

Indy R2000 Series Module Evaluation Kit

User Manual V1.1

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1. About M-2800 Evaluation Board



Product View

2. Reader Configurations

2.1 Initial Use

2.1.1 Step 1: Powering the Reader

Plug the **power cable** in, with the **indicator light** on and sound of a short **beep**, reader is ready. As illustrated below:





2.1.2 Step 2: Connecting Antenna(s) to Reader

Connect the antenna(s) with the antenna port as illustrated below:



Access up to 4 antennas, as illustrated below:



2.1.3 Step 3: Connecting Data Line to Reader

Method NO.1: You can connect the reader to your PC via RS-232 serial port, as illustrated below:





Next, please switch the DIP to the position as illustrated below:



Method NO.2: You can also connect the reader to your PC via TCP/IP, as illustrated below:



Next, please switch the DIP to the position as illustrated below:



DIP Switch :

- ①: EN, ON Status, EN is low level.
- 2: GPIO1, ON Status, GPIO1 is low level.
- 34 : TCP/IP, ON Status is TCP/IP communication.
- 56 : Blank.
- 78 : RS232, ON Status is RS232 communication.

2.1.4 Step 4: Operating Reader via Demo

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



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

| | RS232 RS232 | C TCP/IP | | | | Get |
|-----------------------|-----------------|------------|--------------------------------|----------------------|----------------------------|----------------------|
| | | | | | | |
| S-232 Serial Port: | COM1 - | Connect | Internal lemper | rature | | Get |
| | 115800 - | | | | | |
| baudrate: | 115200 | Disconnect | -Read/Write GPIU -Read GPIO | | | |
| Set Baudrate: | • | Set | | GPI01: 🔘 High | C Low | |
| CP/IP | | | | GPIO2: 🔘 High | C Low | Read |
| Reader IP Add: | 192 168 0 178 | Connect | | | | |
| Port: | 4001 | Disconnect | write GPIO | | . | |
| -485 Address(H | EX) | | | GPIO3: 🔘 High | O Low | Write GPI03 |
| | | Set | | GPIO4: 🔘 High | C Low | Write GPI04 |
| eader Identifie: | r(12 Bytes) | | Buzzer Behavior | | | |
| | | Get | ି ହ | uiet | | |
| | | | () В | eep after an invent | ory round | |
| | | Set | © В | eep after a tag is : | identified.(For test only) | Set |
| | Reset Reader | | | | | Refresh |
| | | | | | | |
| ration History: | Mato Clear | | | | L Ac | tivate Serial Port M |

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:

| Connection | | |
|------------------------|----------|------------|
| | | © TCP/IP |
| RS-232 Serial Port: | COM1 | Connect |
| Baudrate: | 115200 💌 | Disconnect |

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

| Operation History: 📝 Auto Clear | 🔲 Activate Serial Port Monitor |
|--|--------------------------------|
| 2014-04-02 14:48:59 Reader connected COM50115200 | |
| | |
| | |
| | |
| | |

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 | COW1 | Current |
| Baudrate: | 115200 | Disconnect |
| Set Baudrate: | | Set |
| TCP/IP | | |
| Reader IP Add: | 192 168 0 178 | Connect |
| Port: | 4001 | Disconnect |

- 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 | C Activate Serial Port Monitor |
|---|--------------------------------|
| 2014-04-02 18:02:24 Reader connected 192.168.0.17804001 | |
| | |
| | |
| | |
| | |
| | |

3. Text communication with the reader:

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

| nection | | Firmware Version | |
|---|------------|--|---------------------|
| RS232 CP/ TCP/ | IP | 6.9 | Get |
| Serial Port: 0005 | Connect | Internal Temperature | |
| Baudrate: 115200 V | Disconnect | Read/Write GPI0 | Get |
| | | Read GPIO | |
| Set Baudrate: | Set | GPI01: CHigh CLow | |
| TCP/IP Reader IP Add: 192 168 0 178 | Connect | GPIO2: C High C Low | Read |
| A001 | | Write GPIO | |
| POPT: HOOA | Disconnect | GPI03: OHigh OLow | Write GPI03 |
| RS-485 Address(HEX) 01 | Set | GPI04: 🔘 High 💿 Low | Write GPI04 |
| Reader Identifier(12 Bytes) | | Buzzer Behavior | |
| FF | Get | © Quiet | |
| | Set | Beep after an inventory round Beep after a tag is identified. (For test only) | Set |
| Reset Reader | | | Refresh |
| eration History: 📝 Auto Clear | | | Activate Serial Por |
| -04-02 15:06:42 Reader connected CON50115200 | | | |
| -04-02 15:06:45 Get firmware version -04-02 15:06:46 Get reader identifier | | | |

