

M-2800

User Guide


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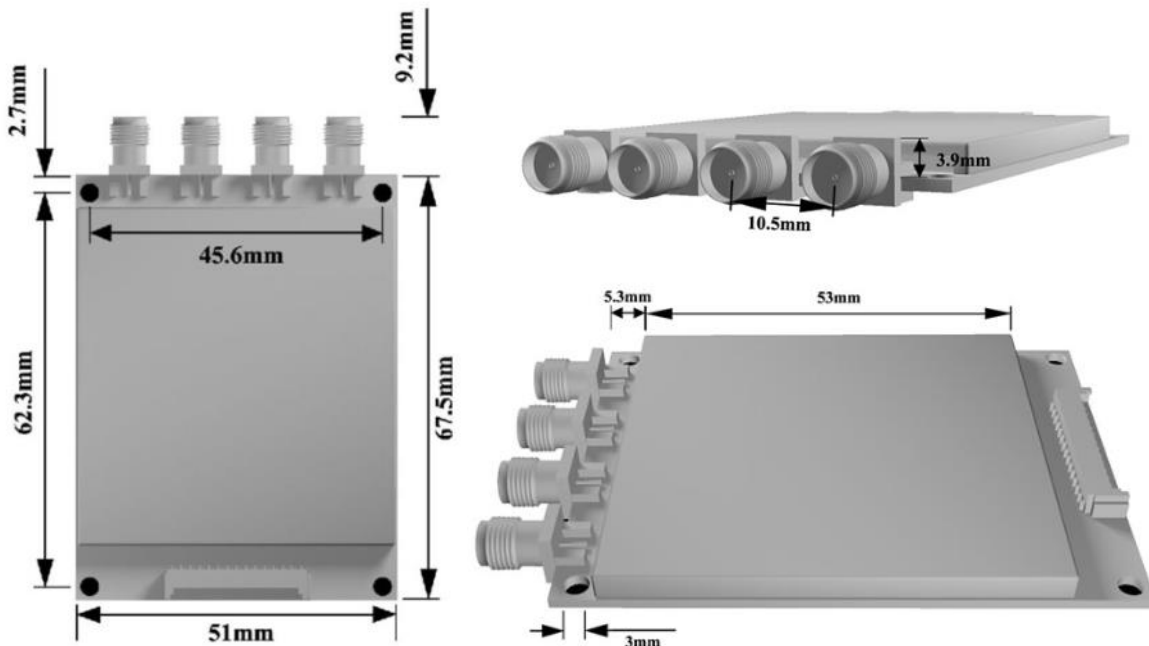
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1 Background

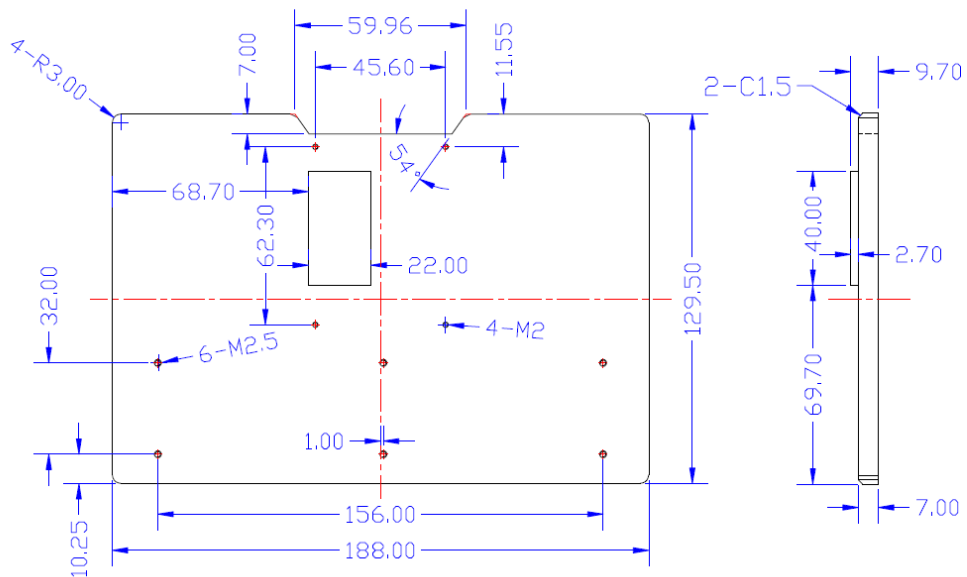
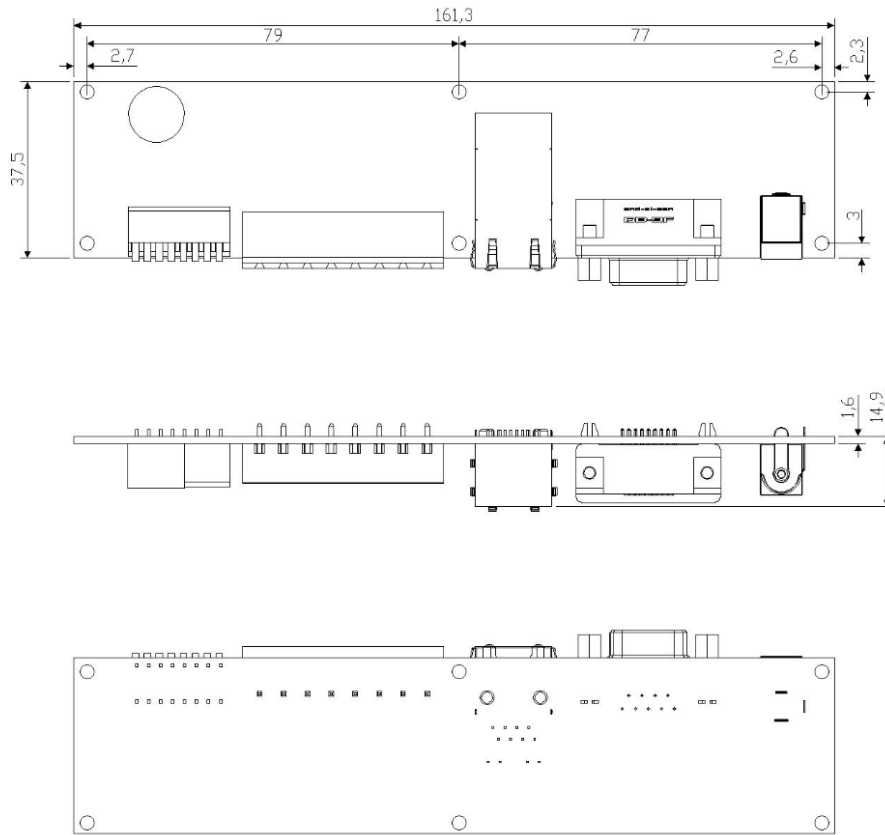
Description	Date	Version	Author	Auditor
First parution	25/05/2020	V1.0	CLO	ACA

