

Multi-Protocol SDK User Manual

Rev2.6

Revision History

Revision	Date	Author	Description
1.0	2012.09.17	C.K	1 st Release
1.1	2012.10.22	C.K	Add Ultralight Function
1.2	2012.12.21	C.K	Add Ultralight C and Topaz function
1.3	2013.02.07	C.K	Add PayWave of TypeA
1.4	2013.03.25	C.K	Add LED and Buzzer control command Add Reset Command
1.5	2013.05.07	C.K	Remove PayWave Series Command
1.6	2013.05.10	C.K	Add remember auto-polling state command
1.7	2013.09.04	C.K	Add ISO15693 command for read multiple blocks
1.8	2013.10.11	C.K	Add Initialize Beep command
1.9	2013.11.27	C.K	Add set/get Machine ID
2.0	2014.02.24	C.K	Add output interface
2.1	2014.06.30	C.K	Add Ultralight EV1 commands
2.2	2014.08.05	C.K	Add PicoTag WriteBlock Command Add ISO14443A Halt Command
2.3	2014.08.14	C.K	Add Enable/Disable RF Command
2.4	2015.08.05	C.K	Add Buzzer times control.
2.5	2015.08.26	C.K	Add Commands for Configuration
2.6	2016.05.20	C.K	Add Change Master Key of Desfire

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1. Protocol Package

1.1 Command Frame Format

Name	SOF	LENG-H	LENG-L	CMD Category	CMD	Data	LRC
Value	0xAE						
Bytes	1-Byte	1-Byte	1-Byte	1-Byte	1-Byte	n-Bytes	1-Byte

1.1.1 Meaning of byte in command frame format

Name	Meaning
SOF	Start of frame byte(0xAE)
LENG-H	High byte of packet length from cmd category to data
LENG-L	Low byte of packet length from cmd category to data
CMD Category	Command category byte
CMD	Command byte in specified command category
Data	Data bytes
LRC	Check sum of package which is XORing result from LENG-H to Data

(1) The package length that maximum is 258 bytes

1.1.2 CMD Category

CMD Category	Meaning
0x00	Command category for general function
0x01	Command category for ISO14443A
0x02	Command category for ISO14443B
0x03	Command category for ISO15693
0x04	Command category for Picotag(HID iClass)
0x05	Command category for Desfire
0x06	Command category for ISO7816

1.2 Response Frame Format

Name	SOF	LENG-H	LENG-L	CMD Category	CMD	Resp	Data	LRC
Value	0xAE							
Bytes	1-Byte	1-Byte	1-Byte	1-Byte	1-Byte	1-Byte	n-Bytes	1-Byte

1.2.1 Meaning of byte in command frame format

Name	Meaning
SOF	Start of frame byte(0xAE)
LENG-H	High byte of packet length from cmd category to data
LENG-L	Low byte of packet length from cmd category to data
CMD Category	Operated command category byte
CMD	Operated command byte
Resp	Response flag of operated command
Data	Response data bytes
LRC	Check sum of package which is XORing result from LENG-H to Data

1.2.2 Response Flags(Resp)

Category	Response Name	Resp	Description
No Error	Operation Success	0x01	Operation is successful
UART Error	LRC error	0x10	LRC check sum verification fails
	Command error	0xFF	Unknown command
RF Communication Error	No Response	0xE0	There is no card or doesn't respond
	Framing Error	0xE1	Received frame error
Desfire	Desfire Error	0xDF	Execute desfire command error
Mifare	Authenticate Error	0xA1	Mifare authenticate fail
PayWave	Response Error	0xCE	PayWave response error code

2. General Command

2.1 General Command Overview(0x00)

Command Name	Command	Description
Select Communication Protocol	0x00	Config the communication protocol
Get Firmware Version	0x01	Get the firmware version
Auto Polling	0x02	Enable/Disable Auto Polling
LED Control	0x03	Control the LED
Buzzer Control	0x04	Control the Buzzer
Reset	0x05	Reset the device
Polling State	0x06	Keep auto-polling state in default.
Initialize Beep	0x07	Enable/Disable Initialize Beep
Set Machine ID	0x08	Setting the machine ID
Get Machine ID	0x09	Getting the machine ID
Output Interface	0x0A	Config the output interface
RF Power	0x0B	Enable/Disable RF Power
Auto Execute	0x0C	Enable/Disable Auto Execute
Preamble	0x0E	Config for Preamble
Postamble	0x0F	Config for Postamble
Data Type	0x10	Config for Data Type
Data Invert	0x11	Config for Data Invert
Data Size	0x12	Config for Data Size
Buzzer Beep Times	0x14	Buzzer Beep Times
Baudrate	0x15	Config for Baudrate
Data Transfer	0xF0	Data Transfer

2.1.1 Select Communication Protocol

Request Format

CMD Category	Command	Payload
0x00	0x00	Type

Type: 0x00 – ISO14443A

0x01 – ISO14443B

0x02 – ISO15693

0x03 – Picotag with ISO14443B

0x04 – Picotag with ISO15693

0x05 – Felica

Response Format

CMD Category	Command	Resp	Payload
0x00	0x00	0x01	

2.1.2 Get Firmware Version
Request Format

CMD Category	Command	Payload
0x00	0x01	

Response Format

CMD Category	Command	Resp	Payload
0x00	0x01	0x01	FirmwareString(NBytes)

FirmwareString: Product + Version + Meaningful filename

2.1.3 Auto Polling
Request Format

CMD Category	Command	Payload
0x00	0x02	Value

Value = 0x00 – Enable

0x01 – Disable(Default)

UID Format : UID(0)+UID(1)+...+UID(N)

