TS-304 RFID Reader

User Manual

Contents

1. About TS-4008 Evaluation Board 3

2. Operating and Setting Reader 3

2.1 Initial Use 3
2.1.1 Step 1: Powering the Reader 3
2.1.2 Step 2: Connecting Antenna(s) to Reader 3
2.1.3 Step 3: Connecting Data Line to Reader 4
2.1.4 Step 4: Operating Reader via Demo 5
2.2 Setting RF Parameter 7
2.2.1 Setting RF Output Power 7
2.2.2 Setting RF Spectrum 8
2.2.3 Antenna Connection Detector 8
2.2.4 Measure RF Port Return Loss 9
2.3 ISO-18000-6C tag inventory 9
2.3.1 Real Time Mode & Buffer Mode 9
2.3.2 Users define Session ID & Inventorying Parameter of Inventoried Flag 12
2.3.3Fast Switching Antenna to Inventory Tags 12
2.4 Accessing ISO-18000-6C Tag 13
2.4.1 Read tag operation 14
2.4.2 Write Tag Operation 15
2.4.3 Lock Tag Operation 15
2.4.4 Kill Tag Operation 16
2.4.5 Tag Selection 16
2.4.6 Error Display Might Be Returned 17
2.5 Accessing & Inventorying ISO-18000-6B Tag 18
2.5.1 Inventorying ISO-18000-6B Tag 18
2.5.2 Accessing ISO-18000-6B Tag 19
2.6 Other Settings 21
2.6.1 Set DRM Status 21
2.6.2 Operating Temperature Monitoring 21
2.6.3 Setting Buzzer Status 21
2.6.4 Charging The Serial Communication Baud Rate 22

3. Develop your own RFID Application 23

1. About TS-4008 Evaluation Board

2. Operating and Setting Reader

2.1 Initial Use

2.1.1 Step 1: Powering the Reader

Connect the plug of supplied power adapter into the power outlet, as illustrated below:

Startup normal completion after "Di" with **Power and Status LED** light, self-test completed successfully, reader is ready.

2.1.2 Step 2: Connecting Antenna(s) to Reader

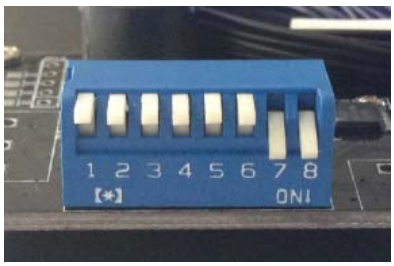
Connect the antenna(s) with SMA port to the reader, as illustrated below:

Access up to 4 antennas, as illustrated below:

2.1.3 Step 3: Connecting Data Line to Reader

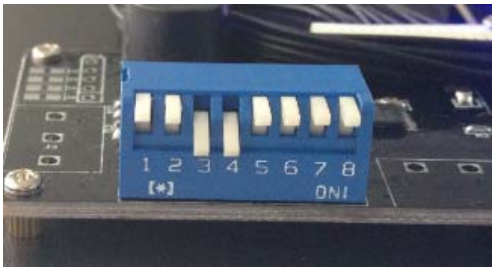
You can connect PC to the reader via RS-232 serial port, as illustrated below:

Then, you need to switch the DIP switch to the position as illustrated below:



You can also connect PC to the reader via TCP/IP if there is TCP/IP port on the board, as illustrated below:

Then, you need to switch the DIP switch to the position as illustrated below:



About DIP Switch：

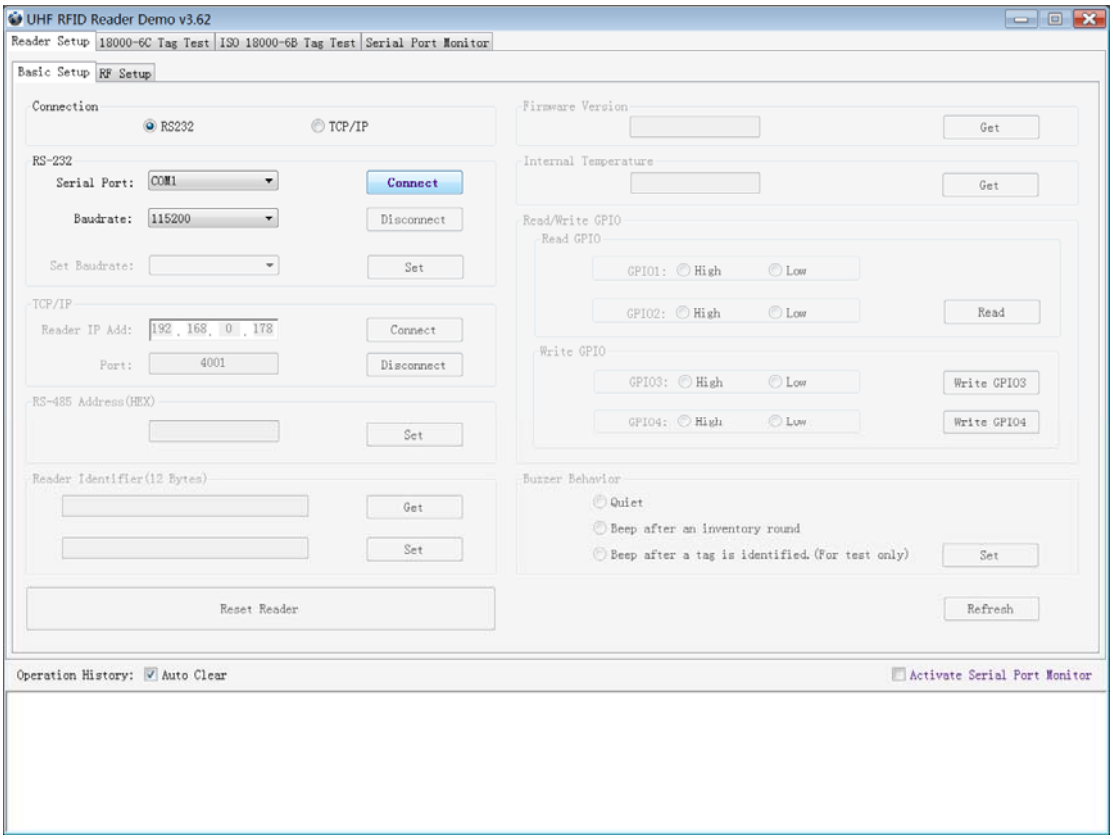
1、①：EN, ON Status, EN is low level.

2、②：GPIO1, ON Status, GPIO1 is low level.
3、③④：TCP/IP, ON Status is TCP/IP communication.
4、⑤⑥： Blank.
5、⑦⑧：RS232, ON Status is RS232 communication.

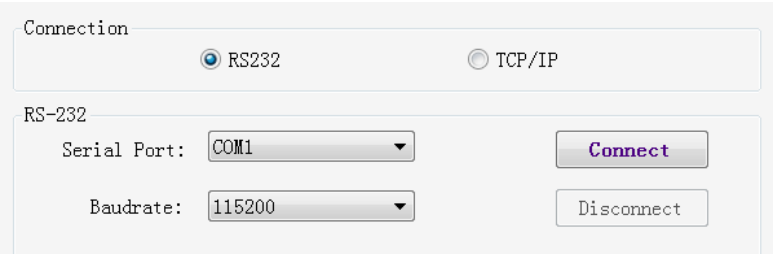
2.1.4 Step 4: Operating Reader via Demo

Launch the supplied Demo. This software don't need to installation. Just put the **UHFDemo.exe**, **reader.dll**, **customControl.dll** into the same folder, and double-click **UHFDemo.exe** to run the software.

