

# **Second Generation RFID Smart Reader**

**with Fan-out Box and RF Switch**

**User Manual**  
**English**

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### Regulatory Information

#### Federal Communication Commission Interference 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.

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 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.

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 transmitter must not be co-located or operating in conjunction with any other antenna or transmitter.

#### 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 22 cm between the radiator & your body.

### **Industry Canada statement:**

This device complies with RSS-210 of the Industry Canada 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.

Ce dispositif est conforme à la norme CNR-210 d'Industrie Canada applicable aux appareils radio exempts de licence. Son fonctionnement est sujet aux deux conditions suivantes: (1) le dispositif ne doit pas produire de brouillage préjudiciable, et (2) ce dispositif doit accepter tout brouillage reçu, y compris un brouillage susceptible de provoquer un fonctionnement indésirable.

### **Radiation Exposure Statement:**

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

### **Déclaration d'exposition aux radiations:**

Cet équipement est conforme aux limites d'exposition aux rayonnements IC établies pour un environnement non contrôlé. Cet équipement doit être installé et utilisé avec un minimum de 22cm de distance entre la source de rayonnement et votre corps.

This device has been designed to operate with a Omni-Directional Shelf antenna have a maximum gain of 5.5dB. Antenna having a higher gain is strictly prohibited per regulations of Industry Canada. The required antenna impedance is 50 ohms.

Under Industry Canada regulations, this radio transmitter may only operate using an antenna of a type and maximum (or lesser) gain approved for the transmitter by Industry Canada. To reduce potential radio interference to other users, the antenna type and its gain should be so chosen that the equivalent isotropically radiated power (e.i.r.p.) is not more than that necessary for successful communication.

This radio transmitter XRAG-P1, XRAG-P2 has been approved by Industry Canada to operate with the antenna type, maximum permissible gain and required antenna impedance for each antenna type indicated. Antenna types not included in this user's manual, having a gain greater than the maximum gain indicated for that type, are strictly prohibited for use with this device.

Ce dispositif a été conçu pour fonctionner avec une antenne ayant un gain maximal de Omni-Directional Shelf antenne avec dB 5.5. Une antenne à gain plus élevé est strictement

interdite par les règlements d'Industrie Canada. L'impédance d'antenne requise est de 50 ohms.

Conformément à la réglementation d'Industrie Canada, le présent émetteur radio peut fonctionner avec une antenne d'un type et d'un gain maximal (ou inférieur) approuvé pour l'émetteur par Industrie Canada. Dans le but de réduire les risques de brouillage radioélectrique à l'intention des autres utilisateurs, il faut choisir le type d'antenne et son gain de sorte que la puissance isotrope rayonnée équivalente (p.i.r.e.) ne dépasse pas l'intensité nécessaire à l'établissement d'une communication satisfaisante.

Le présent émetteur radio XRAG-P1, XRAG-P2 a été approuvé par Industrie Canada pour fonctionner avec les types d'antenne énumérés ci-dessous et ayant un gain admissible maximal et l'impédance requise pour chaque type d'antenne. Les types d'antenne non inclus dans cette liste, ou dont le gain est supérieur au gain maximal indiqué, sont strictement interdits pour l'exploitation de l'émetteur.

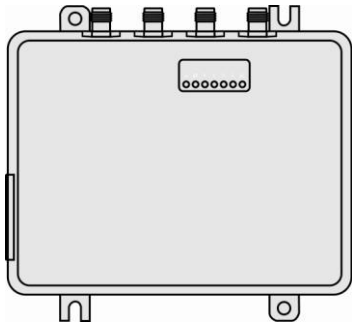
### **警告聲明:**

經型式認證合格之低功率射頻電機，非經許可，公司、商號或使用者均不得擅自變更頻率、加大功率或變更原設計之特性及功能。

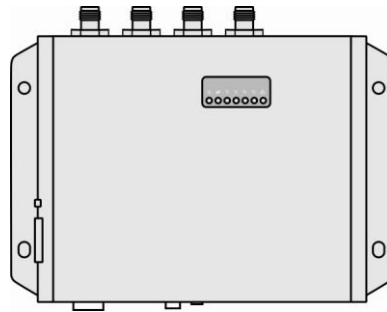
低功率射頻電機之使用不得影響飛航安全及干擾合法通信；經發現有干擾現象時，應立即停用，並改善至無干擾時方得繼續使用。前項合法通信，指依電信法規定作業之無線電通信。低功率射頻電機須忍受合法通信或工業、科學及醫療用電波輻射性電機設備之干擾。

### Getting Started

#### In the Package

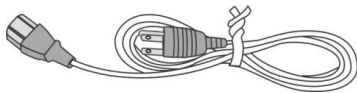


(Plastic Case)

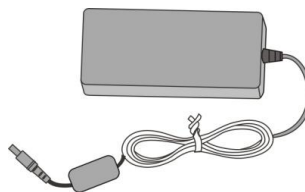


(Metal Case)

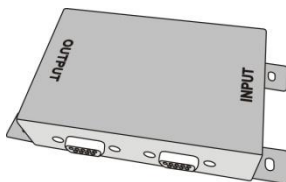
#### Second Generation RFID Smart Reader



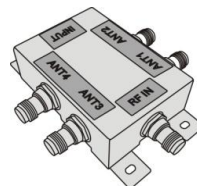
Power Cord



Power Adapter



Fan-out Box (optional)



RF Switch (optional)

#### Note:

- The Fan-out Box and RF Switch work in combination to allow more antenna connections. One Second Generation RFID Smart Reader can connect to one Fan-out Box and four RF Switches.