Please turn off Auto Polling before executing any commands of card

Response Format

CMD Category	Command	Resp	Payload
0x00	0x02	0x01	

2.1.4 LED Control
Request Format

CMD Category	Command	Payload
0x00	0x03	LED ID+State

LED Number: 0x00 – LED1

0x01-LED2

State: 0x00 – Turn On

0x01 – Turn Off

Response Format

CMD Category	Command	Resp	Payload
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0x00	0x03	0x01	
------	------	------	--

2.1.5 Buzzer Control

Request Format

CMD Category	Command	Payload
0x00	0x04	

Response Format

CMD Category	Command	Resp	Payload
0x00	0x04	0x01	

2.1.6 Reset

Request Format

CMD Category	Command	Payload
0x00	0x05	

No any response

2.1.7 Polling State

Request Format

CMD Category	Command	Payload
0x00	0x06	State

State: 0x00 – Enable, 0x01 Disable

Response Format

CMD Category	Command	Resp	Payload
0x00	0x06	0x01	

2.1.8 Initialize Beep

Request Format

CMD Category	Command	Payload
0x00	0x07	State

State: 0x00 – Enable, 0x01 Disable

Response Format

CMD Category	Command	Resp	Payload
0x00	0x07	0x01	

2.1.9 Set Machine ID

Request Format

CMD Category	Command	Payload
0x00	0x08	ID(0)+ID(1)+ID(2)

Response Format

CMD Category	Command	Resp	Payload
0x00	0x08	0x01	

2.1.10 Get Machine ID
Request Format

CMD Category	Command	Payload
0x00	0x09	

Response Format

CMD Category	Command	Resp	Payload
0x00	0x09	0x01	ID(0)+ID(1)+ID(2)

2.1.11 Output Interface
Request Format

CMD Category	Command	Payload
0x00	0x0A	Interface(1Byte)+Parameters

Interface:

0x00 – RS232

0x01 - Wiegand

Parameters:

RS232 – Null

Wiegand – Wiegand Number(1Byte)

Response Format

CMD Category	Command	Resp	Payload
0x00	0x0A	0x01	

2.1.12 RF Power
Request Format

CMD Category	Command	Payload
0x00	0x0B	Value

Value = 0x00 – Enable

0x01 – Disable

Response Format

CMD Category	Command	Resp	Payload
0x00	0x0B	0x01	

2.1.13 Auto Execute
Request Format

CMD Category	Command	Payload
0x00	0x0C	Value

Value = 0x00 – Enable

0x01 – Disable

Response Format

CMD Category	Command	Resp	Payload
0x00	0x0C	0x01	

2.1.14 Preamble
Request Format

CMD Category	Command	Payload
0x00	0x0E	Size + Data1 + Data2 + Data3 + Data4 + Data5

Size = Preamble Size that range is 0 ~ 5

 Data 1 = 1st Data of Preamble

 Data 2 = 2nd Data of Preamble

Data 3 = 3th Data of Preamble

Data 4 = 4th Data of Preamble

Data 5 = 5th Data of Preamble

Response Format

CMD Category	Command	Resp	Payload
0x00	0x0E	0x01	

2.1.15 Postamble
Request Format

CMD Category	Command	Payload
0x00	0x0F	Size + Data1 + Data2 + Data3 + Data4 + Data5

Size = Preamble Size that range is 0 ~ 5

Data 1 = 1st Data of Preamble

Data 2 = 2nd Data of Preamble

Data 3 = 3th Data of Preamble

Data 4 = 4th Data of Preamble

Data 5 = 5th Data of Preamble

Response Format

CMD Category	Command	Resp	Payload
0x00	0x0F	0x01	

2.1.16 Data Type

Request Format

CMD Category	Command	Payload
0x00	0x10	Type

Type = 0x00 – Binary

0x01 – ASCII

Response Format

CMD Category	Command	Resp	Payload
0x00	0x10	0x01	

2.1.17 Data Invert

Request Format

CMD Category	Command	Payload
0x00	0x11	State

State = 0x00 – Disable

0x01 – Enable

Response Format

CMD Category	Command	Resp	Payload
0x00	0x11	0x01	

2.1.18 Data Size

Request Format

CMD Category	Command	Payload
0x00	0x12	Size

Size = The range is 0 ~32

Response Format

CMD Category	Command	Resp	Payload
0x00	0x12	0x01	

2.1.19 Buzzer Beep Times

Request Format

CMD Category	Command	Payload
0x00	0x14	Times

Times = 2~N

Response Format

CMD Category	Command	Resp	Payload
0x00	0x14	0x01	

2.1.20 Baudrate

Request Format

CMD Category	Command	Payload
0x00	0x15	Baudrate(3Bytes MSB->LSB)

Baudrate = 300 ~ 115200

Response Format

CMD Category	Command	Resp	Payload
0x00	0x15	0x01	

2.1.21 Data Transfer

Request Format

CMD Category	Command	Payload
0x00	0xF0	Data(N Bytes)

Response Format

CMD Category	Command	Resp	Payload
0x00	0xF0	0x01	

3. ISO14443A Command

3.1 ISO14443A Command Overview(0x01)

Command Name	Command	Description
Get UID	0x00	Perform three command in ISO14443-3 then get the UID.
RATS	0x01	Perform RATS command in ISO14443-4
APDU	0x02	Perform data exchange in ISO14443-4
Deselect	0x03	Perform Deselect command in ISO14443-4
Mifare Read Block	0x04	Read Mifare Classic One Block
Mifare Write Block	0x05	Write Mifare Classic One Block
Ultralight Read Page	0x06	Read Ultralight one page
Ultralight Write Page	0x07	Write Ultralight one page
Ultralight C Authenticate	0x08	Authenticate Ultralight C
Ultralight C Read Page	0x09	Read Ultralight C one page
Ultralight C Write Page	0x0A	Write Ultralight C one page
Topaz Get UID	0x0B	Get Tag UID
Topaz Read Data	0x0C	Read Data
Topaz Write Data	0x0D	Write Data
Ultralight EV1 Read Page	0x0F	Read Ultralight EV1 one page
Ultralight EV1 Write Page	0x10	Write Ultralight EV1 one page
Ultralight EV1 Authenticate	0x11	Authenticate Ultralight EV1
Unknow	0x12	Keep For P2P Command
Halt	0x13	Perform Halt command in ISO14443-3
Mifare Increase Block	0x17	