Launch the UHF Demo application, the following screen displays:



Please select **RS232** in **Connection** if the reader is connected via RS -232 port. Selecting the corresponding **Serial Port** number and **Baudrate**, default baudrate is 115200. As illustrated below:



Click on **Connect** , if the port isn't occupied, the **Operation History** will displays:

If the reader is connected via TCP/IP, you need to operate these following steps,:

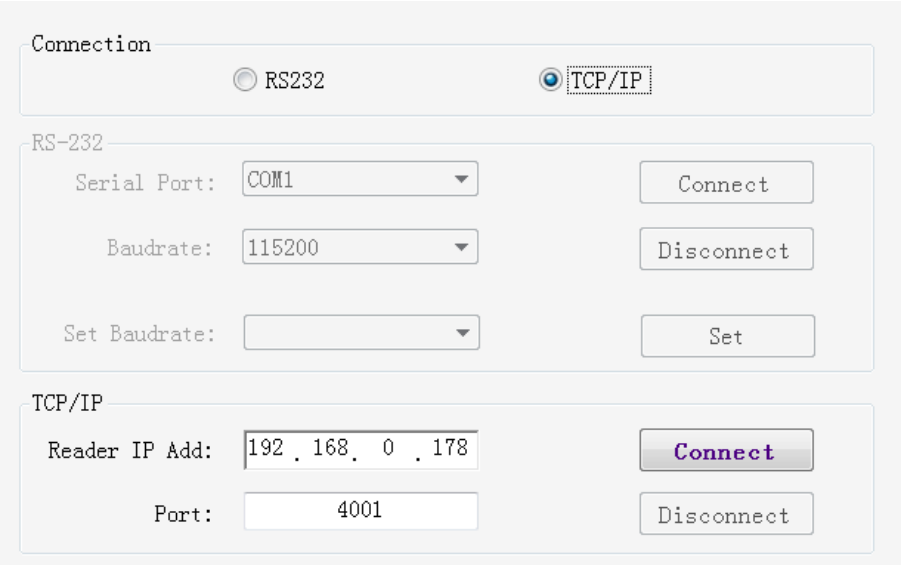
1. Ensure that an Ethernet Card has been installed in the PC.
2. Ensure that PC and reader in the same network segment.

Default settings of Reader as follows:

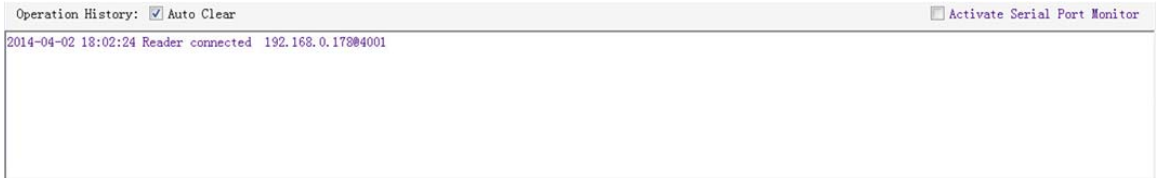
1. IP addresses: 192.168.0.178
2. Net mask: 255.255.255.0
3. Port No.: 4001

Detailed TCP / IP configuration, please refer to the document supplied:\ tcpip configuration \ IPORT-1UM.PDF

Initial use, please configure it as illustrated below:



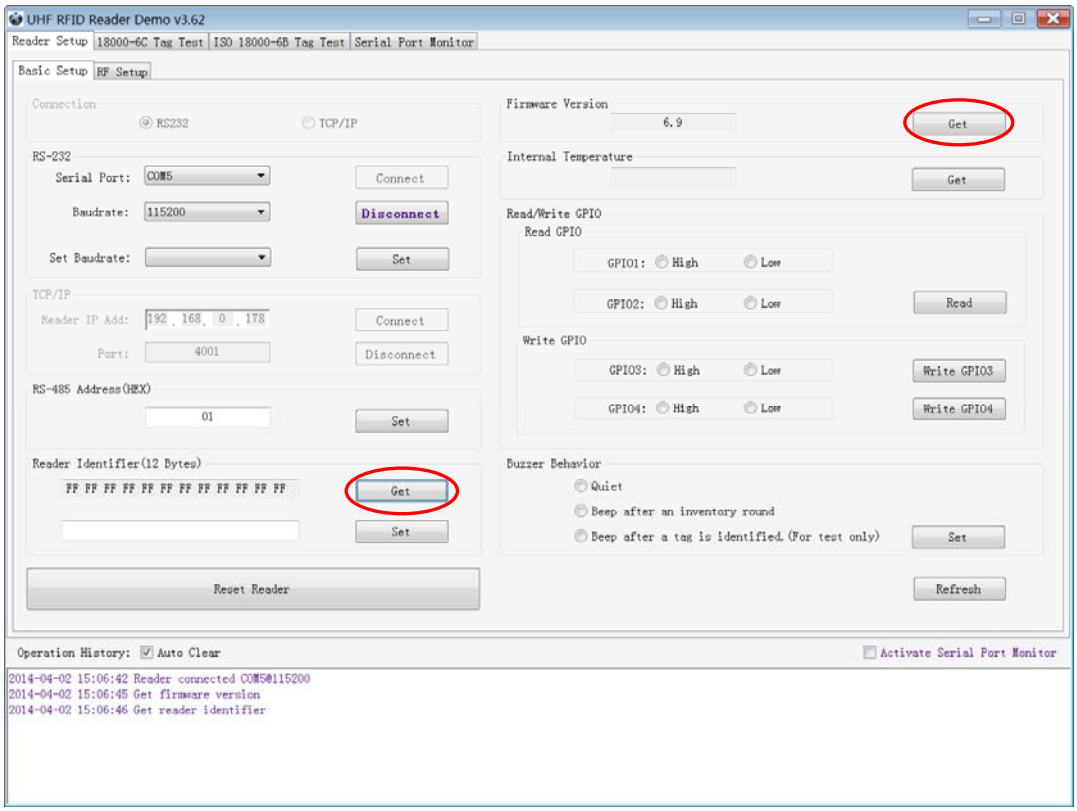
Click on **Connect**, if it connect successfully, the **Operation history** column displays:



Text communication with the reader:

Click on the button below the position shown in figure.

Click on Get in Firmware Version or in Reader Identifier, the following screen displays:

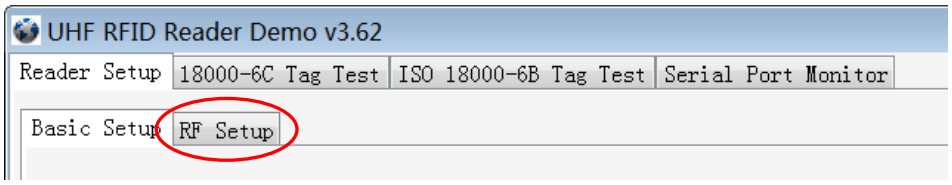


Now the reader has connected to PC successfully.

2.2 Setting RF Parameter

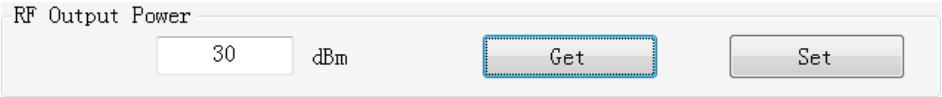
After successfully connecting reader, we need to set some basic RF parameters: RF Output Power & RF Spectrum Setup.

Select RF setup, as illustrated below:



2.2.1 Setting RF Output Power

RF Output Power is the strength of RF output signal from antenna port. Unit is dBm.



The range of output power is 0 - 33dBm. When this value setting completes, it will be saved in the reader automatically, and won't be lost after cut off the power.

Default value is 30dBm (1W).

2.2.2 Setting RF Spectrum

Specific frequency and channel usage dictated by regulations of each country

There are two methods to set RF spectrum.

Method 1: Use the default carrier frequency of the reader.

The default carrier frequency can refer to Frequency parameter tablet in Communication protocol.

Frequency range which the reader supports is 865MHz-868MHz, 902MHz -928MHz.

You can set the reader in **System Default Frequencies**, as illustrate below:

Note the following when you set RF Spectrum:

◆The start frequency and the end frequency must not exceed the scope of RF spectrum norm.

◆Start frequency must be less than or equal end frequency.

◆Set start frequency and end frequency to the same carrier frequency, the reader will work under fixed-frequency.

When the parameter setting completes, RF carrier frequency of reader will be randomly hopping in the scope of limited range.

The default RF spectrum norm is FCC (902MHz-928MHz).

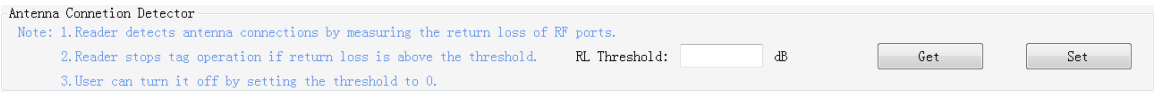
Method 2: Setting the RF spectrum manually.

Users can set RF spectrum via these three parameters: Start Frequency, Frequency Interval, The number of Frequency points.

2.2.3 Antenna Connection Detector

Function of **Antenna Connection Detector** is: Checking whether the port is connected to the antenna before the reader work. If not, users will be notified to connect the antenna.

