

**FEITIAN**



# Rockey501 Dual-Interface Reader User's Guide

V1.1

Feitian Technologies Co., Ltd.

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# Declaration

Caution: The user is cautioned that changes or modifications not expressly approved by the party responsible for compliance could void the user's authority to operate the equipment.

Note: This equipment has been tested and found to comply with the limits for a Class B digital device, pursuant to part 15 of the FCC Rules. These limits are designed to provide reasonable protection against harmful interference in a residential installation. This equipment generates, uses and can radiate radio frequency energy and, if not installed and used in accordance with the instructions, may cause harmful interference to radio communications. However, there is no guarantee that interference will not occur in a particular installation. If this equipment does cause harmful interference to radio or television reception, which can be determined by turning the equipment off and on, the user is encouraged to try to correct the interference by one or more of the following measures:

- Reorient or relocate the receiving antenna.
- Increase the separation between the equipment and receiver.
- Connect the equipment into an outlet on a circuit different from that to which the receiver is connected.
- Consult the dealer or an experienced radio/TV technician for help.

# Chapter 1. Overview

This chapter provides an introduction to ROCKEY501 dual-interface reader and its features.

## 1.1 Introduction

The ROCKEY501 dual-interface reader is a driverless USB HID reader used for smart card applications. The reader provides 1 contact smart card slot (ISO7816-sized) and 3 SAM card slots (SIM card-sized). It supports the T0 and T1 cards compliant with ISO7816 protocol, the contactless card compliant with ISO-14443 TYPEA/TYPEB protocol, and the S50 and S70 contactless card compliant with Mifare1 standard. Thus, it can access the dual-interface smart card, the contactless smart (RF) card, and the contact smart card.

Re-development interface libraries are available for the development of applications. The reader can be connected to a PC or terminal by a USB port. Because it is an HID product, the installation of driver is unnecessary.

## 1.2 Features

Table 1 Rocky501 Reader Features

|  |                           |
|--|---------------------------|
| Main Features  | Product Family            |
| Features:  | ROCKEY501                 |
| Uses HID communication protocol, driverless device   | HID                       |
| Compliant with ISO 7816, ISO14443, ISO15693, and GSM 11.11 smart card standards  | 7816<br>14443<br>GSM11.11 |
| Support for contactless IC card:   |                           |
| Support for the contactless card compliant with ISO14443 TypeA/B   | √                         |
| Support for the contactless card compliant with ISO15693   |                           |
| Support for contactless Mifare S50, Mifare S70, and Mifare Pro cards compliant with Mifare standard  | √                         |
| Support for contact IC card:   |                           |
| 1 contact card slot (ISO7816 standard card-sized), voltage at 3V or 5V   | √                         |
| 3 SAM card slots (SIM card-sized) compliant with 合 GSM 11.11, voltage at 3V or 5V (configured by API)  | √                         |
| Support for T0 and T1 cards compliant with ISO7816   | √                         |
| Re-development interface libraries   | √                         |
| Supported for: Windows CE/98 SE/ME/2000/XP/7/Server2003/VISTA and related SPs, Linux 2.6 (Fedora 7, Ubuntu 7.10, AS4, and openSUSE 11.1) or higher | √                         |
| Certification and Standards:   |                           |
| Compliant with EMV 2000 Level 1  | √                         |
| Certified by CE and FCC  | √                         |

Certified by RoHS

v

## 1.3 Applications

The ROCKEY501 reader is a terminal device used for smart card applications and integration. With support for different interfaces, it can be broadly used in electronic payment systems and authentication systems. It is an ideal solution to authentication, e-commerce, financial institutions, and access control.

In particular, the ROCKEY501 reader can be used for:

- ◇ E-passport
- ◇ Online banking
- ◇ Online shopping
- ◇ Network access
- ◇ Physical access control
- ◇ Digital signing
- ◇ Customer credits
- ◇ Promotion program
- ◇ Stored value
- ◇ Authentication
- ◇ Electronic tickets
- ◇ Automatic charging at parking lot
- ◇ Charging system
- ◇ Online gambling
- ◇ Work attendance checking
- ◇ Vending machine
- ◇ Gas station management
- ◇ Healthcare
- ◇ Public transportation management
- ◇ Refectory retail management