3.1.1 Get UID

Request Format

CMD Category	Command	Payload
0x01	0x00	

Response Format

CMD Category	Command	Resp	Payload
0x01	0x00	0x01	UID(0)+..UID(N)

3.1.2 RATS

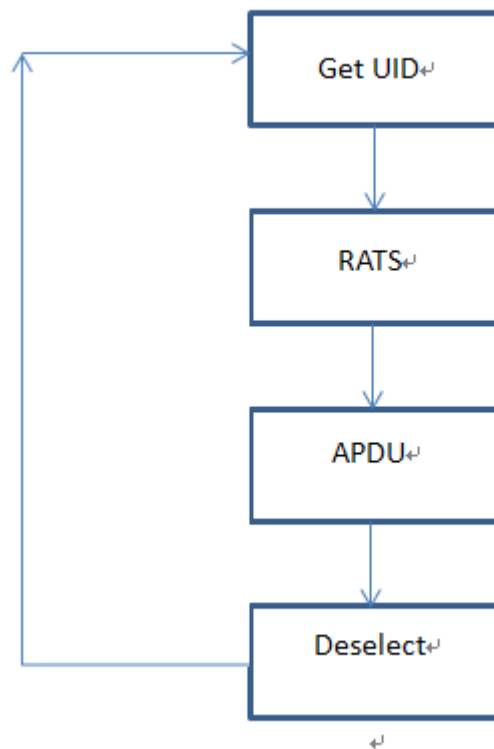
CMD Category	Command	Payload
0x01	0x01	

Response Format

CMD Category	Command	Resp	Payload
0x01	0x01	0x01	

3.1.3 APDU

Using APDU command has to comply with that following flowchart



CMD Category	Command	Payload
0x01	0x02	APDU Commmad

APDU Command: N Byte

Response Format

CMD Category	Command	Resp	Payload
0x01	0x02	0x01	APDU Response

3.1.4 Deselect

CMD Category	Command	Payload
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0x01	0x03	
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Response Format

CMD Category	Command	Resp	Payload
0x01	0x03	0x01	

3.1.5 Read Mifare Block

CMD Category	Command	Payload
0x01	0x04	Block + KeyType + Key

Block:Block Number

KeyType: KeyA - 0x00

KeyB - 0x01

Key:6Byte Value

Response Format

CMD Category	Command	Resp	Payload
0x01	0x04	0x01	BlockData(0)+...+BlockData(15)

3.1.6 Write Mifare Block

CMD Category	Command	Payload
0x01	0x05	Block + KeyType + Key + Data

Block:Block Number

KeyType: KeyA - 0x00

KeyB - 0x01

Key:6Byte Value

Data:16Byte

Response Format

CMD Category	Command	Resp	Payload
0x01	0x05	0x01	

3.1.7 Read Ultralight Page

CMD Category	Command	Payload
0x01	0x06	Page

Page:Page Number

Response Format

CMD Category	Command	Resp	Payload
0x01	0x06	0x01	Data(0)+Data(1)+Data(2)+Data(3)

3.1.8 Write Ultralight Page

CMD Category	Command	Payload
0x01	0x07	Page+Data(0)+Data(1)+Data(2)+Data(3)

Page:Page Number

Response Format

CMD Category	Command	Resp	Payload
0x01	0x07	0x01	

3.1.9 Ultralight C Authenticate

CMD Category	Command	Payload
0x01	0x08	Key(0)+Key(1)+...+Key(15)

Response Format

CMD Category	Command	Resp	Payload
0x01	0x08	0x01	

3.1.10 Read Ultralight C Page

CMD Category	Command	Payload
0x01	0x09	Page

Page:Page Number

Response Format

CMD Category	Command	Resp	Payload
0x01	0x09	0x01	Data(0)+Data(1)+Data(2)+Data(3)

3.1.11 Write Ultralight C Page

CMD Category	Command	Payload
0x01	0x0A	Page+Data(0)+Data(1)+Data(2)+Data(3)

Page:Page Number

Response Format

CMD Category	Command	Resp	Payload
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0x01	0x0A	0x01	
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3.1.12 Topaz Get UID

CMD Category	Command	Payload
0x01	0x0B	

Page:Page Number

Response Format

CMD Category	Command	Resp	Payload
0x01	0x0B	0x01	UID(0)+UID(1)+...+UID(6)

3.1.13 Topaz Read Block

CMD Category	Command	Payload
0x01	0x0C	Block

Block:Block Number

Response Format

CMD Category	Command	Resp	Payload
0x01	0x0C	0x01	Data(0)+Data(1)+...+Data(7)

3.1.14 Topaz Write Block

CMD Category	Command	Payload
0x01	0x0D	Block+Data(0)+Data(1)+...+Data(7)

Block:Block Number

Response Format

CMD Category	Command	Resp	Payload
0x01	0x0D	0x01	

3.1.15 Ultralight EV1 Authenticate

CMD Category	Command	Payload
0x01	0x11	Key(0)+Key(1)+...+Key(3)

Response Format

CMD Category	Command	Resp	Payload
0x01	0x11	0x01	

3.1.16 Read Ultralight EV1 Page

CMD Category	Command	Payload
0x01	0x0F	Page

Page:Page Number

Response Format

CMD Category	Command	Resp	Payload
0x01	0x0F	0x01	Data(0)+Data(1)+Data(2)+Data(3)

