RFID Reader A800 User Manual (Preliminary)

Version 1.2

October 14, 2014

FCC Notice:

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 it is not installed and used in accordance with the instruction manual, it 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.

FCC Caution:

Any changes or modifications not expressly approved by the party responsible for compliance could void the user's authority to operate this equipment.

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

(1) This device may not cause harmful interference, and

(2) This device must accept any interference received, including interference that may cause undesired operation.

Radiation Exposure Statement:

This equipment complies with FCC radiation exposure limits set forth for an uncontrolled environment. This equipment should be installed and operated with minimum distance 22cm between the radiator and your body

Caution:

The YDT A800 reader has been tested to meet all regulatory requirements offered in the jurisdiction. Following rules should be complied strictly.

1. User ought to **avoid** opening the reader housing for any reason.
2. Below are several particular actions that violate regulatory requirements and should be **forbidden** without permission:
   A. Change operation frequency compliant with regulatory requirements.
   B. Increase RF operating output power.
   C. Change external antennas type.
   D. Modify the design or functions of the reader.

The usage of RFID reader must NOT cause interference on flight safety and other legal communication systems. If any, the RFID reader should be shut down until proper improvement is achieved.

Professional installation instruction:

1. Installation personal

   This product is designed for specific application and needs to be installed by a qualified personal who has RF and related rule knowledge. The general user shall not attempt to install or change the setting.

2. Installation location

   The product shall be installed at a location where the radiating antenna can be kept 22 cm from nearby person in normal operation condition to meet regulatory RF exposure requirement.

3. External antenna

   Use only the antennas which have been approved by the applicant. The non-approved antenna(s) may produce unwanted spurious or excessive RF transmitting power which may lead to the violation of FCC limit and is prohibited.

4. Installation procedure

   Please refer to user’s manual for the detail.

5. Warning

   Please carefully select the installation position and make sure that the final output power does not exceed the limit set force in relevant rules. The violation of the rule could lead to serious federal penalty.

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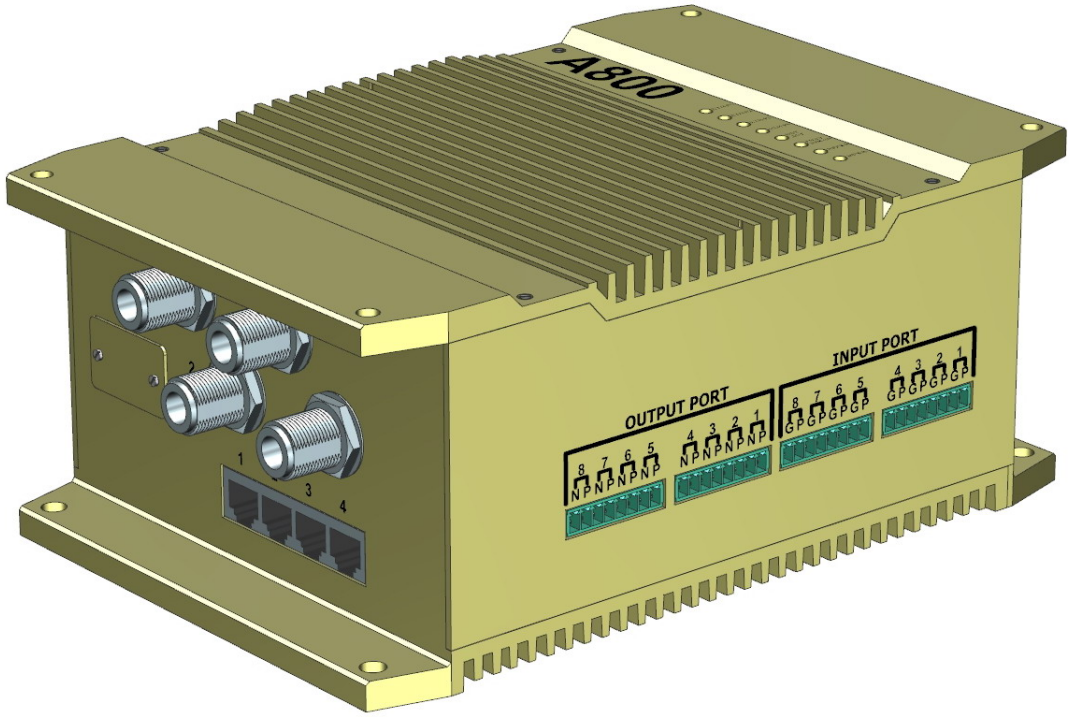
1. Product Overview

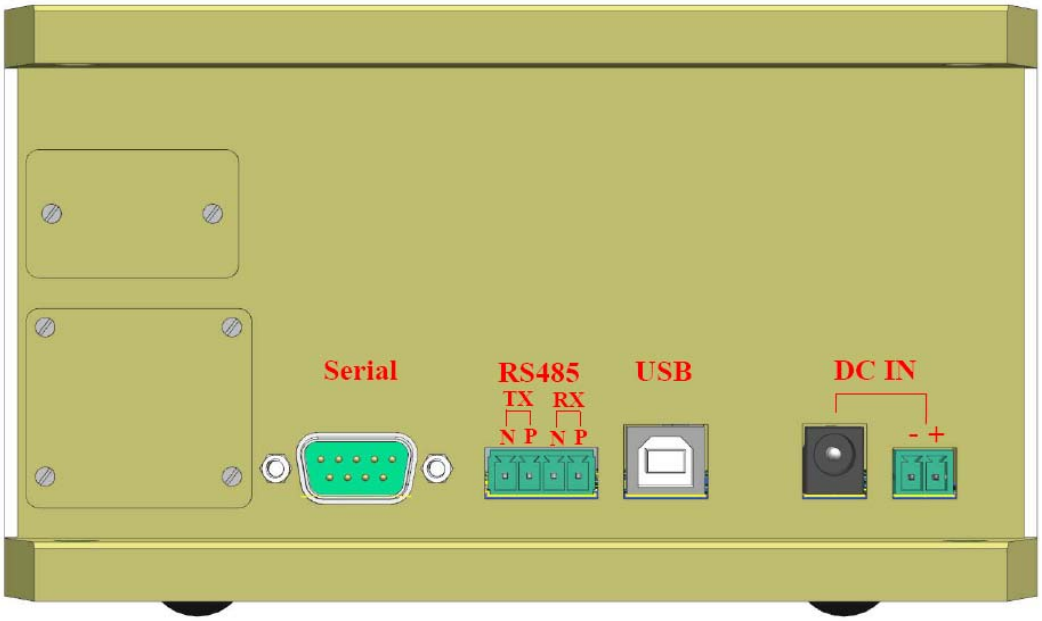
RFID A800 is a multifunctional RFID reader professionally used in 902–928MHz UHF band, which integrates all possible RFID functions for different environment. RFID A800 provides flexible Input and Output ports without extra-used equipment, which can largely reduce the system installation cost.

1.1 Hardware

The whole view of RFID A800 is as shown in Figure 1(a)(b), which marks all connected ports. Detailed information is tabulated in Table 1. Figure 2 shows the LED indicator descriptions.



(a) Front view and Left side view



(b) Right side view

Figure 1 (a) Front view: 16 GPIO ports. **Left side view:** 4 RF ports and 4 RJ45 ports.
(b) Right side view: DC Jack, USB, RS232 and RS485 port.

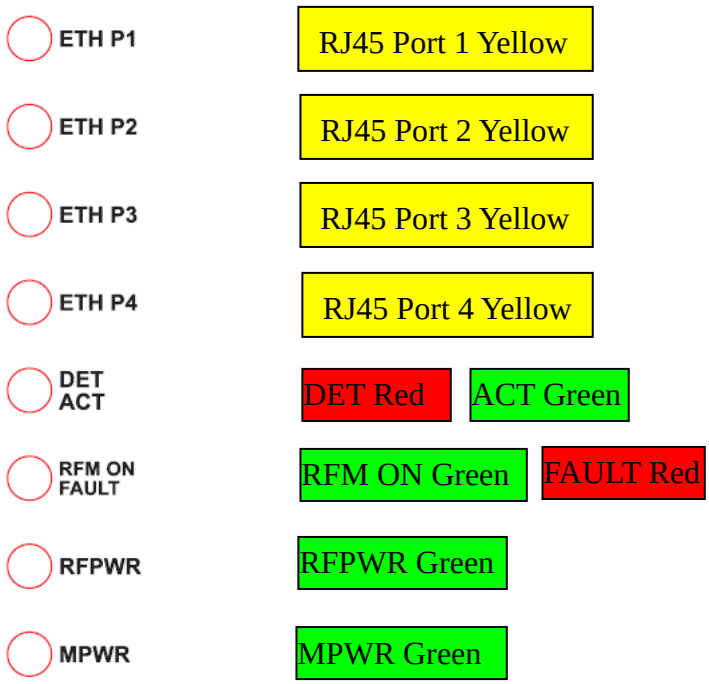


Figure 2 LED descriptions.

Table 1 RFID reader function descriptions

Items	Parameters	Descriptions
1	Power Input	1 DC Jack and 1 Terminal Block two pins for Discrete two-wire DC input for 12V or 24V DC, 2.5A maximum for 12V.
2	Electro-mechanical IO Control Ports	**Wet/Dry contact control Input 8 ports:** Two 4-port Terminal Block, one signal input and ground as a pair of port. **Dry contact control Output 8 ports:** Two 4-port Terminal Block, differential pins as a pair of port.
3	Ethernet Ports	4 Ethernet ports for multi-user
4	RF reader Ports	4 ports of N type Female
5	USB	B type, kept for engineering test of use
6	RS232 Ports	1 port , Kept for engineering test of use
7	RS485	1 full duplex 4-pin port, external controlling or engineering test.
8	Micro SD Card Holder	Access door(port)
9	Future Use Port 1	Access door(port) optional for future use
10	Future Use Port 2	Access door (port) optional for future use
11	LED Indicators	8 LEDs: 4 x Ethernet ports Link, Yellow 1 x Main power, Green 1 x RF power, Green 1 x RFM ON, Green and Fault, Red 1 x RFID ACT, Green RFID DET, Red
12	Operation Temperature	0°C ~ 60°C
13	Dimension	237.2 * 160.5 * 91.5 mm^3
14	Weight	2.52kg

1.2 Software

YDT A800 series provides **ReaderAP** software tools for reader configuration and testing on most of product features. The ReaderAP includes:

- **Reader Setup Tool (RST)**
  Network settings, Protocol and Region settings…
- **Reader Test Tool (RTT)**
  Antenna settings, Tag Management, IO Control…
- **Reader Diagnose Tool (RDT)**
  Event report setting, Power Ramp tool, Tag Log…

Refer to chapter **3. ReaderAP Software Tools** for detail.

2. Installation

2.1 Mechanical Dimensions

Figure 3, 4 and 5 show physical **dimension** with unit **mm**. User should put it into the suitable **case** together with **power adaptor** to safely hold the operating equipment, wherever it is in indoor or outdoor. The **mounting screws** are **M4** size while mounting it to counterparts of mechanical structure.

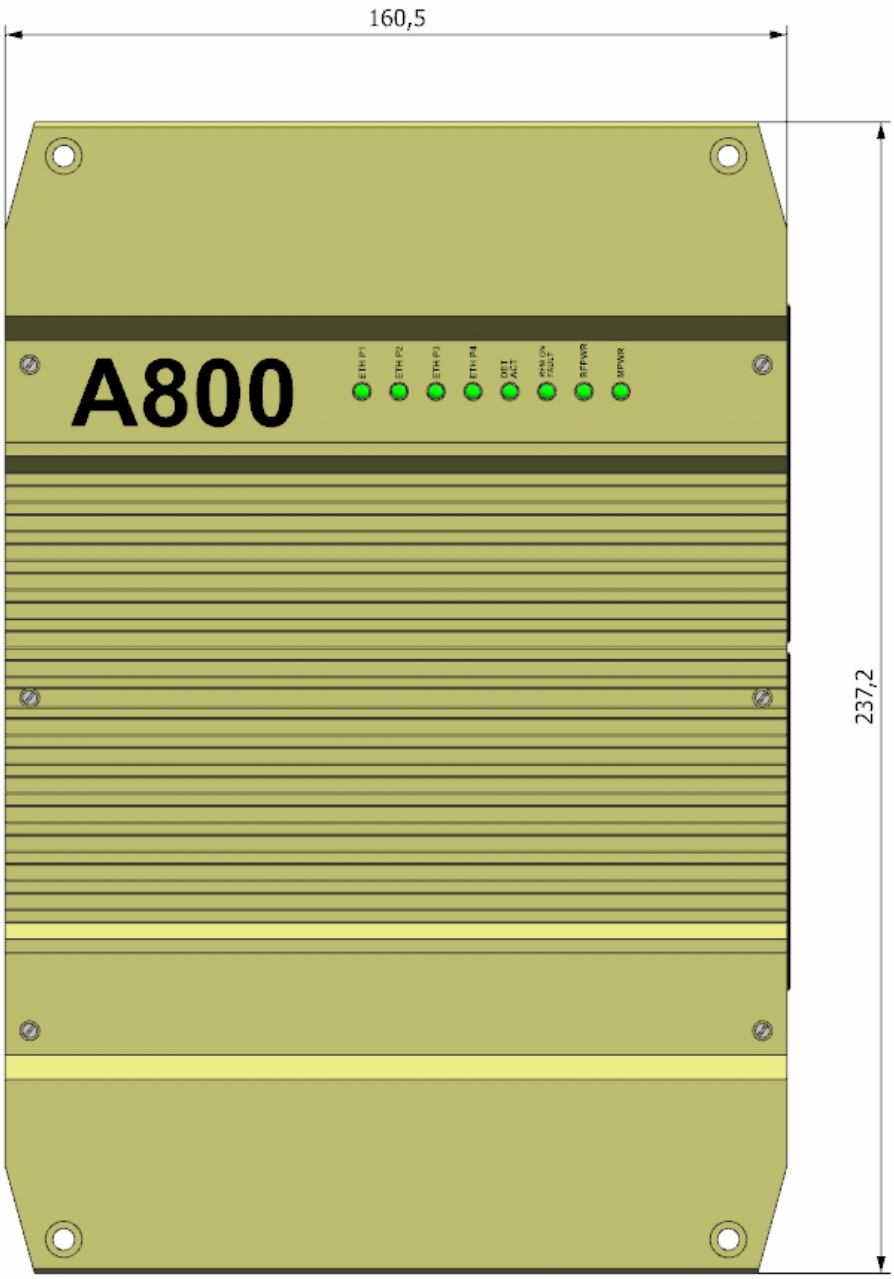


Figure 3 Dimensions in Top view.

