716-52 REV6 Multi Sector MIFARE® Reader/Writer

Data Sheet

Overview

The 716-52 REV6 multi sector MIFARE® Reader/Writer is an intelligent 13.56MHz contactless reader writer designed to operate with the Mifare® Std 1k, 4k, Mifare PlusX/PlusS (in security level 1 mode), Ultralight cards or NTAG NFC tags.

The reader/writer uses a PHILIPS MIFARE® reader IC and complies with ISO 14443A.

The multi sector MIFARE® Reader/Writer can read and write[1] to any sector and block on the card and is MAD compliant. All the encryption needed to provide a secure and reliable transaction is handled automatically with a few simple commands.

Mifare Plus cards, both the X and S types, are supported in compatibility mode (SL1) which offers a further level of security with the option of 128 bit AES authentication.

An RS232 interface is used to communicate between the unit and a PC or application hardware.

Three independent LEDs and a beeper are available for user tasks.

The product consists of three parts, a potted unit containing the electronics and antenna, a front cover, and an optional spacer plate. A fixed 10 way colour-coded cable protrudes from the back of the potted unit.

Features

- Reads MIFARE® cards unique ID number, UID
- Reads and writes to MIFARE® Ultralight data pages[1] and NTAG NFC tags
- Reads data from any sector block on a MIFARE® Std 1k, 4k card or MIFARE PLUS card
- Writes[2] data to any sector block on a MIFARE® Std 1k, 4k card or MIFARE PLUS card
- Reader can store 32 keys for use as A or B keys
- Reader can store 16 128 bit AES keys for Mifare Plus
- Supports optional 128 bit AES authentication of Mifare Plus cards
- Supports MAD1 and MAD2
- Commands to support transactions using the MIFARE® VALUE[3] format
- Format checking on access bytes to prevent inadvertent damage to card
- Uses on-card MIFARE® security keys to prevent card copying and tampering

Applications

- cashless vending machines
- squash court access and lights control
- meal voucher control
- laundry machines
- loyalty programs
- cashless payments
- biometric data storage
- RFID-based ticketing for all kinds of events
- access control

Note 1. Not all pages are available to the user eg. Mifare Ultralight pages 0 and 1 are read only, page 3 is one-time programmable.

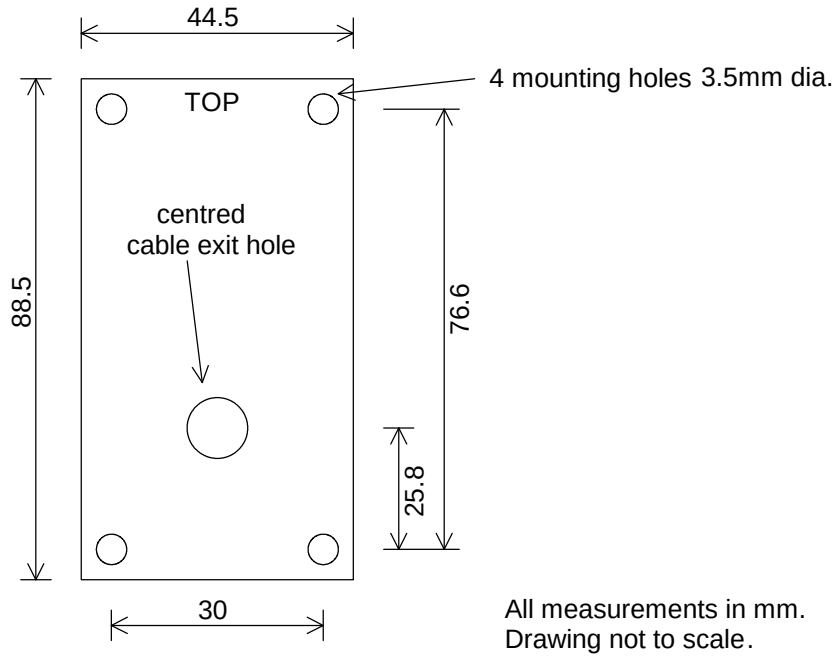
Note 2. The manufacturer's data, sector 0 block 0, is read only.

