Default	0x31		0x00		0x0000		

Byte	7	8	9	10	11	12	13
Contents	0x00	DB-N		0x00	D-START	D-LGT	
Default		0x0001			0x00	0x0004	

TR-DATA:

Selects the data types for read operation.

Bit:	7	6	5	4	3	2	1	0
Function	0	0	TIMER	0	Byte Order DB	0	DB	SNR

SNR

b0: no Serial Number will be stored
b1: Serial Number will be stored

DB

b0: no data block will be stored
b1: data block will be stored

Byte Order DB

b0: MSB first
b1: LSB first

TIMER

b0: no internal system timer
b1: internal system timer will be active

see chapter 5.12. [0x85] Set System Timer for details).

TR-DATA-3:

Selects the data types for read operation.

Bit:	7	6	5	4	3	2	1	0
Function	-	-	-	-	-	-	-	COM Prefix

COM Prefix: (Scan Mode only)

b0: no COM Prefix is send

b1: The Reader will transmit the COM-ADR before each data set.

DB-ADR[1]:

0x00...0xFF

Address of first data block. Range: 0x00...0xFF.

DB-N [1]:

Number of data blocks. Range: 0x01...0x04.

D-START:

This parameter defines the first byte in the raw data (defined by DB-ADR and D-LGT), which will be transferred in Scan-Mode. To transfer the whole data block D-START must be set to 0.

Note:

The size of one data block depends on the type of Transponder.

D-LGT:

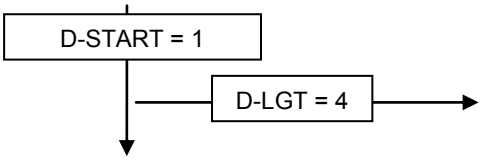
D-LGT defines the length of raw data which are transmitted in the Scan-Mode.

Number of **data bytes** to be transferred, starting with the D-START.

Example:

data block

Byte	0	1	2	3	4	5	6	7
Data	0x01	0x23	0x45	0x67	0x89	0xAB	0xCD	0xEF



Output Data	0x23	0x45	0x67	0x89

[1] *A plausibility check is performed by writing this parameter to the Reader. If an error occurs the Reader answers with STATUS = [0x11].*

3.10. CFG12: Read Mode - Filter

Byte	0	1	2	3	4	5	6
0x00	VALID-TIME[1]		TR-ID				0x00
Default	0x0037 5,5sec.		0x01	0x00	0x00	0x01	

Byte	7	8	9	10	11	12	13
Contents	0x00	0x00	0x00	0x00	0x00	0x00	0x00
Default							

VALID-TIME: (0...65535 x 100 ms = 0 ms ... 6553,5 sec)

The period of time during which a Transponder can't be read a 2nd time.

Note:

- ***Changing of VALID-TIME only becomes effective after writing / saving configuration block CFG12 to EEPROM and reset of the RF Controller with 5.4. [0x64] System Reset in mode 0x00.***

TR-ID: (only for Scan Mode and Notification Mode)

TR-ID sets the parameters for Transponder identification.

If several Transponders has the same content in the addressed data block, only one dataset will be generated.

Byte:	2	3	4	5
Function	TR-ID-SOURCE	TR-ID-DB-ADR		TR-ID-DB-N

TR-ID-SOURCE:

Sets the data source for Transponder identification.

b0 data block

b1 Serial Number

TR-ID-DB-ADR

Sets the address of the data block for Transponder identification. If ID-SOURCE selects the Serial Number as data source, the ID-DB-ADR will be ignored.

TR-ID-DB-N

Sets the number of data blocks to be read for Transponder identification. If ID-SOURCE selects the Serial Number as data source, the ID-DBN will be ignored.

3.11. CFG13 Scan Mode

The configuration block CFG13 contains the Scan Mode settings

Byte	0	1	2	3	4	5	6
Contents	DB-USE	SEP-CHAR	SEP-USER	END-CHAR	END-USR1	END-USR2	END-USR3
Default	0x02	0x20	0x2C	0x01	0x00	0x00	0x00

Byte	7	8	9	10	11	12	13
Contents	0x00	HEADER-USR1	HEADER - USR2	HEADER - USR3	HEADER - USR4	0x00	LEN-USR
Default		0x00	0x00	0x00	0x00		0x00

DB-USE:

Defines the data format of the data and the value of the data.

Bit:	7	6	5	4	3	2	1	0
Function	0	0	0	0	DB-FORMAT			

DB-FORMAT

b0000 unformatted hex-data

In this case the data are transferred as they were read by the reader

b0010 ASCII formatted hex-data

In this case the raw data from the Transponder were converted to ASCII - Code before transfer. For this purpose, the data bytes first are separated into their Nibbles and then changed into ASCII signs according the following table.

raw data (hex / binary)		ASCII data (ASCII / hex)	
0x0	b0000	'0'	0x30
0x1	b0001	'1'	0x31
0x2	b0010	'2'	0x32
0x3	b0011	'3'	0x33
0x4	b0100	'4'	0x34
0x5	b0101	'5'	0x35
0x6	b0110	'6'	0x36
0x7	b0111	'7'	0x37
0x8	b1000	'8'	0x38
0x9	b1001	'9'	0x39
0xA	b1010	'A'	0x41
0xB	b1011	'B'	0x42
0xC	b1100	'C'	0x43
0xD	b1101	'D'	0x44
0xE	b1110	'E'	0x45
0xF	b1111	'F'	0x46

SEP-CHAR:

Selects the separation character between two data types for the send data.

Bit:	7	6	5	4	3	2	1	0
Function	USER	‘ ‘	‘,‘	‘;’	TAB	CR	LF	CR+LF

ASCII	Hex
CR+LF	0x0D and 0x0A
LF	0x0A
CR	0x0D
TAB	0x09
‘;’	0x3B
‘,’	0x2C
‘ ‘	0x20
USER	user defined in SEP-USR
none	0x00

Note:

Only one option could be selected.

SEP-USR:

User defined separation character.

END-CHAR:

Selects the end character between two data types for the send data.

Bit:	7	6	5	4	3	2	1	0
Function	USER	‘ ‘	‘,‘	‘;’	TAB	CR	LF	CR+LF

ASCII	Hex
CR+LF	0x0D and 0x0A
LF	0x0A
CR	0x0D
TAB	0x09
‘;’	0x3B
‘,’	0x2C
‘ ‘	0x20
USER	user defined in SEP-USR
none	0x00

Note:

Only one option could be selected.

END-USR1...3:

User defined end character.

HEADER-USR1...4:

User defined Header character.

LEN-USR:

Defines the length of the HEADER character and END character.

Bit:	7	6	5	4	3	2	1	0
Function	HEADER-LEN				END-LEN			

END-LEN

b0000 END-USR1

b0001 END-USR1

b0010 END-USR1 +2

b0011 END-USR1 + 2 + 3

HEADER-LEN

b0000 no HEADER byte

b0001 HEADER-USR1

b0010 HEADER-USR1 +2

b0011 HEADER-USR1 + 2 + 3

b0100 HEADER-USR1 + 2 + 3 + 4

Example of scan data:

COM-ADR	Separation Character	Header				UID	Separation Character	Blocks	Separation Character	Timer
COM-ADR	SEP-CHAR	USR1	USR2	USR3	USR4	UID	SEP-CHAR	DB	SEP-CHAR	Timer

Separation Character	Date	Separation Character	END Character		
SEP-CHAR	Date	SEP-CHAR	USR1	USR2	USR3

3.12. CFG14-15: Reserved

The configuration block CFG14-15 is reserved for future use.

Byte	0	1	2	3	4	5	6
Contents	0x00	0x00	0x00	0x00	0x00	0x00	0x00

Default

Byte	7	8	9	10	11	12	13
Contents	0x00	0x00	0x00	0x00	0x00	0x00	0x00

Default

3.13. 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 Host Mode and Scan Mode.

Byte	0	1	2	3	4	5	6
Contents	0x00	0x00	PER-RESET-TIME		0x00	0x00	0x00
Default	0x00	0x00	0x0028 40 x 5ms = 200ms		0x00	0x00	0x00

Byte	7	8	9	10	11	12	13
Contents	0x00	0x00	0x00	0x00	0x00	0x00	0x00
Default	0x00	0x00	0x00	0x00	0x00	0x00	0x00

PER-RESET-TIME:

The timer value specifies a time which determine the reset of the Transponder persistence flags by the Reader. The timer PER-RESET-TIME starts after the Reader gets a response at the antenna port. After this time has expired the Reader send a persistence reset command to the Transponders at the antenna port.
Timer ticks = 5ms
Maximum timer value = 5ms x 65534[0xFFFE] = 5,46125 min.

The value 65535 [0xFFFF] indicates that no persistence reset is performed by the Reader

3.14. CFG17-39: Reserved

The configuration blocks CFG17-39 are reserved for future use.

Byte	0	1	2	3	4	5	6
Contents	0x00	0x00	0x00	0x00	0x00	0x00	0x00

Default

Byte	7	8	9	10	11	12	13
Contents	0x00	0x00	0x00	0x00	0x00	0x00	0x00

Default

3.15. CFG40: LAN Settings, Part 1

Byte	0	1	2	3	4	5	6
Contents	IP_ADDRESS_LAN				-	-	-
Default	0xC0	0xA8	0x0A	0x0A	0x00	0x00	0x00
	192	*168*	*10*	*10*			

Byte	7	8	9	10	11	12	13
Contents	-	IP_PORT_NUMBER_LAN		-	-	-	-
Default	0x00	0x27	0x11	0x00	0x00	0x00	0x00
		10001					

IP_ADDRESS_LAN:

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 of the LAN-adapter.

IP_PORT_NUMBER:_LAN

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 of the LAN-adapter.

3.16. CFG41: LAN Settings, Part 2

Byte	0	1	2	3	4	5	6
Contents	SUBNET-MASK-LAN				KEEPALIVE	KEEP-CNT	GW-ADDRES-LAN
Default	0xFF	0xFF	0x00	0x00	0x01	0x02	0x00
	255	*255*	*0*	*0*			

Byte	7	8	9	10	11	12	13
Contents	GW-ADDRES-LAN			KEEP-IDLE		KEEP-INTERVAL	
Default	0x00	0x00	0x00	0x00	0x05	0x00	0x05

SUBNET_MASK_LAN:

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 LAN-adapter.

GW_ADDRESS_LAN:

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.

KEEPALIVE:

0x00: keepalive option disabled
0x01: keepalive option enabled

KEEP-CNT:

Specify the maximum number of retransmissions. This is the number of times that the reader re-transmits a keepalive packet to the host to check for connectivity. The valid range is 5..30.

KEEP-IDLE:

The time the connection needs to remain idle before the reader starts sending keepalive probes. The valid range is 10..65535 sec.

KEEP-INTERVAL:

Set the Keepalive Interval. This is the polling frequency used to determine if a keepalive exchange is needed. This interval is used when the connection failed. The valid range is 10..75 sec.

3.17. CFG49: Notification Channel (only for ID ISC.MR102-E)

Byte	0	1	2	3	4	5	6
Contents	MODE	TIME-TRIGGERED-TIME	0x00	0x00	KEEP-ALIVE	KEEP-ALIVE-TIME	
Default	0x00	0x00	0x00	0x00	0x00	0x00	0x00
	continuously	*0s*			*Off*	*0s*	

Byte	7	8	9	10	11	12	13
Contents	DEST-IP-ADDRESS				DEST-IP-PORT		HOLD-Time
Default	0x00	0x00	0x00	0x00	0x00	0x00	0x01

MODE:

Defines the basic settings for the notification channel.

Bit:	7	6	5	4	3	2	1	0
Function	ACK	0	0	0	0	0	DATA-TRIGGER	

DATA-TRIGGER: ***(OperatingMode.NotificationMode.Transmission.NotifyTrigger)***

b00: continuously

The data records are notified always immediately. For detailed message conditions, see. The message format is described in 7. Protocols for Notification Mode.

