



UHF RFID

001 – Port Reader

Scope of Document	
Firmware Release of Reader	V 6.9
Version of Demo	V 3.62

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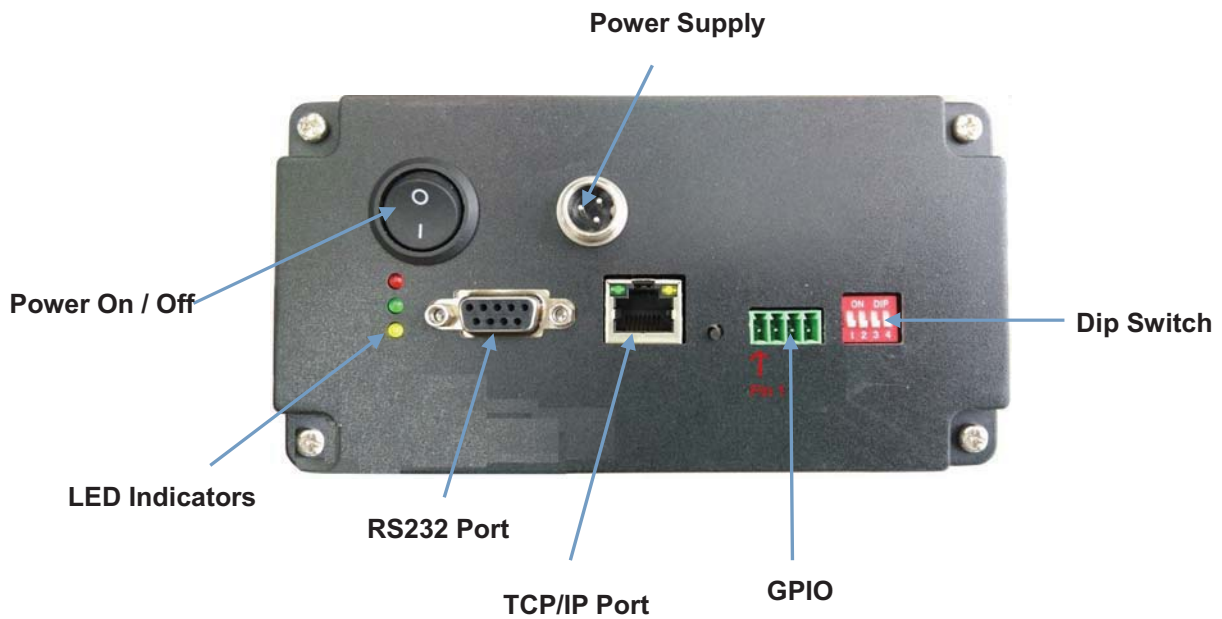
1. About 1-Port and 4-Port Readers

1.1 Antenna Port View



1 – Port Reader

1.2 Front View



2. Ports Illustration

2.1.1 GPIO Port



PIN ID	Function	Equivalent Circuit	Instructions
PIN1	COM		◆ common port of lock relay
PIN2	NO/NC		◆ normally open of relay ◆ normally close of relay
PIN3	GPIO INPUT +		◆ Voltage between PIN 3,4 <=12V
PIN4	GPIO INPUT -		◆ Heteropolarity ◆ Response time<= 150uS

