Invengo

User's Manual

XC2600 Handheld Reader

Invengo Information Technology Co., Ltd.

Welcome to be a user of the Invengo RFID products.

We appreciate that you choose the XC2600 handheld reader, hope our devices will facilitate your experience!

Foreword

XC2600 Handheld Reader

This manual provides information on product application, maintenance, repair and other features for users and maintenance personnel of the products.

All introduction and descriptions written in this manual, in respect of the product's features, functions and other relevant information, are the latest. All information provided is accurate during the time of printing. The company retains all rights to make any correction or amendment to this manual without prior notice and shall bear no responsibility for these actions.

Some of the product functions may vary due to different configuration upon special requests from client.

Safety Instructions

⚠️ **Warning sign**

If operate improperly, it may result in damage to your equipment(s).

ℹ️ **Attention**

If ignored, it may result in unsuccessful operation
If ignored, it may cause undesirable effect

Content

1. Product overview

1.1 Introduction to XC2600

Thank you for using XC2600, our company's latest model of handheld reader. XC2600 is legerity in shape, easy to use and suitable for various applications. XC2600 can coordinate with terminal devices which are equipped with Bluetooth module. Terminal types such as Android mobile, Android tablet and other types of equipment can be flexible according to the specific application of choice. XC2600 supports RFID and barcode functions.
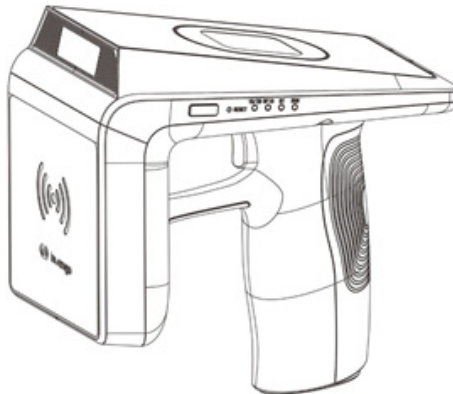
Figure 1 XC2600 Handheld Reader

1.2 Main Usage and Applications

XC2600 has flexible usages and can be operated in various fields, such as retail management, assets management, warehouse management, transportation management and commodity anti-counterfeiting, etc.

1.3 Operating Conditions

XC2600 needs the following operating conditions:

Temperature range: -10℃ – 60℃

Storage temperature: -20℃ - +70℃

Operating humidity: 5% RH – 95% RH, non-condensing

Storage humidity: 5% RH – 95% RH, non-condensing

1.4 Safety and Protective Measures

Please refer to the following important statement before use!

When this reader is operating (emitting microwave), avoid aiming at human or livestock for a long time.

Any radio transmitting equipment, including this equipment, may cause interference with medical equipment that is not properly protected. Should any problem occur, in respect of the aforementioned, please consult your medical equipment manufacturer. The operation of this equipment may also cause interference with other electronic devices.

2.Performance Parameters

2.1 Main Functions

☐ Support UHF RFID tags reading and writing operations

☐ Support mainstream 1D, 2D barcode reading(Optional)

2.2 Technical Parameter

Table 2-1 Function parameter

Processor	Cortex-M3 processer
Memory	Flash:64MBit EEPROM:256Kbit
Power source	Lithium battery: Standard Removable 5200mAh/3.7 V rechargeable lithium battery AC input: 100V - 240V/50Hz - 60Hz DC output: DC5V/2A Working time: Standby - Not less than 200 hours; operating duration -not less than 8hrs Work Status: Real-time monitoring of battery voltage, remaining battery and charging status

UHF-RFID module	Supported protocols: EPC Global UHF Class 1 Gen 2/ISO 18000-6B/6C Operating frequency: 840MHz—845MHz(CN2) 920MHz—925MHz (CN1) 865MHz—868MHz (EU) 902MHz—928MHz (FCC) Output power: 0-30dBm, stepping 3dB Reading distance: Tag reading: 0~6m, tag writing: 0~3m (depending on the specific configuration) Maximum tag capacity: ☐ Maximum 496 Bits for EPC ☐ Maximum 128 Bits for TID ☐ Maximum 64K Bits for user data
Barcode engine (Optional)	Support code system: ☐ 1D code: Code 128, EAN-13, EAN-8, Code 39, UPC-A, UPC-E, Codabar, Interleaved 2 of 5, ITF-6, ITF-14, ISBN, Code 93, UCC/ EAN-128, GS1 Databar, Matrix 2 of 5, Code 11, Industrial 2 of 5, Standard 2 of 5, Plessey, MSI-Plessey, etc. ☐ 2D code: PDF417, QR Code, Data Matrix(ECC200,E CC000,050,080,100,140, etc.)
BT	BT2.0
Status indication	Lights: ☐ Barcode indicator ☐ RFID module indicator ☐ Bluetooth indicator ☐ System/charge indicator ☐ Buzzer ☐ Sounds indication of equipment operational condition
External ports	USB Type-C power port 5V DC power output port(optional, OFF by default)

Working environment	Temperature range: -10℃ – +60℃
	Storage temperature: -20℃ - +70℃
	Operating humidity: 5% RH – 95% RH, non-condensing
	Storage humidity: 5% RH – 95% RH, non-condensing
	Shock resistance: GB/T 2423.10-2008/IEC 60068 -2 -6:1995; acceleration: 4.9m/s2, Frequency range: 5Hz-100Hz; Drive amplitude (Peak mm) 25/f(f=5Hz-10Hz), 250/f2(f=10Hz-100Hz)