2 Product overview

Module type	M-2800
Photo	
RF channel	Four channels
RF connector	SMA
Antenna connecton mode	Four antennas
Interface connector	Molex 53261-1571
RF connector material	Gold-plated
PCB material	Rogers FR4 gold plated
Shield material	Aluminum

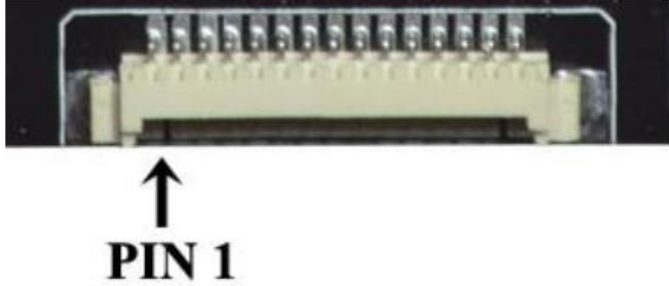


3 Configurations



3.1 Initial Use

3.1.1 Pin connector pin assignment

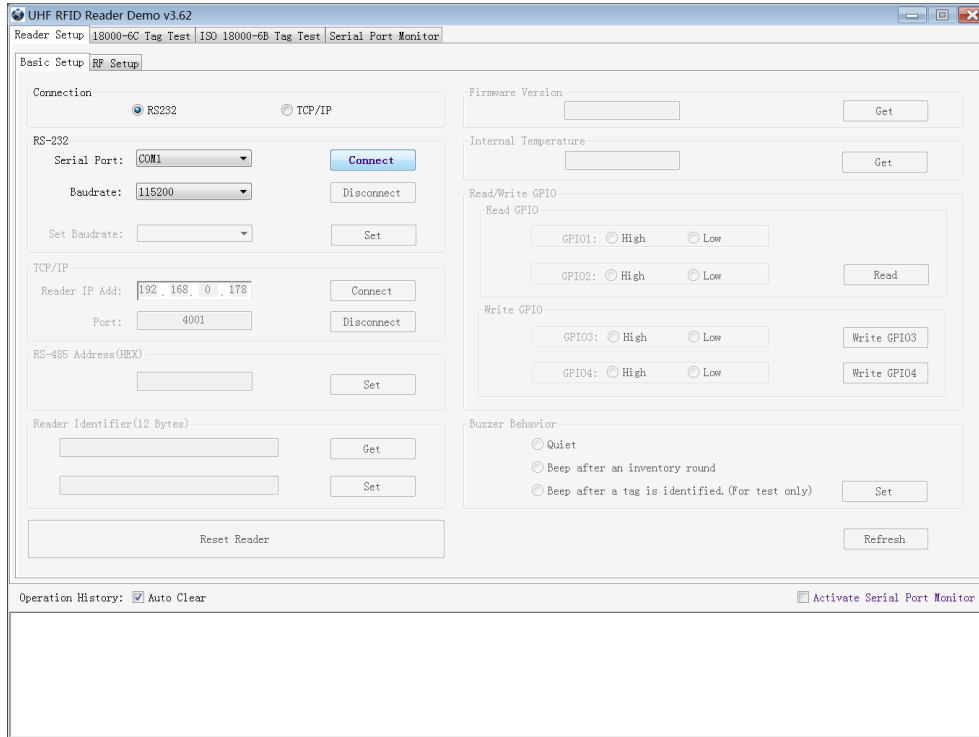


PIN	Interface	Description
1	GND	Meanwhile grounding
2	GND	
3	3.7V - 5V DC	Meanwhile connect power
4	3.7V - 5V DC	
5	GPIO 3	Output
6	GPIO 4	Output
7	GPIO 1	Input
8	Beeper	Has driven with > 50mA output current
9	UART_RXD	TTL level
10	UART_TXD	
11	USB_DM	For testing
12	USB_DP	
13	GPIO 2	Input
14	EN	High level enable
15	GPIO 5	RS-485 direction control

3.1.2 Operating the reader via Demo

Put the **UHF Demo.exe**, **reader.dll**, **customControl.dll** into the same folder, and double-click **UHF Demo.exe** to run the software.

1. Open the software and it will show as below:



2. Please select **RS232** as **Connection** if the reader is connected via RS -232 port. Choose the corresponding **Serial Port** and **Baudrate** (default baudrate is 115200). As illustrated below:



3. Click **Connect**, if it succeeds, the **Operation History** will display as below:



If the reader is connected via TCP/IP, please follow those steps:

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

1. Default settings when connected via TCP/IP as follows:

Connection

RS232 TCP/IP

RS-232

Serial Port:

Baudrate:

Set Baudrate:

TCP/IP

Reader IP Add:

Port:

- IP addresses: 192.168.0.178
- Net mask: 255.255.255.0
- Port No.: 4001

For more TCP / IP configuration details, please defer to the document supplied: \ tcpip configuration \ IPORT-1UM.PDF

2. Click **Connect**, if it is connected successfully, the **Operation history** will display as below:

Operation History: Auto Clear Activate Serial Port Monitor

```
2014-04-02 18:02:24 Reader connected 192.168.0.178#4001
```

Text communication with the reader:

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

UHF RFID Reader Demo v3.62

Reader Setup | 18000-6C Tag Test | ISO 18000-6B Tag Test | Serial Port Monitor

Basic Setup | **RF Setup**

Connection: RS232 TCP/IP

RS-232

Serial Port:

Baudrate:

Set Baudrate:

TCP/IP

Reader IP Add:

Port:

RS-485 Address (HEX)

Reader Identifier (12 Bytes)

Firmware Version:

Internal Temperature:

Read/Write GPIO

Read GPIO

GPIO1: High Low

GPIO2: High Low

Write GPIO

GPIO3: High Low

GPIO4: High Low

Buzzer Behavior

Quiet

Beep after an inventory round

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

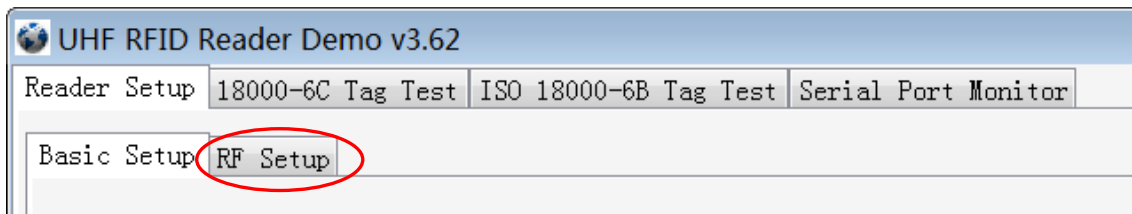
Operation History: Auto Clear Activate Serial Port Monitor

```
2014-04-02 15:06:42 Reader connected COM5#115200
2014-04-02 15:06:45 Get firmware version
2014-04-02 15:06:46 Get reader identifier
```


Now the reader has been connected to PC successfully.

