

Multi-Protocol SDK Software User Manual

Rev2.1

Revision History

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1.0	2013.04.20	C.K	1 st Release
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1. Introduction

This manual describes how to use multi-protocol SDK software for evaluating and exploring various features of readers through providing protocol. The reader contains basic command as stated in the ISO protocol and combo commands. Demonstration software is designed to guide user/developer to quickly understand the reader protocol and be capable to implement your own RFID software applications.

Table 1-1 Card of reader supports

Standard	Card Type
ISO14443A	Mifare Classic Mifare Ultralight Mifare Ultralight C Mifare Desfire Mifare Desfire EV1 ISO14443A memory card ISO14443A smart card(T=CL) PayWave(VISA,Master)
ISO14443B	SRI Series(ST) Cepas PayWave(VISA,Master) ISO14443B memory card ISO14443B smart card(T=CL)
ISO15693	I-Code Family(NXP) Card-it(TI) LRI Series(ST) ISO15693 Label SIC5600(SIC)
ISO7816	ISO7816 smart card National Health IC Card(Taiwan)
Felica	RC-S886 RC-S888 RC-S701 RC-S860
PicoTag	HID iClass
Innovision	Topaz

2. Getting Started

Before user can operate the demonstration software, proper operational environment and the following requirements must be prepared.

2.1 System and Hardware Requirements

Computer	: PC with USB port or Serial port
Hardware	: Pentium 1GHz(above), RAM 512MB(above)
Operation System	: Windows Vista/7/8, Windows XP SP3
System Framework	: 32bits, 64bits
RFID Reader	: MP100, HF320
Software Requirement	: .NET framework higher than 4.0 installed
Others	: Card/Tag, DC Adaptor (some model need)

2.2 Content in CD

Content in CD, shown in Figure 1, consists of
Demonstration software in folder "Demo Software"
Documents namely module datasheet and software manuals in folder
"Documents"
.Net Framework in folder "Framework 4.0"
Driver for emulating RS232 on USB in folder "Driver"

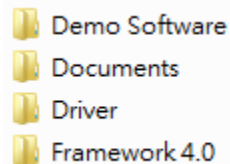


Figure 1 Content in CD

2.3 Install Driver

PL2303

When install PL2303 driver, reference the document in
"Driver\PL2303\PL2303_Prolific_DriverInstaller_v1_8_0\PL2303 Windows
Driver User Manual v1.8.0.pdf"

FTDI

When install FTDI driver, reference the document in "Driver\FTDI\" then
select each document for your system.

Windows XP: FTDI_Drivers_Installation_Guide_for_WindowsXP.pdf

Windows Vista: FTDI_Drivers_Installation_Guide_for_VISTA.pdf

Windows 7: FTDI_Drivers_Installation_Guide_for_Windows7.pdf

Windows 8: FTDI_Drivers_Installation_Guide_for_Windows8.pdf

3. Quick Start with Demonstration Software

The demonstration software is “MP Studio.exe” provided in the folder “Demo Software”. There is no software setup required; just double click the “MP Studio.exe”. The demonstration software can run either from CD or a copy on hard drive. The GUI of software is shown in Figure 2 and ready to use.