Please open this function before you use it, as illustrated bellow:



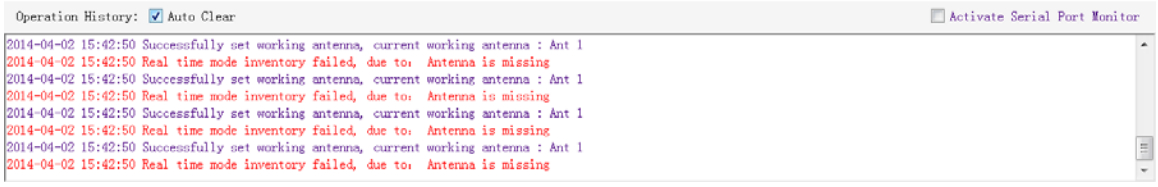
Sensitivity of Antenna Connection Detector is setted by users. Sensitivity of Antenna Connection Detector is the Return Loss of antenna port, the unit is dB. The larger the value, the impedance matching requirements between antenna and port must be better. To ordinary antennas, you can set the threshold to 3-6dB. Sensitivity of Ceramic Antenna and Handset could be more lower.

Note: 1. Reader detects antenna connections by measuring the Return Loss of RF ports.

2. Reader stops tag operation if Return Loss is above the threshold.

3. User can turn it off by setting the threshold to 0.

If antenna is not connected, Reader will stop to operate tags with the following screen display:



2.2.4 Measure RF Port Return Loss

2.3 ISO-18000-6C tag inventory

Connect the Reader correctly. Tag operation could be started when RF Setup completes.

Tag inventory means identify multiple tags' EPC number at the same time. This is the core of UHF RFID Reader whose performance will directly determine the merits of the reader.

2.3.1 Real Time Mode & Buffer Mode

There are many modes to select for tag inventory.

The most commonly used mode is Real time mode. Data will be uploaded immediately and you can find the tags' EPC number at the first time.

The other is **Buffer Mode**, the data will be cached firstly and uploaded together when you need them.

Both models have their own characteristics. Advantages of real-time mode are good multi-tag identification performance and fast response, users could get the data without delay. **RSSI** and **Parameter of Frequency** are change in real time, too.

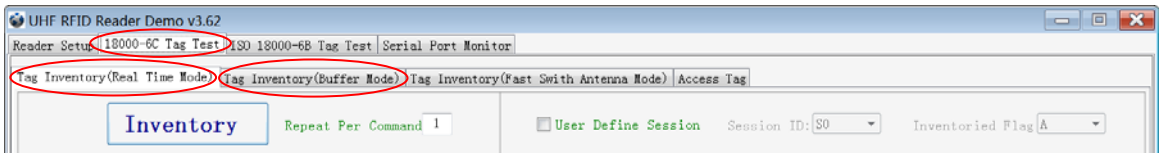
Reader uses a dual CPU architecture, **Identify Tags** and **Data Transmission** are in the charge of two different CPU, they are not interfere with each other. So you don't worry about data transfer will reduce the performance of multi-tag identification. Performance of multi-tag identification under **Real Time Mode** is the best.

Advantage of **Buffer mode** is the small amount of data communication, because the aggregated data is uploaded filtered and no repeat. But it will take some time to filter duplicate data when reader identifies a large number of tags. Therefore, its identification efficiency will be slightly lower than **Real time mode**.

Note, tags can't be operated when you extract data in the cache.

Users can choose the appropriate method based on actual situation.

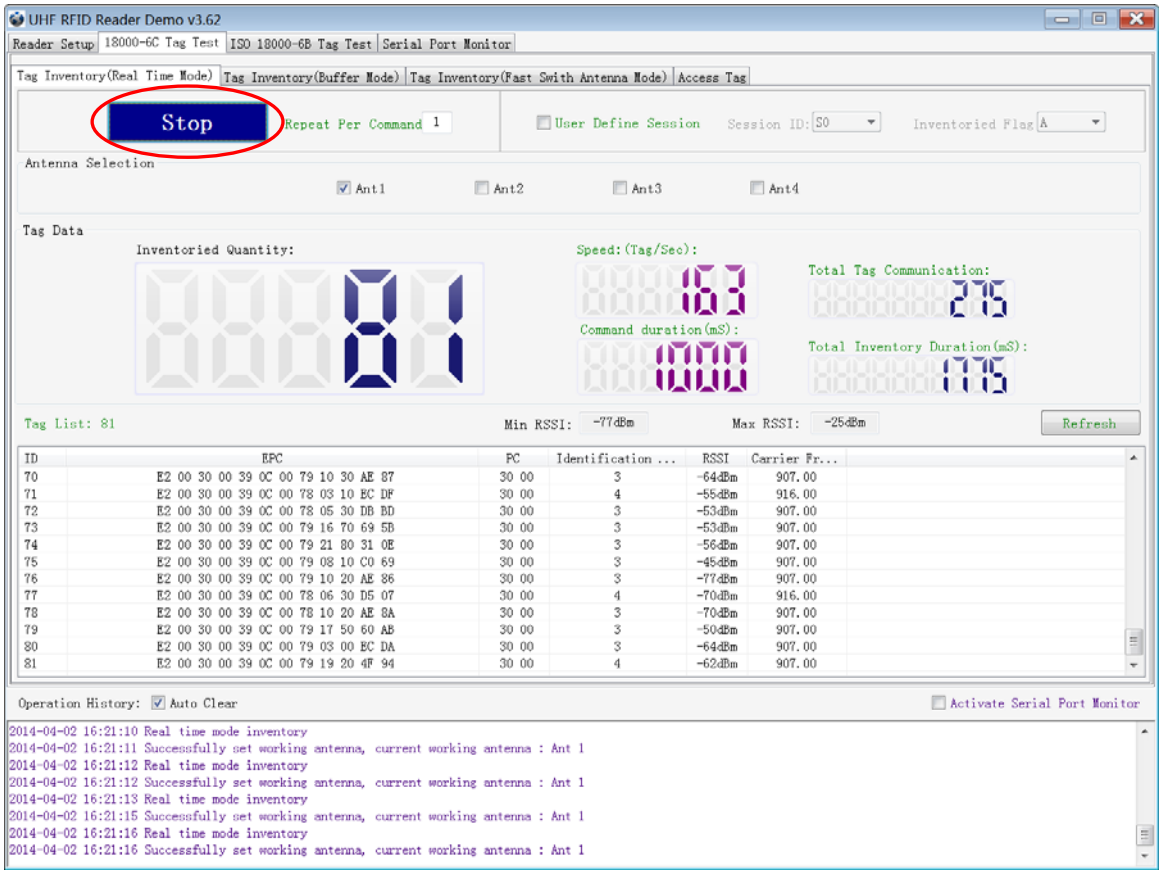
In Demo supplied, you can choose these methods to Inventory Tag as illustrated below:



Let's inventory tags under **Real Time Mode** first.

Click on Tag Inventory (Real Time Mode). Select the checkbox for the port with a connected antenna. Set the number of Repeat per command. This number is the times of repeat inventory command. For example, per inventory command will execute anti-collision algorithm one time when you set the value to 1. It will execute anti-collision algorithm two times when you set the value to 2, and so on.

Next, click on **Inventory**, we can find that the EPC number is uploaded immediately and real time update. If you do not click on **Stop**, the reader will keep inventorying. As shown below:



Meaning of the data as shown below:

Total of inventory Tags	Total number of inventory tags since click on **Inventory Tag**.
Identification Speed	Speed of identification Tag, unit: piece / sec
Cumulative return data	Total return EPC data of tags (Including repeated reading of data)
Command execution time	Time of each Inventory Command takes, unit: ms
Total running time	Total elapsed time since click on **Inventory Tag**, unit: ms.