Note 3. The MIFARE[å] VALUE format is a fixed data format for a sector block that permits error detection, correction and backup management. The size of the data is a signed 4 byte value, for reasons of data integrity and security a value is stored 3 times. A 1 byte address, stored 4 times is also stored in the sector block and is used when implementing backup management.

Specifications

- Power requirements: 5.0 to 13.8V dc
- Current consumption: 100 mA (typical)
- RF Frequency: 13.56MHz
- Typical reading range - 20mm to 50mm, dependant upon card manufacturer
- 3 LEDs (GREEN, RED, YELLOW).
- Beeper emits a 4kHz tone
- Operating temperature range: -20ºC to +60ºC.
- 10 way cable: 0,9m long
- Weight: 90 grams.
- Dimensions: reader 89 x 45 x 16 mm, optional spacer plate 89 x 45 x 7 mm

Physical Dimensions and Mounting Details



If the spacer plate is used the reader cable may be brought out of one of four exit points on the spacer: top, bottom, left or right. This enables the cable to be run on the surface of the wall. If no spacer plate is used a minimum hole size of 6.5mm must be drilled in the wall at the cable exit position as shown above to allow the cable to exit perpendicular to the reader.

The optional spacer plate may also be used when mounting the reader on a metal surface to reduce the negative effects of metal on the read range.

Connections

The table below details the function of each wire:

Colour	Name	Function
ORANGE	TTL[3] RX	TTL RX comms
PURPLE	TTL[3] TX	TTL TX comms
BLUE	COMMS GND	TTL/RS232 comms ground
YELLOW	RS232 RX	RS232 RX comms
GREEN	RS232 TX	RS232 TX comms
RED	+VDC[4]	Connect +5V +13.8V to power supply
BLACK	0V	Connect 0V to power supply

Note 3. TTL comms bypasses the RS232 level shifting and inverting IC and offers the user the ability to connect the application microprocessor directly to the Reader Writer's microprocessor.

Note 4. The Reader Writer has an internal low dropout 5V regulator. For supply voltages less than 5.5V the user must provide a regulated DC with RMS ripple and noise levels below 1mV.

RS232 Communication

There are two alternate full duplex serial communication connections to the Reader Writer, RS232 or TTL. The RS232 conforms to the EIA standard and can be connected directly to the serial COM port of a PC. The TTL connections are non-inverted 0V and 5V levels and are intended to be connected directly to the USART of the application microprocessor.

The baud rate is 19200. Data format is 8 bits, no parity, and 1 stop bit.

Command format

Commands and replies are sent in ASCII and are case sensitive, only keyboard characters are used. Data is sent as ascii chars. A terminal program (HyperTerminal) can be used to send commands and receive replies.

Two COMMAND FORMATS are provided for, one with an appended checksum and one without, either may be used

With checksum the format is:

<$><A>,<C>,<d1>,<d2>,....,<CHK><CR><LF>

Without checksum the format is:

<!><A>,<C>,<d1>,<d2>,....><CR><LF>

where,

<$> command header that indicates start of the command with checksum
<!> command header that indicates start of the command without checksum
<A> is a 1 digit target address code in decimal, this is always 1 for the Reader Writer
<C> is one or more command identification characters
<d1> <d2> ... are optional command parameters in decimal (or hex if preceded by 0x)
<CHK> is the checksum, where sent,
checksum formatted as ‘c-style’ hex number e.g. 0xA3
<CR> is a carriage return \r <enter>
<LF> is a line feed \n - optional and is ignored

the ',' is used as a delimiter between characters

The checksum is calculated by performing an 8 bit addition of the ascii value of each char making up the command and includes the start char and comma delimiters but not the checksum itself.