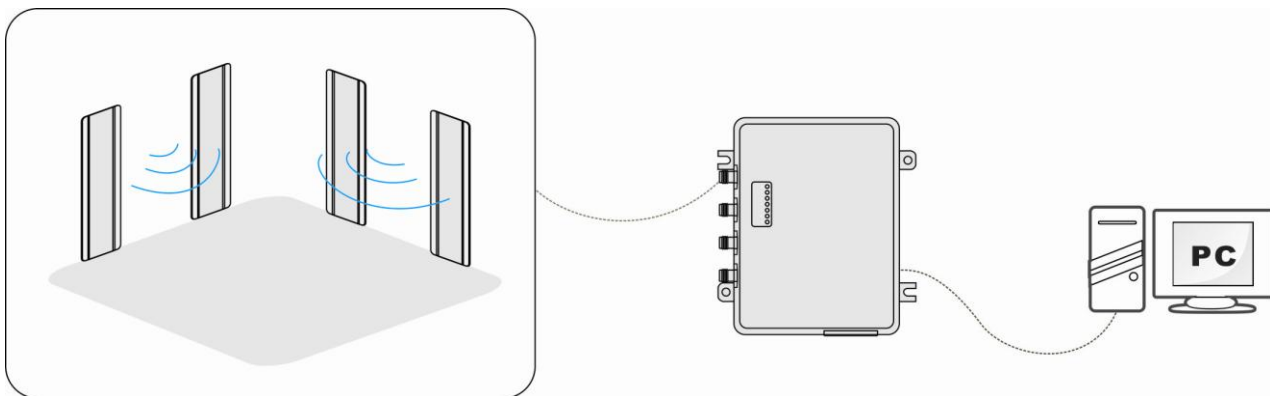
### Introduction

The Reader is designed for uses with a variety of UHF RFID applications. It provides high level RF performance, a user-friendly software development interface and a cost competitive reader solution. Combined with our Wave Antennas, it can provide 100% readability in area sizes of 2' x 2' x 2' to 10' x 10' x 10' when appropriate reader parameters and antennas are set up. You can also connect the Reader to a Fan-out Box and 1 to 4 RF Switches to add additional antennas. A maximum of 16 antennas are allowed with one Reader.

For multi-reader applications, such as retail applications, the Reader solution can efficiently compress data size and solve data traffic issues.

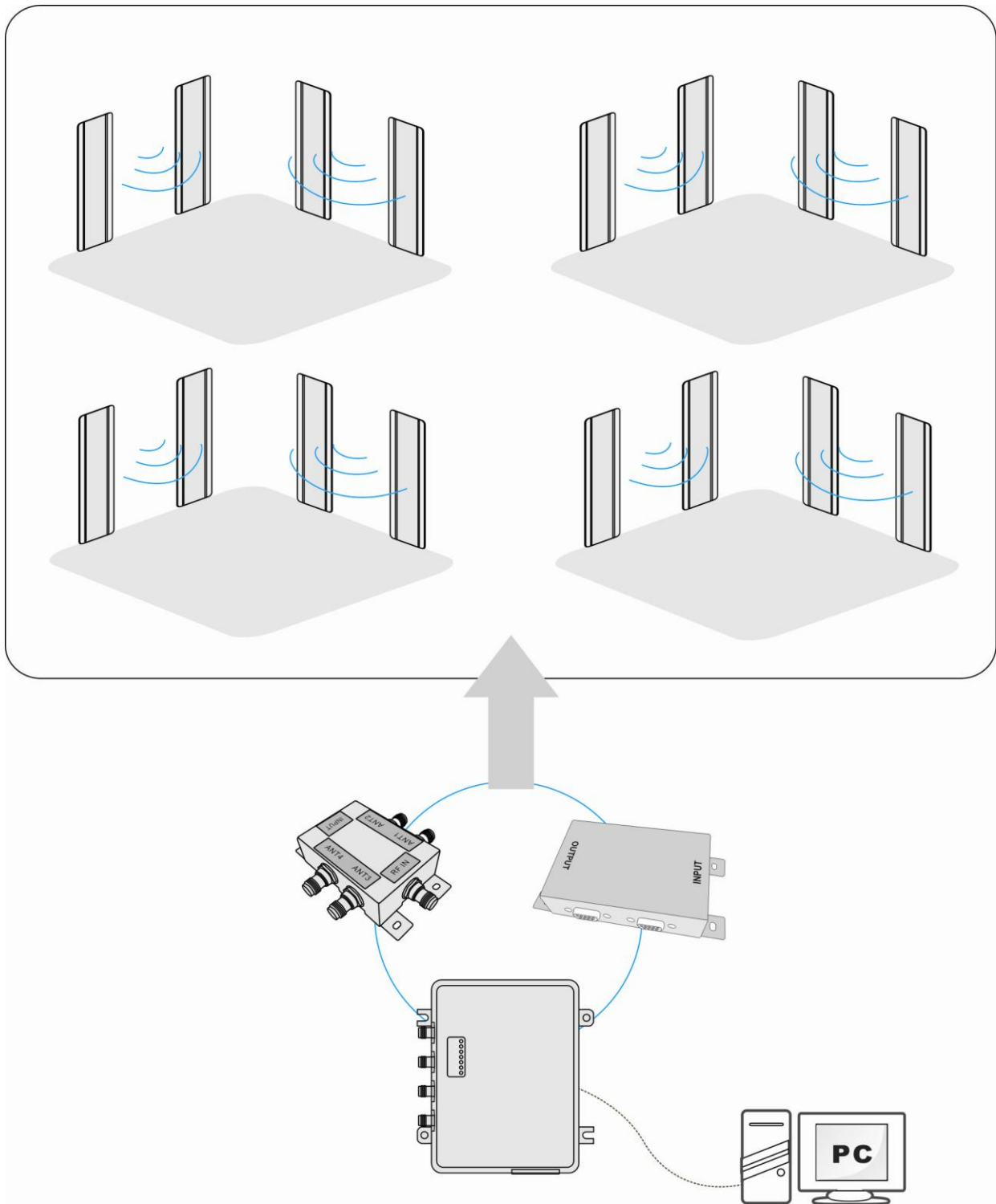
### Basic application:

You can connect to up to four antennas and use a computer to monitor detected parameters.



