Invengo

User's Manual

XCRF-502E Reader

www.invengo.cn

Fig. 1 Welcome to use Invengo's RFID product!

Fig. 3 We are glad that you choose the fixed XCRF-502E Reader.We hope that it will make your job easier.

NOTE:
THE MANUFACTURER IS NOT RESPONSIBLE FOR ANY RADIO OR TV INTERFERENCE CAUSED BY UNAUTHORIZED MODIFICATIONS TO THIS EQUIPMENT. SUCH MODIFICATIONS COULD VOID THE USER'S AUTHORITY TO OPERATE THE EQUIPMENT.

Preface

Fig. 4 This manual is applicable to XCRF-502E Reader.

Fig. 5 This manual provides the information on the product's installation, operation, maintenance and repair and other features, to the personnel for installation, operation and maintenance of this product.

Fig. 6 This manual's version number is V1.1, printed on DD/MM/YYYY, and its versions are as follows:

April 10, 2008	V1.0 (preliminary draft)
May 13, 2008	V1.1
DD/MM/YYYY	

Fig. 7 and logos are owned by Invengo Information Technology Co., Ltd.

Fig. 8 All the description of the features and functions of the product, as well as other information contained in this manual are current and effective at the time of this manual being complied and all the information printed are believed to be accurate and correct. Invengo reserves the right to correct or change the information and instructions

in this manual, without further notice and not assuming any liability.

Fig. 9 Some function of the product may differ as its configuration may differ to satisfy your special requirement. Please contact us through the following numbers if any question arises.

86-0755-26711633 (Shenzhen, China)

86-0931-8555791 (Lanzhou, China)

86-027-86804766 (Wuhan, China)

86-010-63366102 (Beijing, China)

86-0756-3394258 (Zhuhai, China)

86-0754-87912085 (Ningbo, China)

65-67960366 (Singapore)

1-703 793 0085 (USA)

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Safety Instructions

 Warning Mark

Personal injury may be caused in the case of incorrect operation.

The device may be damaged in the case of incorrect operation.

 Notice Mark

Your operation may not be performed successfully by negligence of the instructions.

Unexpected result may be caused by negligence of the instructions.

Table of Contents

1 Product Overview

1.1 Introduction

XCRF-502E Reader is a new type of the fixed RFID reader which fulfills the bi-directional communication between tags and host system.The Reader is the new product developed by Invengo for ISO18000-6B protocol.

Fig. 1.1 XCRF-502E Reader

XCRF-502E Reader can form a RFID system together with tags satisfying ISO18000-6B protocol, to read and write the identification codes and memory data of the tags, by wireless communication with the tags via antenna.

1.2 Main Use and Application

- XCRF-502E Reader works on the frequency band of 902 MHz to 928 MHz, and is able to read different manufacturers' tags conforming to ISO18000-6B protocol. XCRF-502E Reader provides 2 antenna ports controllable by software, through which a scan channel can be built by flexibly connecting to antennas, with a maximum reliable read distance of 5 to 7m.

- Compared with similar readers, XCRF-502E Reader has a compact appearance, popular price, and structural design of the IP53 protection level, which is able to work in the IP53 protective environments.

This Reader boasts a wide range of applications in various fields, such as management of warehouse logistics, management of retail logistics center, management of corporate transportation and management of automated production line.

1.3 Model and Specification

Invengo has produced readers of series for ISO18000-6B protocol and ISO18000-6C protocol for the new RFID, including XCRF-502E Reader, XCRF-804 readers, XC2800 portable reader, XCRSF-800 I/O module and XCRF-804 (EU) reader.

XCRF-502E Reader is a fixed RFID type, and this manual is only applicable to XCRF-502E Reader.

1.4 Working Conditions

The primary condition for XCRF-502E Reader's normal operation is a complete RFID data collecting system (consisting of the Reader, electronic tag, PC and Reader interface software).

Please make sure whether all the components constituting a RFID data collecting system are complete, before using XCRF-502E Reader. Confirm the connections among the components are reliable.

The specific requirements of XCRF-502E Reader on its working environment are as follows:

- Temperature range;

-10℃ to +60℃ (14℉ to +140℉)

- Humidity range:

20%~95%

- Power voltage:

AC: 100V to 240V/50 to 60Hz

1.5 Safety and Protective Measures

 The power range for this product is AC 100V to 240V/50 to 60Hz. Please check the power range carefully before installation and operation!

 The installation and commissioning personnel must stay at least 30cm away from the Reader while it is working (radiating microwave

power), so as to meet the FCC standard (USA)for the maximum allowable exposure to radio frequency (RF) radiation for human body.

The instructions are to be implemented during site installation and commissioning of this device.

 Any radio transmission equipment, including this Reader, may cause disturbance to the performance of the medical devices that have no proper protection.You may consult the manufacturers of such medical devices if such event happens. This equipment may also cause disturbance to other electronic equipment while it is working.

2 Performance Specification

2.1 Main Functions

Air interface protocol: ISO18000-6B

Tag data rate: 40kbps

Number of antennas: 2 at the most, controlled by electronic switches

Isolation between antennas: ≥22dB

Modulation mode: ASK

Available frequency points: 50

Emission bandwidth: <400kHz

2.2 Technical Indicators

Frequency: 902MHz to 928MHz

RF output power: 1.0W (+30dBm)

Frequency stability: ≤±5ppm

Working mode: fixed frequency and frequency hopping are optional

Maximum tag reading distance: 7m

Maximum tag writing distance: 70% of the maximum tag reading distance on the same conditions

Multiple tags read rate: ≥10 tags/s

3 Size and Weight

3.1 Appearance and Size

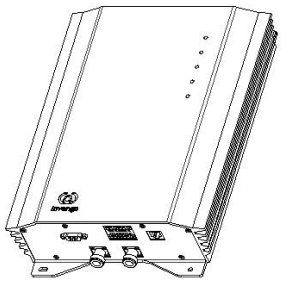

Fig. 3.1 Illustration of XCRF-502E Reader's Size

XCRF-502E Reader has an exquisite appearance with a volume of 29.0 x 23.0 x 7.0 cm (11.4 x 9.2 x 2.8(in)).

3.2 Weight

XCRF-502E Reader not only has an exquisite appearance but also a light weight of about:

3.0kg (4.4lb).

4 Structural Features and Operating Principles

The composition of XCRF-502E Reader and the internal architecture of the components and the operating principles of the modules, the front and Back Panels and the ports are described in detail in this chapter.