## 1.4 Keywords

### ROCKEY501 Keywords:

- ◇ Reader
- ◇ ISO7816
- ◇ ISO14443



- ✧ Mifare
- ✧ Type A
- ✧ Type B
- ✧ HID
- ✧ Dual-interface
- ✧ Contact
- ✧ Contactless
- ✧ T0
- ✧ T1

## Chapter 2. Specification

### 2.1 Technical Facts

- ✧ Port of host: USB 2.0, full speed, driverless
- ✧ Maximum operating current: <150mA
- ✧ Support for: ISO14443, ISO7816, and GSM 11.11
- ✧ Support for contactless IC card: the contactless card compliant with ISO14443 Type A/B protocol, and the contactless MifareS50, MifareS70, and MifarePro cards compliant with Mifare standard
- ✧ Sensitive distance for contactless card:
  - Type A: 0~70mm
  - Type B: 0~50mm
  - Mifare: 0~80mm
- ✧ Communication rate for contactless IC card: 106Kbps; for other cards: 212 Kbps, 424 Kbps, or 848 Kbps (changeable by API)
- ✧ Support for contact IC card: the T0 and T1 cards compliant with ISO7816; 1 standard-sized contact IC card slot; 3 SIM card-sized SAM card slots compliant with GSM 11.11; both support CLASS A, CLASS B, and CLASS AB IC cards of ISO7816 standard (parameters, such as the baud rate during ATR and WWT, can be changed by API)
- ✧ Standard contact IC card slot: 8 contacts
- ✧ Current supplied by contact IC card slot: 0~135mA
- ✧ Flash memory (1.5KB) for users
- ✧ UID feature available
- ✧ Online update in cipher-text manner
- ✧ Automatic and manual PPS

### 2.2 Specification

Table 2 ROCKEY501 Reader Specification

|                                      |   |
|--------------------------------------|---|
| Communication Protocol with Computer | HID (Human Interface Device)                                  |
| Interface Type                       | USB 2.0 full speed, driverless interface, Mini USB (Optional) |
| Power Supply                         | Via USB port  |
| Operating Current                    | <150mA  |

|   |                              |   |                                     |
|---|------------------------------|---|-------------------------------------|
| Operating Temperature                   |                              | 0~+50°C   |                                     |
| Storage Temperature                     |                              | - 20°C ~ 85°C   |                                     |
| Humidity                                |                              | (95±2)% without condensation  |                                     |
| Contact Card Slot                       |                              | Landing-style slot, support for at least 100,000 insertion/removal cycles |                                     |
| Sensitive Distance for Contactless Card |                              | 0~80mm (Depends on the environment and the specific card)                 |                                     |
| Protection                              |                              | Card short circuit protection   |                                     |
| Supported Parameters                    | Card                         | Friction or landing-style contact type (Optional)                         |                                     |
|   |                              | 1 built-in ISO 7816 standard card-sized slot and 3 SAM card slots         |                                     |
|   |                              | Card operating voltage at 3V or 5V  |                                     |
|   |                              | ISO 7816 T=0 or T=1 compliant   |                                     |
|   |                              | GSM 11.11 compliant   |                                     |
|   |                              | Communication rate for T=0 and T=1 protocols: 9600~344000bps              |                                     |
|   | Contactless                  | Built-in antenna  |                                     |
|   |                              | Card operating voltage at 3V or 5V  |                                     |
|   |                              | ISO 14443 Type A and Type B compliant                                     |                                     |
|   |                              | Support for the Mifare standard   |                                     |
|   |                              | Card transfer rate: 106kbps   |                                     |
|   |                              | High-speed transfers: 212kbps, 424kbps, 848kbps                           |                                     |
|   | Certification and Compliance |   | CE, FCC, RoHS, and EMV 2000 Level 1 |

|                     |  |
|---------------------|--|
| Weight              | 300g   |
| Dimension&Casing    | 94*122*28 (mm), C5 casing (optional), or no casing (optional)  |
| Standard&Compliance | ISO14443 Type A/B, ISO7816 T0 and T1, ISO7816 CLASS A, CLASS B, and CLASS AB, Mifare S50, Mifare S70, and Mifare Pro of Mifare standard, GSM 11.11 SIM |
| Supported OSs       | Windows CE/98 SE/ME/2000/XP/7/Server 2003/VISTA and related SPs, Linux 2.6 (Fedora 7, Ubuntu 7.10, AS4, and openSUSE 11.1) or higher                   |

## Chapter 3. Getting Started

This chapter describes how to install the ROCKEY501 reader.