4. Now the reader has been connected to PC successfully.

2.2 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:



| WHF RFID Reader Demo v3.62 | | | | | | | | | | |
|----------------------------|-------------|--------|-----|----------|-----|------|--------|------|---------|--|
| Reader Setup | 18000-6C Ta | g Test | IS0 | 18000-6B | Tag | Test | Serial | Port | Monitor | |
| Basic Setur | RF Setup | | | | | | | | | |

2.2.1 Setting RF Output Power

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

| -RF Output Po | wer | | | |
|---------------|-----|-----|-----|-----|
| | 30 | dBm | Get | Set |
| | | | | |

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).

2.2.2 Setting RF Spectrum

There are two methods to set RF spectrum.

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

- Please defer 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:

| -RF Spectrum Setu | up | | | | | | | |
|-------------------|-----------------|---------------|-------|-------------|--------------|--------|-----|-----|
| | System Default | Frequencies - | | | | | | |
| | C FCC | 🔘 ETSI | 🔘 CHN | Freq Range: | MHz — | ▼ IIHz | | |
| | | | | | | | Get | Set |
| | User Defined Fr | equencies | | | | | | bet |
| 🔲 User Define | Start Freq | uency: | KHz | Freq Space: | KHz Quantity | : | | |

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.

2.2.3 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:



| Antenna Connetion Detector | | | | |
|--|------------------|-----|-----|-----|
| Note: 1.Reader detects antenna connections by measuring the return loss of F | WF ports. | | | |
| 0 Productions for an existent to extern down to show the short ball | DI Thomas I al . | JD. | 0-1 | C |
| 2. Reader stops tag operation if return loss is above the threshold. | KL Inresnoid: | ab | Get | Set |
| 3.User can turn it off by setting the threshold to 0. | | | | |

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:

| Operation History: 🗹 Auto Clear | Activate Serial Port Monitor |
|--|------------------------------|
| 2014-04-02 15:42:50 Successfully set working antenna, current working antenna : Ant 1 | |
| 2014-04-02 15:42:50 Keal time mode inventory failed, due to: Antenna is missing 2014-04-02 15:42:50 Successfully set working antenna, current working antenna : Ant 1 | |
| 2014-04-02 15:42:50 Real time mode inventory failed, due to: Antenna is missing | |
| 2014-04-02 15:42:50 Successfully set working antenna, current working antenna : Ant 1 2014-04-02 15:42:50 Real time mode inventory failed, due to: Antenna is missing | |
| 2014-04-02 15:42:50 Successfully set working antenna, current working antenna : Ant 1 | = |
| 2014-04-02 15:42:50 Keal time mode inventory failed, due to: Antenna is missing | - |

2.3 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.

2.3.1 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:

| UHF RFID Reader Demo v3.62 | | | - • • |
|--|----------------------------------|------------------|----------------------|
| Reader Setu 18000-6C Tag Test ISO 18000-6B Tag Test Serial Port Monito | or | | |
| Tag Inventory(Real Time Mode) Tag Inventory(Buffer Mode) Tag Inventory | (Fast Swith Antenna Mode) Access | s Tag | |
| Repeat Per Command 1 | 🔲 User Define Session | Session ID: SO 💌 | Inventoried Flag 🔺 💌 |

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 until 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:



| 😺 UHF | RFID Re | ader Demo va | 3.62 | | | | | | | - 0 |
|----------------------------------|----------------------------------|---|---|-----------------|----------------------------|--------------|----------|------------|----------------|--|
| Keader | Setup 1 | SUUU-OC Tag I | est ISU 18000-6B Tag Test Se | rial Port Monit | | A | <u> </u> | T | | |
| | Sto | op | Pepeat Per Command: L | Ant1 | Ant2 | Antenna Mod | E) Acces | ss 1ag | Get Clea | t Buffer Get and Clear ar Buffer Query Tag Quantity |
| Tag D | ata | Inventori | ied Quantity: | | | Sneed (Tag/S | Sec): | | | |
| | | | | | | Command Du: | ration (| mS): | Total Total | Tag Communication: |
| Tag L | ist: | | | | | | | | | Refresh |
| ID | PC | CRC | EPC | | | Ant ID | RSSI | Identifica | tion | |
| | | | | | | | | | | |
| Operat | ion Hist | ory: 📝 Auto | Clear | | | | | | | C Activate Serial Port Monitor |
| 2014-04- 2014-04- 2014-04- | -02 16:2 -02 16:2 -02 16:2 | 3:34 Successf 3:35 Buffer m 3:35 Successf | ully set working antenna, cur ode inventory ully set working antenna, cur | rent working an | tenna : Ant tenna : Ant | 1 | | | | |