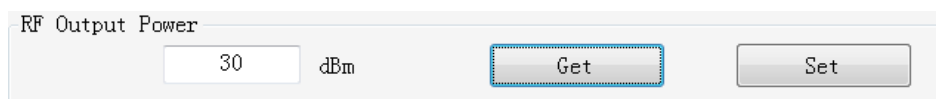
3.2 Setting RF Parameter

After connecting the reader with PC, we need to set some basic RF parameters: RF Output Power & RF Spectrum. Please select **RF Setup** as illustrated below:



3.2.1 Setting RF Output Power

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



The output power range is 0 - 33dBm. When this setting completes, it will be saved in the reader automatically even if the power is cut off. Our default output power is 30dBm (1W).

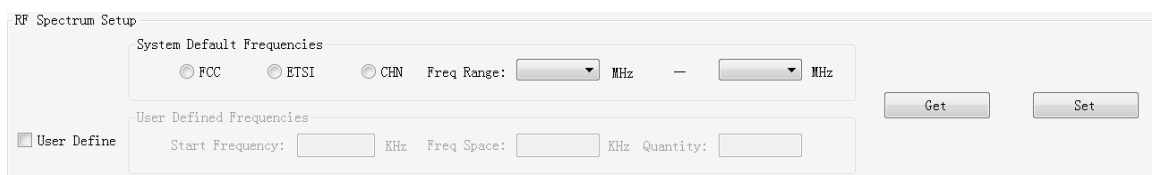
3.2.2 Setting RF Spectrum

There are two methods to set RF spectrum.

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

- Please refer to Frequency parameter tablet in Communication protocol for more information about the carrier frequency.
- Frequency range the reader supports: 865MHz-868MHz(ETSI), 902MHz -928MHz(FCC).

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



Notes:

- The start frequency and the end frequency must not exceed the scope of RF spectrum norm.
- Start frequency must be no more than end frequency.

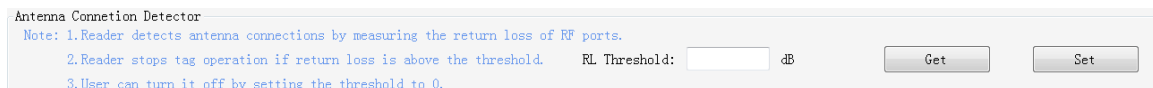
- Set start frequency and end frequency to the same carrier frequency, the reader will work under fixed-frequency.
- When the parameter setting completes, RF carrier frequency of reader will be randomly hopping in the scope of limited range.
- The default RF spectrum norm is FCC (902MHz-928MHz).

Method 2: Set the RF spectrum manually.

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

3.2.3 Antenna Connection Detector

Antenna Connection Detector is for checking if the port is connected to the antenna before the reader work. Otherwise, users will be notified to connect the antenna. Please open this function before you use it, as illustrated bellow:

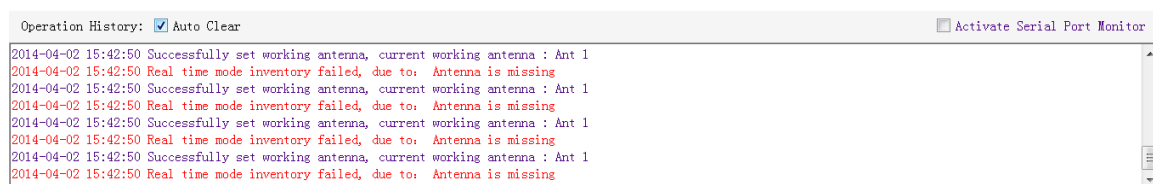


Sensitivity of Antenna Connection Detector is set by users which is the Return Loss of antenna port, the unit of which is dB. The larger this value is, the better impedance matching requirements between antenna and port. For normal antennas, you can set the threshold to 3-6dB. Sensitivity of Ceramic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

Notes:

- Reader detects antenna connection by measuring the Return Loss of RF ports.
- Reader stops tag operation if Return Loss is above the threshold.
- 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:



3.2.4 Measure RF Port Return Loss

3.3 ISO-18000-6C tag inventory

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

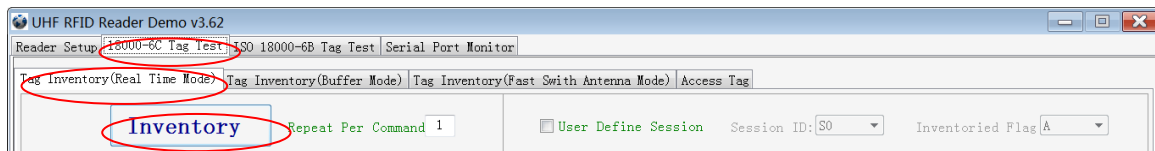
Tag inventory means reader identifying multiple tags' EPC number at the same time. This is the core function of UHF RFID Reader and one of the standards to judge a reader's performance.

3.3.1 Real Time Mode & Buffer Mode

The most commonly used mode for tag inventory is **Real-time** mode. Data will be uploaded meanwhile you can find the tags' EPC number instantly. **RSSI** and **Parameter of Frequency** are changed and recorded in real time. Due to its dual CPU architecture, performance of multi-tag identification under **Real-time** mode is the best.