### 3.1 Runtime Environment

Hardware: PC or terminal, with at least 1 USB port; and

Software: Windows CE/98 SE/ME/2000/XP/7/Server 2003/VISTA and related SPs, Linux 2.6 (Fedora 7, Ubuntu 7.10, AS4, and openSUSE 11.1) or higher

### 3.2 Installing Rockey501 Reader

The ROCKEY501 reader supports USB 2.0 interface. It is a full-speed driverless device. It is designed with a dual-tier PCB structure. The PCBs are connected by connection accessories(It is recommended to use the USB connector with fixed dual coil from Feitian).

To install the Rockey501 reader:

1. Turn on a computer;
2. Please use USB cable to connect PC and card reader.

**Warning :**Please use the USB connector cable in the accessories provided or cable with double-magnetic loop.

3. Connect the Rockey501 reader to your computer and you can see the following by clicking the plus (+) sign ahead of Human Interface Device after selecting My Computer -> Management -> Device Manager:

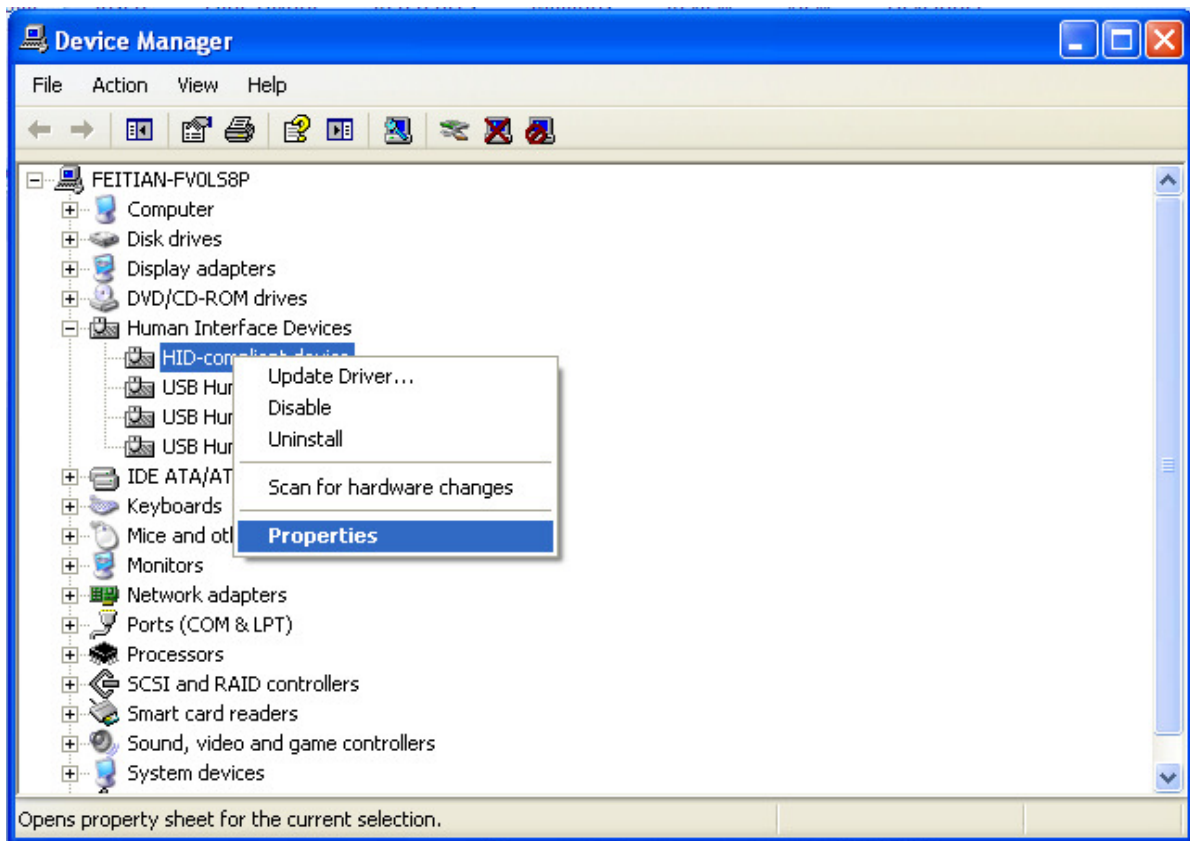


Figure 1 Device Manager

4. Right-click on HID-compliant device and select Properties. You will see the device type I Human Interface Device, which indicates that the Rocky501 reader has been connected successfully (both the red and green indicators are on).