ACK: Acknowledge Notification ***(Operating-Mode.NotificationMode.Transmission.Enable_Acknowledge)***

b0: Notification must not be acknowledged
b1: Notification must be acknowledged with protocol [0x32] Clear Data Buffer

TIME-TRIGGERED-TIME: (Operating-Mode.NotificationMode.Transmission.TimeTriggeredTime)

Defines the cycle time in time-triggered mode.

	max. time period
TIME-TRIGGERED-TIME	0...255 * 1s

KEEP-ALIVE:

Mode for keep alive notification.

Bit:	7	6	5	4	3	2	1	0
Function	0	0	0	0	0	0	0	EN

EN: ***(OperatingMode.NotificationMode.Transmission.KeepAlive.Enable)***

b0: disabled

b1: enabled

KEEP-ALIVE-TIME: ***(OperatingMode.NotificationMode.Transmission.KeepAlive.IntervalTime)***

Defines the cycle time for keep alive notification.

	max. time period
KEEP-ALIVE-TIME	0...65535 * 1s

DEST-IP-ADDRESS: ***(Operating-Mode.NotificationMode.Transmission.Destination.IPv4.IPAddress)***

Defines the destination IP address.

DEST-IP-PORT-NUMBER: ***(Operating-Mode.NotificationMode.Transmission.Destination.PortNumber)***

Defines the destination port number.

HOLD-Time: ***(Operating-Mode.NotificationMode.Transmission.Destination.ConnectionHoldTime)***

Defines the connection hold time.

3.18. CFG63: Customer Parameter

The configuration block CFG63 is used for customer parameter.

Byte	0	1	2	3	4	5	6
Contents	0x00	0x00	0x00	0x00	0x00	0x00	0x00

Default

Byte	7	8	9	10	11	12	13
Contents	0x00	0x00	0x00	0x00	0x00	0x00	0x00

Default

4. Protocols for Reader Configuration

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

4.1. [0x80] Read Configuration

By using the 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.

Host → Reader

1	2	3	4	5	6	7-8
STX (0x02)	MSB ALENGTH	LSB ALENGTH	COM-ADR	[0x82]	CFG-ADR	CRC16

Host ← Reader

1	2	3	4	5	6	7 .. 20	21-22
STX (0x02)	MSB ALENGTH	LSB ALENGTH	COM-ADR	[0x82]	STATUS[1]	CFG-REC	CRC16

CFG-ADR[2]:

Bit:	7	6	5	4	3	2	1	0
Function	LOC	0	CFGn: Address of Configuration Block					

CFGn: memory-address of the required configuration block

LOC: specifies the location of the configuration block
b0 RAM
b1 EEPROM

CFG-REC:

14 bytes configuration block read from address CFGn in CFG-ADR.

Note:

A read configuration from EEPROM with reserved configuration blocks will cause an 0x15 error code.

[1] *see ANNEX D: Index of Status Bytes*
[2] *see Chapter 3. Configuration Parameters (CFG)*

4.2. [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 3. Configuration Parameters (CFG)

Host → Reader

1	2	3	4	5	6	7...20	21-22
STX (0x02)	MSB ALENGTH	LSB ALENGTH	COM-ADR	[0x81]	CFG-ADR	CFG-REC	CRC16

Host ← Reader

1	2	3	4	5	6	7-8
STX (0x02)	MSB ALENGTH	LSB ALENGTH	COM-ADR	[0x81]	STATUS[1]	CRC16

CFG-ADR[2]:

Bit:	7	6	5	4	3	2	1	0
Function	LOC	0	CFGn: Address of Configuration Block					

CFGn: memory-address of the required configuration block

LOC: specifies the location of the configuration block
- b0 RAM
- b1 RAM and EEPROM

CFG-REC:

14 bytes configuration block stored in the configuration memory of the Reader at address CFGn.

Note:

A write configuration to EEPROM with reserved configuration blocks will cause an 0x16 error code.

[1] *see ANNEX D: Index of Status Bytes*
[2] *see chapter 3. Configuration Parameters (CFG)*

4.3. [0x83] Set Default Configuration (Reset)

Using the command Set Default Configuration each configuration block can be reset to the manufacturer's setting.

Host → Reader

1	2	3	4	5	6	7...8
STX (0x02)	MSB ALENGTH	LSB ALENGTH	COM-ADR	[0x83]	CFG-ADR	CRC16

Host ← Reader

1	2	3	4	5	6	7...8
STX (0x02)	MSB ALENGTH	LSB ALENGTH	COM-ADR	[0x83]	STATUS	CRC16

CFG-ADR:

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

CFGn: memory-address of the required configuration block

MODE: specifies one or all configuration blocks
- b0 configuration block specified by CFGn
- b1 all configuration blocks

LOC: specifies the location of the configuration block
- b0 RAM
- b1 RAM and EEPROM

Notes:

- ***A set default configuration with reserved configuration blocks will cause an error code.***

5. Protocols for Reader Control

5.1. [0x52] Baud Rate Detection

This protocol serves to determine the actual baud rate of the Reader's asynchronous interface.

Host → Reader

1	2	3	4	5	6	7,8
STX (0x02)	MSB ALENGTH	LSB ALENGTH	COM-ADR	[0x52]	0x00	CRC16

Host ← Reader

1	2	3	4	5	6	7,8
STX (0x02)	MSB ALENGTH	LSB ALENGTH	COM-ADR	[0x52]	0x00	CRC16

Note:

- ***The return protocol will only be sent if the inquiry is executed with the baud rate and actual parity of the Reader.***
- ***A USB reader will send status 0x00 (OK) if reader can be detected.***

5.2. [0x55] Start Flash Loader

This protocol starts the Flash Loader inside the Reader. Use the windows program "OBIDFirmwareUpdateTool" to process the firmware update. Please refer to the Application Note "N30300-....pdf" for details.

Host → Reader

1	2	3	4	5	6,7
STX (0x02)	MSB ALENGTH	LSB ALENGTH	0x00	[0x55]	CRC16

Host ← Reader

1	2	3	4	5	6	7,8
STX (0x02)	MSB ALENGTH	LSB ALENGTH	0x00	[0x55]	0x00	CRC16

Note:

- ***This command is only available if the correct COM-ADR of the Reader is used. (Do not use 0xFF)***
  - ***Do not flash the DSP-Revision G or greater with Firmwareversion's less than 1.09. See 5.5. [0x65] Get Software Version***

5.3. [0x63] Software reset

This protocol allows you to perform a reset of Reader CPU.

Host → Reader

1	2	3	4	5	6,7
STX (0x02)	MSB ALENGTH	LSB ALENGTH	COM-ADR	[0x63]	CRC16

Host ← Reader

1	2	3	4	5	6	7,8
STX (0x02)	MSB ALENGTH	LSB ALENGTH	COM-ADR	[0x63]	STATUS[1]	CRC16

Note:

- ***The RF-field will be switched off after a "CPU Reset"***
- ***The communication interface will not be reset.***

5.4. [0x64] System Reset

This protocol allows you to reset the RF Controller.

Host → Reader

1	2	3	4	5	6	7,8
STX (0x02)	MSB ALENGTH	LSB ALENGTH	COM-ADR	[0x64]	Mode	CRC16

Host ← Reader

1	2	3	4	5	6	7,8
STX (0x02)	MSB ALENGTH	LSB ALENGTH	COM-ADR	[0x64]	STATUS[2]	CRC16

MODE:

Defines the controller which will be reset.

MODE	Controller
0x00	RF Controller

[1] *see ANNEX D: Index of Status Bytes*
[2] *see ANNEX D: Index of Status Bytes*

Note:

- ***The RF-field will be switched off after a "CPU Reset"***
- ***The communication interface will be reset.***

5.5. [0x65] Get Software Version

This protocol allows you to determine, the software version of the Reader, its type and the types of the Transponders which are supported by the software.

Host → Reader

1	2	3	4	5	6,7
STX (0x02)	MSB ALENGTH	LSB ALENGTH	COM-ADR	[0x65]	CRC16

Host ← Reader

1	2	3	4	5	6	7,8	9
STX (0x02)	MSB ALENGTH	LSB ALENGTH	COM-ADR	[0x65]	STATUS[1]	SW-REV	D-REV

10	11	12,13	14,15
HW-TYPE	SW-TYPE	TR-TYPE	CRC16

SW-REV:

Version of the firmware.

D-REV:

Revision status of the development firmware. D-REV is set to '0' in customized firmware revisions.

HW-TYPE:

Displays options which are supported by the Reader Hardware

Bit:	7	6	5	4	3	2	1	0
Function:	reserved	reserved	reserved	reserved	reserved	reserved	A-Power	USB

USB:

b0: USB

b1: non USB

A-Power:

b0: reserved

b1: 1,2 Watt

[1] *see ANNEX D: Index of Status Bytes*

SW-TYPE:

Displays the type / model of the Reader
(see: ANNEX E: Codes of Reader Types)

TR-TYPE:

Displays the Transponders supported by the software.

Bit:	15	14	13	12	11	10	9	8
Function:	-	-	-	-	-	-	-	-

Bit:	7	6	5	4	3	2	1	0
Function:	-	-	-	-	ISO 15693	-	-	I-Code1

5.6. [0x66] Get Reader Info

This protocol allows you to determine, the Firmware version, its type and the types of the Transponders which are supported by the Firmware, and some other hard- and firmware options of the Reader. Also the Device_ID can be determined.

Host → Reader

1	2	3	4	5	6	7,8
STX (0x02)	MSB ALENGTH	LSB ALENGTH	COM-ADR	[0x66]	MODE	CRC16

Host ← Reader

Depending on the MODE Parameter the reader response has a differing structure with several information's:

Mode = 0 [0x00] (Controller Firmware)

1	2	3	4	5	6	7,8	9
STX (0x02)	MSB ALENGTH	LSB ALENGTH	COM-ADR	[0x66]	STATUS[1]	SW-REV	D-REV

10	11	12,13	14,15	16,17	18,19
HW-TYPE	SW-TYPE	TR-TYPE	RX-BUF	TX-BUF	CRC16

Host ← Reader

Mode = 128 [0x80] (Device_ID)

1	2	3	4	5	6	7-10	11...14
STX (0x02)	MSB ALENGTH	LSB ALENGTH	COM-ADR	[0x66]	STATUS[1]	DEV_ID	Custom_L

15...16	17...18	19...20	21...22	23...24
FW_L	TR_DRV_L	FNC_L	res.	CRC16

MODE:

Via the Parameter MODE different information could requested from the Reader.

0x00: General hard- and firmware information's

0x80: Device-ID
This Information's are necessary for some firmware updates or firmware upgrades.

SW-REV / D-REV / HW-TYPE / SW-TYPE / TR-TYPE:

see: 5.5. [0x65] Get Software Version

[1] *see ANNEX D: Index of Status Bytes*

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.

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.

DEV_ID:

Individual device identifier of the Reader.

CUSTOM_L

Indicates which customer firmware is licensed on the Reader.

FW_L:

Indicates which Firmware version is licensed on the Reader.

TR_DRV_L:

Indicates which Transponder drivers are licensed on the Reader.

FNC_L

Indicates which optional functions are licensed on the Reader.

[1] *see ANNEX D: Index of Status Bytes*

5.7. [0x69] RF Reset

The RF-field of the Reader antenna can be switched off for **t_{rf} = 15 ms** by the command RF Reset. Thus, all Transponders which are within the antenna field of the Reader will be reset to their base setting.