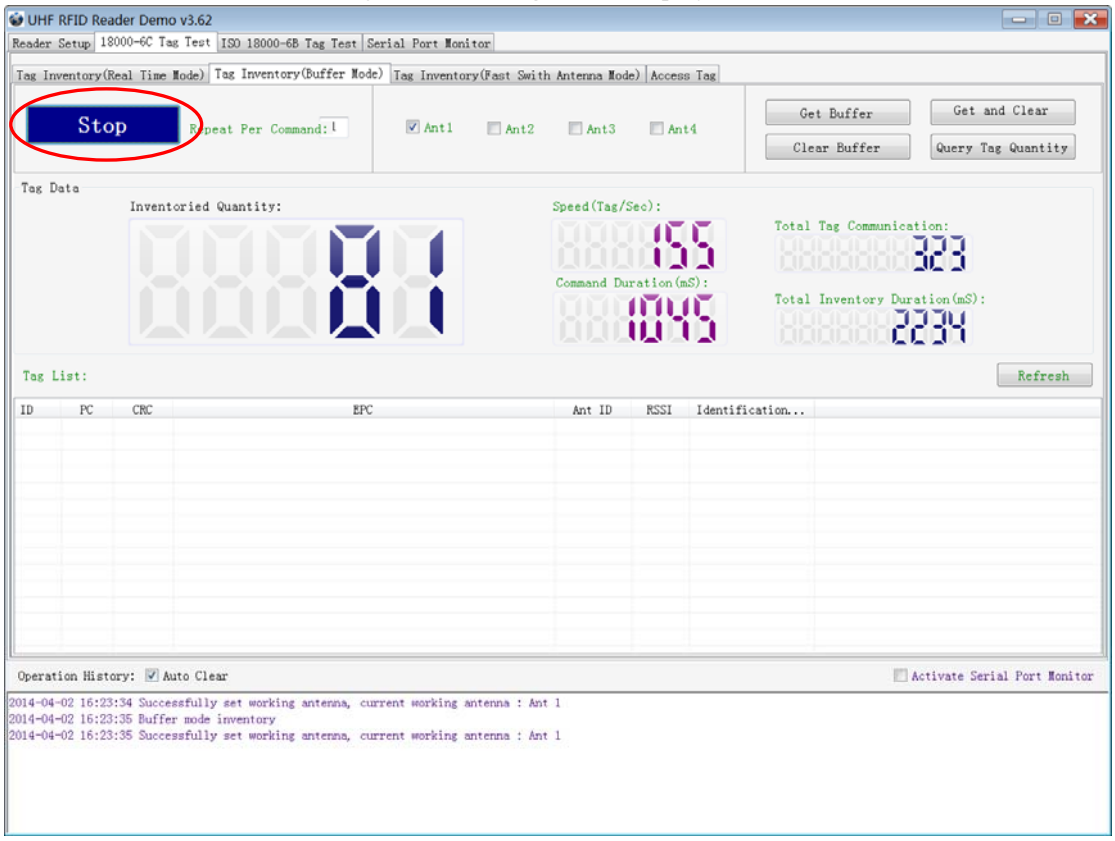
Meaning of the data in Tag list as shown below:

ID	The serial number of data.
E P C	EPC number of tag.
P C	Protocol Control word of tag.
Identification Times	Times of tag identified.
RSSI	The signal strength when tag was identified at the last time.
Carrier Frequency	Carrier Frequency of tag which is identified at the last time.

Next we will inventory tag under Buffer Mode.

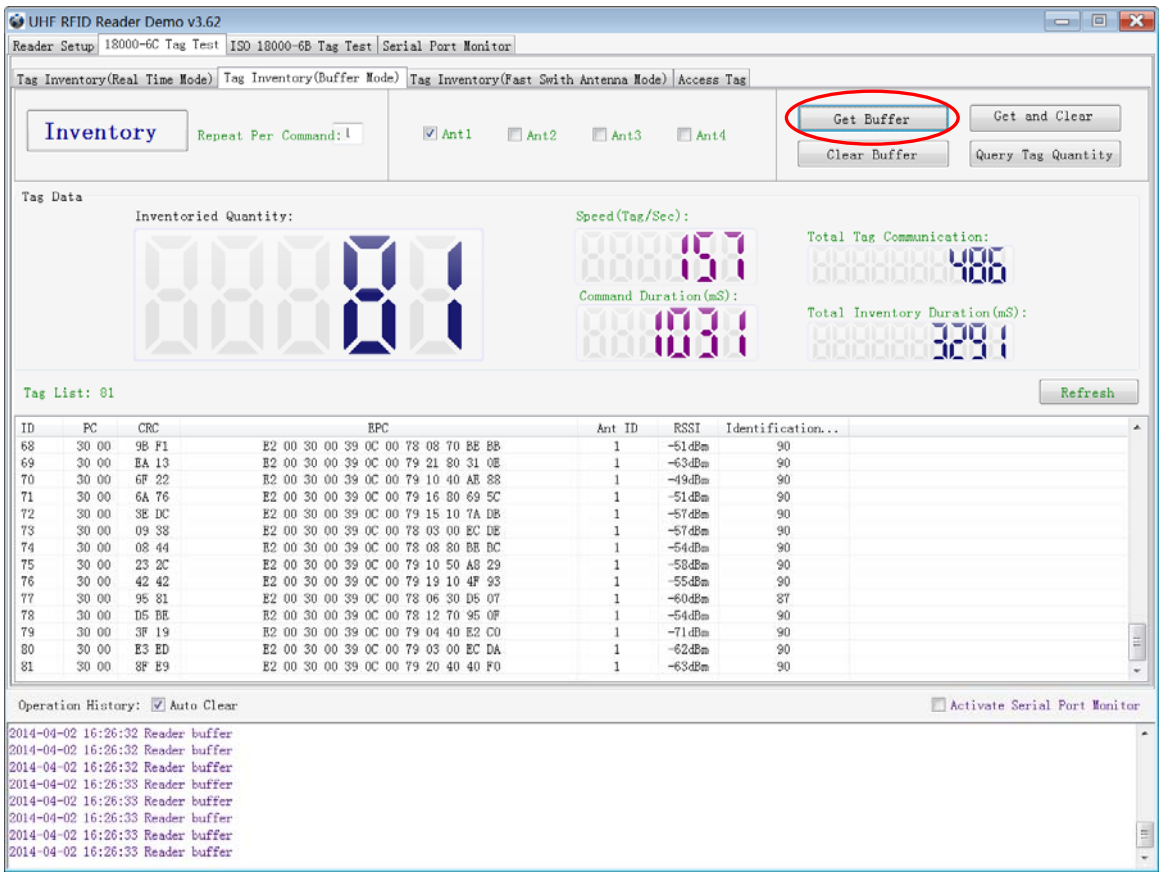
The same as Real Time Mode, click on T**ag Inventory (Buffer Mode)**. Then, select the checkbox for the port with a connected antenna and set the number of **Repeat Per Command**.

Then click on **Inventory**, the following screen displays:



We find that the identified tags won't be shown in the **Tag list**.

Click on **Stop** first, then click on **Get Buffer**. All the data in cache will be uploaded, as illustrated below:



Functions of other three cache operation buttons described as follows:

Get and Clear: Read the data form cache and then clear the cache. It will be empty when you read the cache again.

Query tag Quantity: If you just want to know there are how many tags in cache without details, click on this button.

Clear Buffer: Clear the cache and refresh the screen.

Users could find the difference between Real Time Mode and Buffer Mode through the above operation.

2.3.2 Users define Session ID & Inventorying Parameter of Inventoried Flag

2.3.3Fast Switching Antenna to Inventory Tags

In the standard operation of inventory tag (Real Time Mode & Buffer Mode), the process of each time inventory will takes at least 500-800ms. Only when inventory completed, reader can respond to the other new command.

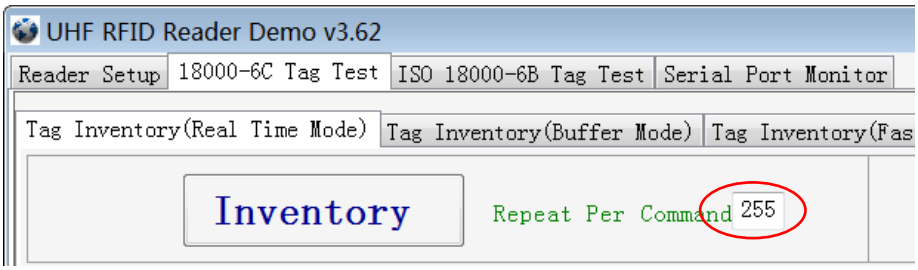
In many case, however, 500-800ms is not be accepted. Then Fast Switch Antenna Mode will be used.

There are two methods can achieve fast switching antenna.

Method 1:

Set the value of **Repeat Per Command** to 255 (0xFF)

As illustrated below:



Then click on **Inventory**. At the moment, operating time of each round inventory will be as short as possible. Generally speaking, if only 1 or 2 tags in RF region, it will takes 50ms to finish the inventory before the reader receive new command. The time-consuming will be longer when the number of tags increasing.

For specific format of command parameter, see the reader's serial interface protocol version V2.35.