3. Dimension and Weight

3.1 Dimension

The overall dimension of XC2600 is 153.8mm×141.8mm×74mm, as shown in Figure 2.
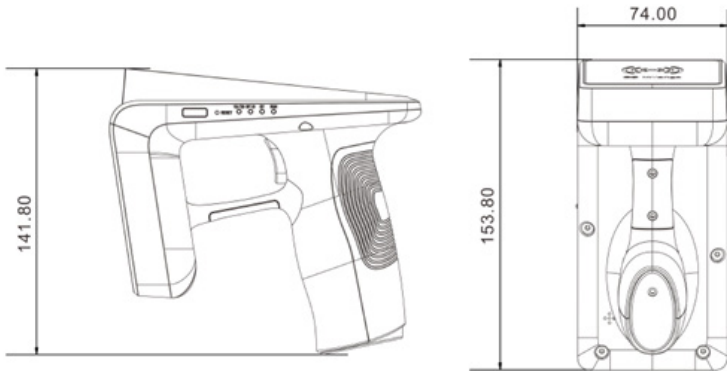

Figure 2 XC2600 size illustration

3.2 Weight

The overall weight of XC2600 is 390g. (Include battery and RFID module but without barcode module).

4. Structural Features and Functions

This chapter describes XC2600's composition, internal structure, functions and interface of respective modules in details.

4.1 Appearance Description

Front view of XC2600 is shown in Figure 3, functions of each part are described as follows.
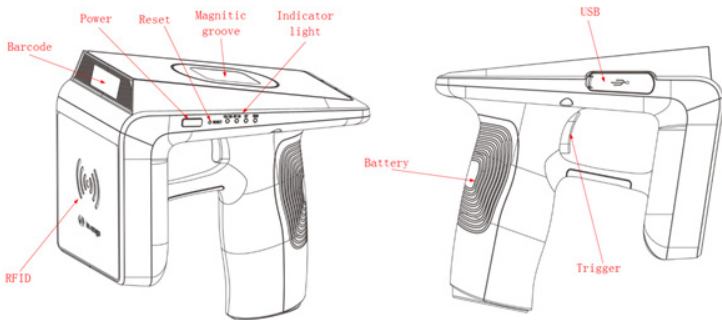
Figure 3 Front view of the reader

RFID Module

Built-in UHF-RFID module, for more information about band and protocol, see the Table 1.

Barcode Module(optional)

Optional module; 1D or 2D barcode module can be selected according to customers' requirements.

Power Button

Can be used for power button, also can be used as a sleep / wake button. Please see figure3 for details

Reset Button

Device forced reset button. Please see figure 3 for details

Magnetic Groove

It is a magnetic groove for smartphone attachment. Take out the sheet iron included in the package and peel off the liner to reveal the adhesive side of sheet iron. Attach the adhesive side of sheet iron to the center of the groove, then attach back of the phone to the groove. Simply remove phone when not in use. The sheet iron and mobile installations are showed in Figure 4.
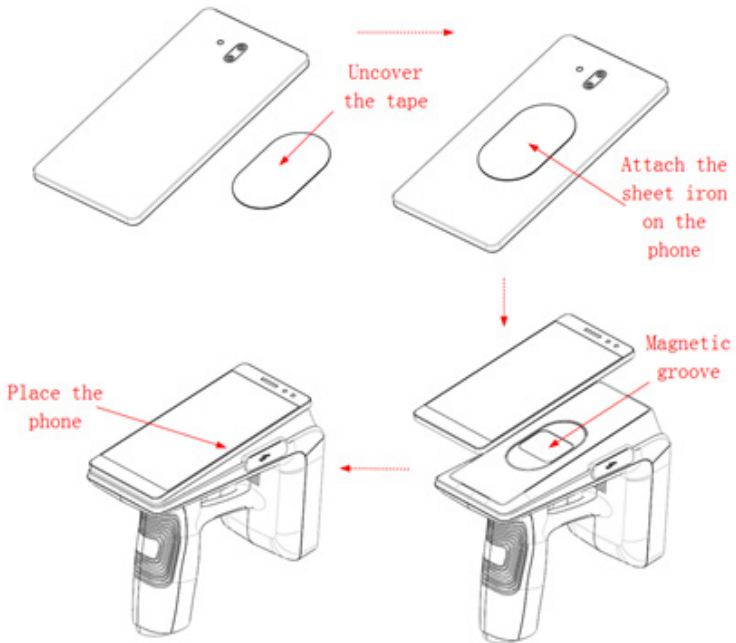
Figure 4 mobile phone installations

Function Indicator Lights

Including Barcode, RFID, Bluetooth and system operating indicator lights. Please see figure 4 for Details

Battery

5200mAh removable battery.

Trigger

RFID or barcode function button, can also be used as standby/wake-up button.

USB Interface

Including USB Type-C charging and communication interface and USB-A power output interface.

4.2 Indicator Lights

□ **1D/2D:** (blue) The indicator light blinks slowly when barcode module is activated; when the barcode module turns off the indicator light switches off.

□ **RFID:** (blue) The indicator light blinks slowly when RFID module is activated, when the RFID module turns off the indicator light switches off.

□ **BT:** (blue) The indicator light blinks slowly when Bluetooth is successfully connected; Off when Bluetooth is unconnected.

□ **RUN:** (red) The indicator light blinks slowly when system operating normally, flashes rapidly when malfunction appears, On when device is being charged.