2.1.2 Dip Switch

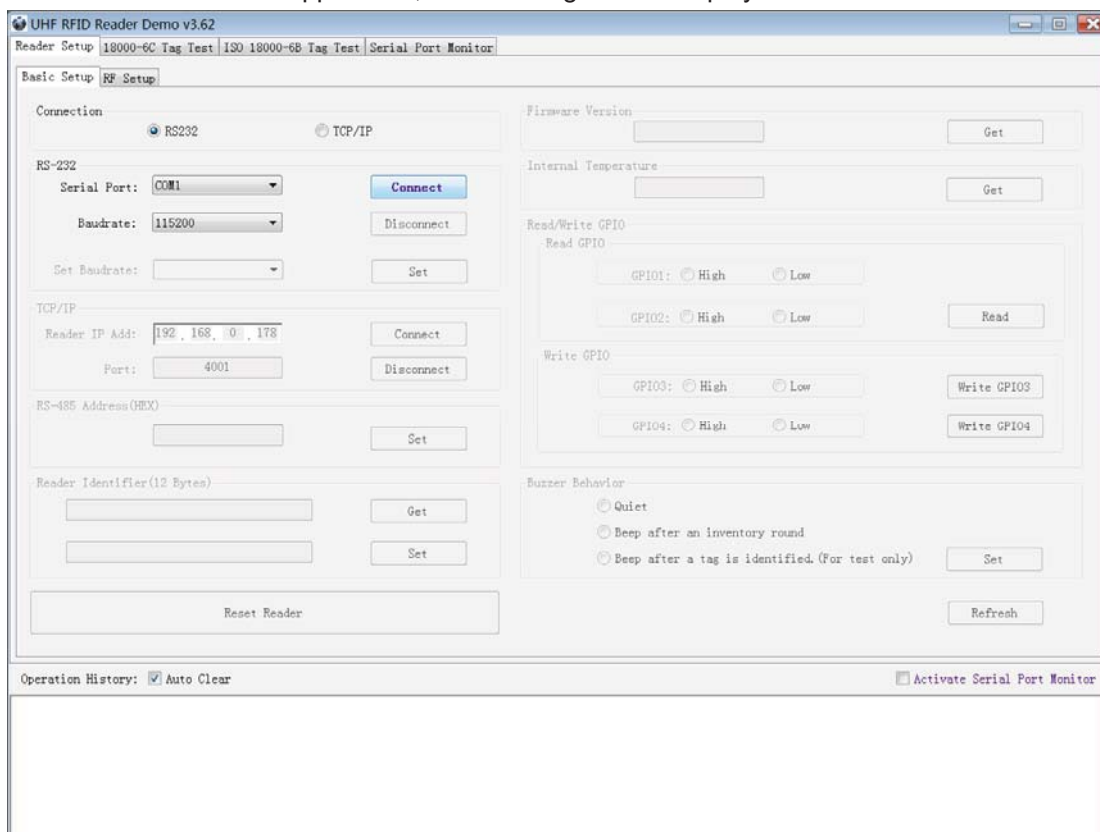


PIN ID	Function	Equivalent Circuit	Instructions
PIN1(Bit1)	Control Buzzer		◆ Up=ON/Down=OFF
PIN2(Bit2)			◆ Reserved
PIN3(Bit3) PIN4(Bit4)	Communication		◆ PIN3+4 Up = Serial Communication ◆ PIN3 Down+PIN4 Up = Network Communication

2.1.3 Operating Reader via Demo

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

Operation History: <input checked="" type="checkbox"/> Auto Clear	<input type="checkbox"/> Activate Serial Port Monitor
2014-04-02 14:48:59 Reader connected COM5@115200	

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:

Connection	
<input type="radio"/> RS232	<input checked="" type="radio"/> TCP/IP
RS-232	
Serial Port: <input type="text" value="COM1"/>	<input type="button" value="Connect"/>
Baudrate: <input type="text" value="115200"/>	<input type="button" value="Disconnect"/>
Set Baudrate: <input type="text"/>	<input type="button" value="Set"/>
TCP/IP	
Reader IP Add: <input type="text" value="192 . 168 . 0 . 178"/>	<input type="button" value="Connect"/>
Port: <input type="text" value="4001"/>	<input type="button" value="Disconnect"/>

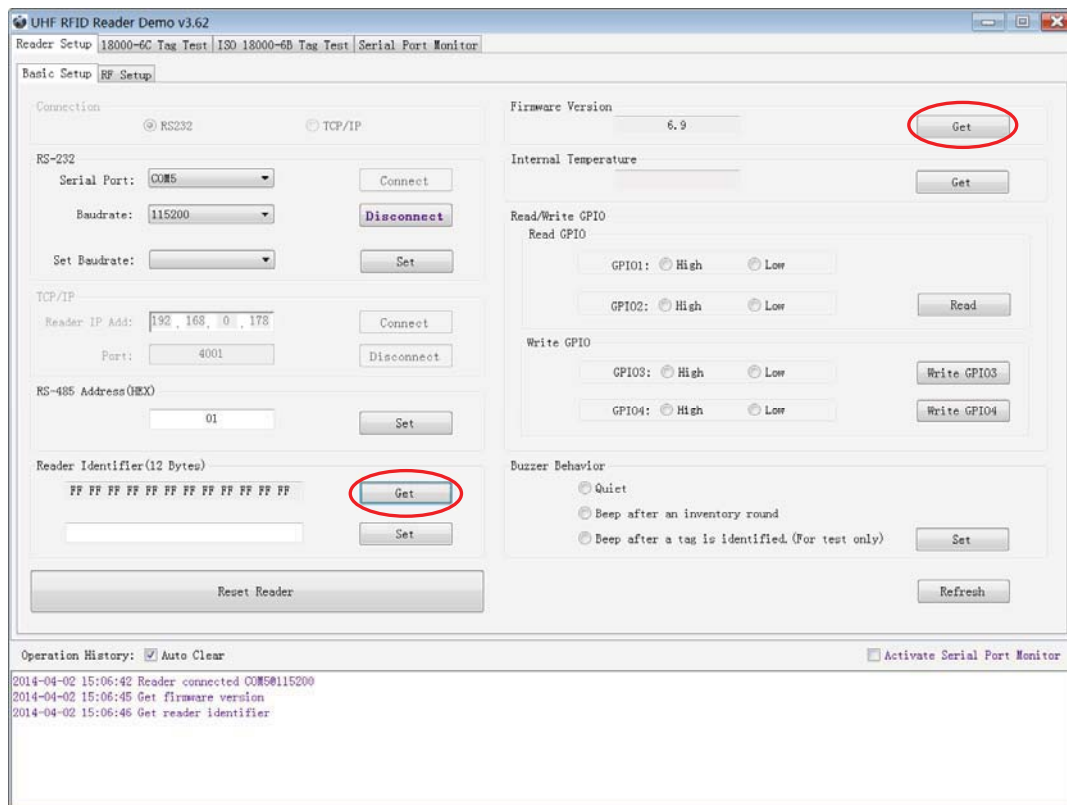
Click on **Connect**, if it connect successfully, the **Operation history** column displays:

Operation History: <input checked="" type="checkbox"/> Auto Clear	<input type="checkbox"/> Activate Serial Port Monitor
2014-04-02 18:02:24 Reader connected 192.168.0.178@4001	

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:

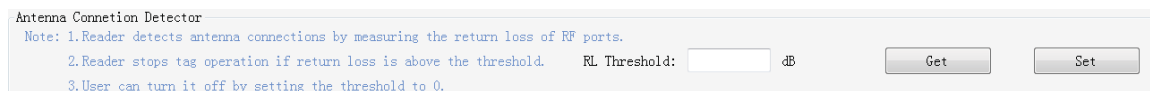


Now the reader has connected to PC successfully.