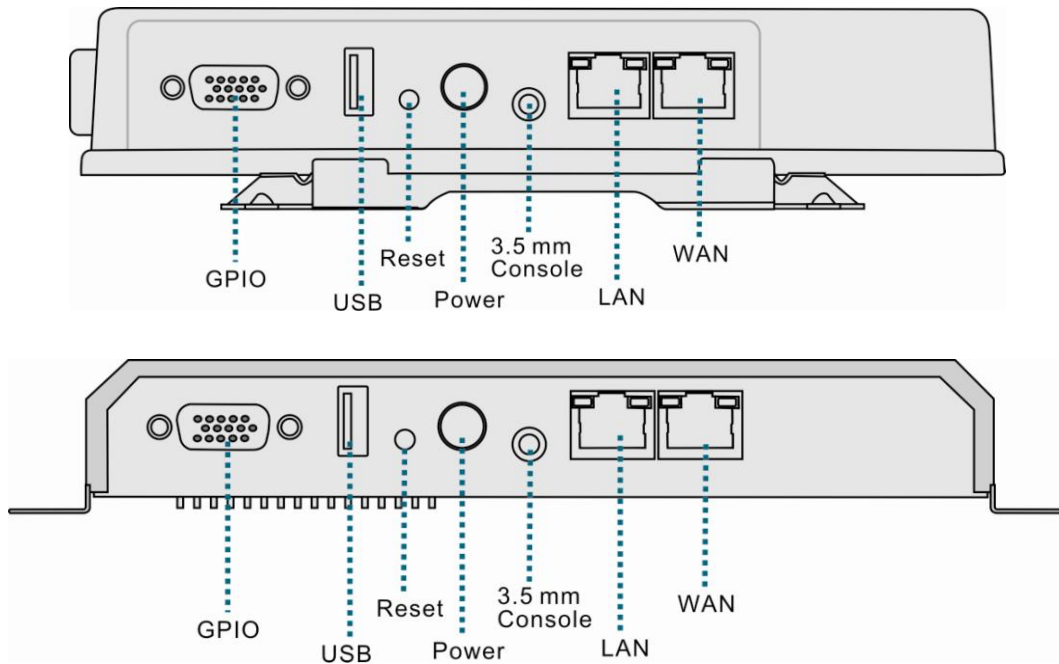
### Advanced application:

Use the Reader with a Fan-out Box and an RF Switch to connect up to 16 antennas.



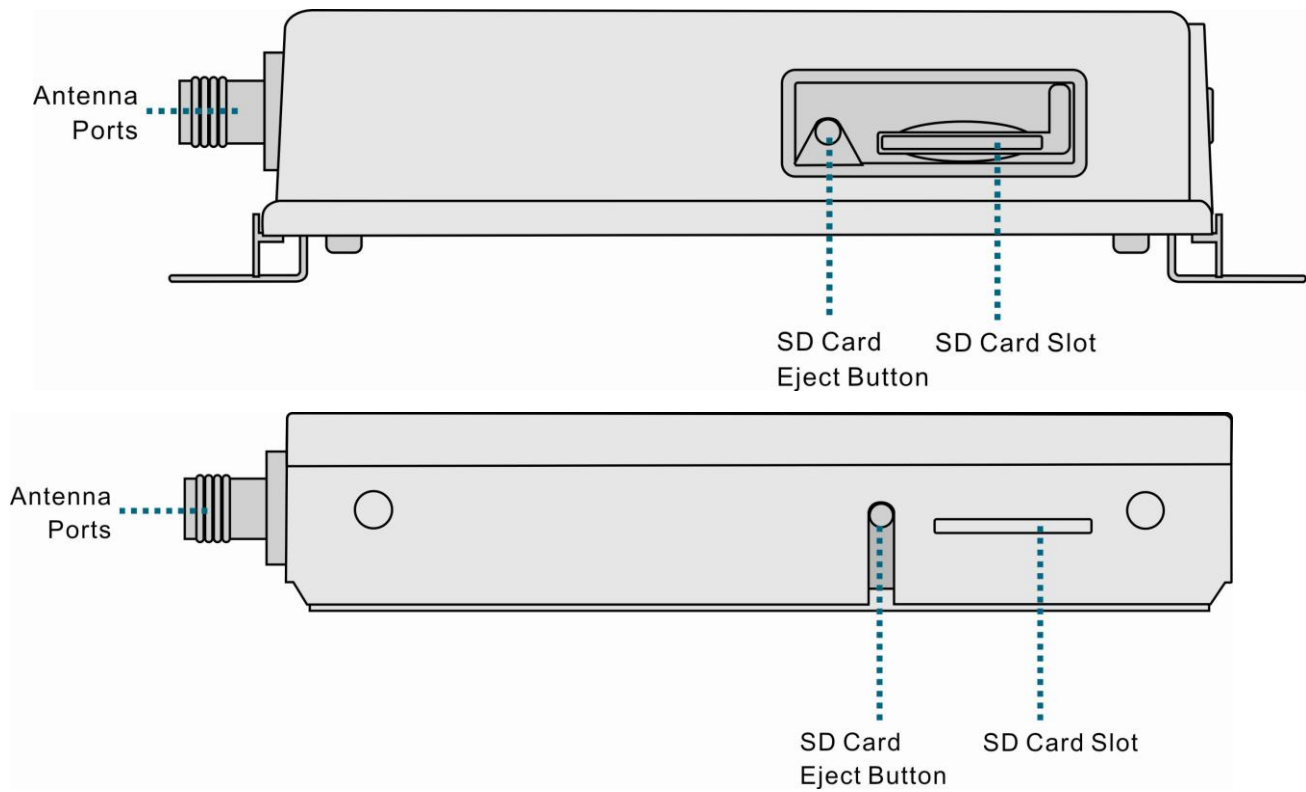


### Hardware Overview- RFID Smart Reader



<b>GPIO</b>	For GPIO purposes such as connecting a Fan-out Box, light sensor or other sensors.
<b>USB</b>	For USB storage device connections.
<b>Reset</b>	Press and hold for 10 seconds to restore the default settings.
<b>Power</b>	Connect the power adapter to the Reader via this intake to power on the Reader.
<b>3.5 mm Console</b>	Connect to a computer for engineering uses.
<b>LAN</b>	Connect a standard RJ-45 Ethernet cable to the port to establish a network connection. This feature allows you to configure settings or read the data from the Reader on your computer via a Graphic User Interface. This port support DHCP server function. IP addresses will be assigned automatically to a connected client device.
<b>WAN</b>	Connect to your DSL/ Cable Modem for Internet connection. The WAN port supports Power over Ethernet (PoE).

