UHF RFID READER

CMC181

User Manual

Version (1.0)

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1. **Introduction**

1.1 Foreword

CMC181 is a new generation ultra-high frequency RFID reader. It complies with FCC ISM (902 ~ 928 MHz) band, and is used to read the electronic tag of ISO18000-6C (i.e.: EPC C1 GEN2). It has features as small-size, high performance, convenient operation, widely-used, safety and reliability etc.; meanwhile, it provides API function so that it can help you to do further development. In addition, with integrated web interface, management software and database, CMC181 RFID reader can be applied to warehouse logistics, VMI-HUB, pallet management, ID identification, material control and access control and so on.

1.2 Product Functions

CMC181 RFID reader includes features of fast speed of read / write, long read / write range, multi-tag read capability (several tags can be read at the same time), operating the tag in specific application system only and strong anti-collision capability for frequency hopping system and so on.

The functions of CMC181 RFID reader are listed as below:

l   Read: it can read the tag's ID number and the data in a specific memory zone of tag. In addition, it can not only read the data from single tag, but also read the data from multiple tags at the same time.

l   Write: it can write the data to the specific memory zone of tag.

l   Wake-up: to prevent from the disturbance from other system's tags and make sure the communication between the reader and tags is reliable and accurate, only the awakening tag can be communicated with the reader.

l   Locking: it can be set "Lock" at specific memory zone of tag, so that the data in this zone can be locked and protected permanently. Besides that, it can check the locked address in any memory zone (0~31).

There are four RF ports in CMC181 RFID reader to connect with four external antennas, and the antennas can be switched fast by using software (the switch interval also can be set).

In addition, CMC181 RFID reader provides API function and all kinds of user interfaces of configuration parameter. You can set the RFID reader's parameters by executing the demo in PC, such as sensitivity, working frequency and reading mode etc., to satisfy the requirements of working environment.

1.3 Product Specification

Features:

l   Reading distance: ≥ 10 m (depends on the gain of antenna and tags working environment)

l   Writing distance: ≥ 3 m (depends on the gain of antenna and tags working environment)

l   Applied tag: the tags which comply with EPC Global class 1 Gen 2 protocol in UHF frequency range (e.g.: Ti, Philips, UPM, Avery Dennison etc.)

l   Convenience: it can help to check the goods without opening the box for stocktaking.

l   Strong ability of anti-collision: it can read 180 tags per second. Besides, its scanning distance can be up to 12 m (adjustable for distance).

l   Low power: the current is less than 1 A when sending RF power with 30 dBm.

l   It can be connected directly with embedded industrial control system.

l   Standard API interface: it provides API function and uses standard API interface, the VC, VB and Delphi development environments can be supported well.

Specifications:

- **l** Physical Characteristics: Dimension: 185*165*50(mm)

    Weight: 1.5 Kg

- **l** Environment: Operating Temp: -10 to + 60℃

    Storage Temp: -20 to + 70℃

    Humidity: 10% to 95% non-condensing

- **l** Power: Power adapter for 110-240 VAC auto-ranging to DC 12V, 3Amps
- **l** RF power: 12 dBm ~ 30 dBm (programmable in software)
- **l** Working frequency: 902 ~ 928 MHz (with central frequency of 915 MHz)
- **l** Support protocol: ISO18000-6C (EPC C1 GEN2)
- **l** Communication port: USB
- **l** RF interface: 4 SMA reverse antenna ports

