

ITP, U9R-SD

UHF RFID Reader

User Manual

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The pictures and screens shots on this document may be different to actual. .
Please thoroughly read the caution section before installing the reader.
Reasonable measures have been taken to ensure that the information included in this manual is complete and accurate.
However, UBISTS reserves the right to change any specification at any time without prior notice.

This equipment has been tested and found to comply with the limits for a Class A digital device, pursuant to the CE Rules.

CE

◆ Cautions ◆

- ✓ Stop the reader in case there is smoke, strange smell and over heated.
 - A. It can cause an electric shock and fire.
 - B. Remove the power cable.
 - C. Do not open the reader.
- ✓ Do not open/ modify the reader in order to repair. It can cause an electric shock and fire.
- ✓ Use the accurate power cable for the reader. If not, it can cause an electric shock and fire.
- ✓ Do not use other power adaptor.
- ✓ Apply the power plug properly. If not, it can cause an electric shock and fire.

Please follow the instruction below to operate the power adaptor.

- A. Make sure that there is no dust inside.
- B. Ensure that the power plug is firmly in place.
- C. Disconnect the reader from the power if the reader is not in use for a long period of time.
- D. Do not remove the power cable with wet hands.
- ✓ Turn off the power before connecting any communication cables or peripheral devices. It not, it can cause electric shock.
- ✓ Do not place any heavy objects on the reader.
- ✓ Do not install the reader under the circumstance of high humidity or heavy dust.
- ✓ Do not install the reader in an unstable environment.
- ✓ Use the Null-Modem cable according to the specification of DB-9Pin cable.
- ✓ Check the antenna port if the reader can not read the tags.
- ✓ This product may interfere with other electronic devices due to the transmission of ultra high radio frequency.
- ✓ risk of explosion if battery is replaced by an incorrect type, dispose of used batteries according to the instructions.

※ **Some of commands and specifications may be different depending on the software version.**
Some pictures may differ according to the software version.

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Chapter 1. Introduction

1.1 Operation specification

- ITP, U9R-SD supports multi-protocols (ISO18000-6C&6B, EPC Class 1 GEN 2) to read and write tags.
- ITP, U9R-SD supports RS-232 and TCP/IP.
- ITP, U9R-SD supports external I/O and controls other devices through the digital I/O.
- Easy to monitor the status of reader through LED.
- Easy to control the reader through the reader's API.
- ITP, U9R-SD provides online upgrade.
- Preferable mode can be saved by the user.
- Possible to operate the programmable multi port antennas.
- Minimize the interference of the frequency Channel. (Dense Reader Mode)
- ITP, U9R-SD supports sensitivity setting for LBT.
- ITP, U9R-SD supports the reader monitoring mode and measurement of RF receiving level.

1.2 Communication Specification

External Interface	Serial	230,400bps / 115,200bps / 57,600bps / 38,400bps
	Ethernet	10 BaseT(TCP/IP, UDP, ARP)
Air Protocol	Tag Air Protocol	ISO18000-6B,6C EPC Class1 GEN II

1.3 Environment Specification

Operating Temp.	-10°C ~ 50°C
Storage Temp.	-20°C ~ 70°C
Humidity	90% (Relative humidity)

1.4 Reader specification

Item	Specification	Remark
Model name	ITP, U9R-SD	
Air interface protocols	ISO-18000-6B/6C, EPC Class1 Gen 2	
Frequency range	910.4~913.6 MHz@Korea/ MIC 917.3~920.3MHz@Korea/ KCC 902.75~929.25 MHz@USA/ FCC 865.7~867.5 MHz@EU/ CE 952.4~953.6 MHz@Japan/ TELEC 920.625~924.375 MHz@China/ CC	ETSI(EU)
RF output power	Max 1W, step:1dBm	
Modulation	PR-ASK	
Antennas	Circular Patch	
Operation Type	FHSS(KOR/USA/CHINA), LBT(JPN/EU)	
Air Protocol speed	Tx 40Kbps/Rx 75Kbps	
Antenna connector	4 monostatic	RP-TNC
Antenna operation	Operate programmable multi-antenna ports	
DSP filter	Minimize the interference of frequency Channel (Dense Reader Mode)	
Read range	≤5m (depends on antenna placement and tag type)	
Channels	17 Channels @Korea/ MIC 6 Channels @Korea/ KCC 50 Channels @USA/ FCC 4 Channels @EU/CE 8 Channels @Japan/ TELEC 16 Channels@China/ CC	
Channel band width	200KHz@Korea/ MIC 600KHz @Korea/ KCC 500KHz @USA/ FCC 600Khz @EU/CE 200KHz @Japan/ TELEC 250KHz @China/ CE	
System OS	Embedded Linux 2.6.29	
Operating program	Window 2K / XP / Vista/7	
User API	API for Window	

Program upgrade	Through the use of Network or RS232	
Mode Setup	Preferable mode can be saved by user	
LBT control	Supports sensitivity setting	
Power supply voltage	DC 12V ($\pm 10\%$)	
DC Current	MAX 3000mA	
Weight	600g	
Dimensions	145 x 153 x 36 (mm)	
LAN	Connector: RJ45, Standard : IEEE802.3, 10Base T Protocol: TCP/IP	
Serial	RS-232C, Baud Rate : Max 230,400bps	
Extended I/O	4 Inputs and 8 outputs	

1.5 Product images

- ITP, U9R-SD reader (Top view, front view)



TopView



FrontView

- ITP, U9R-SD reader (Backside(interface) View)



Chapter 2. Hardware Installation

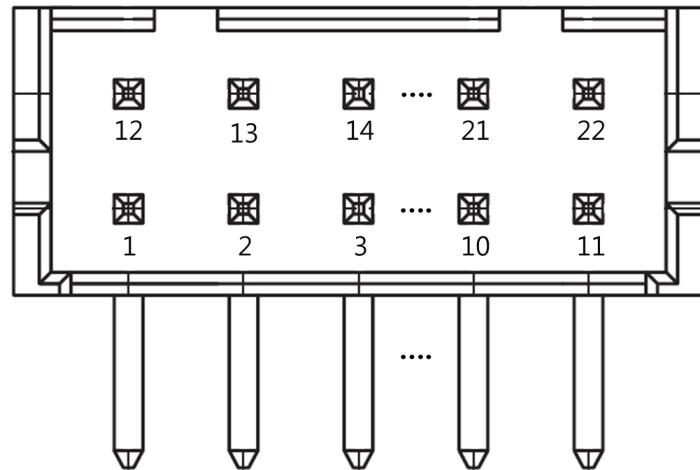
2.1 Hardware

2.1.1 Reader I/O Panel



Table 1] RS-232 & EXT I/O Port pin assign

Number	Description	Number	
Pin 1	EXT INPUT Power(Red)	Pin 12	EXT _IN1(White)
Pin 2	EXT_OUT1(Brown)	Pin 13	EXT _IN2(Blue Kite)
Pin 3	EXT_OUT2(Blue Kite)	Pin 14	EXT _IN3(Red)
Pin 4	EXT_OUT3(Orange)	Pin 15	EXT _IN4(Orange)
Pin 5	EXT_OUT4(Yellow)	Pin 16	EXT _IN_Common(Yellow))
Pin 6	EXT_OUT5(Green)	Pin 17	Consol Rx data(Green)
Pin 7	EXT_OUT6(Blue)	Pin 18	Consol Tx data(Blue)
Pin 8	EXT_OUT7(Purple)	Pin 19	RS-232 Rx data(Purple)
Pin 9	EXT_OUT8(Grey)	Pin 20	RS-232 Tx data(Grey)
Pin 10	EXT_OUT_Common(White)	Pin 21	Ground(Black)
Pin 11	EXT OUT Power(Red)	Pin 22	Ground(Black)