**Note:** RJ-45 Ethernet cable and RF cable are not included in the package



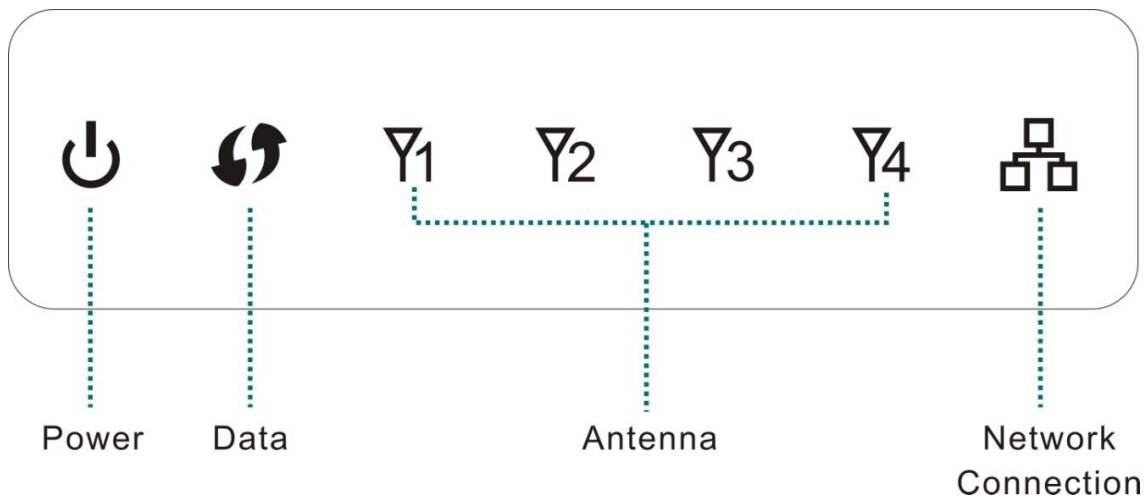
### **Antenna Ports**

For RF cable insertion. The Reader supports up to four antennas at the same time; additional connection is also possible via an optional antenna switch.

### **SD Card Slot & Eject button**

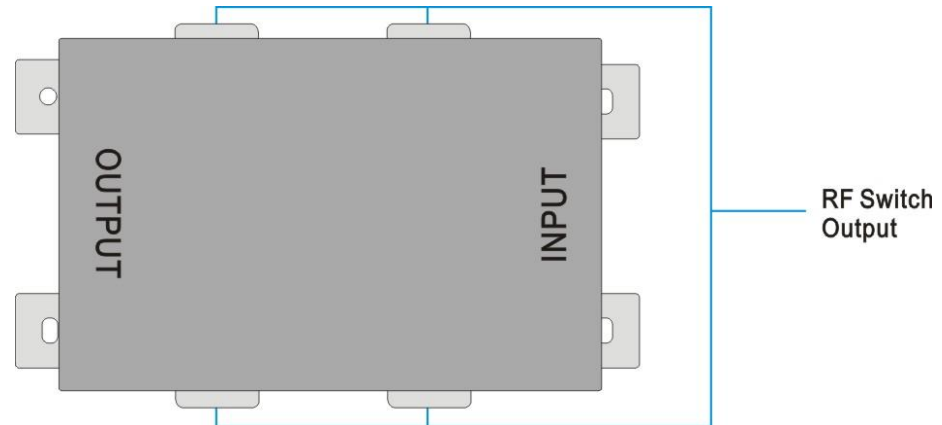
Insert an SD card to save and retrieve data. Push the SD Card Eject button to remove the card from the card slot.

### Hardware Overview- LED Indicators



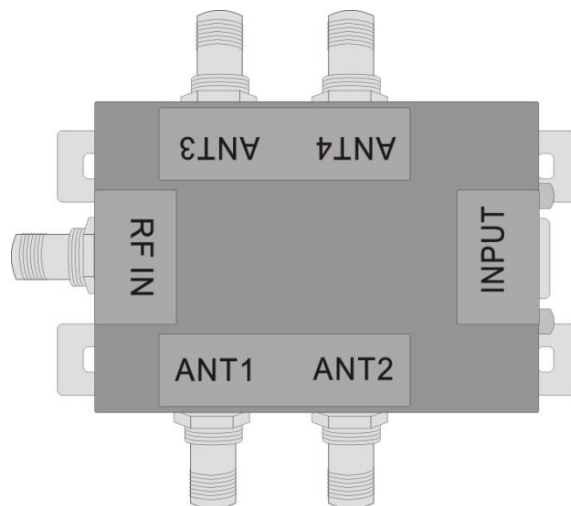
<b>Power</b>	Blue	System on.
	Blinking Blue	System booting or in the firmware upgrade process.
	Off	System off.
<b>Data</b>	Blinking Blue	Data receiving/ transferring through SD card.
	Off	No SD card connected.
<b>Antenna</b>	Blinking Blue (Single)	Antenna switching.
	Blinking Red & Blue (All)	Invalid M6e connection.
<b>Network Connection</b>	Steady Blue	Valid Internet connection.
	Steady Red	Invalid internet connection.

### Hardware Overview- Fan-out Box



<b>OUTPUT</b>	Optional applications. (For example, connecting to an LED notification system).
<b>INPUT</b>	Connect to the GPIO port (DB15) of the Reader.
<b>RF Switch Output</b>	DB9 output ports for RF Switch connection.