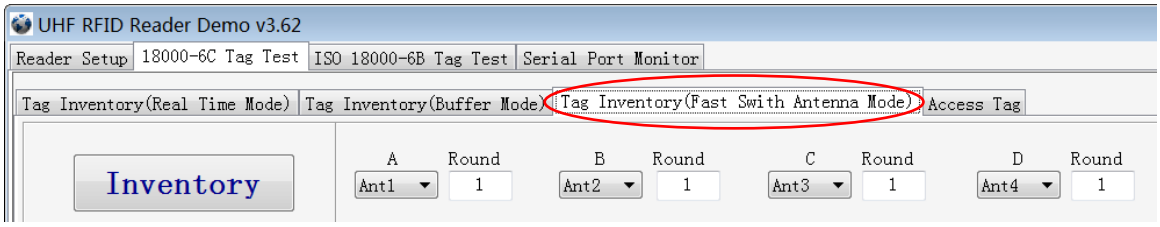
Method 2:

Use **cmd_name_fast_switch_ant_inventory** command (see serial interface protocol version V2.35).

The difference between method 1 and 2 is: the process of sending switch antenna command is omitted in method 2, so it is faster and more efficient. It takes 25ms to read one tag form one antenna. For specific method of this command, see the reader's serial interface protocol version V2.35.

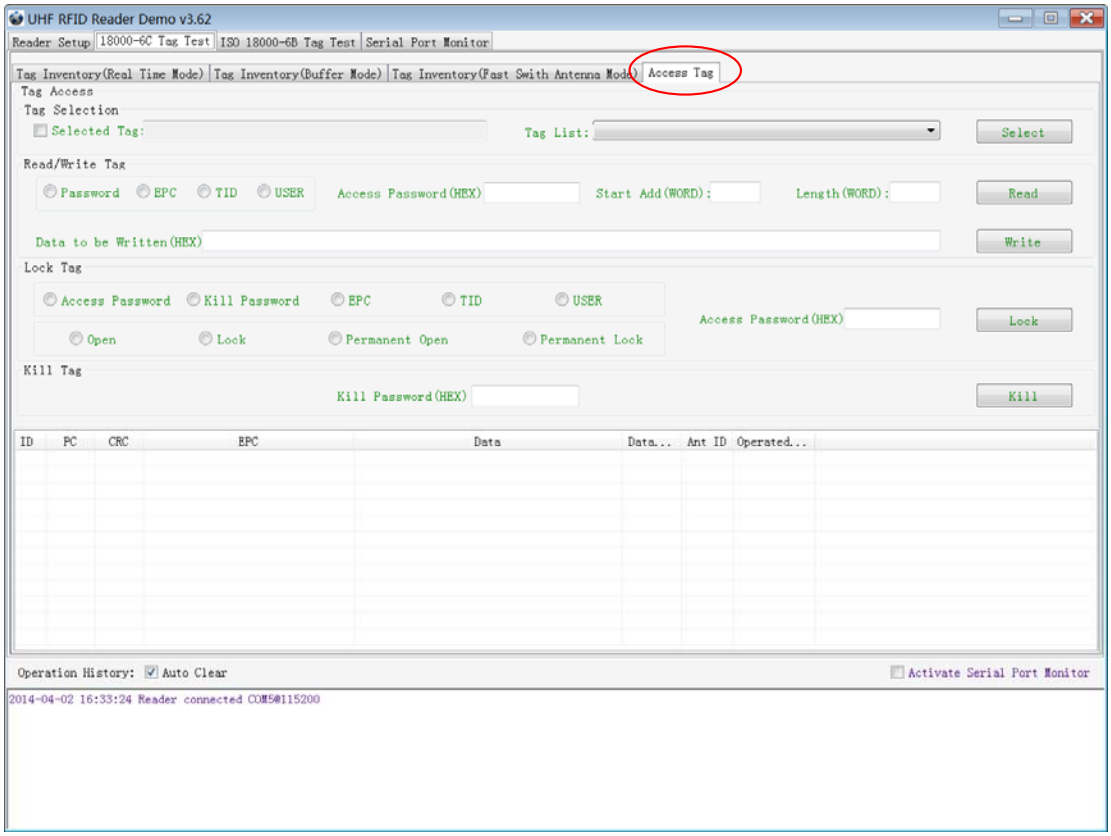
We can see the effect of **Fast Switch Antenna Mode** in demo.

Select **Fast switch Antenna Mode**, the following screen displays:



2.4 Accessing ISO-18000-6C Tag

Click on **Access Tag**, the following screen displays:



The following describes how to read or write the tags.

2.4.1 Read tag operation

You can type the parameter in the interface as illustrated below:

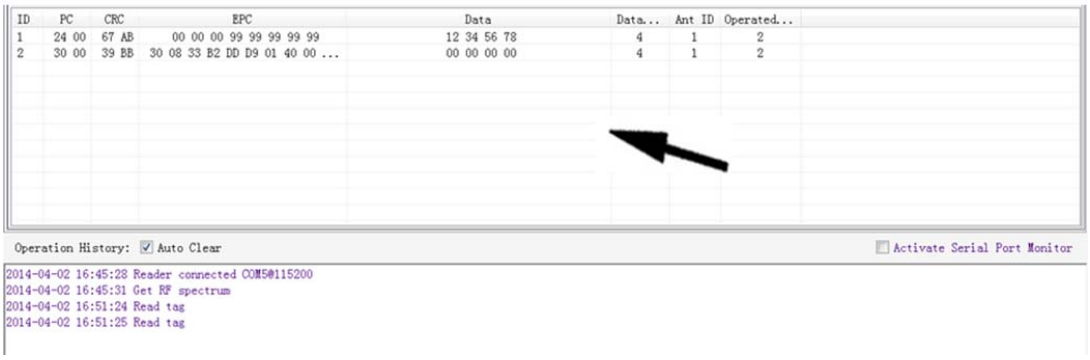
To read tags, you need to input three parameters: Area of Tag, Start Address and Data Length.

Note, the unit of Starting Address and Data Length is WORD which is 16 bit double-byte.

Click on **Inventory**, when the parameter setting completes.

Note, the parameters you input must meet the specification of the tag, or an error message will appear.

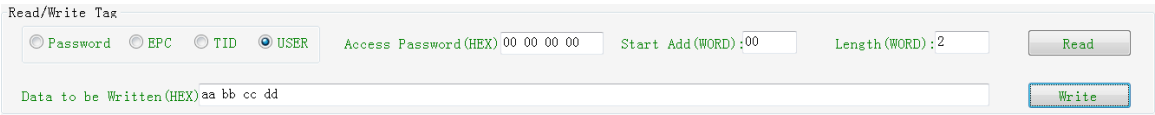
When the operation completes successfully, the following screen displays:



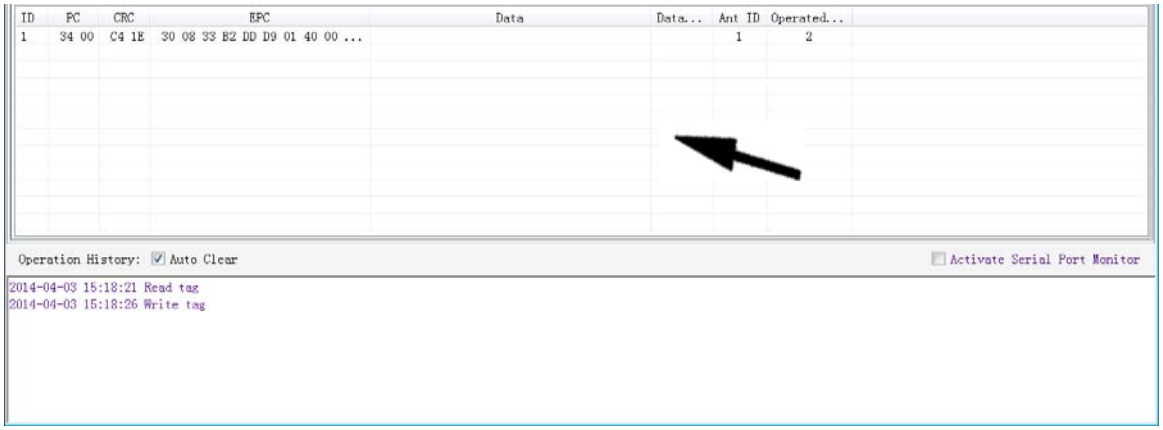
In the above image, it says two tags have been identified successfully.

2.4.2 Write Tag Operation

The area of Write Tag is the same as Read Tag, but you need to provide access password and information of write data extra.



