FEITIAN
WE BUILD SECURITY

Made by: Feitian Technologies

Mar, 2016

Revision Sheet

Date	Revision	Description
Dec. 2014	V1.0	First release
Feb. 2016	V1.1	Second release
April 1, 2016	V1.2	Add B6 casing
May 31, 2016	V1.3	Modify card frequency
Sep 2, 2016	V1.4	Update contents
Dec 22, 2016	V1.5	Add UID and Update tool function into user manual

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USER'S MANUAL
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1.0 GENERAL INFORMATION

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1.1 Product Introduction

R301 reader is a kind of high-speed contact smart card reader, which is used for PC environment or relevant smart card environment. It is compliant with standard CCID specification and USB 2.0 interface (also the USB 1.1 interface). The R301 reader can operate all CLASS A, CLASS B and CLASS C smart cards which are compliant with ISO 7816-1/2/3. The standard size IC card which is compliant with ISO 7816-3 can be supported stably as well. As the mandatory processing device of smart card integrated systems, R301 reader can greatly increase the security of the whole application. It can be widely used in financial, social security, telecom, online banking, e-business, authentication, e-government and other CPU based high level security card application fields.

1.2 Acronyms and Abbreviations

USB – Universal Serial Bus
CCID – (Chip Card Interface Device) Integrated Circuit(s) Card Interface Devices Specification
PCSC – (Short for "Personal Computer/Smart Card") is a specification for smart-card integration into computing environments.

1.3 Keywords and Features

Keywords: Smart Card Reader, CCID, USB, ISO 7816, T0, T1, Full speed USB device, R301

Features:

1. Support USB 2.0 interface
2. Compiled standard CCID specification
3. Read/Write all CLASS A, CLASS B and CLASS C smart cards which are compliant with ISO 7816-1/2/3 standard, T=0 and T=1 protocol
4. For contact card, support full parameter PPS protocol. The ICC data transfer Baud rate is 625K (The result is got when the frequency of IC card is 5MHz-12MHz)
5. Short circuit protection
6. Be compliance with ISO7816, IEC/EN60950, EMV 2000 Level
7. Power supply: 1.8V/3V/5V (independent control)，LDO provides stable 1.8V/3V power
8. Data transfer speed: For T=0 and T=1, Baud rate is 13.440k ~ 625K (The result is got when the frequency of IC card is 5MHz-12MHz) (D=32/F=372)

1.4 Applications

R301 reader is a kind of high-speed contact smart card reader, which is used for PC environment or relevant smart card environment. It is compliant with standard CCID specification and USB 2.0 interface. The R301 reader can operate all Class A, Class B and Class C smart cards which are compliant with ISO 7816-1/2/3. The standard size IC card which is compliant with ISO 7816-3 can be supported stably as well. As the mandatory processing device of smart card integrated systems, R301 reader can greatly increase the security of the whole application. It can be widely used in financial, social security, telecom, online banking, e-business, authentication, e-government and other CPU based high level security card application fields.

1.5 Security feature

1）firmware cannot be read out. Anti-reverse analysis
2）Short circuit protection and overcurrent protection
3）Do not contain any users' sensitive data in product, such as password.
4）PCB board has a 5mm distance with reader shell.

1.6 Extension and maintenance

1）Product can be extended and disassembled.
2）Firmware can be extended, customized and updated.

1.7 Reliability

1）300,000 times plug/unplug. The period of hardware usable is at least 5 years.
2）Frequently read/write 200 times will not lead the system down or error.
3）Continuously using 48 hours will not lead error occurrence rate exceed 3‰

2.0 SPECIFICATION

2.0 SPECIFICATION

Overview:

General Parameters:

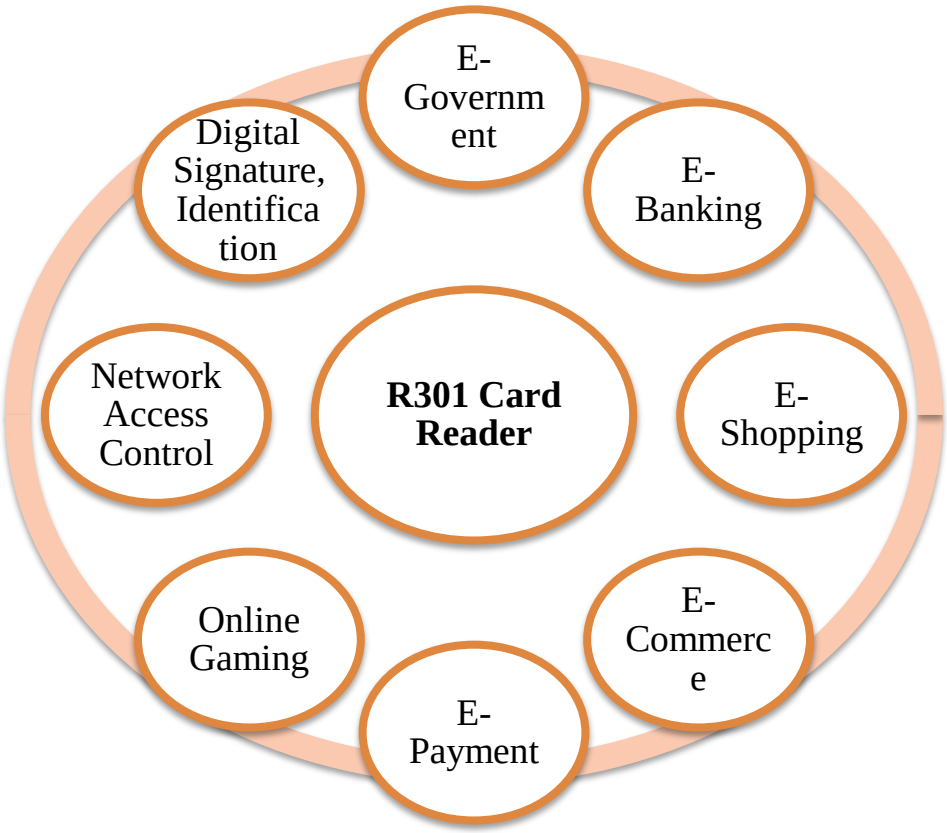
- Work frequency(Hz): 4-12M
- Contact card support:
  - ✓ Support ISO 7816 standard, T0, T1, CLASSB, CLASSC, CLASSBC
- Communication interface:
  - ✓ Communication for PC: USB 1.1/2.0/3.0 full speed(12Mbps)
- Power supply mode:
  - ✓ USB DC 5V
- Open UID (User ID control) Function
- Support 255 bytes' flash memory for customer
- Support firmware upgrade in encryption
- The unique device ID
- Based on CCID standard, PC/SC compatible reader
- Driverless – Plug in and Play
- Support Android device, need OTG cable

2.1 Technical Parameter Table

Technical Specification					
Basic Parameter	**Product Name**	R301			
	Casing Number	C25	C11	C41	B6
	Host Interface	USB 2.0 CCID(also compliant with USB 1.1)			
	Transmission Speed	12Mbps(USB 2.0 Full Speed)			
	Smart Card Clock Frequency	4MHz-12MHz			
	Power to Smart Card	60mA			
	Contact	Supported Card Types: 1.8V, 3V and 5V			
		Smart Card Interface Speed: 10753~625kbps(when supported by card)			
		ISO/IEC7816, T=0 and T=1 protocol, Class A, B, C cards			
	Card Size	ISO 7816-3 ID-1 (full-size)			GSM 11.11
	Custom Items	OEM logo, packaging, color and firmware			
	Support OS	Win2000+/Linux/Mac OS X/UNIX/Android(OTG)			
	Certificate	CE/FCC/RoHS/EMV Level 1/LTIC/BSMI			
Physical Parameter	**Material**	ABS+PC	ABS+PC	Metal+ABS+PC	Metal+ABS+PC
	Weight	46.7g	50g	281.96g	11g
	Status Indicator	Blue and Red			
	Connector Cable	1.5m			N/A
	Contact principle	Friction technology	Landing contact technology	Landing contact technology	Friction technology
	Durability	100,000 insertions	300,000 insertions	300,000 insertions	5000 insertions
	Color	White	Black	Black, Greg	Black
	Dimension	74 *56 *11(mm)	67 *57.5 *12.5(mm)	120*80*76(mm)	56*21*7.5(mm)
Work Environment	**Power supply**	USB port 5V DC			
	Working current	< 50mA without card plugged			
	Working Temperature	0°C ~ 60 °C			