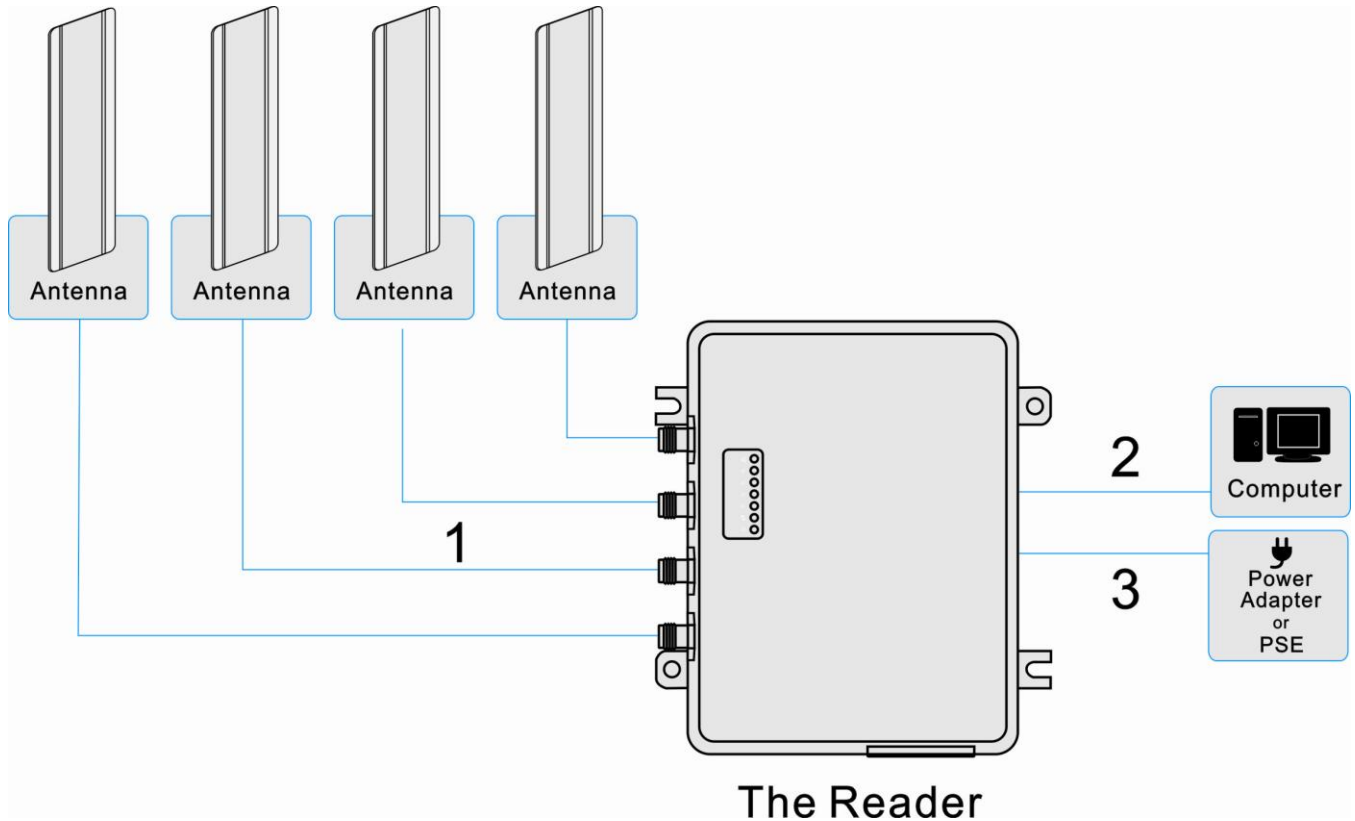
### Hardware Overview - RF Switch



<b>INPUT</b>	Connect to a DB9 OUTPUT port of the Fan-out Box.
<b>RF IN</b>	Connect to an antenna port of the Reader.
<b>ANT 1-4</b>	For antenna connections.

### Connecting the Cables

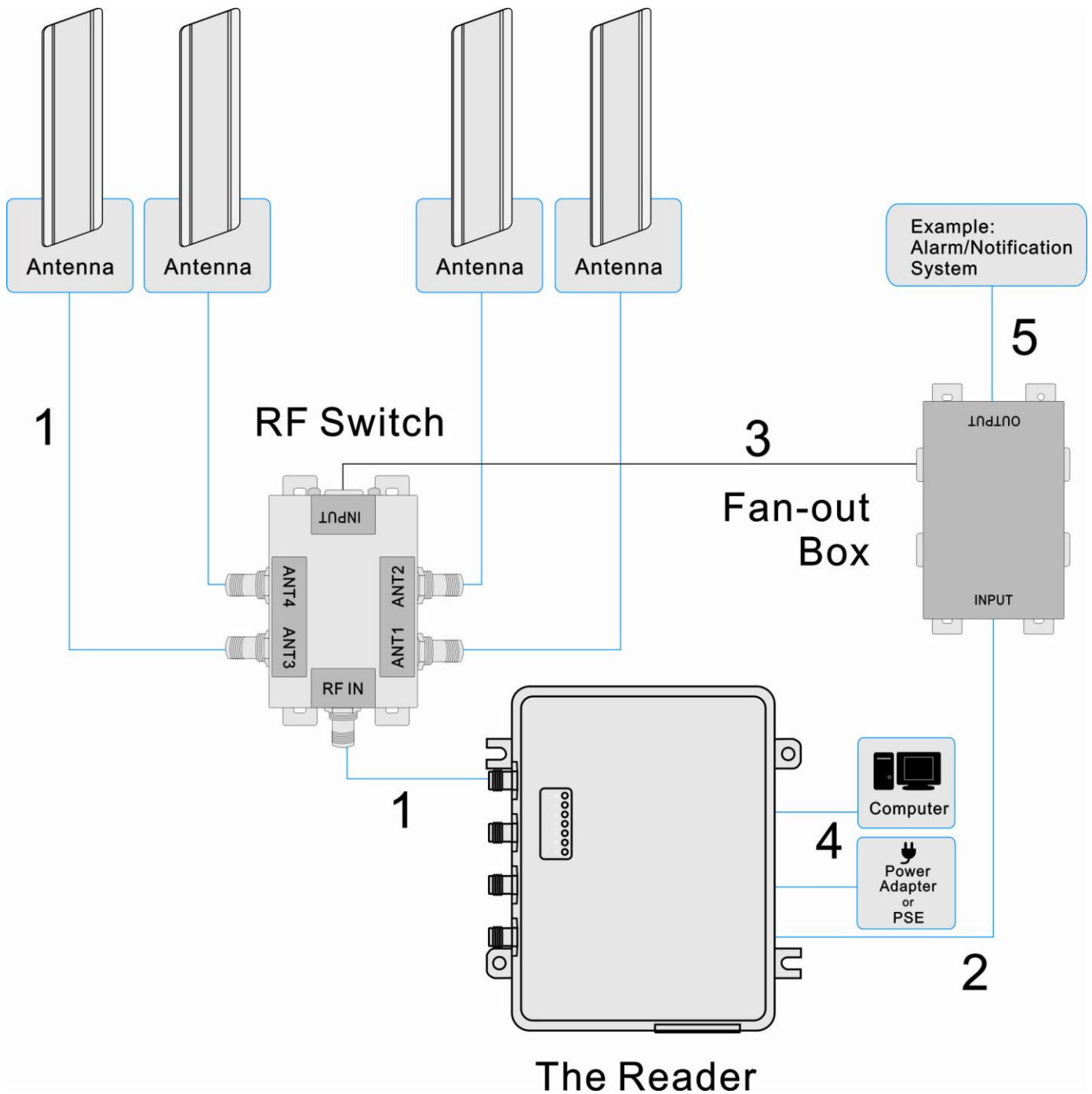
#### Basic installation:



1. Plug an RF cable into an antenna port and an antenna. The Reader supports up to four antennas at the same time.
2. Connect an RJ-45 Ethernet cable to the LAN port and to your computer for software development interface configuration.
3. Connect the power adapter to the Power port on the Reader. Once the power adapter is connected to the Reader, the Power LED indicator will turn blue indicating the power is on.