When you operate successfully, the following screen displays:



How many tags operated successfully, the equal of pieces data will be displayed in **Tag List**. It is blank in **Data** and this is the difference from **Read Tag**. The user can read the tag again in the same area to verify if the data was written correctly.

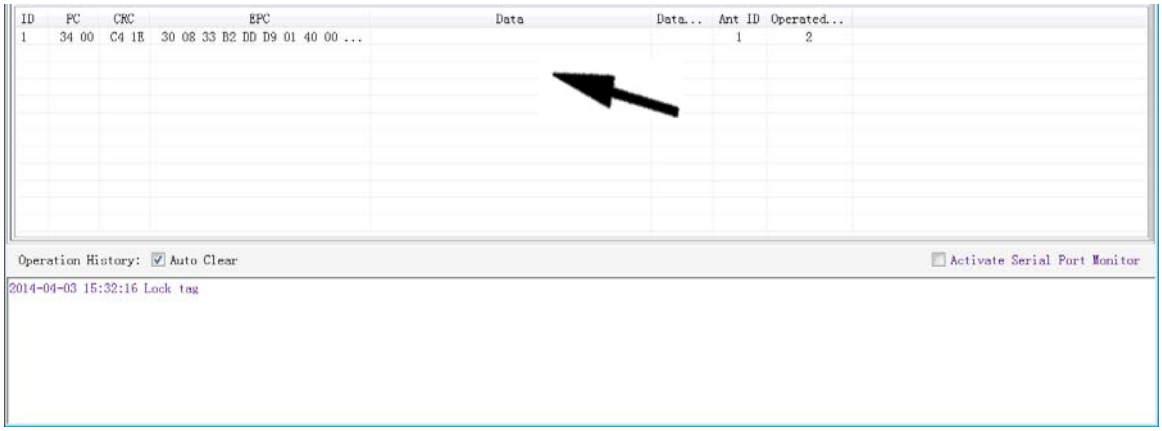
Note: The maximum length of one-time write is 32 Word (64 bytes, 512bits).

2.4.3 Lock Tag Operation

The interface of **Lock Tag Operation** as below:

A password must be provided if you want to Lock Tag.

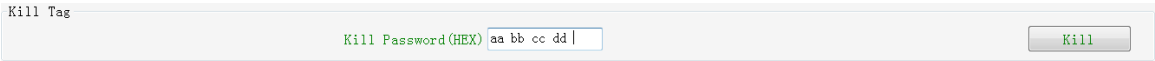
When the operation completes successfully, the following information displays:



The same as **Write Tag Operation,** data of identified tags will be displayed in **Tag List.**

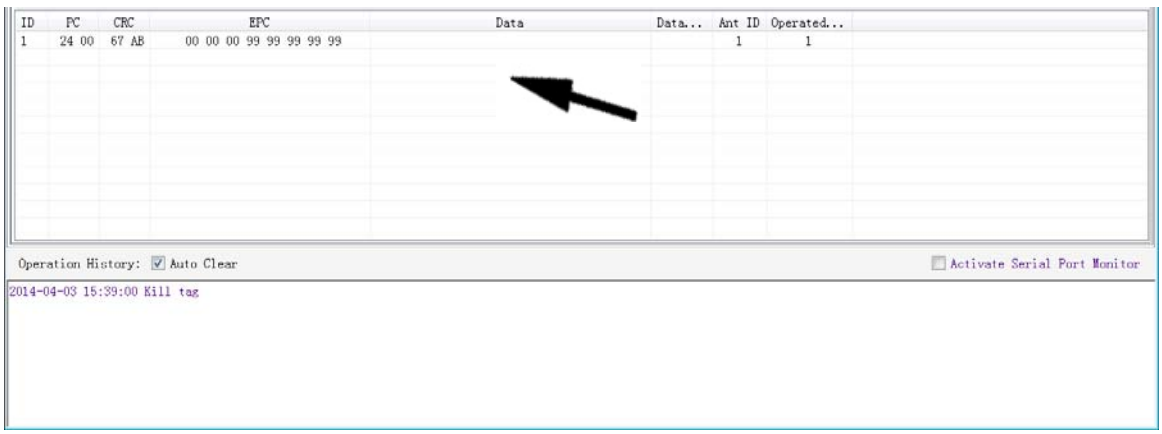
2.4.4 Kill Tag Operation

The interface of Kill Tag Operation as below:



Kill Tag must provide a destruction password and the destruction password can't be 00 00 00 00. Therefore, to kill a tag, you must change the content of password area via **Write Tag Operation**.

When tag is killed successfully, the following information displays:



The same as above, data of killed tags will be displayed in Tag List.

2.4.5 Tag Selection

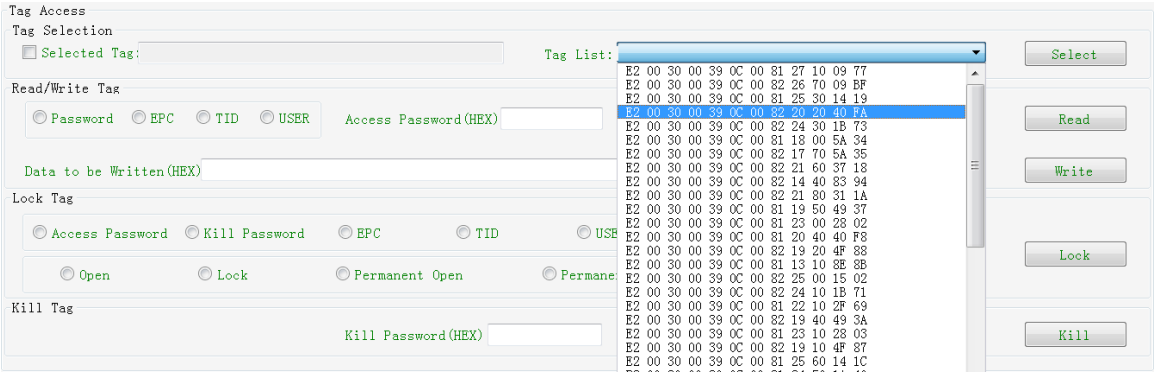
Many times, no matter how many tags in RF region, we just want to access the known EPC tag. Now, we can use the function of Tag Selection (EPC matching).

In demo supplied, we could operate as below:

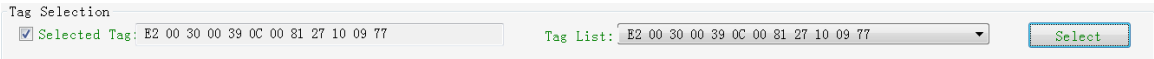
◆First, inventory tags in **Buffer Mode** to get all tags' EPC NO.

◆Second, get buffer.

◆Third, back to the interface of Access tags and choose the EPC NO. which you want , as illustrated below:



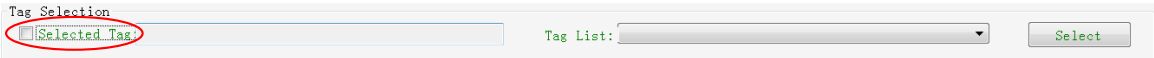
When the choose completes, click on **Select** and the following screen displays:



We could see that the checkbox on the left for **Selected Tag** has been selected, the Selected EPC NO. displays in the text box on the left.

Next, all the operations are only for the tag with this EPC NO.

If you want to cancel the match of EPC, just deselect the checkbox for **Selected Tag**, as below:



2.4.6 Error Display Might Be Returned

There will be some warning of error if we did wrong operations in the process of accessing tags.

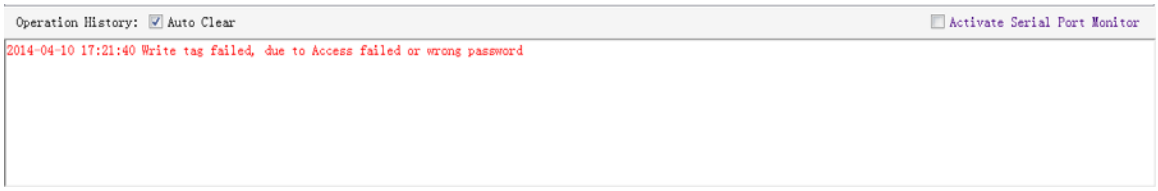
◆Inventory Success, access failure:

Actually there are two-steps to access tag: first inventory tag, second access tag. Prompt in the above image means inventory tag successfully, but can't access.

