

**Korenix JetWave 2450 Series**  
**IEEE 802.11n Wireless Outdoor Access Point**  

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**User Manual**

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**korenix**

[www.korenix.com](http://www.korenix.com)

# **Korenix JetWave 2450 Series IEEE 802.11n Wireless Outdoor Access Point User's Manual**

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## About This Manual

This user manual is intended to guide professional installer to install the JetWave 2450 and how to build the infrastructure centered on it. It includes procedures to assist you in avoiding unforeseen problems.

## Conventions

For your attention on important parts, special characters and patterns are used in this manual:



### Note:

- 
- This indicates an important note that you must pay attention to.
- 



### Warning:

- 
- This indicates a warning or caution that you have to abide.
- 

**Bold:** Indicates the function, important words, and so on.

## **Federal Communication Commission Interference Statement**

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.

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.

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.

## **FCC Radiation Exposure Statement:**

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

To avoid the possibility of exceeding radio frequency exposure limits, you shall keep a distance of at least 100cm between you and the antenna of the installed equipment. This transmitter must not be co-located or operating in conjunction with any other antenna or transmitter.

**The availability of some specific channels and/or operational frequency bands are country dependent and are firmware programmed at the factory to match the intended destination. The firmware setting is not accessible by the end user.**

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# Chapter 1 Introduction

## Introduction

Designed for outdoor environment application, the JetWave 2450 is a high-performance last-mile broadband solution that provides reliable wireless network coverage. As an IEEE 802.11b/g compliant wireless device, the JetWave 2450 is able to give stable and efficient wireless performance, while designed with IEEE 802.11n draft 2.0 standard and high output power makes it possible to deliver several times faster data rate than normal wireless device and higher bandwidth with longer range for outdoor applications.

The JetWave 2450 supports AP and Wireless Client dual wireless communication connectivity, allowing for various application requirements thus helping to find the key to the “last mile” with least effort.

With high output power and reliable performance, the JetWave 2450 is an ideal wireless broadband solution for wireless Internet service providers and system integrators!

# Appearance



Figure 1 JetWave 2450

## Key Features

- Compliant with IEEE 802.11b/g and IEEE 802.11n draft 2.0 as well
- Support Power over Ethernet (PoE)
- IP65 waterproof housing endures almost any harsh environments
- Dual operating modes including AP and Wireless Client
- Support 64/128-bit WEP and 802.1X, WPA, WPA2, WPA&WPA2,WPA-PSK, WPA2-PSK, and WPA-PSK&WPA2-PSK etc
- Support WMM and Quality of service (QoS) for enhanced performance
- Advanced management tools like SNMP
- User-friendly Web and SNMP-based management interface

# Typical Application

This section describes the typical applications of JetWave 2450. By default, it is set to AP mode which allows it to establish a wireless coverage; besides, it is also able to join any available wireless network under wireless client mode. The JetWave 2450 is able to deliver stable and efficient broadband connectivity for various applications.



**Figure 2 Typical Application**

Besides, the JetWave 2450 can also be applied into the following environments:

- Cost-effectively provide long distance backhaul for remote areas (e.g. village, oil well, island, mountain and etc.)
- Establish local backhaul for campus, farm and factory
- Provide and access for video streaming or surveillance for industrial and mining enterprises

# Chapter 2 Hardware Installation

This chapter describes safety precautions and product information you have to know and check before installing JetWave 2450.

## Preparation before Installation

### Professional Installation Required

1. Please seek assistance from a professional installer who is well trained in the RF installation and knowledgeable in the local regulations.
2. The JetWave 2450 is distributed through distributors and system installers with professional technicians and will not be sold directly through retail stores.

### Safety Precautions

1. To keep you safe and install the hardware properly, please read and follow these safety precautions.
2. If you are installing JetWave 2450 for the first time, for your safety as well as others', please seek assistance from a professional installer who has received safety training on the hazards involved.
3. Keep safety as well as performance in mind when selecting your installation site, especially where there are electric power and phone lines.
4. When installing JetWave 2450, please note the following things:
  - ◆ Do not use a metal ladder;
  - ◆ Do not work on a wet or windy day;
  - ◆ Wear shoes with rubber soles and heels, rubber gloves, long sleeved shirt or jacket.
5. When the system is operational, avoid standing directly in front of it. Strong RF fields are present when the transmitter is on.