**Note:** The Reader may be wall-mounted. Insert screws into the four holes on the left and right side brackets of the Reader.

Installation with Fan-out Box and RF Switch:



1. Use an RF cable to connect an antenna port of the Reader to the RF IN port of the RF Switch, and then connect the antennas to the ANT1–4 ports of the RF Switch.

2. Use a DB15 cable to connect the GPIO port of the Reader and the INPUT port of the Fan-out Box.

**Note: Only use a rollover type DB15 cable (not a crossover-type). The cable must be shorter than 5 m.**

3. Use a DB9 cable to connect an RF Switch port of the Fan-out Box to the INPUT port of the RF Switch.

**Note: Only use a rollover-type DB9 cable shorter than 30 m.**

4. Connect the Reader to a computer. Attach the power supply to the Reader and plug it into a wall outlet.

5. You can also connect the OUTPUT port of the Fan-out Box to other devices for optional applications, such as an LED alarm/notification system

**Note:** The Reader, Fan-out Box and the RF Switch may be wall-mounted. Insert screws into the four holes of the brackets on their left and right sides.

### Configuration Software

#### Access the Management Interface (Web UI)

The **Web UI** allows you to configure the Reader using your Web browser.

1. Ensure that the computer you use is connected to the LAN port of the Reader.
2. Open your web browser and type 192.168.0.1 in the address field.



3. An authentication screen will appear. Use the default username and password below:  
**Username: admin**  
**Password: password**
4. The Web UI page will appear. Click the items on the banner to access different management functions.
5. We recommend you change the password for better system security. Please access the Web UI and then go to **System→User Account**.



### Management: Home

The home page will be displayed after you access the Web UI. Use the icons and information on the page to view the current system status and manage the device.

The screenshot displays the X-RAG Web UI Home page. At the top, there is a navigation bar with the X-RAG logo and four icons: Home (house), Ethernet (network card), Wireless (Wi-Fi), and System (computer monitor). A 'logout' button is located in the top right corner. The main content area is divided into four panels:

- Internet:** Shows network configuration details: Internet Type: ETH-WAN, DHCP Status: dhcpc, IP Address: 0.0.0.0, Subnet Mask: 0.0.0.0, and Gateway: 0.0.0.0.
- xrag:** Shows system information: System Uptime: 0 Days, 02:06:39, H/W Version: SGA, and S/W Version: v0.0.0.6.
- Wi-Fi:** Indicates that Wi-Fi is currently in client mode. A note states: 'Press button below will enable Wi-Fi AP mode, but the internet connection might be lose(if it is connected with Wi-Fi offload).'.
- LAN:** Shows local network configuration: IP Address: 192.168.0.1, DHCP Start: 192.168.0.2, and DHCP End: 192.168.0.254.

### Management: Ethernet

#### LAN Settings

#### LAN Settings

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- Host Name
- IP Address
- Subnet Mask
- DHCP Start IP
- DHCP End IP
- Lease Time

You can configure the local network settings of the Reader on this page.

- **Host Name:** Host name of the Reader.
- **IP Address:** Enter the local network IP address for the Reader. The IP address is also the one that you enter when logging in to this Web UI. The default IP address is “192.168.0.1”.  
**Note:** It is strongly suggested that you use the default address for the LAN port at all times so that one can easily access the Reader.
- **Subnet Mask:** The subnet mask along with the previously configured IP address defines the network. The default value for the subnet mask is “255.255.255.0”.
- **DHCP Start IP:** Define the starting value of the IP addresses to be given to LAN users connecting to the Reader
- **DHCP End IP:** Define the last value of the IP address to be given to LAN users connecting to the Reader.
- **Lease Time:** In Lease Time you can specify a period of time after which an assigned IP address will be retrieved from devices due to the fact that there has been no network activity during the specified time.

### WAN Settings

#### WAN Settings

---

● DHCP Mode       Dynamic  Static

● IP Address     

● Subnet Mask   

● Gateway

In this page you can configure the IP address settings for your WAN interface, which will be used for communicating with your modem to connect to the Internet.

- **DHCP Mode:** Select whether or not to enter a specific IP address for the Reader. This will depend on the Internet service you subscribed to.
- **IP Address, Subnet Mask, and Gateway:** When “Static” is selected, you will need to enter the IP address, Subnet Mask and Gateway IP address for connecting to the Internet.

### Management: System

#### Firmware Upgrade

You can find the current firmware version on this page. When a new firmware is available, upgrade your firmware using this page.

- **Current Version:** Indicates the current firmware version that the Reader uses.
- **Select Firmware:** Click “Browse” to locate the new firmware that you have downloaded to your local computer.

**Warning:** Do not operate the Web UI during the firmware upgrade. The system will reboot automatically after the upgrade process is finished.

### System Firmware Upgrade

To apply new firmware that you have downloaded to your local computer first click the Browse icon to locate the file.

**Caution:** Do not operate the Web UI during firmware upgrade. The system will reboot automatically after the upgrade process is finished.

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● Current Version:

● Select Firmware:

### User Account

The Reader allows two permission levels for accessing the Web UI, providing users with different authorities to configure settings or view the information of the Web UI.

The default users are:

- **Admin:** This user is allowed to configure all settings of the Reader. The default password is “admin”.
- **Guest:** This user is allowed to view part of the Web UI pages but cannot change any settings in the Web UI.

To change the Username and Password, click the “Edit” button and then click “Apply” to apply your changes.

