OBID i-*scan*®

MANUAL

ID ISC.MR200

Standard-Reader

from Firmware-Version 1.12

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FEIG ELECTRONIC

Note

FEIG ELECTRONIC GmbH
Lange Strasse 4
D-35781 Weilburg-Waldhausen
Tel.: +49 6471 3109-0
http://www.feig.de

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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).

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Revision History of documentation

Revi-sion	Date	Page	Description
0e	09.09.04		Initial version
1e	21.04.05	75	New Protocol: [0x66] Get Reader Info
		33	CFG3: RF-Interface, New Transponder Driver
		141	New status message [0x17] Firmware activation required:
		109	[0x18] Destroy (only I-Code EPC/UID Transponders)
		129	Supported ISO15693 Host commands for I-Code UID Transponders
		143	Codes of reader types
		127	New Transponder EM4135 supported
2e	02.11.05	14	Integration of Buffered Read Mode
		26 42 44	Configuration of Buffered Read Mode
		130	Buffered Read Mode Commands
		58	LAN Settings
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3e	09.06.06	42 45	Configuration of Scan Mode
4e	25.09.06	15	Integration of Notification Mode
		64	Configuration of Notification Mode
		49	Supported Antenna Multiplexing
	04.10.06	40	Configuration of Trigger
5e	26.05.08	24	Configuration of Reader Login
		66	Configuration of Costumer Parameter

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.MR200 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:

	asynchronous interface (RS232 / RS485)
Configuration Commands	√
Reader Control Commands	√
ISO15693 Host Commands	√

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:

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

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:

Host (Terminal / PC / ....)		Reader	
read data	→	Transponder in antenna field ?	
		Yes	No
	←	status / Transponder read data	status = no Transponder in Reader field
	←		
write data	→	Transponder in antenna field ?	
		Yes	No
	←	OK status	status = no Transponder in Reader field
	←		

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. Buffered Read Mode

The Buffered Read Mode is a high level operating mode to detect Transponders which are within the detection range of the Reader. This operation mode is especially designed for applications which use Transponders to identify objects. The Buffered Read Mode processes all Transponder read data and filter operations to make the user interface transparent to Transponder data and to minimize data transfers between Reader and host. There are only three commands used to control Buffered Read Mode.

In this operating mode the Reader automatically selects Transponders which are within the detection range of the Reader and reads their requested data. The read Transponder data is stored in a 'FIFO' organized data buffer.

The sampled Transponder data can be read with the 10.3. [0x22] Read Buffer command. This command always reads the first available data sets from the data buffer. However already read data has to be deleted with the 10.5. [0x32] Clear Data Buffer command before the next data sets in the data buffer can be reached with the read command.

If the Buffered Read Mode is enabled in the 3.3. CFG1: Interface configuration block the Reader immediately starts sampling Transponder data after power up. The Buffered Read Mode can be reinitialized with the 10.6. [0x33] Initialize Buffer command.

If turned to Buffered Read Mode the Reader answers every valid message with data- or status-protocol. The answer includes the control byte which has been received by the Reader.

<table>
<tr><td>Host (Terminal / PC / ....)</td><td></td><td colspan="2">Reader</td></tr>
<tr><td rowspan="4">read data</td><td>→</td><td colspan="2">Transponder data in data buffer ?</td></tr>
<tr><td></td><td>Yes</td><td>No</td></tr>
<tr><td>←</td><td>status /
data protocol</td><td>status = no valid data</td></tr>
<tr><td>←</td><td colspan="2"></td></tr>
<tr><td rowspan="4">clear data</td><td>→</td><td colspan="2">Transponder data read ?</td></tr>
<tr><td></td><td>Yes</td><td>No</td></tr>
<tr><td>←</td><td>OK status</td><td>status = no valid data</td></tr>
<tr><td>←</td><td colspan="2"></td></tr>
</table>

Note:

- ***Only read operations are available with the Buffered Read Mode.***
- ***The Buffered Read Mode is only available if Scan Mode is disabled***

1.4. Notification Mode

The Notification Mode is an extended option of the Buffered Read Mode: queued Transponder data are notified automatically and asynchronously to a host with the 10.3. [0x22] Read Buffer response protocol. The destination address and the notification conditions can be set in 3.27. CFG49: Notification Channel configuration block. In general, the notification channel **cannot** be used simultaneously with the host interface.