## Installation Precautions

To keep the JetWave 2450 well while you are installing it, please read and follow these installation precautions.

1. Users **MUST** use a proper and well-installed surge arrestor and grounding kit with JetWave 2450; otherwise, a random lightning could easily cause fatal damage to JetWave 2450. **EMD (Lightning) DAMAGE IS NOT COVERED UNDER WARRANTY.**
2. Users **MUST** use the “Power cord & PoE Injector” shipped in the box with the JetWave 2450. Use of other options will cause damage to the JetWave 2450.
3. Users **MUST** power off the JetWave 2450 first before connecting the external antenna to it; otherwise, damage might be caused to the JetWave 2450 itself.

## Product Package

The product package you have received should contain the following items. If any of them are not included or damaged, please contact your local vendor for support.

• JetWave 2450	× 1
• Pole Mounting Ring	× 1
• Power Cord & PoE Injector	× 1
• Quick Installation Guide	× 1
• Product CD	× 1



### Note:

- 
- Product CD contains Quick Installation Guide and User Manual!
-

## Pole Mounting Ring



## Power Cord & PoE Injector



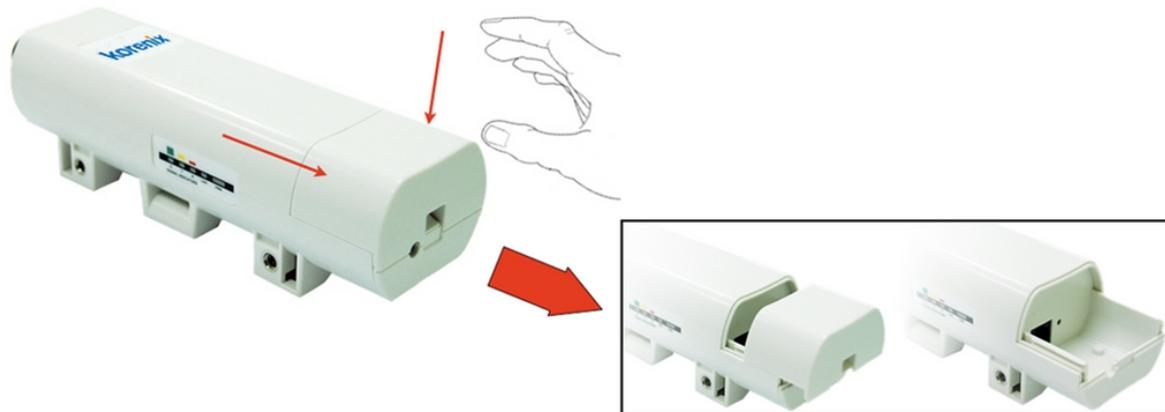
### **Warning:**

- 
- Users **MUST** use the “Power cord & PoE Injector” shipped in the box with the JetWave 2450. Use of other options will cause damage to the JetWave 2450.
-

# Hardware Installation

## Connect up

1. The bottom of the JetWave 2450 is a movable cover. Grab the cover and pull it back harder to take it out as the figure shown below.



**Figure 3 Move the Cover**

2. Plug a standard Ethernet cable into the RJ45 port.



**Figure 4 Cable Connection**

- Slide the cover back to seal the bottom of the JetWave 2450.



**Figure 5 Seal the Bottom**

- Plug the power cord into the DC port of the PoE injector as the following right picture shows.