REPLY FORMAT

The reply always includes a checksum, the format is:

<$><A>,<REPLY>,<y..y>....,<CHK><CR><LF>

where,

<$> reply header that indicates start of the reply
<A> is a 1 digit target address code in decimal, this is always 0 for the application hardware
<REPLY> is the reply, may be, OK for a successfully implemented command, ERROR xx for any failure in deciphering or executing the command (where xx is the error code) or a command identification character
<y...y> any parameters used by the reply
<CHK> is the checksum,
checksum formatted as 'c-style' hex number e.g. 0x0B
<CR> is a carriage return \r <enter>
<LF> is a line feed \n - optional and is ignored

the ',' is used as a delimiter between characters

The checksum is calculated by performing an 8 bit addition of the ascii value of each char making up the command and includes the start char and comma delimiters but not the checksum itself.

Note. Where a hex value is given or requested, two chars always follow the 0x
Example - for hex value 1, 0x1 is illegal, it is required to be 0x01

The reader/writer has a buffer which is cleared and starts filling after the header has been received, the command is processed after a <CR> is received. All commands are replied to.

Command Set

Note. For ease of reading the commands and replies are shown here without the start character, address code, checksum and <CR><LF>

Query Commands

Return Version Information
I

Function. Outputs both hardware and firmware version information
Reply list: 1. Up to 20 ascii chars of version information, example 716-52 rev1 v1.00
2. ERROR xx

Control Commands

Bootloader Command
L
Reply List: 1. OK
2. ERROR xx

To prevent unintentionally entering the bootloader mode and subsequently erasing the current firmware in flash this command will only be accepted by the reader/writer if sent with the checksum.

Note. Once this command has been accepted the current firmware in flash has been erased and no communication is now possible. The reader/writer will remain in this mode until new firmware has been downloaded by using proprietary bootloader software.

Software Reset (Clear)
C

Function. Initiates a microprocessor software reset
Reply list: 1. OK (before resetting)
2. ERROR xx

Control Beeper
B,tttt

Function: Turns on the beeper for tttt ms
where: tttt is the beeper on time in milliseconds entered as decimal ascii chars, will accept any time from 0ms to 9999ms
example B,1 gives 1ms beep time
B,0 turns beeper off
Reply list: 1. OK
2. ERROR xx

Control RF Field
F,x

Function. Turns RF field either on or off
where: x is RF field state
0=OFF
1=ON

Reply list: 1. OK
2. ERROR xx

Control Green LED
G,x

Function. Turns Green LED either on or off
where: x is Green LED state
0=OFF
1=ON

Reply list: 1. OK
2. ERROR xx

Control Red(Scarlet) LED
S,x

Function. Turns Red LED either on or off
where: x is Red LED state
0=OFF
1=ON

Reply list: 1. OK
2. ERROR xx

Control Yellow LED
Y,x

Function. Turns Yellow LED either on or off
where: x is Yellow LED state
0=OFF
1=ON

Reply list: 1. OK
2. ERROR xx

Transaction Commands

Read and Return UID

U

Function. For any MIFARE® card in the field this command will return the card's UID. For cards with a 4 byte UID (MIFARE® STD) 4 bytes are returned, for cards with a 7 byte UID 7 bytes are returned.
Reply List: 1. 4 or 7 byte UID in hex, in 'reverse' order. Note. Reverse order is opposite to that given by the Philips PEGODA reader, but is logically the correct order.
2. ERROR xx

Check Card Type

PT

Function. Checks card type by activating the card which then replies with a 2 byte code

Reply List:
1. 2 byte code in hex (see table 1)
2. ERROR xx

Code	Card
0x00	Mifare Ultralight NTAG NFC tag
0x08	Mifare Std 1k Mifare Plus S (SL1)
0x18	Mifare Std 4k Mifare PlusX (SL1)
0x20	Desfire Mifare PlusS (SL0) Mifare PlusX (SL0)
0x11	Mifare PlusX (SL2)

Table 1. Mifare card type reply codes

Note. The code is not unique for each type of card and therefore not all cards can be unambiguously identified.