4.3 Battery Installation and Removal

The battery is placed in the package box when device is in transportation. Please install the battery before use. The following illustration demonstrates the step-by-step installation procedures:

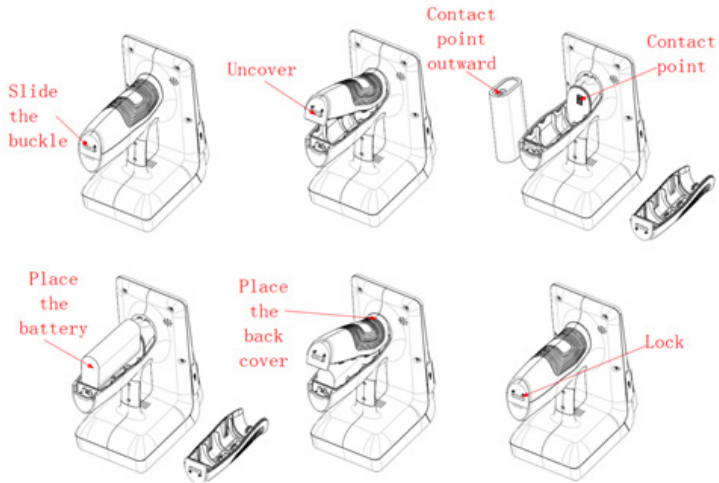(Simply reserve the installation process to remove battery.)

Figure 6 Battery installation step

4.4 Power button Operation

Power button operation includes turn on reader, shutdown, standby, wake reader, restart operation, the specific operation is described as follows:

Turn On Reader

When the device is in off mode, press and hold the power button until the built-in buzzer beeps and the RUN indicator light blinks which means the equipment is successfully start operating. Then release the power button.

Turn Off Reader

When the device in working mode, press and hold the power button until the buzzer beeps, release the power button the system will be shut down completely.

Standby

Briefly press the power button to enter the standby mode when the equipment is operating.

Wake Reader

In standby mode, briefly press the power button or pull the trigger, the equipment will resume and starts operating.

Restart

Softly press the key in the RESET hole with a tool to restart the device.

5.Operating Mode

This equipment can be paired with other Bluetooth-equipped devices via Bluetooth. By using other terminal devices installed with demo application of the XC2600 reader, you can control the device by this Invengo Demo directly. The device may switch into offline mode and work independently when loss the connection with Bluetooth terminal devices temporarily, when the Bluetooth are successfully connected, the local data can be uploaded to the demo software.

5.1 Online Mode

When the device connects with a Bluetooth terminal, it works in Online working mode. Under this mode, you can control equipment working mode with Invengo Demo of the Bluetooth terminal. You can choose mobile phone, tablet computer and other Bluetooth terminals for operating terminals. The APIs for JAVA platform are currently available.

For detailed operation, refer to the Invengo Demo operating instructions of chapter VI.

5.2 Offline Mode

When the Bluetooth connection is not established, it will automatically enter the offline mode. Working data can be stored locally in offline mode. The main features of offline working mode are shown as follows:

☐ Module which was working before offline mode continues

☐ Buzzer works unconditionally

☐ Read data is stored in local memory

You need to set the data saving interval in online mode to ensure the regular operation of the device. The Flash interval is the time interval that working data stored in RAM before writing into Flash, set an appropriate time interval to ensure cached data is not lost. Click "More", then click "Time Interval", insert a value between 1 and 60, then click "Configure", you may also "Query" current parameter by clicking "Query". Please refer to Figure 7 below.
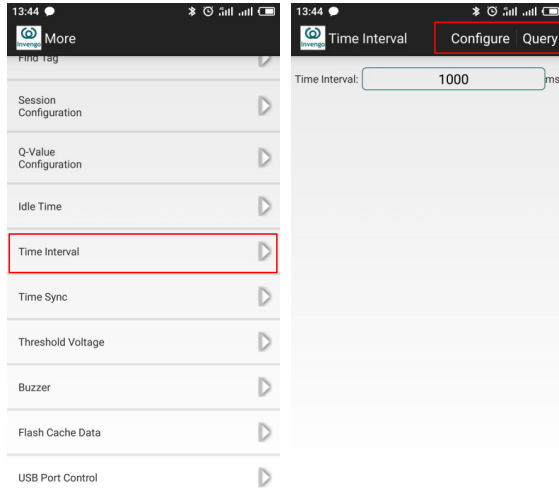
Figure 7 Data save interval setting

The data stored in the local Flash can be uploaded to the background system by connecting to the Bluetooth terminal demo software. Click "**More**" in the menu of the demo software, then click "**Flash Cache Data**", select "**Export**" to download the data cached by the device, as shown in Figure 8.
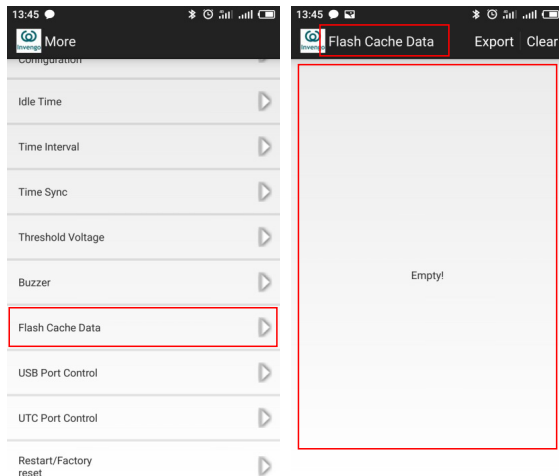
Figure 8 Flash data upload

6.Demo Software Functions and Settings

This equipment can coordinate with Bluetooth terminal, specific functions are implemented by terminal application software.