4.1 Overall Architecture and Operating Principle

XCRF-502E Reader consists of RF unit, baseband unit, power unit and cabinet.As illustrated in Fig. 4.1:

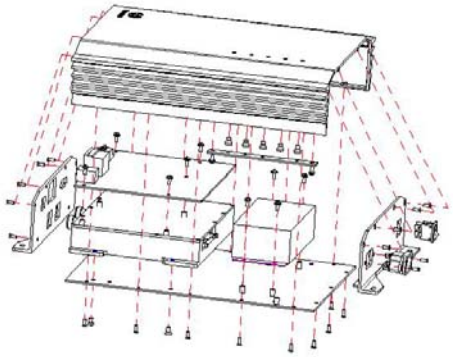

Fig. 4.1 Structure diagram of XCRF-502E Reader

XCRF-502E Reader, together with the antennas, tags and a PC (personal computer), forms a complete application environment for the Reader, in which under the control of the PC, the baseband unit sends instructions to the RF unit, by which relevant instructions will be send according to the types of the tags. After receiving the instructions, the tags will feedback relevant information; after being amplified and shaped by the receiving circuit, the information will be sent to the baseband unit for decoding; and the decoded data will be sent to the PC via the communication port of the baseband unit.

The transmission part of the RF unit is in charge of generating, modulating, amplifying and transmitting carrier waves. Its receiving part is in charge of demodulation, amplification and comparison.

The baseband unit is in charge of coding and decoding the data of the tags and communication with the PC.

4.2 Front and Back Panels

The functions of the front and Back Panels, top and bottom panels, the ports and LEDs of the device are described in this part.

4.2.1 Front Panel

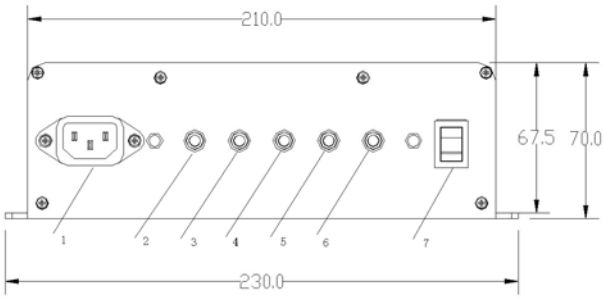

Fig. 4.2 Illustration of the front panel of XCRF-502E Reader

1 – AC power outlet;

2 – Power supply indicator lamp in red; red indicates power on;

3 – Power amplifier indicator lamp in green; green indicates that antennas are emitting RF power;

4 – Read card indicator lamp in green; green indicates that the Reader correctly reads the tag ID;

5 – Antenna indicator lamp in green; green indicates that the antenna 1 is correctly connected;

6 – Antenna indicator lamp in green; green indicates that the antenna 2 is correctly connected;

7 – Power switch;

4.2.2 Back Panel

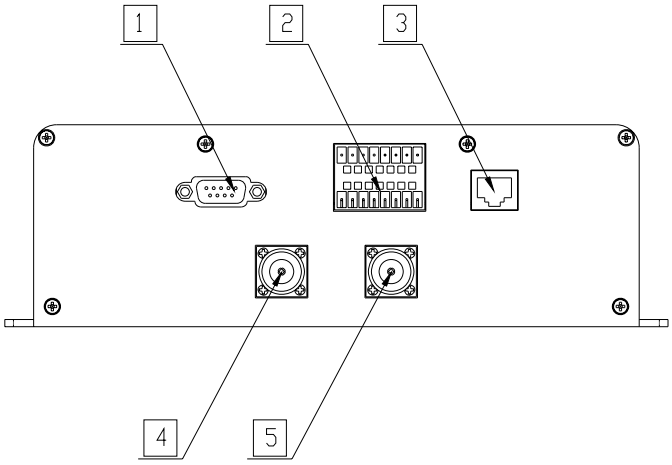

Fig. 4.3 Illustration of the Back Panel of XCRF-502E Reader

1 – RS-232 serial port, for exchanging data with upstream computers or other equipments; Its pin numbers, signal names and signal flow directions are shown in the table below, of which the pin numbers are identical with the numbers marked on DB9 plug.

Pin number	Signal name	Signal flow direction
2	RXD	Input
3	TXD	Output
5	Gnd	Grounding
9	+5V（1A）	External power

2 – Control interfaces include I/O interfaces and Wiegand interface; I/O interfaces include 2 optical coupler input interfaces and 4

relay output interfaces.(Sequence number of above row from left to right: 1, 3, 5… ; Sequence number of bottom row from left to right: 2, 4, 6 …)

Pin Number	Signal Name	Function
1	Wiegand input	Wiegand signal
2	Wiegand output 1	
3	Wiegand output 2	
5	Input port 1	Optical coupler input 1
6	Input port 1 grounding	
7	Input port 2	Optical coupler input 2
8	Input port 2 grounding	
9	Output port 1	Relay output 1
10	Output port 1 grounding	
11	Output port 2	Relay output 2
12	Output port 2 grounding	
13	Output port 3	Relay out 3

14	Output port 3 grounding	
15	Output port 4	Relay output 4
16	Output port 4 grounding	

3 – Network port uses RJ-45 connector, for data transmission to upstream PCs or equipments; the data rate of the network port is 10/100Mbps;

4 -Antenna port 1;

5 - Antenna port 2.

Each antenna port must be connected to an antenna before the Reader is power on. A load of 50Ω must be connected to the ports without antennas, otherwise the Reader will be damaged once power on.

4.2.3 Upper Panel

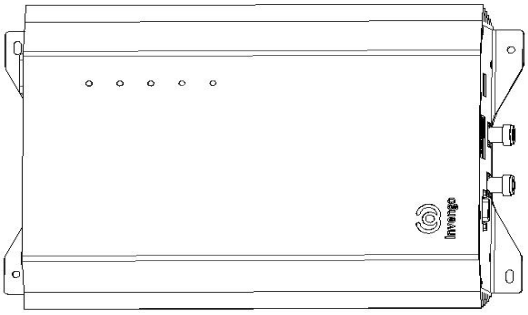

Fig. 4.5 Illustration of the Upper Panel of XCRF-502E Reader

4.2.4 Bottom Panel

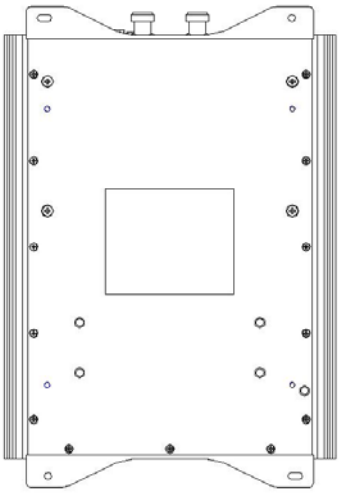

Fig. 4.6 Illustration of the Bottom Panel of XCRF-502E Reader

The bottom panel has 4 ports for mounting plates which are for the installation of the Reader to be wall installed with two mounting plates.