Write Key

K,ii,0xhhhhhhhhhhhh

Function: ii is an index to where the key is stored, 0xhhhhhhhhhhhh is the 6 byte key in hex. Up to 32 keys may be stored, these are the A and B key pairs for each sector. This key is written to a secure read only area in memory. This key cannot be read back after being loaded but new keys may be loaded and will overwrite the existing keys.

How the keys are indexed is up to the user but for a read or write transaction to be successful the correct key type (A or B) and index needs to be used with the relevant command.

where ii is the key storage index

range 00 < ii < 31

Reply list: 1. OK
2. EEROR xx

Write AES Authentication Key

PK,ii,0xhhhhhhhhhhhhhhhhhhhhhhhhhhhhhhhh

Function: ii is an index to where the AES key is stored, 0xhhhhhhhhhhhhhhhhhhhhhhhhhhhhhhhh is the 16 byte (128 bits) key in hex. Up to 16 keys may be stored. This key cannot be read back after being loaded but new keys may be loaded and will overwrite the existing keys.

How the keys are indexed is up to the user but for an optional AES authentication to be successful the correct index needs to be used when using the AES Authentication command.

where ii is the key storage index

range 00 < ii < 16

Reply list: 1. OK
2. EERROR xx

Note. Keys provide the security for the MIFARE system and the user must protect their keys, therefore keys should be written only once, preferably at the factory.

AES Authentication

PA,ii

Function. Does an AES authentication on the card in th field using the key found at the AES key index ii

where ii is the key index in decimal
range 00 ≤ ii ≤ 16

Reply List:
1. OK
2. ERROR xx

Read Data Sector Block

R,ss,bb,k,ii

Function. Reads 16 bytes of data from the addressed sector block ss bb of the MIFARE[â] card, uses the given key type k found at the key index ii

where ss is the sector number in decimal
range 00 ≤ ss ≤ 15 for MIFARE® Std 1k and 4k cards
range 16 ≤ ss ≤ 39 for MIFARE® Std 4k cards

where bb is the block number in decimal
range 00 ≤ bb ≤ 03 for MIFARE® Std 1k and 4k cards
range 04 ≤ bb ≤ 15 for MIFARE® Std 4k cards

where k is the key type
range k=A or k=B

where ii is the key index in decimal
range 00 ≤ ii ≤ 31

Reply List:
1. R,ss,bb,0xhhhhhhhhhhhhhhhhhhhhhhhhhhhhhhhh (a 16 byte hex number)
2. ERROR xx

Read Data AID Sector Block
MR,0xaaaa,bb,k,ii

Function. Reads 16 bytes of data from the sector block addressed by the AID 0xaaaa and the block bb, follows MAD rules (MAD1 and MAD2 are supported), uses the given key type k found at the key index ii

where 0xaaaa is the 2 byte AID in hexadecimal

where bb is the block number in decimal
range 00 ≤ bb ≤ 03 for MIFARE® Std 1k and 4k cards
range 04 ≤ bb ≤ 15 for MIFARE® Std 4k cards

where k is the key type
range k=A or k=B

where ii is the key index in decimal
range 00 ≤ ii ≤ 31

Reply List:
1. R,ss,bb,0xhhhhhhhhhhhhhhhhhhhhhhhhhhhhhhhh (a 16 byte hex number)
2. ERROR xx

where ss is the sector number in decimal, pointed to by the AID
range 00 ≤ ss ≤ 15 for MIFARE® Std 1k and 4k cards
range 16 ≤ ss ≤ 39 for MIFARE® Std 4k cards

Read Ultralight/NTAG Page Data
TR,ppp

Function. Reads 16 bytes of data starting from the addressed page ppp on a MIFARE® Ultralight card or NTAG NFC tag,

where ppp is the page number in decimal
range 00 ≤ ppp ≤ 230 for MIFARE® Ultralight cards and NTAG NFC tags *(for backward compatibility to versions before 5.1 the parameter ppp only requires 2 digits for pages up to and including 99)*

Reply List:
1. R,ppp,00,0xhhhhhhhhhhhhhhhhhhhhhhhhhhhhhhhh (a 16 byte hex number)
2. ERROR xx