### User Account Settings

● User Account List

Username	Password	Description	Actions
admin	*****	default admin user	<input type="button" value="Edit"/>
guest	*****	default guest user	<input type="button" value="Edit"/>

### Time Settings

- **System Time:** The current system time.
- **Sync with your PC:** Pressing this button will set the Reader's time according to the time of your PC.
- **Enable NTP Server:** Marking the box will activate the Network Time Protocol (NTP) function, which is used to synchronize system time to a time server on the Internet.
- **Time Zone:** Select a correct time zone for your region.
- **NTP Server:** The NTP server to synchronize.
- **Sync Interval:** The time interval after which the Reader will perform time synchronization

### Time Settings

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- System Time Sat Jan 01 2000 02:28:11 GMT+0800
- Sync. with your PC
- Enable NTP Server
- Time Zone (GMT+08:00) Beijing, Hong Kong, Ulaan Bataar, Kuala Lumpur ▼
- NTP Server 0.us.pool.ntp.org
- Sync Interval 30 minutes ▼

### System Log

In this page you can backup your system log. The page also allows you to write and maintain the log data to a remote computer.

To activate the remote server function, select the “Enable Remote Server” box and then enter the IP address of your computer.

To activate the system log backup function, select the “Enable Backup System Log” box and then specify a backup interval from the drop-down list.

Click “Apply” to apply the changes, or click Discard to undo your configuration.

The screenshot shows a configuration window with two main sections:

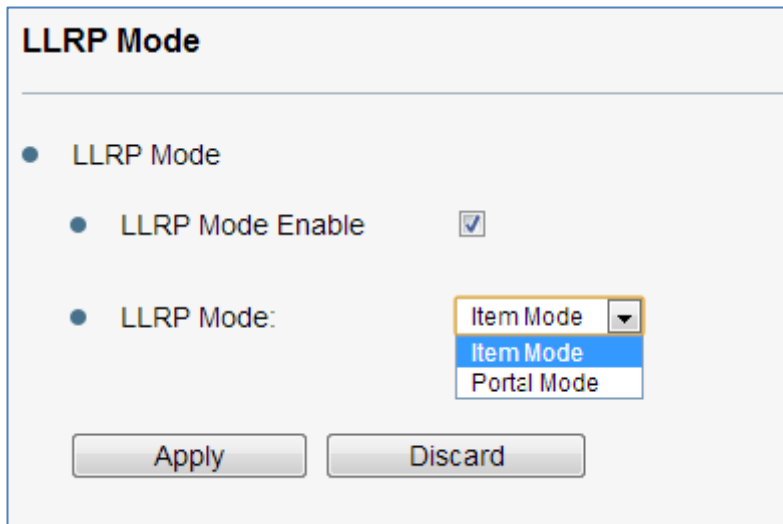
- Remote System Log Server**
  - Enable Remote Server:
  - IP Address:
- Backup System Log**
  - Enable Backup System Log:
  - Backup Time:  (dropdown menu)
  - 2012/10/10 00:00

At the bottom, there are two buttons: **Apply** and **Discard**.

### LLRP Mode

The Reader supports “Low Level Reader Protocol”, which standardize the network interface of the Reader to RFID readers of other LLRP-compatible manufacturers.

Mark the “LLRP Mode Enable”, select an LLRP mode and then click the “Apply” button to activate this mode.



The screenshot shows a configuration window titled "LLRP Mode". It contains three radio buttons under the heading "LLRP Mode":

- The first radio button is selected.
- The second radio button is labeled "LLRP Mode Enable" and has a checked checkbox to its right.
- The third radio button is labeled "LLRP Mode:" and is followed by a dropdown menu. The dropdown menu is open, showing three options: "Item Mode" (highlighted in blue), "Item Mode", and "Portal Mode".

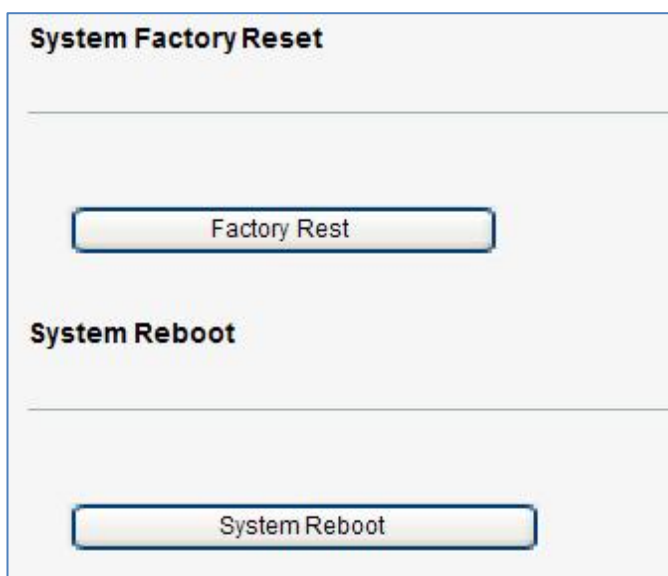
At the bottom of the window, there are two buttons: "Apply" and "Discard".

### Factory Reset & Reboot

This page allows users to restart the Reader or reset all its settings to the factory default.

#### Caution:

All your settings will be erased after clicking the “Factory Reset” icon.



The screenshot shows a configuration window with two sections:

- The top section is titled "System Factory Reset" and contains a single button labeled "Factory Rest".
- The bottom section is titled "System Reboot" and contains a single button labeled "System Reboot".



## Appendix

### Specifications: RFID Smart Reader

RF System	
Chipset	Impinj R2000 ATMEL AT91SAM7S-256
Protocol	
RFID Protocol Support	EPC Global Gen 2 ISO 18000-6C; ISO 18000-6B (optional)
Support EPC DRM	Yes (with DRM Filter), switchable
RF	
Frequency	US: 902–928MHz EU: 865–868MHz KR: 910–914MHz PRC: 920–925MHz Open: 840MHz–960MHz
Demodulation	ASK
Modulation Depth	90% nominal
Data Encoding	FM0 or Miller code
Bit Rate	Supports uplink data rates of up to 640 Kbps
TX Output Power	15 dBm–30 dBm in 1dB
Antenna Type	4 port Mono-static
Antenna Connector	4 pcs RP TNC
General Characteristics	
Dimensions	18.8 × 15.8 × 3.7 cm (Plastic case) 20.6 × 16.7 × 3.0 cm (Metal case)
Weight	Approx. 560g (Plastic case) Approx. 840g (Metal case)
Base Material	Aluminum alloy
Mounting	Wall, floor
Power Input	1. DC power input (12 VDC ± 5%, 19.2W) 2. PoE 802.3at