**Figure 6 Connect to PoE Injector**

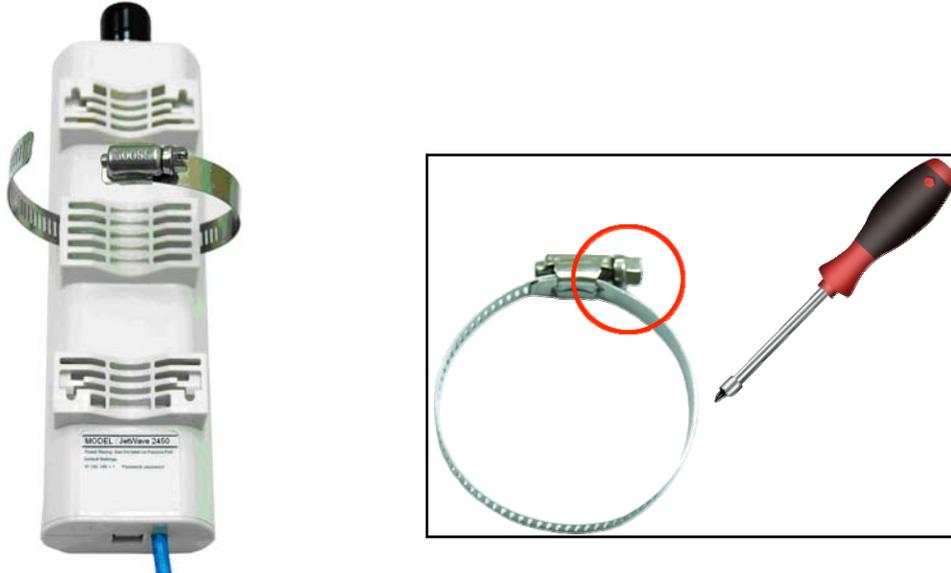
5. Plug the other side of the Ethernet cable as shown in Step 3 into the PoE port of the PoE injector and get the complete set ready.



**Figure 7 Complete Set**

## Pole Mounting

1. Turn the JetWave 2450 over. Put the pole mounting ring through the middle hole of it. Note that you should unlock the pole mounting ring with a screw driver before putting it through JetWave 2450 as the following right picture shows.



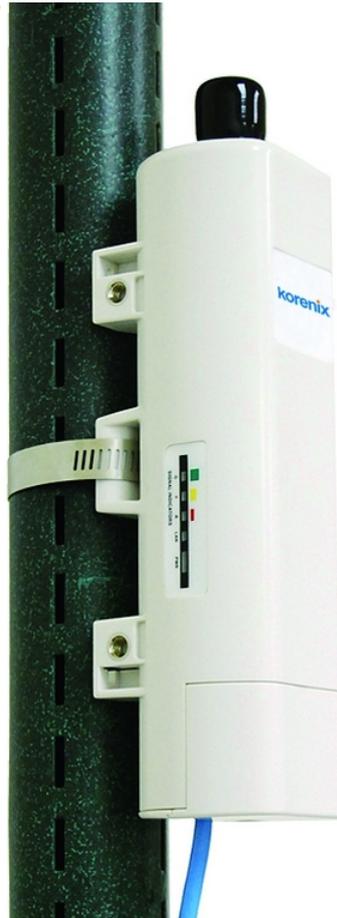
**Figure 8 Pole Mounting – Step 1**

2. Mount JetWave 2450 steadily to the pole by locking the pole mounting ring tightly.



**Figure 9 Pole Mounting – Step 2**

3. Now you have completed the hardware installation of JetWave 2450.

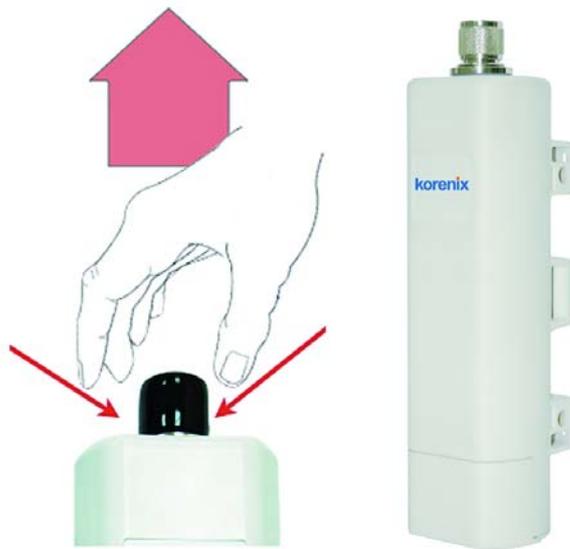


**Figure 10 Pole Mounting – Step 3**

## Using the External Antenna

If you prefer to use the external antenna with N-type connector for your application instead of the built-in directional antenna, please follow the steps below.