Example, read the data from page 4, without checksum

```
!1,TR,04
$0,R,04,00,0x44444444555555556666666677777777,0x9E
```

Example, read the data from page 5, with checksum

```
$1,TR,05,0xE4
$0,R,05,00,0x55555555666666667777777788888888,0xBF
```

Write Data Sector Block
W,ss,bb,k,ii,0xhhhhhhhhhhhhhhhhhhhhhhhhhhhhhhhh

Function. Writes up to 16 bytes of data to the addressed sector block ss, bb of the MIFARE® card using the given key type k found at the key index ii. The data must be at least 1 byte and no more than 16 bytes long. Unused bytes in the block will be filled with NUL's (0x00).

where ss is the sector number in decimal
range 00 ≤ ss ≤ 15 for MIFARE® Std 1k and 4k cards

range 16 ≤ ss ≤ 39 for MIFARE® Std 4k cards

where bb is the block number in decimal
range 00 ≤ bb ≤ 03 for MIFARE® Std 1k and 4k cards
range 04 ≤ bb ≤ 15 for MIFARE® Std 4k cards

where k is the key type
range k=A or k=B

where ii is the key index in decimal
range 00 ≤ ii ≤ 31

Data is in hexadecimal

Reply List: 1.OK
2. ERROR xx

Note. Any block, except the manufacturer's block, sector 0 block 0, can be written to. The sector trailer's will only be written if access bytes are in the correct format.

Write Data AID Sector Block
MW,0xaaaa,bb,k,ii,0xhhhhhhhhhhhhhhhhhhhhhhhhhhhhhhhh

Function. Writes up to 16 bytes of data to the sector block addressed by the AID 0xaaaa and block bb of the MIFARE® card, uses the given key type k found at the key index ii. The data must be at least 1 byte and no more than 16 bytes long. Unused bytes in the block will be filled with NUL's (0x00).

where 0xaaaa is the 2 byte AID in hexadecimal

where bb is the block number in decimal
range 00 ≤ bb ≤ 03 for MIFARE® Std 1k and 4k cards
range 04 ≤ bb ≤ 15 for MIFARE® Std 4k cards

where k is the key type
range k=A or k=B

where ii is the key index in decimal
range 00 ≤ ii ≤ 31

Data is in hexadecimal

Reply List: 1.OK
2. ERROR xx

Note. Any block, except the manufacturer's block, sector 0 block 0, can be written to. The sector trailer's will only be written if access bytes are in the correct format.

Write Ultralight/NTAG Page Data
TW,ppp,0xhhhhhhhh

Function. Writes up to 4 bytes of data to the addressed page ppp of the MIFARE® Ultralight card or NTAG NFC tag. The data must be at least 1 byte and no more than 4 bytes long. Unused bytes in the block will be filled with NUL's (0x00).

where ppp is the page number in decimal
range 00 ≤ ppp ≤ 230 for MIFARE® Ultralight cards and NTAG NFC tags *(for backward compatibility to versions before REV6 the parameter ppp only requires 2 digits for pages up to and including 99)*

Data is in hexadecimal

Reply List: 1.OK
2. ERROR xx

Example, write the data to page 4, without checksum

```
!1,TW,04,0x44444444
$0,OK,0x46
```

Example, write the data to page 5, with checksum

```
$1,TW,05,0x55555555,0x65
$0,OK,0x46
```

Note. Page 0, page 1 and the first byte of page 2 are manufacturer's data and are write protected.

Caution. Page 2 contains lock bits which can be used to lock program memory to read only. Page 3 is the OTP page where the bits may only be 'set' once.