Generally, there are two reasons lead to this problem. One is the parameter settings are incorrect, for example, read a storage area not exist. The other reason is RF energy is not enough, distance of access tab is about 60%-70% distance of inventory tag, so please

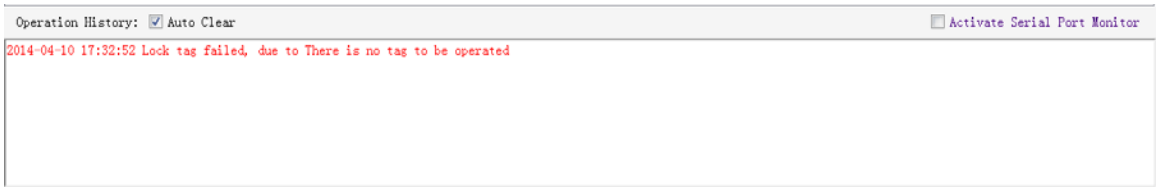
move the tag closer to the antenna.

◆Wrong password:



The reason causing this problem, as the prompt in the above image, is set wrong access password.

◆There is no tag to be operated：



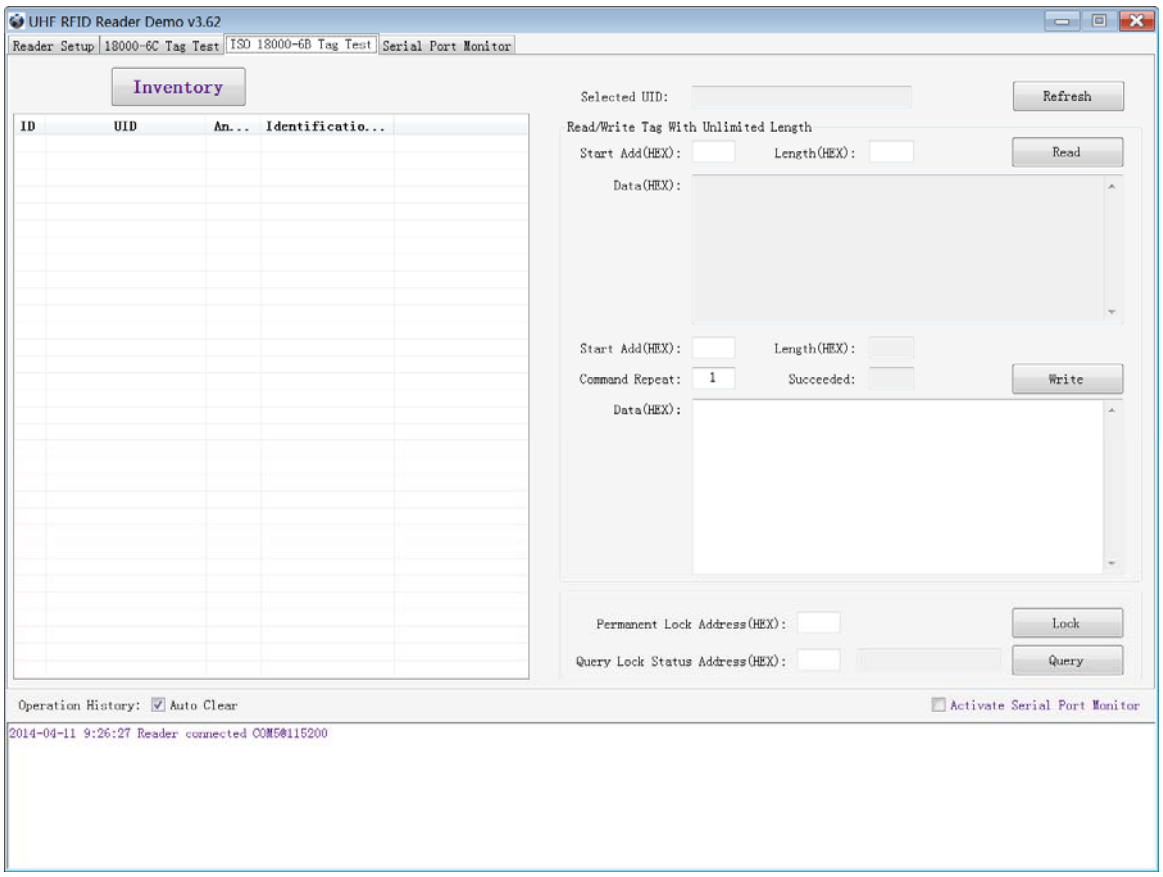
The above warning means there is no tag to be operated in RF region.

The significance of other information returned, users can see the document: UHF_RFID serial interface protocol _V2.38.pdf.

2.5 Accessing & Inventorying ISO-18000-6B Tag

2.5.1 Inventorying ISO-18000-6B Tag

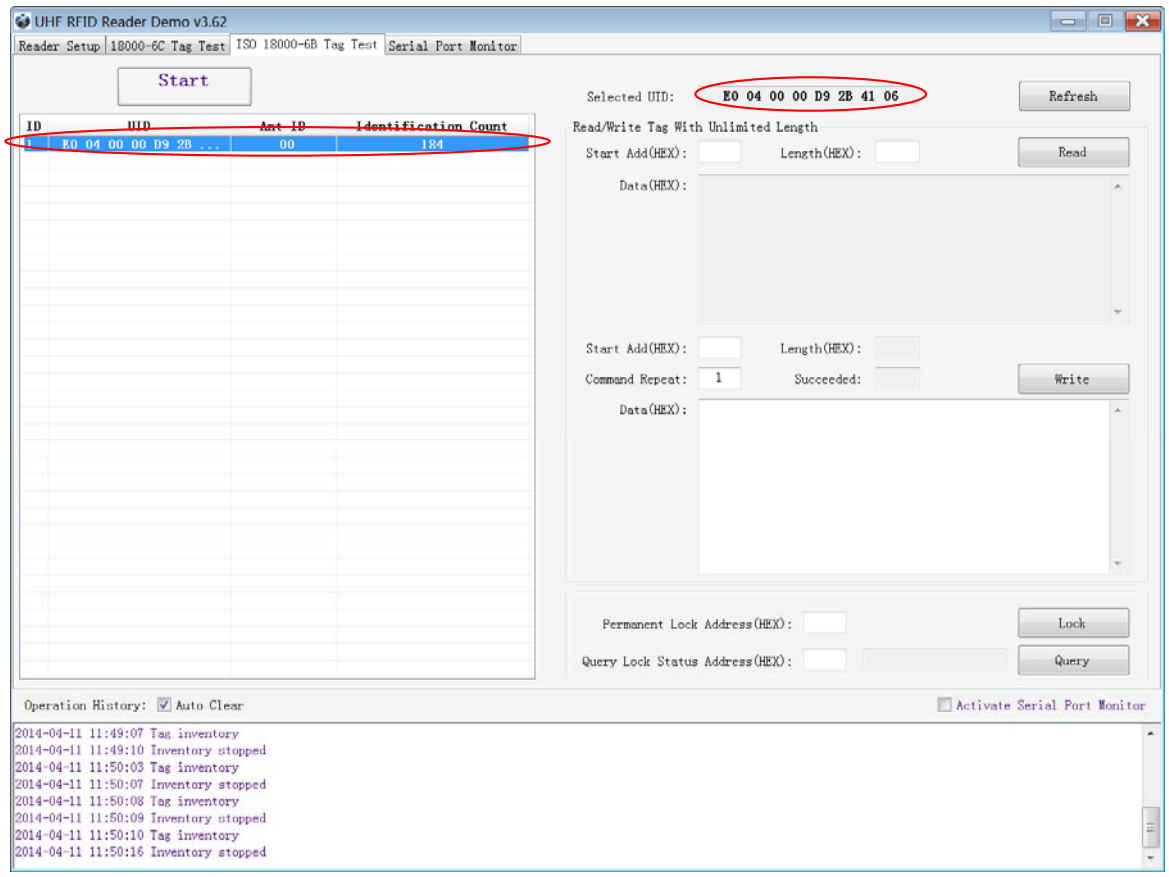
Operating ISO-18000-6B Tag is similar to ISO-18000-6C but easier. It only have **Real Time Mode**, as illustrated below:



Each time when the reader identifies a Tag's UID, the buzzer will sound a short beep. If the buzzer sounds a long beep, it means the reader start the anti-collision function and identifies multiple tags at the same time.

2.5.2 Accessing ISO-18000-6B Tag

Access operation could only for a single ISO-18000-6B tag. After stop Inventorying Tag, click the Tag UID on the left list to choose the Tag, as illustrated below:



The next operation are simple, you can do it yourself. Note the following:

◆Access operation just only for the selected tag.

