Second Generation RFID Smart Reader

with Fan-out Box and RF Switch

User Manual
English

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 20cm 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:

The product comply with the Canada portable RF exposure limit set forth for an uncontrolled environment and are safe for intended operation as described in this manual. The further RF exposure reduction can be achieved if the product can be kept as far as possible from the user body or set the device to lower output power if such function is available.

Déclaration d'exposition aux radiations:

Le produit est conforme aux limites d'exposition pour les appareils portables RF pour les Etats-Unis et le Canada établies pour un environnement non contrôlé.

Le produit est sûr pour un fonctionnement tel que décrit dans ce manuel. La réduction aux expositions RF peut être augmentée si l'appareil peut être conservé aussi loin que possible du corps de l'utilisateur ou que le dispositif est réglé sur la puissance de sortie la plus faible si une telle fonction est disponible.

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 20cm 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 20 cm de distance entre la source de rayonnement et votre corps.
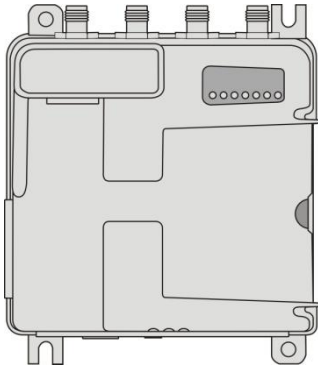
警告聲明:

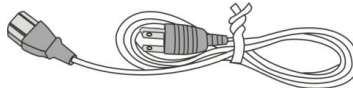經型式認證合格之低功率射頻電機,非經許可,公司、商號或使用者均不得擅自變更頻率、加大功率或變更原設計之特性及功能。

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。
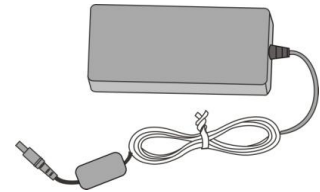
Getting Started

In the Package

Second Generation
RFID Smart Reader

Power Cord

Power Adapter
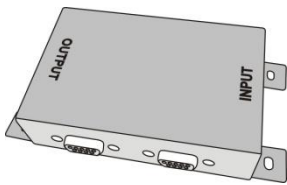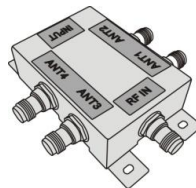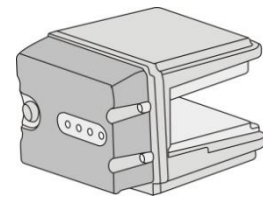

Fan-out Box (optional)

RF Switch (optional)

Battery (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.
- The battery can be used to power the Reader for approximately 6 hours. It snaps onto the Smart Reader and forms a complete unit.

Introduction

The Second Generation RFID Smart Reader (the Reader) enhances the flexibility of its former version by adding a portable feature and wireless connectivity. You can choose to add a battery to the Reader and work in combination with a dedicated antenna for portable use such as the NeWave Smart Vest. An expansion dongle slot is provided for connecting a Wi-Fi dongle or LTE dongle with which you can easily send the collected data wirelessly.