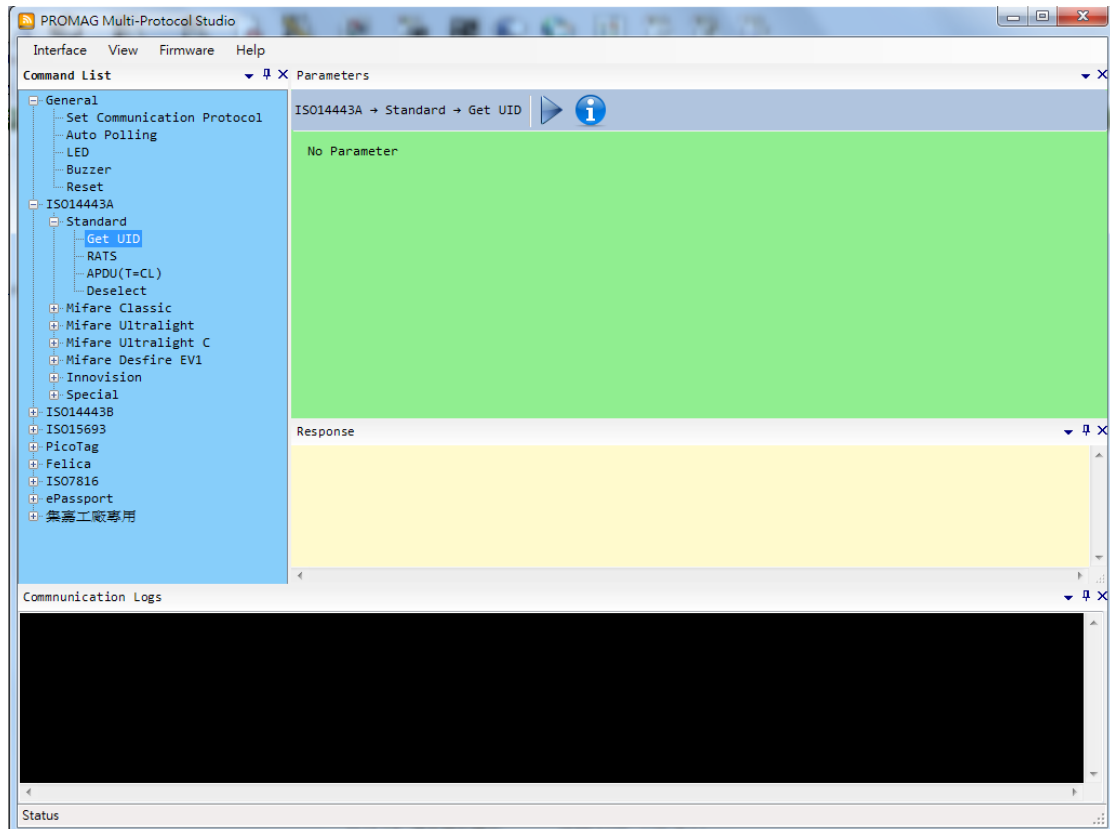


Figure 2 Demonstration software

Following steps, as shown in Figure 3 and Figure 4, demonstration a simple usage in reading UID of ISO14443A card for quick understanding.

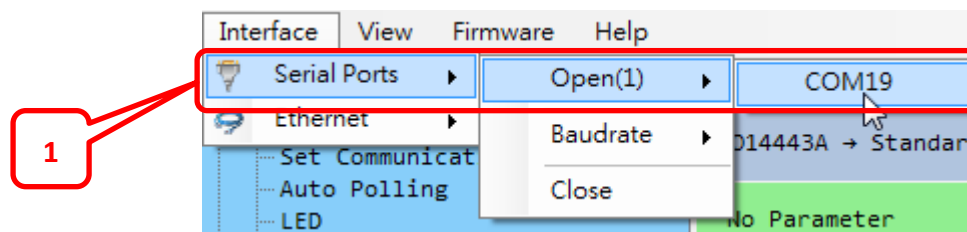


Figure 3 Select Comport



Figure 4 Demonstration Software

Step1. Connect a reader to computer and wait until computer recognize comport as shown in Figure 3. Then click “Port->Open” menu tap to query available comport in computer.

Step2. Select “Setup Communication Protocol” then use “ISO14443A” item then click “Send Command” to configure reader to be ready to transmit and receive ISO14443A frame format.

Step3. Select command “Get UID” by clicking on the name of that command order to read the card UID. The selected command will be highlighted.

Step4. Input necessary parameters. But in this case don’t need it.

Step5. Click “Send Command” to execute the command.

Step6. After transmit command the get the response from reader.

Step7. Transaction between reader and PC is display in communication logs.

4. General Command

4.1 Auto-Polling

Enable/Disable reader for auto-polling. The default is disabling this function.

When you test any command suggest disable this function avoid be effect.

4.2 Reset

Restart the reader.

4.3 Get Firmware Version

Get the current firmware version.

4.4 LED

Turn on/off the LED.

4.5 Buzzer

Trigger the buzzer.

5. ISO14443A Command

5.1 Standard

5.1.1 Get UID

Perform three commands in ISO14443A-3 then get the UID.

5.1.2 RATS

Perform RATS command in ISO14443A-4

5.1.3 APDU

This command is following ISO14443A the PCD activation sequence for a PICC that exchange transparent data.

5.1.4 Deselect

Perform Deselect command in ISO14443A

5.2 Mifare Classic

Mifare Classic card is created by NXP that has structure for sectors and blocks.

In the read/write command just use block number.

Example:

Sector0 Block0 that blocks number is 0.

Sector1 Block0 that blocks number is 4.

Sector2 Block1 that blocks number is 9.

The detail sectors and blocks that how to allocate in each memory size or other thing, need read the datasheet from NXP.