Figure 2 Human Interface Device

### 3.3 Hardware Prompt Message

The red indicator, the green indicator, and the buzzer can give you some messages on the operating status of the reader.

These messages include:

- 1) Both the red indicator and the green indicator are brought on if the power is available when connecting the ROCKEY501 reader to the computer;
- 2) During the self-test after the ROCKEY501 reader is powered up and enumerated, the buzzer beeps for a long time if the checksum of firmware is incorrect; the buzzer beeps for a short time twice if the antenna board is not initialized successfully, while the red indicator is on and the green winks;
- 3) If the self-test is successful and the RF is connected properly, the device has been started normally and is available for operations;
- 4) When a USB communication instruction is received, the green indicator is on and the red winks; after the

instruction is executed, the red indicator is off, and the buzzer is off;

- 5) The red indicator winks when the reader is interacting data with the card.

### 3.4 Indication of Status

The ROCKEY501 dual-interface reader is provided with a two-color indicator to indicate the status of the reader during data transmission and interaction with the card.

#### 3.4.1 USB Interface

The ROCKEY501 reader is a USB 2.0 full-speed device. It is driverless and is designed with a two-tier PCB structure.

#### 3.4.2 Indicator

- ✧ Red (indication of USB 2.0 interface communication status)

Table 3 Red Indicator

| No. | When              | Description       |
|-----|-------------------|-------------------|
| 1   | USB enumeration   | Winks 10 times    |
| 2   | USB not created   | Winks at 1Hz      |
| 3   | USB created       | Always on         |
| 4   | USB data exchange | Winks irregularly |

- ✧ Green (indication of card communication)

Table 4 Green Indicator

| No. | When                     | Description       |
|-----|--------------------------|-------------------|
| 1   | No card                  | Always off        |
| 2   | Card in, not powered up  | Winks irregularly |
| 3   | Card in, powered up      | Always on         |
| 4   | Data exchange with card  | Winks irregularly |
| 5   | Card short, or ATR error | Winks at 4Hz      |



# Chapter 4. Demo Software

With the Demo software, you can perform operations on the ISO7816-sized contact smart card, the SAM contact card, the T0 and T1 card compliant with ISO7816, the contactless card compliant with ISO-14443 TYPEA/TYPEB protocol, and the S50 and S70 contactless card compliant with Mifare1 standard by the ROCKEY501 dual-interface reader. For details on how to use the Demo software, see *ROCKEY501 Dual-Interface Reader Demo Software User's Guide*.

## 4.1 ROCKEY501 Dual-Interface Reader Demo Software

You can try some operations on the ROCKEY501 reader by the Demo software.