3.1.17 Write Ultralight EV1 Page

CMD Category	Command	Payload
0x01	0x10	Page+Data(0)+Data(1)+Data(2)+Data(3)

Page:Page Number

Response Format

CMD Category	Command	Resp	Payload
0x01	0x11	0x01	

3.1.18 Ultralight EV1 Authenticate

CMD Category	Command	Payload
0x01	0x11	Key(0)+Key(1)+Key(2)+Key(3)

Response Format

CMD Category	Command	Resp	Payload
0x01	0x11	0x01	

3.1.19 Halt

CMD Category	Command	Payload
0x01	0x13	

Response Format

CMD Category	Command	Resp	Payload
0x01	0x13	0x01	

3.1.20 Increase Mifare Block

CMD Category	Command	Payload

0x01	0x17	Block + KeyType + Key+Value(0)+Value(1)+Value(2)+Value(3)
------	------	--

Block:Block Number

KeyType: KeyA - 0x00

KeyB - 0x01

Key:6Byte Value

Value(0) is LSB.

Response Format

CMD Category	Command	Resp	Payload
0x01	0x17	0x01	

3.1.21 Decrease Mifare Block

CMD Category	Command	Payload
0x01	0x18	Block + KeyType + Key+Value(0)+Value(1)+Value(2)+Value(3)

Block:Block Number

KeyType: KeyA - 0x00

KeyB - 0x01

Key:6Byte Value

Value(0) is LSB.

Response Format

CMD Category	Command	Resp	Payload
0x01	0x18	0x01	

3.1.22

4. ISO14443B Command

4.1 ISO14443B Command Overview(0x02)

Command Name	Command	Description
Get UID	0x00	Perform three command in ISO14443B then get the UID.
ATTRIB	0x01	Perform ATTRIB in ISO14443B
APDU	0x02	Perform data exchange in ISO14443B
Deselect	0x03	Perform Deselect in ISO14443B
Get UID(For Cepas)	0x04	Get Cepas UID
Get UID(For SRI Series)	0x05	Get UID For SRI Series
Read Block(For SRI Series)	0x06	Read Block For SRI Series
Write Block(For SRI Series)	0x07	Write Block For SRI Series

4.1.1 Get UID

Request Format

CMD Category	Command	Payload
0x02	0x00	

Response Format

CMD Category	Command	Resp	Payload
0x02	0x00	0x01	UID(0)+..UID(N)

4.1.2 ATTRIB

Request Format

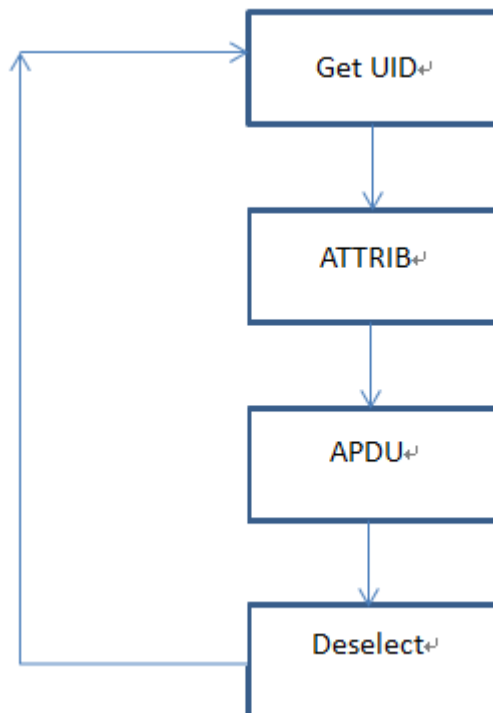
CMD Category	Command	Payload
0x02	0x01	

Response Format

CMD Category	Command	Resp	Payload
0x02	0x01	0x01	

4.1.3 APDU

Using APDU command has to comply with that following flowchart



Request Format

CMD Category	Command	Payload
0x02	0x02	APDU Commmad

Response Format

CMD Category	Command	Resp	Payload
0x02	0x02	0x01	APDU Response

4.1.4 Deselect

Request Format

CMD Category	Command	Payload
0x02	0x03	

Response Format

CMD Category	Command	Resp	Payload
0x02	0x03	0x01	

4.1.5 Get UID For Cepas

Request Format

CMD Category	Command	Payload
0x02	0x04	

Response Format

CMD Category	Command	Resp	Payload
0x02	0x04	0x01	UID(0)+...+UID(N)

4.1.6 Get UID For SRI

Request Format

CMD Category	Command	Payload
0x02	0x05	

Response Format

CMD Category	Command	Resp	Payload
0x02	0x05	0x01	UID(0)+...+UID(N)

4.1.7 Read Block For SRI

Request Format

CMD Category	Command	Payload
0x02	0x06	Address

Response Format

CMD Category	Command	Resp	Payload
0x02	0x06	0x01	Data(0)+...+Data(3)

4.1.8 Write Block For SRI
Request Format

CMD Category	Command	Payload
0x02	0x07	Address+Data(0)+...+Data(3)

Response Format

CMD Category	Command	Resp	Payload
0x02	0x07	0x01	

5. ISO15693 Command

5.1 ISO15693 Command Overview(0x03)

Command Name	Command	Description
Get UID	0x00	Preform three command in ISO5693 then get the UID.
Read Block	0x01	Read single block
Write Block	0x02	Write single block
Read Multiple Blocks	0x03	Read Multiple Blocks

5.1.1 Get UID
Request Format

CMD Category	Command	Payload
0x03	0x00	

Response Format

CMD Category	Command	Resp	Payload

0x03	0x00	0x01	UID(0)+..UID(N)
------	------	------	-----------------

5.1.2 Read Block

Request Format

CMD Category	Command	Payload
0x03	0x01	Block

Block:Block Address(1Byte)