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:

| 🍪 UHF | RFID Read | der Demo v | /3.62 | | | | | | — — — — |
|--------------------|---------------------------|----------------|--------------------------------|-----------------|--------------|---------------|-------------|----------------|--|
| Reader | Setup 180 | 00-6C Tag | Test ISO 18000-6B Tag Test Se | rial Port Moni | tor | | | | |
| T T | · /D | 1 T. W | 1) Tan Januartanu (Buffan Hada | | /R . 0 | 5 i W 1 | 1. | T | |
| lag ir | nventory(Ke | al lime Mc | de) lag inventory(builer mode | lag Inventor | y(rast Switr | n Antenna Mod | e) Access | s lag | |
| Ι | nvent | ory | Repeat Per Command: L | ▼ Ant1 | Ant2 | Ant3 | 🔲 Ant | Ge Cle | t Buffer Get and Clear ar Buffer Query Tag Quantity |
| Tag I | Data | | | | | | | | |
| - | | Inventor | ied Quantity: | | | Speed (Tag/S | Sec): | | |
| | | | | | | | | Total | Tag Communication: |
| | | | | | | | | | |
| | | | | | | | | | |
| | | | | | | Command Du | ration(m | ເຮ): | |
| | | | | | | | | Total | Inventory Duration (mS): |
| | | | | | | | | | |
| | | | | | | | | | |
| Tag | List: 81 | | | | | | | | Refresh |
| ID | PC | CRC | EPC | | | Ant ID | RSSI | Identification | |
| 68 | 30 00 | 9B F1 | E2 00 30 00 39 0C 0 | 78 08 70 BE B | В | 1 | -51 dBm | 90 | |
| 69 | 30 00 | EA 13 | E2 00 30 00 39 0C 0 | 0 79 21 80 31 0 | E | 1 | -63dBm | 90 | |
| 70 | 30 00 | 6F 22 | E2 00 30 00 39 0C 0 |) 79 10 40 AE 8 | 8 | 1 | -49dBm | 90 | |
| 71 | 30 00 | 6A 76 | E2 00 30 00 39 0C 0 | 79 16 80 69 5 | С | 1 | -51 dBm | 90 | |
| 72 | 30 00 | 3E DC | E2 00 30 00 39 0C 0 | 0 79 15 10 7A D | В | 1 | -57dBm | 90 | |
| 73 | 30 00 | 09 38 | E2 00 30 00 39 0C 0 | 0 78 03 00 EC D | E | 1 | -bYdBm | 90 | |
| 74 | 30 00 | 08 44 | E2 00 30 00 39 0C 0 | J 78 US 80 BE B | C . | 1 | -54dbm | 90 | |
| 15 | 30 00 | 23 2U 49 49 | E2 00 30 00 39 00 01 |) 79 IU 50 A8 2 | 9 | 1 | -58dDm | 90 | |
| 77 | 30 00 | 42 42 0E 01 | E2 00 30 00 39 00 0 |) 79 19 10 4F 9 | 7 | 1 | -60 dBm | 90 | |
| 78 | 30.00 | D5 BE | E2 00 30 00 39 00 0 |) 78 12 70 95 0 | F | 1 | -54dBm | 90 | |
| 79 | 30.00 | 3F 19 | E2 00 30 00 39 00 0 |) 79 04 40 F2 C | 0 | 1 | -71 dBm | 90 | |
| 80 | 30.00 | E3 ED | E2 00 30 00 39 0C 0 |) 79 03 00 EC D | Ă | 1 | -62dBm | 90 | |
| 81 | 30 00 | 8F E9 | E2 00 30 00 39 0C 0 |) 79 20 40 40 F | 0 | 1 | -63dBm | 90 | - |
| | | | | | | | | | |
| Opera | tion Histo | ry: 🔽 Auto | o Clear | | | | | | Activate Serial Port Monitor |
| 2014-04 | -02 16.26. | 22 Readow | huffen | | | | | | |
| 2014-04 2014-04 | -02 10.20. 1-02 16:26: | 32 Reader | huffer | | | | | | - |
| 2014-04 | -02 16:26: | 32 Reader | buffer | | | | | | |
| 2014-04 | -02 16:26: | 33 Reader | buffer | | | | | | |
| 2014-04 | -02 16:26: | 33 Reader | buffer | | | | | | |
| 2014-04 | -02 16:26: | 33 Reader | buffer | | | | | | |
| 2014-04 | -02 16:26: | 33 Reader | buffer | | | | | | = |
| 2014-04 | -02 16:26: | 33 Reader | buffer | | | | | | |

Functions description under Buffer Mode:

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



cache again.