2.2.3 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:

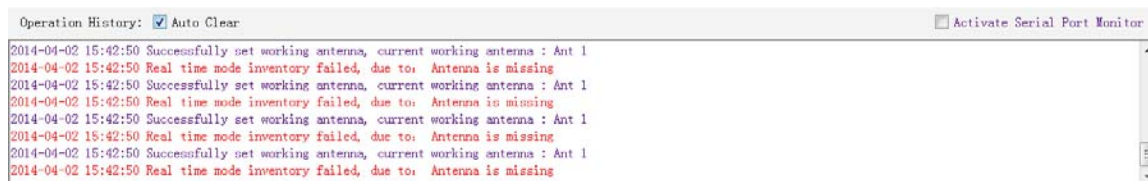


Sensitivity of Antenna Connection Detector is setted by users. Sensitivity of Antenna Connection Detector is the Return Loss of antenna port, the unit is dB. The larger the value, the impedance matching requirements between antenna and port must be better. To ordinary antennas, you can set the threshold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

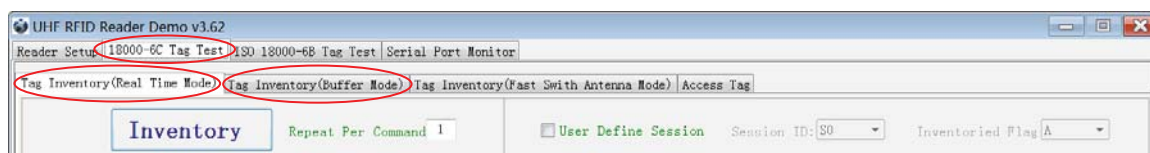
Reader uses a dual CPU architecture, **Identify Tags** and **Data Transmission** are in the charge of two different CPU, they are not interfere with each other. So you don't worry about data transfer will reduce the performance of multi-tag identification. Performance of multi-tag identification under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

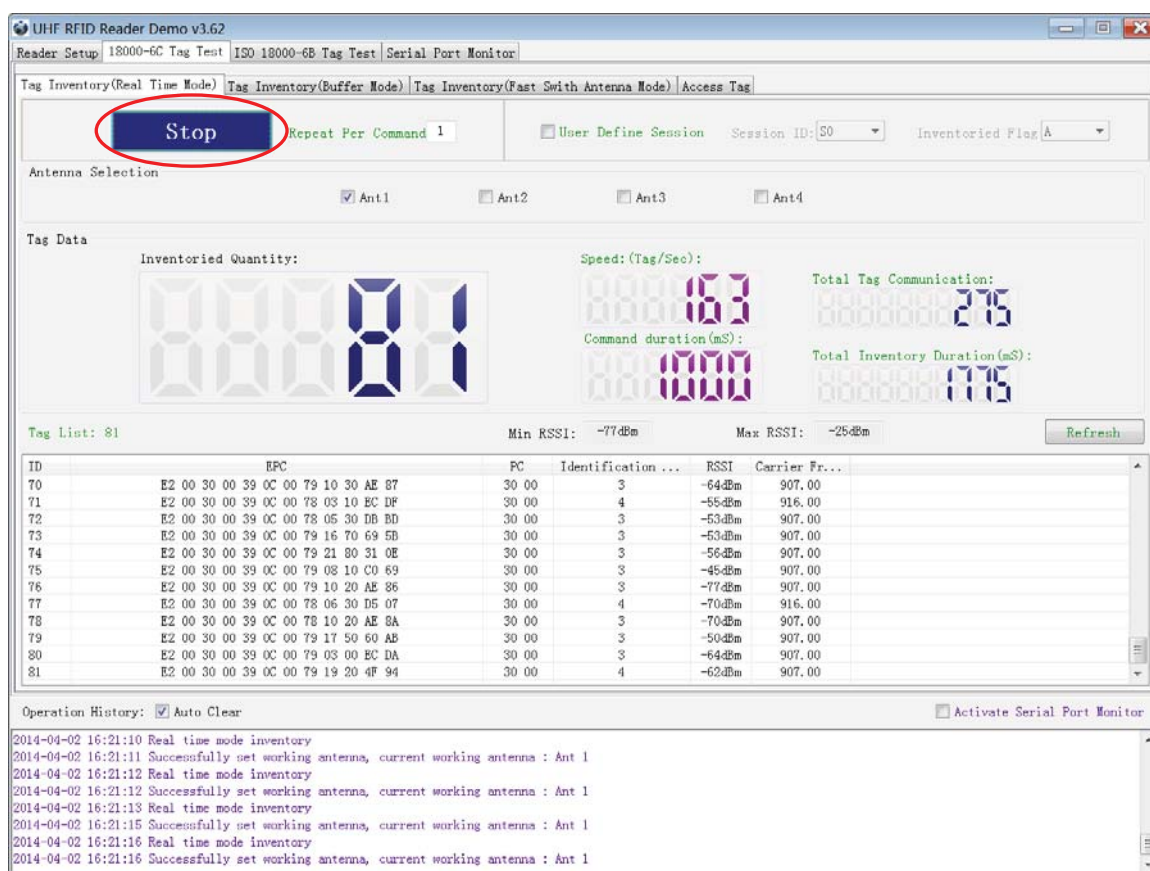
In Demo supplied, you can choose these methods to Inventory Tag as illustrated below:



Let 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.

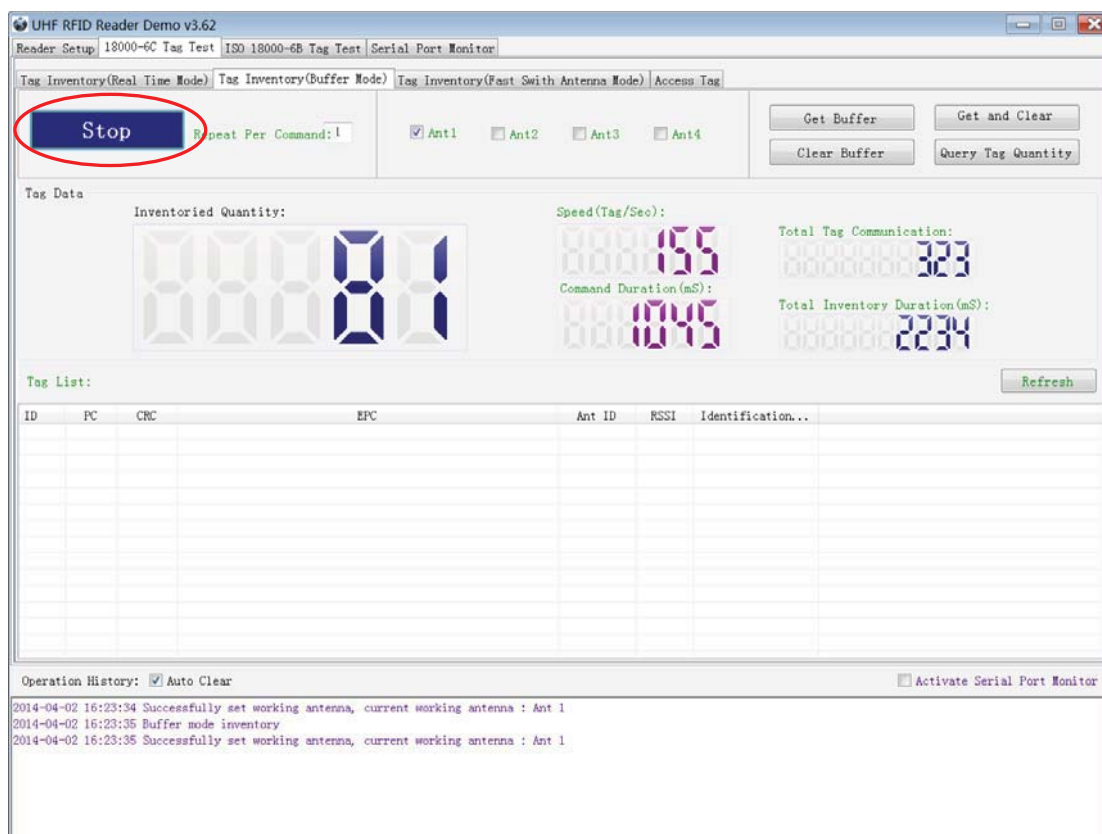
Meaning of the data in Tag list as shown below:

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.