Response Format

CMD Category	Command	Resp	Payload
0x03	0x01	0x01	Data(0)+...+Data(3)

5.1.3 Write Block

Request Format

CMD Category	Command	Payload
0x03	0x02	Block+Data(0)+...Data(3)

Response Format

CMD Category	Command	Resp	Payload
0x03	0x02	0x01	

5.1.4 Read Multiple Blocks

Request Format

CMD Category	Command	Payload
0x03	0x03	Start Block(1Byte) + Block Count(1Byte)

Response Format

CMD Category	Command	Resp	Payload
0x03	0x03	0x01	

6. PicoTag Command

6.1 PicoTag Command Overview(0x04)

Command Name	Command	Description
Get UID	0x00	Get the UID
Read Block	0x01	Read single block

Write Block	0x02	Write single block
-------------	------	--------------------

6.1.1 Get UID

Request Format

CMD Category	Command	Payload
0x04	0x00	

Response Format

CMD Category	Command	Resp	Payload
0x04	0x00	0x01	UID(0)+..UID(N)

6.1.2 Read Block

Request Format

CMD Category	Command	Payload
0x04	0x01	Block

Block:Block Address(1Byte)

Response Format

CMD Category	Command	Resp	Payload
0x04	0x01	0x01	Data(0)+...+Data(N)

6.1.3 Write Block

Request Format

CMD Category	Command	Payload
0x04	0x02	Block+Data(0)+...+Data(N)

Block:Block Address(1Byte)

Data:8 Bytes

Response Format

CMD Category	Command	Resp	Payload
0x04	0x02	0x01	

7. Desfire Command(0x05)

7.1 Desfire Error Code

Status	Code	Description
NO_CHANGES	0x0C	No changes done to backup files,CommitTransaction/AbortTransaction

		notnecessary
OUT_OF_EEPROM_ERROR	0x0E	Insufficient NV-Memory to complete command
ILLEGAL_COMMAND_CODE	0x1C	Command code not supported
INTEGRITY_ERROR	0x1E	CRC or MAC does not match data Padding bytes not valid
NO_SUCH_KEY	0x40	Invalid key number specified
LENGTH_ERROR	0x7E	Length of command string invalid
PERMISSION_DENIED	0x9D	Current configuration / status does not allow the requested command
PARAMETER_ERROR	0x9E	Value of the parameter(s) invalid
APPLICATION_NOT_FOUND	0xA0	Requested AID not present on PICC
APPL_INTEGRITY_ERROR	0xA1	Unrecoverable error within application, application will be disabled
AUTHENTICATION_ERROR	0xAE	Current authentication status does not allow the requested command
ADDITIONAL_FRAME	0xAF	Additional data frame is expected to be sent
BOUNDARY_ERROR	0xBE	Attempt to read/write data from/to beyond the file's/record's limits. Attempt to exceed the limits of a value file
PICC_INTEGRITY_ERROR	0xC1	Unrecoverable error within PICC, PICC will be disabled
COMMAND_ABORTED	0xCA	Previous Command was not fully completed Not all Frames were requested or provided by the PCD
PICC_DISABLED_ERROR	0xCD	PICC was disabled by an unrecoverable error
COUNT_ERROR	0xCE	Number of Applications limited to 28, no additional CreateApplication possible
DUPLICATE_ERROR	0xDE	Creation of file/application failed because file/application with same number already exists
EEPROM_ERROR	0xEE	Could not complete NV-write operation due to loss of power, internal

		backup/rollback mechanism activated
FILE_NOT_FOUND	0xF0	Specified file number does not exist
FILE_INTEGRITY_ERROR	0xF1	Unrecoverable error within file, file will be disabled

When response code is 0xDF then payload has the desfire error code.

7.2 Desfire Command Overview(0x05)

Command Name	Command	Description
Get Version	0x00	Get manufacture related data.
Select Application	0x01	Select one specific application for further access.
Authenticate	0x02	
Get Key Version	0x03	Read out the current key version of any key stored on the PICC.
Get Key Setting	0x04	Gets information on the PICC and application master key settings. In addition it returns the maximum number of keys which are configured for the selected application.
Get Application IDS	0x05	Returns the Application IDentifiers of all applications on a PICC.
Delete Application	0x06	Permanently deactivates applications on the PICC.
Create Application	0x07	Creates new applications on the PICC.
Free Memory	0x08	Returns the free memory available on the card
Format PICC	0x09	Releases the PICC user memory.
Change Key Settings	0x0A	Changes the master key settings on PICC and application level.
Change Key	0x0B	Change any key stored on PICC
Get File IDs	0x0C	Returns the File IDentifiers of all active files within the currently selected application
Create Standard Data File	0x0D	Creates files for the storage of plain unformatted user data within an existing application on the PICC.
Delete File	0x0E	Permanently deactivates a file within

		the file directory of the currently selected application.
Create Backup Data File	0x0F	Creates files for the storage of plain unformatted user data within an existing application on the PICC, additionally supporting the feature of an integrated backup mechanism.
Create Value File	0x10	Creates files for the storage and manipulation of 32bit signed integer values within an existing application on the PICC.
Create Linear Record File	0x11	Creates files for multiple storage of structural similar data, for example for loyalty programs, within an existing application on the PICC. Once the file is filled completely with data records, further writing to the file is not possible unless it is cleared.
Create Cyclic Record File	0x12	Creates files for multiple storage of structural similar data, for example for logging transactions, within an existing application on the PICC. Once the file is filled completely with data records, the PICC automatically overwrites the oldest record with the latest written one. This wrap is fully transparent for the PCD.
Get FileSettings	0x13	Get information on the properties of a specific file.
Change File Setting	0x14	Changes the access parameters of an existing file.
Commit Transaction	0x15	Validates all previous write access' on Backup Data Files, Value Files and Record Files within one application.
Abort Transaction	0x16	Invalidates all previous write access' on Backup Data Files, Value Files and Record Files within one application.