A nameplate is mounted on the bottom panel.

4.3 Internal Structure and Modules

4.3.1 RF Unit

- Receive the tag signals from the baseband unit and modulate microwaves, amplify the modulated microwaves and transmit them through a specified antenna with an electronic switch;
- Receive the signals feedback by the tags for compared output after modulation and amplification;
- Adjust the output powers and frequencies of the antenna ports according to the instructions from the baseband unit.

4.3.2 Baseband Unit

- Receive the control instructions and data sent by the PC via the RS-232 or network port, or send data and implementation results to the PC;
- Send tag control signals to the RF unit;
- Receive the tag data signals that the RF unit feedbacks for decoding and check;

- Modify and query the configuration information of the Reader by the instructions from the PC.

4.3.3 Power Unit

- Transform AC input voltage into DC output voltage, to provide DC power to the Reader.

No internal UPS power supply is provided to this device.

4.3.4 Data Interface Unit

- Connect the RS-232, Ethernet port and power port of the Reader to the panel of the cabinet via a standard patch plug.

4.3.5 Cabinet

- The cabinet uses aluminum alloy sections with exterior protective layer of oxide metal.

4.4 Auxiliaries

As mentioned before, a complete RFID data collecting system is comprised of the Reader, electronic tags, antennas, PC and Reader interface software, and the specific requirements on the auxiliaries are as follows.

4.4.1 PC

The minimum PC requirements:

- 9-pin RS-232 serial port;
- Windows 98/2000/XP with stable performance;

4.4.2 RF Cable

The requirements on RF cables:

- Maximum length: 10m;
- Impedance: 50Ω.

An excessive RF cable will cause attenuation of transmitted signals, and the attenuation of received echo signals will also be augmented, which will therefore reduce the distance of read and write.

4.4.3 Reader Port Software

- API dynamic link library for XCRF-502E Reader;
- Demo software for XCRF-502E Reader.

See the *Technical Reference Handbook to XCRF-502E Reader* and the *User's Manual to Demo Software for XCRF-502E Reader* for details.

4.4.4 Antenna

The XCAF-11L and XCAF-12L antennas produced by Invengo Information Technology Co., Ltd. are recommended.The XCAF-11L

model is the linear polarization antenna and XCAF-12L model is the circular polarization antenna.

In addition, a wide range of options is also available, and that the antennas you use can be compatible to XCRF-502E Reader if they conform to the following standards:

- Impedance: 50Ω;
- Working frequency: 902MHz to 928MHz;

4.4.5 Communication Cable

There are 3 communication modes between the Reader and a PC: the network port, the serial port and the USB port. The requirements on the network cable and the serial port cable are as follows:

- Network cable: less than 10m.There are different requirements on the network cables connecting to a switch and directly to the PC. A through line is required for the connection with a switch; while a cross wire is required for the connection with the PC.
- Serial port cable: Cross wire of less than 5m.

5 Installation and Commissioning

Please carefully read this chapter before installing XCRF-502E Reader.

5.1 Installation Precautions

The following preparations must be done before installation and operation of XCRF-502E Reader, in order to guarantee personal and property safety.

 Check the performance of the power supply outlet and whether the power voltage of the local power supply conforms to the voltage range of the Reader.

 Ensure the device to be grounded!

 The installation location must be damp proof and have sunscreen, and be well-ventilated;

 The distances between the devices and the system (e.g. the reader and the antennas, the Reader and the PC, and the Reader and the power outlet) must be measured and estimated;

 Check whether the installation locations and directions of the Reader and the antennas have signal interference to information exchange between the Reader and the electronic tags;

 Be careful of the length limits to the serial port cable and the network cable (through line and cross wire) and the selection of them;

 The device must undergo status test before installation and operation;

When multiple/intensive readers are installed, be careful of the layout and the minimum distance between antennas for the several readers, in order to avoid interference.

5.2 Installation Conditions

Before installing XCRF-502E Reader, please carefully check whether the product is in good condition, and whether the accessories are complete; please timely contact local suppliers for replacement, if any damage or shortage. In addition, check whether the following installation conditions are satisfied:

- Conform to the standards of working environment;
- Required accessories are complete and meet the specified standards, and able to constitute a complete application environment for the Reader.

5.2.1 Choose an Installation Location

XCRF-502E Reader can be installed either on desktop or wall mounted, to adapt to specific application environments.

Its installation location is subject to the way of installation. Appropriate locations must be chosen according to different installation methods. Generally, the Reader must be installed in a place safe and convenient for operation.

⚠ The minimum safety distance to potential positions with human activity must be first considered at the time of installing the antennas.

5.2.2 Check the Working Settings

If the network communication mode was chosen, set the network parameters via the serial port and check if there is any mistake before installation (No collision between IP and other devices in the same network segment).

5.3 Network Setting

How to complete XCRF-502E Reader's Ethernet connection and settings is introduced in this section.

TCP/IP protocol is followed in the network settings of XCRF-502E Reader.The network settings of XCRF-502E Reader is configured via demo software. See the operation introductions of Demo Software for XCRF-502E Reader in the following chapters.

5.3.1 Communication Mode Setting

Click the icon "XCRF-502E Series Reader Demo" at the directory of installation, and run the software directly.The display interface of Demo Software is illustrated in Fig. 5.1:

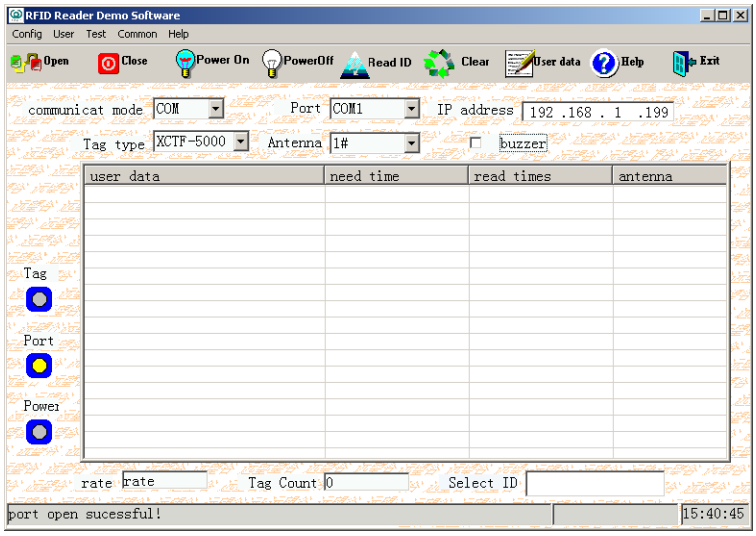

Fig. 5.1 Main Screen of Demo Software

Two communication modes are provided for this system:

- Network port: TCP;
- Serial port: COM;

To set the communication mode, click the folded box "Communication Port", as illustrated in Fig. 5.2:

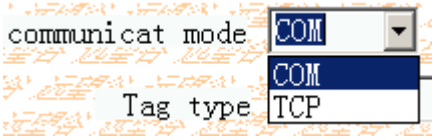

Fig. 5.2 Selection of Communication Mode

5.3.2 IP Search

The main display interface of demo software will display the current IP of the Reader after successfully clicking the “Connect”; after “successfully connected”, click “Function”>“Query the Reader’s parameters” and the current IP of the Reader will be searched.