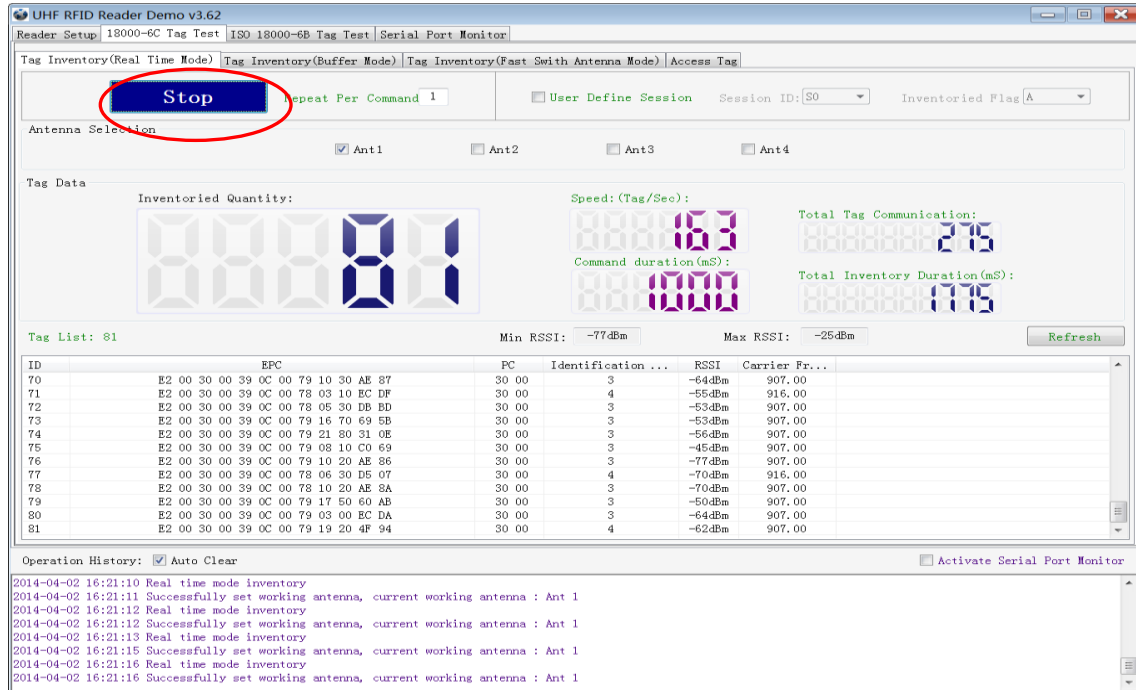
The other is **Buffer** mode, the data will be cached and uploaded together when you need them. When there are tags with small volume, the data is uploaded filtered and with no repeat. But it will take some time to filter duplicate data when reader identifies a large number of tags. Therefore, its identification 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 as illustrated below:



Method NO.1: Real-time Mode

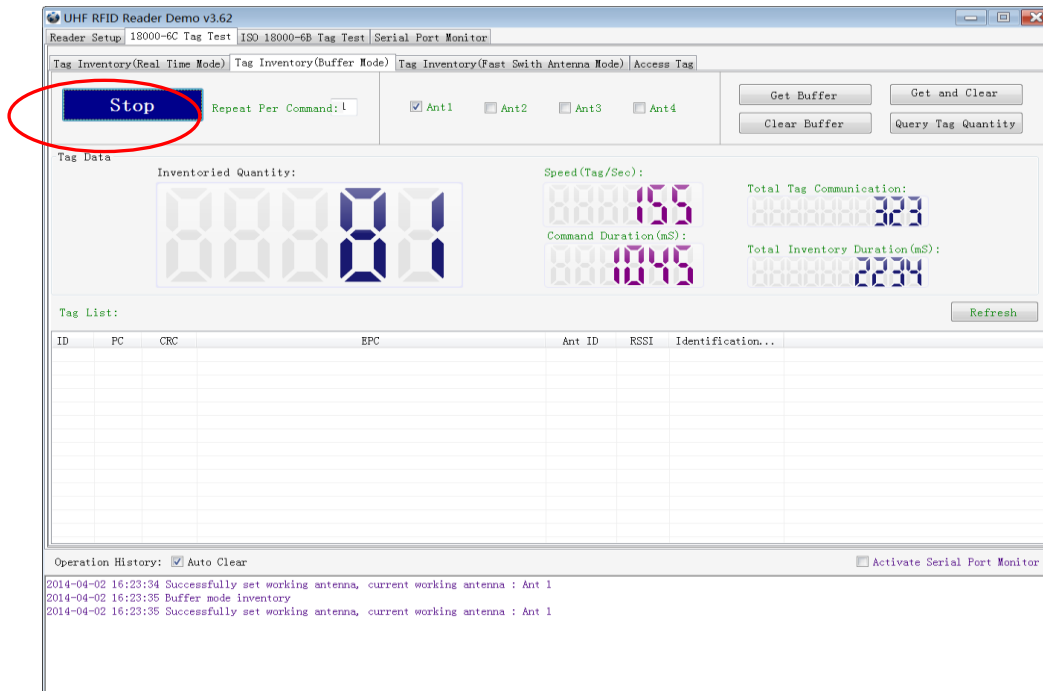
1. Click Tag Inventory (Real Time Mode). Select the connected antenna(s) port. Set the number of Repeat per command, which is the times of repeat inventory command. For example, inventory command will execute anti-collision algorithm one time when you set the value to 1. It will execute anti-collision algorithm two times when you set the value to 2...
2. Click **Inventory**, you will find that the EPC number is uploaded immediately and it is real-time updating. The reader will keep inventory unless you click **stop** as shown below:



Inventoried Quantity	Total number of inventory tags since click on Inventory Tag .
Speed	Speed of identification Tag, unit: piece / sec
Total Tag Communication	Total return EPC data of tags (Including repeated data)
Command Duration	Time of each Inventory Command takes, unit: ms
Total Inventory Duration	Total elapsed time since click on Inventory Tag , unit: ms.
ID	The serial number of data.
EPC	EPC number of tag.
PC	Protocol Control word of tag.
Identification Count	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.

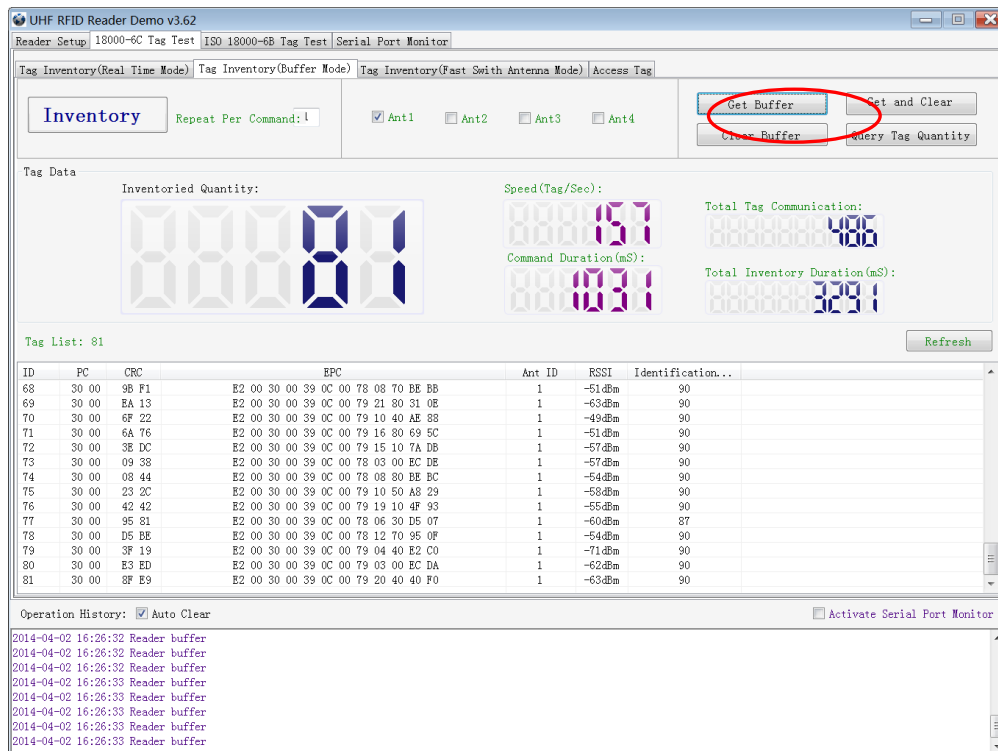
Method NO.2: Buffer Mode

1. Click **Inventory**, the screen will display as below:



Note: the identified tags won't be shown in the **Tag list**.