	Storage Temperature	~20°C ~ 85°C
	Humidity	≤90%(non-condensed)
Standard	**Card Reader Standard**	ISO-7816 Class A, B, C (5V, 3V,1.8V) Standard
		EMV Level 1 Standard
		PC/SC Standard
		USB 2.0 Standard
		CCID Standard
	API Standard	PC/SC Lite/WINSCARD API
Features	Plug and Play	
	Readily Compliant	
	Suits Any Application	
	Open UID(user ID) function	
	300,000 times plug/unplug of card slot	
	Meantime Between Failure (MTBF) - 500,000 hours	
Security	**Physical Security**	Short circuit and thermal protection/over-voltage protection
		High security level chipset
		electrostatic prevention
	Firmware Security	Firmware encryption mechanism
		Firmware upgradability in encryption
		Firmware cannot be read out. Anti-reverse analysis
Warranty	**Meantime Between Failure(MTBF)**	500,000 hours
	Warranty	Two year manufacturer’s warranty.

2.2 Key Application



2.2 Product photo

R301 reader is a kind of high-speed contact smart card reader, which is used for PC environment or relevant smart card environment. Product shell is using C25 by default. Also customer can choose other casing, like C11 and C41, for SIM SIZE card, we have B5 and B6 casing.

C11, with full size card slot and SIM card slot:

C25 with full size card slot only:

B6 with SIM Card slot only:

C41 with full size card slot only:

3.0 HARDWARE CONFIGURATION

3.0 HARDWARE CONFIGURATION

3.1 Operating Environment

R301 supports contact smart cards and it can be used in various operating environments, including hardware and software operating environments, thus expanding the scope of use of reader R301 Card Reader.

3.2 Hardware Operating Environment

R301 Card Reader providing user with USB, it helps to make connection between PC, Android device or other equipment more convenient. The card can be operated by local PC or Android device via R301 Card Reader.

3.3 Software Environment

R301 Card Reader has rich software environment. It supports Android (Has not be tasted on all Android versions or smartphones), Windows 2003Server, Windows XP (SP2, SP3), Windows 2008Server, Windows Vista, Windows 7, Windows CE, Linux, Mac OS X 10.6 (X64)/Mac OS X 10.6 (X32)/Mac OS X 10.5 (X32) (These systems need to install the driver first), etc.

3.4 Hardware Configuration

In order to help user to understand interaction between reader, device and card, the R301 Card Reader hardware has various status of prompt information. Three LED status indicator lights is provided for the user: red, blue, each of them representing work and charging indicator light, card detection indicator light and data communication indicator. For details, please refer to the following table

Name of indicator light	Color	Prompt state	
Work indicator	Red	Flashing	USB Enumeration process
		Turn on	USB is established
		Irregular flashing	USB exchange data
Data communication indicator	Blue	Turn off	No card
		Turn on	Card insert
		Flashing	Exchange data between Card and reader

Note: When the program is upgraded, the indicator light (except for the charge) is flashing.

4.0 R301 CARD READER RELATED TOOL

4.0 R301 CARD READER FIRMWARE UPDATE TOOL

4.1 Introduction of Update tool

Firmware update tool using to upgrade R301 Card Reader firmware, it is for maintain in future. R301 Card Reader apply dual encrypted mechanism. The firmware will have encrypted by UID (User ID), only the right UID firmware can be update by right reader. We will explain UID function later. To using update tool, please check R301 Card Reader SDK.

*The related files of update application

Name	Date modified	Type	Size
HIDDLL.dll	2016-03-22 10:56	Application extens...	64 KB
ISPDLL.dll	2016-03-22 10:56	Application extens...	1,635 KB
R301E2_Update_20160425.meta	2016-04-25 10:10	META File	226 KB
Readme.txt	2016-12-21 18:09	Text Document	1 KB
Update_Tool_V1.0.exe	2016-03-22 10:56	Application	4,904 KB