Figure 4 Dimensions in Bottom view. The 4 mounting holes are for M4 screws and washers.

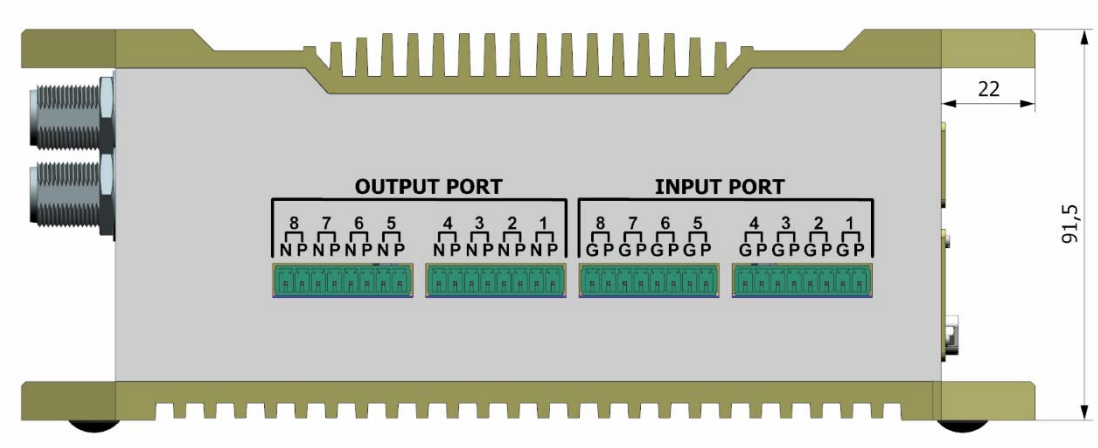


Figure 5 Dimensions in Front view.

2.2 Electrical Installation

Figure 6 shows the connections between A800 and other equipment.

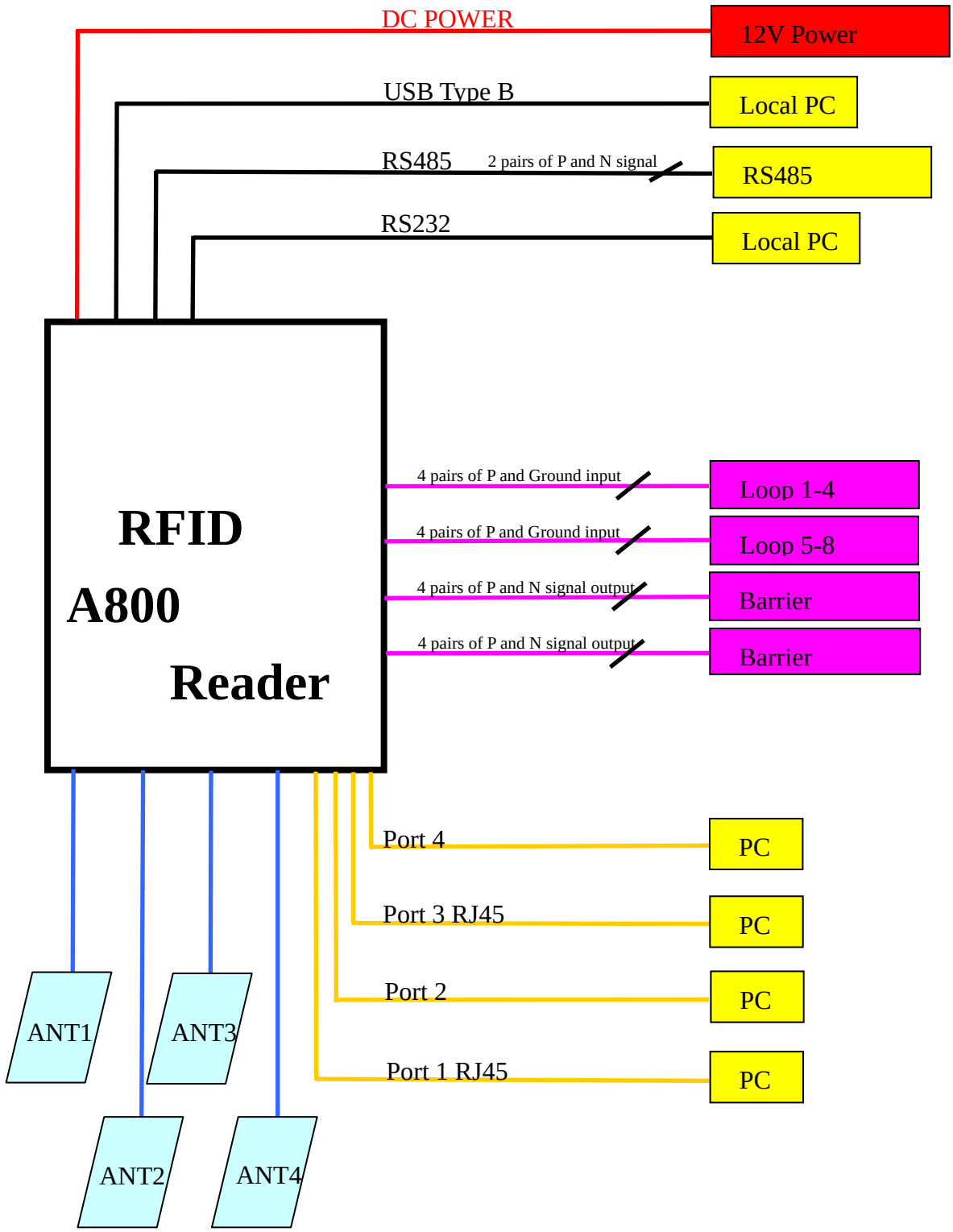


Figure 6 Electrical connections on RFID reader.

2.3 Installation Notes

- **DC Power**

The adaptor input can be 100V or 240V AC max; standard output is 12V DC. One alternative input is Terminal block connector, but, it is not allowed to connect power with both DC Jack and Terminal Block to different DC source.

- **RS232**

Default 115200 Baud for RS-232 serial port for communication. The suggested maximum serial cable length is 3 meters.

- **USB**

The default USB is type B connector, which is mainly used for local engineering test, not for general data transferred purpose.

- **RS485**

RS485 provide extra function for engineering test, which also can be selected as extended controlling purpose to be connected to a RS485 controller or equivalent equipment. This function must depend on the software support. Contact manufacturer if needed.

- **Micro SD Memory Card**

This is mainly used as extended memory for easy hand-carry purpose. This function must depend on the software support. Contact manufacturer if needed.

- **Electro-Mechanical Ports**

1. 8 Input ports: “0” is short to ground or voltage less than 3V, “1” is open to ground or voltage more than 5V, 30V maximum.
2. 8 Output ports: “0” is P to N short, “1” is P to N open.
   The output status of after power up will be default “0”, namely, the output is shorting of P and N. Unless user changes output status using software tools, it will keep the “short” status. Therefore, user should take care of the initial process of applications-- if power is not provided, the Output port is in “Open” status.

- **Ethernet Ports**

The Ethernet ports can provide high speed switch performance up to 1,000 Mbps.
By default, the IP address of RFID A800 is 192.168.1.8 and can be changed using Reader Setup Tool (RST).

- **Antenna Ports**

Total 4 RF output ports can be connected. With default profile, all of the 4 ports will be transmitted. Therefore, to select or deselect an antenna port, user should modify **antenna setting** through Reader Setup Tool and Reader Test Tool in prior to RF power activated. For insurance, it is recommended to make **unconnected ports terminated with 50 ohms load**. Before removing an antenna or a load, user should deactivate the RF power.

User must be sure that cables are **well connected** before running "**Perform Antenna Check**" operation in Reader Tests Tool (RTT) to avoid unexpected test results.
In practical application, while using the **Antenna Port Detection** function, some types of antenna might NOT be detected well, and it will cause the" **Perform Antenna Check**" function fail to detect the correspondent antenna. If so, follow the **troubleshooting** information in section **3.2.1 Antenna Setting**. The mismatch problem of Antenna Port Detection on "Perform Antenna Check" does NOT mean the installed antenna is truly malfunction, instead it is decided by the detection mechanism of the circuits. If users make sure that everything related to the RF port is in normal condition, just **skip the "Perform Antenna Check" operation** and use **manual antenna selection** instead. (Refer to **3.2.1 Antenna Setting**)

- **LED indicator**

✧ One of 4 **Ethernet** ports Linked, **Yellow** LED will light.

✧ **MPWR** (Main power) and **RFPWR** (RF power) LED should be lighted green after **power on**. If any of them doesn't light, it means the reader is in malfunction.

✧ **FAULT** LED will light in **RED** in two conditions:
1. During system initiation. (Turns **OFF** after system is ready.)
2. When system encounters some problem. (This function is pended and will be built in line with future software support and fault definition. Contact the manufacture for further information.)

✧ **RFM Power** LED will light **Green** when **alternative RF module** function activated. The function is pending at present version.

✧ **RFID ACT** lights **Green** when RFID RF power is **transmitted**;
RFID DET lights **Red** while RFID **detects** possible tags.

2.4 Installation Cautions

The RFID reader is RF power transmitted product, for safety of equipment and operator, the rules below should be followed,

A. Antennas should be located away from any person by **more than 0.5 meters**.
B. Reader should be **grounded** properly.
C. Any **unconnected port**, especially the center pin of RF port, should be rid of fingering of person against ESD damage.
D. The antenna location should be kept away from **other antenna** of different transmitter, particularly the near band of from 902 to 928MHz. Co-location interference could be happened in worst condition.

3. ReaderAP Software Tools

The YDT A800 is delivered with **ReaderAP** tools for reader setup and configuration. To use YDT ReaderAP, copy the ReaderAP folder from the CD-ROM into any path of the hard drive. Make sure the three executable files (.exe) below are shown in the ReaderAP folder.

- **PrjRST.exe** --- Reader Setup Tool (RST) / Application Entry
- **PrjRTT.exe** --- Reader Test Tool (RTT)
- **PrjRDT.exe** --- Reader Diagnose Tool (RDT)

Check antennas and network setting according to Chapter 2 Installation. Make sure that YDT A800 is in the same network segment as the PC running ReaderAP.

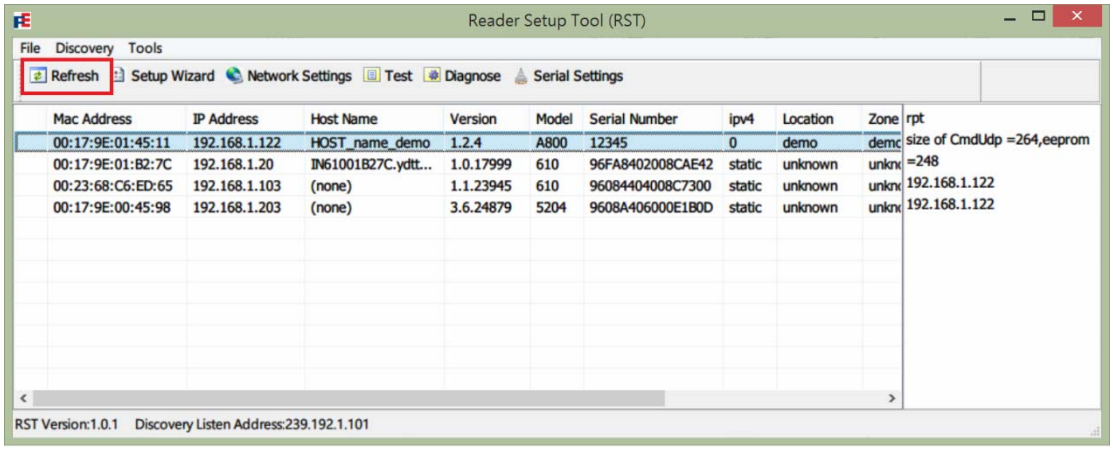
3.1 Reader Setup Tool (RST)

The Reader Setup Tool (RST) provides the entry to perform:

- View list of readers in the network segment.
- Launch Setup Wizard to set basic configuration.
- Launch Network Settings to modify a reader's description and network settings.
- Launch Reader Test Tool (RTT) to do antenna, I/O, and tag management.
- Launch Reader Diagnose Tool (RDT) to perform power ramp test and dump system logs.

Open YDT ReaderAP:

1. Run **PrjRST.exe** to open the main window.



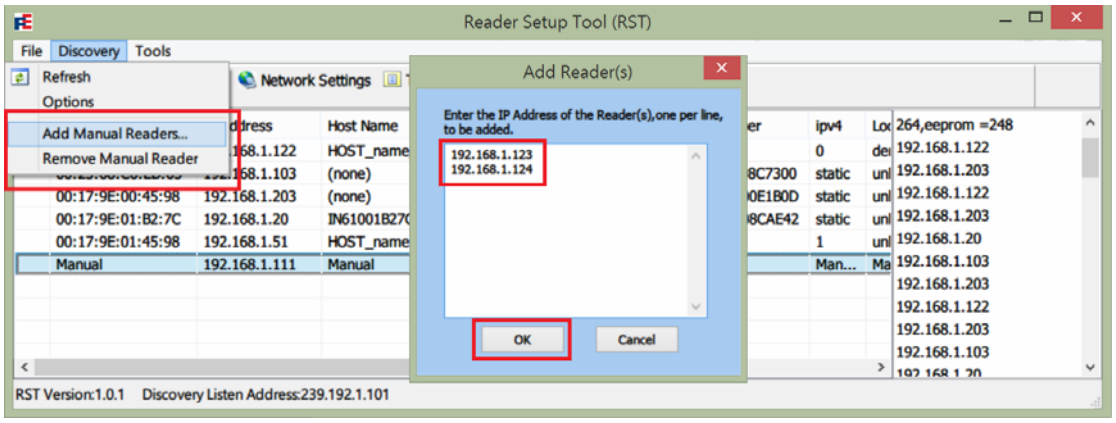
2. For the first time you may receive security alert message from Windows firewall or 3rd party security applications. **Unblock PrjRST.exe** to continue executing

ReaderAP.

Warning: If there is advanced policy of security on the PC that causes YDT ReaderAP unworkable, try to contact the network administrator for resolution.

Select a specific reader:

1. Press **Refresh** button on the RST toolbar.
2. The list view will show available readers in the network segment.
3. Click on a reader list item to select a YDT **A800** Model.
4. Or you can manually add readers by filling the IP list in **Discovery**->**Add Manual Reader**, and remove a manual reader by clicking **Discovery**->**Remove Manual Reader**.