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



Functions description under Buffer Mode:

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.

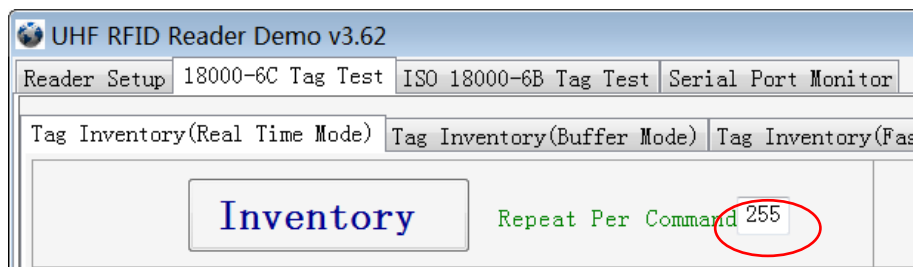
Clear Buffer: Clear the cache and refresh the screen.

3.3.2 Fast Switching Antenna to Inventory Tags

Under standard operation of tag inventory(Real Time Mode & Buffer Mode), the inventory period will takes at least 500-800ms. Only when inventory is completed, reader can respond to the other new command. Sometimes when 500-800ms is not accepted, we need to use Fast Switch Antenna function.

There are two methods to achieve fast switching antenna.

Method NO.1: Set the value of Repeat Per Command to 255 (0xFF), as illustrated below:



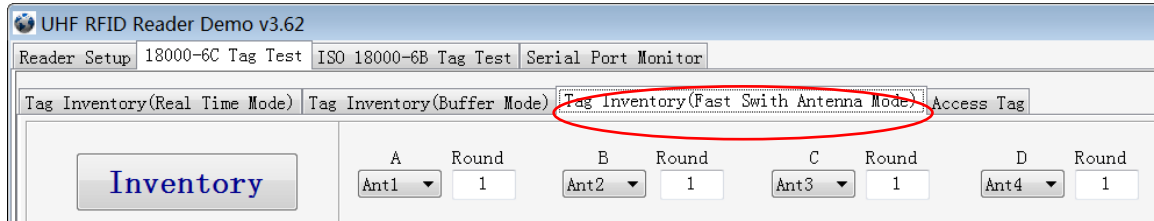
Click **Inventory**, operating time of each round will be as short as possible; Generally speaking, if there are only 1 or 2 tags in RF region, it will takes 50ms to finish the inventory before the reader receive new command. The time-consuming will longer with the increasing tags.

Note: For specific format of command parameter, please defer to the reader's **UHF RFID Reader Serial Interface Protocol V3.1**.

Method NO.2: Use `cmd_name_fast_switch_ant_inventory` command (see **UHF RFID Reader Serial Interface Protocol V3.1**).

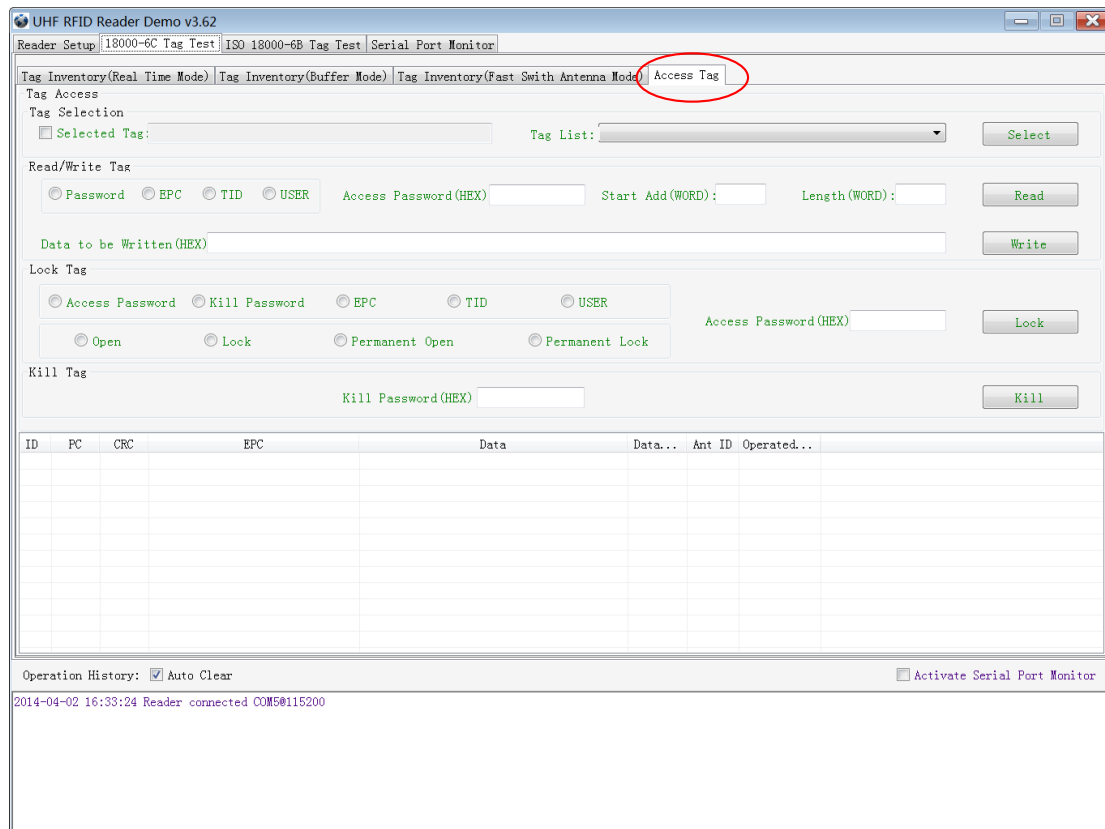
Difference between method NO.1 and NO.2 is: the process of sending switch antenna command is omitted in method 2, so it is faster and more efficient, which takes 25ms to read one tag from one antenna.