Host → Reader

1	2	3	4	5	6,7
STX (0x02)	MSB ALENGTH	LSB ALENGTH	COM-ADR	[0x69]	CRC16

Host ← Reader

1	2	3	4	5	6	7,8
STX (0x02)	MSB ALENGTH	LSB ALENGTH	COM-ADR	[0x69]	STATUS[1]	CRC16

Notes:

- ***After a RF Reset the Reader is not able to receive a new Transponder before expiration of t_{rf} .***
- ***After a RF Reset, a Transponder which is located within the field has to be re-selected.***
- ***The response of this command will be sent after the RF Reset was completed.***

5.8. [0x6A] RF ON/OFF

The command RF ON/OFF switches the RF field of the Reader antenna ON and OFF.

Host → Reader

1	2	3	4	5	6	7,8
STX (0x02)	MSB ALENGTH	LSB ALENGTH	COM-ADR	[0x6A]	RF	CRC16

Host ← Reader

1	2	3	4	5	6	7,8
STX (0x02)	MSB ALENGTH	LSB ALENGTH	COM-ADR	[0x6A]	STATUS[2]	CRC16

RF:

0x00 RF-Field of Reader antenna is OFF
0x01 RF-Field of Reader antenna is ON

[1] *see ANNEX D: Index of Status Bytes*
[2] *see ANNEX D: Index of Status Bytes*

5.9. [0x6D] Get Noise Level

The command Get Noise Level reads the actual Noise Levels from the Reader.

Host → Reader

1	2	3	4	5	6,7
STX (0x02)	MSB ALENGTH	LSB ALENGTH	COM-ADR	[0x6D]	CRC16

Host ← Reader

1	2	3	4	5	6	7...12	13...14
STX (0x02)	MSB ALENGTH	LSB ALENGTH	COM-ADR	[0x6D]	STATUS[1]	NOISE-LEVEL	CRC16

NOISE-LEVEL:

Byte	7,8	9,10	11,12
NOISE-LEVEL	min. NL	avg. NL	max. NL

Value min.NL, avg.NL and max.NL in mV.

[1] *see ANNEX D: Index of Status Bytes*

5.10. [0x6E] Reader Diagnostic

The command Reader Diagnostic performs several hardware diagnostics on the Reader.

Host → Reader

1	2	3	4	5	6	7,8
STX (0x02)	MSB ALENGTH	LSB ALENGTH	COM-ADR	[0x6E]	MODE	CRC16

Host ← Reader

1	2	3	4	5	6	7...n-2	n-1...n
STX (0x02)	MSB ALENGTH	LSB ALENGTH	COM-ADR	[0x6E]	STATUS	DATA	CRC16

MODE:

Reader Diagnostic Modes

0x01 Listing of detail information for STATUS = 0x84.

DATA:

Response for Reader Diagnostic Modes

MODE = 0x01:

7	8
FLAGS A	FLAGS B

FLAGS A:

Bit:	7	6	5	4	3	2	1	0
Function:	Temp-Alarm	-	-	-	-	< |Z| >	NOISE	-

FLAGS B:

Bit:	7	6	5	4	3	2	1	0
Function:	-	-	-	-	-	DC Power Error	-	-

Error Conditions (1st Byte):

Error	Set condition	Clear condition	RF Power	alternating LED red/green 8Hz
Temp-Alarm	Temperature to high T-Power Amp. – T-Environment >15°C	CPU reset	OFF	ON
Wrong antenna Impedance	absolute impedance value |Z|<<50Ω<<|Z|	Check and tune antenna	ON	ON
	HF-short circuit		OFF	
NOISE	Noise to high	Check environment, antenna, cable	ON	ON

Error	Set condition	Clear condition	RF Power	alternating LED red/green 8Hz
DC Power Error	Short circuit on antenna output and DC < 1V	Check cable and antenna	ON	ON

5.11. [0x72] Set Output

The command Set Output serves temporary limited or unlimited activation of the digital outputs.

Via this command the outputs can be switched on or off for the indicated period of time. If the Reader receives a command Set Output, all times that have been active until then are being overwritten by the new times included in the command if they are > 0.

Host → Reader

1	2	3	4	5	6	7
STX (0x02)	MSB ALENGTH	LSB ALENGTH	COM-ADR	[0x72]	Mode	OUT-N

8	9	10,11	n-1...n
OUT-NR	OUT-S	OUT-TIME	CRC16
Repeated OUT-N times			

Host ← Reader

1	2	3	4	5	6	7,8
STX (0x02)	MSB ALENGTH	LSB ALENGTH	COM-ADR	[0x72]	STATUS	CRC16

Mode: 0x00

OUT-N:

Defines the number of output records.

OUT-NR:

Defines the type and the number of the output

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

OUT-Typ:

b001 LED

OUT-Number:

b0001 LED green
b0010 LED red
b0011 DC OUT (ext. antenna)

OUT-S:

OUT-S (Output State) 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.

Bit:	7	6	5	4	3	2	1	0
Function:	0	0	0	0	0	0	OUTx-mode	

OUTx-mode:

b00: OFF
b01: ON
b10: FLASHING SLOW
b11: FLASHING FAST

OUT-TIME:

By the values defined by “OUT-TIME” the outputs can be activated temporary limited or unlimited.
Accepted are the time values 0 and 65535 (0xFFFF) (see following table).

0x0001	1 x 100ms	-> 100ms
...	...	
0xFFFE	65534 x 100ms	-> 1:49:13 h
0xFFFF	continuously active	

Notes:

- ***In order to reset a continuously active time, OUT-TIME = 1 has to be sent to the Reader, which effects a change to the idle status after 100 ms.***
- ***The continuous activation is being set back after a reset or a power failure.***

5.12. [0x85] Set System Timer

The Set System Timer command sets the internal system timer of the CPU. The actual internal system time is stored in each data set after a Transponder select, read or write command.

Host → Reader

1	2	3	4	5	6-9	10,11
STX (0x02)	MSB ALENGTH	LSB ALENGTH	COM-ADR	[0x85]	TIMER	CRC16

Host ← Reader

1	2	3	4	5	6	7,8
STX (0x02)	MSB ALENGTH	LSB ALENGTH	COM-ADR	[0x85]	STATUS	CRC16

TIMER:

Byte	6	7	8,9
TIME	h	min	ms
	0...23	0...59	0...59999

Note:

- ***The internal system timer is not a real-time clock (RTC) and the accuracy cannot be guaranteed.***

5.13. [0x86] Get System Timer

The Get System Timer command reads the internal system timer of the CPU.

Host → Reader

1	2	3	4	5	6,7
STX (0x02)	MSB ALENGTH	LSB ALENGTH	COM-ADR	[0x86]	CRC16

Host ← Reader

1	2	3	4	5	6	7...10	11...12
STX (0x02)	MSB ALENGTH	LSB ALENGTH	COM-ADR	[0x86]	STATUS[1]	TIMER	CRC16

TIMER:

Byte	7	8	9,10
TIMER	h	min	ms
	0...23	0...59	0...59999

Note:

- ***The internal system timer is not a real-time clock (RTC) and the accuracy cannot be guarantied.***

5.14. [0xA0] Reader-Login

The Reader-Login must be executed after every power up or ***5.4. [0x64] System Reset*** command, if an access to the configuration parameters is desired.

Host → Reader:

1	2	3	4	5	6-9	10,11
STX (0x02)	MSB ALENGTH	LSB ALENGTH	COM-ADR	[0xA0]	READER-ID	CRC16

Host ← Reader

1	2	3	4	5	6	7,8
STX (0x02)	MSB ALENGTH	LSB ALENGTH	COM-ADR	[0xA0]	STATUS[1]	CRC16

READER-ID:

The READER-ID is a password which protects the configuration parameters from any read and write access.
The READER-ID can be changed in the configuration block 3.1. CFG0: Passwords.

NOTE:

- ***A Reader-Login with wrong READER-ID cause a "Logout".***
- ***A "Logout" can be effected via the command 5.4. [0x64] System Reset.***

[1] *see ANNEX D: Index of Status Bytes*

6. Protocols for ISO15693 Host Commands

Some ISO15693 Host commands can be used to access ISO15693, I-Code 1 Transponders. The following combinations are possible:

	Transponder Types	
	ISO15693	I-Code 1
6.1. [0xB0] Host commands for ISO15693 Mandatory and Optional Commands	√	√
6.1.1. [0x01] Inventory	√	√
6.1.2. [0x02] Stay Quiet	√	
6.1.3. [0x22] Lock Multiple Blocks	√	
6.1.4. [0x23] Read Multiple Blocks	√	√
6.1.5. [0x24] Write Multiple Blocks	√	√
6.1.6. [0x25] Select	√	
6.1.7. [0x26] Reset to Ready	√	
6.1.8. [0x27] Write AFI	√	
6.1.9. [0x28] Lock AFI	√	
6.1.10. [0x29] Write DSFI	√	
6.1.11. [0x2A] Lock DSFI	√	
6.1.12. [0x2B] Get System Information	√	
6.1.13. [0x2C] Get Multiple Block Security Status	√	

6.1. [0xB0] Host commands for ISO15693 Mandatory and Optional Commands

This command sends ISO 15693 defined RF commands to the Transponder.

Host → Reader

1	2	3	4	5	6...n-2	n-1,n
STX (0x02)	MSB ALENGTH	LSB ALENGTH	COM-ADR	[0xB0]	REQUEST-DATA	CRC16

Host ← Reader

1	2	3	4	5	6	7...n-2	n-1,n
STX (0x02)	MSB ALENGTH	LSB ALENGTH	COM-ADR	[0xB0]	STATUS	RESPONSE-DATA	CRC16

REQUEST-DATA:

Command specific request

RESPONSE-DATA:

Command specific response

Notes:

- ***Data is only transferred if STATUS = 0x00, 0x83, 0x94, 0x95.***
- ***These commands aren't available if Scan-Mode is active.***

6.1.1. [0x01] Inventory

This command reads the UID of all Transponders inside the antenna field. If the Reader has detected a new Transponder, the Transponder will be automatically set in the quiet state by the Reader. In this state the Transponder does not send back a response for the next inventory command.

The Transponder sends back a response every time:

- if the Transponder has left the antenna and reentered the antenna field or
- if a 5.7. [0x69] RF Reset command was send to the Reader or
- if the Persistence Reset Time has expired.
- 3.6. CFG5: Anticollision is disabled

REQUEST-DATA

6	7
0x01	MODE

RESPONSE-DATA **(standard)**

7	8	9	10...17
DATA-SETS	TR-TYPE	DSFID	UID
	Repeated DATA-SETS times		

MODE:

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

MORE:

b0 new Inventory requested

b1 more data requested (IF Status 0x94 appears-> more data sets are available)

DATA-SETS:

Number of Transponder data sets to be transferred in this Reader response.

TR-TYPE:

Bit:	7	6	5	4	3	2	1	0
Function	RF_TEC		-	-	TYPE_NO			

RF_TEC:

Indicates the RFID - Technology of the present Transponder:
b00: 13,56 MHz Transponder

TYPE_NO

Displays the Transponder type of the present Transponder
(see: **ANNEX A: Codes of Transponder Types**).

DSFID: (only ISO15693Transponders)
Data Storage Family Identifier. For I-CODE 1 Transponders this value will return 0x00.

UID: Transponder UID

Notes:

- ***This command supports all Transponders.***
- ***Depending on the Persistence Reset time settings in 3.13. CFG16: Persistence Reset the transponder can be read a second time after the Persistence Reset time has elapsed.***
- ***If the STATUS byte of the protocol frame has the value 0x94, more UID's can be read out of the Reader with MORE = b1.***
- ***STATUS Byte 0x94 (More Data) is displayed dependence on the Tag Typ:***

Tr-Type	*ISO15693*
amount of Transponder setting status 0x94 *(with Advanced Protocol Length)*	***> 55***

6.1.2. [0x02] Stay Quiet

This command sets one Transponder to Quiet State.

REQUEST-DATA

6	7	8-15
0x02	MODE	UID

MODE:

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

ADR:

b001 addressed

UID:

Read only UID of the Transponder.