5.2.1 Read Block

Block num: It's the block number that would be read

Select Key: Key A or Key B

Key: It's 6 bytes binary value, usually the default key is FFFFFFFFFF.

5.2.2 Write Block

Block num: It's the block number that would be written

Select Key: Key A or Key B

Key: It's 6 bytes binary value, usually the default key is FFFFFFFFFF.

Data: It's 16 bytes binary value.

5.3 Mifare Ultralight

Mifare Ultralight card is created by NXP that detail for memory mapping need read the datasheet from NXP.

5.3.1 Read Page

Page num: It's page number that would be read.

5.3.2 Write Page

Page num: It's page number that would be written.

Data: Each page could be write 4 bytes binary value.

5.4 Mifare Ultralight C

Mifare Ultralight C card is created by NXP that detail for memory mapping need read the datasheet from NXP. For this card need execute "Get UID" first then could execute Mifare Ultralight C commands.

5.4.1 Read Page

Page num: It's page number that would be read.

5.4.2 Write Page

Page num: It's page number that would be written.

Data: Each page could be write 4 bytes binary value.

5.4.3 Authenticate

Key: 16 bytes binary value.

5.5 Mifare Desfire EV1

Mifare Desfire Ev1 card is created by NXP that detail for command sequence and each command parameters need read the datasheet from NXP. For this card need execute "Get UID" and "RATS" first then could execute Mifare Desfire EV1 commands.

5.5.1 Authenticate

Crypto Type: That has 3 types for crypto.

Key No: Key number.

Key Value: 16 bytes binary value.

5.5.2 Change Key Setting

Change the master key setting on card and application level.

5.5.3 Change Key

Change any key stored on the card.

5.5.4 Get Key Version

Read out the current key version of any key stored on the card.

5.5.5 Create Application

Create the new application on the card.

5.5.6 Delete Application

Permanently deactivates application on the card.

5.5.7 Get Application IDs

Return the application identifiers of all applications on a card.

5.5.8 Free Memory

Return the free memory available on the card.

5.5.9 Get Key Settings

Get information on the card and application master key settings. In addition it returns the maximum number of keys which are configured for the selected application.

5.5.10 Select Application

Select one specific application for further access.

5.5.11 Format PICC

Release the card user memory.

5.5.12 Get Version

Return manufacturing related data of the card.

5.5.13 Get File IDs

Return the file identifiers of all active files within the currently selected application.

5.5.14 Get File Settings

Get information on the properties of specific file.

5.5.15 Change File Settings

Change the access parameters of an existing file.

5.5.16 Create Std(Standard) Data File

Create files for the storage of plain unformatted user data within an existing application on the card.

5.5.17 Create Backup Data File

Create files for the storage of plain unformatted user data within an existing application on the card, additionally supporting the feature of an integrated back up mechanism.

5.5.18 Create Value File

Create files for the storage and manipulation of 32bits signed integer values within an existing application on the card.

5.5.19 Create Linear Record File

Creates files for multiple storage of structural similar data, for example

for loyalty programs, within an existing application on the card. Once the file is filled completely with data records, further writing to the file is not possible unless it is cleared.

5.5.20 Create Cyclic Record File

Creates files for multiple storage of structural similar data, for example for logging transactions, within an existing application on the card. Once the file is filled completely with data records, the card automatically overwrites the oldest record with the latest written one. This wrap is fully transparent for the reader.

5.5.21 Delete File

Permanently deactivates a file within file directory of the currently selected application.

5.5.22 Read Data

Read data from standard data files or backup data files.

5.5.23 Write Data

Write data to standard data files or backup data files
Data: It's binary value.

5.5.24 Get Value

Read the currently stored value from value files.

5.5.25 Credit

Increase a value stored in a value file.

5.5.26 Debit

Decreases a value stored in a value file.

5.5.27 Limited Credit

Allows a limited increase of a value stored in a value file without having full Credit permissions to the file.

5.5.28 Write Record

Write data to a record in a Cyclic or Linear record file.
Data: It's binary value.

5.5.29 Read Records

Read out a set of complete records from a Cyclic or Linear record file.

5.5.30 Clear Record File

Reset a Cyclic or Linear record file to empty state.

5.5.31 Commit Transaction

Validate all previous write access on backup files, value files and record files within one application.

5.5.32 Abort Transaction

Invalidate all previous write access on backup files, value files and

record files within one application.

5.6 Innovision Topaz

Topaz card is created by Innovision that detail for memory mapping need read the datasheet from Innovision.