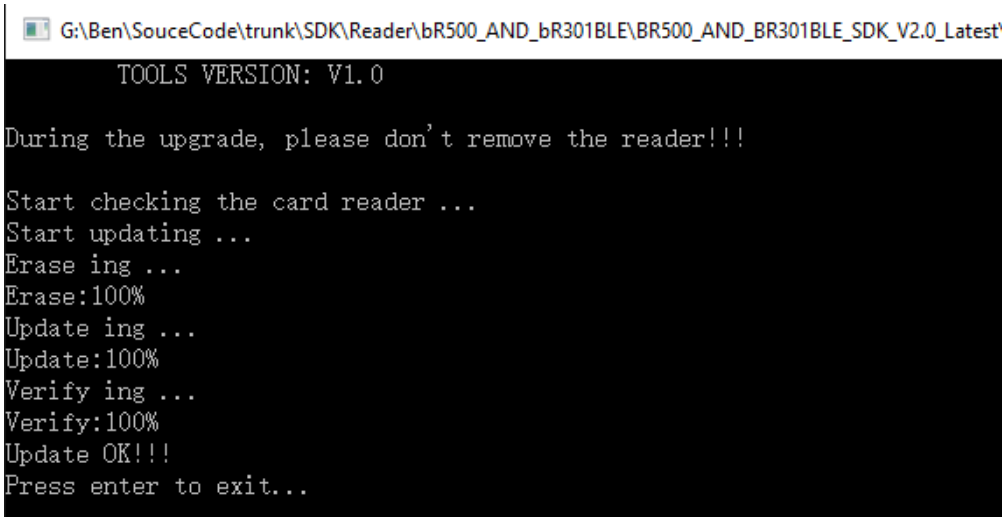
➔ Update_Tool_V1.0.exe is execute file
➔ *. meta file is firmware BIN file, please don't rename this file

4.2 The operation of Update tool

The update tool is easy, convenient and safe too. We will introduce how to using this tool to update your reader.

Step #1: Insert reader to PC and double click "Update_Tool.exe" by **administrator**. If you are first running this tool, the tool will inform to re-plug reader.

Step #2: After re-plug reader, open update tool application again and then starts updating.
The whole progress will cost around 30s. **please not remove reader while in updating.** If something happens while in updating progress, please open tool and re-updating reader again.

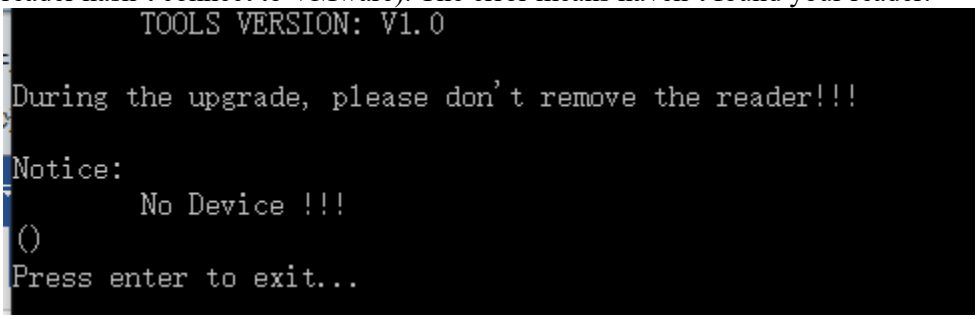


4.3 Errors and solutions

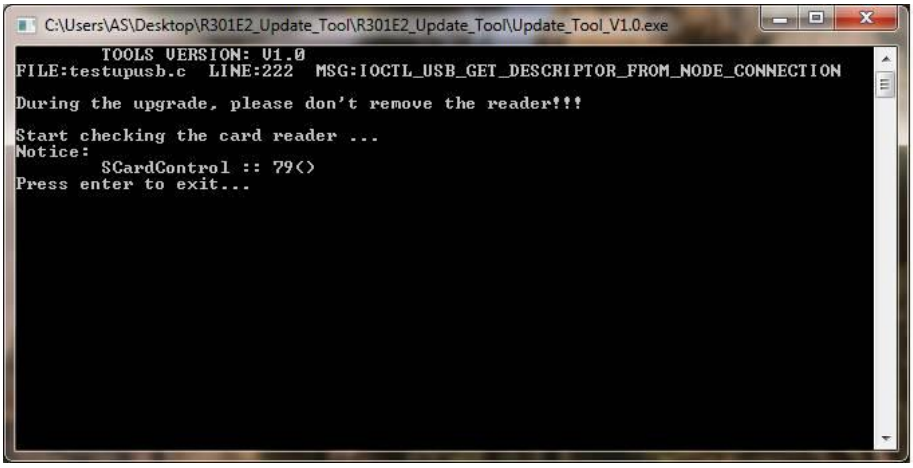
1. If the update tool happens below error, please do re-plug reader.