Note:

- ***This command is only available for ISO15693Transponders.***

6.1.3. [0x22] Lock Multiple Blocks

This command locks one or more data blocks.

The supported ISO15693 Host commands depend on the different ISO15693Transponder types, they are described in chapter 6.3. Supported ISO15693 Host commands for ISO15693 Transponders.

- ***Note:***
  This command is only available for ISO15693Transponders.
- REQUEST-DATA

6	7	8	9	1 or 2 Bytes (def. by EXT_ADR)	1 Byte
0x23	MODE	UID	BANK	DB-ADR	DB-N

RESPONSE-DATA (STATUS = 0x03)

7
DB-ADR-E

RESPONSE-DATA (STATUS = 0x95)

7	8
ISO15693 ERROR	DB-ADR-E

MODE:

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

ADR:

b000 non-addressed
b001 addressed
b010 selected

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** byte DB-ADR Field

UID:

Read-only serial number of the Transponder. The UID is required only in the addressed mode.

BANK:

Memory bank of the Transponder which will be accessed by the Reader

Bit:	7	6	5	4	3	2	1	0
Function	0	0	0	0	0	0	BANK_NR	

BANK_NR:

Defines the memory area on the transponder.

b00 reserved
b01 reserved
b10 reserved
b11 User memory bank

DB-ADR:

First block number to be locked. Depending on EXT_ADR. First block can be any value between 0 and 255 or 0 and 65535.

DB-N:

Number of data blocks to be locked from the Transponder, starting at DB-ADR.
The maximum number of DB-N, depends on the interface transmit buffer size TX-BUF. The maximum number of DB-N is:
(TX-BUF - 10)/(DB-Size+1) ⇒ Standard Protocol
(TX-BUF - 12)/(DB-Size+1) ⇒ Advanced Protocol

ISO15693 ERROR:

ISO15693 ERROR code of Transponder response. This byte is only available if STATUS = 0x95.

DB-ADR-E:

Block number where the error occurred.

6.1.4. [0x23] Read Multiple Blocks

This command reads one or more data blocks.

The supported ISO15693 Host commands depend on the different ISO15693Transponder types, which are described in chapter 6.3. Supported ISO15693 Host commands for ISO15693 Transponders.

REQUEST-DATA

6	7	8	9	1 or 2 Bytes (def. by EXT_ADR)	1 Byte
0x23	MODE	UID	BANK	DB-ADR	DB-N

RESPONSE-DATA (STATUS = 0x95)

7
ISO15693 ERROR

RESPONSE-DATA

7	8	9	10...n
DB-N	DB-SIZE	SEC-STATUS	DB
		Repeated DB-N times	

MODE:

Bit:	7	6	5	4	3	2	1	0
Function	0	0	EXT_ADR	0	SEC	ADR		

ADR:

b000 non-addressed
b001 addressed
b010 selected

SEC:

b0 SEC-STATUS always = 0x00
b1 security status of following data block in SEC-STATUS

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** byte DB-ADR Field

UID:

Read-only serial number of the Transponder. The UID is required only in the addressed mode.

BANK:

Memory bank of the Transponder which will be accessed by the Reader

Bit:	7	6	5	4	3	2	1	0
Function	0	0	0	0	0	0	BANK_NR	

BANK_NR:

Defines the memory area on the transponder.

b00 reserved
b01 reserved
b10 reserved
b11 User memory bank

DB-ADR:

First block number to be read. Depending on EXT_ADR. First block can be any value between 0 and 255 or 0 and 65535.

DB-N:

Number of data blocks to be read from the Transponder, starting at DB-ADR.
The maximum number of DB-N, depends on DB-Size and the interface transmit buffer size TX-BUF. The maximum number of DB-N is:
(TX-BUF - 10)/(DB-Size+1) ⇒ Standard Protocol
(TX-BUF - 12)/(DB-Size+1) ⇒ Advanced Protocol

ISO15693 ERROR:

ISO15693 ERROR code of Transponder response. This byte is only available if STATUS = 0x95.

DB-SIZE:

Number of bytes of one data block. This value depends on the specification of the Transponder manufacturer, see chapter 6.3. Supported ISO15693 Host commands for ISO15693 Transponders.

SEC-STATUS:

Block security status of following data block. If supported by the ISO15693 transponder.
I-Code 1 Transponder doesn't support this function.

DB:

Requested data block. The block size is defined by DB-SIZE.

Notes:

- ***A read from 1 block uses a Read Single Block command to the Transponder.***
- ***If a Transponder does not support Read Multiple Blocks commands several Read Single Block commands are used for this Transponder.***
- ***Only one Transponder can be read in the non-addressed mode.***

6.1.5. [0x24] Write Multiple Blocks

This command writes one or more data blocks.

The supported ISO15693Host commands depend on the different ISO15693Transponder types, which are described in chapter 6.3. Supported ISO15693 Host commands for ISO15693 Transponders.

REQUEST-DATA

6	7	8	9	1 or 2 Bytes (def. by EXT_ADR)	1 Byte	1 Byte	DB-N times DB-SIZE Bytes
0x24	MODE	UID	BANK	DB-ADR	DB-N	DB-SIZE	DB
							Repeated DB-N times

RESPONSE-DATA (STATUS = 0x03)

7
DB-ADR-E

RESPONSE-DATA (STATUS = 0x95)

7	8
ISO15693 ERROR	DB-ADR-E

MODE:

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

ADR:

b000 non-addressed
b001 addressed
b010 selected

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** byte DB-ADR Field

UID:

Read-only serial number of the Transponder. The UID is required only in the addressed mode.

BANK:

Memory bank of the Transponder which will be accessed by the Reader

Bit:	7	6	5	4	3	2	1	0
Function	0	0	0	0	0	0	BANK_NR	

BANK_NR:

Defines the memory area on the transponder.

b00 reserved
b01 reserved
b10 reserved
b11 User memory bank

DB-ADR:

First block number to be read. Depending on EXT_ADR First block can be any value between 0 and 255 or 0 and 65535.

DB-N:

Number of data blocks to be written to the Transponder, starting at DB-ADR.
The maximum number of DB-N, depends on DB-Size and the interface receiver buffer size RX-BUF. The maximum number of DB-N is:
(RX-BUF - 10)/(DB-Size) ⇒ Standard Protocol
(RX-BUF - 12)/(DB-Size) ⇒ Advanced Protocol

DB-SIZE:

Number of bytes of one data block. This value depends on the specification of the Transponder manufacturer, see chapter 6.3. Supported ISO15693 Host commands for ISO15693 Transponders.

DB:

Data of the data block to be written to the Transponder. The required block size is defined by DB-SIZE. The number of the expected bytes are DB-N * DB-SIZE.

ISO15693 ERROR:

ISO15693 ERROR code of Transponder response. This byte is only available if STATUS = 0x95.

DB-ADR-E:

Block number where the error occurred.

Notes:

- ***A write to 1 block uses a Write Single Block command to the Transponder. This will be managed by the Reader internally.***
- ***If a Transponder does not supports Write Multiple Blocks commands several Write Single Block commands are used for this Transponder.***
- ***A write command on I-Code 1 Transponders can only be performed in the addressed mode.***
- ***If an error occurred during a write command, the number of the block where the error occurred will be send to host***

6.1.6. [0x25] Select

This command sets one Transponder to the Select State. Only one ISO15693 Transponder can be selected at once. An already selected Transponder will automatically be set to Ready State.

REQUEST-DATA

6	7	8...15
0x25	MODE	UID

RESPONSE-DATA (STATUS = 0x95)

7
ISO15693 ERROR

MODE:

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

ADR:

b001 addressed

UID:

Read-only UID of the Transponder.

ISO15693 ERROR:

ISO15693 ERROR code of Transponder response. This byte is only available if STATUS = 0x95.

Note:

- ***This command is only available for ISO15693 Transponders.***

6.1.7. [0x26] Reset to Ready

This command sets one Transponder to Ready State.

REQUEST-DATA

6	7	(8...15)
0x26	MODE	UID

RESPONSE-DATA (STATUS = 0x95)

7
ISO15693 ERROR

MODE:

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

ADR:

b000 non-addressed
b001 addressed
b010 selected

UID:

Read-only serial number of the Transponder. The UID is required only in the addressed mode.

ISO15693 ERROR:

ISO15693 ERROR code of Transponder response. This byte is only available if STATUS = 0x95.

Note:

- ***This command is only available for ISO15693 Transponders.***

6.1.8. [0x27] Write AFI

This command writes a new AFI code to one Transponders

The supported ISO15693 Host commands depend on the different ISO15693 Transponder Types,which are described in chapter 6.3. Supported ISO15693 Host commands for ISO15693 Transponders.

REQUEST-DATA

6	7	(8...15)	8 / (16)
0x27	MODE	UID	AFI

RESPONSE-DATA (STATUS = 0x95)

7
ISO15693 ERROR

MODE:

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

ADR:

b000 non-addressed
b001 addressed
b010 selected

UID:

Read-only serial number of the Transponder. The UID is required only in the addressed mode.

AFI:

Application Family Identifier of the Transponder.

ISO15693 ERROR:

ISO15693 ERROR code of Transponder response. This byte is only available if STATUS = 0x95.

Note:

- ***This command is only available for ISO15693 Transponders.***

6.1.9. [0x28] Lock AFI

This command locks the AFI register in one Transponders.

The supported ISO15693 Host commands depend on the different ISO15693 Transponder types,which are described in chapter 6.3. Supported ISO15693 Host commands for ISO15693 Transponders.

REQUEST-DATA

6	7	(8...15)
0x28	MODE	UID

RESPONSE-DATA (STATUS = 0x95)

7
ISO15693 ERROR

MODE:

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

ADR:

b000 non-addressed
b001 addressed
b010 selected

UID:

Read-only serial number of the Transponder. The UID is required only in the addressed mode.

ISO15693 ERROR:

ISO15693 ERROR code of Transponder response. This byte is only available if STATUS = 0x95.

Note:

- ***This command is only available for ISO15693 Transponders.***

6.1.10. [0x29] Write DSFI

This command writes the DSFID to one ore more Transponders.

The supported ISO15693 Host commands depend on the different ISO15693 Transponder types, which are described in chapter 6.3. Supported ISO15693 Host commands for ISO15693 Transponders.

REQUEST-DATA

6	7	(8...15)	8 / (16)
0x29	MODE	UID	DSFID

RESPONSE-DATA (STATUS = 0x95)

7
ISO15693 ERROR

MODE:

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

ADR:

b000 non-addressed
b001 addressed
b010 selected

UID:

Read-only serial number of the Transponder. The UID is required only in the addressed mode.

DSFID:

Data Storage Format Identifier of the Transponder.

ISO15693 ERROR:

ISO15693 ERROR code of Transponder response. This byte is only available if STATUS = 0x95.

Note:

- ***This command is only available for ISO15693 Transponders.***

6.1.11. [0x2A] Lock DSFI

This command locks the DSFID register in one Transponders.

The supported ISO15693 Host commands depend on the different ISO15693 Transponder types, which are described in chapter 6.3. Supported ISO15693 Host commands for ISO15693 Transponders.

REQUEST-DATA

6	7	(8...15)
0x2A	MODE	UID

RESPONSE-DATA (STATUS = 0x95)

7
ISO15693 ERROR

MODE:

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

ADR:

b000 non-addressed
b001 addressed
b010 selected

UID:

Read-only serial number of the Transponder. The UID is required only in the addressed mode.

ISO15693 ERROR:

ISO15693 ERROR code of Transponder response. This byte is only available if STATUS = 0x95.

Note:

- ***This command is only available for ISO15693 Transponders.***

6.1.12. [0x2B] Get System Information

This command reads the system information from one Transponder.