5.3.3 IP Address Setting

Search IP to check whether the Reader’s IP address has been set, before IP address setting.

1. Select “TCP” in the communication mode, if the Reader’s IP address has been set.As illustrated in Fig. 5.3;

Fig. 5.3 IP Address Setting

2. Follow the procedure below to set the Reader’s IP address, if it hasn’t been set:

1） Connect the Communication Port

Connect the serial port of the Reader and the serial port of the host via a communication cable. Select “Communication port” as the port mode, as illustrated in Fig. 5.4:

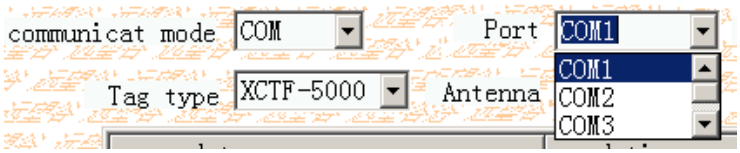

Fig. 5.4 Selection of Serial Port for the Communication Mode

2） IP Address Configuration

Select “Configuration”->“Configuration of the Reader’s parameters”, and set the Reader’s IP address in the pop-up dialog box “Configuration of the Reader’s parameters”, as illustrated in Fig. 5.5:

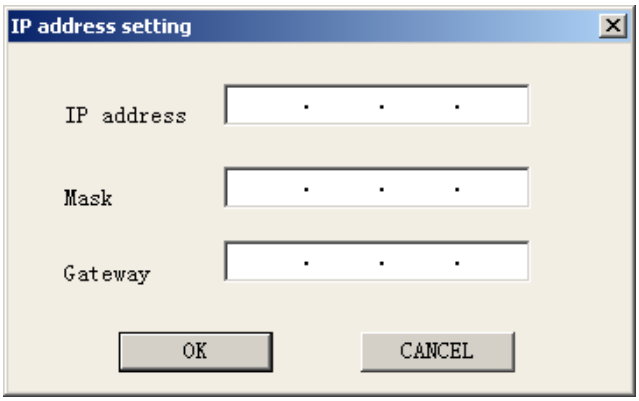

Fig. 5.5 IP Address Configuration

Click “Configuration” to close the dialog box.

Reset the IP address with TCP connected according to the same steps above.

If the network connection will be successful, the domain name of the set IP address must be identical to that of the host (the Reader’s default IP address is: 192.168.0.210).

3） Restart the Device

Turn off your Reader. And then turn on the power supply to restart the device.

4） Select the “Communication Mode”

Select the network port mode of “TCP” in the “Communication mode”.

Fig. 5.6 Selection of Network Port Mode

5） Open the Reader’s port, to check whether the connection is “OK”.

Click “Connect”; the indicator lamp of “Connect” status will be yellow if the connection is successful and relevant notice will appear in case of failure.

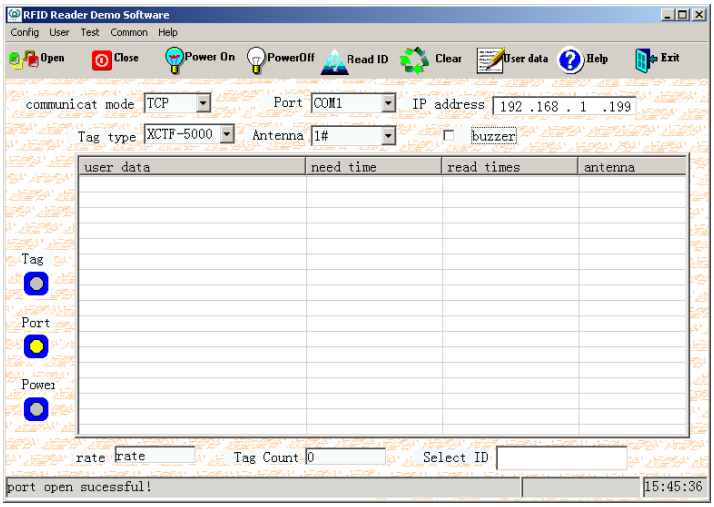

Fig. 5.7 Illustration of XCRF-502E Reader Creating Connection

The IP address must be identical to the actual IP address of the Reader, when opened with the network port; additionally, the network

connection will be successful if the domain name of the host must be identical to the IP address.

5.4 Installation step

5.4.1 Fixing XCRF-502E Reader

There are following fixing methods, depending on the different installation locations:

1. Desktop Installation

In this way, XCRF-502E Reader will be horizontally put on a desktop.

2. Wall Mounted Installation

Fix XCRF-502E Reader on a vertical surface with its 4 installation ports on the projections of its bottom plate. The fixing method: insert expansion bolts into a vertical surface (a wall or side face of a rainproof box) or fix the Reader with bolts and nuts.

5.4.2 Connections to Other Devices

Connect the Reader to antennas and PC.

1. Connection to External Antennas

The 2 N-type ports for coaxial cable are provided on the Back Panel of XCRF-502E Reader, in order to connect the Reader to external antennas.Low-loss RF cable is used as the connection cable. Tightened connections are required among cable, antenna and the Reader.

2. Installation of External Antennas

The external antennas of XCRF-502E Reader are usually installed outdoors. The beam coverage is the effective range of reading and writing electronic tags by the system.

Dependent on the specific application requirements on the site, the external antennas of the Reader can be installed in a horizontal top-loading way (the gantry of a vehicle channel) or a vertical side-loading way (pillar mounted). Adjust the antennas' inclination or striking angle to the best status through read/write test.

Antennas of various specifications can be configured to XCRF-502E Reader according to application requirements.

Linear polarization antennas are usually recommended for XCRF-502E Reader (to avoid antenna loss). During installation, be careful of polarization matching of the Reader's antennas and the electronic tags' antennas; otherwise the read/write distance of the Reader to the electronic tags will be seriously influenced.

3. Connection to the PC

XCRF-502E Reader has two connection modes: serial port RS-232 and Ethernet port.