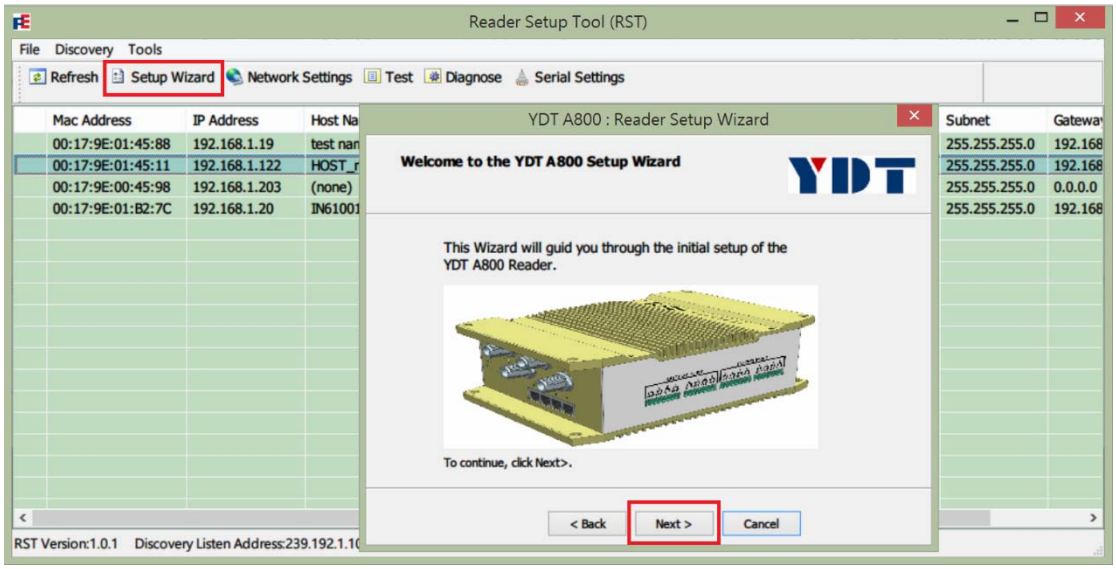


3.1.1 Setup Wizard

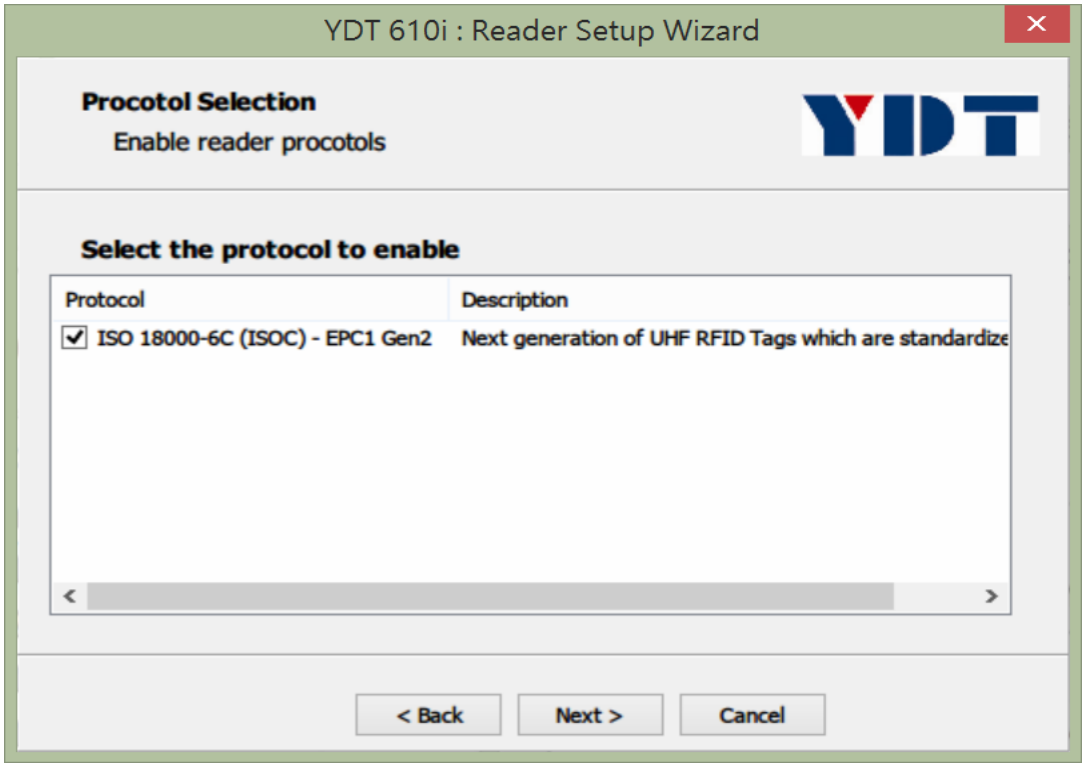
Initiate basic settings of a reader:

Note: The words of 610i in software title is temporary expression, it will be changed to A800 for normal version.

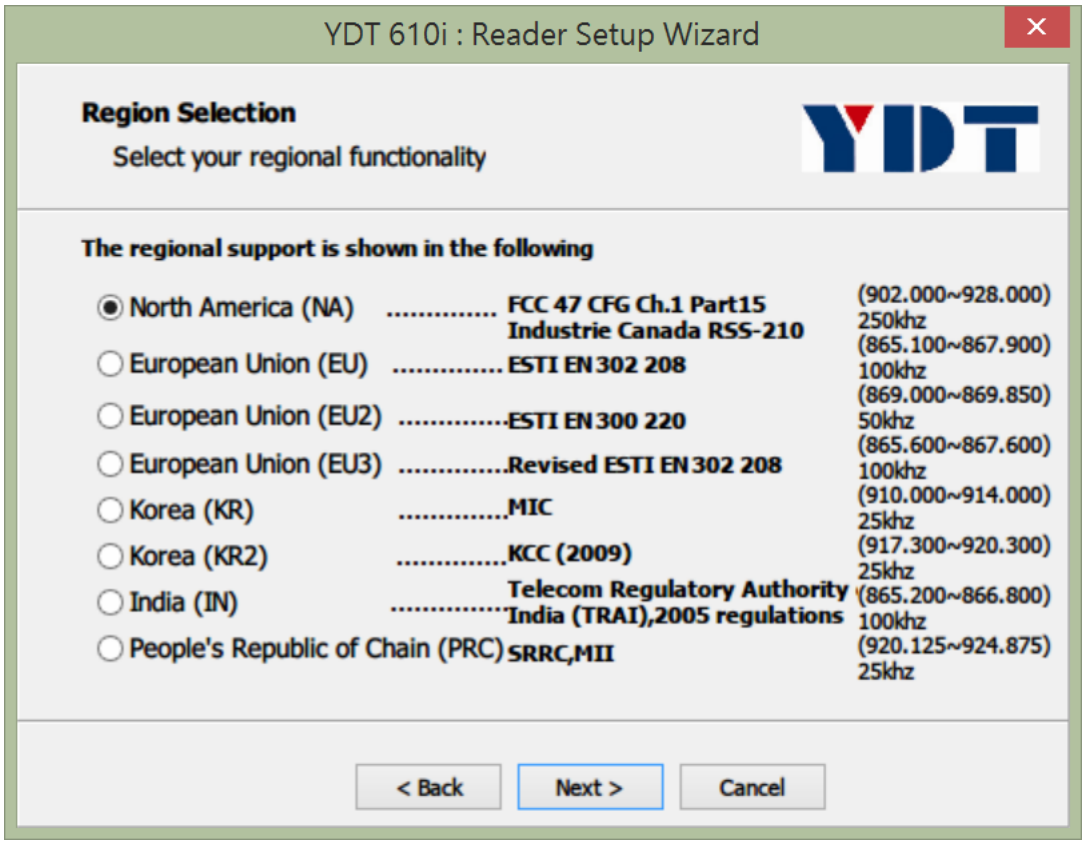
1. Open the Reader Setup Tool (RST).
2. In the list view, select the reader to be configured. And then press **Setup Wizard** button on the RST toolbar.



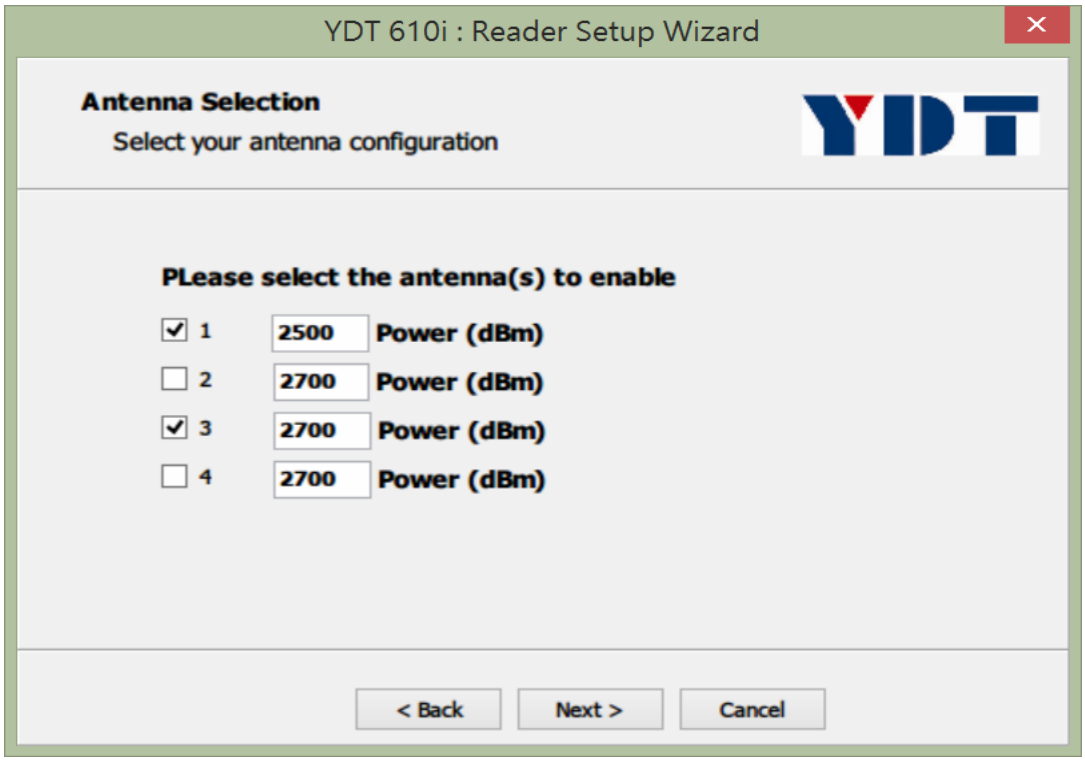
3. Press **Next >** button to start.
4. Select the **protocol** of the tags and press **Next >**. YDT A800 currently support only **ISO 18000-6C EPC1-Gen2** protocol.



5. Select the **region** in which the reader is installed to configure the **frequency hopping** range. Press **Next >** to continue.

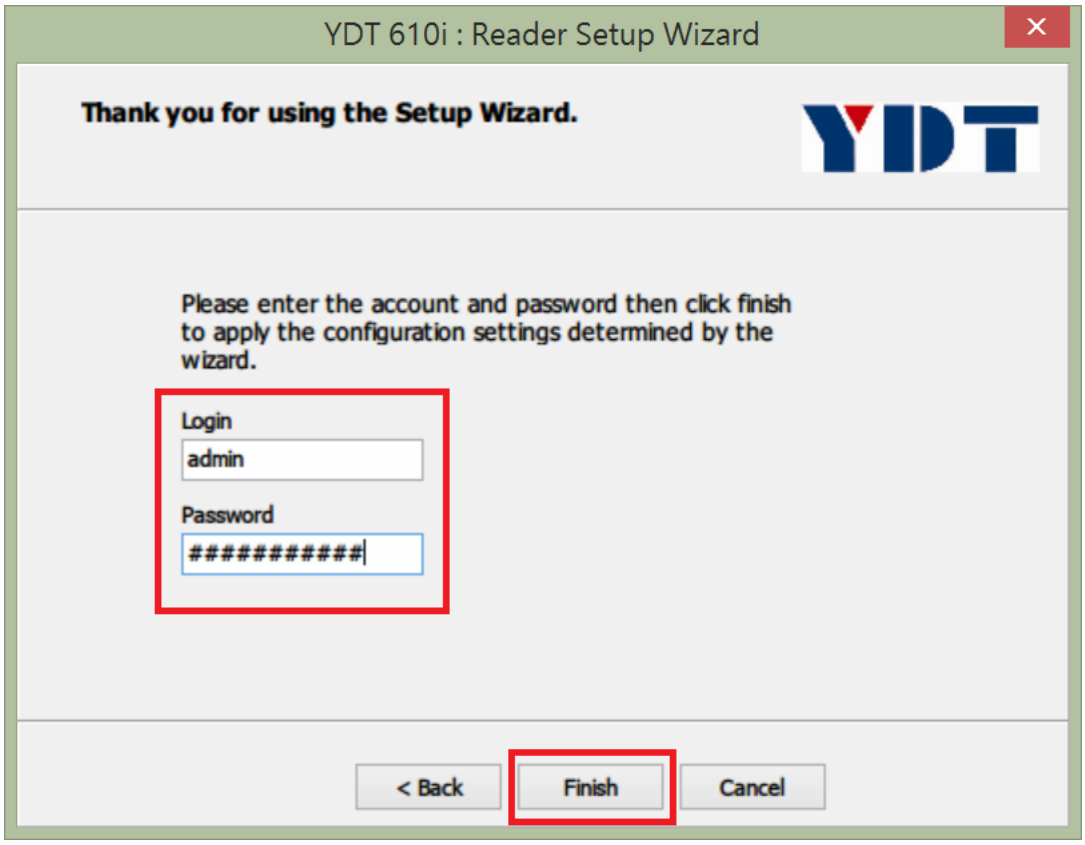


6. Choose the **used antenna ports** with **conducted power** respectively. Press **Next >** to continue.



7. Enter login **account** / **password** (default: **admin**/**readeradmin**) of the reader with administrator authority.

Warning: The **maximum length** of **account/password** is **16 bytes**



8. Press **Finish** button to save settings.

9. Wait by **10 seconds** for reloading profile. Press **Refresh** button on the toolbar of Reader Setup Tool (RST) to renew reader list. **If RST does NOT response for a long time, reboot the reader manually (Power down → wait by 5 seconds → power up → wait until FAULT Red LED turns off)**.