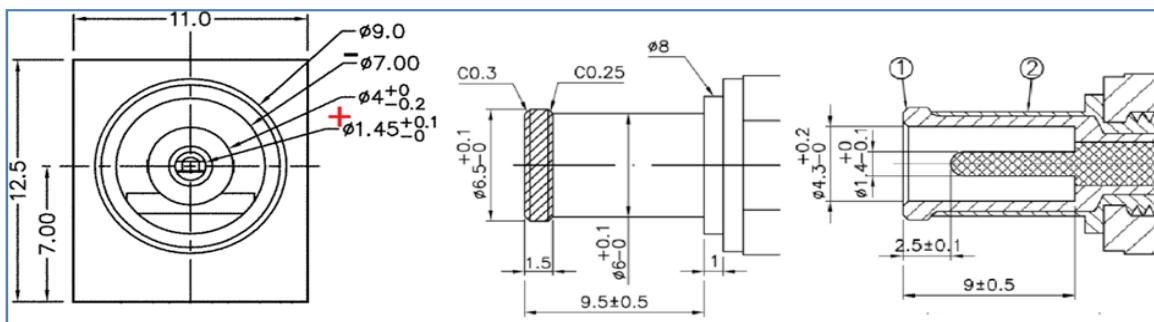


RS-232 & EXT I/O Connector(YDAW200-22)

- Power

Table 2] 입력전원 요구 사항

Input voltage	DC 12V ($\pm 10\%$)	
Input Cur	1000mA more than	
Ripple and ripple noise	50mVp-p or less	Spike at the moment: 100mVp-p or less



Power Connector(DC Power Socket & Jack)

- Antenna Port



Antenna Connector

- RF specification

Item	Specification	Remark
Frequency Range	910.4~913.6 MHz@Korea/ MIC 917.3~920.3MHz@Korea/ KCC 902.75~929.25 MHz@USA/ FCC 865.7~867.5 MHz@EU/ CE 952.4~953.6 MHz@Japan/ TELEC 920.625~924.375 MHz@China/ CC	
RF output power	Max 1W (30dBm less)	
Modulation	PR-ASK	
Aerial type	Circular Patch	
Air interface protocol	ISO-18000-6B/ISO18000-6C(EPC Class1 GEN II)	
Antenna ports	4 monostatic	
Read Range	≤ 5m (depend on reader placement and tag type)	
Antenna Gain	6dBi Below	

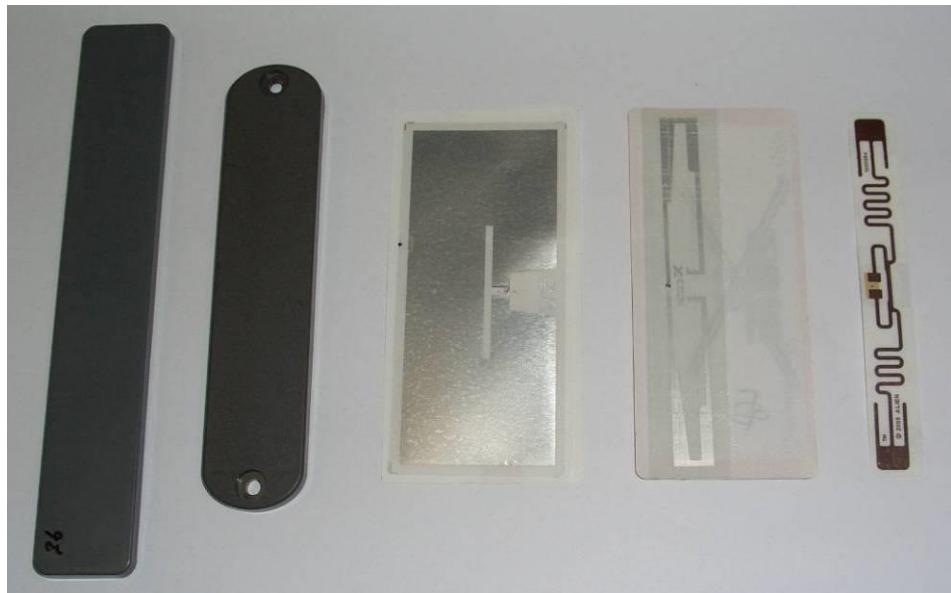
Channels	17 Channels @Korea/ MIC 6 Channels @Korea/ KCC 50 Channels @USA/ FCC 4 Channels @EU/CE 8 Channels @Japan/ TELEC 16 Channels @China/ CC	
Channel Band Width	200KHz @Korea/ MIC 600KHz @Korea/ KCC 500KHz @USA/ FCC 600KHz @EU/CE 200KHz @Japan/ TELEC 250KHz @China/ CE	

2.1.2 LED Panel



- POWER (Green): It indicates the power; ON/OFF
- STATUS (Red): It flashes once the reader finishes booting and blinks faster while the reader reads the tags.
- READ (Blue): It flashes when the reader reads the tags.

2.1.3 Various types of Gen2 tags



Tag Reader, which can be read by many.

2.2 Hardware installation

- ① Locate the host PC.
- ② Connect the reader with the RS-232C cable.
- ③ Connect the RS-232C cable with the host PC.
- ④ Connect the power adaptor to the reader..



RS-232C Cable & Power Adaptor Connection

- ⑤ Connect the antenna port (1) with the antenna cable.
- ⑥ Connect the antenna with the antenna cable.



Reader & Antenna with Connection by Antenna Cable

- ⑦ Plug the power code.
- ⑧ Operate the host PC and execute the PC program (RfBag.exe).

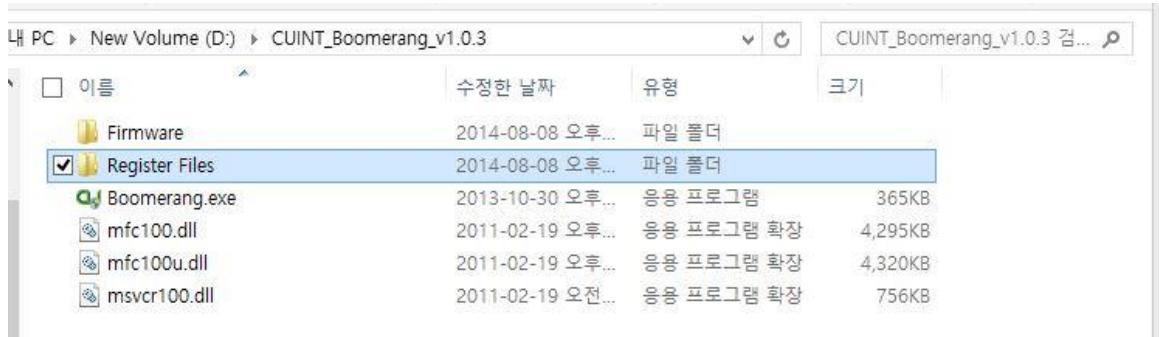
Chapter 3. Software Installation

3.1 Check before installation

- ① Confirm the appropriate software.
- ② Confirm the host PC that connects to the network.