Power Consumption	11W
<b>System Architecture</b>	
Processor	TI AM335XZCZ
System Memory / Ram	128MB
Internal Storage / Flash	32MB
<b>Communication</b>	
USB	USB 2.0 x1
Ethernet	10/100 Base-T (RJ-45) x 2 (PoE x 1, 802.3at compliant)
GPIO	6 input and 4 output (DB15)
Indicators	7 two-color LED status indicator
<b>Software</b>	
Operation System	Embedded Linux
Software SDK	C#
<b>Environment</b>	
Humidity	5% to 95%, non-condensing
Operating Temperature	0 °C to 55 °C / 32 °F to 131 °F
Storage Temperature	- 40 °C to 85 °C / -40 °F to 185 °F
Sealing / Dust and Water	IP40(NEMA 1)
Immunity	

#### Specifications: Fan-out Box

RF System	
Chipset	MC33202DR2G
Regulatory and Environmental Compliance	
EMC Certification	FCC 47 CFG Ch.1 Part 15 (US) (15.247) ETSI EN 302 208-1 (V1.1.1) (EU) (optional)
Certification	RoHS / FCC / CE(optional)
General Characteristics	
Dimensions	13.2 × 7.3 × 2.6 cm
Weight	Approx. 250g
Base Material	SECC
Mounting	Wall, floor
Power Consumption	0.5W
Communication	
Input port	1 DB15 female connector
RF Switch Output port	4 DB9 female connector
Output port	1 DB15 female connector
Environment	
Humidity	5% to 95%, non-condensing
Operating Temperature	0 °C to 55 °C / 32 °F to 131 °F
Storage Temperature	- 40 °C to 85 °C / -40 °F to 185 °F
Sealing / Dust and Water	IP40(NEMA 1)
Immunity	

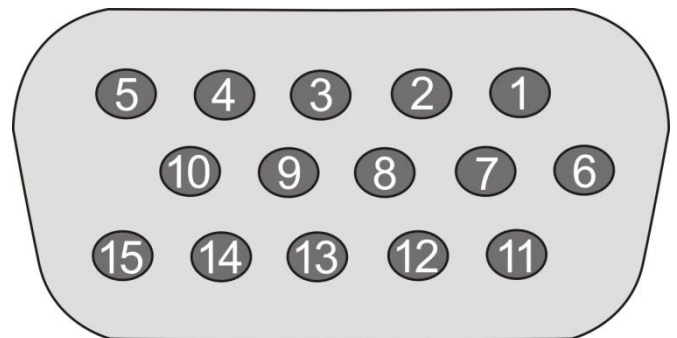
### Specifications: RF Switch

RF System	
Chipset	SN74HC139PWR SN74HC240PWR AS221
RF	
Frequency	US: 902–928MHz/ EU: 865–868MHz/ KR: 910–914MHz/ PRC: 920–925MHz/ Open:840MHz–960MHz/
Typical Insertion Loss	1.2dB
Typical Isolation	36dB
Regulatory and Environmental Compliance	
EMC Certification	FCC 47 CFG Ch.1 Part 15 (US) (15.247) ETSI EN 302 208-1 (V1.1.1) (EU) (optional)
Certification	RoHS / FCC / CE(optional)
General Characteristics	
Dimensions	11.4 × 9.7 × 2.7 cm
Weight	Approx. 350g
Base Material	SECC
Mounting	Wall, floor
Communication	
Input port	1 DB9 female connector
R-TNC	4 R-TNC Connector
Environment	
Humidity	5% to 95%, non-condensing
Operating Temperature	0 °C to 55 °C / 32 °F to 131 °F
Storage Temperature	- 40 °C to 85 °C / -40 °F to 185 °F
Sealing / Dust and Water Immunity	IP40(NEMA 1)

## Pin Definition

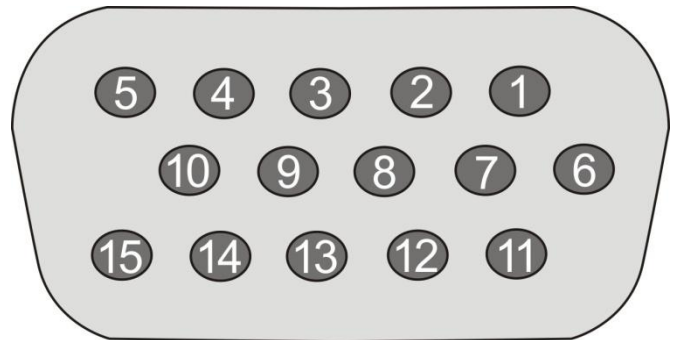
### GPIO port of RFID Smart Reader

DB15 female connector	
Pin1	5V
Pin2	Fan-out output1 5v
Pin3	Fan-out output2 5v
Pin4	Fan-out output3 5v
Pin5	Fan-out output4 5v
Pin6	Fan-out output5 5v
Pin7	Fan-out output6 5v
Pin8	GND
Pin9	Fan-out input1 5v
Pin10	Fan-out input2 5v
Pin11	Fan-out input3 5v
Pin12	Fan-out input4 5v
Pin13	GND
Pin14	Fan-out mode select 5V
Pin15	GND



#### DB15 Output port of Fan-out Box

DB15 female connector	
Pin1	5V
Pin2	Fan-out output1 5v
Pin3	Fan-out output2 5v
Pin4	Fan-out output3 5v
Pin5	Fan-out output4 5v
Pin6	Fan-out output5 5v
Pin7	Fan-out output6 5v
Pin8	GND
Pin9	Fan-out input1 5v
Pin10	Fan-out input2 5v
Pin11	Fan-out input3 5v
Pin12	Fan-out input4 5v
Pin13	GND
Pin14	GND
Pin15	GND



#### DB9 Output ports of Fan-out Box

DB9 female connector	
Pin1	5V
Pin2	GPO_1-
Pin3	GND
Pin4	GPO_2+
Pin5	GND
Pin6	GND
Pin7	GPO_1+
Pin8	GPO_2-
Pin9	GND