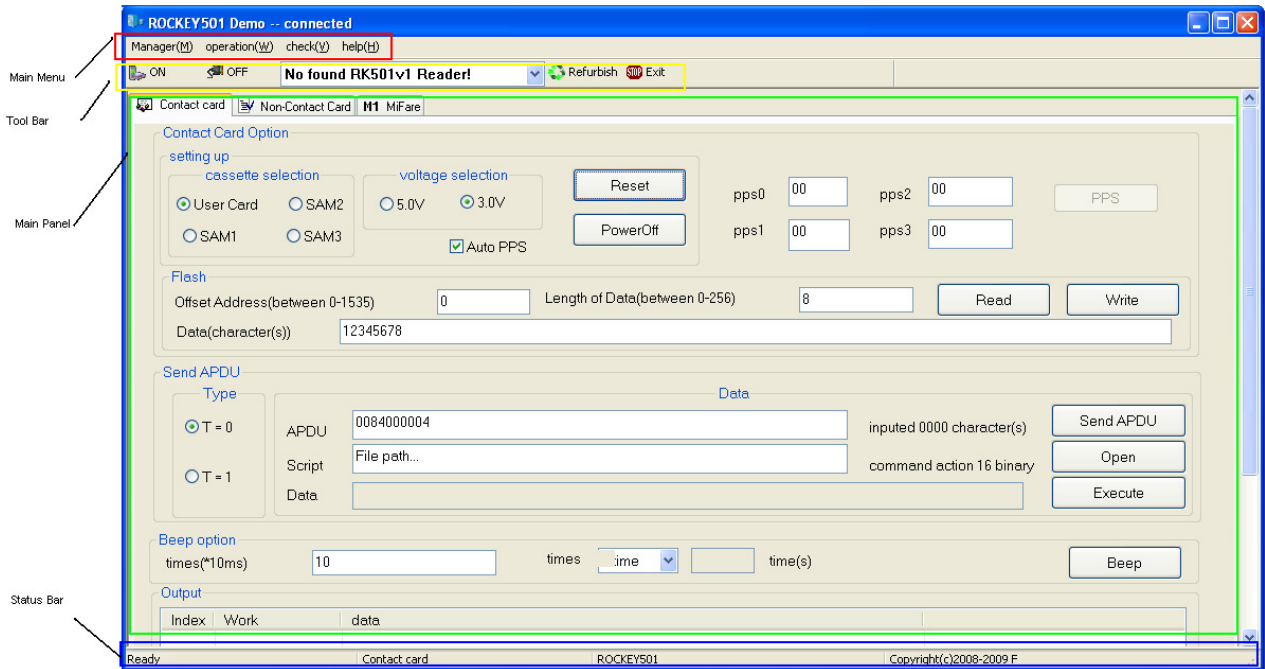


Figure 3 Demo Software

## Chapter 5. Application Development

You can develop applications with the ROCKEY501 reader using the re-development interface libraries. See *ROCKEY501 Dual-Interface Reader Developer's Guide*.

## Chapter 6. Problems & Troubleshooting

### 6.1 The indicator of the reader is off

Failure: The device is not powered up properly.

Troubleshooting: Connect the reader to a different USB port of the host; or check the connection cable.

### 6.2 “No connection” is shown after double-clicking the Demo software

Failure: Double-click RK501DEMOV2.exe. “No connection” is displayed.

Troubleshooting: Check if the device has been powered up and connected properly. Run the software again.

### 6.3 “No Rockey501 device found” is displayed after double-clicking the update software

Failure: Double-click Rk501UpDevV2.exe. “No Rockey501 found” is displayed.

Troubleshooting: Check if the device has been connected properly and then update again.

### 6.4 Firmware update failed

Failure: Firmware update failed.

Troubleshooting: After updating the UID, you need to remove the reader and attach it again.

### 6.5 The contactless card can be sensed remotely but not nearby

Failure: The contactless card can be sensed by the reader remotely. But it cannot be sensed nearby the reader.

Troubleshooting: Make changes to MFRC531 register parameters.

### 6.6 Power-up reset failed

Failure: The power-up reset failed.

Troubleshooting:

1) contact card: for large slot, the contact of the card should be placed downwards; for small slot, check if the orientation of the card is proper. If the card has been inserted properly, check if the communication with the reader is correct. You can try the buzzer. If the communication is also proper, check if the power-up voltage is

appropriate.

2) contactless card: Try closing RF and opening it. Or, you can reset the parameters of the reader.

## 6.7 Failed to issue APDU for contact card

Failure: Failed to issue APDU for contact card.

Troubleshooting: Check if you have selected the T0 or T1 protocol properly and if PPS is normal.

## 6.8 Command cannot be issued

Failure: The command cannot be issued.

Troubleshooting: Check if the service has been started properly. The ROCKEY501 reader is a driverless device. The service acts as a middle program between the library functions and the reader device. You can check if the red indicator winks. If so, the USB command can be issued.