3.2 Software installation

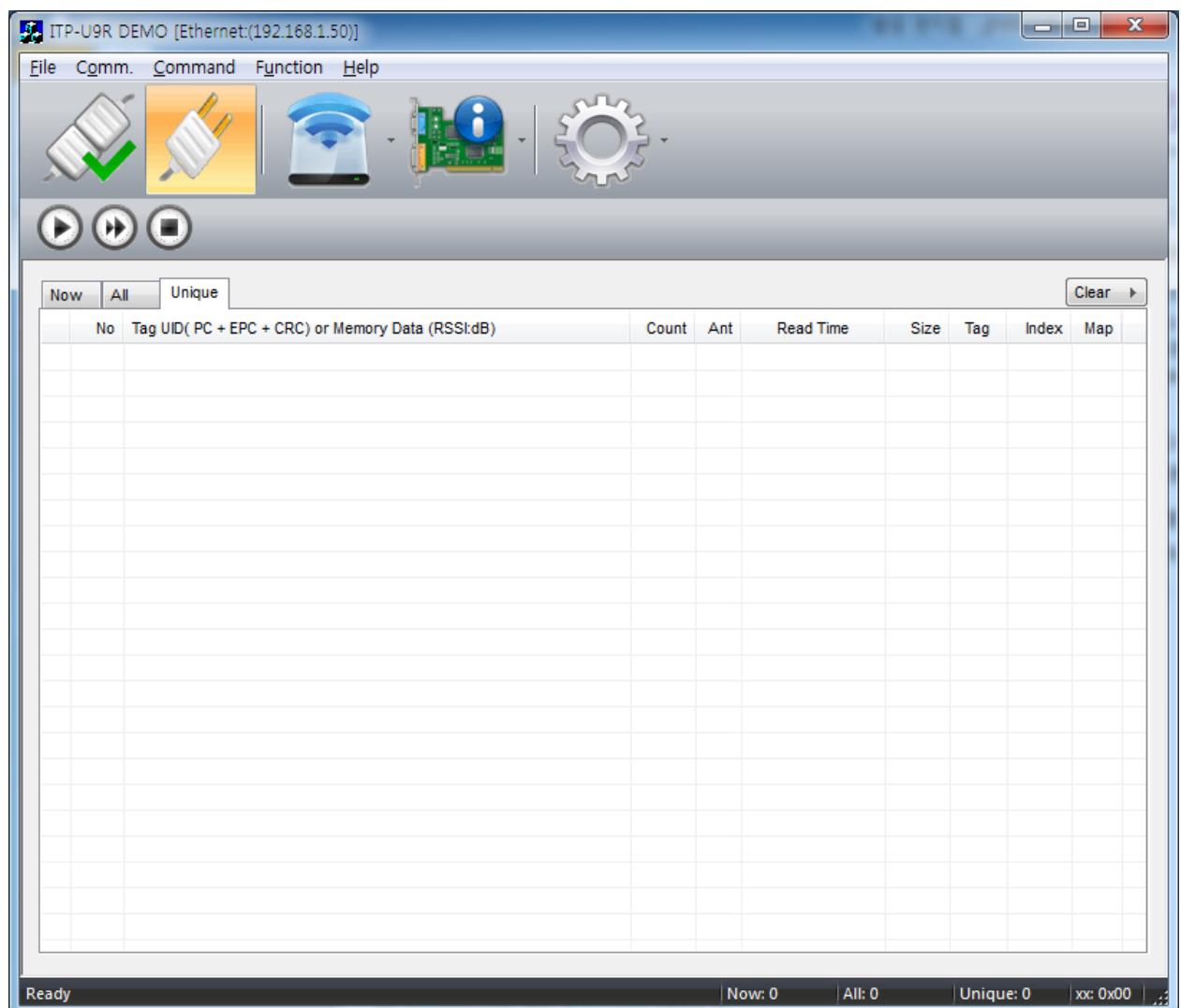
- ① Copy the software into the host PC (E.g.. Copy the ITP, U9R-SD folder onto D:)



Software Folder

- ※ **Firmware folder:** It includes .bin file in order to upgrade a firmware.
- Register file folder:** It includes .rgs file in order to set a registry
- Boomerang .exe:** It is the executable PC program.

- ② When you execute the Boomerang.exe, you can see the Main Menu window as follows.



Main Window after executing Boomerang

Chapter 4. Software Operation

There are two ways to operate the ITP, U9R-SD UHF Reader. One is to operate the reader with directly received input and the other is the Machine-to-Machine(MtoM) mode, in other words, to operate automatically by the connected host or software which has been programmed in the middleware. In order to operate in MtoM mode, you need the program that is developed with the appropriate protocol which is discussed in chapter 6 and 7.

The reader can be controlled using binary protocols (See chapter 7) for the provided program. It can also be controlled as the terminal form which is delivered in text format, while the reader connects through serial or TCP/ IP. User inputs commands directly to the keyboard (See chapter 6, Reader String Protocol).

In this chapter, it describes how to control the reader by the program that uses binary protocols and also discusses how the user reads and writes the tags.

4.1 Execute the RFDEMO (PC Application Program)

- ① Turn the reader on while connects to the antenna(s).

※ It takes approximately 20~30 seconds for booting the reader. (The status LED blinks when the booting finishes)

- ② Execute Boomerang.exe (PC Application Program)

4.2 Connect the host PC with the reader through RS232C

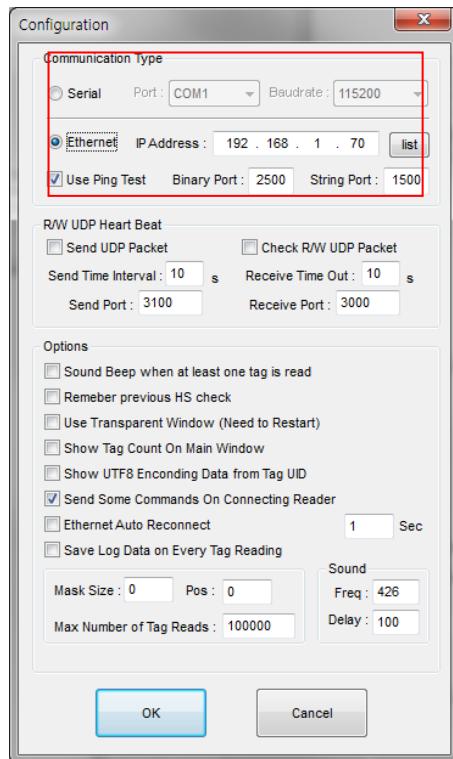
※ NOTICE: Check a serial connection of the Reader

You need to choose the protocol type in the serial communication method that operates only one channel. The factory default setting will be the binary protocol which can be used.