2. If occurs error while in updating, please re-plug reader and running application do updating again

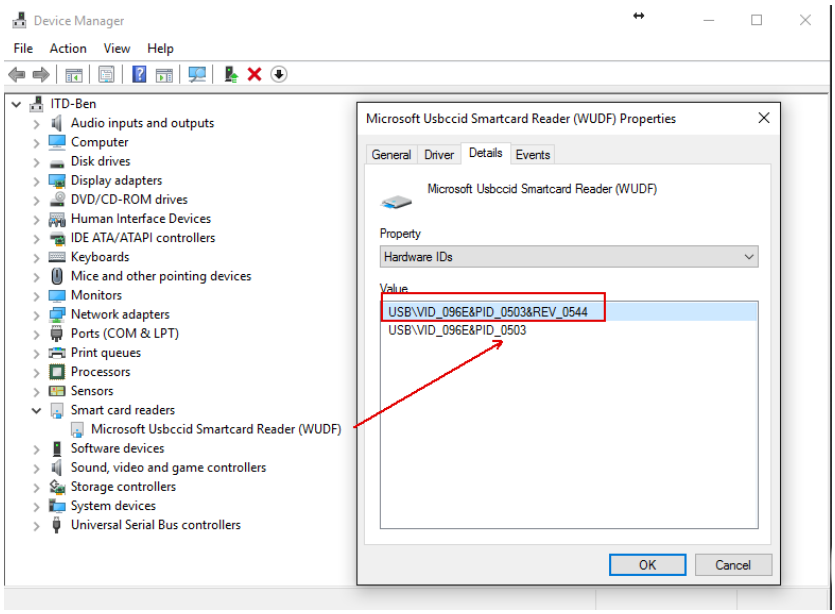
3. If it shows below error, please check your reader has connected to PC with USB port correctly (or check your reader hasn't connect to VMware). The error means haven't found your reader.



4. If you found below error, please check your reader firmware version, the tool only using for R301E2, which firmware is 5.4x.



5. Check reader firmware version, you can follow below step to check firmware version in device manager



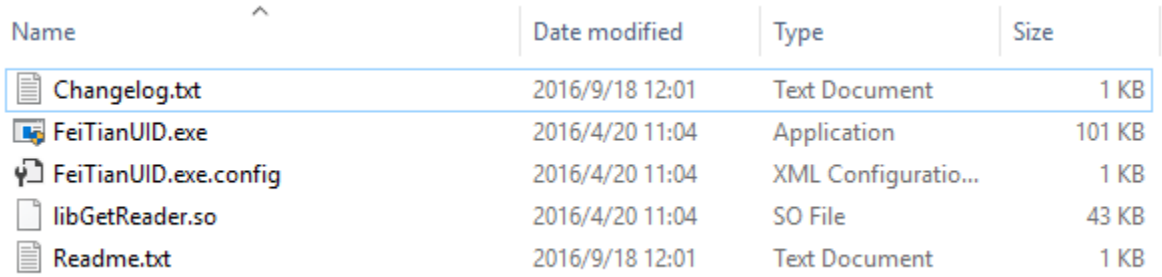
5.0 R301 CARD READER UID TOOL

5.1 Introduction of UID Tool

UID(User) Tool is security mechanism for distributor or people who want the reader only can be distinguish by their application, The UID is generate by seed code, user can input their privacy seed code, using UID Tool write code into reader, reader generate 8bytes ID, called user ID. And FEITIAN provide API to read this UID from different platform. Then user only need keep their seed won't be stolen, and do bind their application with this UID, to keep their customer only can be using specified reader.

The operation API include in R301 Card Reader SDK, also we provide windows tool for customer do operation on Windows. For mobile platform, also have such API for call (check developer guide).