Get Value	0x17	Reads the currently stored value from Value Files.
Credit	0x18	Increases a value stored in a Value File.
Debit	0x19	Decreases a value stored in a Value File.
Limited Credit	0x1A	Allows a limited increase of a value stored in a Value File without having full Credit permissions to the file.
Read Records	0x1B	Reads out a set of complete records from a Cyclic or Linear Record File.
Write Records	0x1C	Writes data to a record in a Cyclic or Linear Record File.
Clear Record File	0x1D	Resets a Cyclic or Linear Record File to empty state.
Write Data	0x1E	Writes data to Standard Data Files or Backup Data Files.
Read Data	0x1F	Reads data from Standard Data Files or Backup Data Files.
Change Master Key	0x21	Change Master Key and Type

7.2.1 Get Version

Request Format

CMD Category	Command	Payload
0x05	0x00	

Response Format

CMD Category	Command	Resp	Payload
0x05	0x00	0x01	Hardware(7Byte)+Software(7Byte)+Info(14Byte)

Hardware:

- Byte 1: codes the vendor ID
- Byte 2: codes the type
- Byte 3: codes the subtype
- Byte 4: codes the major version number
- Byte 5: codes the minor version number
- Byte 6: codes the storage size
- Byte 7: codes the communication protocol type

Software:

- Byte 1: codes the vendor ID
- Byte 2: codes the type
- Byte 3: codes the subtype
- Byte 4: codes the major version number
- Byte 5: codes the minor version number
- Byte 6: codes the storage size
- Byte 7: codes the communication protocol type

Info:

- Byte 1 to 7: code the unique serial number
- Byte 8 to 12: code the production batch number
- Byte 13: codes the calendar week of production
- Byte 14: codes the year of production

7.2.2 Select Application

Request Format

CMD Category	Command	Payload
0x05	0x01	AID(0)+AID(1)+AID(2)

Response Format

CMD Category	Command	Resp	Payload
0x05	0x01	0x01	
		0xDF	Desfire Error Code

7.2.3 Authenticate

Request Format

CMD Category	Command	Payload
0x05	0x02	Type+KeyNo+Key(0)+Key(1)+...+Key(15)

Type: 0x00 – DES/3DES

0x01 – 3KDES

0x02 - AES

KeyNo:0x00~0x0D

Response Format

CMD Category	Command	Resp	Payload
0x05	0x02	0x01	
		0xDF	Desfire Error Code

7.2.4 Get Key Version

Request Format

CMD Category	Command	Payload
0x05	0x03	Key No.(1Byte)

Key Number: 0x00 ~ 0x0D

Response Format

CMD Category	Command	Resp	Payload
0x05	0x03	0x01	Key Version(1Byte)
		0xDF	Desfire Error Code

7.2.5 Get Key Setting
Request Format

CMD Category	Command	Payload
0x05	0x04	

Response Format

CMD Category	Command	Resp	Payload
0x05	0x04	0x01	KeySetting(1Byte)+MaxKeys(1Byte)
		0xDF	Desfire Error Code

KeySetting:

Bit7 - ChangeKey Access Right Bit3

Bit6 - ChangeKey Access Right Bit2

Bit5 - ChangeKey Access Right Bit1

Bit4 - ChangeKey Access Right Bit0

Bit3 - 0: configuration not changeable anymore (frozen).

1: this configuration is changeable if authenticated with the application master key

Bit2 - 0: CreateFile / DeleteFile is permitted only with application master key authentication.

1: CreateFile / DeleteFile is permitted also without application master key authentication.

Bit1 - 0: Successful application master key authentication is required for executing theGetFileIDs GetFileSettings and GetKeySettings commands.

1: GetFileIDs, GetISOFileIDs, GetFileSettings and GetKeySettings commandssucceed independently of a preceding application master key authentication (default setting).

- Bit0 – 0: Application master key is not changeable anymore (frozen).
- 1: Application master key is changeable (authentication with the current application master key necessary, default setting).

MaxKey:

- Bit7 and Bit6 - 00 (3)DES authentication of card
- 01 3KDES authentication of card
- 10 AES authentication of card
- Bit5 and Bit4 – Not Use
- Bit3 to Bit0 – It's max number of keys(1~14)

7.2.6 Get Application IDS

Request Format

CMD Category	Command	Payload
0x05	0x05	

Response Format

CMD Category	Command	Resp	Payload
0x05	0x05	0x01	AID1(3Byte)+AID2(3Byte)+...+AIDN
		0xDF	Desfire Error Code

Each AID is AID(0)+AID(1)+AID(2)

7.2.7 Delete Application

Request Format

CMD Category	Command	Payload
0x05	0x06	AID(0)+AID(1)+AID(2)

Response Format

CMD Category	Command	Resp	Payload
0x05	0x06	0x01	
		0xDF	Desfire Error Code

7.2.8 Create Application

Request Format

CMD Category	Command	Payload
0x05	0x07	AID(3Byte)+NumOfKeys(1Byte)+CryptoType(1Byte) +ChangeKeyAccessRight(1Byte)+Condition1(1Byte) +Condition2(1Byte)+Condition3(1Byte)+

	Condition4(1Byte)
--	-------------------

AID: AID(0)+AID(1)+AID(2)

