



OEM-DESFire Series
13.56 MHz HF RFID Module
NEO2

Examples

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1 Introduction

This document contains various examples for using the communication protocol.

Notes:

- The Checksum is CheckSum8, XOR over the complete telegram before the checksum itself.
- Active-IDLE = Send REQ, Anticollision and Select; will only work on cards that are not HALTED.
- Active-ALL = Send WUPA, Anticollision and Select; works on all cards.

2 Examples

2.1 Read Firmware Number

Command to RFID device:

```
>> 50 00 00 04 54
```

Reply from RFID device:

```
<< 50 00 04 04 71 17 03 20 15  
    71 17 03 20 Firmware number
```

2.2 ISO 15693

2.2.1 Inventory

Command to RFID device:

```
>> 50 00 03 A1 16 00 00 E4  
    50 Start of telegram  
    00 03 3 bytes payload between command code and checksum  
    A1 Command code (I2_Inventory)  
    16 Flag; 16 = Slot Inventory, 26 = 1 slot inventory  
    00 AFI; 0x00 = no AFI used  
    00 No UID will be sent with this telegram -> no RFID tag will be addressed directly  
    E4 Checksum
```

Reply from RFID device: (success)

```
<< 50 00 08 A1 F5 25 26 9F 00 01 04 E0 75  
    50 Start of telegram  
    00 08 8 bytes payload between command code and checksum  
    A1 Command code (I2_Inventory)  
    F5 25 26 9F 8 bytes UID  
    00 01 04 E0  
    75 Checksum
```

2.3 ISO 14443A

2.3.1 Error occurs: No tag in field

Command to RFID device:

```
>> 50 00 02 22 10 26 46  
    50 Start of telegram  
    00 02 2 bytes payload between command code and checksum  
    22 Command code (PICCACTIVATE)
```

10 Shut off antenna for 10 ms
 26 Request IDLE
 46 Checksum

Reply from RFID device: (error)

<< F0 00 01 22 E0 33
 F0 Start of telegram with error message
 00 01 1 byte payload between command code and checksum
 22 Command code (PICCACTIVATE)
 E0 No card response within given time (timeout)
 33 Checksum

2.3.2 Detects Mifare card with 7-byte long UID

Command to RFID device:

>> 50 00 02 22 10 26 46
 50 Start of telegram
 00 02 2 bytes payload between command code and checksum
 22 Command code (PICCACTIVATE)
 10 Shut off antenna for 10 ms
 26 Request IDLE
 46 Checksum

Reply from RFID device: (success)

<< 50 00 0B 22 44 00 08 07 04 49 69 AA 2B 2B 80 3C
 50 Start of telegram
 00 0B 11 bytes payload between command code and checksum
 22 Command code (PICCACTIVATE)
 44 00 ATQ (Answer To Request), contains type designation
 08 SAK (Select Acknowledge)
 07 7-byte long UID follows
 04 49 69 AA 7-byte long UID
 2B 2B 80
 3C Checksum

2.3.3 Detects Mifare card with 4-byte long UID

Command to RFID device:

>> 50 00 02 22 10 26 46
 50 Start of telegram
 00 02 2 bytes payload between command code and checksum
 22 Command code (PICCACTIVATE)
 10 Shut off antenna for 10 ms
 26 Request IDLE
 46 Checksum

Reply from RFID device: (success)

<< 50 00 08 22 02 00 18 04 03 E7 FB 6B 10
 50 Start of telegram
 00 08 8 bytes payload between command code and checksum
 22 Command code (PICCACTIVATE)

```

    02 00  ATQ (Answer To Request), contains type designation
    18  SAK (Select Acknowledge)
    04  4-byte long UID follows
03 E7 FB 6B 4-byte long UID
    10  Checksum

```

2.3.4 Mifare Authenticate

Command to RFID device:

```

>> 50 00 0C 16 60 05 03 E7 FB 6B FF FF FF FF FF FF 5B
    50  Start of telegram
    00 0C 12 bytes payload between command code and checksum
    16  Command code
    60  Authenticate with Key A (use 0x61 for Key B)
    05  Authenticate for block number 5
03 E7 FB 6B 4-byte long UID of card
FF FF FF FF Key
FF FF
    5B  Checksum