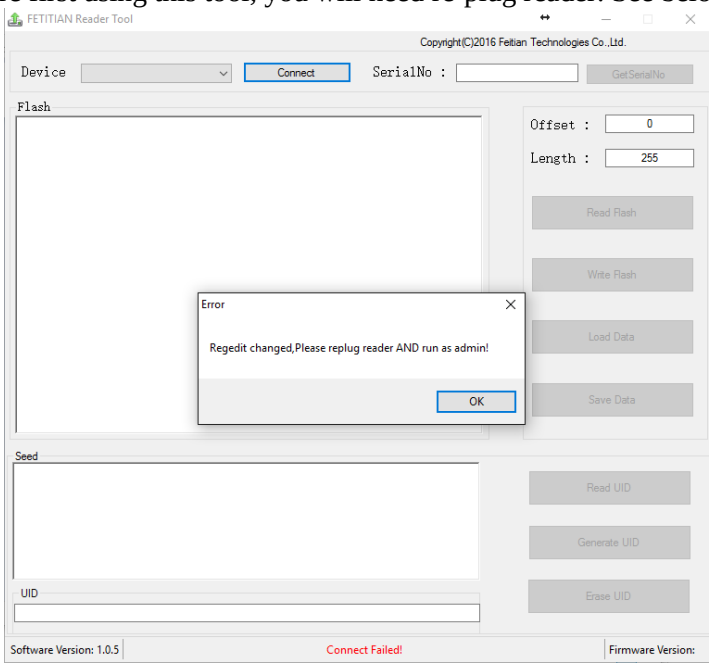
*The related files of update application



➔ FeiTianUID.exe is execute file
➔ LibGetReader.so is packaged lib

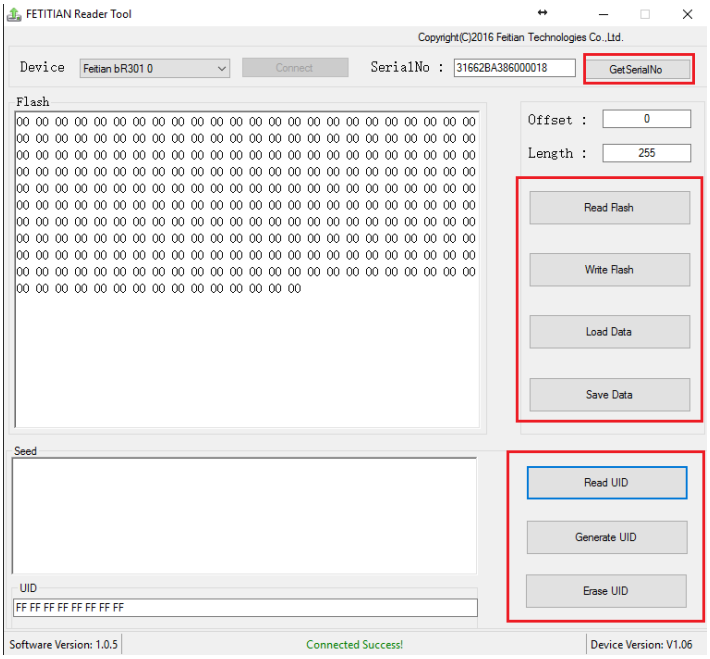
5.2 The operation of UID tool

Step #1: Please keep all the related file in same directory, and using administrator running FeiTianUID.exe, if you are first using this tool, you will need re-plug reader. See below:



Step #2: re-plug reader and using administrator to run the tool again. And start to do operation. The tool provide three function, we will do introduction later.

- ➔ Read serial number
- ➔ UID management
- ➔ Flash management



5.3 Serial number

The serial number is specific unique number for reader, the number includes production date. We provide API for PC and Mobile platform to read it out.

On this part, we only show the tool that Feitian made. After you connected reader to PC, click “Get serialNo” button to get SN.

5.4 UID management

As we motioned before, the UID function using to manager customer brand and encrypted firmware. If you don’t want your reader using by others, you can write your private seed and get UID, bind your UID with your application to make the application only detect this UID after then can using reader, if the UID is not your specific UID, then refuse it.

This tool show user read/write/erase UID, the UID generated by private algorithm through the seed. the default UID is 16xFF, before input your seed, please don’t forget it. If you forgot the seed or lost the seed, without exist seed, you cannot change others and erase it.

On other hand, we provide read/write/erase APDU and sample code allow using to do bind in mobile and PC platform. For such document, please contact Feitian and sign NDA to get it.