But if you have changed the serial protocol mode to string, it can only work with the terminal method. Therefore, check the next chapter for the serial connection.

String Protocol Mode methods in the transition to Binary Protocol String Protocol "SerialMode" command is listed in detail.

- ① Connect the RS232C cable to the reader.
- ② In the Main Menu, choose the Option from Help or configuration button, the Configuration window opens.

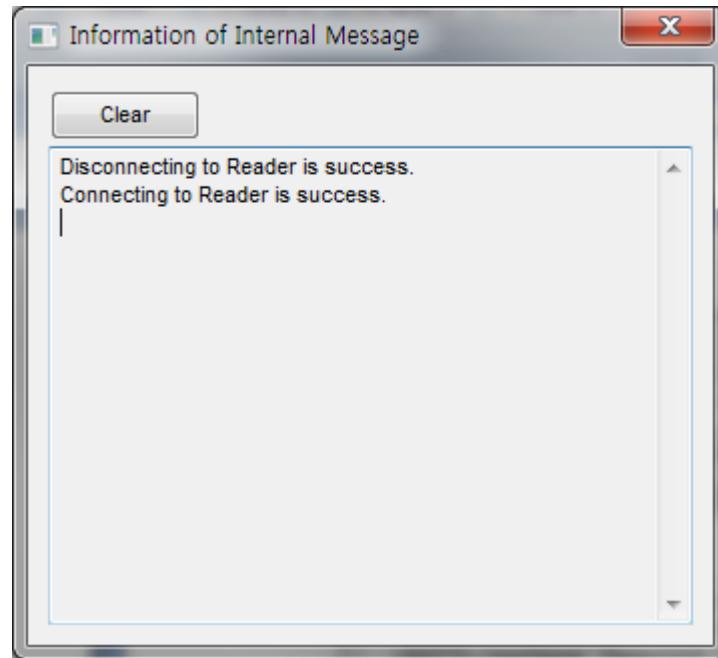


- ③ Choose the Serial from Communication Type.
- ④ Select the host PC's communication port. (ex. COM1, COM2....)

※ How to check the host PC's communication port

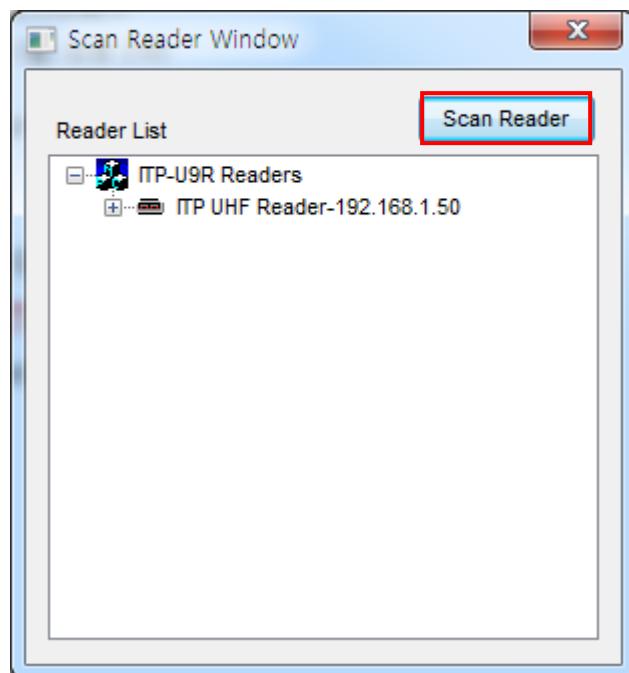
Right click on My computer → Select Properties → Systems Properties → Hardware → Device Manager → Ports (COM/ LPT)

- ⑤ Select 115200 bps for Baudrate and then click OK. 
- ⑥ In the Main Window, click connect button.  It will connect the reader to the host PC.
- ⑦ If you want to check the connectivity between the reader and the host PC, Window->Setting->Message click the button. The Information of Internal Message window appears.

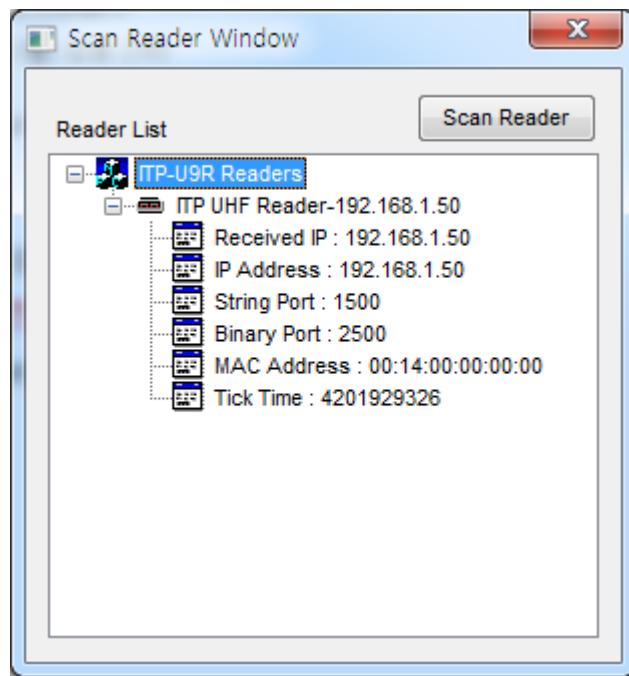
**Information of Internal Message**

4.3 Search the reader using the program and Ethernet

- ① Connect the Ethernet cable to the reader.
- ② The Select Search Function of the Reader in the main menu or click Window-> Setting-> Search Reader is the Search Window to the following Reader.

**Reader Search Screen**

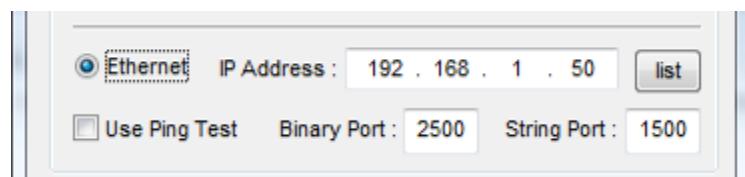
- ③ Click a Scan Reader button.
- ④ The information about the reader on the local network area will appear.



Search the Reader's info

4.4 Connect the host PC and reader through the Ethernet

- ① Connect the reader and host PC using the Ethernet Cable (Cross Cable). If you have multiple readers, use the Ethernet Network Hub to connect with the PC.
- ② Click to open the main Window-> Setting->Option menu
- ③ From the Configuration window, select the Ethernet from the Communication Type.
- ④ Type the IP Address of the reader and set port number as 2500 and then click OK.