1.4 Applied Fields

- **l** Vehicular transport management: monitoring and managing the vehicle and container transport.
- **l** Customs clearance management: managing the goods for clearance and transition.
- **l** Warehouse and Logistics management: managing the circulation of commodities and warehouse; the letters and parcel.
- **l** Access control management: including the vehicle and personnel access management.
- **l** Production process management: monitoring the components in whole production process.
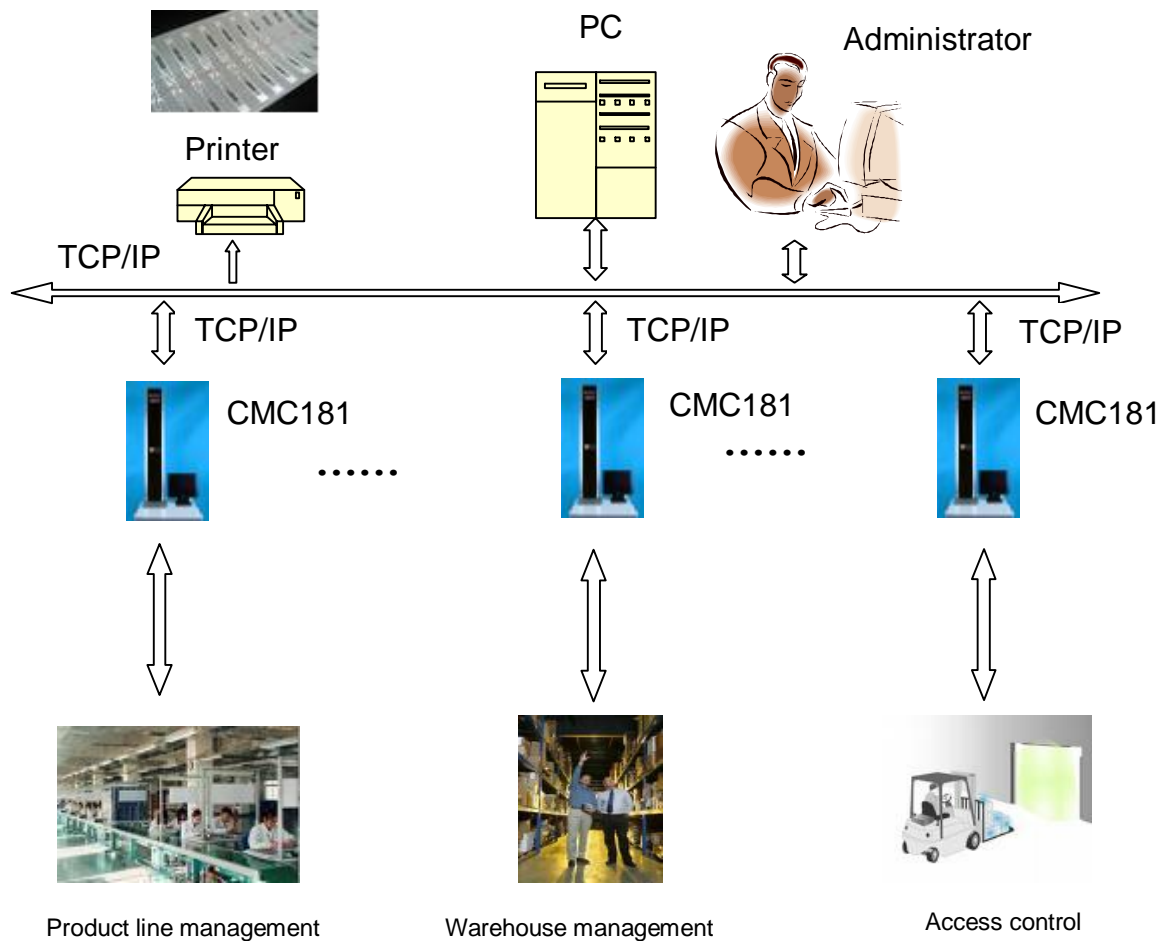- **l** Equipment management: monitoring the circulation of equipment.

CMC181

Fig. 1: Typical application for system configuration

2. Configuration and Components Introduction

2.1 Configuration Introduction

For the configuration of CMC181 RFID reader, please refer to the following photo:

Fig. 2: Configuration photo of CMC181 RFID Reader

The CMC181 RFID Reader should connect to the adapter with 12V / 3 Amps. It can be connected to the PC by using USB cable, and can connect with four external antennas at most.

Fig. 3: Power Adapter   Fig. 4: USB Cable

2.2   Components Introduction

RF Cable

CMC181 RFID reader's RF cable is a coaxial cable which with SMA connector, please refer to the following photo:

Fig. 5: Heat-resistant RF cable (RG142)

CMC181 RFID reader provides 4 coaxial cable connectors for external antenna connections. The standard length of coaxial cable is 2 m. If the cable is more than 2 m, it is recommended to choose another low loss RF cable (as shown in Fig. 6).

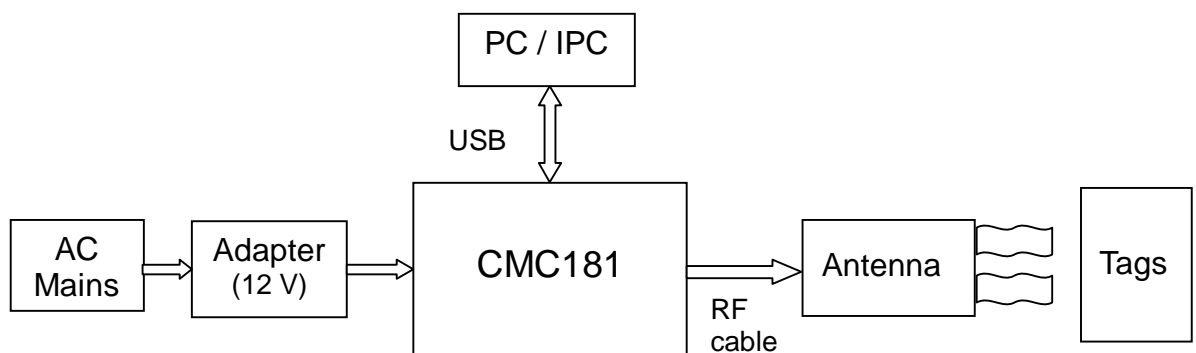Fig. 6: Low loss RF cable (HCAHY-50-9)