6.0 DEMO SOFTWARE

Do operation with R301 Card Reader, we provide mobile SDK, for PC platform, customer can call WINSCARD API or PCSC Lite API, they are standard API, you can check MSDN or PCSC LITE official website. FEITIAN also made sample code for reference with different development language.
https://github.com/FeitianSmartcardReader/R301/tree/master/Sample%20Code

7.0 DRIVER

The R301 is CCID standard reader, after windows XP, Microsoft has integrated CCID driver in system by default, if your system is Windows 2000 or Windows XP, please download driver from:
http://download.ftsafe.com/files/reader/CCID_driver_on_Windows2000+.zip

For Linux:
* Please refer to http://pcsclite.alioth.debian.org/ccid/shouldwork.html
  Install CCID driver on your Linux, follow http://pcsclite.alioth.debian.org/ccid.html#download

For Mac OS X 10.5 - 10.10:
* The Mac OS X already integrated FEITIAN R301 support, you just plug-in and using. Also you can build CCID driver by yourself on MAC OS X, check
http://pcsclite.alioth.debian.org/ccid.html#MacOSX

Buy samples, please access http://www.ftsafe.com/onlinestore/product?id=11

8.0 OEM ITEMS

1. **Case Customization**
   Feitian can provide AI file of the casing, and customer can based on our AI put their logo on casing or provide logo with AI file, Feitian help do it.

   Customization options: silk-printing

2. **Packaging Customization**
   A: using Feitian packaging directly
   B: Customer give idea, Feitian charging OEM fee to do OEM packaging for customer

3. **Firmware Customization Information**
   PC/Android smart card reader:
   Manufacturer name: Feitian
   Reader name: SCR301
   Firmware version: 5.44
   UID (User ID): FFFFFFFFFFFFFFFF (The default UID is all FF, user can do OEM, the UID function introduction: http://javacardos.com/javacardforum/viewtopic.php?f=19&t=811)

9.0 FAQ

9.0 FAQ

Q：How to develop application based on R301 reader?
A: The SDK based on PCSC API implement, we provide demo source code to reference and guidance customer how to call our APIs.

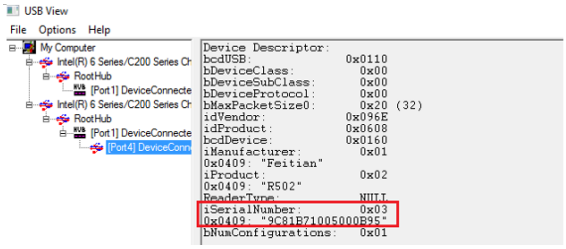
Q: Why there is no "found new hardware" popup window when I attach a R301 reader?
Symptom: After attached R301 reader, there is no "found new hardware" popup window.
A: Right click "My Computer" -> "Device Manager" -> "Smart card readers", right click "update driver", need open your system update.

Q: Red light is off
Symptom: The device light is off. The device may not be correctly connected.
A: Re-attach the device, check the USB connection or using bus hound to capture data for us to do check.
http://perisoft.net/bushound/

Q: Red light is flashing when no card is in card reader
Symptom: The device is broken.
A: Return this device to manufacturer for repairing.

Q: Blue light is flashing when a card is inserted in the card reader
Symptom: Blue light is flashing when a card is inserted in the card reader. The card is unusable.
A: Insert the card again with another side;
The card is not compatible with the ISO-7816 (e.g., timeout, byte intervals);
The card is not compatible with the power supply.
The output current of the card is too weak to be recognized by the card reader.
The card is damaged.
The device is damaged and need to be return to manufacturer.

Q: How to check SN from usb description?
A: You can using USBViewer to do check, the code also opened by Microsoft, check from below:
When you run USBViewer, the tool will need authorize to change register in register.
So when you run USBViewer at first time, you need plug-in two times.
The tool can run on Windows system, the source code can found from
https://github.com/Microsoft/Windows-driver-samples/tree/master/usb/usbview
Below just show you the SN from USB card reader:



We also made a demo app for read SN, check
https://github.com/FeitianSmartcardReader/R301/tree/master/Sample%20Code/GetR301E2SN

10.0 APPENDIX ABBREVIATION

CE Attestation of Conformity

The equipment complies with the principal protection requirement of the EMC Directive (Directive 89/336/EEC relating to electromagnetic compatibility) based on a voluntary test.

This attestation applies only to the particular sample of the product and its technical documentation provided for testing and certification.

After preparation of the necessary technical documentation as well as the conformity declaration the CE marking as shown below can be affixed on the equipment as stipulated in Article 10.1 of the Directive. Other relevant Directives have to be observed.

FCC certificate of approval

This Device is conformance with Part 15 of the FCC Rules and Regulations for Information Technology Equipment.

WEEE

Dispose in separate collection.

RoHS