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' × 2' × 2' to 10' × 10' × 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.
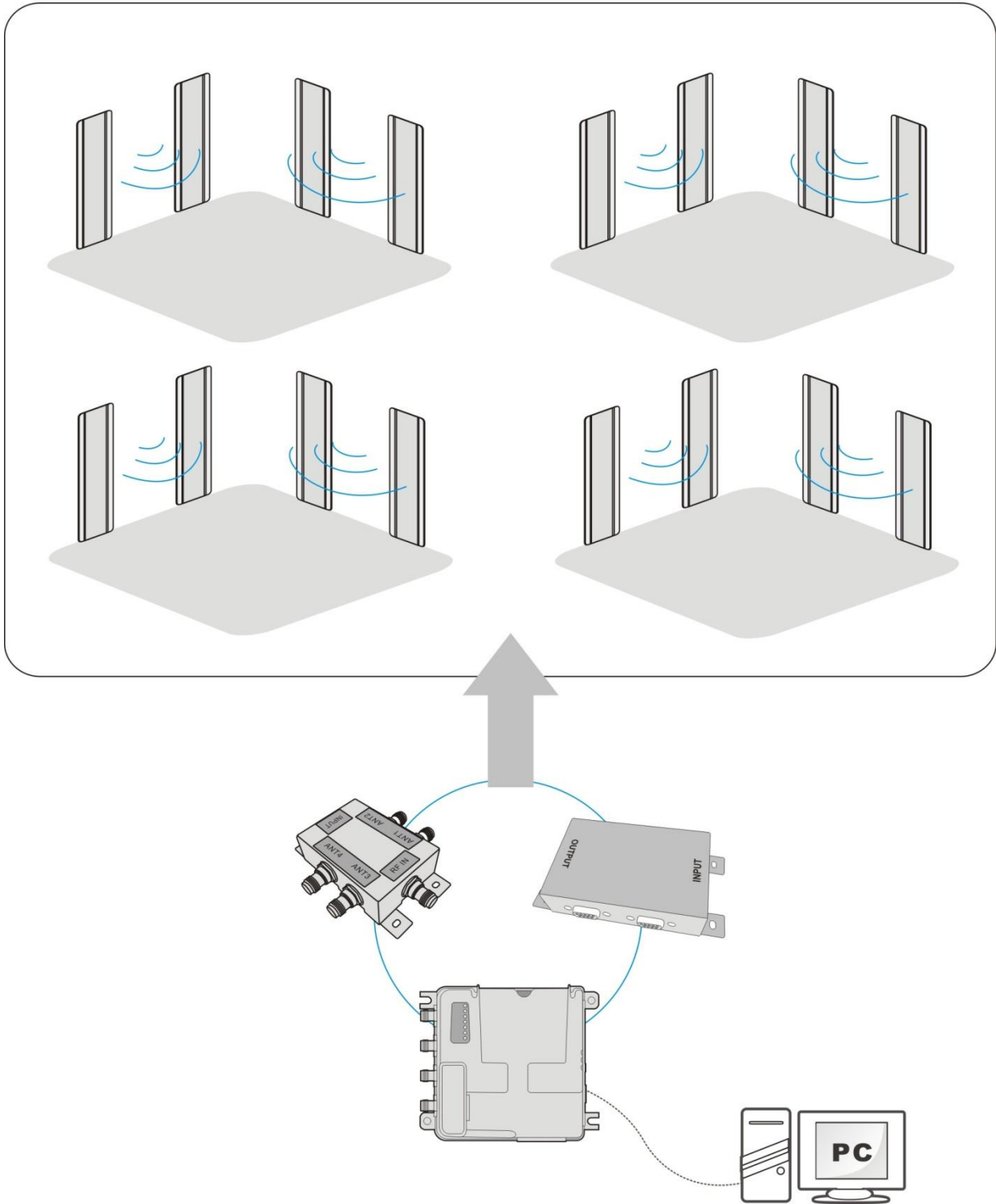
Basic application:

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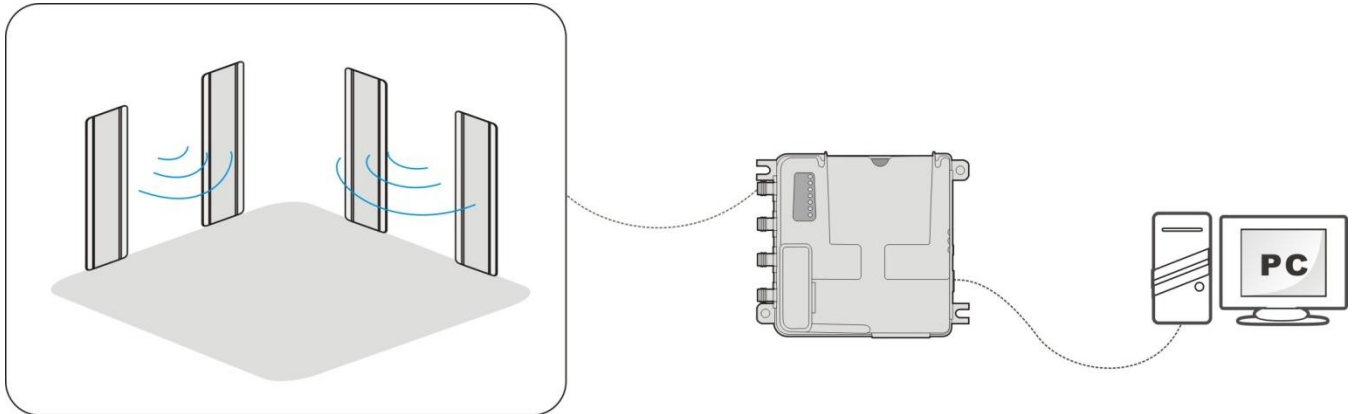
Advanced application:

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

Hardware Overview- RFID Smart Reader

USB	For additional function expansion such as Wi-Fi or 4G connectivity.
Reset	Press and hold for 10 seconds to restore the default settings.
GPIO	For GPIO purposes such as connecting a Fan-out Box, light sensor or other sensors.
Power	Connect the power adapter to the Reader via this intake to power on the Reader.
3.5 mm Console	Connect to a computer for engineering uses.
LAN	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.
WAN	Connect to your DSL/ Cable Modem for Internet connection

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

Battery Connector   Antenna Ports

SD Card   SD Card Slot
Eject Button
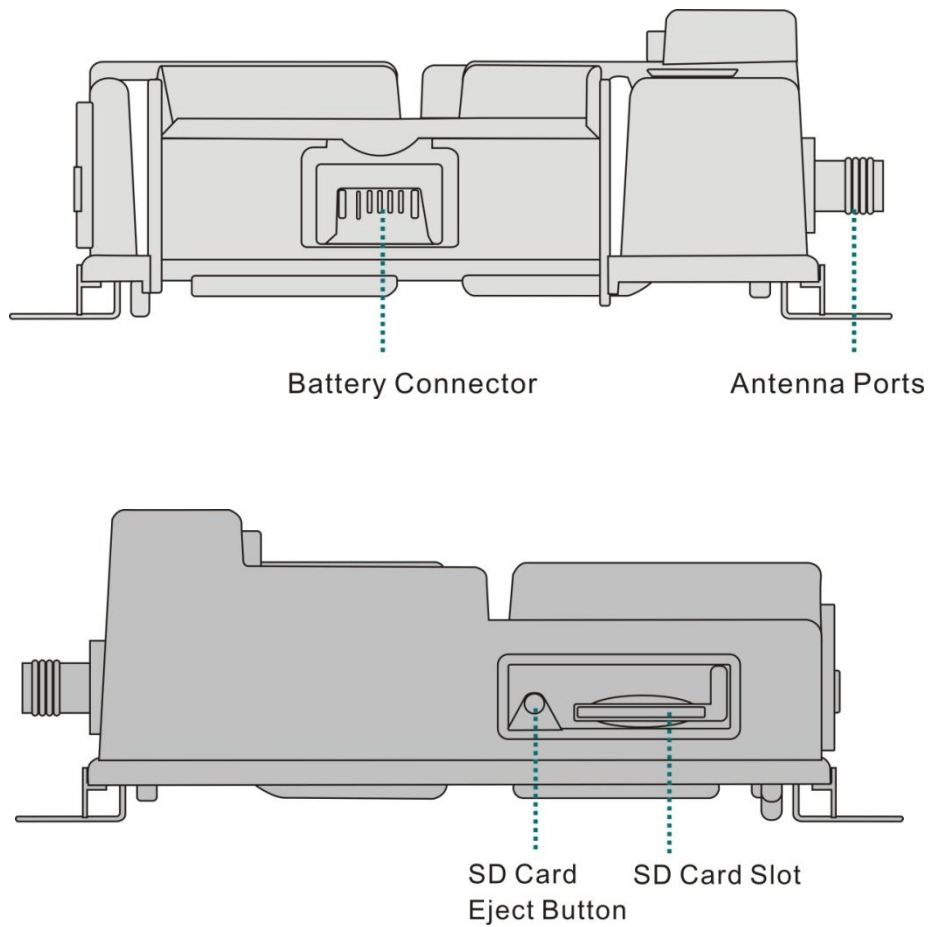
Battery Connector	For battery pack connection.
Antenna Ports	For RF cable insertion. The Reader supports up to four antennas at the same time; additional connection is also possible via an optional antenna switch.
SD Card Slot & Eject button	Insert an SD card to save and retrieve data. Push the SD Card Eject button to remove the card from the card slot.