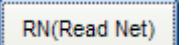


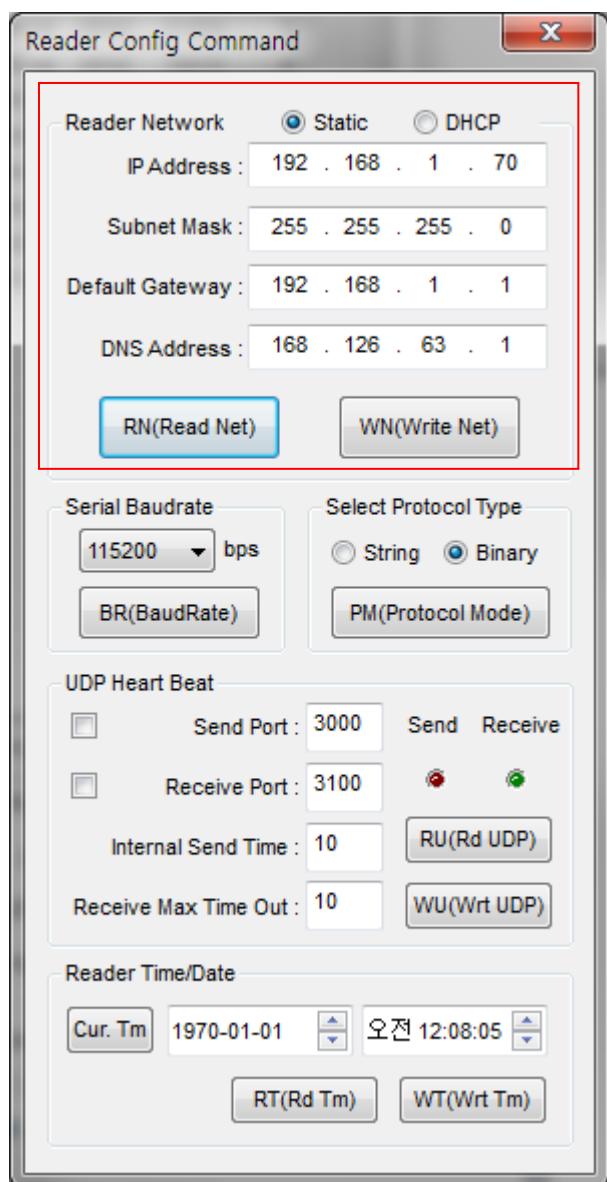
Setting the Ethernet Configuration Window

- ⑤ From the main window, click the Connect button  to connect the reader and the host PC.

⑥ To check the connectivity between the reader and the host PC, click the Info button.

*** How to check the IP Address of the reader**

1. Connect the reader and the host PC through the RS232.
2. Click to open the main Window-> Setting->Reader Config
3. Click the RN(Read Net) button  from the Reader Network to see the IP Address, Subnet Mask, Default Gateway and DNS Address.

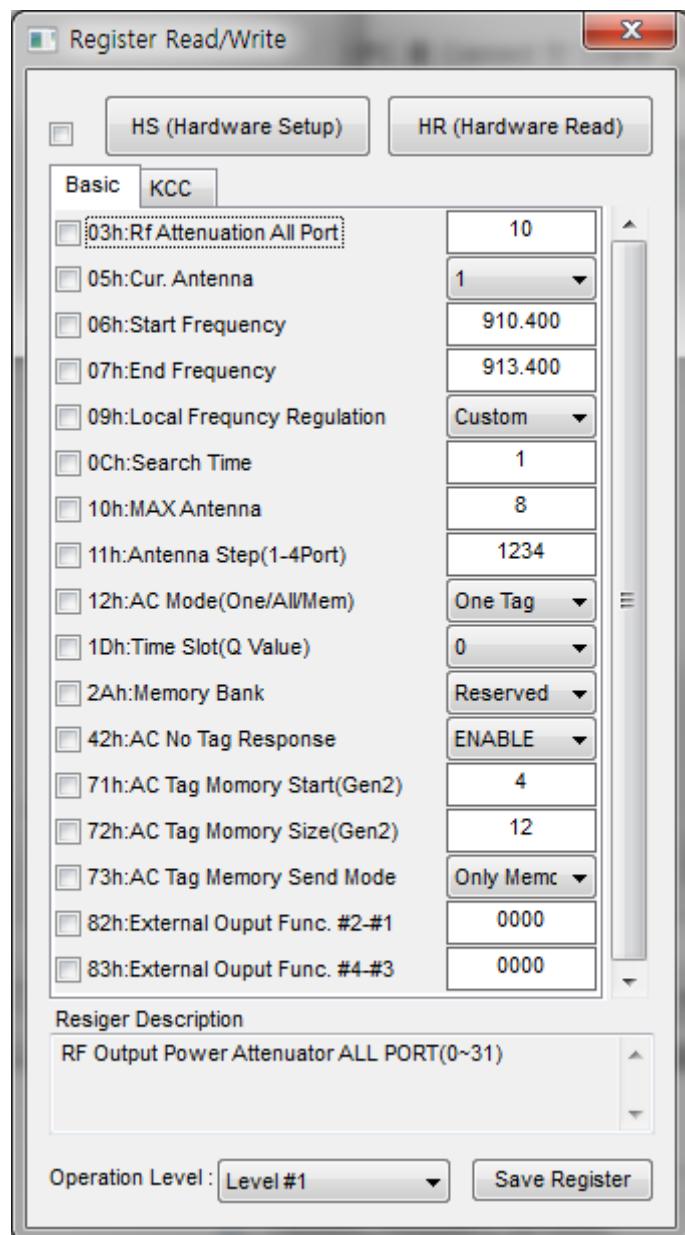


Reader Config Command Window of the Reader Network

4.5 Check or change the register settings

You can view the value of the Register using the HR(HardwareRead) button. And also you can modify the value using the HS(HardwareSetup) button.

- ① Connect the reader and the host PC, click the Window->Reader Configuration->Register, The Register Read/Write window appears.



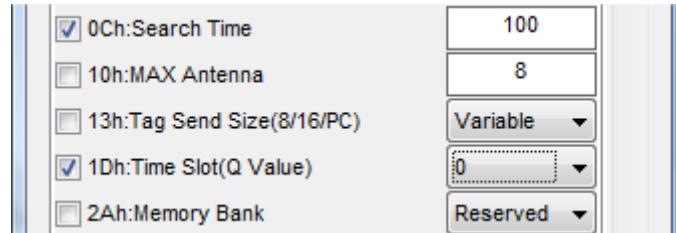
Register Read/Write Window

② To check the default value of the Register, click HR(Hardware Read).

HR (HarewareRead)

※ If the HS or HR are deactivated, HS (HarewareSetup) HR (HarewareRead)
check the connectivity between the reader and the host PC.

③ Check the check box to modify the value of the Register.