In difference to the Buffered Read Mode procedure, a notification is normally not acknowledged by the host. Thus, the deletion of the transferred data with the 10.5. [0x32] Clear Data Buffer command is not necessary. As an option, this acknowledgement can be enabled to synchronize the notifications with the host to prevent notification overflow in the host application.

The notification message format depends on settings for the read mode in 3.10. CFG11 Read Mode Data and 3.11. CFG12: Read Mode - Filter as well as settings for the notification trigger in 3.27. CFG49: Notification Channel.

An additional option of the Notification Mode is the Keepalive message, which can be sent periodically to the host. The Keepalive message transports valuable information about the reader hardware and antenna tuning status. Keepalive messages are always not acknowledged by the host. The Keepalive message should not be mistake with the keepalive option (s. CFG41/CFG43) of a LAN/WLAN connection initiated by a host.

Note:

- ***The MR200-Reader does support only one TCP/IP – Connection at the same time.***
- ***The reader hardware version FE556/4 is necessary for using the Notification Mode.***

1.5. 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.

The Reader starts the output of the protocol block as soon as all required data have been read correctly from the Transponder. If the Reader is not able to read all data of a protocol block completely and without error, it does not send data. For example, if the address of the data block is invalid, the UID of the Transponder will not send out.

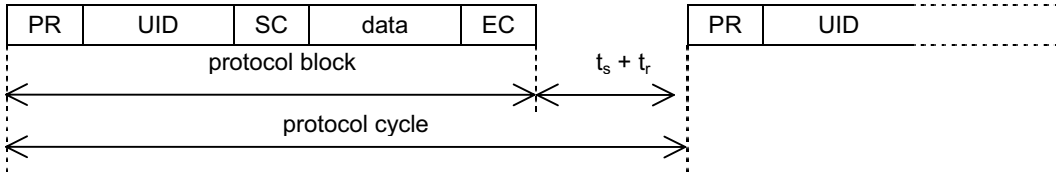
Scan-Mode via asynchronous interface:

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	UID1	EC	UID2	EC	UID3	EC

Example 3:

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

PR	data1	EC	data2	EC	data3	EC

Example 4:

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

PR	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)		

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.***
- ***Scan Mode is only available if Buffered Read Mode is disabled***

2. Interface

The Reader ID ISC.MR200 has 2 interface ports. 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.MR200-A can be configured 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: Standard Protocol-Length (up to 255 Byte)

Host → Reader

1	2	3	4...n-2	n-1	n
LENGTH = n	COM-ADR	CONTROL-BYTE	(DATA)	LSB CRC16	MSB CRC16

Host ← Reader

1	2	3	4	(5...n-2)	n-1	n
LENGTH (n)	COM-ADR	CONTROL-BYTE	STATUS	(DATA)	LSB CRC16	MSB CRC16

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

The Reader supports both Protocol frames, standard and advanced protocol frame. The Host Application can chose which protocol frame is used. If the host application chose advanced protocol frame the Reader will always response with advanced protocol frame. If the host application chose the Standard Protocol frame the Reader's response will depend on the length of the response. If the host request leads to a response with more than 255Byte the Reader will chose the advanced protocol frame as response frame otherwise the Reader response uses the standard protocol frame.

Information on:

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..253 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

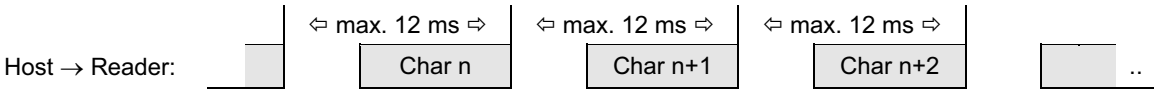
Timing conditions:

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);
        }
}
```

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
5	COM-ADR	[0x69]	CRC16

Host ← Reader

1	2	3	4	5,6
6	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
6	COM-ADR	[0x6A]	RF	CRC16

Host ← Reader

1	2	3	4	5,6
6	COM-ADR	[0x6A]	STATUS[2]	CRC16

RF:

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

Notes:

- ***If BRM-Mode is enable, an RF OFF stops the communication and ISO-Host commands are allowed. With a RF ON command the BRM-Mode starts again.***

[1] *see ANNEX D: Index of Status Bytes*
[2] *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 UID and EPC Transponders. The following combinations are possible:

	Transponder Types	
	ISO15693	I-Code UID/EPC
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	√	√[1]
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	√	

[1] *only Philips I-Code UID*

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...n-2	n-1,n
n	COM-ADR	[0xB0]	REQUEST-DATA	CRC16

Host ← Reader

1	2	3	4	5...n-2	n-1,n
n	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, Buffered Read Mode, or Notification 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 ONT bit in the ONT register of the
- 3.7. CFG5: Anticollision configuration block is not set.

REQUEST-DATA

4	5
0x01	MODE

RESPONSE-DATA **(standard)**

5	6	7	8...15
DATA-SETS	TR-TYPE	DSFID	UID
	Repeated DATA-SETS times		

RESPONSE-DATA **(I-CODE EPC)**

5	6	7...14 (18)
DATA-SETS	TR-TYPE	EPC
	Repeated DATA-SETS times	

RESPONSE-DATA **(I-Code UID)**

5	6	7...25
DATA-SETS	TR-TYPE	IDD (14 byte data bytes + 5 byte 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 EPC and UID Transponders this value will return 0x00.

EPC:

- For I-Code EPC Transponders: if 8 or 12 Bytes of the I-Code EPC are transmitted, dependents on the I-Code EPC Transponder type.

UID:

- For UID Transponder: the 19 Byte Identifier Data (IDD) will be displayed.

Identifier Data (IDD):

User Data *(Read/Write)*	UD CRC 16 *(Read/Write)*	UID *(ReadOnly)*
DB 0-11	DB12-13	DB14-18

Notes:

- ***This command supports all Transponders.***
- ***Depending on the Persistence Reset time settings in [3.15. CFG16: Persistence Reset](#) the transponder can 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*	*I-Code EPC 96*	*I-Code UID*
amount of Transponder setting status 0x94 *(with Advanced Protocol Length)*	***> 50***	***> 38***	***> 25***

6.1.2. [0x02] Stay Quiet

This command sets one Transponder to Quiet State.

REQUEST-DATA

4	5	6-13
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 **7.1. ☞ Supported ISO15693 Host commands** for ISO15693 **Transponders**.

Note:
This command is only available for ISO15693Transponders.

REQUEST-DATA

4	5	(6...13)	6 / (14)	7 / (15)
0x22	MODE	UID	DB-ADR	DB-N

RESPONSE-DATA (STATUS = 0x03)

5
DB-ADR-E

RESPONSE-DATA (STATUS = 0x95)

5	6
ISO15693 ERROR	DB-ADR-E

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 to be locked. First block can be any value between 0 and 255.

DB-N:

Number of data blocks to be locked, 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.

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 7.1. ☞ Supported ISO15693 Host commands for ISO15693 Transponders.

REQUEST-DATA

4	5	(6...13)	6 / (14)	7 / (15)
0x23	MODE	UID	DB-ADR	DB-N

RESPONSE-DATA (STATUS = 0x95)

5
ISO15693 ERROR

RESPONSE-DATA

5	6	7	8...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	0	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

UID:

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

DB-ADR:

First block number to be read. First block can be any value between 0 and 255.

DB-N:

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

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 depend on the specification of the Transponder manufacturer, see chapter 7.1. ☞ Supported ISO15693 Host commands for ISO15693 Transponders.

SEC-STATUS:

Block security status of following data block. If supported by the ISO15693 transponder.

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 depends on the different ISO15693Transponder types, which are described in chapter 7.1. ☞ Supported ISO15693 Host commands for ISO15693 Transponders.

REQUEST-DATA

4	5	(6...13)	6 / (14)	7 / (15)	8 / (16)	9...n / (17...n)
0x24	MODE	UID	DB-ADR	DB-N	DB-SIZE	DB
						Repeated DB-N times

RESPONSE-DATA (STATUS = 0x03)

5
DB-ADR-E

RESPONSE-DATA (STATUS = 0x95)

5	6
ISO15693 ERROR	DB-ADR-E

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:

Address of the first data block to be written to the Transponder. First block can be any value between 0 and 255.

DB-N:

Number of data blocks to be written to the Transponder, starting at DB-ADR.
The maximum number of DB-N, depend on DB-Size and the interface receiver buffer size RX-BUF. The maximum number of DB-N is:
(RX-BUF - 20)/(DB-Size) e.g. Block size 4 (DB-N = (280 – 20) / 4 = 65)

DB-SIZE:

Number of bytes of one data block. This value depend on the specification of the Transponder manufacturer, see chapter 7.1. ☞ Supported ISO15693 Host commands for ISO15693 Transponders. DB-SIZE must be 1 for the I-CODE EPC Transponder.

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 were 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 support Write Multiple Blocks commands several Write Single Block commands are used for this Transponder.***
- ***If an error occurred during a write command, the number of the block were the error occurred will be send to host***
- ***A write command on I-Code UID and EPC Transponders can only be performed in the non-addressed mode whereas the block-size (DB-SIZE) must be 1 Byte.***
- ***If an I-Code UID and EPC Transponder is already locked, the reader answers with status = [0x03].***

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

4	5	6...13
0x25	MODE	UID

RESPONSE-DATA (STATUS = 0x95)

5
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

4	5	(6...13)
0x26	MODE	UID

RESPONSE-DATA (STATUS = 0x95)

5
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 7.1. ☞ Supported ISO15693 Host commands for ISO15693 Transponders.

REQUEST-DATA