REQUEST-DATA

6	7	(8...15)
0x2B	MODE	UID

RESPONSE-DATA (STATUS = 0x95)

7
ISO-ERROR

RESPONSE-DATA

7	8...15	16	17...18	19	
DSFID	UID	AFI	MEM-SIZE	IC-REF	←ISO

MODE:

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

ADR:

b000 non-addressed
b001 addressed
b010 selected

UID:

Read-only serial number of the Transponder. The UID is required only in the addressed mode.

ISO-ERROR:

ISO15693 error code of Transponder response. This byte is only available if STATUS = 0x95.

DSFID:

Data Storage Format Identifier of the Transponder.

UID:

The LSB (32bits) from the Read only Serial Number of the Transponder.

AFI:

Application Family Identifier. If not supported by the Transponder, this value will return 0x00.

Manufacturer Code:

Manufacturer specific code (see: ANNEX A: Codes of Transponder Types)

MEM-SIZE:

Memory size of the Transponder. If not supported by the Transponder, this value will return 0x0000.

Byte	15		16
Bit:	7 .. 5	4 .. 0	7 .. 0
content	res.	Block size in Bytes	Number of blocks

IC-REF:

IC reference (version) of the Transponder. If not supported by the Transponder, this value will return 0x00.

Chip Version:

Chip version of the Transponder

Note:

This command is only available for ISO15693 Transponders.

6.1.13. [0x2C] Get Multiple Block Security Status

This command reads the public block security status from one Transponder.

REQUEST-DATA

6	7	(8...15)	8 / (16)	9 / (17)
0x2C	MODE	UID	DB-ADR	DB-N

RESPONSE-DATA (STATUS = 0x95)

7
ISO15693 ERROR

RESPONSE-DATA

7	8
DB-N	SEC-STATUS
	Repeated DB-N times

MODE:

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

ADR:

b000 non-addressed
b001 addressed
b010 selected

UID:

Read-only serial number of the Transponder. The UID is required only in the addressed mode.

DB-ADR:

First block number from which security status is requested. First block number can be any value between 0 and 255.

DB-N:

Number of Security data blocks to be read from the Transponder, starting at DB-ADR.
The maximum number of DB-N is 255.

ISO15693 ERROR:

ISO15693 ERROR code of Transponder response. This byte is only available if STATUS = 0x95.

SEC-STATUS:

Block security status .

Note:

This command is only available for ISO15693 Transponders

6.2. [0xBF] ISO15693 Transparent Command

This command sends user transparent commands to the Transponder.

Host → Reader

1	2	3	4	5	6	7...8
STX (0x02)	MSB ALENGTH	LSB ALENGTH	COM-ADR	[0xBF]	MODE	RSP-LENGTH

MODE 1+2+6	9...10	11...n-2	n-1,n
	CMD-RSP-DELAY	REQUEST-DATA	CRC16

MODE 3+4	11...12	13...14	15...n-2	n-1,n
	CMD-RSP-DELAY	EOF-PULSE-DELAY	REQUEST-DATA	CRC16

MODE 5	9...10	11 – 12	13 ... n-2	n-1,n
	CMD-RSP-DELAY	MULTIPLE 302 GRIDS	REQUEST-DATA	CRC16

Host ← Reader

1	2	3	4	5	6	7...n-2	n-1,n
STX (0x02)	MSB ALENGTH	LSB ALENGTH	COM-ADR	[0xBF]	STATUS[1]	RESPONSE-DATA	CRC16

MODE:

Bit:	7	6	5	4	3	2	1	0
Function	TxCRCEn	0	0	0	X	Options		

Options:

Options for request.

b001 = read request

Response is sampled corresponding to CMD-RES-DELAY

b010 = write request with Option “0”

The Reader tries to sample the response after CMD-RES-DELAY + a multiple of 302µs. If there is no response within 20ms the command sends back Status “no Transponder” 0x01

b011 = write request with Option “1”

The Reader tries to sample the response after CMD-RES-DELAY. If there

[1] *see ANNEX D: Index of Status Bytes*

is no response the Reader sends a EOF after EOF-PULSE-DELAY and tries to sample the response after CMD-RES_DELAY

b100 = inventory request

The Reader tries to sample the response after CMD-RES-DELAY. If ISO15693 “Nb_slot_flag” Flag is:

“0” the Reader sends a EOF after EOF-PULSE-DELAY and tries again to sample the response in the next timeslot (after CMD-RES_DELAY). This is done 16 times.
In this case the RSP-LENGTH defines the response length in one timeslot. Transponder responses with other response length will be ignored. If there is a CRC error in one of the timeslots the protocol status is set to 0x02 [CRC error]. The user should calculate which Transponder data hold the CRC error.

“1” the Reader sends back the received data.

b101= request with grid position of response

The Reader tries to sample the response after ISO15693-3 CMD-RES-DELAY. If there is no response the Reader sample at the time/grid specified in MULTIPLE 302us GRIDS. If there is no response the command sends back status "no Transponder" 0x01. The maximum value for MULTIPLE 302us GRIDS is 125 (→ 302,08us * 125 = 37,76ms)
Depending on the Error-Flag in the Transponder response the length of the sample data is:
- 4 Byte if Error-Flag is "1"
- REP-LENGTH if Error-Flag is "0"

b110= read request without any ISO15693 specific data checks and ISO15693 data interpretation

Response is sampled corresponding to CMD-RES-DELAY.
cause by the fact that no data check is performed inside of the Reader all data with response length same as response length specified in the Host command to the Reader will be transfers with status 0x00. If response length of data from Transponder and response length specified in the Host command to the Reader are unequal, status 0x01 “No Transponder” will be the response of the Reader.
The user of the command mode 6 has to control the data coding and de-coding option of the Reader by setting CFG8/Byte 4 – ISO-Mode in the manner the Reader should code the data in the RF forward link and decode the data in the RF return link.

TxCRCEn:

b0 A CRC is calculated over the transmitted data and the CRC byte(s) are appended to the data stream

b1 No CRC is inserted/transmitted

RSP-LENGTH:

Length of the Transponder response in bit without SOF and EOF. If the Error-Flag in the Transponder response is set, the length of the sample data is 4 Byte.
This value need to be specified correctly now!

CMD-RSP-DELAY:

Response delay for Transponder response (ISO15693: t1)
e.g. ISO15693 average value: 0x021F * 590ns = 320,4 µs

Note:
If the parameter is set to "0x0000 the default value 0x021F will be used.

EOF-PULSE-DELAY:

EOF Pulse delay is used in write operations with ISO15693 write option "1". EOF to define the response delay for Transponder response (ISO15693: t1)
e.g. ISO15693 maximum value: 0x846A * 590ns = 20ms

REQUEST-DATA:

Complete Transponder request without SOF, CRC16 and EOF.

Note:
The read and write option FLAGS in the REQUEST-DATA must correspond to the MODE Byte in the request protocol. Reader is always forcing the command in the way specified by MODE Byte in the request protocol

RESPONSE-DATA:

Complete Transponder response without SOF and EOF. A CRC16 check is performed inside the Reader. However the Transponder CRC16 is transferred with the response data.

Notes:

- ***Data is only transferred if STATUS = 0x00, 0x02, 0x83, 0x84, 0x94.***
- ***The response data ever contains the in RSP-LENGTH defined number of data bytes.***

Note:

- ***This command is only available for ISO15693 Transponders.***
- ***This command is not available if the Scan Mode is switched on.***

Supported ISO15693 Host commands

6.3. Supported ISO15693 Host commands for ISO15693 Transponders

The command codes listed in the following table supports the various Transponder commands and operations that are available for each ISO15693 Transponder type.

6.3.1. Fujitsu (MB89R116)

IC manufacturer identifier: 0x08

Chip ID: 0h = 00000000b (Bit 47 - 40 of UID)

Memory organization: 256 x 8 Byte = 16kBit

Number of blocks	256 (user area: 0 – 249)
Block size	8 byte
WR-OPTION	0 or 1

Command Code	Function		Mode			Comment
			non-addressed	addressed	select	
0x01	Inventory	√		-	-	
0x02	Stay Quiet	√	-	√	-	
0x22	Lock Multiple Blocks	√	√	√	√	
0x23	Read Multiple Blocks*	√	√	√	√	Security Status is always 0x00
0x24	Write Multiple Blocks**	√	√	√	√	
0x25	Select	√	-	√	-	
0x26	Reset to Ready	√	√	√	√	
0x27	Write AFI	√	√	√	√	
0x28	Lock AFI	√	√	√	√	
0x29	Write DSFID	√	√	√	√	
0x2A	Lock DSFID	√	√	√	√	
0x2B	Get System Information	√	√	√	√	
0x2C	Get Multiple Block Security Status	√	√	√	√	

*** The Custom Specific Commands Read Multiple Blocks Unlimited [0xA3] will be used automatically by the Reader. In non addressed Mode only one or two blocks can be read and the parameter DB-Blocksize in CFG4 should be set to 8.**

**** The WR-OPTION will be set automatically by the FEIG Readers if the WR-OPTION parameter is set to "00: automatically set". Up to two blocks of data can be written for one request.**

6.3.2. Fujitsu (MB89R118)

IC manufacturer identifier: 0x08

Chip ID: 1h = 00000001b (Bit 47 - 40 of UID)

Memory organization: 256 x 8 Byte = 16kBit

Number of blocks	256 (user area: 0 – 249)
Block size	8 byte
WR-OPTION	0 or 1

Command Code	Function		Mode			Comment
			non-addressed	addressed	select	
0x01	Inventory	√		-	-	
0x02	Stay Quiet	√	-	√	-	
0x22	Lock Multiple Blocks	√	√	√	√	
0x23	Read Multiple Blocks*	√	√	√	√	Security Status is always 0x00
0x24	Write Multiple Blocks**	√	√	√	√	
0x25	Select	√	-	√	-	
0x26	Reset to Ready	√	√	√	√	
0x27	Write AFI	√	√	√	√	
0x28	Lock AFI	√	√	√	√	
0x29	Write DSFID	√	√	√	√	
0x2A	Lock DSFID	√	√	√	√	
0x2B	Get System Information	√	√	√	√	
0x2C	Get Multiple Block Security Status	√	√	√	√	

*** The Custom Specific Commands Read Multiple Blocks Unlimited [0xA3] will be used automatically by the Reader. In non addressed Mode only one or two blocks can be read and the parameter DB-Blocksize in CFG4 should be set to 8.**

**** The WR-OPTION will be set automatically by the FEIG Readers if the WR-OPTION parameter is set to "00: automatically set". Up to two blocks of data can be written for one request.**

6.3.3. Fujitsu (MB89R119)

IC manufacturer identifier: 0x08

Chip ID: 2h = 00000010b (Bit 47 - 40 of UID)

Memory organization: 64 x 4 Byte = 2kBit

Number of blocks	64 (user area: 0 – 57)
Block size	4 byte
WR-OPTION	0 or 1

Command Code	Function		Mode			Comment
			non-addressed	addressed	select	
0x01	Inventory	√		-	-	
0x02	Stay Quiet	√	-	√	-	
0x22	Lock Multiple Blocks	√	√	√	-	
0x23	Read Multiple Blocks	√	√	√	-	Security Status is always 0x00
0x24	Write Multiple Blocks*	√	√	√	-	
0x25	Select	-	-	-	-	
0x26	Reset to Ready	√	√	√	-	
0x27	Write AFI	√	√	√	-	
0x28	Lock AFI	√	√	√	-	
0x29	Write DSFID	√	√	√	-	
0x2A	Lock DSFID	√	√	√	-	
0x2B	Get System Information	√	√	√	-	
0x2C	Get Multiple Block Security Status	-	-	-	-	

*** The WR-OPTION will be set automatically by the FEIG Readers if the WR-OPTION parameter is set to "00: automatically set". Up to two blocks of data can be written for one request.**

6.3.4. Infineon (my-d page mode) 0x60

IC manufacturer identifier: 0x05

memory organization:

SRF55V10P: 128 x 8 Byte = 8kBit

Number of blocks	128 (user area: 3...127)
Block size	8 byte
WR-OPTION*	0

SRF55V02P: 32 x 8 Byte = 2kBit

Number of blocks	32 (user area: 3...31)
Block size	8 byte
WR-OPTION*	0

Command Code	Function		Mode			Comment
			non addressed	addressed	select	
0x01	Inventory	√		-	-	
0x02	Stay Quiet	√	-	√	-	
0x22	Lock Multiple Blocks**	√	-	√	√	
0x23	Read Multiple Blocks**	√	-	√	√	Security Status is always 0x00
0x24	Write Multiple Blocks**	√	-	√	√	
0x25	Select	√	-	√	-	
0x26	Reset to Ready	√	√	√	√	
0x27	Write AFI	√	√	√	√	
0x28	Lock AFI	√	√	√	√	
0x29	Write DSFID	-	-	-	-	
0x2A	Lock DSFID	-	-	-	-	
0x2B	Get System Information	-	-	-	-	
0x2C	Get Multiple Block Security Status	-	-	-	-	

* **The WR-OPTION will be set automatically by the FEIG Readers if the WR-OPTION parameter in "CFG4 Transponder Parameters" is set to "00: automatically set".**

** **The user has to take the Custom Specific Commands Read [0x10], Write [0x30] and the Write Byte [0x90]. The commands will be not used automatically by the Reader.**

6.3.5. Infineon (ISO address mode) 0xE0

IC manufacturer identifier: 0x05

memory organization:

SRF55V10P: 256 x 4 Byte = 8kBit

Number of blocks	256 (user area: 0...249)
Block size	4 byte
WR-OPTION*	0

SRF55V02P: 64 x 4 Byte = 2kBit

Number of blocks	64 (user area: 0...57)
Block size	4 byte
WR-OPTION*	0

Command Code	Function		Mode			Comment
			non addressed	addressed	select	
0x01	Inventory	√		-	-	
0x02	Stay Quiet	√	-	√	-	
0x22	Lock Multiple Blocks	√	√	√	√	
0x23	Read Multiple Blocks	√	√	√	√	
0x24	Write Multiple Blocks	√	√	√	√	
0x25	Select	√	-	√	-	
0x26	Reset to Ready	√	√	√	√	
0x27	Write AFI	√	√	√	√	
0x28	Lock AFI	√	√	√	√	
0x29	Write DSFID	-	-	-	-	
0x2A	Lock DSFID	-	-	-	-	
0x2B	Get System Information	-	-	-	-	
0x2C	Get Multiple Block Security Status	√	√	√	√	

* **The WR-OPTION will be set automatically by the FEIG Readers if the WR-OPTION parameter in "CFG4 Transponder Parameters" is set to "00: automatically set".**

6.3.6. Infineon (My-d Light)

Chip ID: A1h = 10100001b (Bit 47 - 40 of UID)

Memory organization: 18 x 4 Byte = 576Bit

Number of blocks	18 (user area: 0...12)
Block size	4 byte
WR-OPTION*	0

Command Code	Function		Mode			Comment
			non-addressed	addressed	select	
0x01	Inventory	√		-	-	
0x02	Stay Quiet	√	-	√	-	
0x22	Lock Multiple Blocks	√	√	√	√	
0x23	Read Multiple Blocks	√	√ **	√	√	Single Read
0x24	Write Multiple Blocks	√	√	√	√	
0x25	Select	√	-	√	-	
0x26	Reset to Ready	√	√	√	√	
0x27	Write AFI	√	√	√	√	
0x28	Lock AFI	√	√	√	√	
0x29	Write DSFID	-	-	-	-	
0x2A	Lock DSFID	-	-	-	-	
0x2B	Get System Information	-	-	-	-	
0x2C	Get Multiple Block Security Status	-	-	-	-	
Custom specific commands						
0x90	Write Byte	√	√	√	√	

* **The WR-OPTION will be set automatically by the FEIG Readers if the WR-OPTION parameter in "CFG4 Transponder Parameters" is set to "00: automatically set".**

** **Reading of more than one block in non addressed mode is only possible, if parameter "Read Mode" in CFG4 is set to "01: Single Read".**

6.3.7. NXP (I-Code SLI)

Chip ID: 1h = 00000001b (Bit 47 - 40 of UID)

Memory organization: 32 x 4 Byte = 1kBit

Number of blocks	32 (user area: 0 – 27)
Block size	4 byte
WR-OPTION*	0

Command Code	Function		Mode			Comment
			non-addressed	addressed	select	
0x01	Inventory	√	-	-	-	
0x02	Stay Quiet	√	-	√	-	
0x22	Lock Multiple Blocks	√	√	√	√	
0x23	Read Multiple Blocks	√	√	√	√	
0x24	Write Multiple Blocks	√	√	√	√	
0x25	Select	√	-	√	-	
0x26	Reset to Ready	√	√	√	√	
0x27	Write AFI	√	√	√	√	
0x28	Lock AFI	√	√	√	√	
0x29	Write DSFID	√	√	√	√	
0x2A	Lock DSFID	√	√	√	√	
0x2B	Get System Information	√	√	√	√	
0x2C	Get Multiple Block Security Status	√	√	√	√	

* **The WR-OPTION will be set automatically by the FEIG Readers if the WR-OPTION parameter in "CFG4 Transponder Parameters" is set to "00: automatically set".**

6.3.8. NXP (I-Code SLI-S)

Chip ID: 2h = 00000010b (Bit 47 - 40 of UID)

Memory organization: 40 x 4 Byte = 1280Bit

Number of blocks	40 (user area: 0 – 39)
Block size	4 byte
WR-OPTION*	0

Number of pages	10 (user area: 0 – 9)
Page size	16 byte = 4 Blocks
WR-OPTION*	0

Command Code	Function		Mode			Comment
			non-addressed	addressed	select	
0x01	Inventory	√	-	-	-	
0x02	Stay Quiet	√	-	√	-	
0x22	Lock Multiple Blocks	√	√	√	√	
0x23	Read Multiple Blocks	√	√ **	√	√	Single Read
0x24	Write Multiple Blocks	√	√	√	√	
0x25	Select	√	-	√	-	
0x26	Reset to Ready	√	√	√	√	
0x27	Write AFI	√	√	√	√	
0x28	Lock AFI	√	√	√	√	
0x29	Write DSFID	√	√	√	√	
0x2A	Lock DSFID	√	√	√	√	
0x2B	Get System Information	√	√	√	√	
0x2C	Get Multiple Block Security Status	-	-	-	-	

* **The WR-OPTION will be set automatically by the FEIG Readers if the WR-OPTION parameter in "CFG4 Transponder Parameters" is set to "00: automatically set".**

** **Reading of more than one block in non addressed mode is only possible, if parameter "Read Mode" in CFG4 is set to "01: Single Read".**

6.3.9. NXP (I-Code SLI-L)

Chip ID: 3h = 00000110b (Bit 47 - 40 of UID)

Memory organization: 16 x 4 Byte = 512Bit

Number of blocks	16 (user area: 0 – 7)
Block size	4 byte
WR-OPTION*	0

Number of pages	4 (user area: 0 – 1)
Page size	16 byte = 4 Blocks
WR-OPTION*	0

Command Code	Function		Mode			Comment
			non-addressed	addressed	select	
0x01	Inventory	√	-	-	-	
0x02	Stay Quiet	√	-	√	-	
0x22	Lock Multiple Blocks	√	√	√	√	
0x23	Read Multiple Blocks	√	√ **	√	√	
0x24	Write Multiple Blocks	√	√	√	√	
0x25	Select	√	-	√	-	
0x26	Reset to Ready	√	√	√	√	
0x27	Write AFI	√	√	√	√	
0x28	Lock AFI	√	√	√	√	
0x29	Write DSFID	√	√	√	√	
0x2A	Lock DSFID	√	√	√	√	
0x2B	Get System Information	√	√	√	√	
0x2C	Get Multiple Block Security Status	-	-	-	-	

* **The WR-OPTION will be set automatically by the FEIG Readers if the WR-OPTION parameter in " CFG4 Transponder Parameters" is set to "00: automatically set".**

** **Reading of more than one block in non addressed mode is only possible, if parameter "Read Mode" in CFG4 is set to "01: Single Read".**

6.3.10. STMicroelectronics (LRI64)

IC manufacturer identifier: 0x02

memory organization: 16 x 1 Byte = 128Bit

Number of blocks	5 (user area: 10...14)
Block size	1 byte
WR-OPTION*	0

Command Code	Function		Mode			Comment
			non addressed	addressed	select	
0x01	Inventory	√	-	-	-	
0x02	Stay Quiet	√	-	√	-	
0x22	Lock Multiple Blocks	-	-	-	-	
0x23	Read Multiple Blocks	√	√ **	√	-	Single Read
0x24	Write Multiple Blocks	√	√	√	-	
0x25	Select	-	-	-	-	
0x26	Reset to Ready	-	-	-	-	
0x27	Write AFI	-	-	-	-	
0x28	Lock AFI	-	-	-	-	
0x29	Write DSFID		-	-	-	
0x2A	Lock DSFID		-	-	-	
0x2B	Get System Information	√	√	√	-	
0x2C	Get Multiple Block Security Status		-	-	-	

* **The WR-OPTION will be set automatically by the FEIG Readers if the WR-OPTION parameter in ”CFG4 Transponder Parameter” is set to “00: automatically set”.**

** **Reading in non addressed mode is only possible, if parameter “Read Mode” is set to “01”: Single Read“ and DB-Blocksize is set to “1” in CFG4.**

6.3.11. STMicroelectronics (LRI2k / LRIS2k)

LRI2k:
Chip ID: 8h = 001000xxb (Bit 47 - 42 of UID)

LRIS2k:
Chip ID: Ah = 001010xxb (Bit 47 - 42 of UID)

memory organization: 64 x 4 Byte = 2kBit

Number of blocks	64 (user area: 0...63)
Block size	4 byte
WR-OPTION*	0

Command Code	Function		Mode			Comment
			non addressed	addressed	select	
0x01	Inventory	√	-	-	-	
0x02	Stay Quiet	√	-	√	-	
0x22	Lock Multiple Blocks	√	√	√	√	
0x23	Read Multiple Blocks	√	√ **	√	√	LRIS2k: Single Read
0x24	Write Multiple Blocks	√	√	√	√	
0x25	Select	√	√	√	√	
0x26	Reset to Ready	√	√	√	√	
0x27	Write AFI	√	√	√	√	
0x28	Lock AFI	√	√	√	√	
0x29	Write DSFID	√	√	√	√	
0x2A	Lock DSFID	√	√	√	√	
0x2B	Get System Information	√	√	√	√	
0x2C	Get Multiple Block Security Status	√	√	√	√	

* **The WR-OPTION will be set automatically by the FEIG Readers if the WR-OPTION parameter in ”CFG4 Transponder Parameter” is set to “00: automatically set”.**

** **Reading of LRIS2k in non addressed mode is only possible, if parameter “Read Mode” is set to “01”: Single Read“ in CFG4.**

6.3.12. STMicroelectronics (M24LR64-R)

IC manufacturer identifier: 0x02

Product Code for M24LR64-R: Bit 47-42 of UID

Bit 47 - 42	Product ID
001011xxb	Bh

memory organization: 64 x 32 x 4 Byte = 64kBit

Number of sectors	64 (0...63)
Number of blocks	2048 (user area: 0...2047) 32 blocks per sector
Block size	4 byte

Command Code	Function		Mode			Comment
			non addressed	addressed	select	
0x01	Inventory	√	-	-	-	
0x02	Stay Quiet	√	-	√	-	
0x22	Lock Multiple Blocks	√	√	√	√	WR-OPTION = 0 *
0x23	Read Multiple Blocks	√	√	√	√	
0x24	Write Multiple Blocks	√	√	√	√	WR-OPTION = 0 *
0x25	Select	√	√	√	√	
0x26	Reset to Ready	√	√	√	√	
0x27	Write AFI	√	√	√	√	WR-OPTION = 0 *
0x28	Lock AFI	√	√	√	√	WR-OPTION = 0 *
0x29	Write DSFID	√	√	√	√	
0x2A	Lock DSFID	√	√	√	√	
0x2B	Get System Information	√	√	√	√	
0x2C	Get Multiple Block Security Status	√	√	√	√	

* **The WR-OPTION will be set automatically by the FEIG Readers if the WR-OPTION parameter in**

"CFG8 General" ***(ID ISC.LR200);***

"CFG4 Transponder Parameter" ***(ID ISC.PR/PRH/MR101/MR102 or ID ISC.LR2000/2500)***

is set to "00: automatically set" (see the according System Manual).