6.1 Equipment Connection

Bluetooth pairing is required when devices connect for the first time. After pairing, use the Demo to set up connection, as shown in Figure 9.
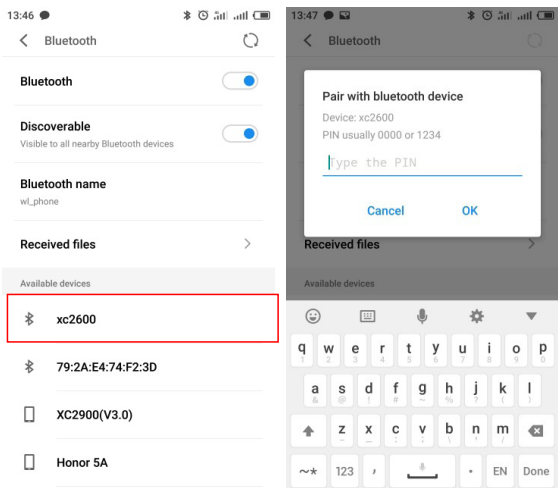
Figure 9 Bluetooth pairing

1) Search for the device you want to connect on a smartphone installed with Bluetooth. (take XC2600 for example)

2) In the pairing interface, enter the pairing password. The default password is 1234. After pairing, start the Demo software, as shown in Figure 10.
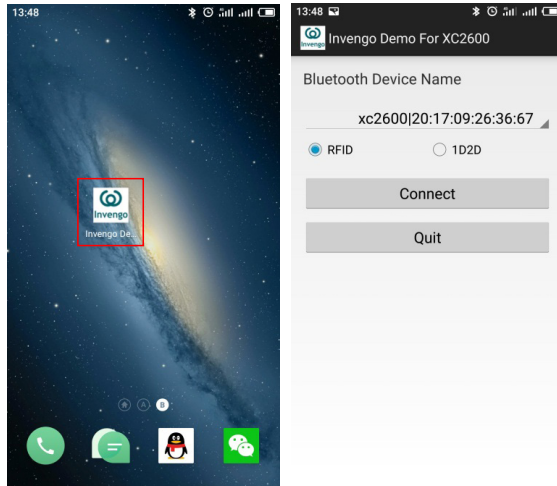
Figure 10 start Demo

6.2 Instructions on RFID Function

RFID function is mandatory, RFID performance and the practical working environment is closely related. Label read distance 0 ~ 6M, write distance 0 ~ 3m, Actual performance is related to the label and the specific configuration of the device.

6.2.1 Start RFID

There are two ways to turn on the RFID function, as shown in Figure 11.
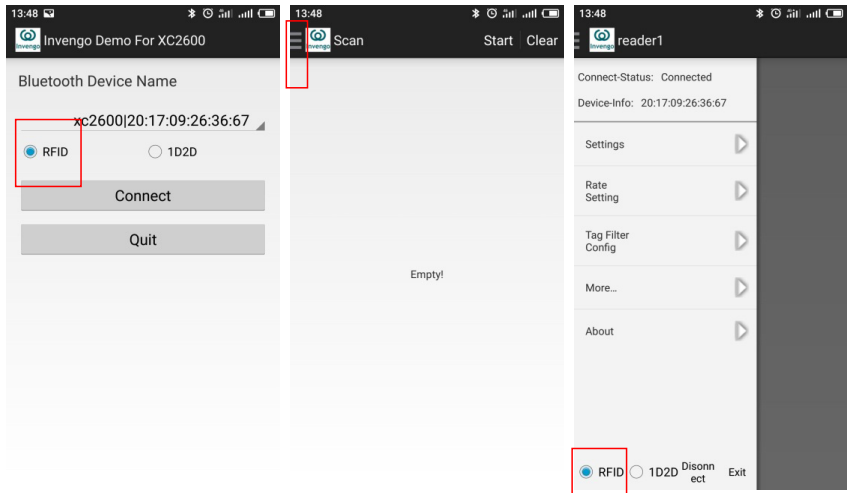
Figure 11 RFID function selection

1) Select RFID when you open the Demo application, click the Connect button, you can open the RFID.

2) At the status of being connected to 1D, 2D (barcode), click the "Menu", you can switch to the RFID channel.

6.2.2 Tag Reading Operation

1) Click the start button on the Invengo Demo or pull the trigger button on the handle to start reading the tags.

2) Tag reading information is located in the center of the interface. Total number of tags locates at the bottom, as shown in Figure 12
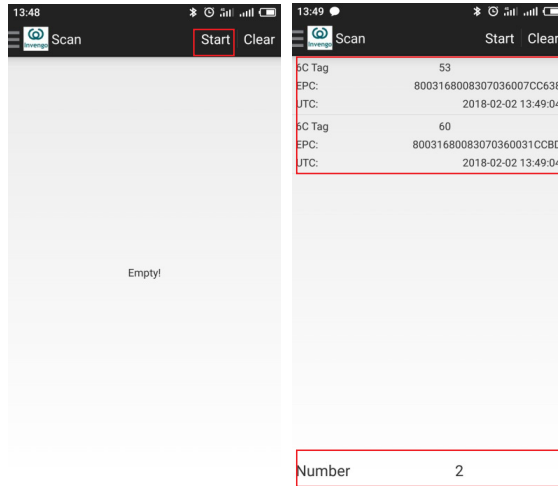
Figure 12 RFID tag reading