Register Time Slot Change the value of the RF Attenuator

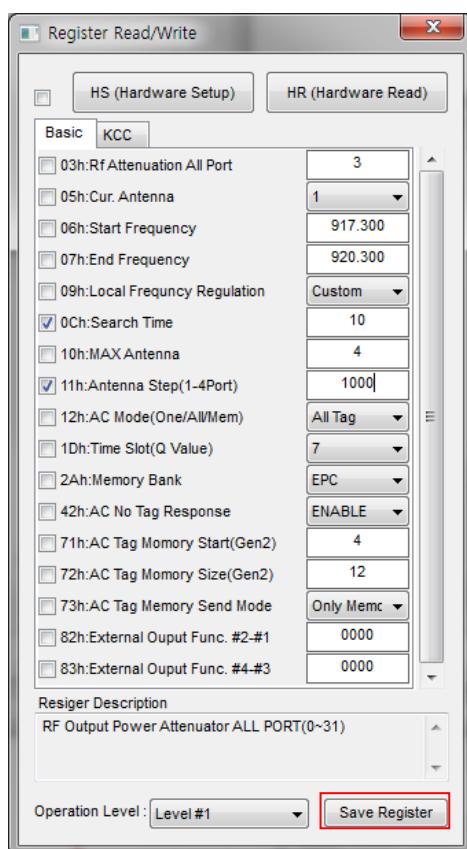
④ Click the HS(HardwareSetup) button HS (HarewareSetup) to apply the changed value.

⑤ To check the modified value, click HR(HardwareRead) button HR (HarewareRead)

※ If you want to have more information on the Register, please see the chapter6 for the Binary protocols.

※ **How to keep the current setting as the default register value**

- ① The default register value is saved on the flash memory.
- ② You can change the default register setting using the SR Command.
- ③ From the Main Menu, click the Window->Reader Configuration->Register, The Register Read/Write window appears.
- ④ Click the HR(HardwareRead) to view the current register value. Ant the click the Save Register button.



Register Read / Write Window of SR

- ⑤ After rebooting the reader the Connect Host PC and the Reader
- ⑥ Click **HR (HardwareRead)** the Apply button **Save Register** when you Register is set to a value that can be found

4.6 How to read tags while using the single port

※ Tag caveat before reading

1. [Chapter 2] Hardware Installation Connect the Reader to read and make sure that appropriate.
2. Reader supported on this machine is ready to make sure that the Tag.
3. Tag Reader to read well and where you can make sure that you have placed in front of the Ant.

- ① You need to set the Register value in the reader to read the tag.
- ② Click window->Reader Configuration->Register, the Register Read/Write window appears.

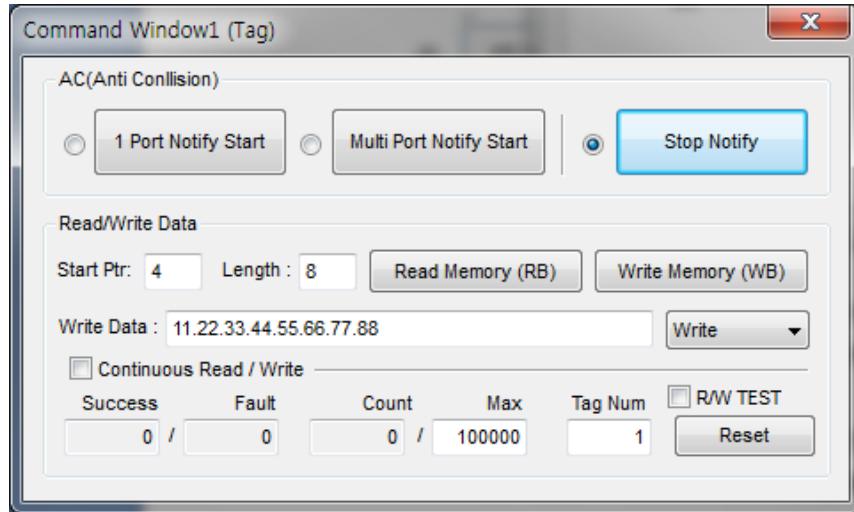
※ If the button is deactivated,

HS (HardwareSetup)

HR (HardwareRead)

check the connection between the reader and the host PC.

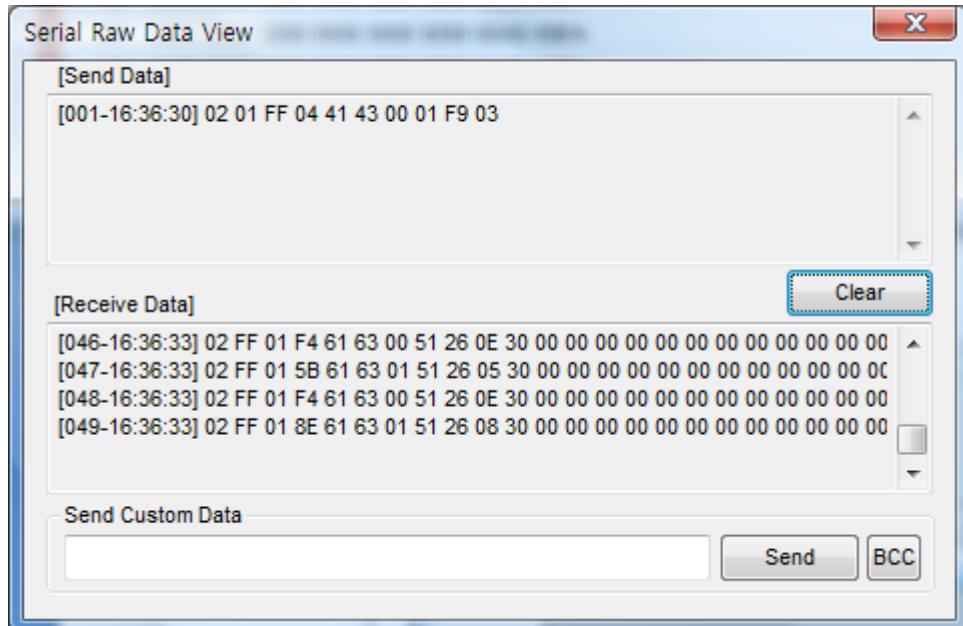
- ③ Click the HR(HardwareRead) button to set the current register value. **HR (HardwareRead)**
- ④ Check the antenna port number that is connected to the reader.
- ⑤ After any changes in the register value, click HS(HardwareSetup) to set the changes.
- ⑥ After setting the Register value, click the window->Tag Reading Operation-> Tag Read, from the Main Menu, the Command Window1 (Tag) appears.



Command Window1 (Tag) of the AC (Anti Collision)

⑦ Click 1 Port Notify Start button [1 Port Notify Start](#) from the AC(Anti Collision) to read tags.