4	5	(6...13)	6 / (14)
0x27	MODE	UID	AFI

RESPONSE-DATA (STATUS = 0x95)

5
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 7.1. ☞ Supported ISO15693 Host commands for ISO15693 Transponders.

REQUEST-DATA

4	5	(6...13)
0x28	MODE	UID

RESPONSE-DATA (STATUS = 0x95)

5
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 7.1. ☞ Supported ISO15693 Host commands for ISO15693 Transponders.

REQUEST-DATA

4	5	(6...13)	6 / (14)
0x29	MODE	UID	DSFID

RESPONSE-DATA (STATUS = 0x95)

5
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 7.1. ☞ Supported ISO15693 Host commands for ISO15693 Transponders.

REQUEST-DATA

4	5	(6...13)
0x2A	MODE	UID

RESPONSE-DATA (STATUS = 0x95)

5
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

4	5	(6...13)
0x2B	MODE	UID

RESPONSE-DATA (STATUS = 0x95)

5
ISO-ERROR

RESPONSE-DATA

5	6...13	14	15...16	17	
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

4	5	(6...13)	6 / (14)	7 / (15)
0x2C	MODE	UID	DB-ADR	DB-N

RESPONSE-DATA (STATUS = 0x95)

5
ISO15693 ERROR

RESPONSE-DATA

5	6
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
n	COM-ADR	[0xBF]	MODE	RSP-LENGTH

MODE 1+2+6	7...8	9...n-2	n-1,n
	CMD-RSP-DELAY	REQUEST-DATA	CRC16

MODE 3+4	7...8	9...10	11...n-2	n-1,n
	CMD-RSP-DELAY	EOF-PULSE-DELAY	REQUEST-DATA	CRC16

MODE 5	7...8	9 – 10	11 ... n-2	n-1,n
	CMD-RSP-DELAY	MULTIPLE 302 GRIDS	REQUEST-DATA	CRC16

Host ← Reader

1	2	3	4	5...n-2	n-1,n
n	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 is

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

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.

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 or Buffered Read Mode is switched on.***

7. Special Commands

7.1 [0x18] Destroy (only I-Code EPC/UID Transponders)

This command will render the I-CODE EPC/UID Transponder permanently unable to give any replies.

Host → Reader (TYPE – I-Code EPC)

1	2	3	4	5...16	17...19	20...21
0x15	COM-ADR	0x18	Mode	EPC	Password	CRC16

Host → Reader (TYPE – I-Code UID)

1	2	3	4	5...23	24...26	27...28
0x1C	COM-ADR	0x18	Mode	IDD	Password	CRC16

Host ← Reader

1	2	3	4	5...6
6	COM-ADR	0x18	STATUS	CRC16

MODE:

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

TYPER:

b000 I-Code EPC
b001 I-Code UID

EPC:

12 Byte EPC Data (electronic product code) If the EPC data has only a length of 8 Byte, the EPC must be written left-justified (Byte 5-12). The last 4 Bytes will be ignored.

IDD:

19 Byte IDD Data of I-Code UID

Password:

The password is of length 24 bits and must match with the content which was previously written into the relevant section of the I-Code UID or EPC memory.

Notes:

- ***Only one Transponder may be in the RF-field. If more than one transponder in the field the reader returns with status [0x83] (RF Communication Error.)***
- ***If the EPC doesn't match, the reader also answers with status [0x83].***
- ***If the command was not successfully (reader may continue read the EPC), the reader answers with status [0x03].***

Supported ISO15693 Host commands

7.1. ☞ 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.