The serial port is used for a short-distance connection (less than 5m), while the RS-232 serial port is used for a direct connection to the serial port of PC via special cables.

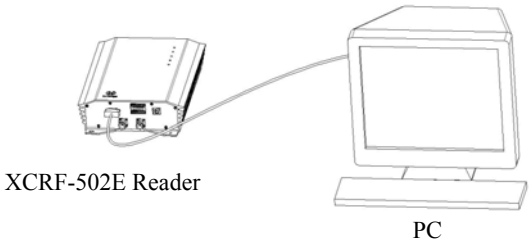

Fig. 5.8 Connection of XCRF-502E Reader to PC via Serial Port

XCRF-502E Reader includes a RS-232 special cable of 1.5m in its basic configuration.

The connection between XCRF-502E Reader and the RS-232 special cable is as shown in Fig. 5.9.

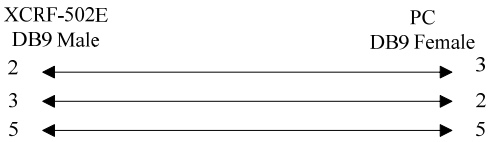

Fig. 5.9 Connection between XCRF-502E Reader and RS-232 Special Cable

The network port is used for a long-distance high-speed connection (100m). The network port can be related with the switch or the concentrator via the network cable, or directly connected to the network port of PC.

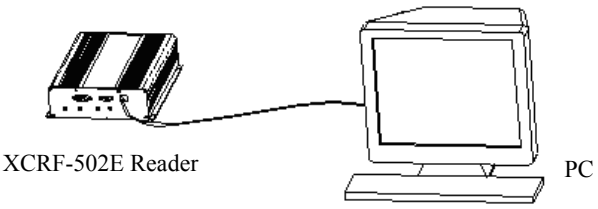

Fig. 5.10 Connection of XCRF-502E Reader to the PC via Serial Port

5.4.3 External AC Power

Please put through XCRF-502E Reader's external AC power by the following steps.

1. Make sure that the AC power's voltage and working frequency conform to the requirements: AC100V to 240V or 50Hz to 60Hz;

2. Make sure that XCRF-502E Reader's switch is at the Off position;

3. Insert a power cable into the AC power's outlet, and then insert its another end into XCRF-502E Reader's 3-core AC power input port;

4. Turn on the power switch on XCRF-502E Reader's front panel; the POWER indicator lamp will be turned on after the Reader gives off a sound notice, which indicates that the Reader is initializing; after the initialization, the Reader is standing by.

In its default status, XCRF-502E Reader will maintain the standby status after power on.The Reader has no power emission in initializing or standby status (RF power amplifier is off); the Reader will be in the working status only if it is connected to an antenna or a load and receives the instruction “Read and Write Tag” or “Power Amplifier On” from the PC.

The Reader will be damaged if the power amplifier is turned on without a connected antenna or with a dummy load.

5.4.4 Antenna Configuration

The Reader’s read/write range can be preliminarily confirmed according to the site application. Choose an installation location of an antenna, fix it, and adjust its inclination (striking) angle with XCRF-502E Reader’s read tag test, to make the read distance at the best status.

Finally, fix the antenna’s installation location and inclination (striking) angle.

5.5 Tests of the Reader

The test of XCRF-502E Reader includes: read tag, write tag, read distance, write distance, test of read tag information and test of write tag information.

5.5.1 Read Tag

1. Read Single Tag

The test includes read ID of a tag, read partial data of a specified electronic tag's memory, and read all the data of a specified electronic tag's memory.

2. Read Multiple Tag

The test includes read ID of multiple electronic tags, and read the data of multiple specified electronic tags' memories.

5.5.2 Write Tag

1. Write Single Tag

Read a tag's ID, update the data at specified position of an electronic tag's memory, update all the data of an electronic tag's memory, and test write-protect.

2. Write Multiple Tag

Read multiple tags' ID, update the data at specified positions of multiple electronic tags' memories, update all the data of multiple electronic tags' memories, and test write-protect.

5.5.3 Read Distance

Use test of read single tag to test a single tag's read range, and help adjust the installation location and inclination (striking) angle the Reader's antenna. The test of read distance can be performed either from the near to the distant, or from the distant to the near.

5.5.4 Write Distance

It is usually performed after the test of read tag, with the test of write single tag from the distant to the near.

5.6 Test of Read Tag Information

It can be performed through the "XCRF-502E Demo".

5.7 Test of Write Tag Information

It can be performed through the "XCRF-502E Demo".

5.8 Common Faults in Commissioning

The common faults in commissioning are described in detail in this section, especially the general faults resulted from incorrect or inaccurate installation, and the solutions.

The common faults in commissioning are as follows:

- The Reader has no response

☆ Indicator lamps off → check the power supply;

☆ The indicator lamp for power supply is on → check related cable connections, and check corresponding items by the relevant indicator lamps' status;

☆ In network port communication status → check whether the connected IP is correct; and check whether any collision to the IP address;

☆ Serial port connection → whether the application software's ports and communication rates are correctly set;

☆ Whether the antenna number settings are correct.

- Read/write tag error
- ☆ Check whether the application software's Reader type configuration is correct;
- ☆ Whether the Reader is compatible to the tags;
- ☆ Check the positions of the tags, and whether the tags are within the Reader's effective read/write range;
- ☆ Whether there is electromagnetic interference between Readers or other devices;
- ☆ Whether the tags are damaged.
- The read/write range fails to satisfy the requirements:
- ☆ The installations and directions of the antennas;
- ☆Whether any interfering matter exists in the surroundings.

5.9 Acceptance

The acceptance standards mainly focus on two aspects: structure and performance.

5.9.1 Structure

Check whether the installation conforms to the corresponding requirements, and whether the connections among the devices are OK.

- Whether the Reader is fixed and not loose;
- Whether all the cables are tightly connected and fixed;
- Whether the screws are tightened.

See Installation Precautions for other information.

5.9.2 Performance

Whether the Reader works normally depends on two aspects:

1. Prepare some 6B tags, and connect the antenna, power cable, network cable and cross serial port cable to the Reader;
2. After the Reader is power on, the power supply indicator lamp is on and the buzzer gives off two sounds;
3. Connect Demo Software to the Reader via network port or serial port to use the software.
4. Select “Read card continuously”; the tag ID will be read continuously in the range of 5 to 7m right in front of the antenna with the time intervals of 30ms;
5. Power supply lamp, power amplifier lamp, read card lamp and antenna lamp will give correct indications when reading card or implementing other operations.
6. Read data and write data to the tags correctly;

7. Correctly implement the IP settings, temperature and humidity test, buzzer control, frequency hopping control, antenna test and IO control.
8. If the several requirements are successfully realized then the Reader is qualified to be accepted.