Click the area of EPC information of tag which needs to be handled to open the tag operation dialog box, as shown in Figure 13.
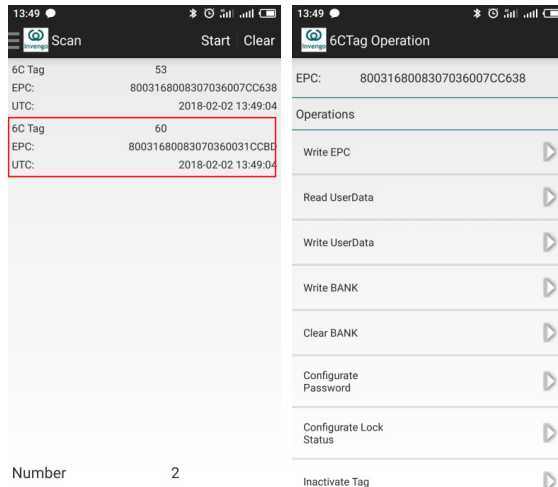
Figure 13 Tag information operation

In the tag operation interface, each area of the tag can be read or written, or implement related configuration.

6.2.3 Scan Settings

The setting for prompt sounds, RSSI, tag type and tag data areas are shown in Figure 14.
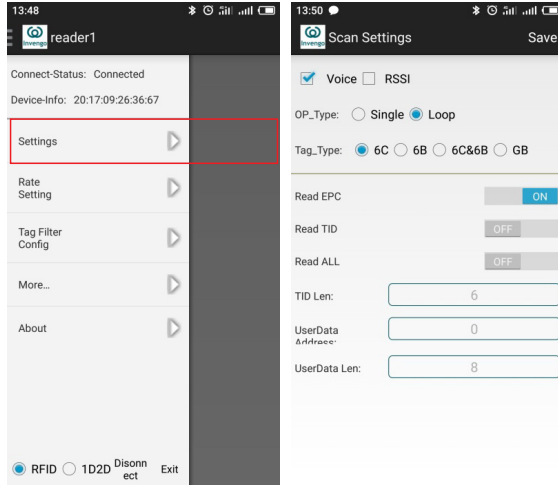
Figure 14 scan settings

Save

Save the changes.

Prompt Sounds

This setting is for switching on/off of prompt sounds when reading.

RSSI

This setting is for RSSI to be shown or not when reading.

Operation Type

This setting is for reading type, single reading means work once after reading starts; continuous reading means the reader keep reading once upon it is started.

Tag Types

Set types of tags that you want to read.

TID Reading

Read tags' TID area only.

General Reading

Read tags' EPC, TID, user data area at the same time.

TID Length

Set the TID length of tags that you need to read (settable only in general reading status).

User Data Initial Address

This is for setting the start address of user data area for tag reading(settable only in general reading status).

User Data Area Length

This is for setting the length of user data area (settable only in general reading status).

6.2.4 Power Settings

Query and set query the antenna power, as shown in Figure 15.
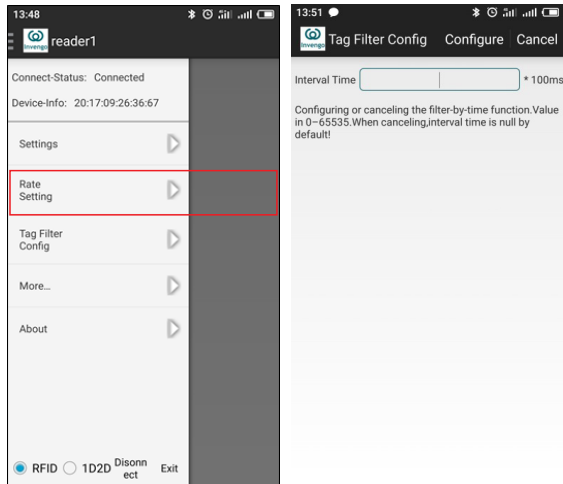
Figure 15 Power settings

☐ **Configuration:** Save the antenna power setting;

☐ **Query:** Check the antenna power has been set;

☐ **Antenna:** The power varies according to the hardware.

6.2.5 Tag Filtering Configuration

This setting is about an interval, once a tag data was uploaded, filtering that tag within that interval, for more information, see Figure 16.
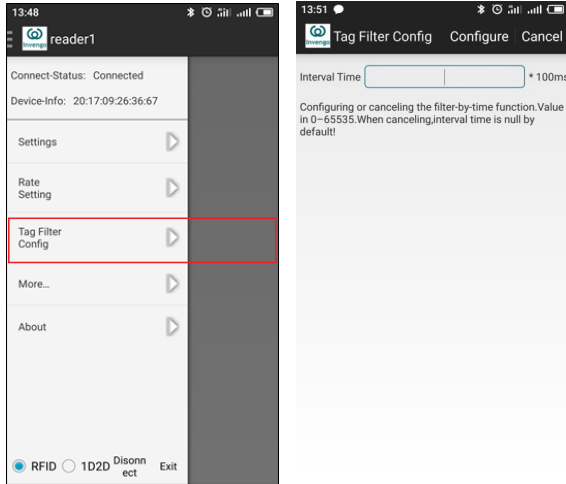
Figure 16 Tag filter configuration

☐ **Configuration:** set the saving time interval.

☐ **Cancel:** cancel the label filtering settings.

☐ **Interval Time:** Setting for the filter time interval, within this interval a repeated tag should be ignored.