3.1.2 Network Settings

Change reader description and network settings:

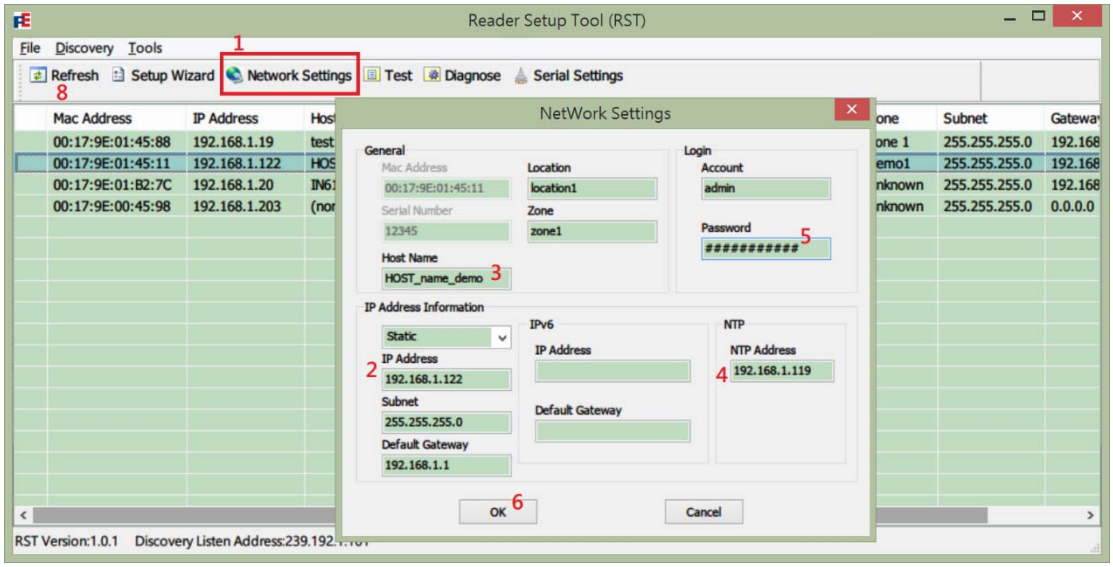
1. In the list view, select the reader to be configured. Press **Network Settings** button on the RST toolbar to open **Network Settings** dialog.
2. On the left side of **Network Settings** dialog, modify the network address information. YDT A800 uses **Static IP** **192.168.1.8** by default.
3. In **General** area, edit **Host Name**, **Location** and **Zone** fields if it is necessary to identify naming and location information of readers.

Warning: The **maximum length** of **Host Name**, **Location** and **Zone** is **16 bytes**.

4. Edit **NTP** to assign **IP address** of time synchronization service.
5. In **Login** area, enter **Account** and **Password** of administrator authority. (default: **admin** / **readeradmin**)

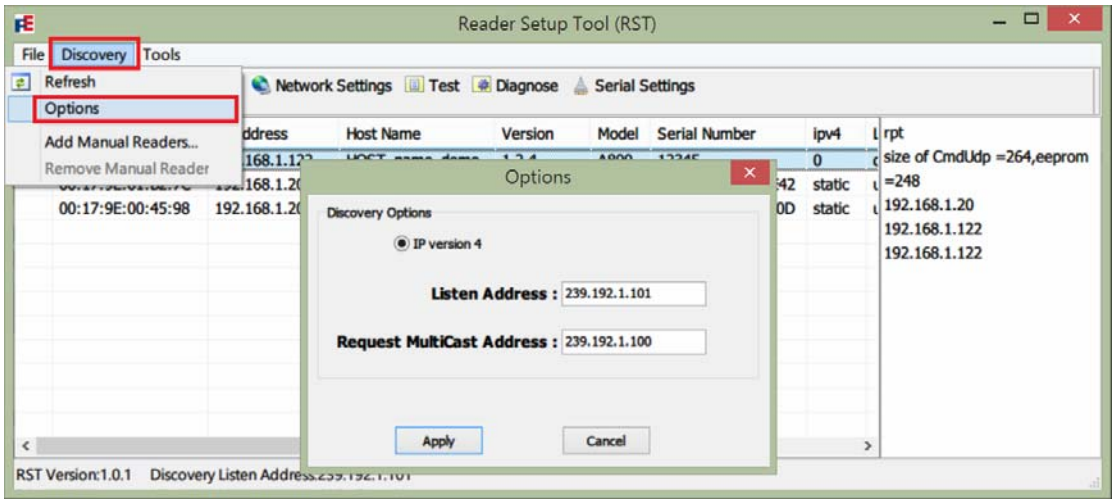
Warning: The **maximum length** of **account** and **password** is **16 bytes**.

6. Press **OK** button to save settings.
7. After network settings changed, the reader will **automatically reboot** to reload the configuration in profile. Please wait by 1 minute for reader startup. If RST does NOT response for a long time, **reboot** the reader manually (**Power down → wait by 5 seconds → power up → wait until FAULT Red LED turns off**).



8. Press **Refresh** button to renew the list view in Reader Setup Tool.

Customize Discovery Options:



1. In the **Discovery** menu in Reader Setup Tool (RST), select **Options**.
2. In the Options popup dialog, modify the broadcast settings.

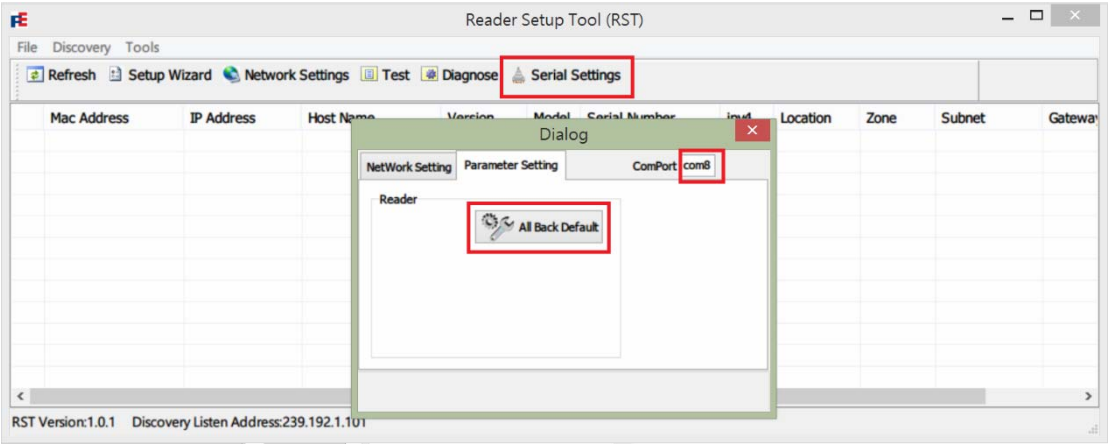
   Listen Address: IP address for **listening UDP discovery packets**.

   Request Multicast Address: Broadcast IP address for **sending out UDP update request packets**.

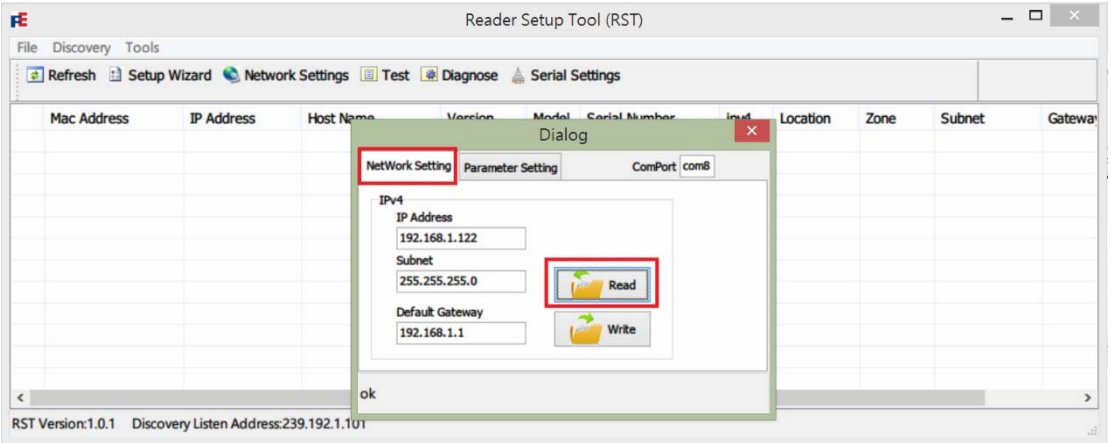
3.1.3 Serial Settings

Restore settings when network is unavailable:

1. Make sure the **Serial Port (RS232)** has been connected to PC.
2. Press **Serial Setting** button on the toolbar to open the serial settings dialog.
3. Enter **ComPort** which is an available **serial port number** of the PC. Default value is "**com8**".
4. Press **All Back Default** button in **Parameter Setting** tab to reset reader profile.



5. Wait by **10~20 seconds** while overwriting reader profile.
6. Select **Network Setting** tab in the dialog. Press **Read** button to **load** settings from reader.
7. Edit **IP Address** and other network settings if necessary.



8. Press **Write** button in the **Network Setting** tab to **save** settings to reader.
9. **Reboot** reader manually (**Power down → wait by 5 seconds → power up → wait until FAULT Red LED turns off**) to reload the profile.
10. Run **Setup Wizard** or other configurations to setup the reader again.

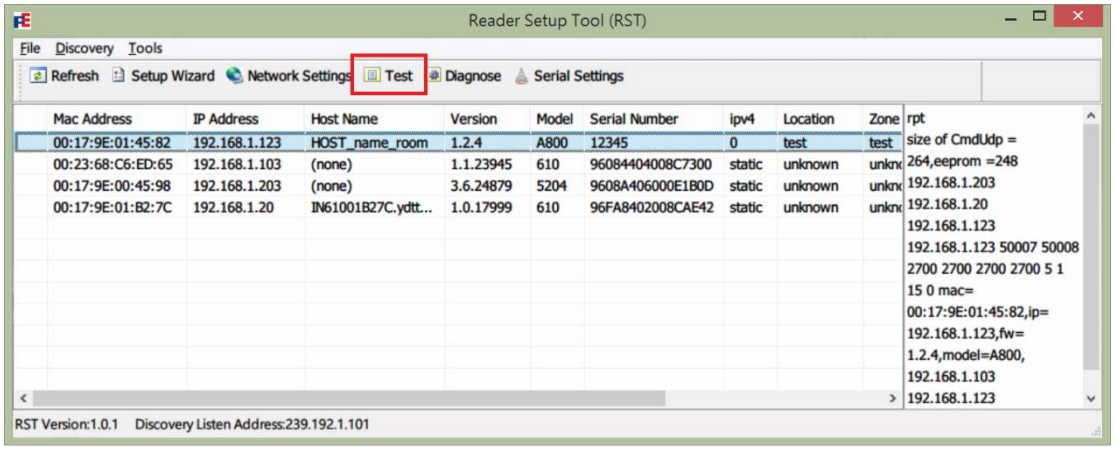
3.2 Reader Test Tool (RTT)

The Reader Test Tool (RTT) is a utility for testing reader operations including:

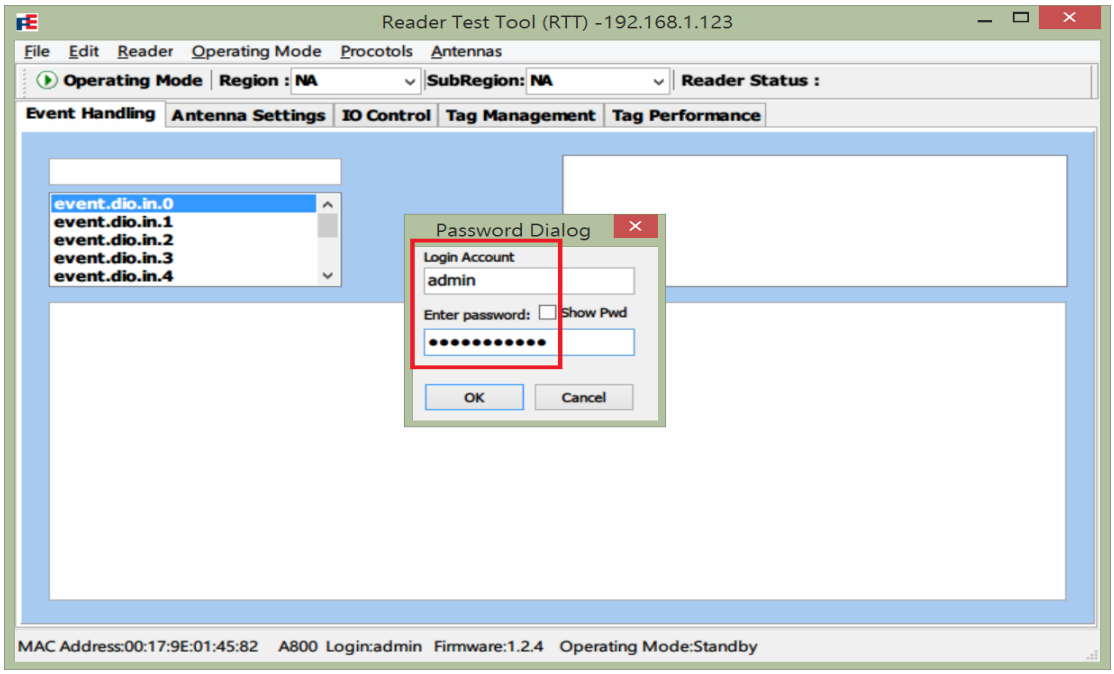
- Antenna Setting
- Event Handling
- I/O Control
- Tag Management

Open and Login into Reader Test Tool (RTT):

1. In the list view of Reader Setup Tool (RST), select a YDT A800 Model.
2. Press **Test** button to launch Reader Test Tool (RTT).



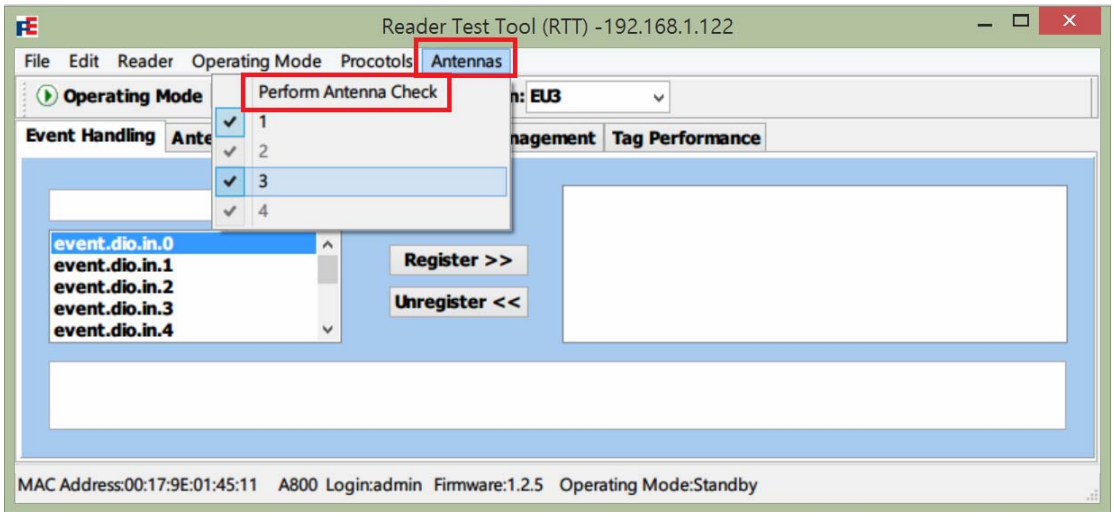
3. Login with **Account** and **Password** (default: **admin**/**readeradmin**) then press **OK** button.