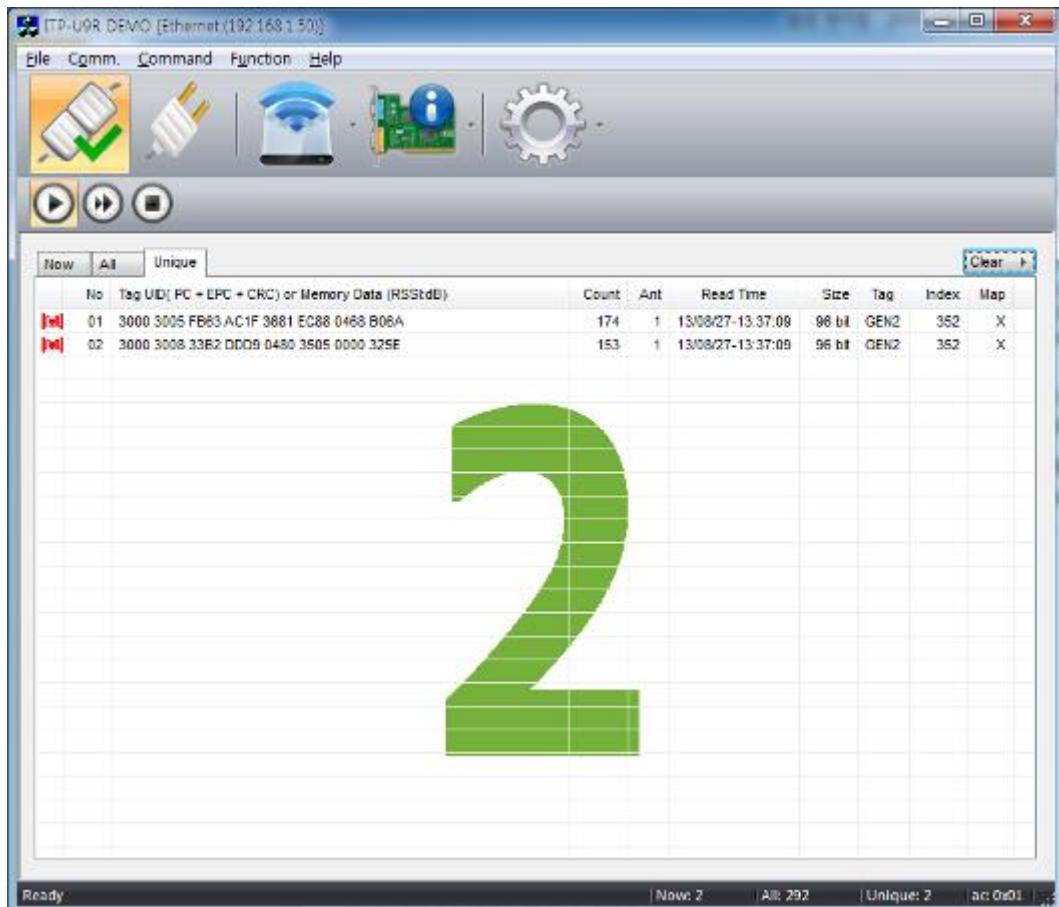
- ※ To view the raw data view, click the Serial Raw Data button from the Main Menu. The Serial Raw Data View window appears.
From this window, you can see the [Send Data] from the reader to the host PC and the [Receive Data] for their responses.



※ Use this view to check other commands.

⑧ The tag data is displayed. Each raw show the tag ID, number of times tag has been read, antenna

number and the tag reading time.



메인 Window에서 Tag UID 확인

⑨ In order to stop the transmission Tag Command Window1 (Tag) of the AC (Anti Collision) from the
 Clicking Tag transfer is complete.

4.7 How to change antenna setting while using a Single Port

- ① Connect the reader and the host PC.
- ② Check the current port.



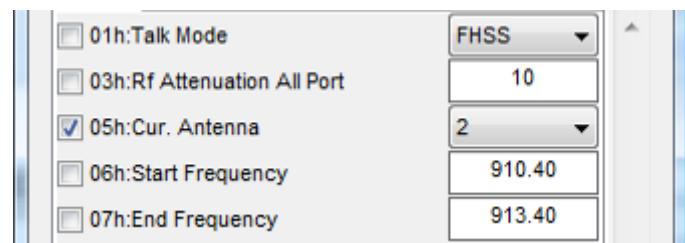
Check the current Port(ANT1)

- ③ Change the antenna cable from ANT1 to ANT2.



Port 1 and Port 2 as a replacement

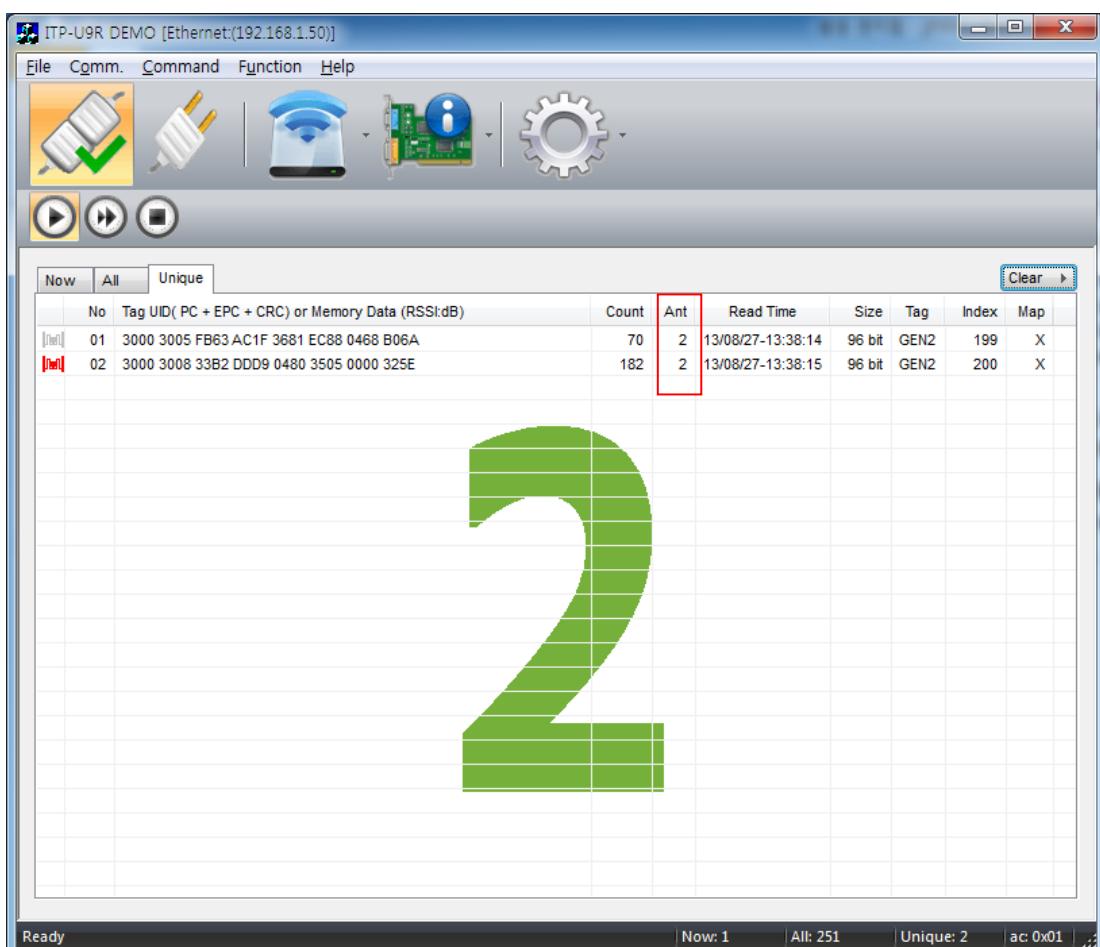
- ④ Click the Window->Reader Configuration->Register, from the Main Menu.
- ⑤ Select the 05h:Cur. Antenna and choose 2 for the antenna port 2. Click HS(HardwareSetup) button to save the changes.