6.2.6 Tag Searching

Click "Find Tag" in the "More" interface. Enter the "Find Tag" interface, as shown in Figure 17.
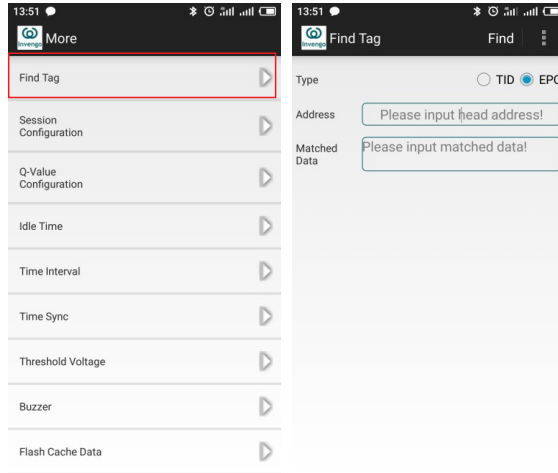
Figure 17 Tag Searching

Set the conditions of tag searching, you can "Find" search relevant tags.

6.2.7 Session Configuration

Session configuration parameters will affect single tag or multi-tag reading efficiency, generally can be set in multi-tag read mode. Enter the "More" interface and select "Session Configuration" to enter the session configuration interface, as shown in Figure 18
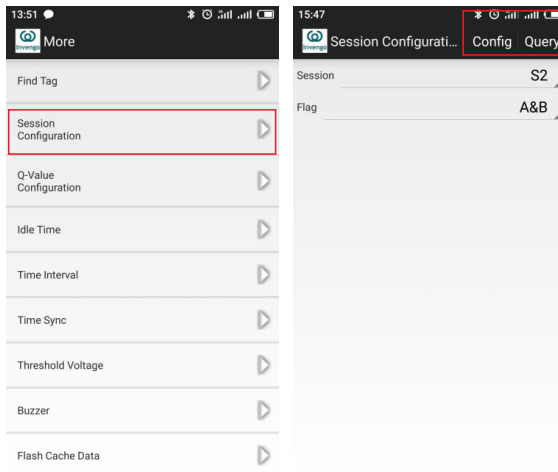
Figure 18 session configuration

After setting the type of session configuration S0,S1,S2,S3 and session mark click "Configure" to take effect, or you can "query" current configuration parameters.

6.2.8 Q-value Configuration

The Q-value will affect the performance of multi-tag reading. The maximum of tag number which can be read is 2Q-1, and for multi-tag reading, the recommended Q-value is 4. Click "Q-value Configuration" in "More" interface, as shown in Figure 19:
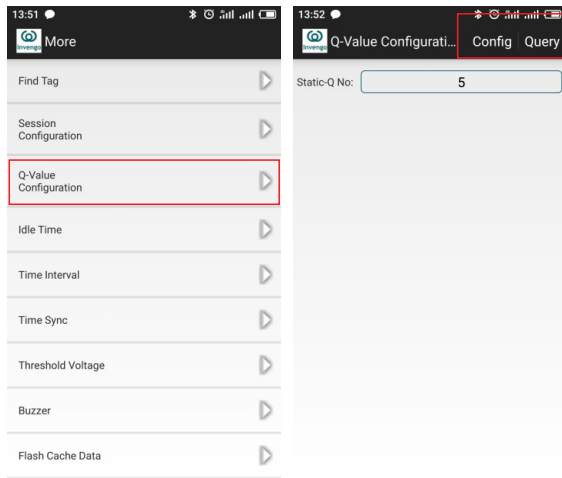
Figure 19 Q-value configuration

6.3 Barcode Function Operation Demonstration

1D and 2D barcode (compatible with the identification of 1D barcode) are optional configurations and can be added on demand, the main support barcode system are:

1D code: Code 128, EAN-13, EAN-8, Code 39, UPC-A, UPC-E, Codabar, Interleaved 2 of 5, ITF-6, ITF-14, ISBN, Code 93, UCC/EAN-128, GS1 Databar, Matrix 2 of 5, Code 11, Industrial 2 of 5, Standard 2 of 5, Plessey, MSI-Plessey.

2D code: PDF417, Data Matrix (ECC200, ECC000, 050, 080, 100, 140), QR Code.

There are two ways to turn on the barcode function, as shown in Figure 20:

Select "1D2D" in the interface, click "Connect", you can review the barcode function.

Under the RFID mode, click the menu to switch to the barcode channel.
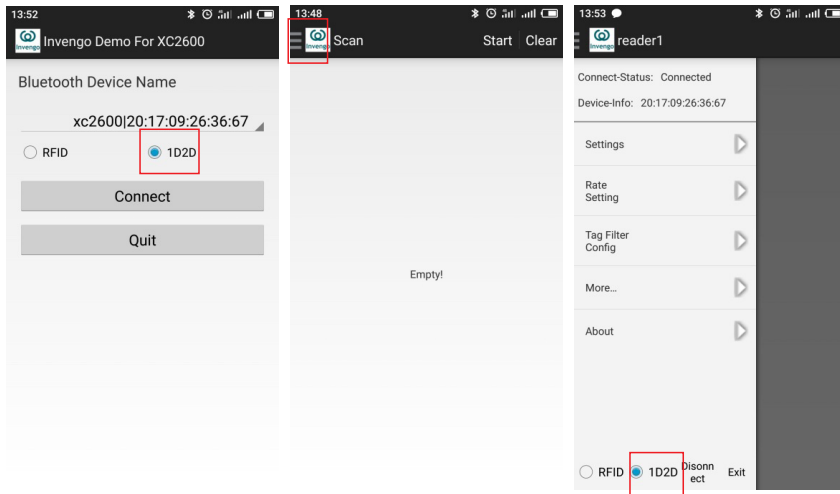
Figure 20 barcode function selection

6.4 Other Functions

Enter "**More**" interface, you can set other relevant information.