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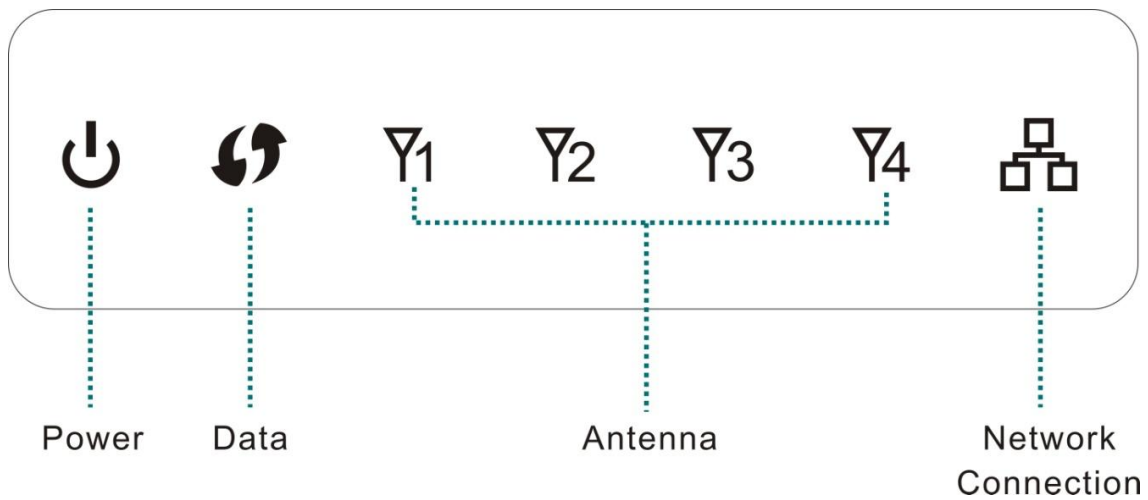
Power	Blue	System on.
	Blinking Blue	System booting or in the firmware upgrade process.
	Off	System off.
Data	Blinking Blue	Data receiving/ transferring through SD card.
	Off	No SD card connected.
Antenna	Blinking Blue (Single)	Antenna switching.
	Blinking Red & Blue (All)	Invalid M6e connection.
Network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

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Hardware Overview- Fan-out Box
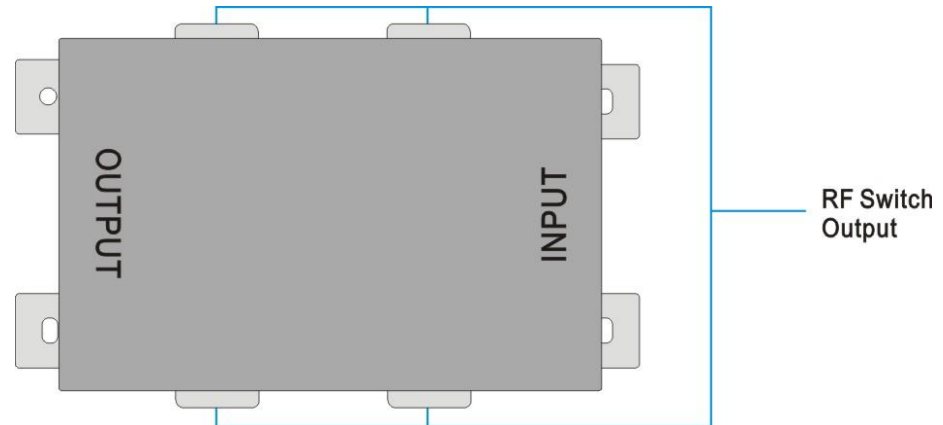
OUTPUT	Optional applications. (For example, connecting to an LED notification system).
INPUT	Connect to the GPIO port (DB15) of the Reader.
RF Switch Output	DB9 output ports for RF Switch connection.