Change the settings for the antenna Register

⑥ From the Main Menu, click the Window->Tag Reading Operation->Tag Read to open the Command window1 (Tag). Click 1 Port Notify Start button.

1 Port Notify Start



Window to verify the result f a change through the main antenna

4.8 How to read tags while using multiple ports

- ① Connects the reader with more than 2 antennas.

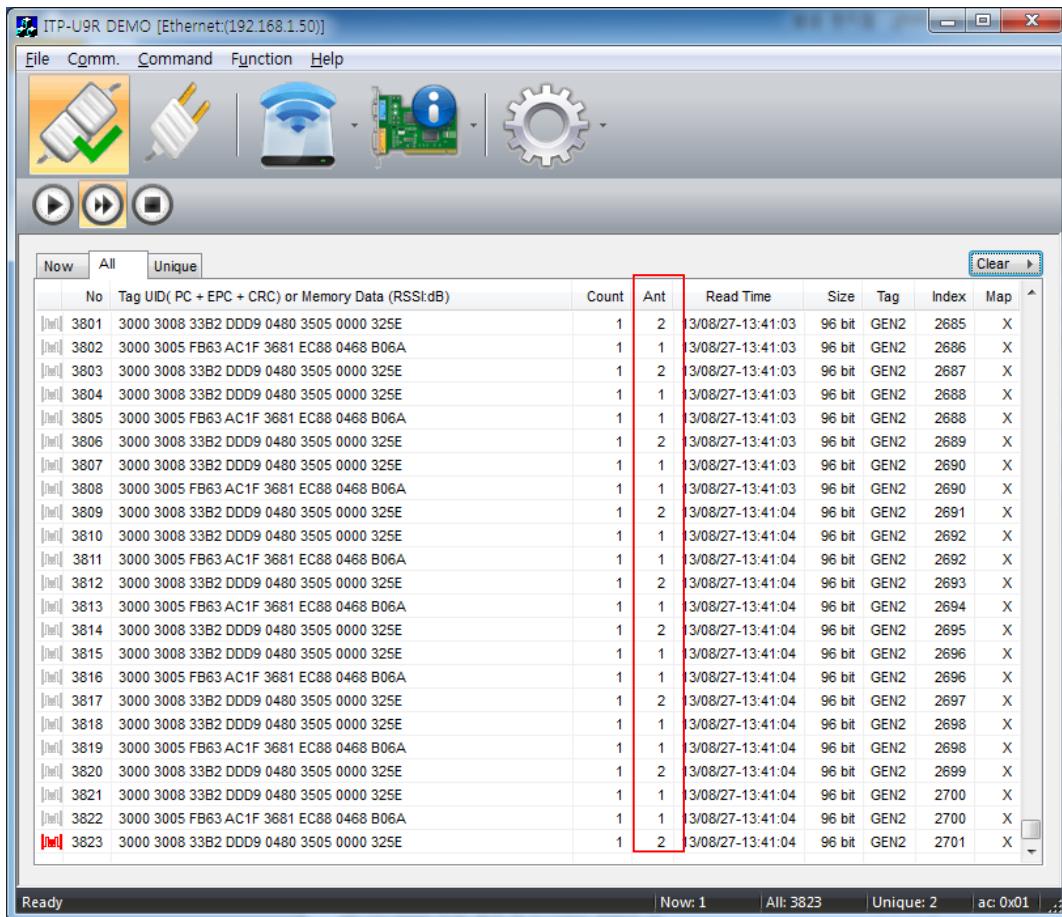


Reader Connect the two antenna

- ② Connect the reader and the host PC, click Window->Reader Configuration->Register. Register Read/Write window appears.
- ③ Select 10h:MAX Antenna and choose 2. Click HS(HardwareSetup) to save the changes.



- ④ From the Main Menu, click the Tagcmd button to open the Command window1 (Tag). Click 1 Port Notify Start button.
- ⑤ From the Main Menu, you can see the number of antenna which is activating with the tags.



Check the results through the Multi Port Main Window

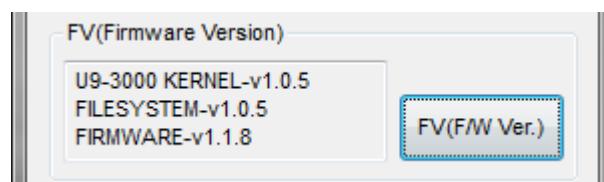
- ※ Tag Multi Port while reading only the specific antenna Register Read / Write Window at 05h: Cur.Antenna antenna set to receive the part after Tag Command Window1 (Tag g) Window of the AC (Anti Collision) If you click **1 Port Notify Start** on the button Tag can be read only on a specific antenna.

4.9 Check the Firmware Version

- ① Click the Etc Cmd button,  the Command Window2 (ETC) window appears.

**Command Window2 (ETC) Window**

② On the FV(Firmware Version), click the FV(F/W Ver.) button. FV(F/W Ver.)

**Check Firmware Version**

4.10 System Reset, Factory Default Config

- ① Click the Etc Cmd button,  the Command Window2 (ETC) Window appears.
- ② On the System Reset & Force Factory Default Config, select All or ARM7 and then click the Reset button  to reboot the system.
- ③ Select the check box of Register and click Set Default to set the register value as default



4.11 Modulation Off

- ① Click the Register button  the Register Read/Write window appears.
- ② Select 01h:Talk Mode and set the value as the FIX.
- ③ Select 02h:Modulation and set the value as the OFF.
- ④ Click the HS(HardwareSetup) button. 
- ⑤ Use the Spectrum Analyzer to change settings.

4.12 Change the Frequency Band

※ NOTE

Before start, set the Modulation Off.

- ① Click the Window->Reader Configuration->Registe. The Register Read/Write window appears.
- ② Select the 06h:Start Frequency and set the frequency.
- ③ Click the HS(HardwareSetup) button. 

FCC Compliance Information

This equipment has been tested and found to comply with the limits for a Class A digital device, pursuant to part 15 of the FCC Rules.

These limits are designed to provide reasonable protection against harmful interference when the equipment is operated in a commercial environment. This equipment generates, uses, and can radiate radio frequency energy and, if not installed and used in accordance with the instruction manual, may cause harmful interference to radio communications. Operation of this equipment in a residential area is likely to cause harmful interference in which case the user will be required to correct the interference at his own expense.

This device complies with Part 15 of FCC Rules. Operation is subject to the following two conditions:

(1) the device may not cause interference, and (2) the device must accept any interference, including interference that may cause undesired operation of this device.

IMPORTANT NOTE:

FCC RF Radiation Exposure Statement:

This equipment complies with FCC RF radiation exposure limits set forth for an uncontrolled environment.

This equipment should be installed and operated with a minimum distance of 20 centimeters between the radiator and your body. This transmitter must not be co-located or operating in conjunction with any other antenna or transmitter.

NOTE: THE GRANTEE IS NOT RESPONSIBLE FOR ANY CHANGES OR MODIFICATIONS NOT EXPRESSLY APPROVED BY THE PARTY RESPONSIBLE FOR COMPLIANCE. SUCH MODIFICATIONS COULD VOID THE USER'S AUTHORITY TO OPERATE THE EQUIPMENT.