3.2.1 Antenna Setting

Antenna Selection:

1. Make sure the antennas were correctly connected. For detail, refer to **2.3 Installation Notes** to check antenna installation.
2. Select **Antennas** menu after logged in Reader Test Tool (RTT).
3. Click to run **Perform Antenna Check** to detect connected antennas. Detected antenna port number will be shown in **black** and others in **gray**.
4. Manually **check**/**uncheck** the antenna ports to enable/disable antennas.



Troubleshooting: If the antenna **cannot be detected after Step 3. Perform Antenna Check** (the connected antenna port index is still in gray), please follow operations below:

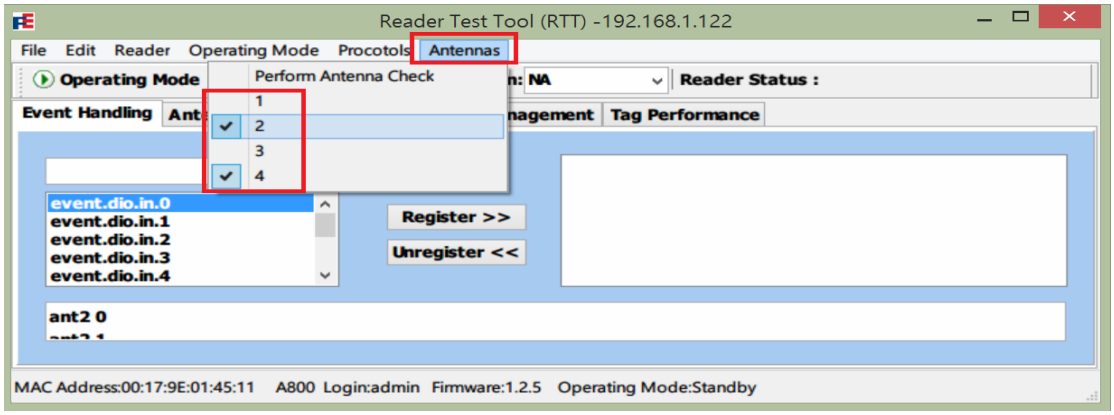
i **Close** RTT and RST.

ii **Reboot** the reader (**Power down → wait by 5 seconds → power up → wait until FAULT Red LED turns off**).

iii Reopen RST. Launch and login into **RTT**

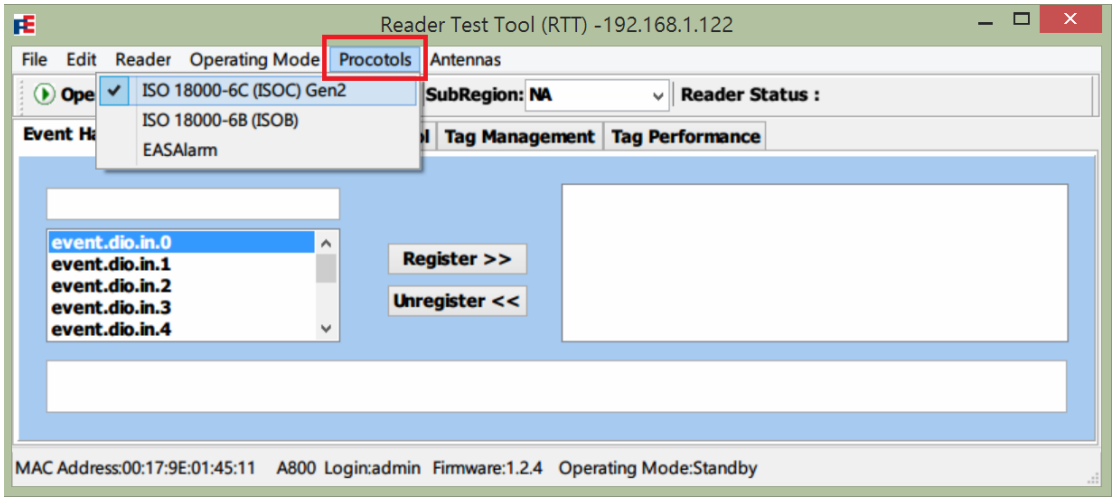
iv Select **Antennas** menu but **do NOT launch Perform Antenna Check**.

v Follow **Step 4**, **manually check the connected ports** and **uncheck the empty ports**.



Protocol Selection:

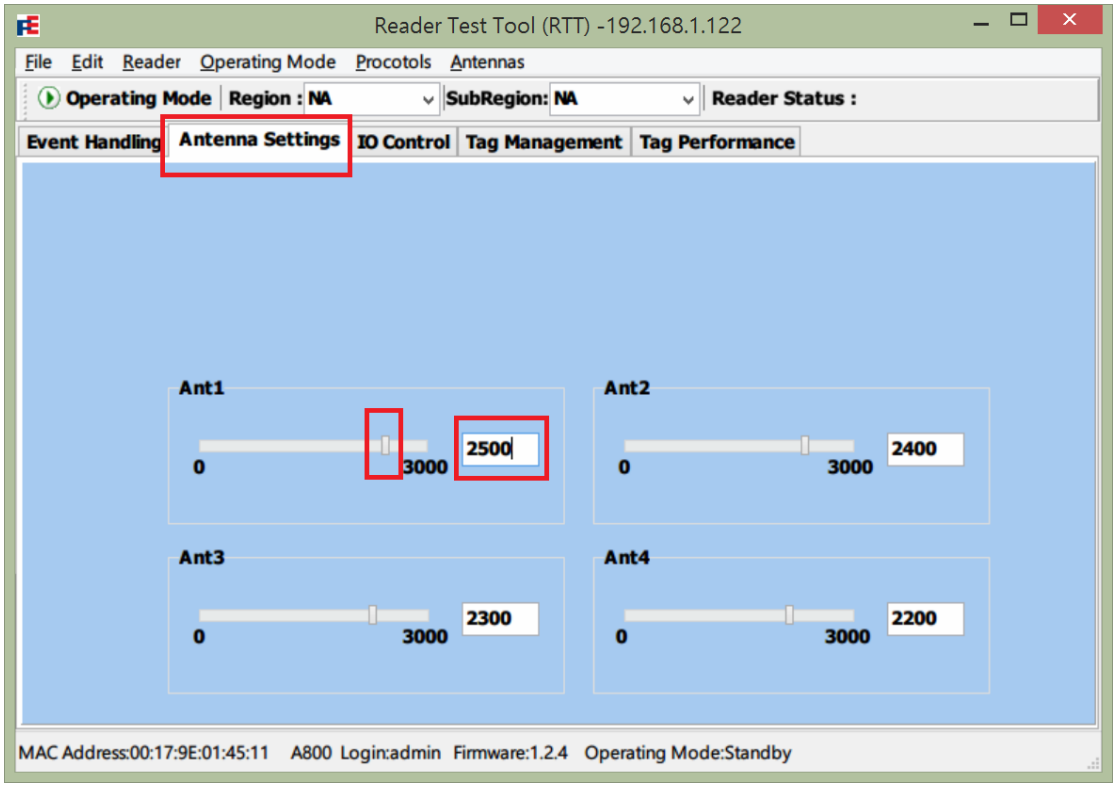
1. Select **Protocols** menu after logged in Reader Test Tool (RTT).
2. Check **ISO18000-6C (ISOC) Gen2**.



Warning: YDT A800 currently support **only ISO18000-6C (ISOC) Gen2** protocol.

Set antenna conducted power:

1. Select **Antenna Settings** tab in Reader Test Tool (RTT).
2. Adjust conducted power of Ant1~4 by dragging slide bars or giving numbers from 0 to 3000(0 to 30 dBm, if applicable) in the text fields.



3. Note that the **above operations do NOT modify the profile setting**, that is, the

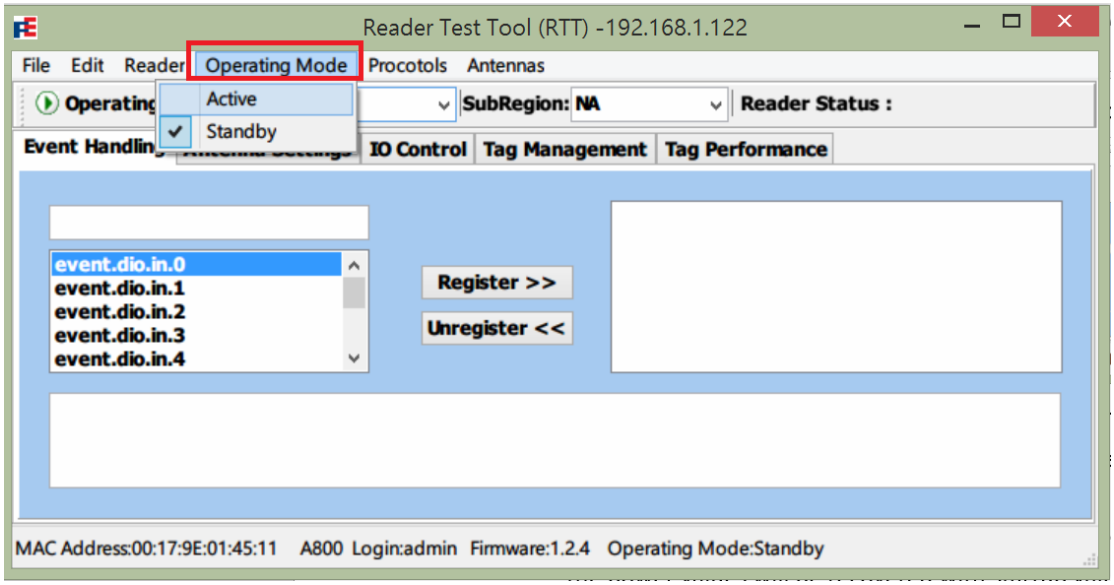
conducted power will be recovered with startup values **after reader reboot**.

Select Operating Mode:

1. Select **Operating Mode** menu in Reader Test Tool (RTT).
2. Check on **Active** or **Standby** to change between 2 operating modes.

   Active: Reader is continuously transmitting and detecting tags. The result is reported through asynchronous events.

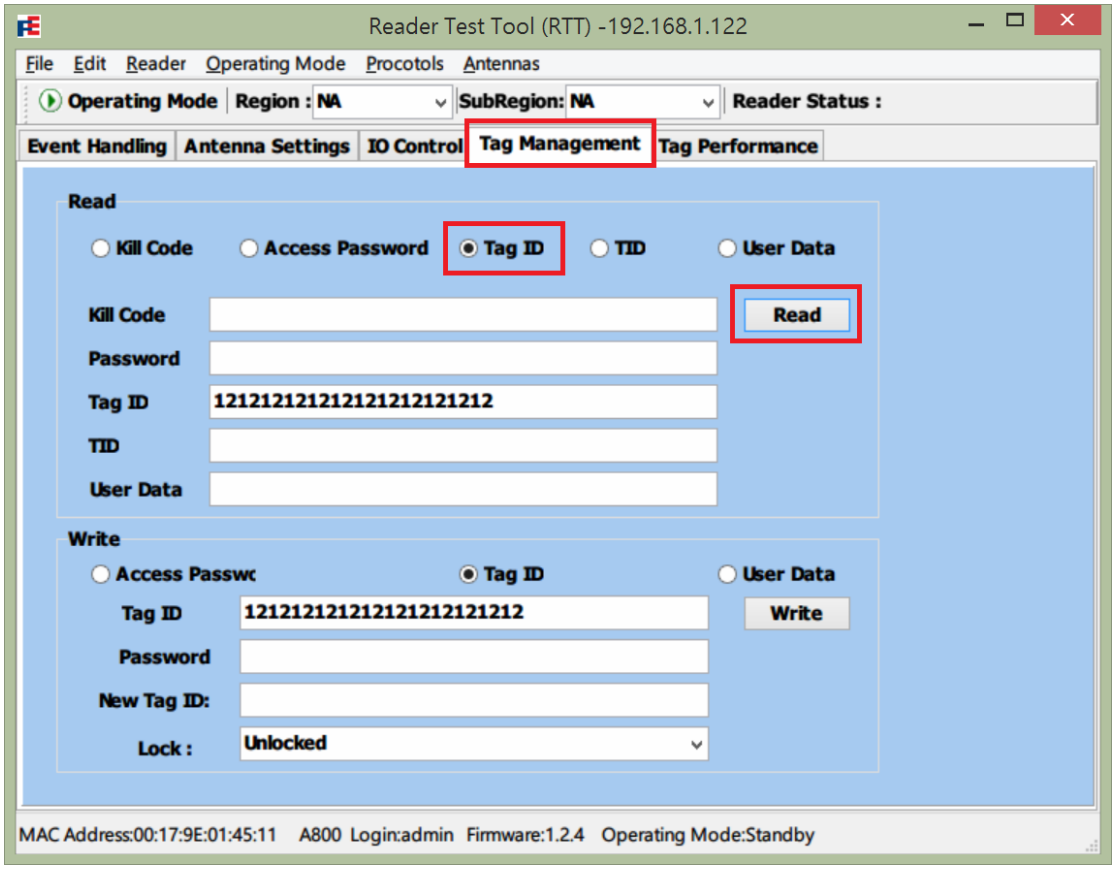
   Standby: Reader enables RF transmitter when receiving a tag related command. After the command process finish, the RF transmitter is turned off.