```

Reply from RFID device: (success)

```
<< 50 00 00 16 46
```

2.3.5 Mifare Read Block

Command to RFID device:

```

>> 50 00 01 17 05 43
    50  Start of telegram
    00 01 1 byte payload between command code and checksum
    17  Command code
    05  Read block number 5
    43  Checksum

```

Reply from RFID device: (success)

```

<< 50 00 10 17 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 57
    50  Start of telegram
    00 10 16 bytes payload
    17  Command code
00 00 00 00 16 bytes of the read block
00 00 00 00
00 00 00 00
00 00 00 00
    57  Checksum

```

2.3.6 Mifare Write Block

Command to RFID device:

```

>> 50 00 11 18 05 55 55 55 55 55 55 55 55 55 55 55 55 55 55 5C
    50  Start of telegram
    00 11 17 bytes payload between command code and checksum
    18  Command code
    05  Write block number 5

```

```

55 55 55 55 16 bytes to write to the target block
55 55 55 55
55 55 55 55
55 55 55 55
5C Checksum

```

Reply from RFID device: (success)

```
<< 50 00 00 18 48
```

2.4 Autolistcards

Supported tag types:

```

0x01      ISO14443 A card only
0x04      ISO15693 card only
0x05      ISO15693 and ISO14443 A
0x00, 0xFF All card types supported by the module

```

Time when a telegram shall be sent:

```

0x01      NOTICE when a tag enters the field
0x02      NOTICE when a tag leaves the field
0x03      NOTICE when a tag enters and leaves the field
0x04      NOTICE continuously as long as the tag is in the field (notification interval is the inventory interval)

```

2.4.1 Switch On Autolistcards

Command to RFID device:

```

>> 50 00 05 23 FF 64 00 01 00 EC
    50 Start of telegram
    00 05 5 bytes payload between command code and checksum
    23 Command code (AUTOLISTCARD)
    FF All supported tag types
    64 Interval between tag inventory in milliseconds (here 100 ms)
    00 Antenna number; 0x00 = all antennas
    01 When a telegram shall be sent
    00 Reserved for future use, do not send other values than 0x00
    EC Checksum

```

Reply from RFID device: (success/confirmation)

```
<< 50 00 00 23 73
```

2.4.2 Switch Off Autolistcards

Command to RFID device:

```

>> 50 00 05 23 FF 00 01 01 00 89
    50 Start of telegram
    00 05 5 bytes payload between command code and checksum
    23 Command code (AUTOLISTCARD)
    FF All supported tag types
    00 Interval between tag inventory (0x00 switches Off)
    01 Antenna number
    01 When a telegram shall be sent
    00 Reserved for future use, do not send other values than 0x00

```

89 Checksum

Reply from RFID device: (success/confirmation)

```
<< 50 00 00 23 73
```

2.4.3 Output for a data tag of type ISO14443A

Output from RFID device:

```
<< 50 00 0D 23 01 64 03 01 00 04 00 08 04 1D 13 D1 A0 6E
    50 Start of telegram
    00 0D 13 bytes payload between command code and checksum
    23 Command code (AUTOLISTCARD)
    01 ISO 14443A
    64 Interval between tag inventory (here 100 ms)
    03 Detected on antenna 3
    01 Notify when tag is detected first
    00 unused
    40 00 ATQ
    08 SAK
    04 4-byte long UID follows
    1D 13 D1 A0 UID
    6E Checksum
```

2.4.4 Output for a data tag of type ISO15693

Reply from RFID device:

```
<< 50 00 0D 23 04 64 03 04 00 5A 3D F8 01 00 00 05 E0 62
    50 Start of telegram
    00 0D 13 bytes payload between command code and checksum
    23 Command code (AUTOLISTCARD)
    04 ISO15693
    64 Interval between tag inventory (here 100 ms)
    03 Detected on antenna 3
    04 Notify steadily as long as tag is detected
    00 unused
    5A 3D F8 01 8-byte long UID
    00 00 05 E0
    62 Checksum
```