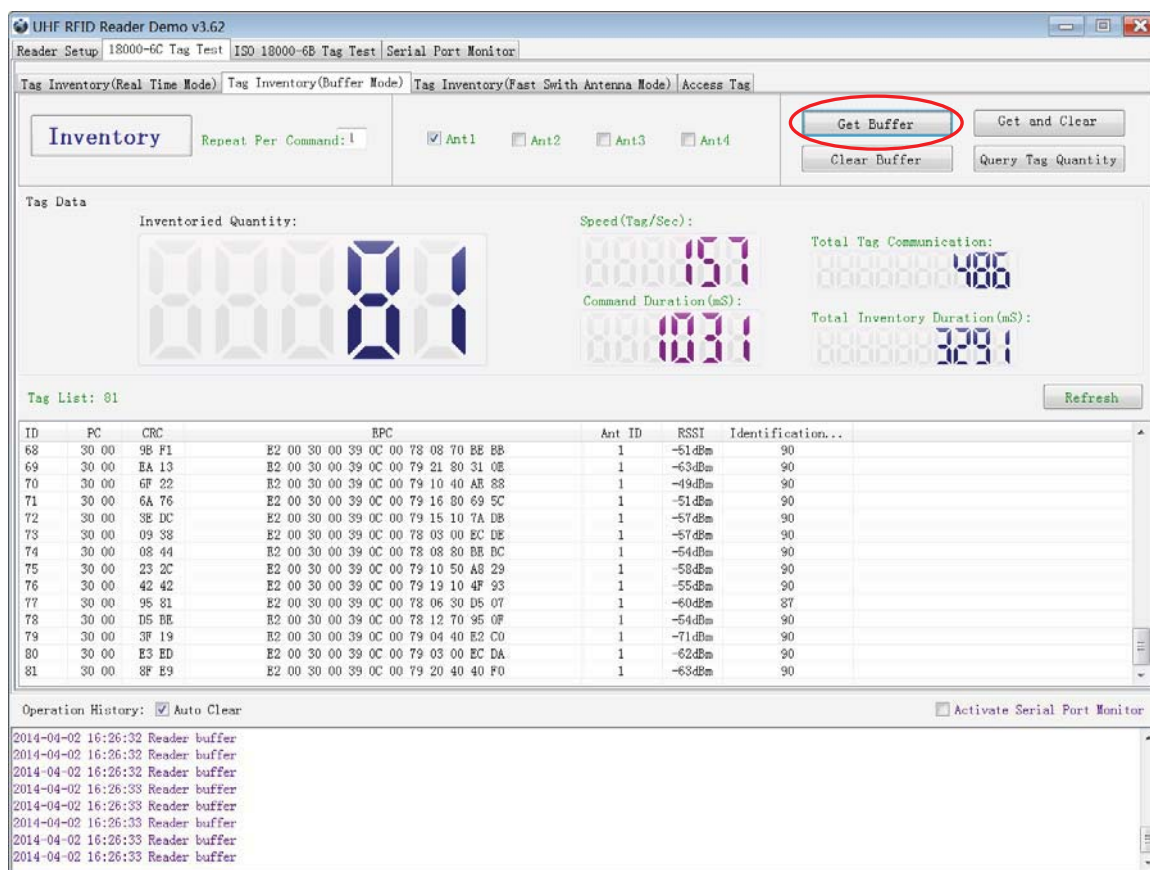
The same as Real Time Mode, click on **Tag Inventory (Buffer Mode)**. Then, select the checkbox for the port with a connected antenna and set the number of **Repeat Per Command**.

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 from 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

2.3.3 Fast Switching Antenna to Inventory Tags

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

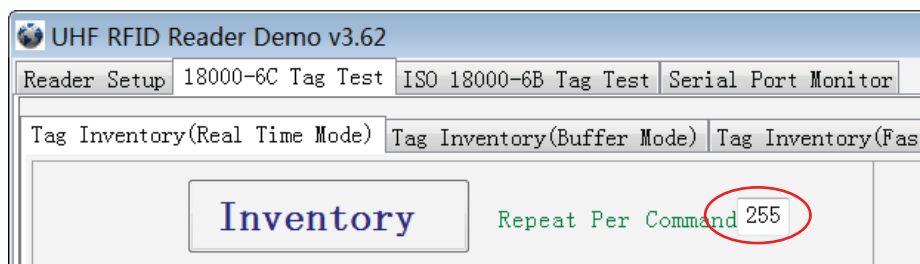
In many cases, however, 500-800ms is not acceptable. Then Fast Switch Antenna Mode will be used.

There are two methods to 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.

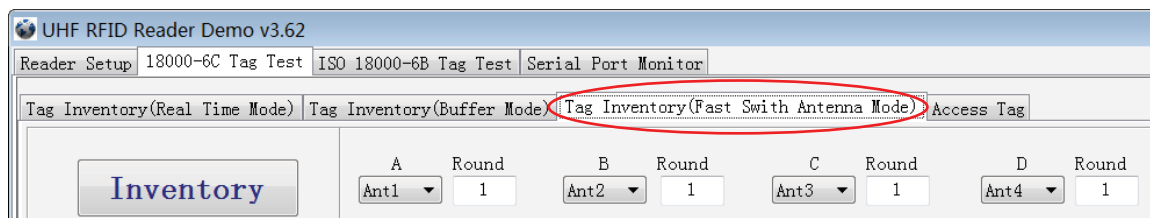
Method 2:

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:



2.4.2 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.

Read/Write Tax

☐ Password
 ☐ EPC
 ☐ TID
 ☒ USER
 Access Password (HEX)
 Start Add (WORD) :
 Length (WORD) :

Data to be Written (HEX)

When you operate successfully, the following screen displays:

[illegible]

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:

Lock Tag

☐ Access Password ☐ Kill Password ☐ EPC ☐ TID ☒ USER

☒ Open ☐ Lock ☐ Permanent Open ☐ Permanent Lock

Access Password (HEX) 00 00 00 00

Lock

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

When the operation completes successfully, the following information displays:

[illegible]

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

Kill Password (HEX)

Kill Tag must provide a destruction password and the destruction password can't be 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:

[illegible]

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:

The screenshot shows the 'Tag Access' window. On the left, there are sections for 'Tag Selection', 'Read/Write Tag', 'Lock Tag', and 'Kill Tag'. The 'Tag Selection' section has a checkbox for 'Selected Tag' and a text box for the EPC number. The 'Read/Write Tag' section has radio buttons for 'Password', 'EPC', 'TID', and 'USER', and a text box for 'Access Password (HEX)'. The 'Lock Tag' section has radio buttons for 'Access Password', 'Kill Password', 'EPC', 'TID', and 'USER', and buttons for 'Open', 'Lock', 'Permanent Open', and 'Permanent'. The 'Kill Tag' section has a text box for 'Kill Password (HEX)'. On the right, there is a 'Tag List' dropdown menu showing a list of tags with their EPC numbers. Below the list are buttons for 'Select', 'Read', 'Write', 'Lock', and 'Kill'.