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

Clear Buffer: Clear the cache and refresh the screen.

2.3.2 Users define Session ID & Inventorying Parameter of Inventoried Flag

2.3.3 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 **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:

| 🐳 UHF RFID Reader Demo v3.62 | | | | |
|-----------------------------------|-----------------------|----------------------|------------------------|---------------------|
| Reader Setup 18000-6C Tag Test IS | 0 18000-6B Tag Test S | erial Port Monitor | | |
| Tag Inventory(Real Time Mode) Tag | Inventory(Buffer Mode | Tag Inventory(Fast S | with Antenna Mode) Acc | ess Tag |
| Inventory | A Round Ant1 V 1 | B Round Ant2 • 1 | C Round Ant3 V 1 | D Round Ant4 🕶 1 |

2.4 Accessing ISO-18000-6C Tag

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



| 🍪 UH | IF RFID Re | ader Demo | v3.62 | | | | | | - D × |
|------------|----------------------|-------------|--------------------------|----------------------------------|---------------------------|----------|-------------------|------------|---------------------|
| Reade | r Setup 1 | 8000-6C Tag | Test ISO 18000-6B Ta | ag Test Serial Port Monitor | | | | | |
| Tag Tag | Inventory(Access | Real Time N | Mode) Tag Inventory(Bu | uffer Mode) Tag Inventory(Fast | : Swith Antenna Mode) Acc | ess Tag |) | | |
| lag | Selection | on | | | | | | | |
| | Selected | l Tag: | | | Tag List: | | | • | Select |
| Rea | d/Write | lag | | | | | | | |
| | O Passwo | rd 🔘 EPC | © TID © USER | Access Password(HEX) | Start Add(| WORD): | Length (W | ORD): | Read |
| D | ata to be | Written() | HEX) | | | | | | Write |
| Loc | k Tag | | | | | | | | |
| | C Access | Password | ◯ Kill Password | © EPC 	◎ TID | O USER | Acce | ss Password (HEX) | | Lock |
| | 🔘 Оре | n | 🔘 Lock | 🔘 Permanent Open | Permanent Lock | | | | |
| Kil | l Tag | | | Kill Password (HEX) | | | | | Kill |
| ID | PC | CRC | EPC | Data | Data | . Ant ID | Operated | | |
| | | | | | | | | | |
| | | | | | | | | | |
| | | | | | | | | | |
| | | | | | | | | | |
| | | | | | | | | | |
| | | | | | | | | | |
| | | | | | | | | | |
| | | | | | | | | | |
| | | | | | | | | | |
| Oper | ation Hist | ory: 📝 Au | to Clear | | | | | 🗌 Activate | Serial Port Monitor |
| 2014- | 04-02 16:3 | 3:24 Reader | connected COM5011520 | 0 | | | | | |
| | | | | | | | | | |
| | | | | | | | | | |
| | | | | | | | | | |
| | | | | | | | | | |
| | | | | | | | | | |
| | | | | | | | | | |

2.4.1 Read tags

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

| Read/Write Tag | | | | |
|---|-----------------------|--------------------|---------------------|---|
| $\ensuremath{\bigcirc}$ Password $\ensuremath{\bigcirc}$ EPC $\ensuremath{\bigcirc}$ TID $\ensuremath{}$ USER | Access Password (HEX) | Start Add(WORD):00 | Length(WORD):2 Read | > |
| Data to be Written(HEX) | | | Write | |

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

Click **Read** 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 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 | |
| | | | | | | | | |
| | | | | | | | | |
| | | | | | | | | |
| | | | | | | | | |
| | | | | | | | | |
| | | | | | | | | |
| | | | | | | | | |
| | | | | | | _ | | |
| Oper | ation Hi | story: | ✓ Auto Clear | | | | | 🔲 Activate Serial Port Monitor |
| 2014-0 | 4-02 16: | 45:28 R | eader connected COM50115200 | | | | | |
| 2014-0 | 04-02 16: | 45:31 G | et RF spectrum | | | | | |
| 2014-0 | 04-02 16: | 51:24 R | ead tag | | | | | |
| 2014-0 | 04-02 16: | 51:25 R | ead tag | | | | | |
| | | | | | | | | |