3. System Installation

3.1 Installing the RFID Reader

A whole RFID system consists of reader, antenna and tag. The working principle is: the reader emits wireless radio waves in a specific frequency range via antenna. When tag is in the magnetic field, the tag's antenna couples with the reader's antenna, and then the RF energy which from the inductive current can be used to drive the tag circuit and sent out the data. After that, the reader receives the data.

The operation configuration of CMC181 RFID reader is shown as below:

```
                            ┌───────────┐
                            │  PC / IPC │
                            └───────────┘
                                  ▲
                             USB  │
                                  ▼
┌────────┐   ┌──────────┐   ┌───────────┐   ┌──────────┐   ┌──────┐
│   AC   │──▶│ Adapter  │──▶│  CMC181   │──▶│ Antenna  │≈≈≈│ Tags │
│ Mains  │   │  (12 V)  │   │           │   │          │   │      │
└────────┘   └──────────┘   └───────────┘   └──────────┘   └──────┘
                                   RF
                                   cable
```

The PC sends "read / write" commands to CMC181 RFID reader via USB port. After receiving the commands, CMC181 RFID reader emits radio waves in a specific frequency range via antenna, when tag is in the electromagnetic field, the tag's antenna couples with the reader's antenna, and then the RF energy which from the inductive current can be used to drive the tag circuit and sent out the data. After that, the CMC181 RFID reader receives the data and sends it back to PC.
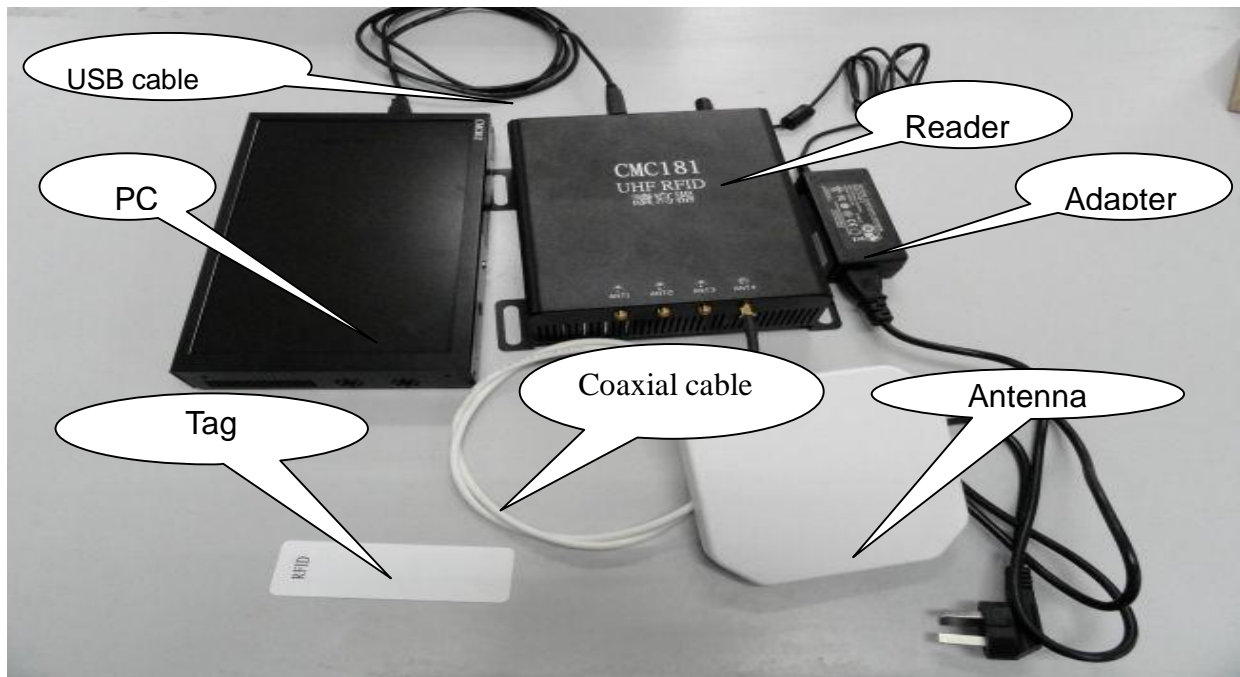
3.2 Notes