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



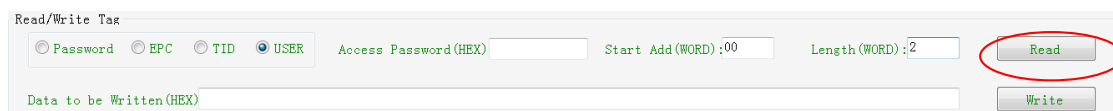
3.4 Accessing ISO-18000-6C Tag

Click **Access Tag**, and the screen will display as following:



3.4.1 Read tags

You can type the parameter(zones to be read, Start Address and Data Length) as illustrated below:



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

Click **Inventory** when the parameter setting is completed.

Picture as below shows two tags have been identified successfully.

ID	PC	CRC	EPC	Data	Data...	Ant ID	Operated...
1	24 00	67 AB	00 00 00 99 99 99 99	12 34 56 78	4	1	2
2	30 00	39 BB	30 08 33 B2 DD D9 01 40 00 ...	00 00 00 00	4	1	2

Operation History: Auto Clear Activate Serial Port Monitor

```

2014-04-02 16:45:28 Reader connected COM5@115200
2014-04-02 16:45:31 Get RF spectrum
2014-04-02 16:51:24 Read tag
2014-04-02 16:51:25 Read tag
    
```

3.4.2 Write Tags

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

Read/Write Tag

Password
 EPC
 TID
 USER
 Access Password(HEX) 00 00 00 00
 Start Add(WORD):00
 Length(WORD):2

Data to be Written(HEX) aa bb cc dd

When the operation done successfully, the screen will display as follows:

ID	PC	CRC	EPC	Data	Data...	Ant ID	Operated...
1	34 00	C4 1E	30 08 33 B2 DD D9 01 40 00 ...			1	2

Operation History: Auto Clear Activate Serial Port Monitor

```

2014-04-03 15:18:21 Read tag
2014-04-03 15:18:26 Write tag
    
```

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

3.4.3 Lock Tags

Lock Tag

Access Password
 Kill Password
 EPC
 TID
 USER
 Access Password(HEX) 00 00 00 00

Open
 Lock
 Permanent Open
 Permanent Lock

A password is necessary to be provided for locking tags. When the operation is completed successfully, the screen will display as follows:

ID	PC	CRC	EPC	Data	Data...	Ant ID	Operated...
1	34 00	C4 1E	30 08 33 B2 DD D9 01 40 00 ...			1	2

Operation History: Auto Clear Activate Serial Port Monitor

2014-04-03 15:32:16 Lock tag

Same as **Write Tags**, data of identified tags will be displayed in **Tag List**.

3.4.4 Kill Tags

Kill Tag
Kill Password (HEX)

Password is necessary which can't be 00 00 00 00 before Kill Tags. Therefore, to kill a tag please change the content of password via **Write Tag Operation** first.

When tag is killed successfully, the information will display as follows:

ID	PC	CRC	EPC	Data	Data...	Ant ID	Operated...
1	24 00	67 AB	00 00 00 99 99 99 99			1	1

Operation History: Auto Clear Activate Serial Port Monitor

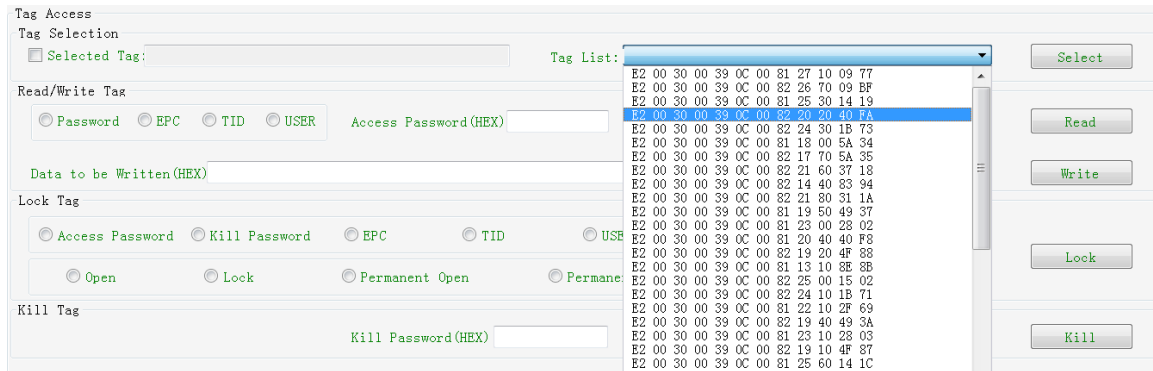
2014-04-03 15:39:00 Kill tag

3.4.5 Tag Selection

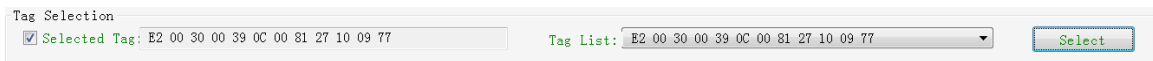
No matter how many tags in RF region, we just want to access EPC tags which are already identified. Now, we can use the function of Tag Selection (EPC matching).

1. Inventory Tags in **Buffer Mode** to get all tags' EPC number.
2. Get tags in cache.

3. Access tags and choose the EPC NO. which is needed , as illustrated below:

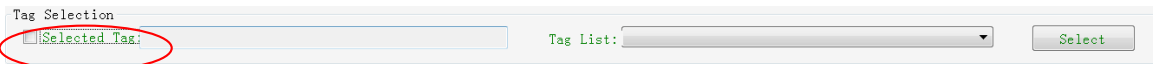


After choosing the tag, please click **Select** and the screen will display as follows:



We could see that the column on the left for **Selected Tag** has been selected. Next, all the operations are based on the tag with this EPC NO.

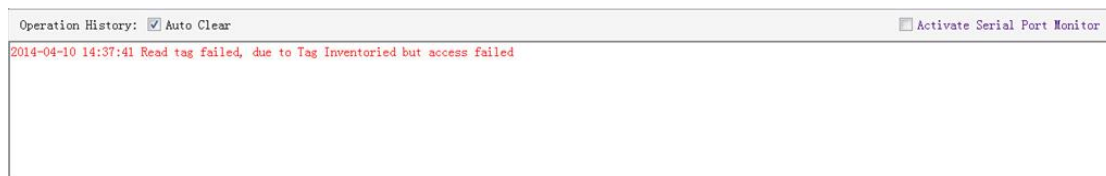
If you want to cancel the match of EPC, just deselect the column for **Selected Tag**, as below:



3.4.6 Error Display Might Be Returned

Errors occur if wrong operations done:

- Inventory success, access failure:

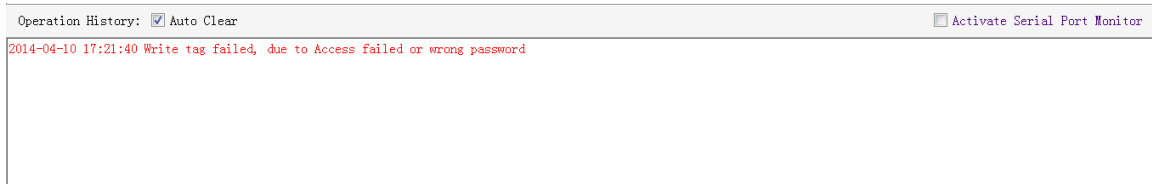


There are two steps to get access to tags: firstly, tag inventory; secondly, access tags. Picture above shows the inventory is successful, but we can't access to tags.