2.4.2 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 1 | ag | | | | | | |
|--------------|-----------|------------|--------|-----------------------------------|---------------------|-----------------|-------|
| O Passwor | d 🔘 EPC | © TID | • USER | Access Password (HEX) 00 00 00 00 | Start Add (WORD):00 | Length (WORD):2 | Read |
| | | | | | | | |
| Data to be | Written(H | gx)aa bb o | c dd | | | | Write |

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 | |
| | | | | | | | | |
| | | | | | | | | |
| | | | | | | | | |
| | | | | | | | | |
| | | | | | | | | |
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| | | | | | | | | |
| | | | | | | | | |
| <u> </u> | | | | | | | | |
| Uper | ation Hi | story: | M Auto Clear | | | | | Activate Serial Port Monitor |
| 2014- | 04-03 15: | 18:21 R | ead tag | | | | | |
| 2014- | 04-03 15: | 18:26 W | rite tag | | | | | |
| | | | | | | | | |
| | | | | | | | | |
| | | | | | | | | |
| | | | | | | | | |
| | | | | | | | | |

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

2.4.3 Lock Tags

| L | ock Tag | | | | | |
|---|---|-----------------|------------|--------|------------------|--|
| | Access Password Access Password | ◯ Kill Password | © EPC | © tid | USER | Access Recented (URV) 00, 00, 00, 00, 00, 00, 00, 00, 00, 00 |
| | () Open | C Lock | © Permanen | : Open | 🔘 Permanent Lock | Access Fassword (HEA) 00 00 00 00 Lock |

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



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

2.4.4 Kill Tags



| Kill Tag | | |
|--------------------|---------------|------|
| Kill Password (HEX |) aa bb cc dd | Kill |

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 99 | | | 1 | 1 | |
| | | | | | | | | |
| | | | | | | | | |
| | | | | | | | | |
| | | | | | | | | |
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| | | | | | | | | |
| | | | | | | | | |
| | | | | | | | | |
| | | | | | | | | |
| Oper | ation Hi | story: 👿 | Auto Clear | | | | | Activate Serial Port Monitor |
| 2014-0 | 4-03 15: | 39:00 Ki | ll tas | | | | | |
| | | | | | | | | |
| | | | | | | | | |
| | | | | | | | | |
| | | | | | | | | |
| | | | | | | | | |
| | | | | | | | | |

2.4.5 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:

| Tag Access | | | | | | |
|---------------------|-----------------|----------------------|-----------|---|----------|------|
| Tag Selection | | | | | | |
| E Selected Tag: | | | Tag List: | | - Se | lect |
| D 1/11 1 0 | | | | E2 00 30 00 39 0C 00 81 27 10 09 77 E2 00 30 00 39 0C 00 82 26 70 09 BE | <u> </u> | |
| Read/Write lag | | | | E2 00 30 00 39 0C 00 81 25 30 14 19 | | |
| 🔘 Password 🛛 EPC | C TID O USER | Access Password(HEX) | | E2 00 30 00 39 0C 00 82 20 20 40 FA E2 00 30 00 39 0C 00 82 24 30 1B 73 | R | ead |
| | | | | E2 00 30 00 39 0C 00 81 18 00 5A 34 | | |
| Data to be Written(| HEX) | | | E2 00 30 00 39 0C 00 82 21 10 5A 55 E2 00 30 00 39 0C 00 82 21 60 37 18 | = Wr | ite |
| Lock Tag | | | | E2 00 30 00 39 0C 00 82 14 40 83 94 E2 00 30 00 39 0C 00 82 21 80 31 1A E2 00 30 00 39 0C 00 81 19 50 49 37 | | |
| C Access Password | ◯ Kill Password | © EPC ◎ TID | 🔘 USE | E2 00 30 00 39 0C 00 81 23 00 28 02 E2 00 30 00 39 0C 00 81 20 40 40 F8 | | |
| | - | - | - | E2 00 30 00 39 0C 00 82 19 20 4F 88 E2 00 30 00 39 0C 00 81 13 10 8E 8B | L | ock |
| 🔘 Open | 🔘 Lock | 🔘 Permanent Open | Permane: | E2 00 30 00 39 0C 00 82 25 00 15 02 | | |
| Kill Tag | | | | E2 00 30 00 39 0C 00 81 22 10 2F 69 | | |
| | | Kill Pageword (HEX) | | E2 00 30 00 39 0C 00 82 19 40 49 3A E2 00 30 00 39 0C 00 81 23 10 28 03 | K | ;11 |
| | | MIII I dasword (hbh) | | E2 00 30 00 39 0C 00 82 19 10 4F 87 | | |
| | | | | E2 00 30 00 39 0C 00 81 25 60 14 1C | | |