7.1.1. EM Microelectronics (EM4034)

Chip ID: 1h = x00001xxb (Bit 46 - 42 of UID)

Memory organization: 14 x 4 Byte = 448Bit

Number of blocks	14 (user area: 3 – 11)
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	√	√ *	√	-	Multiple 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	-	-	-	-	

*** Reading of one block in non addressed mode is only possible, if parameter "Read Mode" in CFG4 is set to "10: Multiple Read".**

**** 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".**

7.1.2. EM Microelectronics (EM4135)

Chip ID: 4h = 000100xx (Bit 47 - 42 of UID)

Memory organization: 38 x 8 Byte = 2432Bit

Number of blocks	36 (user area: 13 – 48)
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	√	√ *	√	√	Multiple 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	-	-	-	-	

*** Reading of one block in non addressed mode is only possible, if parameter "Read Mode" in CFG8 is set to "10: Multiple Read".**

**** 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".**

7.1.3. 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.**

7.1.4. 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.**

7.1.5. 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.**

7.1.6. 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.**

7.1.7. 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".**

7.1.8. 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".**

7.1.9. 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".**

7.1.10. 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".**

7.1.11. 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".**

7.1.12. STMicroelectronics (LRI512)

IC manufacturer identifier: 0x02

memory organization: 16 x 4 Byte = 512Bit

Number of blocks	16 (user area: 0...15)
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		-	-	-	

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

7.1.13. 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.**

7.1.14. 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.**

7.1.15. 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".

7.1.16. 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.

8. Supported ISO15693 Host commands for I-Code EPC Transponders

The command codes listed in the following table support the various Transponder commands and operations that are available for I-Code EPC Transponders.

Memory organization: 17 x 1 Byte = 136 Bit

Number of blocks	17 (user area: -)
Block size	1 byte

Command Code	Function		Mode			Comment
			non-addressed	addressed	select	
0x01	Inventory	√	-	-	-	
0x02	Stay Quiet	-	-	-	-	
0x18	Destroy	√	√	-	-	
0x22	Lock Multiple Blocks	-	-	-	-	
0x23	Read Multiple Blocks	-	-	-	-	
0x24	Write Multiple Blocks	√	√	-	-	Block-Size =1 Byte
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	-	-	-	-	
0xA0	Read Config Block	-	-	-	-	
0xA1	Write Config Block	-	-	-	-	

9. Supported ISO15693 Host commands for I-Code UID Transponders

The command codes listed in the following table support the various Transponder commands and operations that are available for I-Code UID Transponders.