◆It can read multi-byte data of tag at the same time, length of the data is not limited.

◆Multi-byte data could be witten. If an error occurs, the reader will stop writing, but has been written data will not be changed, while the reader returns the number of bytes written successfully.

◆Only one Byte data of tag can be locked at one time.

◆Only one Byte data state of tag can be inquired at one time.

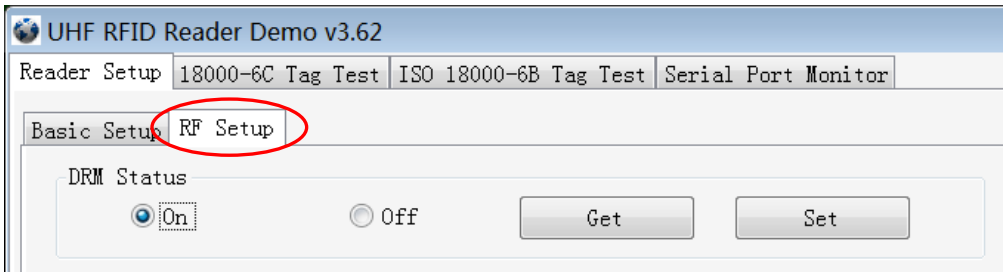
◆Lock byte operation is permanent, irreversible.

2.6 Other Settings

2.6.1 Set DRM Status

DRM is Dense Reader Mode. When multiple readers work at the same time, the RF signal transmission will interfere with each other, you can open the DRM mode to reduce the interference between them.

Operation interface as below (Reader Setup->RF Setup):

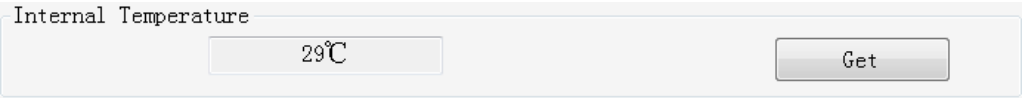


Note: If DRM was opened, the sensitivity of the reader will reduce significantly. So users could start this function according to the actual situation.

2.6.2 Operating Temperature Monitoring

Reader will generate heat under high intensity continuous working. Users can monitor the internal temperature via the built-in temperature sensor to avoid reader overheating (Operating temperature over 65℃). If it's too hot, you could stop reading for a while.

Interface of the **Temperature Monitor** as below:



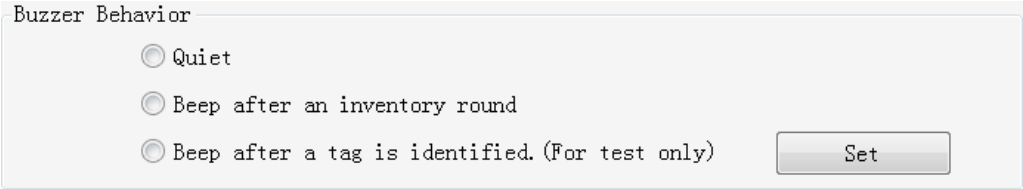
2.6.3 Setting Buzzer Status

Sound of the reader's working status provided to users through the Buzzer.

Users can turn off the buzzer or set it "beep" after each time reader inventory tag.

You can also set it "beep" afer each time reader identifies a tag. But this will reduce the efficiency of multi-tag identification.

Operation interface as below:



Note: The Buzzer will ring when Power On Self Test successfully and it is not controlled by this setting.

After setting completes, the state of buzzer will be saved in the FLASH inside of reader and won't lose after power cut.

2.6.4 Charging The Serial Communication Baud Rate

Reader supports two kinds of baud rate: 38400 bps and 115200 bps.

You can set baud rate via the interface as below:

After setting successfully, new baud rate will be saved in the FLASH inside of reader and won't lose after power cut. But the baud rate communicate with the reader must be new.

Note:

◆If you use the TCP/IP interface, please change the serial rate of TCP/IP module into corresponding. Details see the supplied TCP/IP interface configuration document.

◆Inventorying Tags under **Real Time Model** will produce large amounts of data, please try to use 115200 baud rate.

3. Develop your own RFID Application

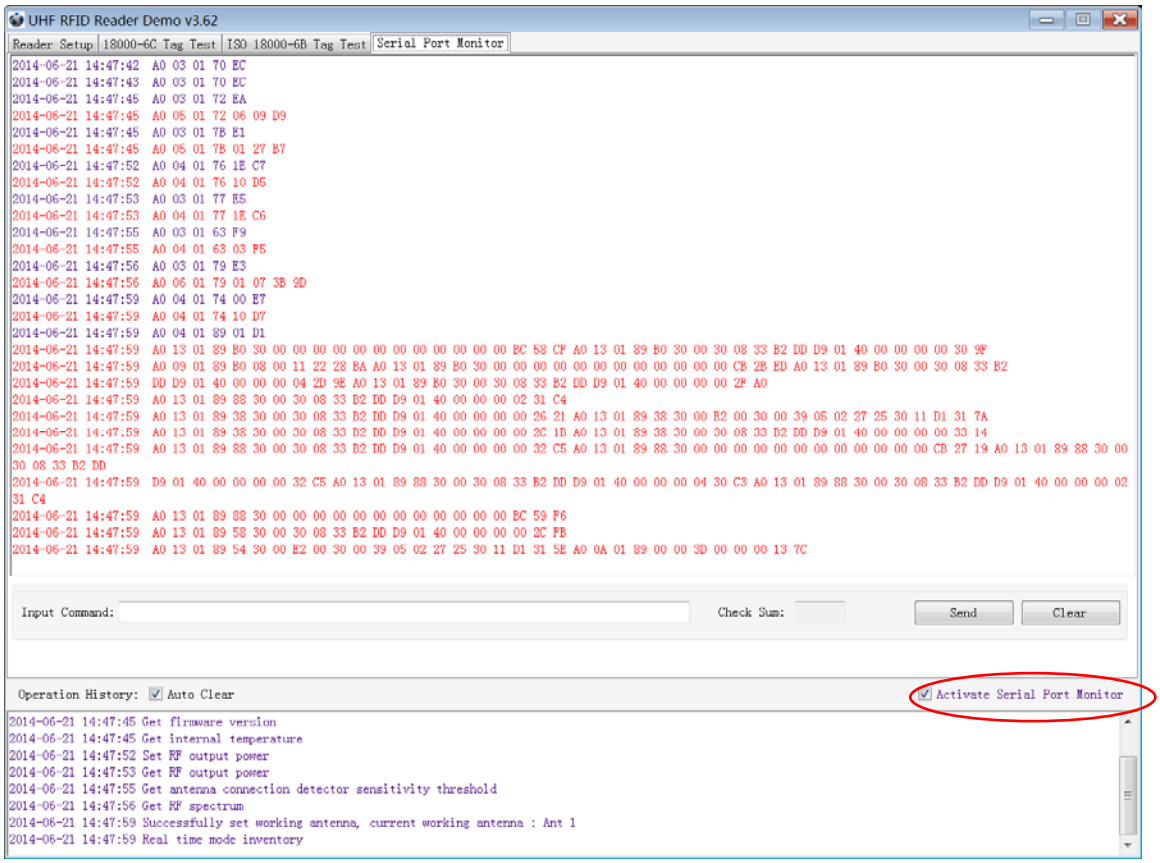
You can operate most functions of reader through the demo. But in actual situation, may be you need to develop your own applications.

Supplied document: **UHF RFID serial interface protocol_V2.38.pdf** provides a complete interface to operate reader.

This port is based on serial communication, so both RS - 232 and TCP / IP, the reader follows the definition of the interface.

Demo provides an important function: recording serial transmission, users can quickly grasp the content of Communication protocol document when you compared it with serial data in the actual operation.

Select the checkbox of **Activate Serial Port Monitor** on the bottom right corner, all uplink and downlink serial data will be recorded, as illustrated below:



Note: Response speed of Demo will be slow down after opening the **Activate Serial Port Monitor**. Generally, this function should be turn off.

Violet blue information is sent to reader by PC, red information is back to PC via reader.

Input Command manually used to debug serial command which could calculate checksum automatically.

In addition, the supplied documentation also includes the complete source code of the demo（Based on C # of .Net platform）. To help users develop applications based on this reader.

During the development process, users could refer to the documentation "Developer FAQ Q & A.PDF" or contact our Technical Support Engineer.

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: 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: 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 this equipment

Changes or modifications not expressly approved by the party responsible for compliance could void the user's authority to operate the equipment.
The distance between user and products should be no less than 20cm