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

| Tag Selection | | | | |
|---|-----------|-------------------------------------|---|--------|
| ☑ Selected Tag: E2 00 30 00 39 0C 00 81 27 10 09 77 | Tag List: | E2 00 30 00 39 0C 00 81 27 10 09 77 | - | Select |
| | | | | |

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:

| Tag Selection | | | |
|---------------|-----------|---|--------|
| Selected Tag: | Tag List: | • | Select |
| \smile | | | |

2.4.6 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:

| | Activate Serial Port Monitor |
|--|------------------------------|
| 2014-04-10 17:21:40 Write tag failed, due to Access failed or 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.**

2.5 Accessing & Inventorying ISO-18000-6B Tag

2.5.1 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:



| ader of | stup 18000-oc 1 | ag lest 150 | 18000-66 Tag Test Serial Port Mc | nitor | |
|---------|-------------------|-------------|----------------------------------|--------------------------------------|--------------------------|
| | Inve | ntory | | Selected UID: | Refresh |
|) | UID | An | Identificatio | Read/Write Tag With Unlimited Length | |
| | | | | Start Add(HEX): Length(HEX): | Read |
| | | | | Data(HEX): | ^ |
| | | | | | |
| | | | | | - |
| | | | | Start Add(HEX): Length(HEX): | |
| | | | | Command Repeat: 1 Succeeded: | Write |
| | | | | Data(HEX): | A |
| | | | | | |
| | | | | Permanent Lock Address(HEX): | Lock |
| | | | | Query Lock Status Address(HEX): | Query |
| ratio | on History: 💌 | Auto Clear | | | Activate Serial Port Mon |
| 04-1 | 1 9:26:27 Reade | r connected | CON50115200 | | |

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.

2.5.2 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:

| | | | | Selected UID: 🧲 🛛 | 0 04 00 00 D9 2B 41 06 | Refresh |
|--------|---------------|--------|----------------------|-------------------------|------------------------|---------|
| ID | UID | Ant ID | Identification Count | Read/Write Tag With Unl | imited Length | |
| 1 EO O | 4 00 00 D9 2B | 00 | 184 | Start Add(HEX): | Length(HEX): | Read |
| | | | | Data(HEX): | | |
| | | | | | | |
| | | | | | | |
| | | | | | | |
| | | | | | | |
| | | | | a | 1 (1992) | |
| | | | | Start Add(HEX): | Length(HEX): | |
| | | | | Command Repeat: 1 | Succeeded: | Write |
| | | | | Data(HEX): | | |
| | | | | | | |
| | | | | | | |
| | | | | | | |
| | | | | | | |
| | | | | | | |
| | | | | | | |
| | | | | Permanent Lock Addr | ess(HEX): | Lock |
| | | | | | | <u></u> |
| | | | | Querry Lock Status Addr | age (UEX) : | Query |



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.

2.6 Other Settings

2.6.1 Operating Temperature Monitoring

Reader will generate heat under intensive work. Users can monitor the internal temperature via built-in temperature sensor to avoid reader overheating (Operating temperature over 65° C). **Temperature Monitor** illustrated as below:

| -Internal Temperat | ure | | |
|--------------------|------|-----|--|
| - | | | |
| | 29°C | 0-+ | |
| | 200 | vet | |
| | | | |

2.6.2 Set GPIO Level

General-purpose input/output (GPIO) is a generic pin on an integrated circuit whose functions (including whether it is an input or output pin) can be controlled (programmed) by users. This reader provides two inputs (GPIO1 and GPIO2) and two outputs (GPIO3 and GPIO4).