6.3.13. Texas Instruments (Tag-it HFI Pro / Standard)

IC manufacturer identifier: 0x07

Chip ID: Ch = 1100xxxxb (Bit 47 - 44 of UID)

Standard:
Product ID: 0h = 000b (Bit 43 – 41 of UID)
memory organization: 11 x 4 Byte = 48Byte (8 * 4 Byte = 256 Bit user data)

Number of blocks	11 (user area: 0 – 7)
Block size	4 byte
WR-OPTION	1

Pro:
Product ID: 0h = 100b (Bit 43 – 41 of UID)
memory organization: 12 x 4 Byte = 48Byte (8 * 4 Byte = 256 Bit user data)

Number of blocks	12 (user area: 0 – 7)
Block size	4 byte
WR-OPTION	1

Command Code	Function		Mode			Comment
			non addressed	addressed	select	
0x01	Inventory	√	-	-	-	
0x02	Stay Quiet	√	-	√	-	
0x22	Lock Multiple Blocks	√	√	√	-	
0x23	Read Multiple Blocks	√	√ *	√	-	Single Read
0x24	Write Multiple Blocks	√	√	√	-	
0x25	Select	-	-	-	-	
0x26	Reset to Ready	-	-	-	-	
0x27	Write AFI	-	-	-	-	
0x28	Lock AFI	-	-	-	-	
0x29	Write DSFID	-	-	-	-	
0x2A	Lock DSFID	-	-	-	-	
0x2B	Get System Information	-	-	-	-	

0x2C	Get Multiple Block Security Status	-	-	-	-	
0xA3	Inventory Read Multiple Blocks	-	-	-	-	
0xAB	Inventory Get System Information	-	-	-	-	
0xAC	Inventory Get Multiple Block Security Status	-	-	-	-	
0xA2	Write 2 Blocks	-	-	-	-	
0xA3	Lock 2 Blocks	-	-	-	-	
0xA4	Kill (only Tag-it HFI Pro)	√		√		
0xA5	WriteBlockPwd (only Tag-it HFI Pro)	√		√		

Note:

*** Reading of more than one block in non addressed mode is only possible, if parameter "Read Mode" in CFG4 is set to "01: Single Read".**

**** The WR-OPTION will be set automatically by the FEIG Readers if the WR-OPTION parameter in "CFG4 General" is set to "00: automatically set".**
When using the "non-addressed" mode the WR-OPTION must be set manually to "WR-OPTION = 1".

6.3.14. Texas Instruments (Tag-it HFI Plus)

IC manufacturer identifier: 0x07

Chip ID: 0h = 0000xxxxb oder 8h = 1000xxxxb (Bit 47 - 44 of UID)

memory organization: 64 x 4 Byte = 2kBit user data

Number of blocks	64 (user area: 0 – 63)
Block size	4 byte
WR-OPTION	1

Command Code	Function		Mode			Comment
			non addressed	addressed	select	
0x01	Inventory	√	-	-	-	
0x02	Stay Quiet	√	-	√	-	
0x22	Lock Multiple Blocks	√	√	√	√	
0x23	Read Multiple Blocks	√	√	√	√	
0x24	Write Multiple Blocks	√	√	√	√	
0x25	Select	√	-	√	-	
0x26	Reset to Ready	√	√	√	√	
0x27	Write AFI	√	√	√	√	
0x28	Lock AFI	√	√	√	√	
0x29	Write DSFID	√	√	√	√	
0x2A	Lock DSFID	√	√	√	√	
0x2B	Get System Information	√	√	√	√	
0x2C	Get Multiple Block Security Status	√	√	√	√	
0xA3	Inventory Read Multiple Blocks	-	-	-	-	
0xAB	Inventory Get System Information	-	-	-	-	
0xAC	Inventory Get Multiple Block Security Status	-	-	-	-	
0xA2	Write 2 Blocks	√	√	√	√	
0xA3	Lock 2 Blocks	√	√	√	√	

**** The WR-OPTION will be set automatically by the FEIG readers if the WR-OPTION parameter in "CFG4 General" is set to "00: automatically set"**
When using the "non-addressed" mode the WR-OPTION must be set manually to "WR-OPTION = 1".

Note:

- The **"Write_2_Blocks"** command and **"Lock_2_Blocks"** command will be used automatically by the reader. This will only become an effect if the block address starts with an even-numbered address.
- In the case of writing / locking an odd number of blocks the **"Write_2_Blocks"/"Lock_2_Blocks"** command will be combined with the "write single Block"/ "Lock single Block" command.

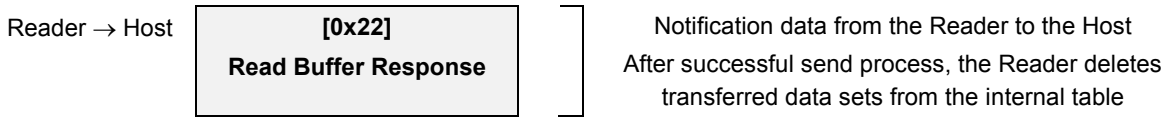
7. Protocols for Notification Mode

Notification mode is only available if a TCP/IP interface is available.

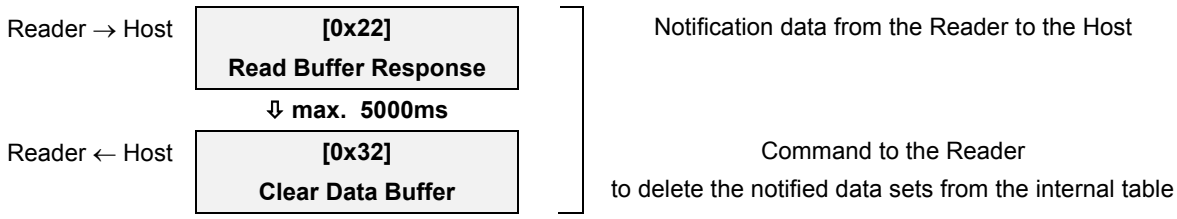
7.1. The Notification Mode Procedure

By using Notification Mode the Reader itself reads data from every Transponder which is inside the antenna field **and** enables a connection to a host to send the queued data asynchronously. This mode must be enabled in the 3.2. CFG1: Interface configuration block and configured in 3.9. CFG11 Read Mode Data configuration block. The settings for the Read Mode defines the notification information sent to the host.

Only one command is necessary to send sampled Transponder data sets. The figure below illustrates the Notification Mode procedure:



The reader sends notifications as fast as possible, if the notification trigger is set to continuously or a very short cycle time in time-triggered mode is defined. To prevent a notification overflow in a host application the acknowledgement option can be set. In this case the notification must be acknowledged by the host with an response protocol to synchronize the notification process with the host application. The figure below illustrates this procedure:



The acknowledge protocol 7.4. [0x32] Clear Data Buffer must be in the space of 5 seconds. If no acknowledge is received the Reader repeats the notification as it is configured.

If the host-triggered notification is defined, the reader never sends notifications, unless the host sends a 7.2. [0x34] Force Notify Trigger command. With this setting, the host application can control the amount and point of time of notifications.

Additional information about the capacity of the data buffer can be determined with the 7.3. [0x31] Read Data Buffer Info command.

As an additional option Keepalive messages can be sent periodically to a host. Keepalive notifications are never acknowledged. The information sent by a Keepalive notification is identical with the command 5.10. [0x6E] Reader Diagnostic with mode = 0x01.

7.2. [0x34] Force Notify Trigger

This command forces a notification, if the notification mode are enabled in 3.2. CFG1: Interface configuration block.

Host → Reader

1	2	3	4	5	6	7...8
STX (0x02)	MSB ALENGTH	LSB ALENGTH	COM-ADR	[0x34]	MODE	CRC16

Host ← Reader

1	2	3	4	5	6	7...8
STX (0x02)	MSB ALENGTH	LSB ALENGTH	COM-ADR	[0x34]	STATUS[1]	CRC16

MODE:

Reserved for future use. Send always 0x00.

Notes:

- ***This command reads the same data sets until they are cleared with the 7.4. [0x32] Clear Data Buffer command.***
- ***This command is only available in the Notification mode.***
- ***Data are only transferred if STATUS = 0x00, 0x83, 0x84, 0x93, 0x94.***
- ***If STATUS = 0x83, 0x84, 0x85 the TR-DATA and DATA SETS will be always transferred.***

7.2.1. DATA Structure in Notification Mode

Requested number of data sets from the data buffer. Only selected data will be transferred to the host. See chapter 3.9. CFG11 Read Mode Data for details.
Each data set has the following structure:

Data Type		**DATA**			
Record Length	byte no.	1	2		
		MSB RecLen	LSB RecLen		
Serial Number	byte no.	1	2	3	3+LEN
		TR-TYP	IDDT	IDD-LEN	IDD
Data Blocks	byte no.	1	2	3	4…4+DB-N*DB-SIZE
		DB-N		DB-SIZE	DB
Timer	byte no.	1...4			
		TIMER			

7.3. [0x31] Read Data Buffer Info

The command Read Data Buffer Info reads the actual parameters of the data buffer.

Host → Reader

1	2	3	4	5	6...7
STX (0x02)	MSB ALENGTH	LSB ALENGTH	COM-ADR	[0x31]	CRC16

Host ← Reader

1	2	3	4	5	6	7...8	9,10
STX (0x02)	MSB ALENGTH	LSB ALENGTH	COM-ADR	[0x31]	STATUS[1]	TAB-SIZE	TAB-START

11,12	13,14
TAB-LEN	CRC16

TAB-SIZE:

Maximum count of Transponder data sets in the data buffer.

TAB-START:

Address of first Data Set in the data buffer.

TAB-LEN:

Number of Transponder data sets reserved in the data buffer.

Notes:

- ***Additional information about the data table status is transferred if STATUS = 0x00, 0x84, 0x85, 0x93.***

7.4. [0x32] Clear Data Buffer

The command Clear Data Buffer clears the data sets from the data buffer which were transferred with the command 7.2. [0x34] Force Notify Trigger.

Host → Reader

1	2	3	4	5	6...7
STX (0x02)	MSB ALENGTH	LSB ALENGTH	COM-ADR	[0x32]	CRC16

Host ← Reader

1	2	3	4	5	6	7...8
STX (0x02)	MSB ALENGTH	LSB ALENGTH	COM-ADR	[0x32]	STATUS[2]	CRC16

[1] *see ANNEX D: Index of Status Bytes*
[2] *see ANNEX D: Index of Status Bytes*

7.5. [0x33] Initialize Buffer

The command Initialize Buffer clears the data buffer to an initial state. It does not matter if the data sets in the data buffer were read or not.

Host → Reader

1	2	3	4	5	6...7
STX (0x02)	MSB ALENGTH	LSB ALENGTH	COM-ADR	[0x33]	CRC16

Host ← Reader

1	2	3	4	5	6	7...8
STX (0x02)	MSB ALENGTH	LSB ALENGTH	COM-ADR	[0x33]	STATUS[1]	CRC16

ANNEX

ANNEX A: Codes of Transponder Types

Value	Transponder type
0x03	ISO15693 Tags
0x01	I-Code1

The Information will be send by performing the 6.1.1. [0x01] Inventory command.