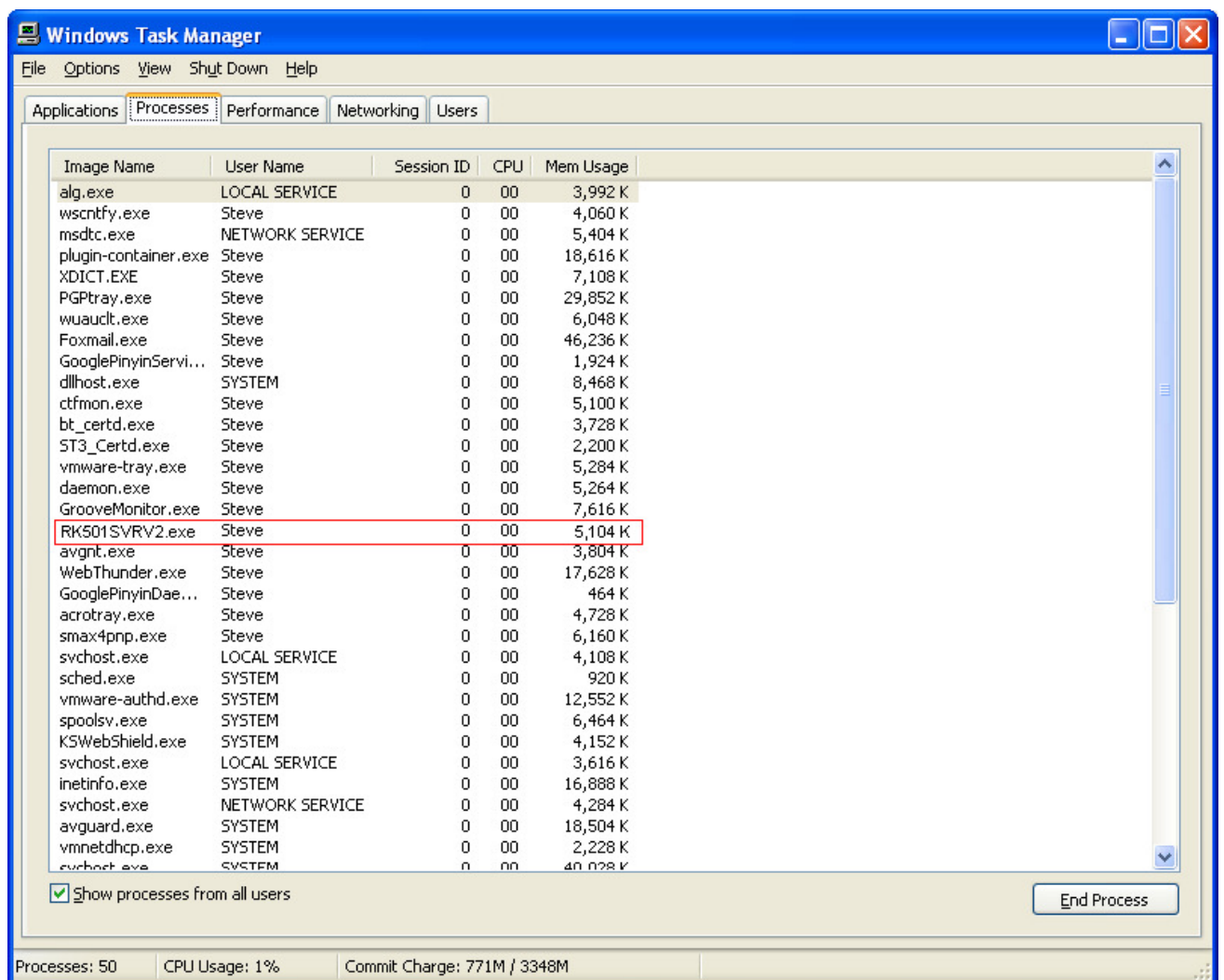


Figure 4 Service

## 6.9 USB cannot be recognized

Failure: The USB cannot be recognized.

Troubleshooting: Do not use the reader with a notebook computer. Replace the USB cable.

## 6.10 Contactless card does not work normally

Failure: The contactless card does not work normally.

Troubleshooting:

- 1) Keep metal objects out of the 30cm radius of the card. Or, the signal can be interrupted by electromagnetic wave.
- 2) Check if the RF field has been opened in the application. The feature is controlled by special functions.
- 3) Check if an appropriate protocol has been selected. For example, Mifare is not suitable for the ISO14443 card.
- 4) Insufficient card sensing distance: if this is the case for only a few cards, replace the cards; if this is the case for all of the cards, a hardware failure may have occurred.

## 6.11 Data returned from IC card is not the data expected

Failure: The data returned from the IC card is not the data that is expected.

Troubleshooting: Normally, the data returned from the IC card is standard data. The reader is only a channel, which does nothing to the data. You need to know the IC card specification and IC card data in depth. For example, some data is intermediate data and you need to know that. Generally, it is correct that the reader returns "9000", "61 xx", or "6C xx".

## Chapter 7. List of DK Items

| ID | ITEMS                                       | Qty | Notes                       |
|----|---|-----|-----------------------------|
| 1  | White Box Packaging                         | 1   |                             |
| 2  | CD(with Paper Envelope)                     | 1   | English version             |
| 3  | USB Connector                               | 1   | with fixed dual coils       |
| 4  | ROCKEY400/B2                                | 1   | with English logo           |
| 5  | Product tag (product name + version number) | 1   |                             |
| 6  | Smart Card                                  | 0   | need to purchase separately |