3.2.1 Notes for Reading the Tag

1. When using the linear polarization antenna, while the Inlay antenna is linear polarized as well, make sure that both polarization directions should be the same, or else it will affect the identification seriously. The detailed operation method is shown as below: make sure the long edge of the antenna parallels to Inlay (see method #1). If the pasting direction of Inlay is changed, the direction of antenna should be adjusted accordingly, to assure the reading result is best.
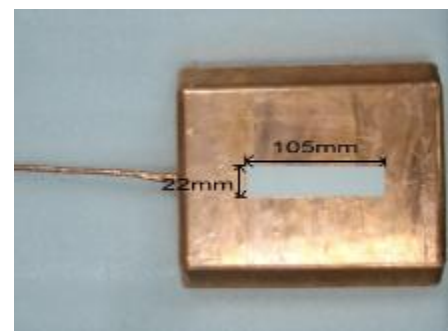

(Operation configuration for CMC181 RFID reader)

2. Since different materials cause large deviations in affection of UHF frequency, especially when there are some metal materials around the antenna, it will affect the identification effect. Do not put any other metal material around the antenna (e.g.: iron gate, any other things contain with metal etc.). At least 0.5 m clear space on each sides of antenna is recommended.

3. When passing the channel, the passing speed of goods which pasted with RFID tag should be slow down, to make sure the tags can stay long enough in the radiation area of the antenna. It is recommended that the passing speed is 1m / s.

4. To assure that there is no any other person passing when the tag is passing the channel, to avoid the non-identification due to the magnetic wave is shielded by human body.

3.2.2 Notes for Writing the Tag

Since the radiation area of antenna is large, in order to avoid the problem that information is written to the non-specific Inlay by mistake, the antenna and tag should be shielded when writing the information to the tag, the tags which not being used should be placed in a special shielding box. The shielding method of antenna is shown as the following:

I Paste a metal shielding shell on the plastic casing of antenna (as shown in the left figure), and then make a hole with size of 105 mm*22 mm (length*width) over the antenna for radiation, which as shown in the right figure:
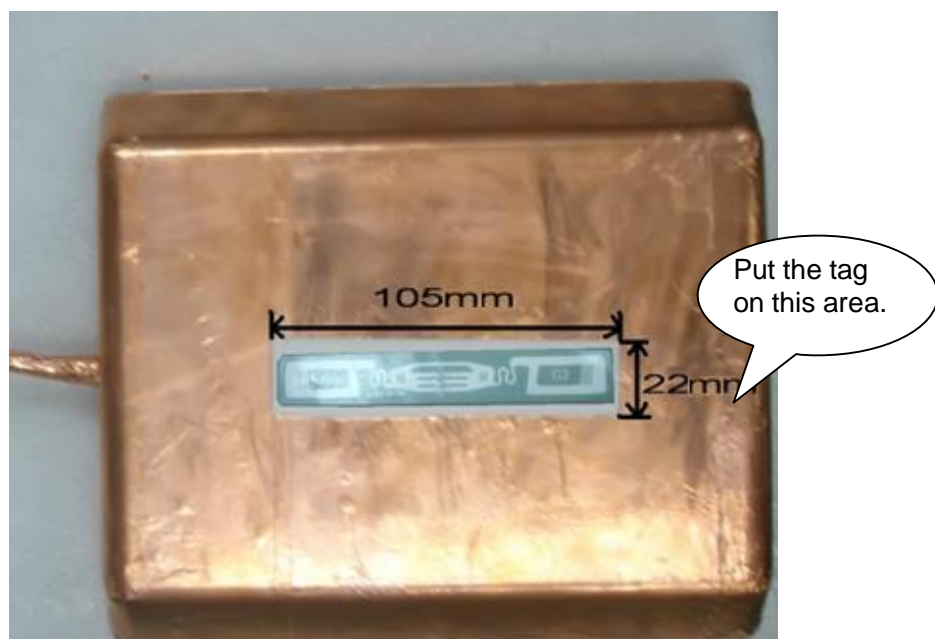

(Operation configuration for CMC181 RFID reader)