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

The screenshot shows the 'Tag Selection' window. The 'Selected Tag' checkbox is checked, and the EPC number 'E2 00 30 00 39 0C 00 81 27 10 09 77' is displayed in the text box. The 'Tag List' dropdown menu is also set to the same EPC number. The 'Select' button is highlighted.

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:

The screenshot shows the 'Tag Selection' window. The 'Selected Tag' checkbox is unchecked, and the EPC number is still displayed in the text box. The 'Tag List' dropdown menu is also set to the same EPC number. The 'Select' button is highlighted.

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:

The screenshot shows the 'Operation History' window. It has a checkbox for 'Auto Clear' and a checkbox for 'Activate Serial Port Monitor'. Below the checkboxes, there is a text box displaying the error message: '2014-04-10 14:37:41 Read tag failed, due to Tag Inventoried but access failed'.

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.

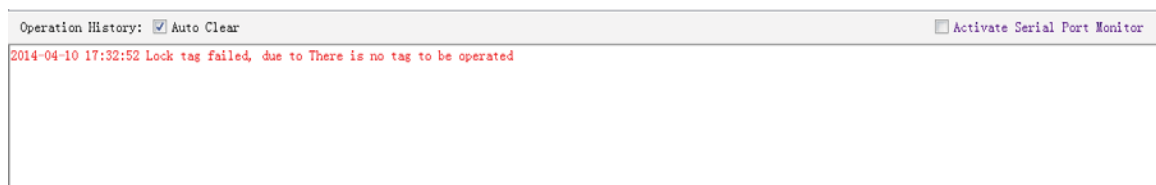
Generally, there are two reasons lead to this problem. One is the parameter settings are incorrect, for example, read a storage area not exist. The other reason is RF energy is not enough, distance of access tag is about 60%-70% distance of inventory tag, so please move the tag closer to the antenna.

◆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:



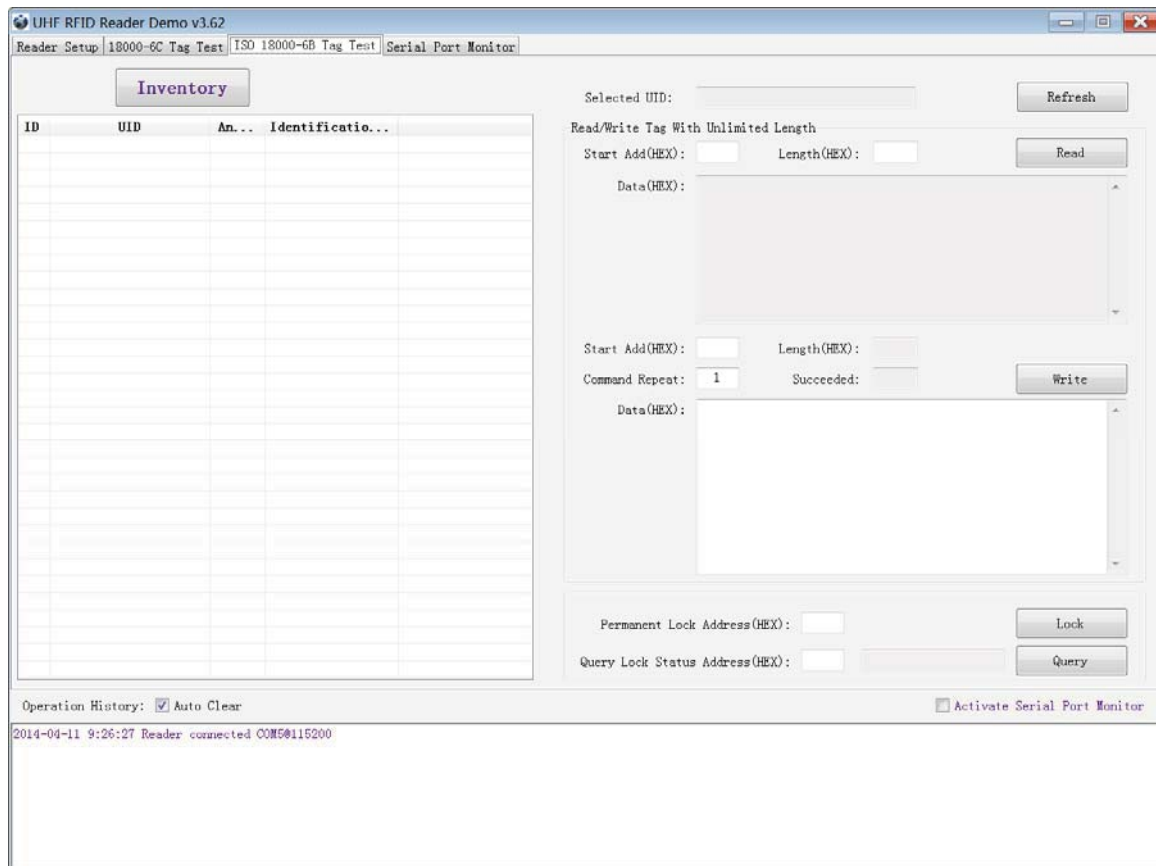
The above warning means there is no tag to be operated in RF region.