Num Of Keys: 0x01~0x0E

Crypto Type: 0x00 DES/3DES

0x01 3DES/3KDES

0x02 AES

Change Key Access Right: 0x00~0x0D

Condition1: Configuration changeable

0x00:Disable 0x01:Enable

Condition2: Free create/delete without master key

0x00:Disable 0x01:Enable

Condition3: Free directory list access without master key

0x00:Disable 0x01:Enable

Condition4: Allow master key change

0x00:Disable 0x01:Enable

Response Format

CMD Category	Command	Resp	Payload
0x05	0x07	0x01	
		0xDF	Desfire Error Code

7.2.9 Free Memory

Request Format

CMD Category	Command	Payload
0x05	0x08	

Response Format

CMD Category	Command	Resp	Payload
0x05	0x08	0x01	Size(0)+Size(1)+Size(2)

Size(0) is LSB Size(2) is MSB

7.2.10 Format PICC

Request Format

CMD Category	Command	Payload
0x05	0x09	

Response Format

CMD Category	Command	Resp	Payload
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0x05	0x09	0x01	
		0xDF	Desfire Error Code

7.2.11 Change Key Settings

Request Format

CMD Category	Command	Payload
0x05	0x0A	ChangeKeyAccessRight(1Byte)+Condition1(1Byte)+Condition2(1Byte)+Condition3(1Byte)+Condition4(1Byte)

Change Key Access Right: 0x00~0x0D

Condition1: Configuration changeable

0x00:Disable 0x01:Enable

Condition2: Free create/delete without master key

0x00:Disable 0x01:Enable

Condition3: Free directory list access without master key

0x00:Disable 0x01:Enable

Condition4: Allow master key change

Response Format

CMD Category	Command	Resp	Payload
0x05	0x0A	0x01	
		0xDF	Desfire Error Code

7.2.12 Change Key

Request Format

CMD Category	Command	Payload
0x05	0x0B	KeyNo+OldKey(16Byte)+NewKey(16Byte)+KeyVersion

Response Format

CMD Category	Command	Resp	Payload
0x05	0x0B	0x01	
		0xDF	Desfire Error Code

7.2.13 Get File IDs

Request Format

CMD Category	Command	Payload
0x05	0x0C	

Response Format

CMD Category	Command	Resp	Payload
0x05	0x0C	0x01	ID(0)+ID(1)+...ID(n)
		0xDF	Desfire Error Code

7.2.14 Create Standard Data File
Request Format

CMD Category	Command	Payload
0x05	0x0D	FileNo+ReadAccess+WriteAccess+ Read/WriteAccess+ChangeAccess+ FileSize(0)+FileSize(1)+FileSize(2)

Response Format

CMD Category	Command	Resp	Payload
0x05	0x0D	0x01	
		0xDF	Desfire Error Code

7.2.15 Delete File
Request Format

CMD Category	Command	Payload
0x05	0x0E	FileNo(1Byte)

Response Format

CMD Category	Command	Resp	Payload
0x05	0x0E	0x01	
		0xDF	Desfire Error Code

7.2.16 Create Backup Data File
Request Format

CMD Category	Command	Payload
0x05	0x0F	FileNo+ReadAccess+WriteAccess+ Read/WriteAccess+ChangeAccess+ FileSize(0)+FileSize(1)+FileSize(2)

Response Format

CMD Category	Command	Resp	Payload
0x05	0x0F	0x01	

		0xDF	Desfire Error Code
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7.2.17 Create Value File

Request Format

CMD Category	Command	Payload
0x05	0x10	FileNo+ReadAccess+WriteAccess+ Read/WriteAccess+ChangeAccess+ LowerLimit+UpperLimit+Value+LimitCredit

LowerLimit(4Bytes): LSB to MSB

UpperLimit(4Bytes): LSB to MSB

Value(4Bytes): LSB to MSB

Limit Credit: 0x00 is disable,0x01 is enable

Response Format

CMD Category	Command	Resp	Payload
0x05	0x10	0x01	
		0xDF	Desfire Error Code

7.2.18 Create Linear Record File

Request Format

CMD Category	Command	Payload
0x05	0x11	FileNo+ReadAccess+WriteAccess+ Read/WriteAccess+ChangeAccess+ RecordSize+MaxRecords

RecordSize(3Bytes): LSB to MSB

MaxRecords(3Byte): LSB to MSB

Response Format

CMD Category	Command	Resp	Payload
0x05	0x11	0x01	
		0xDF	Desfire Error Code

7.2.19 Create Cyclic Record File

Request Format

CMD Category	Command	Payload
0x05	0x12	FileNo+ReadAccess+WriteAccess+ Read/WriteAccess+ChangeAccess+

		RecordSize+MaxRecords
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RecordSize(3Bytes): LSB to MSB

MaxRecords(3Bytes): LSB to MSB

Response Format

CMD Category	Command	Resp	Payload
0x05	0x12	0x01	
		0xDF	Desfire Error Code

7.2.20 Get File Settings

Request Format

CMD Category	Command	Payload
0x05	0x13	FileNo(1Byte)

Response Format

CMD Category	Command	Resp	Payload
0x05	0x13	0x01	FileType+AccessRight+FileSize
			FileType+AccessRight+ LowerLimit+UpperLimit+ LimitedCredit+LimitedCreditEnable
			FileType+AccessRight+ RecordSize+MaxRecords+CurrentRecord
		0xDF	Desfire Error Code

File Type:

0x00:Standard Data File

0x01:Backup Data File

0x02:Value File

0x03:Linear Record File

0x04:Cyclic Record File

AccessRight:

Read/Write Access(4bits)+Change Access(4bits)+Read Access(4Bits)+Write
Access(4bits)

File Size:LSB~MSB

Lower Limit:LSB~MSB

Upper Limit:LSB~MSB

Limited Credit:LSB~MSB

Limited Credit Enable: 0x00-Disable 0x01-Enable

Record Size: LSB~MSB

Max Records:LSB~MSB

Current Records:LSB~MSB

7.2.21 Change File Setting

Request Format

CMD Category	Command	Payload
0x05	0x14	ReadAccess+WriteAccess+ Read/WriteAccess+ChangeAccess