Hardware Overview - RF Switch
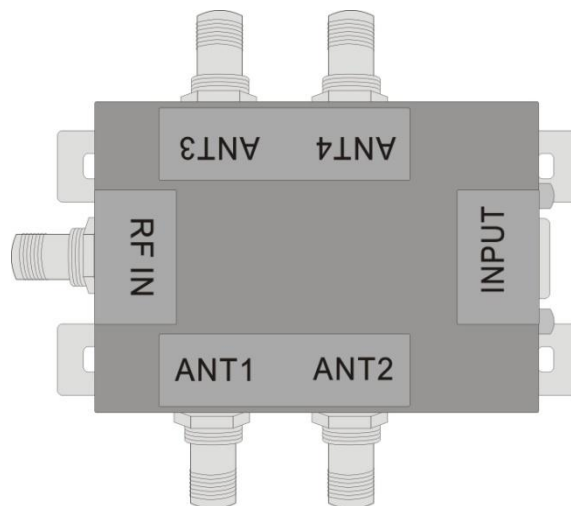
INPUT	Connect to a DB9 OUTPUT port of the Fan-out Box.
RF IN	Connect to an antenna port of the Reader.
ANT 1–4	For antenna connections.

Connecting the Cables

Basic installation:
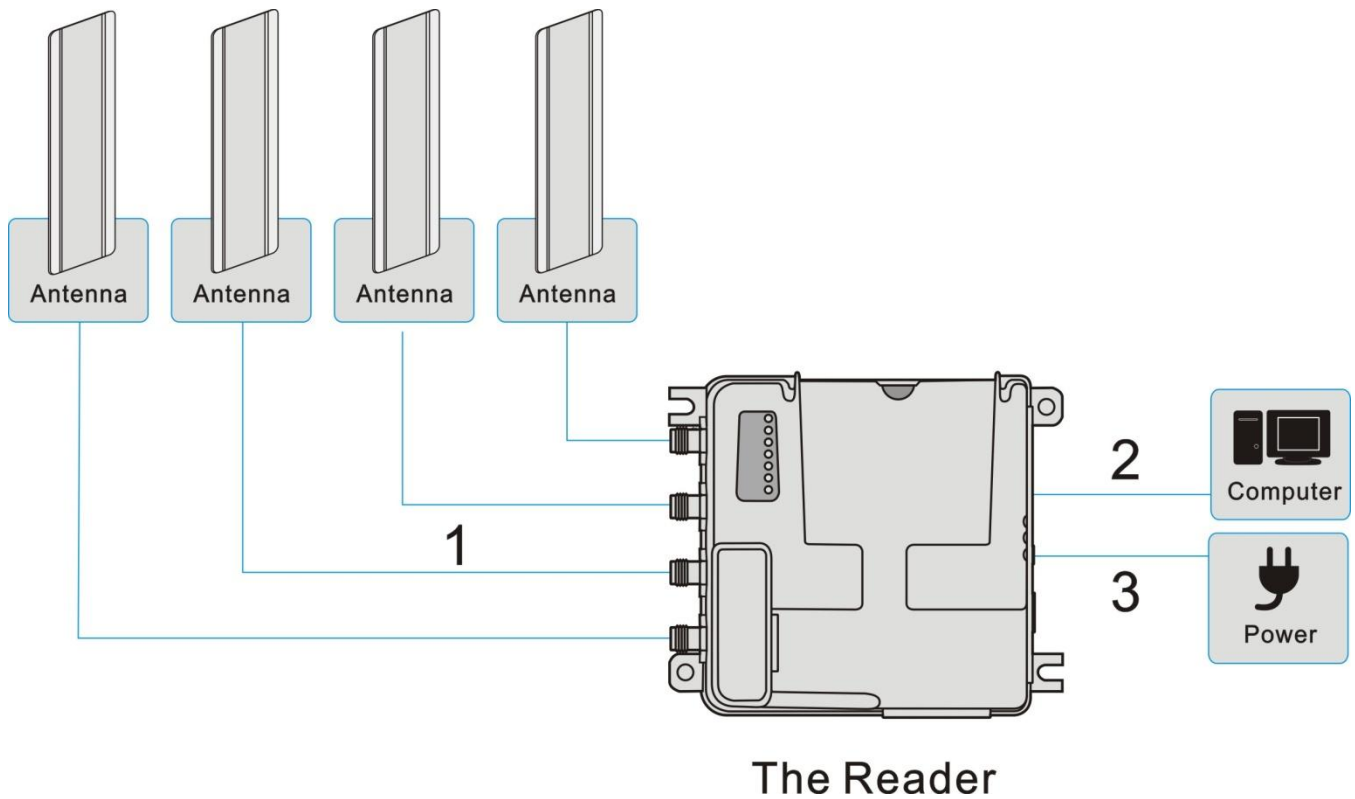
The Reader

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:
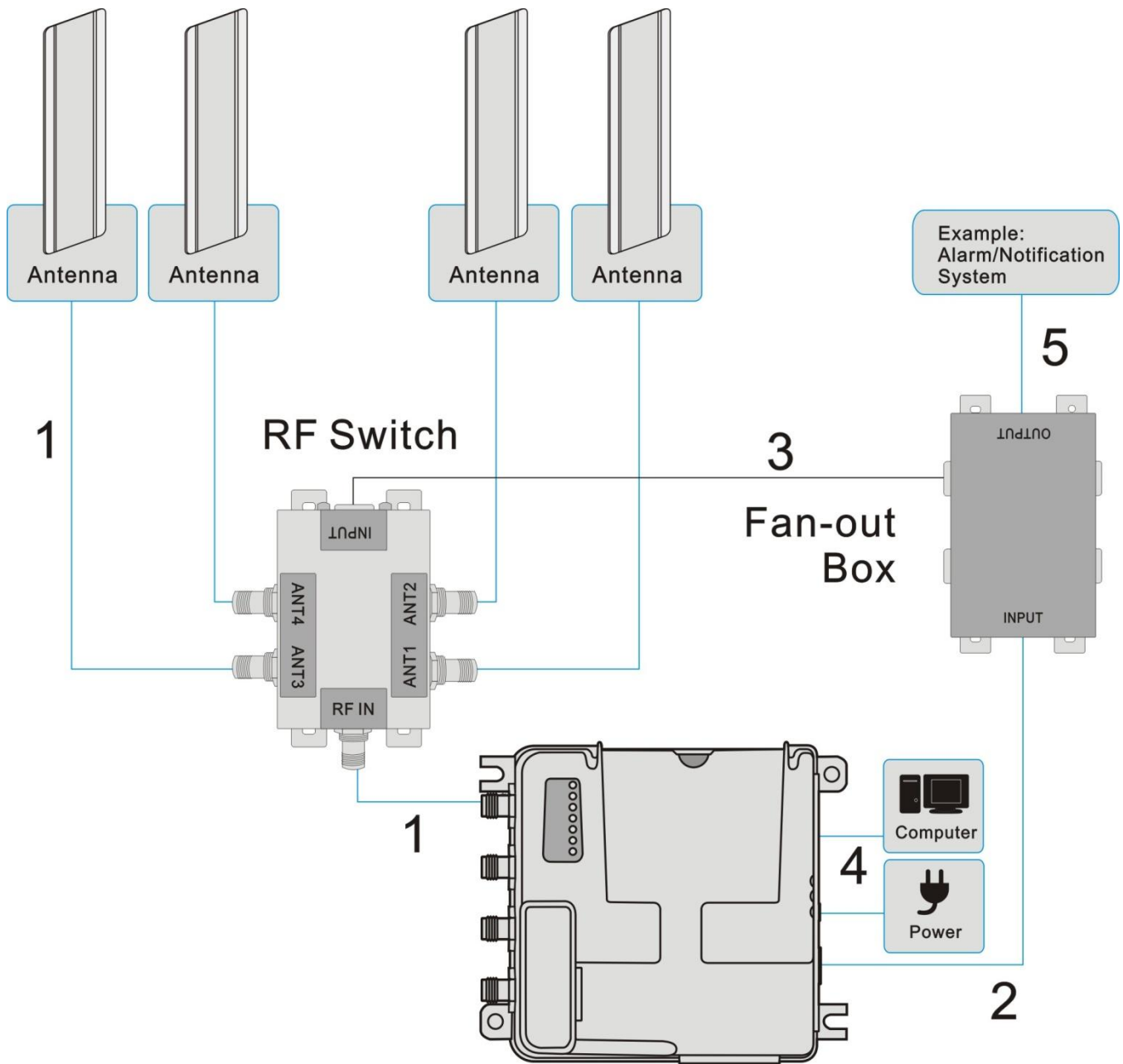
1. Use an RF cable to connect an antenna port of the Reader to the RF IN port of the RF Switch, and then connect the antennas to the ANT1–4 ports of the RF Switch.
2. Use a DB15 cable to connect the GPIO port of the Reader and the INPUT port of the Fan-out Box.
   Note: Only use a rollover type DB15 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.