The image of GPIO port as below:



| PIN ID | Function | Equivalent Circuit | Instructions |
|--------|----------------|---|---|
| PIN 1 | GPIO 1 Input + | | ◆ Voltage between PIN 1.2 (PIN 3.4) <=12V |
| PIN 2 | GPIO 1 Input - | | ◆Hetero-polarity |
| PIN 3 | GPIO 2 Input + | | ♦LED equivalent resistance 470Ω |
| PIN 4 | GPIO 2 Input - | | ◆Response time<= 150uS |
| PIN 5 | GPIO 4 Output | 5 5 5 | ♦ Voltage between PIN 5.6 (PIN 7.8)<=12V |
| PIN 6 | GPIO 4 Output | o the | ♦Non-polarity |
| PIN 7 | GPIO 3 Output | → | ♦On resistance110Ω |
| PIN 8 | GPIO 3 Output | α ό—Ι · · · · | ◆Response time <= 6mS |



Operations as below:

| -Read/Write G Read GPIO | PIO | | |
|----------------------------|---------------|-------|-------------|
| | GPIO1: 🔘 High | C Low | |
| | GPIO2: 🔘 High | C Low | Read |
| Write GPIC |) | | |
| | GPIO3: 🔘 High | C Low | Write GPI03 |
| | GPIO4: 🔘 High | Cow (| Write GPIO4 |
| | | | |

Users can use the serial port commander to read and write GPIO in their own applications.

2.6.4 Setting Buzzer Status

Reader's working status is provided to users through the Buzzer. Three ways to set the buzzer:

- 1. Quite: turn off the buzzer
- 2. Beep after an inventory round: set it as beep each time when tag inventory is taken.

3. Beep after a tag is identified: set it as beep each time when reader identifies a tag. (It will reduce the efficiency of multi-tag identification)

This setting will be stored even when the power is cut off.

Operation as below:

| Buzzer Behavior | |
|--|-----|
| 🔘 Quiet | |
| 🔘 Beep after an inventory round | |
| 🔘 Beep after a tag is identified.(For test only) | Set |

Note: There is a short beep when turn on the reader (reader self-test to check the connection to PC), which is not controlled by this setting.

2.6.5 Charging The Serial Communication Baud Rate

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

You can set baud rate as below:

| RS-232 | | |
|---------------|----------|------------|
| Serial Port: | COM5 | Connect |
| Baudrate: | 115200 🔹 | Disconnect |
| Set Baudrate: | | Set |

This setting will be stored even if the power is cut off. Notes:

♦ When connecting the reader with TCP/IP port, please change the serial rate of TCP/IP module correspondingly. For more details, please check the TCP/IP interface configuration document.

◆ Tag inventory under Real Time Model will produce large amounts of data, please try to use 115200



baud rate.

3. 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:

| WHF RFID Reader Demo v3.62 | | | | × |
|---|--------|--------|--------|----|
| Reader Setup 18000-6C Tag Test ISO 18000-6B Tag Test Serial Port Monitor | | | | |
| 2014-06-21 14:47:42 A0 03 01 70 EC | | | | |
| 2014-06-21 14:47:43 A0 03 01 70 EC | | | | |
| 2014-06-21 14:47:45 AO 03 01 72 EA | | | | |
| 2014-06-21 14:47:45 A0 05 01 72 06 09 D9 | | | | |
| 2014-06-21 14:47:45 A0 03 01 7B E1 | | | | |
| 2014-06-21 14:47:45 A0 05 01 7B 01 27 B7 | | | | |
| 2014-06-21 14:47:52 A0 04 01 76 1E C7 | | | | |
| 2014-06-21 14:47:52 A0 04 01 76 10 D5 | | | | |
| | | | | |
| 2014 00 - 21 141471:53 A0 04 01 77 1E 05 | | | | |
| 2014-06-21 14:47:55 A0 04 01 63 03 FF | | | | |
| | | | | |
| 2014 -06-21 14-47-56 A0 06 01 79 01 07 38 9D | | | | |
| 2014-06-21 14:47:59 A0 04 01 74 00 67 | | | | |
| 2014-06-21 14:47:59 A0 04 01 74 10 D7 | | | | |
| 2014-06-21 14:47:59 A0 04 01 89 01 D1 | | | | |
| 2014-06-21 14:47:59 A0 13 01 89 B0 30 00 00 00 00 00 00 00 00 00 00 00 00 | | | | |
| 2014-06-21 14:47:59 A0 09 01 89 B0 08 00 11 22 28 BA A0 13 01 89 B0 30 00 00 00 00 00 00 00 00 00 00 00 00 | | | | |
| 2014-06-21 14:47:59 DD D9 01 40 00 00 00 04 2D 9E A0 13 01 89 B0 30 00 30 08 33 B2 DD D9 01 40 00 00 00 02F A0 | | | | |
| 2014-06-21 14:47:59 A0 13 01 89 88 30 00 30 08 33 B2 DD D9 01 40 00 00 00 02 31 C4 | | | | |
| 2014-06-21 14:47:59 A0 13 01 89 38 30 00 30 08 33 B2 DD D9 01 40 00 00 00 02 62 1 A0 13 01 89 38 30 00 E2 00 30 00 39 05 02 27 25 30 11 D1 31 7A | | | | |
| 2014-06-21 14:47:59 A0 13 01 89 38 30 00 30 08 33 B2 DD D9 01 40 00 00 00 02 C1B A0 13 01 89 38 30 00 30 08 33 B2 DD D9 01 40 00 00 00 33 14 | | | | |
| 2014-06-21 14:47:59 A0 13 01 89 88 30 00 30 08 33 B2 DD D9 01 40 00 00 00 03 2C 5 A0 13 01 89 88 30 00 00 00 00 00 00 00 00 00 00 00 00 | .3 01 | 89-8 | 8 30 | 00 |
| 30 08 33 B2 DD | | | | |
| 2014-06-21 14:47:59 D9 01 40 00 00 00 02 2C A0 13 01 89 88 30 00 30 08 33 B2 DD D9 01 40 00 00 04 30 C3 A0 13 01 89 88 30 00 30 08 33 B2 DD D9 0 | JI 40 | 00 0 | 0 00 | 02 |
| | | | | |
| 2014-06-21 14:47:59 A0 13 01 89 58 30 00 00 00 00 00 00 00 00 00 00 00 00 | | | | |
| 2014-00-21 14:41:53 A0 13 01 89 58 50 00 50 08 55 D2 DD 30 14 00 00 00 00 02 AD 2014-00-21 14:41:55 A0 13 01 90 E4 30 00 52 00 190 00 50 02 DD 30 14 00 00 00 00 02 AD | | | | |
| 2014-00-21 14:41:53 AU 13 01 83 54 30 00 52 00 30 00 39 05 02 21 25 30 11 D1 31 55 AU 0A 01 83 00 00 30 00 00 00 13 10 | | | | |
| | | | | |
| Input Command: Check Sum: Send | | Clear | r | ר |
| | | | | |
| | | | | |
| Operation History: 🖉 Auto Clear | ial Po | ort V | loni t | ~ |
| | | or e a | | ~ |
| 2014 0 C 1 14:47.45 C t introver version | | | | ^ |
| 2014-06-21 14:41:45 Get Internal teleperature | | | | |
| 2014-06-114-47-53 Get RF output power | | | | |
| 2014-06-21 14:47:55 Get antena connection detector sensitivity threshold | | | | |
| 2014-06-21 14:47:56 Get RF spectrum | | | | = |
| 2014-06-21 14:47:59 Successfully set working antenna, current working antenna : Ant 1 | | | | |
| 2014-06-21 14:47:59 Real time mode inventory | | | | - |
| <u>ll</u> | | | | |

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 platform) to help users develop applications on the reader. Thank you!



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.

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

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.

The modular can be installed or integrated in mobile or fix devices only. This modular cannot be installed in any portable device, for example, USB dongle like transmitters is forbidden. This modular complies with FCC RF radiation exposure limits set forth for an uncontrolled environment. This transmitter must not be co-located or operating in conjunction with any other antenna or transmitter. This modular must be installed and operated with a minimum distance of 20 cm between the radiator and user body. The device is indoor use only.

If the FCC identification number is not visible when the module is installed inside another device, then the outside of the device into which the module is installed must also display a label referring to the enclosed module. This exterior label can use wording such as the following: "Contains Transmitter Module FCC ID: 2AKQD-M2800 Or Contains FCC ID: 2AKQD-M2800"

when the module is installed inside another device, the user manual of this device must contain below warning statements;

1. 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.

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

2. Changes or modifications not expressly approved by the party responsible for compliance could void the user's authority to operate the equipment. The device is indoor use only

The devices must be installed and used in strict accordance with the manufacturer's instructions as described in the user documentation that comes with the product



Any company of the host device which install this modular with limit modular approval should perform the test of radiated emission and spurious emission according to FCC part 15C 15.247 and 15.209

requirement, Only if the test result comply with FCC part 15C 15.247 and 15.209 requirement, then the host can be sold legally.

Device is equipped with unique non-standard antenna connector and the recommended specific antenna by the manufacture