Response Format

CMD Category	Command	Resp	Payload
0x05	0x14	0x01	
		0xDF	Desfire Error Code

7.2.22 Commit Transaction

Request Format

CMD Category	Command	Payload
0x05	0x15	

Response Format

CMD Category	Command	Resp	Payload
0x05	0x15	0x01	
		0xDF	Desfire Error Code

7.2.23 Abort Transaction

Request Format

CMD Category	Command	Payload
0x05	0x16	

Response Format

CMD Category	Command	Resp	Payload
0x05	0x16	0x01	
		0xDF	Desfire Error Code

7.2.24 Get Value

Request Format

CMD Category	Command	Payload
0x05	0x17	FileNo(1Byte)

Response Format

CMD Category	Command	Resp	Payload
0x05	0x17	0x01	Value(0)+Value(1)+Value(2)+Value(3)
		0xDF	Desfire Error Code

7.2.25 Credit
Request Format

CMD Category	Command	Payload
0x05	0x18	FileNo(1Byte)+ Value(0)+Value(1)+Value(2)+Value(3)

Response Format

CMD Category	Command	Resp	Payload
0x05	0x18	0x01	
		0xDF	Desfire Error Code

7.2.26 Dedit
Request Format

CMD Category	Command	Payload
0x05	0x19	FileNo(1Byte)+ Value(0)+Value(1)+Value(2)+Value(3)

Response Format

CMD Category	Command	Resp	Payload
0x05	0x19	0x01	
		0xDF	Desfire Error Code

7.2.27 Limited Credit
Request Format

CMD Category	Command	Payload
0x05	0x1A	FileNo(1Byte)+ Value(0)+Value(1)+Value(2)+Value(3)

Response Format

CMD Category	Command	Resp	Payload
0x05	0x1A	0x01	
		0xDF	Desfire Error Code

7.2.28 Read Records

Request Format

CMD Category	Command	Payload
0x05	0x1B	FileNo(1Byte)+ Offset(0)+Offset(1)+Offset(2) Records(0)+Records(1)+Records(2)

Response Format

CMD Category	Command	Resp	Payload
0x05	0x1B	0x01	Datas
		0xDF	Desfire Error Code

7.2.29 Write Records

Request Format

CMD Category	Command	Payload
0x05	0x1C	FileNo(1Byte)+ Offset(0)+Offset(1)+Offset(2) RecordSize(0)+ RecordSize (1)+ RecordSize (2)+ Data(nBytes)

Response Format

CMD Category	Command	Resp	Payload
0x05	0x1C	0x01	
		0xDF	Desfire Error Code

7.2.30 Clear Record File

Request Format

CMD Category	Command	Payload
0x05	0x1D	FileNo(1Byte)

Response Format

CMD Category	Command	Resp	Payload
0x05	0x1D	0x01	

		0xDF	Desfire Error Code
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7.2.31 Write Data

Request Format

CMD Category	Command	Payload
0x05	0x1E	FileNo(1Byte)+ Offset(0)+Offset(1)+Offset(2) DataSize(0)+ DataSize (1)+ DataSize (2)+ Data(nBytes)

Response Format

CMD Category	Command	Resp	Payload
0x05	0x1E	0x01	
		0xDF	Desfire Error Code

7.2.32 Read Data

Request Format

CMD Category	Command	Payload
0x05	0x1F	FileNo(1Byte)+ Offset(0)+Offset(1)+Offset(2) RecordSize(0)+ RecordSize (1)+ RecordSize (2)

Response Format

CMD Category	Command	Resp	Payload
0x05	0x1F	0x01	Datas(nByte)
		0xDF	Desfire Error Code

7.2.33 Change Master Key

Request Format

CMD Category	Command	Payload
0x05	0x21	Type+Key(0)+Key(1)+...+Key(15)

Type: 0x00 – DES/3DES

0x01 – 3KDES

0x02 - AES

Response Format

CMD Category	Command	Resp	Payload
0x05	0x21	0x01	

		0xDF	Desfire Error Code
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8. ISO7816 Command

8.1 ISO7816 Command Overview(0x06)

Command Name	Command	Description
Get ATS	0x00	Get ATS
APDU	0x01	Send APDU command to chip card

8.1.1 Get ATS

Request Format

CMD Category	Command	Payload
0x06	0x00	

Response Format

CMD Category	Command	Resp	Payload
0x06	0x00	0x01	ATS(NBytes)

8.1.2 APDU

Request Format

CMD Category	Command	Payload
0x06	0x01	APDU(Command)

Response Format

CMD Category	Command	Resp	Payload
0x06	0x01	0x01	APDU(Response)

9. Felica Command

9.1 Felica Command Overview(0x07)

Command Name	Command	Description
Get UID	0x00	Get UID

9.1.1 Get UID

Request Format

CMD Category	Command	Payload
0x07	0x00	SystemCode+Reserved

System Code: 0000h to FFFFh

Reserved: 00h to FFh

Response Format

CMD Category	Command	Resp	Payload
0x07	0x00	0x01	UID(0)+UID(1)+...+UID(15)

10. Peer To Peer Command

10.1 Peer To Peer Command Overview(0x08)

Command Name	Command	Description
Set Mode	0x00	Set the communication mode
Send Data	0x01	Send data from initiator

10.1.1 Set Mode

Request Format

CMD Category	Command	Payload
0x08	0x00	Mode

Mode:

0x00 – Initiator

0x01 - Target

Response Format

CMD Category	Command	Resp	Payload
0x08	0x00	0x01	

10.1.2 Send Data

Request Format

CMD Category	Command	Payload
0x08	0x01	Data(N Bytes)

Data: Any bytes send to target device

Response Format

CMD Category	Command	Resp	Payload
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0x08	0x01	0x01	Data(N Bytes)
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Data:Any bytes from target device

11.