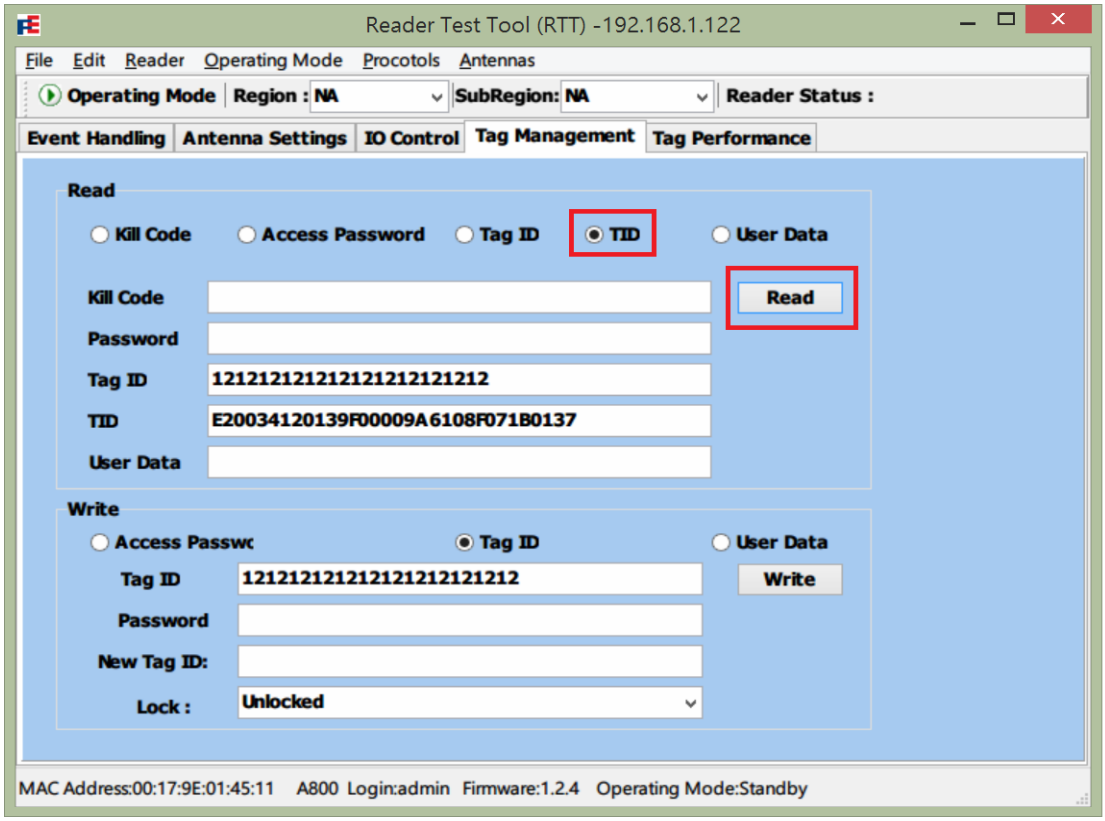
3.2.2 Tag Management

Read Tag Data:

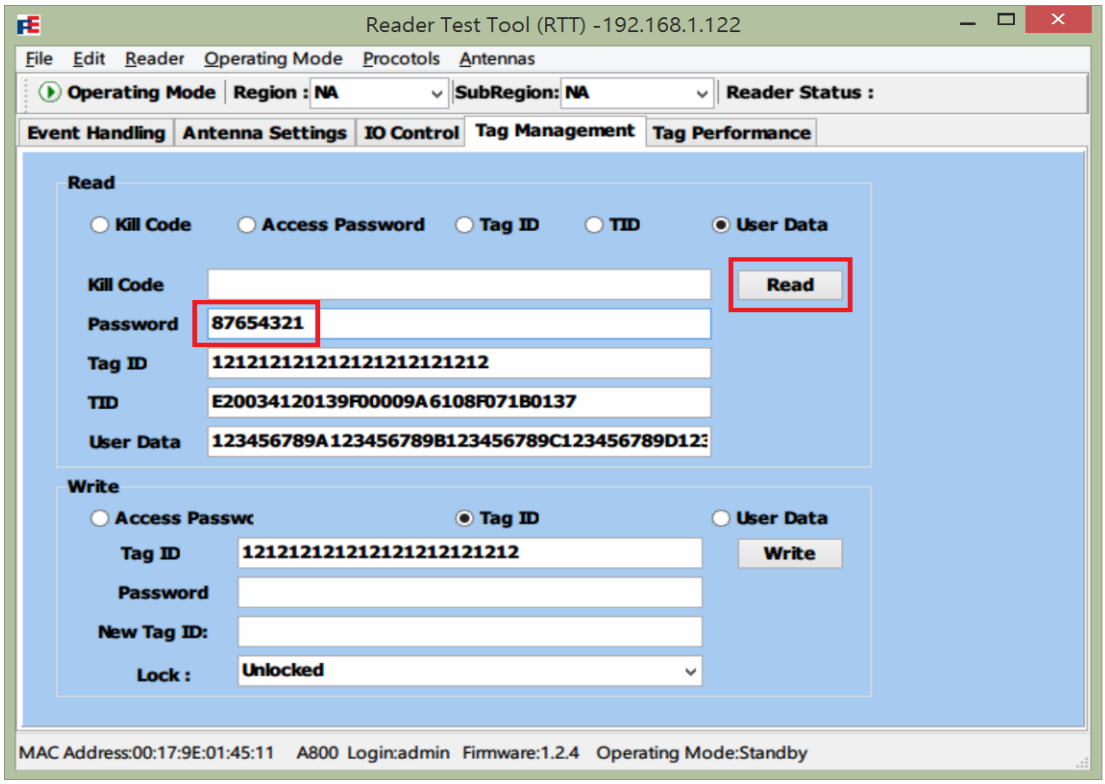
1. Make sure the antennas were properly configured (refer to [3.2.1 Antenna Setting])
2. Select **Tag Management** tab after logged in Reader Test Tool (RTT).
3. In the **Read** area, select the **Tag ID** field, and press **Read** button to detect a tag's Tag ID (EPC).



4. Keep the **Tag ID** (EPC) in the text field, select other fields including **TID, User Data**, **Access Password** and **Kill Code**, and then press **Read** button to get the field values.



5. If a field was **locked**, the **Password** (Access Password) must be given to access the field value. The **password** is an **8-digit hex string** (4 bytes).



Set Access Password:

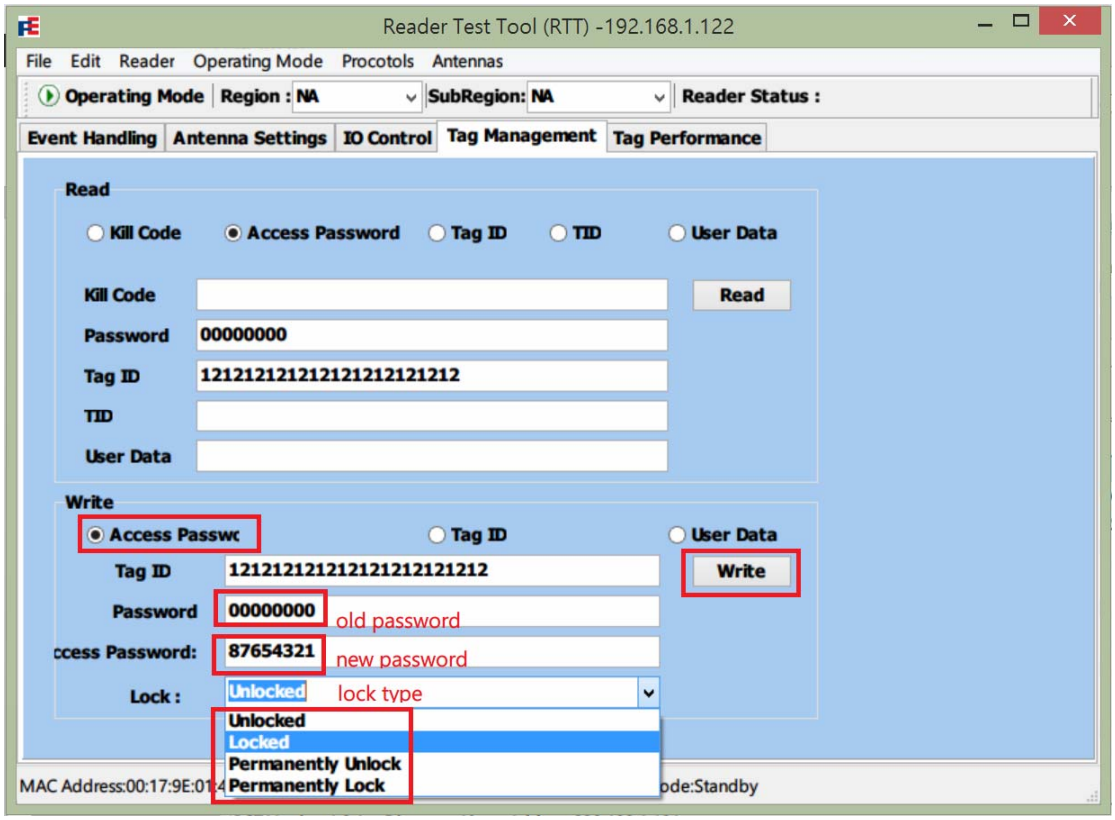
1. If a tag's password has not been set, it can be extracted in the **Read** area. Default access password is "00000000".
2. In the **Write** area, select **Access Password** radio item.
3. Give **Old Password**, **New Password**.
4. Select **Lock Type** of a field data:

   Locked: Password required to modify the field data.

   Unlocked: Free read and write.

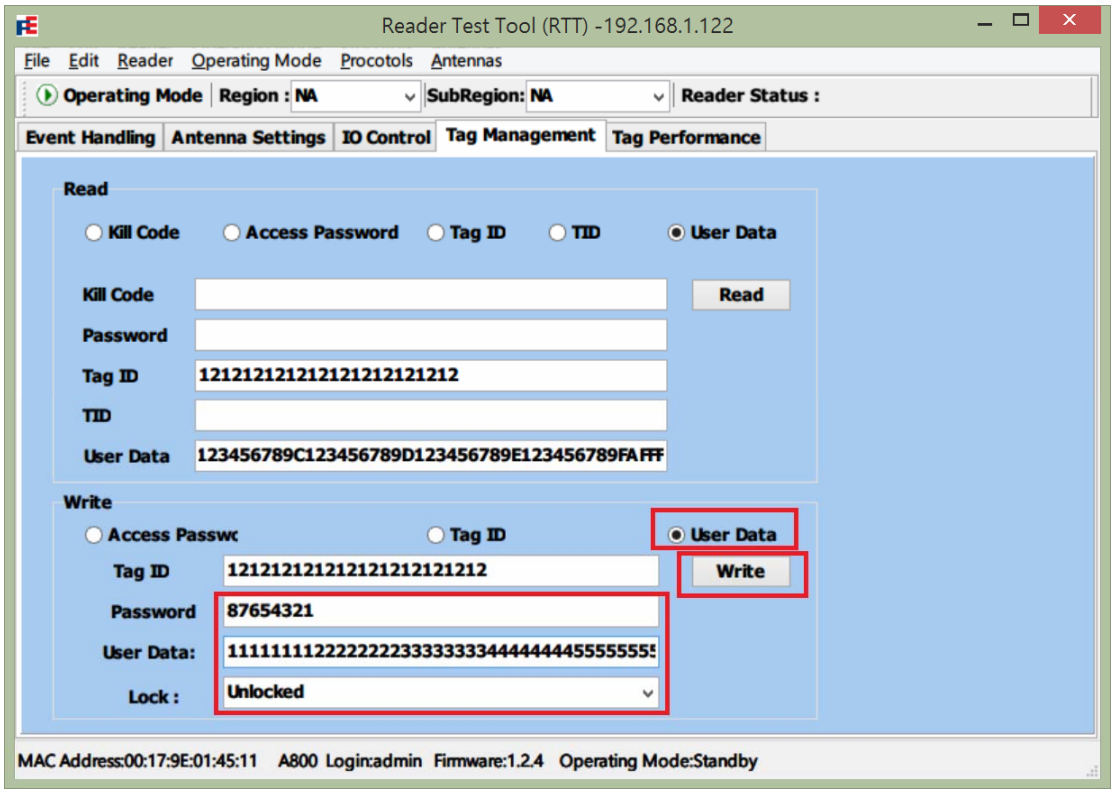
   Permanently Unlock: Freeze a field in **Unlocked** state and cannot be locked.

   Permanently Lock: Freeze a field in **Locked** state and cannot be unlocked.
5. Press **Write** button to apply the changes.



Write Tag Data:

1. In the **Read** area, scan the **Tag ID** (EPC) of a specific tag.
2. In the **Write** area, select **Tag ID** (EPC) or **User Data** field to be modified.
3. Give new data and lock type. If the field was **locked**, the **Password** must be given.
4. Press **Write** button to apply the changes.

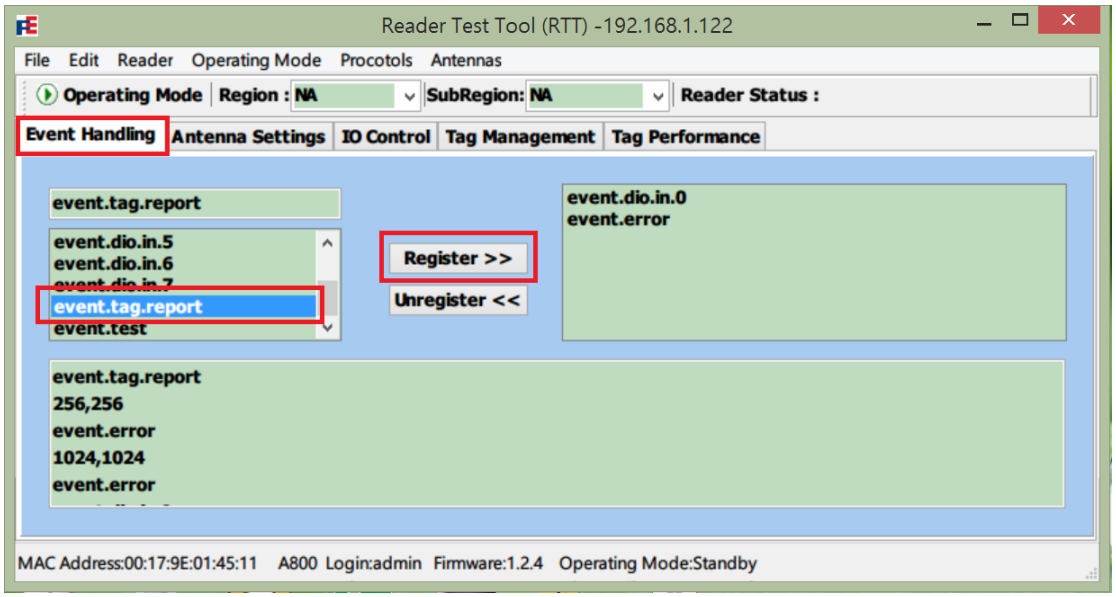


Note: YDT A800 supports **Tag ID (EPC)** of **12 bytes (24 hex characters)**, **TID** of **12 bytes (24 hex characters)**, and **User Data** of **32 bytes (64 hex characters)**.