> http://192.168.0.1/

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.

Management: Ethernet

LAN Settings

```
┌─────────────────────────────────────────────────────┐
│ LAN Settings                                        │
│ ─────────────────────────────────────────────────── │
│                                                      │
│  ● Host Name       xrag                             │
│  ● IP Address      192.168.0.1                      │
│  ● Subnet Mask     255.255.255.0                    │
│                                                      │
│  ● DHCP Start IP   192.168.0.2                      │
│  ● DHCP End IP     192.168.0.254                    │
│  ● Lease Time      1 day     ▼                      │
│     ┌─────────────────┐   ┌─────────────────┐       │
│     │     Apply       │   │    Discard      │       │
│     └─────────────────┘   └─────────────────┘       │
└─────────────────────────────────────────────────────┘
```

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        192.168.51.26
●  Subnet Mask       255.255.255.0
●  Gateway           192.168.51.1


        Apply                Discard
```

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: Wireless

Wi-Fi Offload

When a Wi-Fi dongle is connected, the Reader will be able to communicate with your network via Wi-Fi.

To connect the Reader to a wireless access point (AP):

1. Select the AP from the list.

2. Enter the encryption keys if required.

Note: When the SSID of an AP is hidden, the AP will not be listed. You will need to click the "Manual Input" button to enter the AP's SSID and its password (if required).

4G Settings

When a 4G dongle is connected, the Reader will be able to access the Internet through a 4G network and deliver collected data to a remote server.

- **Preferred Network:** You can choose to use 4G or 3G for connecting to the Internet. Selecting "Auto" will allow the Reader to select a 3G network when a 4G signal is not available.
- **Radio Frequency:** Select the frequency that will be used for the mobile network service.
- **APN Settings**: Select an APN profile and click the "Connect" button to start connecting to the service. When APN settings need to be modified, click the "Apply" button after you finish changing its settings.