Two reasons why:

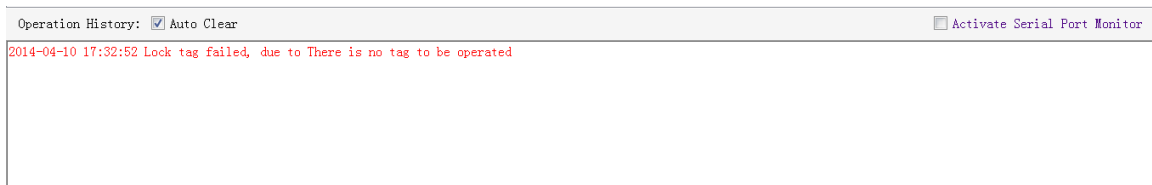
1. Parameters incorrect: for example, zones(password/ EPC/ TID/ User) to be read do not exist.
2. Tags beyond the area that the RF could cover: distance when accessing to tags is about 60%-70% of tag inventory; in this case, please proceed the tag closer to antenna.

- Wrong password:



Reason why: wrong password is set.

- No tags to be operated:



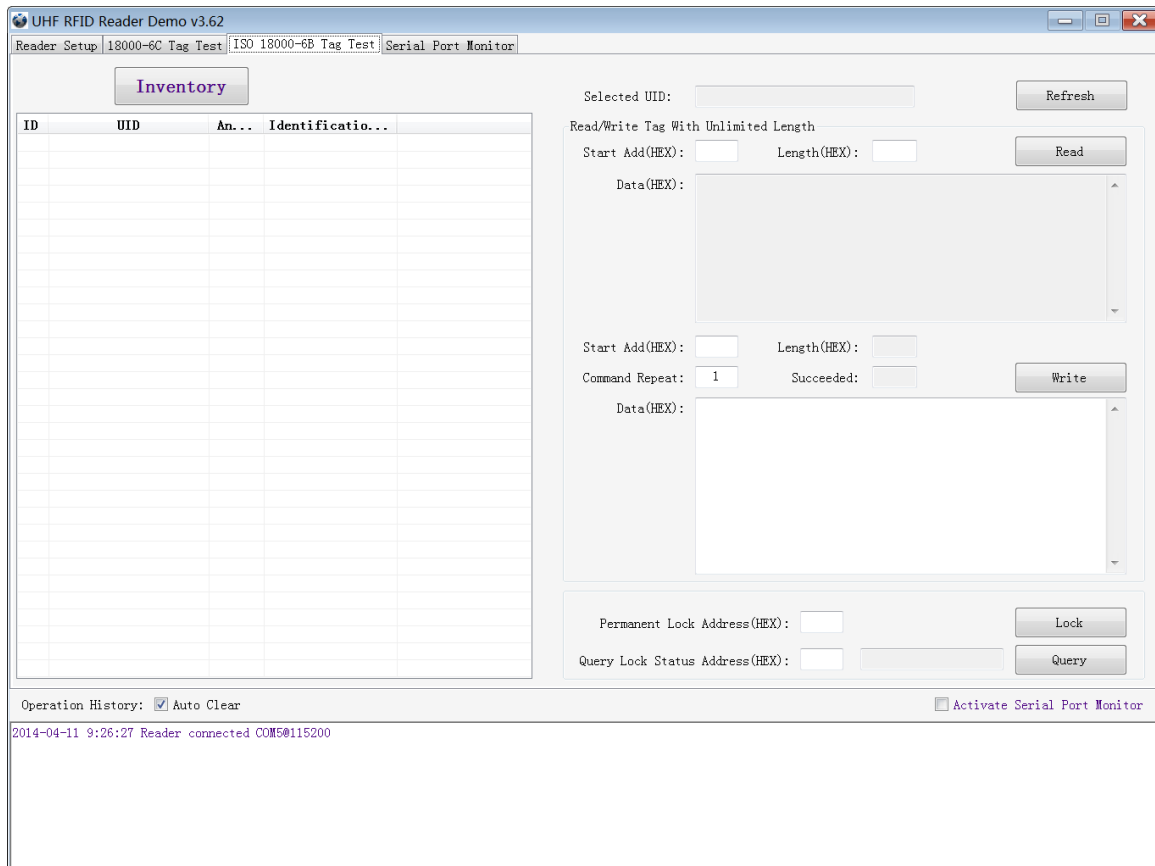
Reason why: Tags beyond the area that the RF could cover.

For more information about the operation history returned, please defer to the document: **UHF RFID Reader Serial Interface Protocol V3.1.**