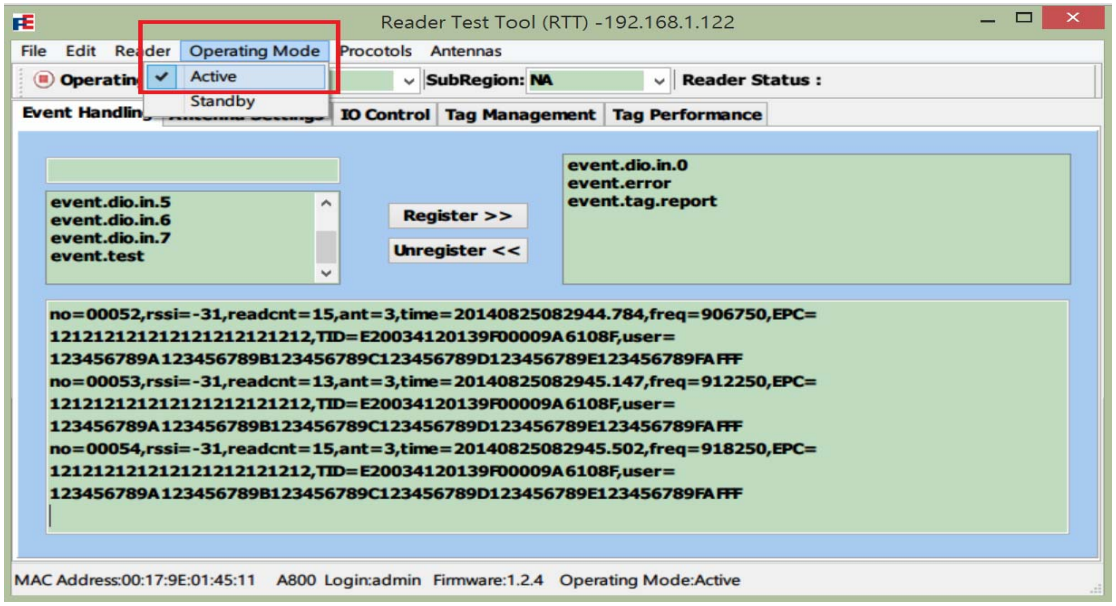
3.2.3 Event Handling

Register/Unregister an Event:

1. Select **Event Handling** tab after logged in Reader Test Tool (RTT).
2. The **left** side list shows all **supported events**; the **right** side list shows **registered events** associated to the current session (channel id).
3. To **register** an event, select a specific event name on the **left** side. Press **Register** button to make the event to be registered and then moved to the right list.

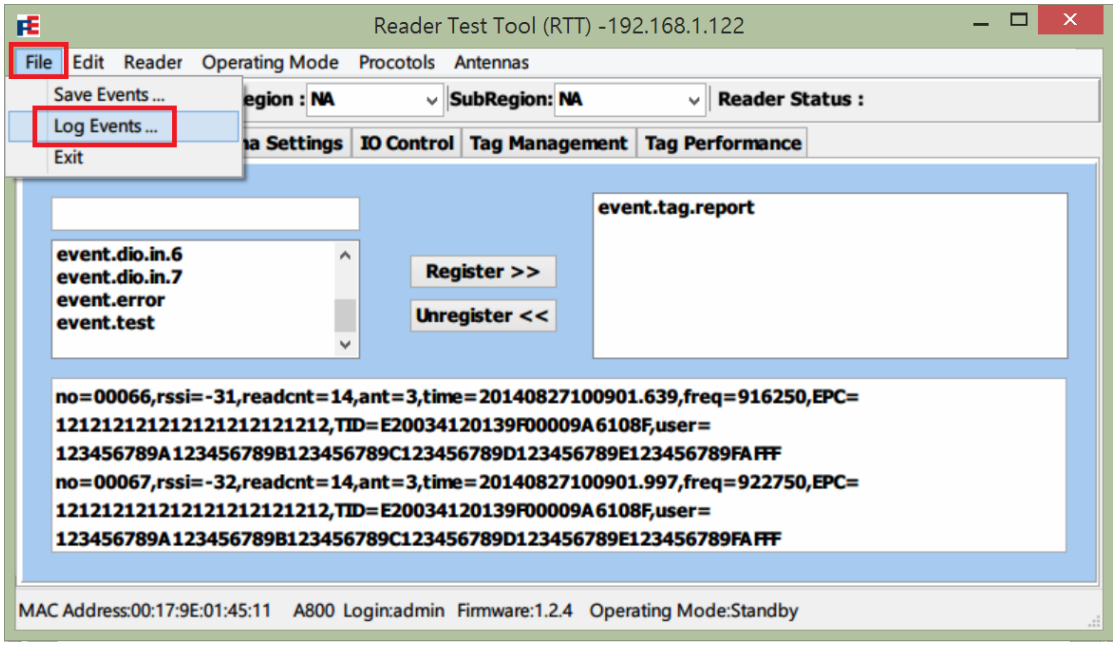


4. Set **Operating Mode** to **Active** to start transmitting and receive events.
5. To **unregister** an event, select an event name on the **right** side, and press **Unregister** button.



Get and Save Event Report:

1. Select **File** menu → **Log Events**. Browse and assign the report file name. **Incoming event log** will be **appended** to the file.
2. **Register** events according to use case.
3. Select **Operating Mode** menu, and set operating mode to **Active**.
4. The asynchronous **event report** will be displayed in the text scrolling area, and also be **appended to the log file**.
5. Switch **Operating Mode** to **Standby** to stop transmitting.
6. To **store the log data displayed in the text area**, select **File** menu → **Save Events**. Browse and assign the log file name to save log data.

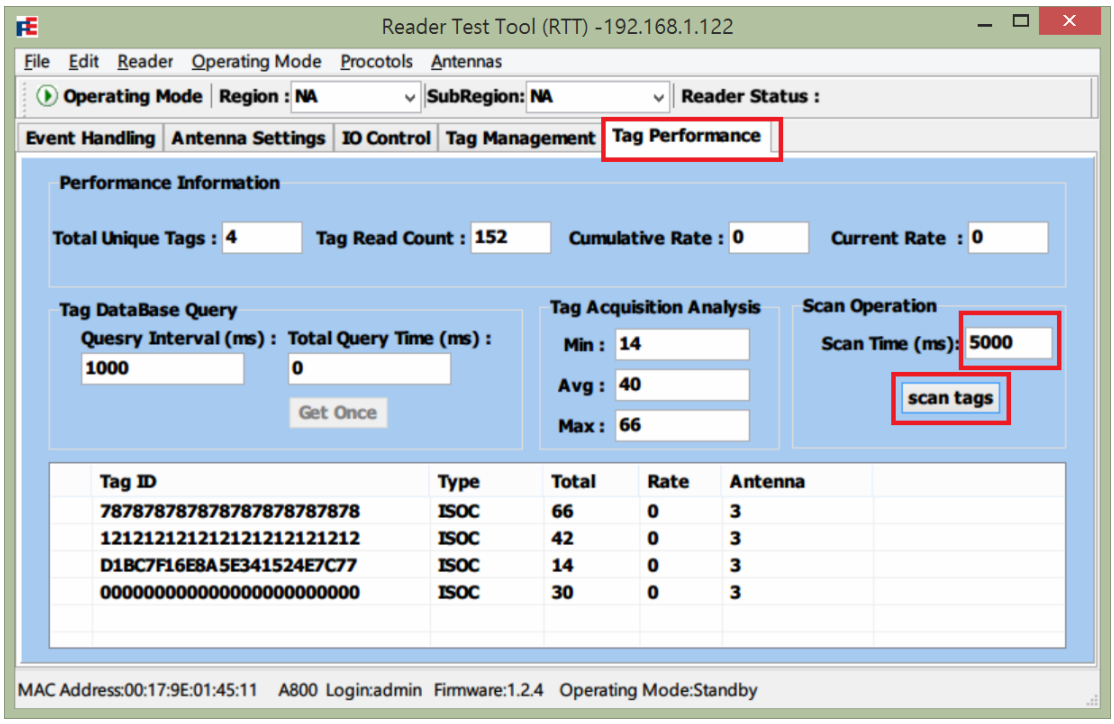


Warning: In step 6, **Save Events** only save the content in the text area for one time. Future incoming log data will not be append to this file.

3.2.4 Tag Performance

Performance Test:

1. Select **Tag Performance** tab after logged in Reader Test Tool (RTT).
2. Enter the **Scan Time** (in milliseconds) value which is period of a test.
3. Press **scan tags** button to start a test.



4. After the test finished, performance data is displayed in the **Performance information** and **Tag Acquisition Analysis** area, including:

   Tag Unique Tags: Number of unique tags found.

   Tag Read Count: Total number of tags read (including repeat reads)

   Cumulative Rate: Cumulative read rate (tags/sec) during the test. Cumulative rate is NOT available now.

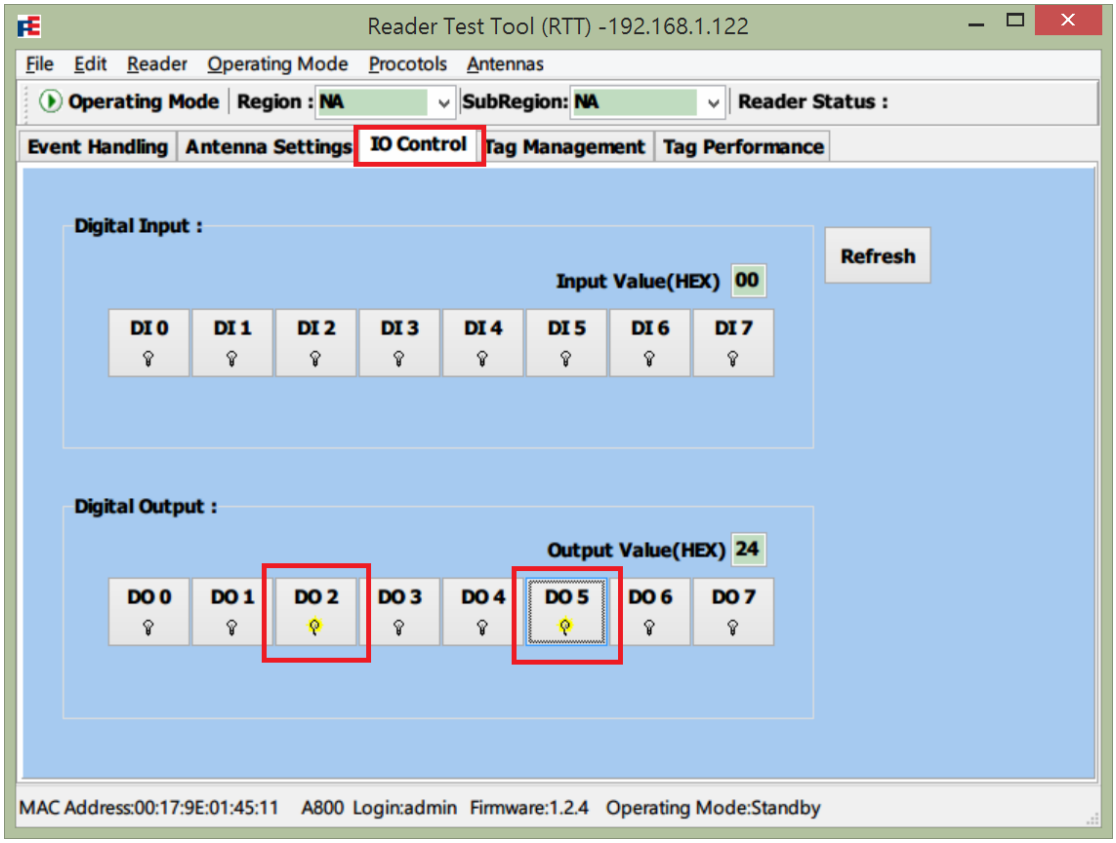
   Current Rate: Current read rate (tags per second). Current rate is NOT available now.

   Tag Acquisition Analysis: Minimum, maximum and average read count of each tag.

3.2.5 IO Control

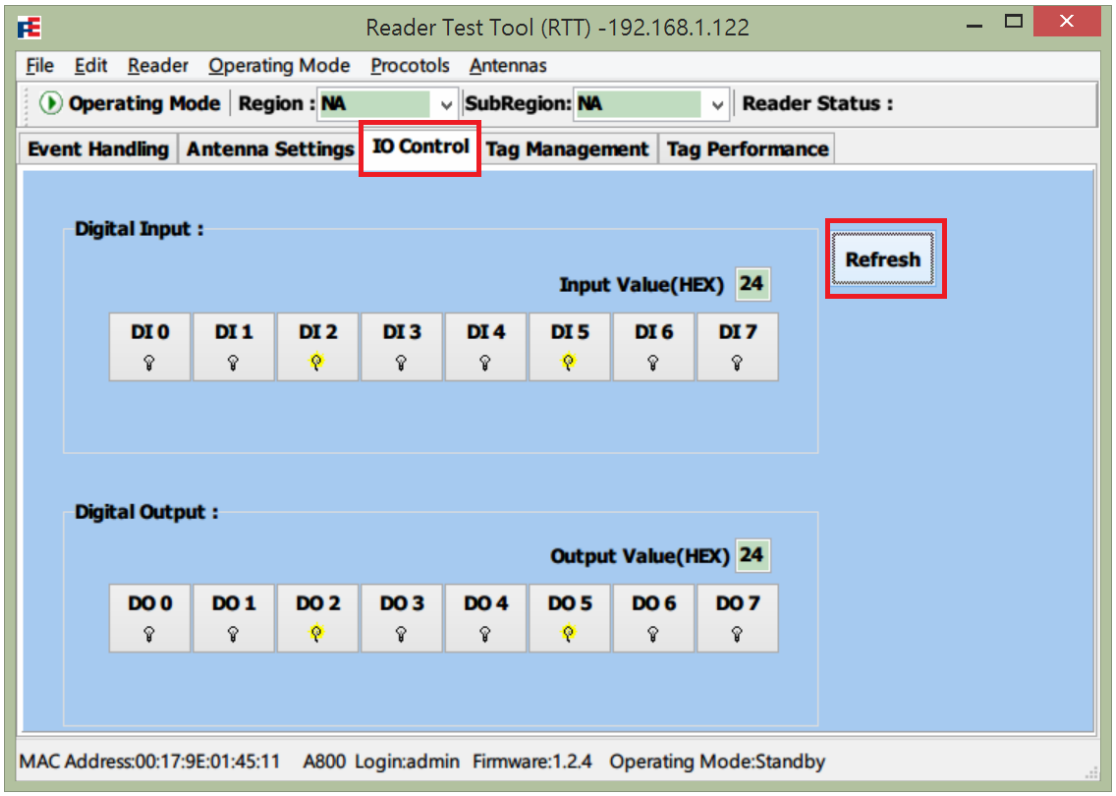
Set Digital Output:

1. Select **IO Control** tab after logged in Reader Test Tool (RTT).
2. In the **Digital Output** area, check or uncheck the **DO #0~7** buttons to set the **8-port D-out** value to **high** or **low**. DO#7 is for MSB and DO#0 is for LSB. The yellow light bulb icon stands for high.