I The four edges of contact surface, which between the antenna's plastic shell and soleplate, should be shielded. The white cable shipped with antenna should be shielded with copper foil as well.
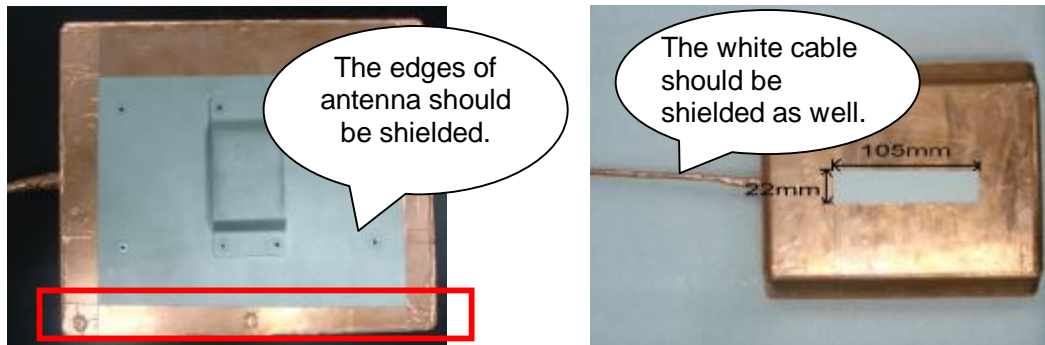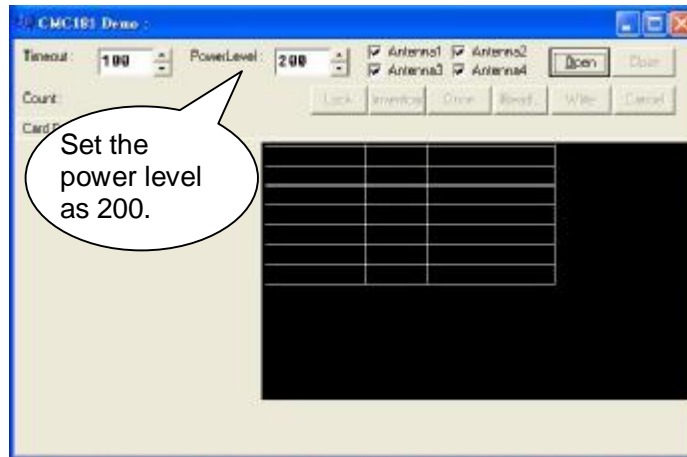

(Operation configuration for CMC181 RFID reader)

I Put the tag on the radiation hole of antenna when writing the tag, the other tags keep far away from the radiation hole.

(Operation configuration for CMC181 RFID reader)

l Set the power level as 200 by using software, to make sure the information is written correctly to the specific tag.

(Operation Configuration for CMC181 RFID reader)

4. Appendix

4.1 Notes

1. Do not turn on the power before connecting the antenna to the reader, or it may cause damage to the reader.

2. During the testing, human body and tag do not keep close to the tag's antenna, and it is recommended to keep the distance of 50 cm or more.

3. The RFID antenna and RFID tag should be matched in polarization, if the reader can not read the data from tag, just rotating the tag with 90°, to make sure the maximum receiving area of tag face the antenna.

4. Make sure the RF cable between the antenna and reader shall not exceed 10 m in length. When the length exceeds 2m, it is recommended to use the low loss RF cable, or else the reading range would be affected.

5. The tag's reading range depends on many factors, such as antenna gain, the angle between the antenna and tag, the material which the tag pasted on, environment conditions etc.. Please choose the best match for practice using.

6. For the parking management and access control: a good antenna installation is not judged by the longest effective reading distance of the tag, it should meet following 2 criteria: first, read the tag close the barrier and make the barrier open to let the tagged car go; second, prevent long effective reading distance from mis-reading the tag of the rearward car to let go the front car without tag. So, the installation of antenna should depend on the on-site situation to adjust the effective reading distance.

4.2 Packaging List

CMC181 RFID Reader (1 Pcs)
USB cable (1 Pcs)
Adapter (1 Pcs)
CMC181 User Manual (1 Pcs)
Screw (4 Pcs)
RF cable (1 Pcs)

5. FCC Statement

This device 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 radiated 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.

To assure continued compliance, any changes or modifications not expressly approved by the party responsible for compliance could void the user's authority to operate this equipment.

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.

RF Exposure Information

This device meets the government's requirements for exposure to radio waves.

This device is designed and manufactured not to exceed the emission limits for exposure to radio frequency (RF) energy set by the Federal Communications Commission of the U.S. Government.

This device complies with FCC radiation exposure limits set forth for an uncontrolled environment. In order to avoid the possibility of exceeding the FCC radio frequency exposure limits, human proximity to the antenna shall not be less than 20cm (8 inches) during normal operation.