ANNEX B: Time Behavior of the Asynchronous Interface

The execution times of the asynchronous interface depend on:

- The extent of the data that needs to be read or written
- Type and amount of Transponders supported by the Reader
- Position of the Transponder at the time of the request
- Probable local electromagnetic interference present
- The success or failure of the request

	min.	max.	Unit
EE-Parameter change 1 Block (16 Bytes) all (8) Blocks	5	 300 600	 ms ms
5.7. [0x69] RF Reset		15	ms
6.1. [0xB0] Host commands for ISO15693 Mandatory and Optional Commands	5	[1]	ms

[1] *as configured in 3.2. CFG1: Interface TR-RESPONSE-TIME*

ANNEX C: Time Behavior of ISO15693 Host Commands

The execution times for ISO15693 Host Commands depend on:

- Amount of Transponders in the antenna field (duration of the anticollision process),
- The extent of the data that needs to be read or written
- Types of Transponders supported by the Reader,
- Position of the Transponder at the time of the requirement,
- Probable local electromagnetic interferences present.

Time Behavior for [0x01] Inventory and ISO15693 Transponders

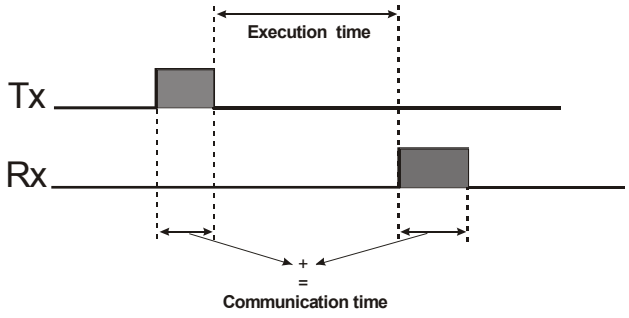
All times apply to the following parameters: ISO15693 MODE = 0x0B (see 3.5. CFG4: Transponder Parameters) and 3.5. CFG4: Transponder Parameters.)

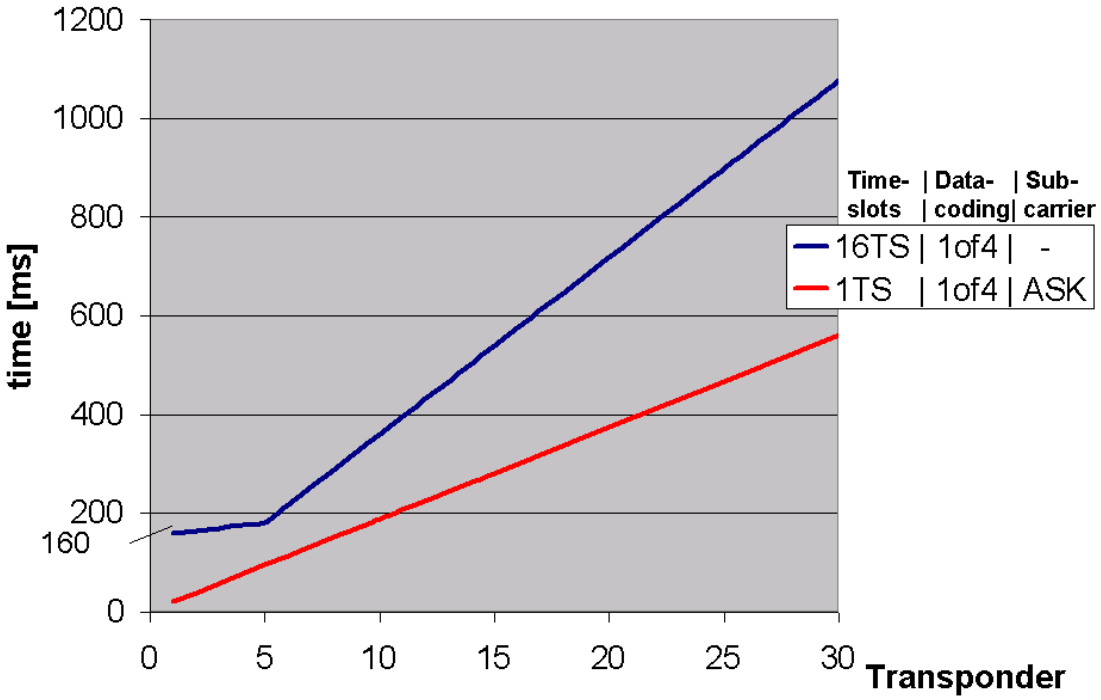
- AFI disabled
- Anticollision enabled
- only ISO15693 Transponder driver active

The modulation and the subcarrier have a negligible influence on the reaction time.

The following diagrams shows the average value of timing behavior, dependent on the number of Transponders. For certain UID's the real timing can be higher or lower as show below.

The timing is measured inclusive of the communication time at 38,4Kbaud. A modified baud rate will slightly increase the timing but the Inventory timing is mostly determine by the anticollision so you may neglect the communication time.





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

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 on 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 noise 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.
0x17	**Firmware activation required:** The firmware must be activated first using ISOStart demo program and the command “Set Firmware Upgrade”. The update code must be ordered by Feig Electronic. 1. Read the Device-ID using the command [0x66] Firmware version (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 Update

Hex-value	Interface Status
0x80	**Unknown Command:** • The Reader does not support the selected function.
0x81	**Length-Error:** • Protocol is too short or too long
0x82	**Command not available:** •
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: • The collision handling algorithm was not continued until no collision is detected, reasons for the break: - TR-RESPOSE-TIME in CFG1: Interface is to short
0x94	**More Data:** • There are more Transponder data sets requested than the response protocol can transfer at once.
0x95	**ISO 15693 Error:** • An additional error code for ISO15693 Transponders is sent with response data.

Error-Code for ISO15693 Transponders

Hex-value	Response error code definition
0x01	The command is not supported, i.e. the request code is not recognized
0x02	The command is not recognized, for example: a format error occurred
0x03	The option is not supported
0x0F	Unknown error
0x10	The specified block is not available (doesn’t exist)
0x11	The specified block is already locked and thus cannot be locked again
0x12	The specified block is locked and its content cannot be changed
0x13	The specified block was not successfully programmed
0x14	The specified block was not successfully locked
0xA0 - 0xDF	Custom command error codes
all others	reserved for future use

ANNEX E: Codes of Reader Types

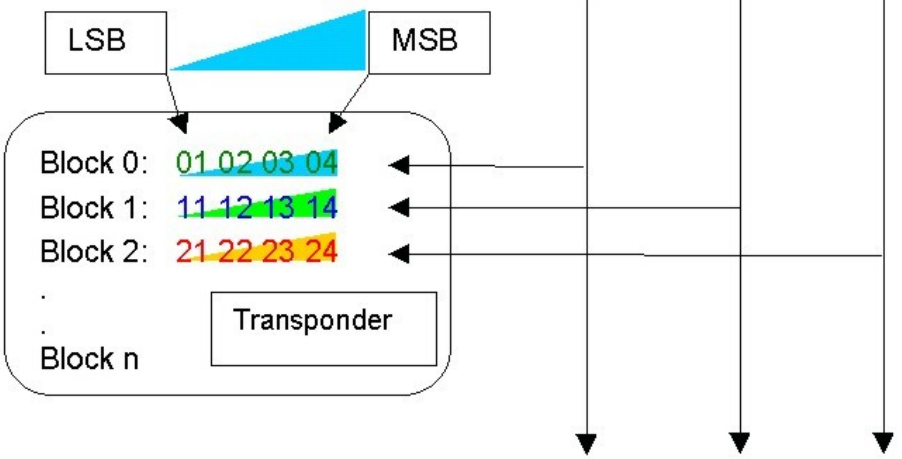
No.	Reader Type
30	ID ISC.M01
31	ID ISC.M02
60	ID ISC.PRH101
61	ID ISC.PRH101-U (USB-Version)
62	ID ISC.PRHD102
71	ID ISC.PRH100–U (USB-Version)
72	ID ISC.PRH100
73	ID ISC.MR100–U (USB-Version)
74	ID ISC.MR100 / .PR100
75	ID ISC.MR200-A / -E
76	ID ISC.MR101-A
78	ID ISC.MR101-U
40	ID ISC.LR100
41	ID ISC.LR200
42	ID ISC.LR2000
43	ID ISC.LR2500-B
44	ID ISC.LR2500-A
55	ID ISC.MRU200
56	ID ISC.MRU200-U
92	ID ISC.LRU1000
93	ID ISC.LRU2000
80	ID CPR.M02
81	ID CPR.02
82	ID CPR40.30-Ux
83	ID CPR40.0x-Ax / -Cx
84	ID CPR.M03 (586/#)
85	ID CPR.03 (584/#)
86	ID CPR30
87	ID CPR.04 (596/#)
88	ID CPR.04-U
77	ID ISC.MR102

ANNEX I: Examples for Read Data

The setting "**LSB first**" and "**MSB first**" gives the direction of the received data bytes

ISO15693 Host Command (DB-Size of the Transponder = 4 bytes)

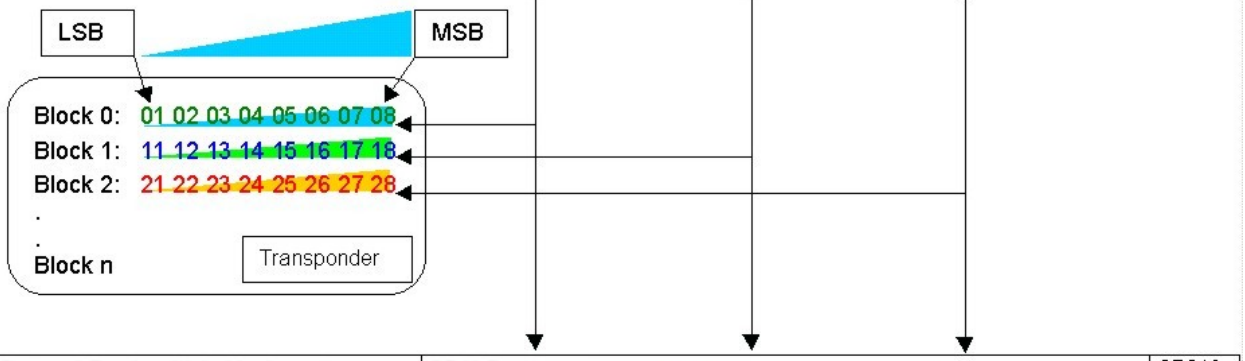
ISO Host Protocol: Write multiple block: *transmit*	**DB-N=3**, addressed	CRC16
>>1E FF B0 24 01 E0 07 00 00 01 47 67 7E 00 03 04	04 03 02 01 14 13 12 11 24 23 22 21	7C 34



ISO Host Protocol: Read multiple block: *receive*	**DB-N=3**, addressed	CRC16
<<17 00 B0 00 03 04 00	04 03 02 01 00 14 13 12 11 00 24 23 22 21	B4 5B

ISO15693 Host Command (DB-Size of the Transponder = 8 bytes)

ISO Host Protocol: Write multiple block: *transmit*	**DB-N=3**, addressed	CRC16
2A FF B0 24 01 60 05 00 00 02 11 25 04 03 03 08	08 07 06 05 04 03 02 01 18 17 16 15 14 13 12 11 28 27 26 25 24 23 22 21	E6 25



ISO Host Protocol: Read multiple block: *receive*	**DB-N=3** addressed	CRC16
23 00 B0 00 03 08 00	08 07 06 05 04 03 02 01 00 18 17 16 15 14 13 12 11 00 28 27 26 25 24 23 22 21	99 65