Memory organization: 24 x 1 Byte = 192 Bit

Number of blocks	12 Byte User Data (UD)
Block size	1 byte

Command Code	Function		Mode			Comment
			non-addressed	addressed	select	
0x01	Inventory	√	-	-	-	
0x02	Stay Quiet	-	-	-	-	
0x18	Destroy	√	√	-	-	
0x22	Lock Multiple Blocks	-	√	-	-	
0x23	Read Multiple Blocks	-	-	-	-	
0x24	Write Multiple Blocks	√	√	-	-	Block-Size =1 Byte
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	-	-	-	-	
0xA0	Read Config Block	-	-	-	-	
0xA1	Write Config Block	-	-	-	-	

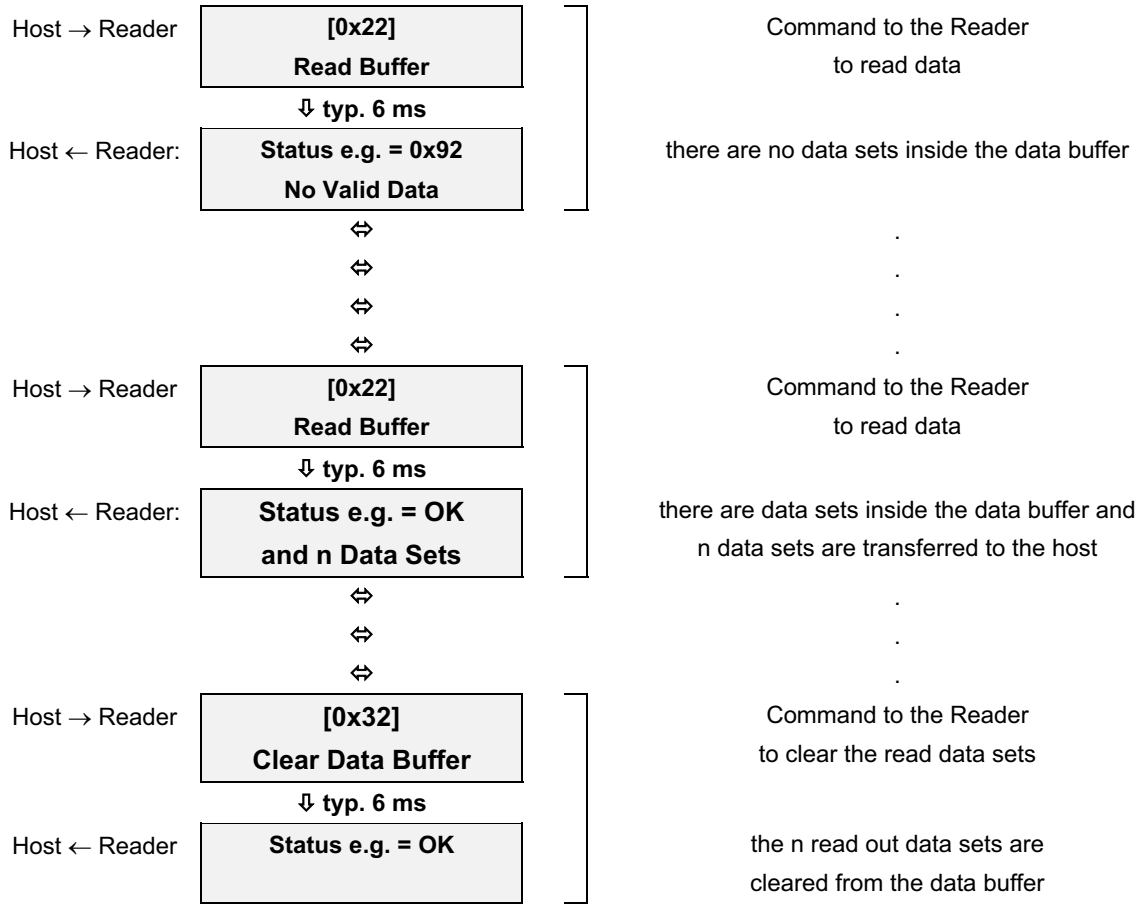
10. Protocols for Buffered Read Mode

10.1. The Buffered Read Mode Procedure

By using the “BRM” the Reader itself reads data from every Transponder which is inside the antenna field. This mode must be enabled in the 3.3. CFG1: Interface configuration block and configured in the 3.10. CFG11 Read Mode Data and 3.11. CFG12: Read Mode - Filter configuration block.

The sampled Transponder data sets are stored in a FIFO organized data buffer inside the Reader. The buffered read mode runs offline from any host commands and it is immediately started after power up or a *5.4.* [0x64] System Reset command.

Only two commands are necessary to read out sampled Transponder data sets. The figure below illustrates the Buffered Read Mode procedure:



⇩: ***Host waits for an answer from the Reader***

⇔: ***Host is able to do other jobs e.g. to communicate with other Readers***

Additional information about the capacity of the data buffer can be determined with the 10.4. [0x31] Read Data Buffer Info command.

10.2. Transponder Access in the Buffered Read Mode

The Buffered Read Mode only reads data blocks from the Transponders in the antenna field

The anticollision procedure can be configured in the 3.7. CFG5: Anticollision configuration block. configuration block are used.

10.3. [0x22] Read Buffer

The command Read Buffer reads a number of data sets from the data buffer.

Host → Reader

1	2	3	4 .. 5	6...7
6	COM-ADR	[0x22]	DATA-SETS	CRC16

Host ← Reader

1	2	3	4	(5)	(6 .. 7)
6 / (n)	COM-ADR	[0x22]	STATUS[1]	TR-DATA	DATA-SETS

(8...n-2)	5...6 / (n-1,n)
DATA	CRC16

DATA-SETS:

Number of data sets to be transferred from the data buffer. If the data buffer does not contain the requested number of data sets, the Reader responds with all available data sets and an error will occur.

TR-DATA:

Selects the data types for read operation.

Bit:	7	6	5	4	3	2	1	0
Function	-	-	TIMER	ANT-No	Byte Order	-	DB	UID

UID = Identifier Data (UID or EPC)

DB = data block

Byte Order = b0:MSB first, b1:LSB first

ANT-No = Antenna number if a antenna multiplexer is used. Without multiplexer it is set to

TIMER = internal system timer

DATA:

Requested number of data sets from the data buffer. Only selected data will be transferred to the host. See chapter 3.10. CFG11 Read Mode Data for details.
Each data set has the following structure:

Data Type		DATA			
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			
Antenna	byte no.	1			
		ANT-NO			

TR-Typ:

see ANNEX A: Codes of Transponder Types