- **Network Provider Selection:** You can choose to manually designate a service provider or allow this device to automatically select mobile network service providers.

4G LTE Network Settings

- Preferred Network   Auto
- Radio Frenquency   Auto

[Apply]   [Discard]

- APN Settings

	Profile Name	APN	Interface	Status	Actions
●	profile1	undefined	USB	APN Error	[Connect]

[Apply]

- Network Provider Selection   ○ Auto ○ Manual

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.

- Current Version: v0.0.0.6
- Select Firmware: [   ] Browse...
  [Apply]   [Discard]

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.

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

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

Apply   Discard

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.

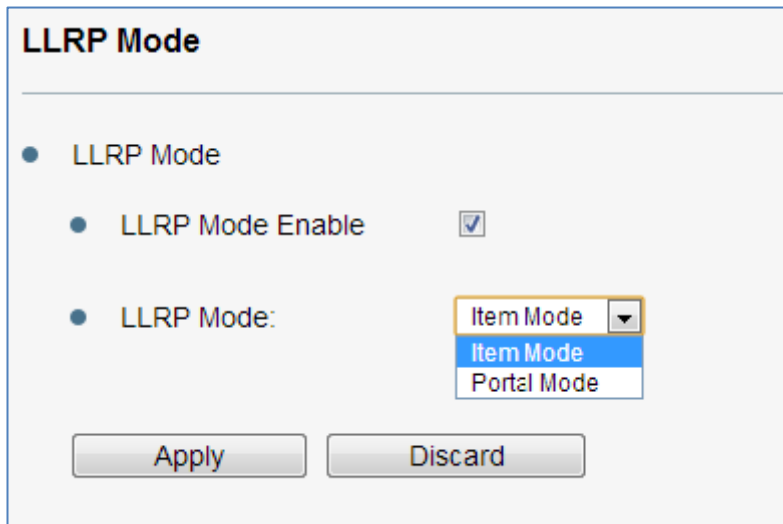Click "Apply" to apply the changes, or click Discard to undo your configuration.

- Remote System Log Server

  - Enable Remote Server   ☐
  - IP Address   0.0.0.0

- Backup System Log

  - Enable Backup System Log   ☐
  - Backup Time   5 minutes
  2012/10/10 00:00

  Apply   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.
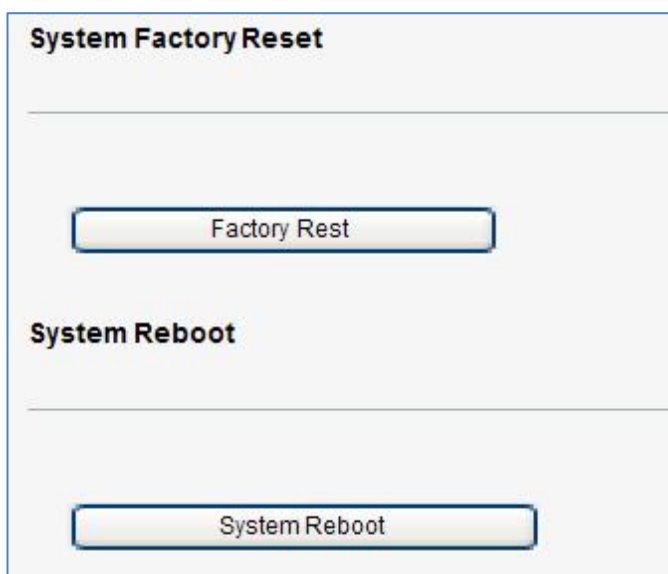
Factory Reset & Reboot

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.

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 or PSK
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	18.2 x 15.6 x 7.8 cm (with battery)
	16.6 x 14.7 x 5.8 cm (without battery)
Weight	Approx. 1016g (with battery)
	Approx. 485g (without battery)
Base Material	Aluminum alloy
Mounting	Wall, floor
Power Input	1. DC power input (12 VDC ± 5%, 19.2W)
Power Consumption	11W

System Architecture	
Processor	TI AM335XZCZ
System Memory / Ram	128MB
Internal Storage / Flash	32MB

Communication	
USB	USB 2.0 x1
Ethernet	10/100 Base-T (RJ-45) X2
GPIO	6 input and 4 output (DB15)
Indicators	7 two-color LED status indicator

Software	
Operation System	Embedded Linux
Software SDK	C#

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	IP54 (NEMA 3) (with battery)
Immunity	IP40(NEMA 1)(without battery)

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 Immunity	IP40(NEMA 1)

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)

3 Appendix

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
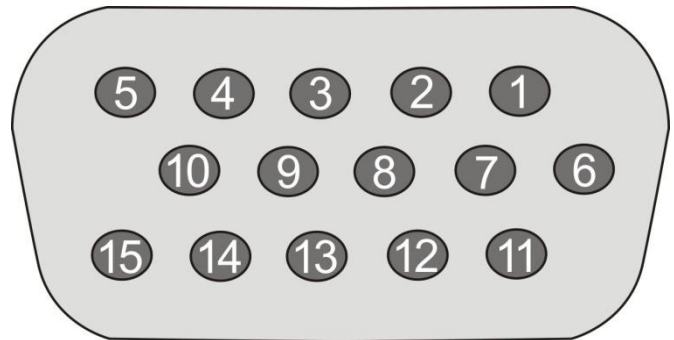
DB9 Output ports of Fan-out Box

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