Restart/Reset

Restart: restart the handheld reader, Reset: return XC2600 settings to their defaults.

Standby Time

Time interval that device enter standby mode without being operated, configurable range: 30 ~ 600s; The device automatically enters standby mode when exceed the set time.

Flash Time Interval

Flash Time Interval is the time interval that data is written to Flash under the offline mode, configurable time within 60s.

Clock Synchronization

After the device connects to a Bluetooth terminal device, you can manually synchronize the local time.

Buzzer Configuration

Select whether the buzzer function is enabled when the device is under online mode

Flash Cache

Export data that cached in Flash in offline mode.

USB Power Supply Control

The switch for USB-A port and 5V power supply.

UTC Switch

Turn on the clock display switch during card reading operation.

6.5 About

This chapter describes the software and hardware version of the device, as shown in Figure 21.
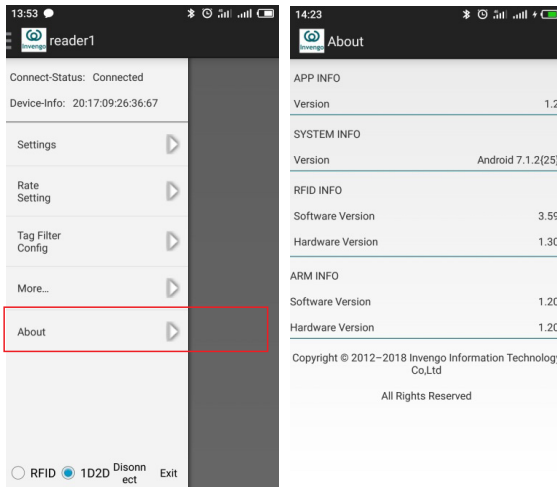
Figure 21 version information

□ **Application Information:** Application Version Information.

□ **System Information:** Bluetooth terminal system version.

□ **RFID information:** Relevant information about software and hardware version of the RFID module.

□ **ARM information:** XC2600 baseband software version information.

For the functional introduction and application development issues of the DEMO program, please refer to the corresponding directory under "RFID Handheld Universal Demo Software User Manual" in the CD provided.

6.6 Description on API interface program

API interface program is the intermediary between XC2600 and background applications, providing the users with the software interface for secondary development.

For the application of API interface program and development issue pertaining to the application software, please refer to the corresponding directory under "Reader's Generic API Technical Reference Manual" in the CD provided.

7.Routine Maintenance, FAQs and Troubleshooting

7.1 Routine Maintenance

Store the device in a cool and dry place, with temperature ranged between +10℃- +40℃. Avoid contact with corrosive substances and keep away from fire and heat sources (For details please refer to 8.2 storage requirement).

⚠️ *Due to the self-discharging characteristics of lithium battery, if the device is not being in use for a long period of time (not less than 1 month), it is recommended that the battery should be removed from the handheld device and stored separately (Battery capacity is best for long term storage at 40%, and should be fully charged and left discharged every three months, if possible).*

⚠️ Precautions for battery usage:

☐ Do not directly connect the input to output terminal;

☐ Do not expose the battery to water or get it wet;

☐ Do not use or store the battery near a heat source (such as fire or heater);

☐ Please use original charger;

☐ Do not reverse the positive and negative;

☐ Do not plug the battery directly in a wall outlet or car cigarette lighter socket;

☐ Do not put the battery into a fire or heat up the battery;

☐ Do not use wire or other metal to connect the positive and negative terminals

☐ of the battery, do not transport or store the battery with necklace, hairpins or

☐ other metallic objects;

☐ Do not disassemble the battery or cause battery short circuit;

☐ Do not cause impact to the battery or use sharp object to hit the battery.

7.2 FAQs and Troubleshooting

This section introduces solutions to some of the common problems or irregularities during the usage of the device.

Unable to Read Tags

Initially, please check whether the tag samples are functioning, or use another tags which has been verified for further test;

☐ Please confirm if the electronic tag is within the effective range of reader;

☐ Please confirm if there is any RF signal interference.

Unable to Wright Tags

☐ Initially, please confirm if the tag is writable.

☐ Please confirm if the electronic tag is within the effective range of the reader;

☐ Please confirm if the data area of the electronic tag has been locked;

☐ Please confirm if the instruction parameter is configured correctly;

☐ Please confirm if there is any RF signal interference.

Why is the tag writing distance closer than data reading distance?

This is due to the special characteristics of RFID technology. Tag writing requires more energy than tag reading, hence the distance is shorter and success rate of tag writing is much lower as compared to tag reading.

Why do the reading distances for various tags appear to be so different?

This is due to the special characteristics of RFID technology. Different tag chip and their sealing materials have different sensitivity towards the reader; hence the operating distance and success rate are different.

7.3 RF Communication Optimization

Under normal circumstances, radio technology is used for device communication. The system performance is very sensitive towards signal interference and attenuation. This section provides some tips for radio communication optimization between XC2600 and electronic tags.

7.3.1 Signal Interference

Signal interference refers to the radio frequency (RF) signal that caused interference to the data exchange between the handheld reader and electronic tag. Signal interference can severely affect the capability of a handheld reader to retrieve information from an electronic tag.

Sources of signal interference:

☐ Radio frequency (RF) system, such as RF local area network and nearby interactive identification system;

☐ RF signals from security doors, garage doors or other devices;

☐ Other RF radiation sources.