6 Operation Instructions

6.1 Preparation and Check before Operation

Demo Software mainly demonstrates XCRF-502E Reader's system control, parameter settings, parameters query, communication mode selection, read RF tags, and display.

6.2 Application Environment of Demo Software.

- Software environment

Windows9x, Windows2000, Windows XP

- Hardware environment

PC with P4/1.7GHz CPU, and a minimum of 128M.

6.3 Start Method of Demo Software

First, copy the file named "setup" of the CD to any harddisk directory of the PC.

1. Software Installation

Click the application program of "setup"

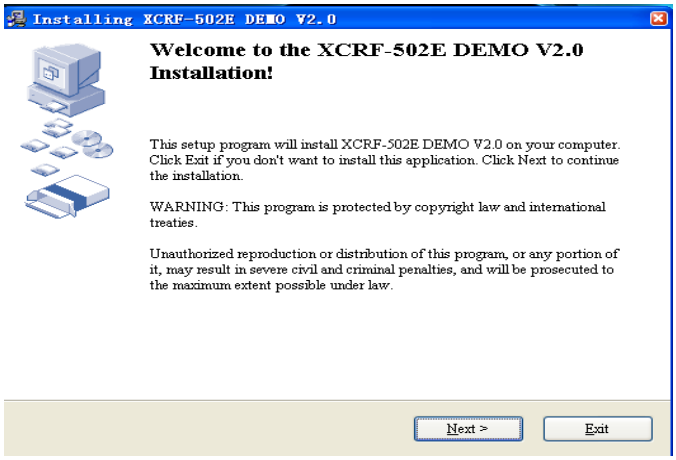

Fig. 6.1 Installation Step 1

Click "Next"

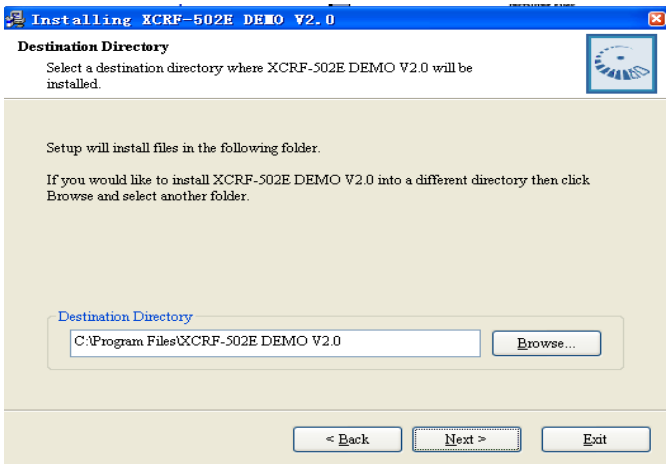

Fig. 6.2 Installation Step 2

Select the installation path and click “next”

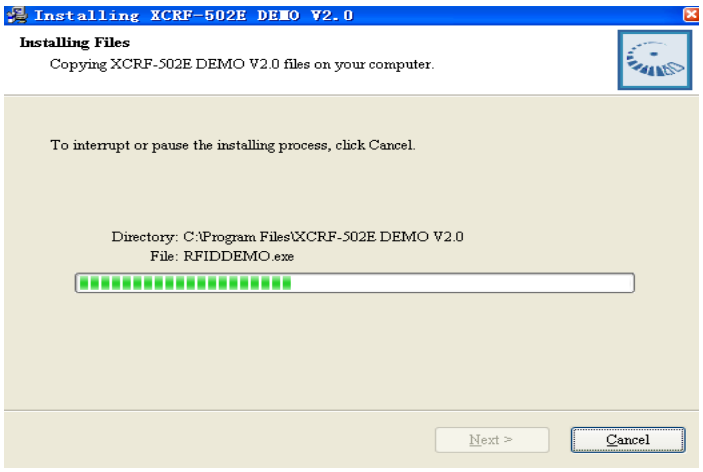

Fig. 6.3 Installation Step 3

The next step will be automatically run.

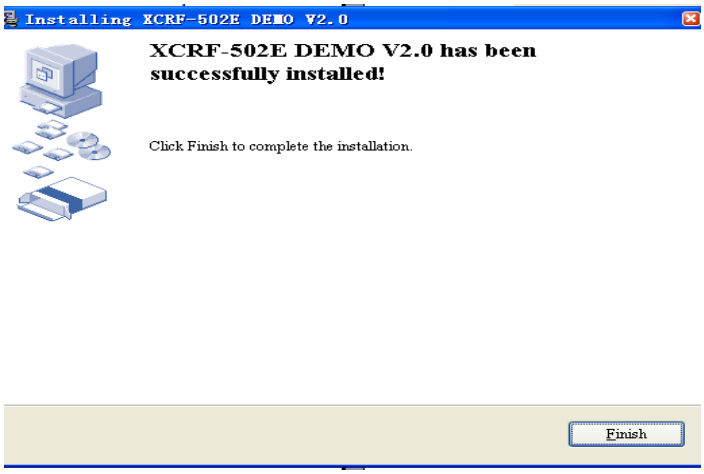

Fig. 6.4 Installation Step 4

Click “Finish” to complete the installation.

2. Software Operation

Click the icon “XCRF-502E DEMO V2.0 .exe” in the installation directory to run the software directly.

6.4 Resource Kits of Demo Software for XCRF-502E Reader

The installation directory contains the executable program, and the dynamic link library of API interface functions (including XCRF502EAPI.dll, XCRF502EAPI.Lib, and XCRF502EAPI.h).

6.5 Help and Version Information of Demo Software

1. Help

Click “Help”->“Content” to pop up the Online Help information of the software. As illustrated in Fig. 4.18:

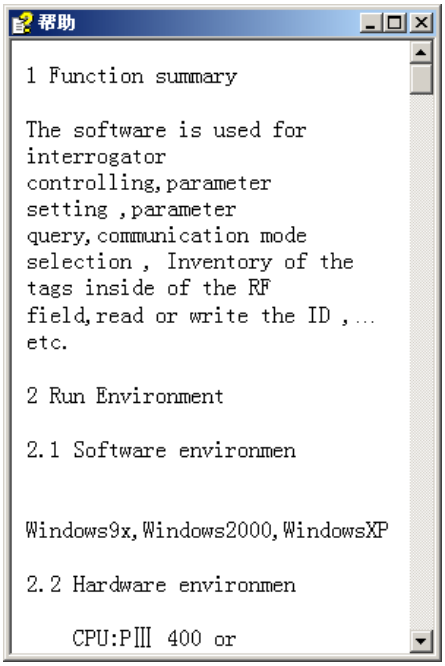

Fig. 6.5 Help Information for Demo Software

2. Version information

Click "Help"->"About" to view the version information about Demo Software. As illustrated in Fig. 4.19:

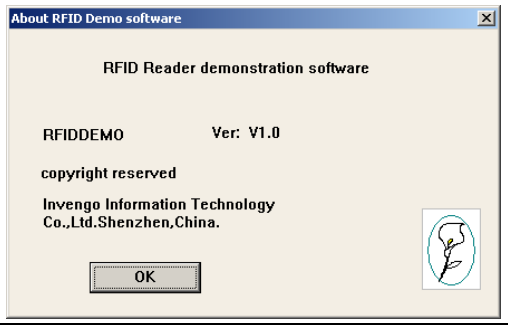

Fig. 6.6 Relevant Information for Demo Software

6.6 Upgrading Demo Software

Please visit Invengo's website for relevant information about upgrading the Reader's demo software and other issues.

6.7 Setting Multiple Readers Operation

As illustrated in Fig. 6.33, if two or more Readers work in close proximity to each other, the following two instructions must be followed during installation and commissioning, so as to eliminate interference to each other.

1 The minimum distance between centers of the antennas of two adjacent readers should be 3m;

2 The operating frequencies of two adjacent readers must be respectively set as "Default A" and "Default B".

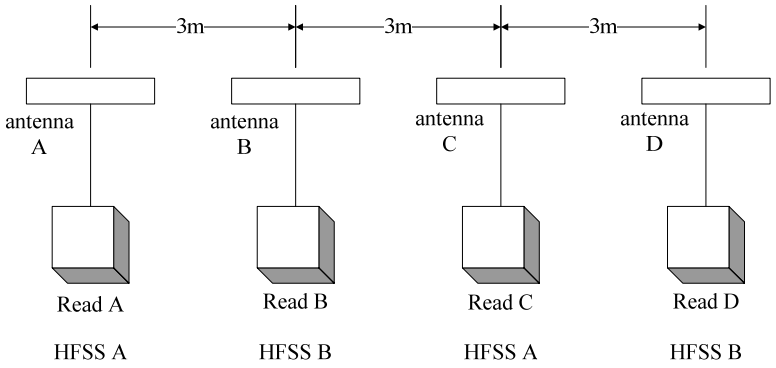

Fig. 6.7 Working Environment Layout of Multiple Readers

7 Routine Maintenance and Repair

7.1 Routine Maintenance

Follow the requirements on storage.

7.2 Common Faults and Troubleshooting

The solutions to the abnormal situations during using XCRF-502 E reader are mainly introduced here.

- "POWER" indicator lamp on the front panel is off when the Power is on

☆ Fault in the power supply system: Check whether the AC power supply is OK, and whether the AC power voltage is in the range of 100V to 240V;

☆ If other indicator lamps are on, a failure happens to the DSP inside; users must contact Invengo for repair if a failure in DSP occurs;

- Network port connection failure
- ☆ The default IP address is 192.168.0.210. If the PC's IP address and the Reader's IP address (e.g.) are of one segment network, the connection between the Reader and PC can be established. If the Reader's IP address is forgotten, reset the Reader's IP address on the PC with RS-232 serial port.

- Network port connection failure

- The Baud rate of the Reader is 115200bps; whether the XC_BaudRate value of the file named “sysit.cfg” is 115200 at the installation directory.

- ☆ Whether the selected COM port conforms to the connection of the Reader and PC.

- ☆ Whether the serial port cable is correctly connected, as disconnection or loose connection may disable the instructions from the PC to reach the Reader.

- Unable to Read Card

☆ Whether the serial port cable or network cable is correctly connected, as disconnection or loose connection may disable the instructions from the PC to reach the Reader.

☆ Please check whether the antenna’s connector is tightened and whether the tag is damaged. Or the users can only contact Invengo for repair if a failure in DSP occursPlease contact Invengo for repair if your problem can’t be solved by yourself; see After-sale Service Information for details.**RF Communication Optimization**

Usually, devices using radio technology for communication are sensitive to signal interference and attenuation. This chapter gives some advice on the RF communication optimization between XCRF-502E Reader and the electronic tags.

7.3.1 Signal Interference

Signal interference is the RF signals causing interference during the information exchange between the Reader and the electronic tags. Signal interference can seriously weaken the Reader's capacity of reading the data of the electronic tags.

The sources of interfering signals can be:

- RF systems, such as RF local-area network, and adjacent interactive identification system;
- The RF signals from safety gates, garage doors and other devices;
- Other RF radiation sources.

These interfering sources' impact can be diminished or neutralized by adjusting the installation locations of the Reader and the antennas.

The Reader system's performance (exchanging data information with electronic tags) will be greatly weakened if RF interference or noises exist. At any time, the Reader can only "receive" one signal, unable to distinguish unexpected "noises" and expected "useful RF signals".

7.3.2 Signal Attenuation/Reflex

Signal attenuation is the natural attenuation of signal strength occurring with distance, and the attenuation of signal strength caused by barriers in its transmission path.

The following are the factors that may become a barrier for the transmission of RF signals:

- Closed spaces with cement walls, floors and ceilings;
- Metallic surface surrounding antennas or tags;
- Water or other liquids surrounding antennas or tags;

Nearly all the objects (furniture or partition) on the transmission path of RF signals will cause attenuation in varied degrees. The RF signal attenuation caused by barriers can be diminished to the minimum extent by carefully adjusting the installation locations of the antennas.

The reflex caused by the metallic or metalized surfaces on the back of the electronic tags can also impact signal attenuation. In some cases, such impact can slightly extend the read distance, while form some blind angles within the read area. The commutation performance between the electronic tags and the Reader will become significantly deteriorated, if the tags are on such positions.

7.3.3 Optimization of System Performances

It is usually impossible to precisely predict the Reader system's performance under randomly specified circumstances (that's because of the complexity of electromagnetic radiation, including frequency stability of the signal sources, the direction layout of the antennas, the side lobes, and the surrounding environments). However, the

suggestions given below are helpful to the system performance optimization in specific environments and applications.

- Carefully design and install the Reader's antennas. The standard length of the RF cable between the Reader and the antennas is set as 10m. An excessive RF cable will cause attenuation of transmitted signals, and the attenuation of received echo signals will also be augmented, which will therefore reduce the distance of read and write.
- Any change to the connection of the antennas and the models of the antennas will greatly impact the system performance.
- Consider the RF features of the environment, including the construction materials, office hours, and the configurations of the windows and the pipes. The mode and read distance of the RF field may be influenced by adjacent metal objects, such as home appliances, devices and metal frameworks.
- Make sure that the object to be identified by the electronic tags stays no less than 10ms in the effective read area of the Reader.
- The Reader antennas' directions of polarization must be identical to that of the electronic tags' antennas (linear polarization); the electronic tags can find the minimum and maximum read distances by rotating them by 90°, when the linear polarization is used.