5.6.1 Get UID

Get the card UID.

5.6.2 Read Data

Read a block data from the card.

5.6.3 Write Data

Write a block data to the card.

Data: 8 Bytes binary value.

5.7 Pay Wave

The function is only support VISA and Master then following ISO14443A card.

5.7.1 Get UID

Get the card UID.

6. ISO14443B Command

6.1 Standard

6.1.1 Get UID

Perform commands in ISO14443B-3 then get the UID.

6.1.2 ATTRIB

Perform commands in ISO14443B.

6.1.3 APDU

This command is following ISO14443B the PCD activation sequence for a PICC that exchange transparent data.

6.1.4 Deselect

Perform Deselect command in ISO14443A

6.2 Cepas

6.2.1 Get UID

Get the card UID.

6.3 SRI Series

SRI card is created by ST that detail for memory mapping need read the datasheet from ST.

6.3.1 Get UID

Get the card UID.

6.3.2 Read Data

Read data from the card.

6.3.3 Write Data

Write data to the card.

Data: It's 4 bytes binary value.

6.4 Pay Wave

6.4.1 Get UID

Get the card UID.

7. ISO15693 Command

7.1 Standard

7.1.1 Get UID

Perform commands in ISO15693.

7.1.2 Read Block

Perform commands in ISO15693 then get the data.

7.1.3 Write Block

Perform commands in ISO15693 then write the data to card.

Data: It's 4 bytes binary value.

8. PicoTag Command

PicoTag has two types of protocol communication. First need to know what kind of communication protocol that on your card. The detail need read the datasheet from HID.

8.1 Standard

8.1.1 Get UID

Get the card UID.

8.1.2 Read Block

Read a block data from the card.

Attention: the card data could be locked. If the data be locked then data value is 0xFFFFFFFF.

9. Felica Command

9.1 Standard

9.1.1 Get UID

Get the card UID.

10. ISO7816 Command

10.1 Standard

10.1.1 Get ATR

Perform commands in ISO7816 then get ATR.

10.1.2 APDU

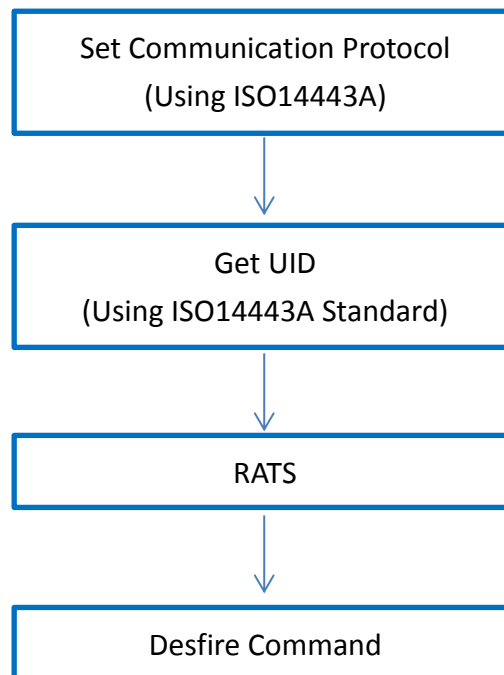
Perform commands in ISO7816.

Appendix A

(Informative)

Desfire Introduction

Desfire is a card of according to ISO/IEC 14443 Type A. The command sequence is following the flow chart.

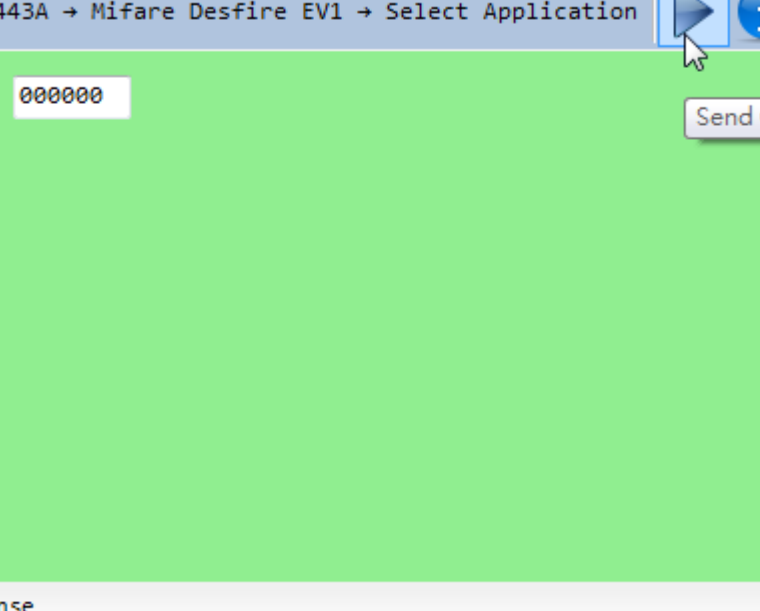


Example

Describe how to create an application and file on card then read/write the file data.