When there is radio frequency (RF) interference or noise, the performance of handheld reader (with regard to its data exchange with electronic tag) will be reduced significantly. Handheld reader can only "accept" one signal at any given time, and it is not capable to distinguish between undesirable noise and useful RF signals

7.3.2 Signal Attenuation/Reflection

Signal attenuation refers to the natural attenuation of signal strength, resulted from the distance. It may be due to the obstacle encountered in its transmission path.

Possible obstacles for radio frequency signal:

☐ Enclosed space with concrete walls, floors and ceilings;

☐ Metallic surface surrounding antenna or tag;

☐ Water or other liquid surrounding antenna or tag.

Almost every object (including furniture or partition) will cause a different degree of attenuation during transmission process. This attenuation resulted from obstacle can be reduced to the lowest degree through careful repositioning of antenna installation position.

At the same time, the reflection caused by metal or metalized surface on the back of the electronic tag may also contribute to signal attenuation. Under some circumstances, this causes slight increase in reading distance and results in blind corners. At these blind corners, the communication between the electronic tag and handheld reader is very poor.

Generally, it is impossible to conduct accurate prediction of the handheld reader system's performance under any given environment (this is due to the complexity

of electromagnetic radiation, including stability of frequency of signal source, antenna pattern, antenna sidelobe, and the surrounding environment). However, some of the recommendations given below can provide a certain degree of guidance in the specific environment, as well as application in optimizing system performance:

Take into account the radio frequency (RF) characteristic in the surrounding area, including building materials, office hour, windows, and piping configuration. Radio frequency (RF) field mode and reading distance may be affected by metal objects nearby, such as household appliances, equipment and metal frames.;

The electronic tag must remain in the effective reading area of the handheld reader for not less than 100ms (for XC-TF8030-B-C07 electronic tags);

The optimal antenna length for electronic tag is related to the non-conductive materials sealed or embedded with the tag. Here is the basic concept: For electronic tag embedded within non-conductive materials (The dielectric constant is generally larger than the dielectric constant in the air, causing the effective wavelength of the medium to be shorter than the wavelength of the air) or placed in substrate, if its effective wavelength has been adjusted to the optimal length in open space (at the furthest reading distance from the handheld reader), the electric length of the tag antenna must be reduced to achieve the best effect in open space. On the contrary, if the effective wavelength has been adjusted to the optimal length within non-conductive materials, the electrical length of the tag antenna must be increased to achieve the best effect in open space.

Do not expose naked, unsealed electronic tag with chemicals. Certain chemicals, such as alcohol, can be corrosive under high temperature, even though they are safe under normal temperature.

8.Transportation and Storage

8.1 Transport Requirements

XC2600 meets all the standard requirements of road, rail, air, and water transportations.

8.2 Storage Requirements

The long term storage of XC2600 must meet the following conditions:

Ambient temperature: -10℃ - +40℃;

Relative humidity: less than 80%;

No abrupt temperature change, with the absence of acidic gas and other harmful gases;

Due to the self-discharging characteristics of lithium battery, if the device is not in use for a long period of time (not less than 1 month), it is recommended that the battery should be removed from the handheld device and stored separately.

9.Packaging and Unpacking

9.1 Packaging

XC2600 is packed in a box, and transported through large transport container.

9.2 Unpacking

In order to facilitate future storage and transport, keep the box and packaging materials when you unpack the product packaging.

Please check the product and its accessories according to the packing list. Please contact us immediately if there is any discrepancy or damage.

10.After-sales

10.1 After-sales Service

If you encounter any unsolvable problem when using our product, please contact the customer service center.

Before a user engages our customer service center, please prepare the following information at hand:

☐ Handheld reader model

☐ Handheld reader serial number (Located at the bottom of a handheld reader)

☐ Any changes to the handheld reader or tag

☐ Application software's status and condition Handheld reader model

10.2 Other Matters

If our customer service officer has confirmed with the user to return his/her handheld reader for maintenance, the user will receive a return merchandise authorization (RMA) from our customer service officer. Please indicate the RMA no. on the exterior of the return product packaging and, at the same time, provide the same no. on a piece of paper and place it inside the packaging. This will ensure the quick processing of the return product.

Please follow these steps when returning the handheld reader for maintenance:

☐ Carefully pack the handheld reader and its accessories into the original antistatic foam box. Please use a box with protective effect if the original box no longer exists.

☐ Use filler to cover the products in the box.

☐ Place a note, written with RMA no., in the box.

☐ Indicate RMA no. and the word "fragile" on the exterior of the box.

11.Safety Instructions

⚠ **Warning Sign**

Improper operation may cause the damage to the device.

ℹ **Attention Sign**

☐ If ignored, your operation might not work well.

☐ If ignored, might cause results beyond anticipation.

FCC RF Exposure Information and Statement

The XC2600 Handheld Reader （model：XC2600）has been tested for body Specific Absorption Rate (SAR) compliance. The radio module has been evaluated under KDB 865664 D01 and found to be compliant to the requirements as set forth in CFR 47 Sections, 2.1093, and 15.247 (b) (4) addressing RF Exposure from radio frequency devices. This model meets the applicable government requirements for exposure to radio frequency waves. The highest SAR level measured for this device was 0.41 W/kg.

FCC Warning

This device complies with Part 15 of the FCC Rules. Operation is subject to the following two conditions: (1) This device may not cause harmful interference, and (2) this device must accept any interference received, including interference that may cause undesired operation.

NOTE 1: 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.

NOTE : Any changes or modifications to this unit not expressly approved by the party responsible for compliance could void the user's authority to operate the equipment.

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