2.5 Mifare Ultralight EV1

2.5.1 Fast Read

Begin Communication with PICCActivate

Command to RFID device:

```
>> 50 00 02 22 10 26 46
    50 Start of telegram
    00 02 2 bytes payload between command code and checksum
    22 Command code
    10 Shut off antenna for 10 ms
    26 Request IDLE
```


46 Checksum

Now Communicate using direct PICCTransfer

Command to RFID device:

```
>> 50 00 03 2E 3A 00 06 41
      50 Start of telegram
      00 03 3 bytes payload between command code and checksum
      2E PICCTransfer
      3A FAST_READ
      00 Start page number
      06 End page number
      41 Checksum
```

2.5.2 Read-Write Counter

There is no direct support of counter commands for the 3 counters of Mifare Ultralight EV1 but you can use the PICCTransfer command to communicate directly with the RFID-PICC.

Begin Communication with PICCActivate

Command to RFID device:

```
>> 50 00 02 22 10 26 46
      50 Start of telegram
      00 02 2 bytes payload between command code and checksum
      22 Command code
      10 Shut off antenna for 10 ms
      26 Request IDLE
      46 Checksum
```

Reply from RFID device:

```
<< 50 00 0B 22 44 00 00 07 04 97 CE C2 37 30 80 22
      50 Start of telegram
      00 0B 11 bytes payload between command code and checksum
      22 Command code
      44 00 ATQ (Answer to Request), contains type designation
      00 SAK (Select Acknowledge)
      07 7-byte UID follows
      04 97 CE C2 UID
      37 30 80
      22 Checksum
```

Now Communicate using direct PICCTransfer**GET_VERSION**

Command to RFID device:

```
>> 50 00 01 2E 60 1F
      50 Start of telegram
      00 01 1 byte payload between command code and checksum
      2E PICCTransfer
      60 GET_VERSION
      1F Checksum
```

Reply from RFID device:

```
<< 50 00 08 2E 00 04 03 01 01 00 0B 03 79
    00 04 03 01  Version Info (see Mifare Ultralight EV1 data sheet)
    01 00 0B 03
```

READ_CNT

Command to RFID device:

```
>> 50 00 02 2E 39 00 45
    50  Start of telegram
    00 02  2 bytes payload between command code and checksum
    2E  Command code (PICCTransfer)
    39  READ_CNT
    00  Number of counter
    45  Checksum
```

Reply from RFID device:

```
<< 50 00 03 2E 00 00 00 7D
    50  Start of telegram
    00 03  3 bytes of payload between command code and checksum
    2E  PICCTransfer
    00  LSB of counter
    00  Next byte of counter
    00  MSB of counter
    7D  Checksum
```

INCR_CNT

Command to RFID device:

```
>> 50 00 06 2E A5 00 00 01 00 00 DC
    50  Start of telegram
    00 06  6 bytes of payload between command code and checksum
    2E  PICCTransfer
    A5  INCR_CNT
    00  Number of counter
    00  LSB of counter
    01  Next byte of counter
    00  MSB of counter
    00  Padding byte
    DC  Checksum
```

The reply may be an error but when you read out the value, the value is added

Reply from RFID device: (error)

```
<< F0 00 01 2E 02 DD
```

Command to RFID device: (Read value)

```
>> 50 00 02 2E 39 00 45
```

Reply from RFID device: (success)

```
<< 50 00 03 2E 00 01 00 7C
```

To check if an error occurred during counter operations, use the following command:

Command to RFID device:

```
>> 50 00 02 2E 3E 00 42
    50  Start of telegram
```

00 02 2 bytes payload between command code and checksum
2E PICCTransfer
3E CHECK_TEARING EVENT
00 Number of counter
42 Checksum

Reply from RFID device: (success)

<< 50 00 01 2E BD C2

50 Start of telegram
00 01 1 byte payload between command code and checksum
2E PICCTransfer
BD Result flag (BD = no problems occurred)
C2 Checksum