Step1. Referencing previous command sequence into the Desfire command layer, you may use Desfire commands.

Step2. Select application of AID 000000. AID 000000 is a special application in Desfire that could create/delete applications.



Parameters

ISO14443A -> Mifare Desfire EV1 -> Select Application

AID 000000

Send Command

Response

Response Time: 11:28:57.054

Response OK

Step3. Authentication for AID 000000

Parameters

ISO14443A → Mifare Desfire EV1 → Authenticate

Crypto Type

DES/3DES

KeyNo

0

Key



00000000000000000000000000000000

Response

Response Time:11:33:44.457
Response OK

Step4. Create an application (AID 000001)

Parameters

ISO14443A → Mifare Desfire EV1 → Create Application  

AID

Num Of Keys

Change Key Access Right

Crypto Type

☒ Configuration changeable

☒ Free Create/Delete without master key

☒ Free directory list access without master key

☒ Allow master key change



Response

Response Time:11:37:10.872


Response OK

Step5. Select application of AID 000001

Parameters

ISO14443A → Mifare Desfire EV1 → Select Application  

AID

 Send Com



Response

Response Time:11:43:57.671

Response OK

Step6. Authentication for AID 000001

Parameters

ISO14443A → Mifare Desfire EV1 → Authenticate  

Crypto Type

KeyNo



Key

Response

Response Time:11:44:55.731
Response OK

Step7. Create a standard data file

Parameters

ISO14443A → Mifare Desfire EV1 → Create Standard Data File  

Read Access

Write Access

Read/Write Access

Change Access

File No.



File Size(Byte)

Response

Response Time:11:46:08.172
Response OK

Step8. Write data to the file

Parameters

ISO14443A → Mifare Desfire EV1 → Write Data  

File No.

Offset

Data(Maximun 1000Byte)



0102030405

Response

Response Time:11:47:16.015
Response OK

Step9. Read data from the file

Parameters

ISO14443A → Mifare Desfire EV1 → Read Data  

File No.