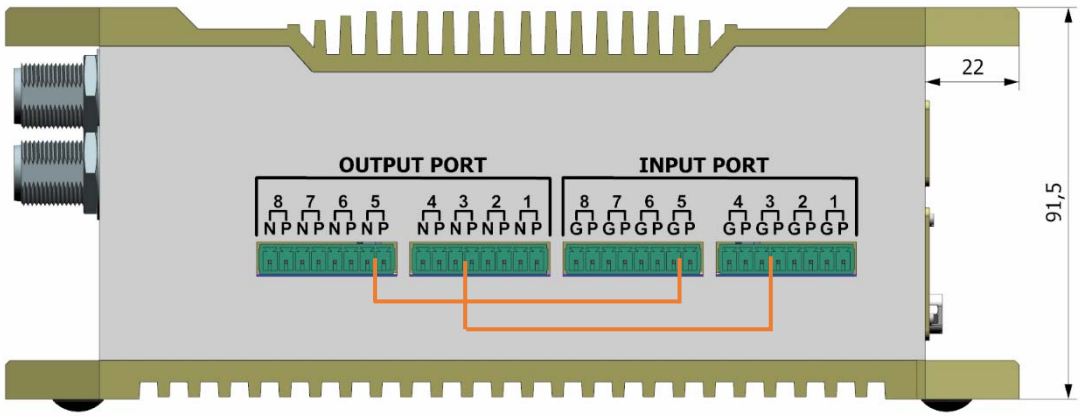
Read Digital Input:

1. Select **IO Control** tab in Reader Test Tool (RTT).
2. Press **Refresh** button to read Digital Input values.
3. In the **Digital Input** area, the **DO#0~7** icons and the **2-digit hex string** show values of the 8-port digital input.



Simple IO Test:

1. Connect **D-out** ports to **corresponding D-in** ports.
2. Set **Digital Output** values in **IO Control** page.
3. Press **Refresh** button and check if **Input values equals Output values**.



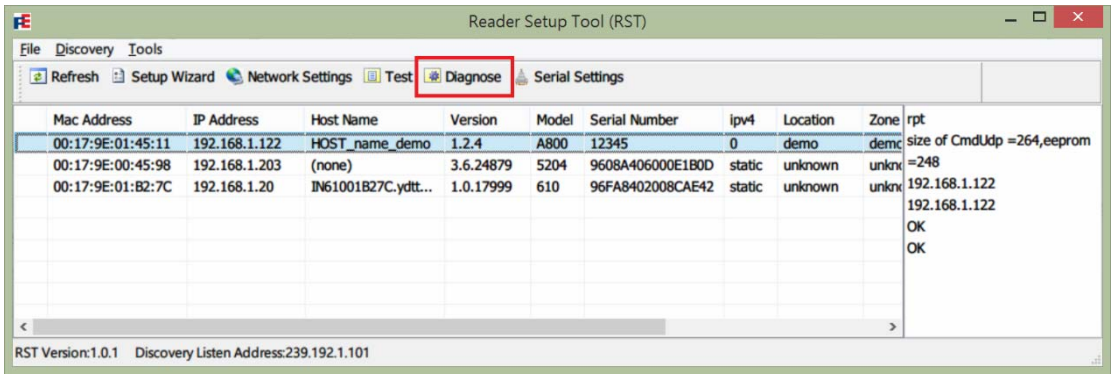
3.3 Reader Diagnose Tool (RDT)

The Reader Diagnostic Tool (RDT) is used to:

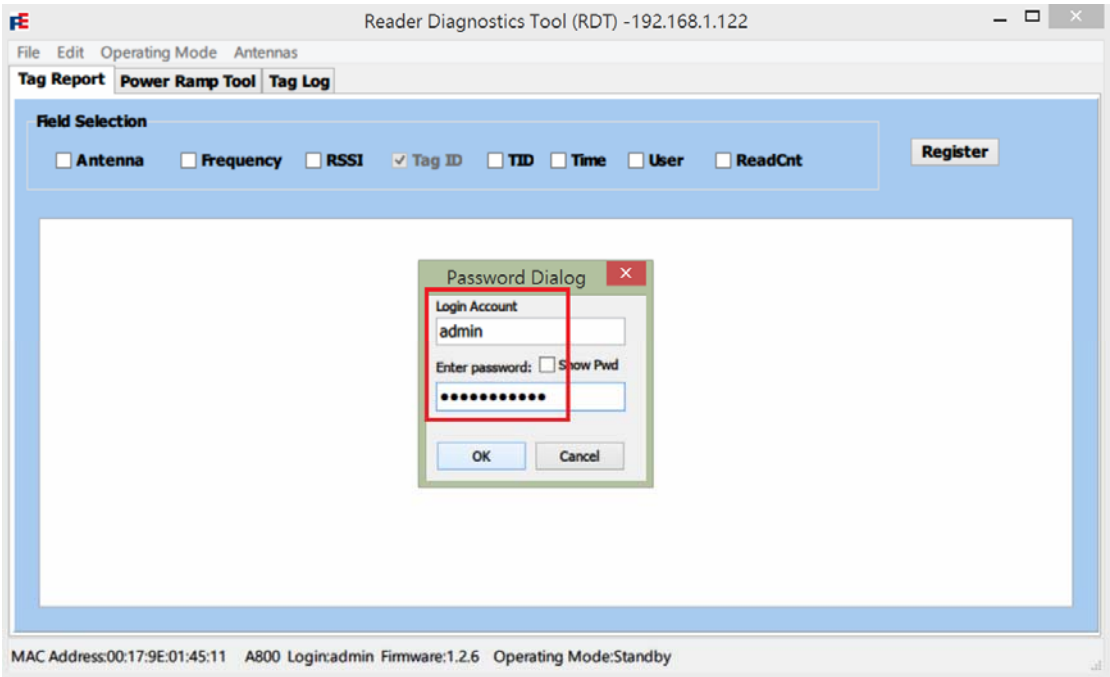
- Diagnose reader issues.
- Do adjustment on advanced and low level settings.

Open and login into the Reader Diagnostics Tool (RST):

1. In the list view of **Reader Setup Tool (RST)**, select a YDT A800 Model.
2. Press **Diagnose** button to launch **Reader Diagnostics Tool (RDT)**.



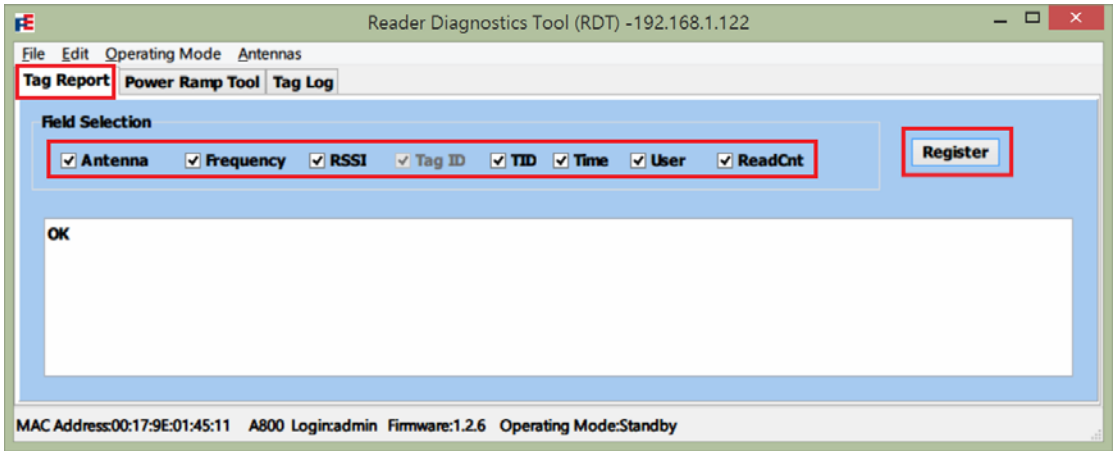
3. Login with **Account** and **Password** (default: **admin**/**readeradmin**) then press **OK** button.



3.3.1 Tag Report

Choose specific fields for each tag report event:

1. Select **Tag Report** tab after logging in Reader Diagnostics Tool (RDT).
2. Select **Operating Mode** menu, change antenna **Operating Mode** to **Standby**.
3. Check or uncheck items in **Field Selection** to configure the report fields in tag events.
4. Press **Register** button apply the changes. If success, an **OK** message will be displayed in the text area.



Note: Any changes in **Tag Report** page does **NOT** modify the reader **profile**. Field information will be **restored** in line with the startup values after **reboot**.

3.3.2 Power Ramp Tool

The Power Ramp Tool determines the minimum power to activate a tag and help determine tag quality. The activation power level can help determine the read range at various attenuation levels.

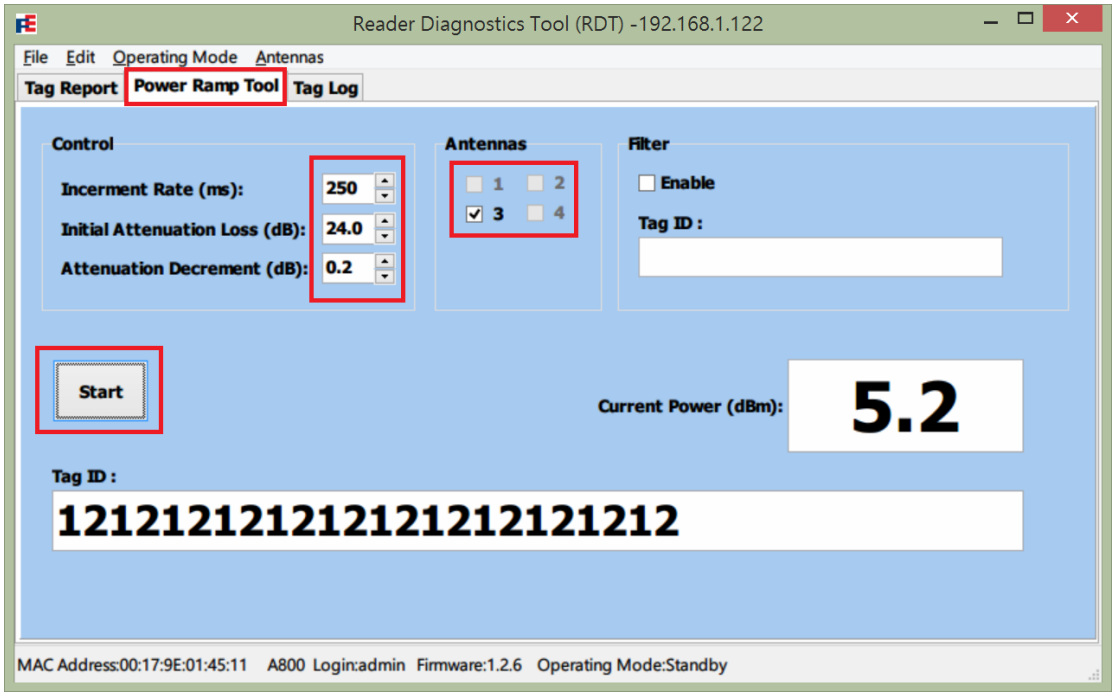
Perform a Power Ramp Analysis:

1. Select **Power Ramp Tool** tab after logging in Reader Diagnostics Tool (RDT).
2. In **Antennas** area, check on antenna indices to be activated.
3. In **Control** area, choose **power ramp control parameters**:

   Increment Rate: Time period (in millisecond) of staying at each power level.

   Initial Attenuation Loss: Initial attenuation level (in dB)

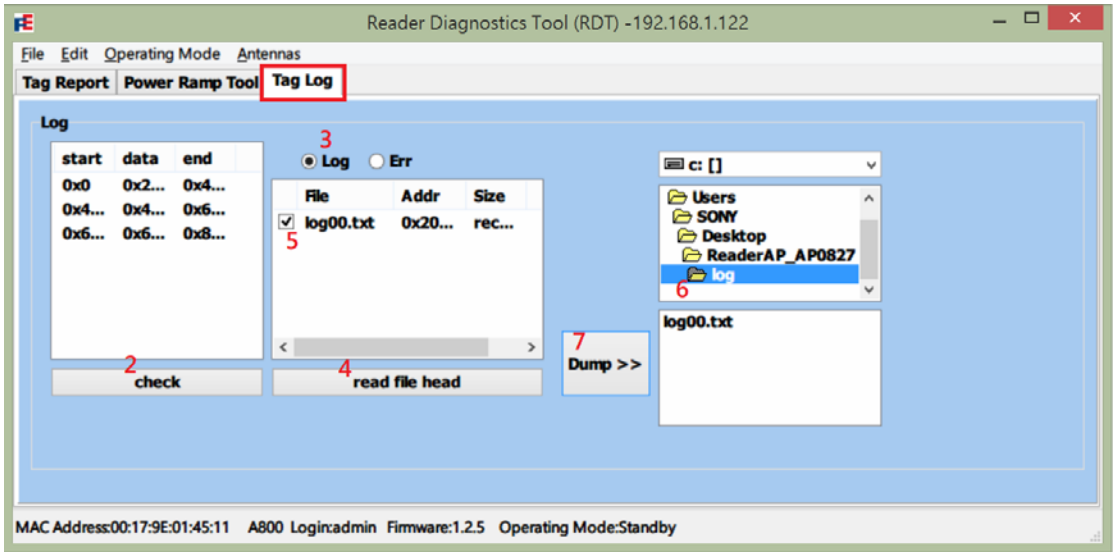
   Attenuation Decrement: Step size of attenuation decrement.
4. Press **Start** button to perform power ramp analysis.



5. The result **activation power** will be displayed in **Current Power** grid.

3.3.3 Tag Log

Dump Reader Logs:



1. Select **Tag Log** tab after logging in **Reader Diagnostics Tool (RDT)**.
2. Press **check** button to scan log data section in reader.
3. Check on **Log** or **Err** radio item to select log type.

   Log: Event records (tag report event, IO event)

   Err: Error records. (antenna error)

CHECK error type

4. Press **read file head** button to extract the log file name.
5. **Check** on the extracted log file to be stored.
6. In the **folder view on the right side**, browse to a **path** to store log files.
7. Press **Dump>>** button to save log data into log file.