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

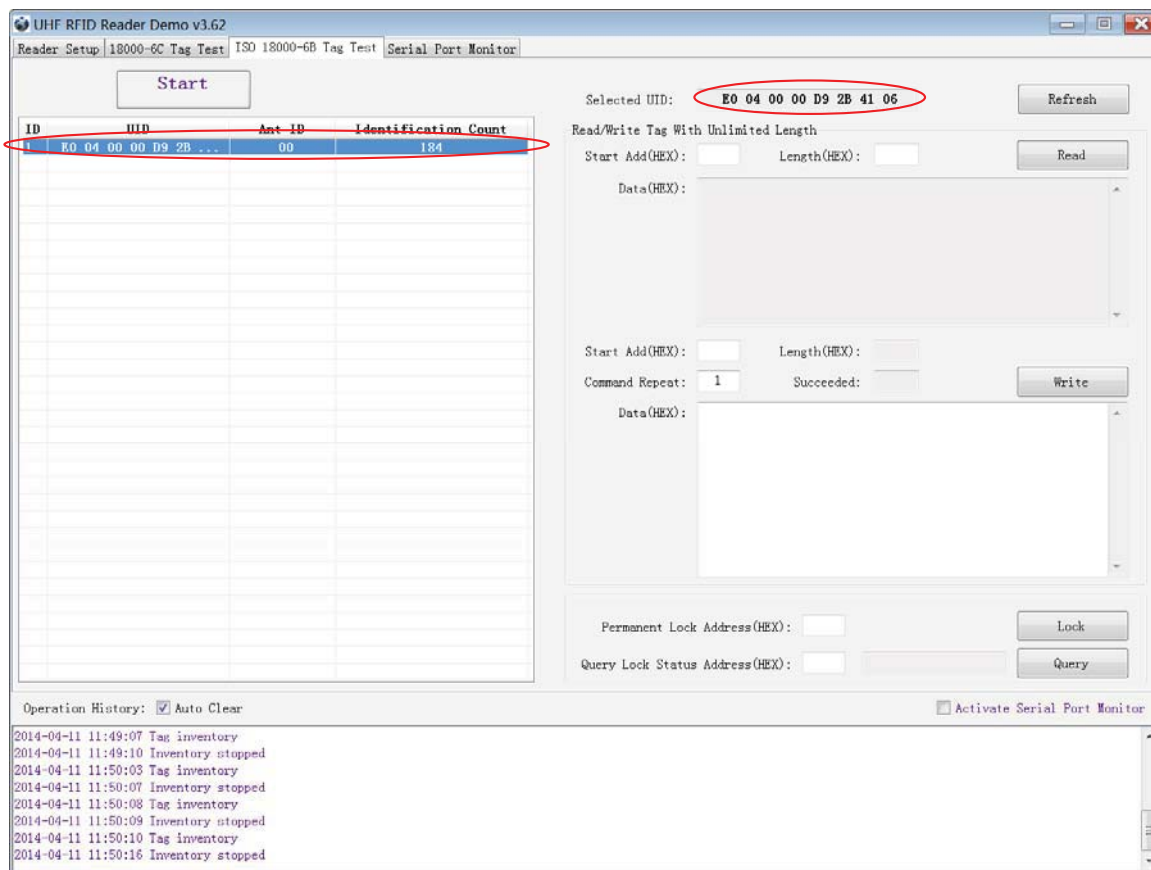
Operating ISO-18000-6B Tag is similar to ISO-18000-6C but easier. It only have **Real Time Mode**, as illustrated below:



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:

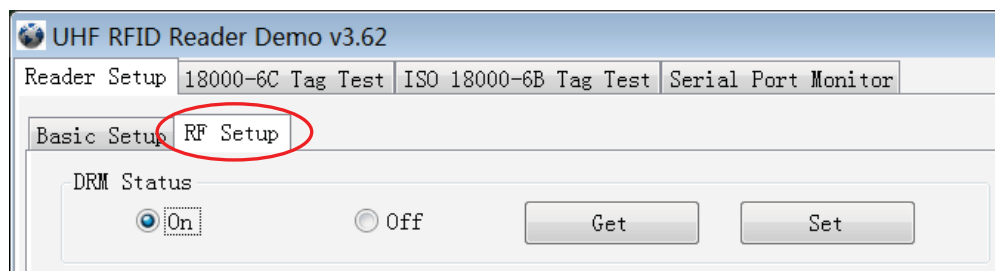
- ◆ Access operation just only for the selected tag.
- ◆ It can read multi-byte data of tag at the same time, length of the data is not limited.
- ◆ Multi-byte data could be witten. If an error occurs, the reader will stop writing, but has been written data will not be changed, while the reader returns 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):