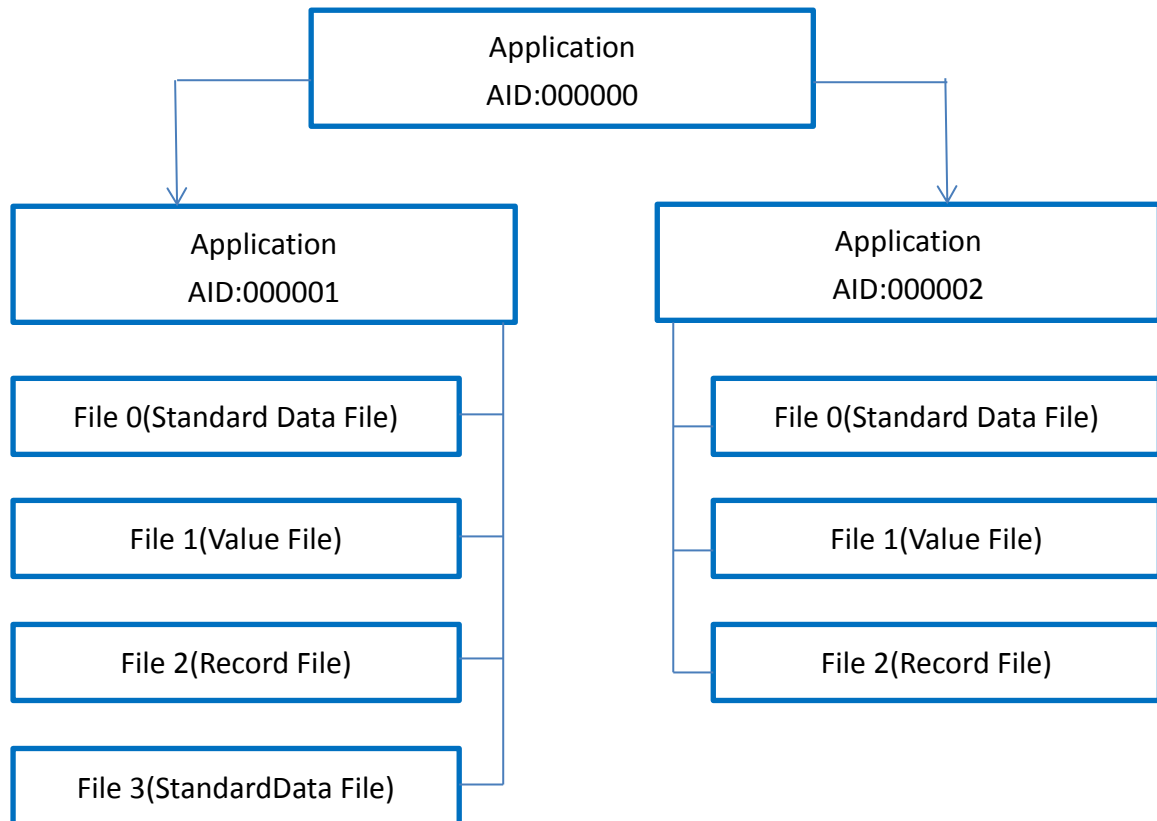
Offset

Data Size

Response

Response Time:11:47:56.464
Response OK
Data:0102030405

Desfire is not a general memory mapping card. It has structure in the card. Special application (AID 000000) is use for create/delete applications. It's a top application also could free the memory and formats the card. Each application has some files. The files have different type. Following the structure figure

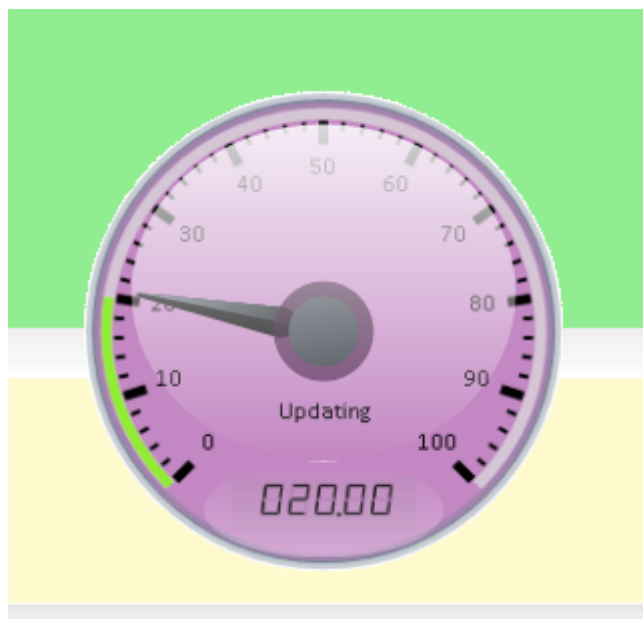
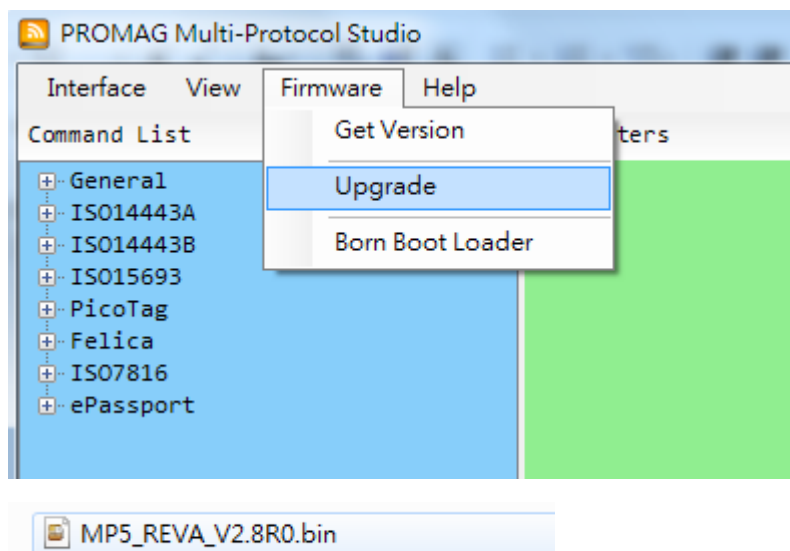


Appendix B

(Informative)

How to update firmware

Click “upgrade” then assign the firmware file.



Wait some minutes when updated the reader will restart.