Read VALUE² Sector Block
V,ss,bb,k,ii

Function. Reads 4 bytes of data in the MIFARE® VALUE² format from the addressed sector block ss, bb of the MIFARE® card, uses the given key type k found at the key index ii

where ss is the sector number in decimal
range 00 ≤ ss ≤ 15 for MIFARE® Std 1k and 4k cards
range 16 ≤ ss ≤ 39 for MIFARE® Std 4k cards

where bb is the block number in decimal
range 00 ≤ bb ≤ 02 for MIFARE® Std 1k and 4k cards
range 04 ≤ bb ≤ 14 for MIFARE® Std 4k cards

where k is the key type
range k=A or k=B

where ii is the key index in decimal
range 00 ≤ ii ≤ 31

Reply List:
1. V,ss,bb,0xhhhhhhhh(a 4 byte signed hex number)
2. ERROR xx

Read VALUE² AID Sector Block
MV,0xaaaa,bb,k,ii

Function. Reads 4 bytes of data in the MIFARE® VALUE² format from the sector block addressed by the AID 0xaaaa and the block bb, follows MAD rules (MAD1 and MAD2 are supported), uses the given key type k found at the key index ii

where 0xaaaa is the 2 byte AID in hexadecimal

where bb is the block number in decimal
range 00 ≤ bb ≤ 03 for MIFARE® Std 1k and 4k cards
range 04 ≤ bb ≤ 15 for MIFARE® Std 4k cards

where bb is the block number in decimal

range 00 ≤ bb ≤ 02 for MIFARE® Std 1k and 4k cards
range 04 ≤ bb ≤ 14 for MIFARE® Std 4k cards

where k is the key type
range k=A or k=B

where ii is the key index in decimal
range 00 ≤ ii ≤ 31

Reply List:
1. V,ss,bb,0xhhhhhhhh(a 4 byte signed hex number)
2. ERROR xx

where ss is the sector number in decimal
range 00 ≤ ss ≤ 15 for MIFARE® Std 1k and 4k cards
range 16 ≤ ss ≤ 39 for MIFARE® Std 4k cards

Decrement VALUE² Sector Block
D,ss,bb,k,ii,0xhhhhhhhh

Function. The 4 bytes of hex data will be subtracted from the VALUE² found at the addressed sector block, ss,bb, of the MIFARE® card using the given key type k found at the key index ii.

where ss is the sector number in decimal
range 00 ≤ ss ≤ 15 for MIFARE® Std 1k and 4k cards
range 16 ≤ ss ≤ 39 for MIFARE® Std 4k cards

where bb is the block number in decimal
range 00 ≤ bb ≤ 02 for MIFARE® Std 1k and 4k cards
range 04 ≤ bb ≤ 14 for MIFARE® Std 4k cards

where k is the key type
range k=A or k=B

where ii is the key index in decimal
range 00 ≤ ii ≤ 31

where 0xhhhhhhhh is a 4 byte signed hex number, negative numbers are not permitted (this effectively limits numbers to 31 bits).

Reply List: 1.OK
2. ERROR xx

Decrement VALUE² AID Sector Block
MD,0xaaaa,bb,k,ii,0xhhhhhhhh

Function. The 4 bytes of data will be subtracted from the VALUE² found at the sector block addressed by the AID 0xaaaa and the block bb, follows MAD rules (MAD1 and MAD2 are supported), uses the given key type k found at the key index ii

where 0xaaaa is the 2 byte AID in hexadecimal

where bb is the block number in decimal
range 00 ≤ bb ≤ 02 for MIFARE® Std 1k and 4k cards
range 04 ≤ bb ≤ 14 for MIFARE® Std 4k cards

where k is the key type
range k=A or k=B

where ii is the key index in decimal
range 00 ≤ ii ≤ 31

where 0xhhhhhhhh is a 4 byte signed hex number, negative numbers are not permitted (this effectively limits numbers to 31 bits).

Reply List: 1.OK
2. ERROR xx

Increment VALUE² Sector Block
A,ss,bb,k,ii,0xhhhhhhhh

Function. The 4 bytes of hex data will be added to the VALUE² found at the addressed sector block, ss,bb, of the MIFARE® card using the given key type k found at the key index ii.

where ss is the sector number in decimal
range 00 ≤ ss ≤ 15 for MIFARE® Std 1k and 4k cards
range 16 ≤ ss ≤ 39 for MIFARE® Std 4k cards

where bb is the block number in decimal
range 00 ≤ bb ≤ 03 for MIFARE® Std 1k and 4k cards
range 04 ≤ bb ≤ 15 for MIFARE® Std 4k cards

where k is the key type
range k=A or k=B

where ii is the key index in decimal
range 00 ≤ ii ≤ 31

where 0xhhhhhhhh is a 4 byte signed hex number, negative numbers are not permitted (this effectively limits numbers to 31 bits).