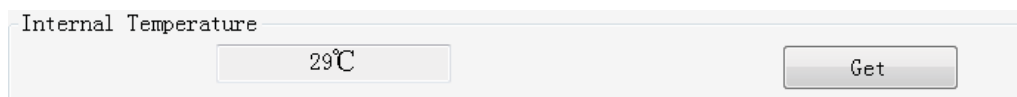


Note: If DRM was opened, the sensitivity of the reader will reduce significantly. So users could start this function according to the actual situation.

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°C). If it's too hot, you could stop reading for a while.

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



2.6.4 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" after each time reader identifies a tag. But this will reduce the efficiency of multi-tag identification.

Operation interface as below:

Buzzer Behavior

☐ Quiet

☐ Beep after an inventory round

☐ Beep after a tag is identified. (For test only)

Set

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.

2.6.5 Changing 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:

RS-232

Serial Port: COM5

Baudrate: 115200

Set Baudrate:

Connect

Disconnect

Set

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

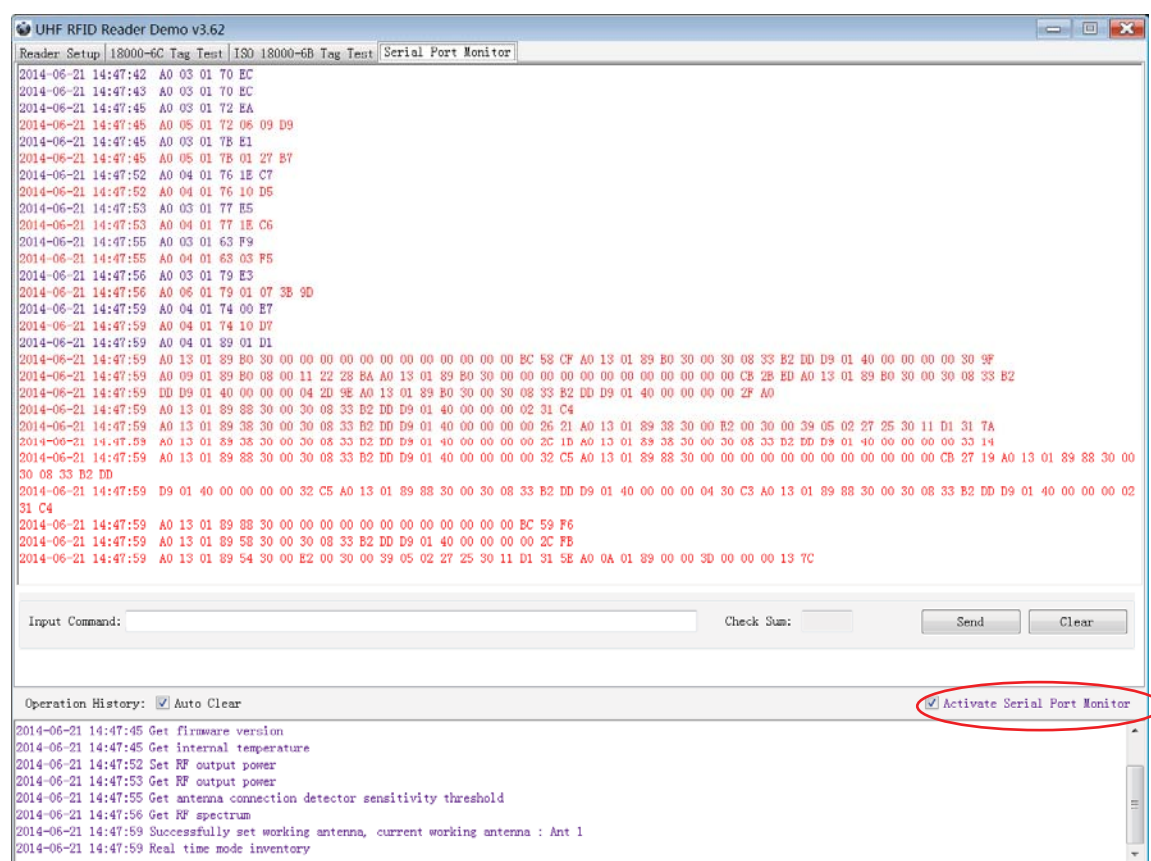
You can operate most functions of reader through the demo. But in actual situation, may be you need to develop your own applications.

Please refer to additional 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 they 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.

Purple texts show 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.

Federal Communications Commission (FCC) Statement

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.

Warning: Changes or modifications made to this device not expressly approved by International SID Global Sdn Bhd may void the FCC authorization to operate this device.

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.

RF exposure statement:

The transmitter must not be colocated or operated in conjunction with any other antenna or transmitter. This equipment complies with the FCC RF radiation exposure limits set forth for an uncontrolled environment. This equipment should be installed and operated with a minimum distance of 20cm between the radiator and any part of your body.