3.5 Accessing & Inventorying ISO-18000-6B Tag

3.5.1 ISO-18000-6B Tag Inventory

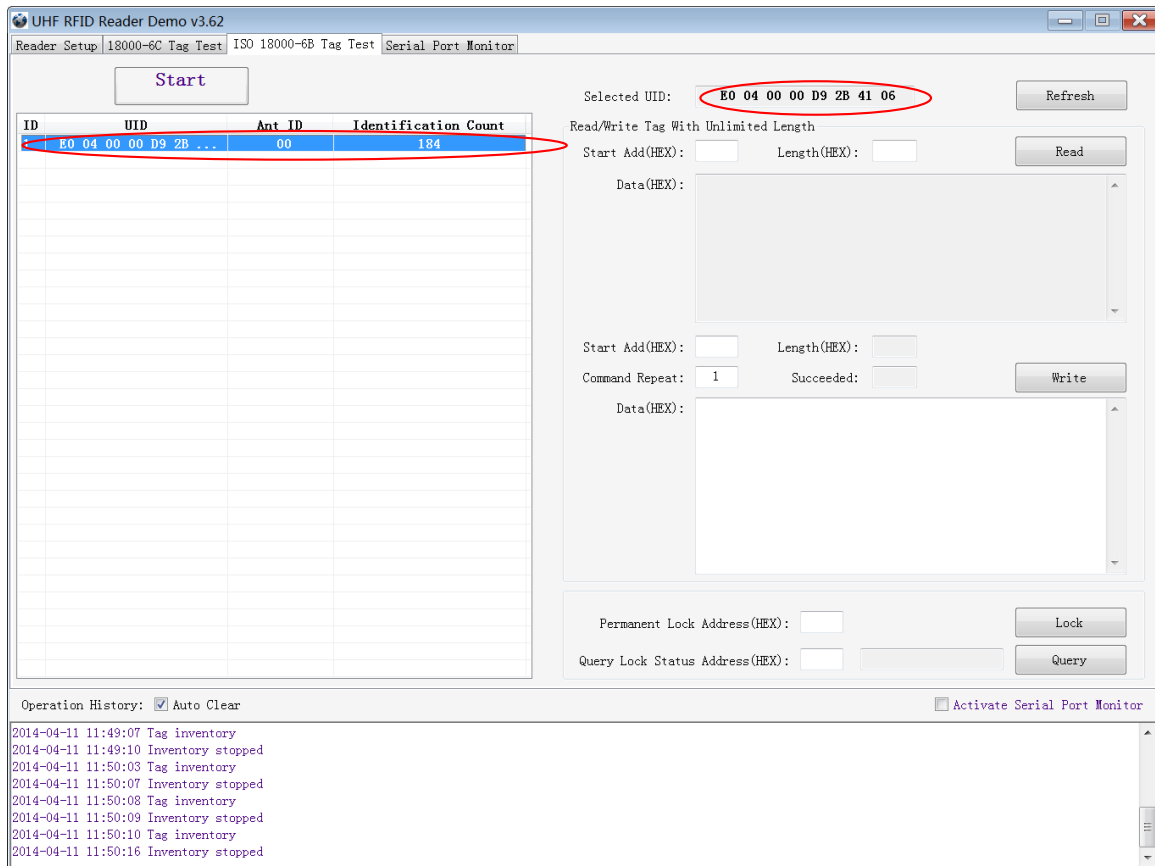
Operating ISO-18000-6B Tag is similar to ISO-18000-6C but it will be easier, since **Real-time** is the only mode for ISO-18000-6B tags inventory, as illustrated below:



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

3.5.2 Accessing to ISO-18000-6B Tag

There is only one tag available each time when we get access to ISO-18000-6B tag. After stopping inventory, please click the Tag UID on the left list to choose the tag you would like to do the operation, as illustrated below:



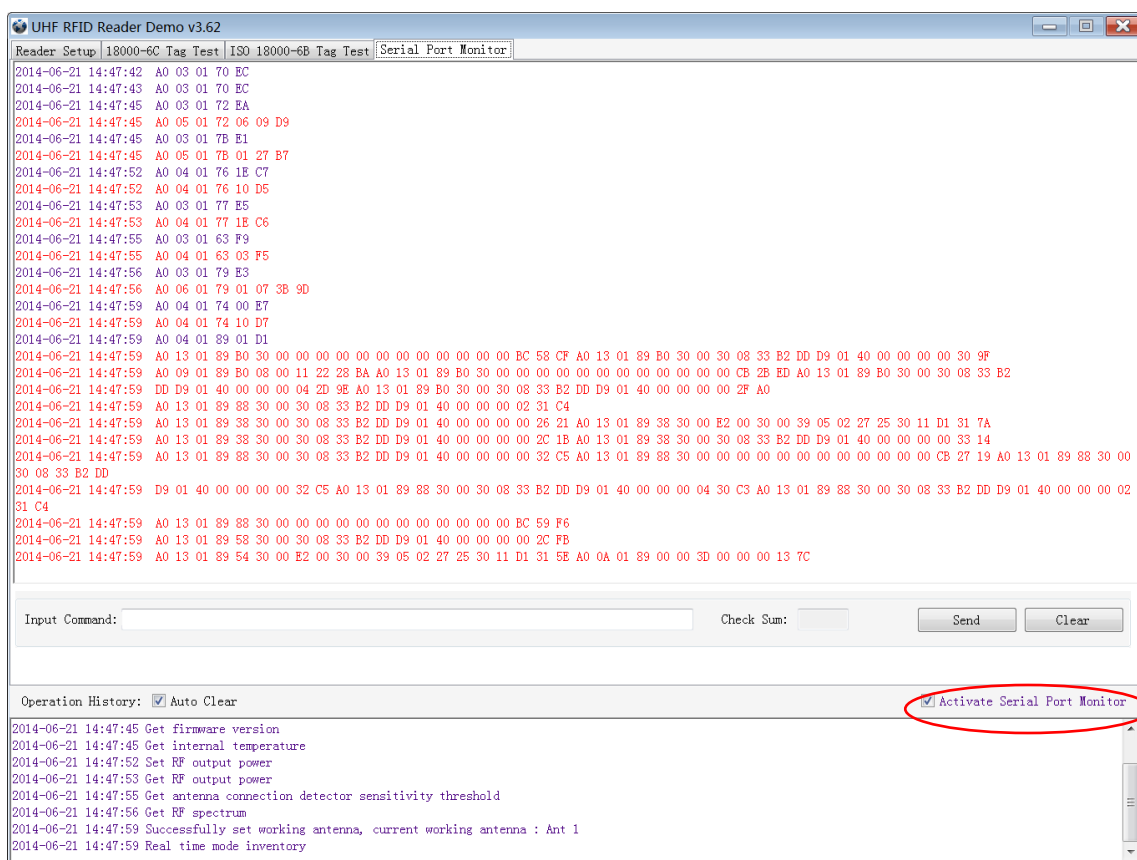
Notes for access operations:

- Access operations 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 written. If error occurs, the reader will stop writing, but data which has been written will not change, thus reader will return the number of bytes which have been written successfully.
- Only one-byte data of tag can be locked each time.
- Only one-byte data state of tag is queriable each time.
- Operation to lock tag is permanent and irreversible.

4 Develop your own RFID Application

Most reader functions can be operated through the demo. But in practical applications, user might need to develop their own applications. Please defer to the document: **UHF RFID Reader Serial Interface Protocol V3.1**. The reader follows the definition both of the RS - 232 and TCP / IP interface.

Demo provides an important function of recording serial transmission, so that users can quickly grasp the content of communication protocol in practice. Please defer to the screenshot below and select **Activate Serial Port Monitor**, all uplink and downlink serial data will be recorded, as illustrated below:



Notes:

1. Response speed of Demo will slow down after opening the **Activate Serial Port Monitor**. Please turn off this function when it is not necessary.
2. Data in violet blue is sent to the reader by PC, and data in red is the returned information to PC via reader.
3. Manual **Input Command** is used to debug serial command which could calculate the checksum automatically.
4. **UHF RFID Reader Serial Interface Protocol V3.1**, this document includes the integral source codes of the demo Based on C # of .Net