Reply List: 1.OK
2. ERROR xx

Increment VALUE² AID Sector Block
MA,0xaaaa,bb,k,ii,0xhhhhhhhh

Function. The 4 bytes of data will be added to the VALUE² found at the sector block addressed by the AID 0xaaaa and the block bb, follows MAD rules (MAD1 and MAD2 are supported), uses the given key type k found at the key index ii

where 0xaaaa is the 2 byte AID in hexadecimal

where bb is the block number in decimal
range 00 ≤ bb ≤ 03 for MIFARE® Std 1k and 4k cards
range 04 ≤ bb ≤ 15 for MIFARE® Std 4k cards

where k is the key type
range k=A or k=B

where ii is the key index in decimal
range 00 ≤ ii ≤ 31

where 0xhhhhhhhh is a 4 byte signed hex number, negative numbers are not permitted (this effectively limits numbers to 31 bits).

Reply List: 1.OK
2. ERROR xx

Write VALUE² Sector Block
X,ss,bb,k,ii,0xhhhhhhhh

Function. Writes 4 bytes of hex data in the MIFARE^{â} VALUE^{2} format to the addressed sector block, ss,bb, of the MIFARE^{â} card using the given key type k found at the key index ii.

where ss is the sector number in decimal
range 00 ≤ ss ≤ 15 for MIFARE® Std 1k and 4k cards
range 16 ≤ ss ≤ 39 for MIFARE® Std 4k cards

where bb is the block number in decimal
range 00 ≤ bb ≤ 03 for MIFARE® Std 1k and 4k cards
range 04 ≤ bb ≤ 15 for MIFARE® Std 4k cards

where k is the key type
range k=A or k=B

where ii is the key index in decimal
range 00 ≤ ii ≤ 31

where 0xhhhhhhhh is a 4 byte signed hex number, negative numbers are not permitted (this effectively limits numbers to 31 bits).

Reply List: 1.OK
2. ERROR xx

Note: The manufacturer's block, sector 0 block 0 and all the sector trailer's, block 3, cannot be used in the MIFARE^{â} VALUE^{2} format.

Write VALUE^{2} AID Sector Block
MX,0xaaaa,bb,k,ii,0xhhhhhhhh

Function. Writes 4 bytes of data in the MIFARE^{â} VALUE^{2} format to the sector block addressed by the AID 0xaaaa and the block bb, follows MAD rules (MAD1 and MAD2 are supported), uses the given key type k found at the key index ii

where 0xaaaa is the 2 byte AID in hexadecimal

where bb is the block number in decimal
range 00 ≤ bb ≤ 03 for MIFARE® Std 1k and 4k cards
range 04 ≤ bb ≤ 15 for MIFARE® Std 4k cards

where k is the key type
range k=A or k=B

where ii is the key index in decimal
range 00 ≤ ii ≤ 31

where 0xhhhhhhhh is a 4 byte signed hex number, negative numbers are not permitted (this effectively limits numbers to 31 bits).

Reply List: 1.OK
2. ERROR xx

Note: The manufacturer's block, sector 0 block 0 and all the sector trailer's, block 3, cannot be used in the MIFARE^{â} VALUE^{2} format.

Note. An OK reply does not necessarily guarantee that the transaction took place successfully, it is up to the user application to validate this.

Error Codes

The table shows the error codes returned when a transaction with a MIFARE® card fails

Error Code	Error Message
1	No card in the field
2	Communication error
3	Authentication error
4	Corrupt Value
5	Transaction value negative
6	Transaction failed
7	Command format error
8	MAD transaction error