- Facing the Reader antennas, the electronic tags can be rotated by 360° in a same plane without influencing the read distance, when the Reader antennas use circular polarization.
- When the plane of the electronic tags is vertical to that of the Reader antennas, neither polarization mode can enable the Reader antennas to have communication with the electronic tags.
- The optimal antenna length of the electronic tags is subject to the non-conductor materials into which they are encapsulated or embedded. The basic concept is: for an electronic tag embedded into non-conductor (whose dielectric constant is usually larger than the dielectric constant in the air, therefore the effective wave length in the medium is shorter than that in the air), if its effective electric length is adjusted to the optimal in the air (its matching read distance to the Reader is farthest), so the tag antenna' electric length must be adjusted to shortening, so as to realize the optimal performance as that in the air, when it is placed in non-conductor or on substrate; contrarily; the electric length must be adjusted to extending, if the effective electric length is adjusted to the optimal in the non-conductor.
- In order to avoid interactive interference of multiple electronic tags installed on the same object, there must be

enough distance between two tags installed on a same object. The interactive interference among several electric tags occurs when their separation distances are less than 10cm and they are equidistant to the antennas.

- Don't expose the electronic tags not encapsulated to chemicals. Some chemicals, like alcohol, have slight influence on the electronic tags at ordinary temperatures, whereas they will be corrosive to certain extent when the temperature rises.

8 Transportation and Storage

8.1 Requirements on Transportation

XCRF-502E Reader satisfies the requirements specified in relevant standards on road, railway, air and water transportation.

Precautions during the transportation: make sure the violent collision, exposure to rain, erosion of the corrosive chemicals and harmful gases must be avoided.

8.2 Requirements on Storage

The warehouse for long-term storage of XCRF-502E Reader must satisfy the following conditions:

- Ambient temperature:-20℃ to +40℃；
- Relative humidity: not greater than 80%;

- No radical temperature change, and no acid and other harmful gases in the surrounding atmosphere.

9 Packing and Unpacking Inspection

9.1 Packing

XCRF-502E Reader is packed with a color box, and suitable for large transportation turnover tank.

9.2 Unpacking

Please keep the package and the packing materials in good condition after unpacking, for future storage and transportation.

The accessories for the product's operation, as well as XCRF-502E Reader, are contained in the package; the details are as follows:

Table 9.1 The packing list

S/N	Description	Unit	Quantity	Remarks
1	XCRF-502E cabinet	Set	One	
2	3-core power cable(1.8m)	Piece	One	
3	Serial port communication cable (1.5m)	Piece	One	
4	RJ45 cross network	Pie	One	

	cable (1.5m)	ce		
5	CD-ROM	She et	One	
6	Warranty Card	She et	One	
7	Certificate of Qualification	She et	One	
8	Quick Guide	Cop y	One	

Please check whether the product and the accessories are complete by the packing list, and contact us in time if any inconsistency or damage.

10 After-sale Service and Contact Information

10.1 After-sale Service

Please contact our customer service center if your problem arising in using this Reader can't be solved.

Please record the following information, before you contact our customer service center:

10.1.1 The Reader

- The model of the Reader;
- The Reader's S/N (on the bottom of the Reader);
- Any modification to the Reader or the tags;
- The Reader's installation location;
- The application software for the Reader;

10.1.2 PC

- Brand and model of the PC;
- CPU's processing rate and RAM available;
- The COM port used;
- The information of the operation system (OS);

10.2 Contact Information

Shenzhen Invengo Information Technology Co., Ltd.
Add: 3/F, Building T2-B, South Zone, Shenzhen Hi-tech Industrial Park
Postal code: 518057
Tel: 0755-26711686 26711633
Fax: 0755-26711693
URL: http://www.invengo.cn
E-mail: sales@ invengo.cn
South China: 0755-26711695 East China: 0755-26711689
Central China: 0755-26711690 Northwest China: 0755-26711689

Lanzhou Yuanwang Information Technology Co., Ltd
地址：Add: No. 575 Zhangsutan, Hi-tech Industrial Park, Lanzhou, Gansu Province
Postal code: 730020
Tel: 0931-8555791
Fax: 0931-8555782
E-mail: ywit@yuanwanggu.com.cn

Wuhan Yuanwang Information Technology Co., Ltd
Add: 2/F, Building E, Qingshan High-tech Center for Innovation and Entrepreneurship, Yejin Avenue, Qingshan District, Wuhan City, Hubei Province
Postal code: 430080
Tel: 027-86804766
Fax: 027-86804767
E-mail: sales01@ invengo.cn

Zhuhai Yuanwang Information Technology Co.,Ltd
Add: Room A-105, No. 6 Building, Nanfang Software Park, Gangwan Avenue, Zhuhai City, Guangdong Province
Postal code: 519085

Tel: 0756-3394258
Fax: 0756-3394158
E-mail:

Ningbo Yuanwang Information Technology Co.,Ltd
Add: 5-12 Room, Building of Center for Innovation and Entrepreneurship, Yongcheng Technology Park, Ningbo City, Zhejiang Province
Postal code: 315040
Tel: 0574-87912085
Fax: 0574-87912182
E-mail:

Shenzhen Invengo Information Technology Co., Ltd. (Singapore Office)
Add: #03-03, Creative Resource Building, No. 31, International Business Park, Singapore
Postal code: 609921
Tel: (65) 67960366
Fax: (65) 67960364
E-mail: singapore@ invengo.cn

(US Subsidiary)
Invengo Technology Corp.
Address: 12801 Worldgate Drive, Suite 500 Herndon, VA 20170 U.S.A
Tel: 1 703 793 0085
Fax: 1 703 871 3901
E-mail: america@ invengo.cn

10.3 Other Issues

If our customer service personnel decides that you need to return the Reader for repair, our customer service representative will give you a Return Merchandise Authorization (RMA). Please write this number on the surface of the package for the product to be returned, and put a

note with this number into the package, so as to make sure the returned product will be processed in time.

Please follow the steps below to return the Reader for repair:

- Carefully pack the Reader and its accessories and put them into the original antistatic foam package; Please find a package that has protective measures, if the original package is unavailable;
- Cover the items in the package with filling materials;
- Put a note with your RMA number into the package;
- Write the RMA number and “Fragile” on the surface of the package.

Chinese Customer Service Hotline: 800-891-0036