IDDT:

always set to 0x00 for HF-reader

IDD-LEN:

Identifier Data Length defines the length of the IDD in Byte.

IDD:

Identifier Data (UID or EPC)

DB-N:

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

DB-Size:

The data block size in the Buffered Read Mode is always 4 bytes.

DB:

content of data blocks

Timer:

internal system time. Time when the transponder has been stored in the buffer.

ANT-NO:

Antenna number
ANT is a bit field. If the tag is read on more than one antenna and the configuration option "all antenna ports act as one reading point" is set, the corresponding bits of each antenna where the Transponder is read will by set in the bit field.

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

ANT1...8

b0	this antenna has not read transponder data
b1	this antenna has read transponder data

Notes:

- ***This command reads the same data sets until they are cleared with the 10.5. [0x32] Clear Data Buffer command.***
- ***This command is only available in the Buffered Read 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.***

10.4. [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
5	COM-ADR	[0x31]	CRC16

Host ← Reader

1	2	3	4	5...6	7,8	9,10	11,12
12	COM-ADR	[0x31]	STATUS[1]	TAB-SIZE	TAB-START	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.***

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

10.5. [0x32] Clear Data Buffer

The command Clear Data Buffer clears the data sets from the data buffer which were transferred with the 10.3. [0x22] Read Buffer command.

Host → Reader

1	2	3	4...5
5	COM-ADR	[0x32]	CRC16

Host ← Reader

1	2	3	4	5...6
6	COM-ADR	[0x32]	STATUS[1]	CRC16

10.6. [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
5	COM-ADR	[0x33]	CRC16

Host ← Reader

1	2	3	4	5...6
6	COM-ADR	[0x33]	STATUS[1]	CRC16

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

ANNEX

ANNEX A: Codes of Transponder Types

Value	Transponder type
0x03	ISO15693 Tags
0x06	Philips I-Code EPC
0x07	Philips I-Code UID

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 3.3. 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

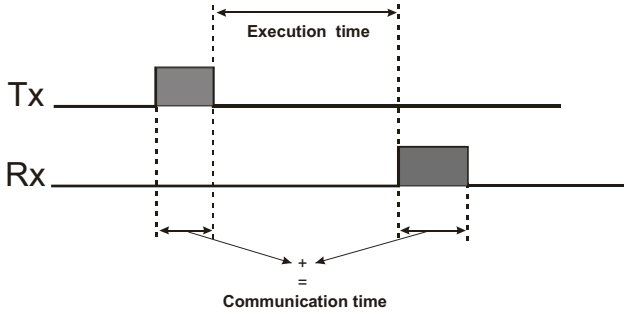
All times apply to the following parameters: ISO15693 MODE = 0x0B (see 3.6. CFG4: Transponder Parameters) and 3.7. CFG5: Anticollision.)

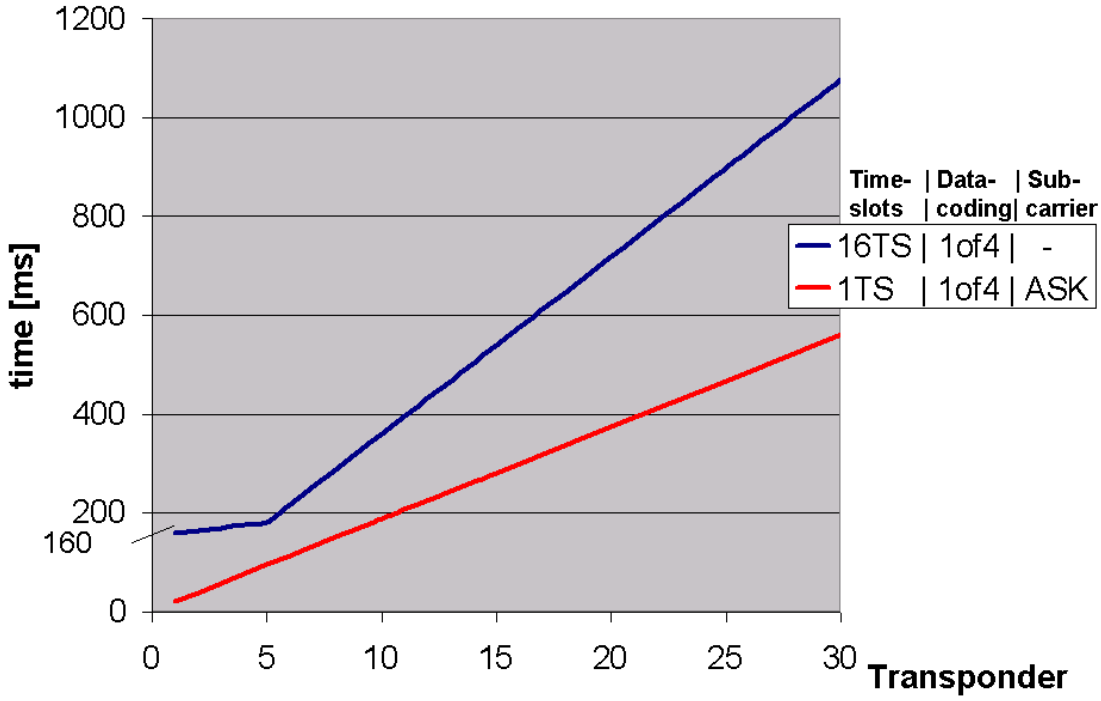
- AFI disabled
- Anticollision enabled
- only ISO15693 Transponder driver active
- ONT = Only new Transponder will be send to the host

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

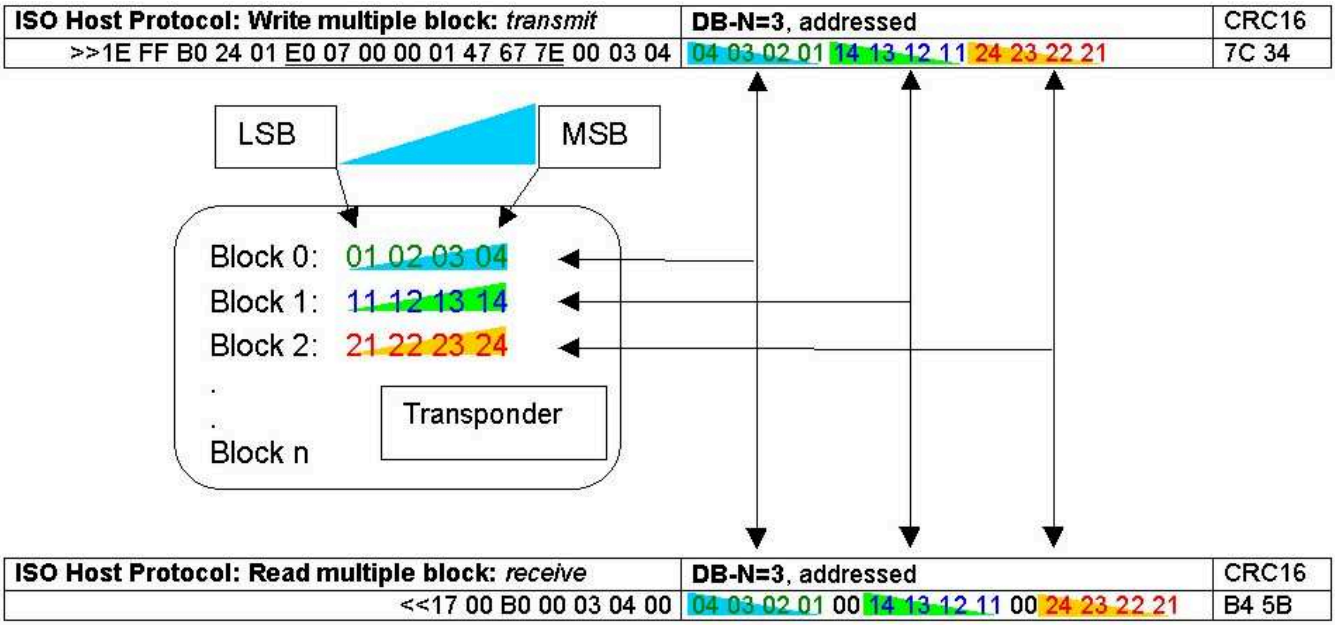
ANNEX E: Codes of Reader Types

No.	Reader Type
30	ID ISC.M01
31	ID ISC.M02
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
40	ID ISC.LR100
41	ID ISC.LR200
91	ID ISC.LRU1000
80	ID CPR.M02
81	ID CPR.02
84	ID CPR.M03 (586/#)
88	ID CPR04-U
78	ID ISC MR101-U / PR101-U
76	ID ISC.MR101-A / PR101-A
60	ID ISC.PRH101-A (RS232 or Bluetooth)
61	ID ISC.PRH101-U (USB-Version)

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)



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