1. Grab the black rubber on the top of JetWave 2450, and slightly pull it up. The metal N-type connector will appear.



**Figure 11 Move the Rubber**

2. Connect your antenna with the N-type connector on the top of JetWave 2450.



**Note:**

- 
- If you are going to use an external antenna on JetWave 2450, get some cable in advance.
  - Be aware of the force you use while connecting to the N-type connector, inappropriate force may damage the N-type connector!
- 



**Warning:**

- 
- Users **MUST** power the JetWave 2450 off first before connecting the external antenna to it; otherwise, damage might be caused to the JetWave 2450 itself.
-

# Chapter 3 Basic Settings

## Factory Default Settings

We'll elaborate the JetWave 2450 factory default settings. You can re-acquire these parameters by default. If necessary, please refer to the ["Restore Factory Default Settings"](#).

**Table 1 JetWave 2450 Factory Default Settings**

Features		Factory Default Settings
Username		admin
Password		password
Wireless Device Name		apXXXXXX (X represents the last 6 digits of Ethernet MAC address)
Operating Mode		AP
Data Rate		Auto
LAN	IP Address	192.168.1.1
	Subnet Mask	255.255.255.0
	Gateway	0.0.0.0
	Primary DNS Server	0.0.0.0
	Secondary DNS Server	0.0.0.0
Spanning Tree		Enable
802.11 Mode		802.11b/g/n
Channel Number		6
SSID		Wireless
Broadcast SSID		Enable
HT Protect		Disable
Data Rate		Auto
Output Power		100% (Full)
Channel Mode		20MHz
WMM		Enabled
RTS Threshold (byte)		2346
Fragmentation Length (byte)		2346
Beacon Interval		100
DTIM Interval		1
Space in Meter		0
Flow Control by AP		Disable
Security		Open System
Encryption		None

Wireless Separation		Disable
Access Control		Disable
SNMP	Enable/Disable	Enable
	Read Community Name	Public
	Write Community Name	Private
	IP Address	0.0.0.0

## System Requirements

Before configuration, please make sure your system meets the following requirements:

- A computer coupled with 10/ 100 Base-TX adapter;
- Configure the computer with a static IP address of 192.168.1.x, as the default IP address of JetWave 2450 is 192.168.1.1. (X cannot be 0, 1, nor 255);
- A Web browser on PC for configuration such as Microsoft Internet Explorer 6.0 or above, Netscape or Firefox.

## How to Login the Web-based Interface

The JetWave 2450 provides you with user-friendly Web-based management tool.

- Open Web browser and enter the IP address (Default: **192.168.1.1**) of JetWave 2450 into the address field. You will see the login page as below.



Your Industrial Computing & Networking Partner

Welcome to the JetWave 2450  
802.11b/g/n Wireless Outdoor AP/CPE

Name

Password

Figure 12 Login Page

- Enter the username (Default: **admin**) and password (Default: **password**) respectively and click “**Login**” to login the main page of JetWave 2450. You can see the basic information of JetWave 2450. This management interface provides five main options, which are Status, System, Wireless, Management and Tools.

### Information

This page shows the current status and some basic settings of the device.

---

#### Device Information

Device Name	ap7dcc
Wireless Mode	AP
Firmware Version	1.0.6 CE
MAC Address	00:12:77:27:dc:c7

---

#### IP Settings

IP Address	192.168.1.1
Subnet Mask	255.255.255.0
Gateway IP Address	0.0.0.0

---

#### Wireless Settings

802.11 Mode	802.11b/g/n
Channel	1
WLAN SSID	Korenix
WLAN Encryption Method	Open System

---

**Figure 13 Main Page**

 **Note:**

- 
- The username and password are case-sensitive, and the password should be no more than 19 characters!
-

# Basic System Settings

For users who use the JetWave 2450 for the first time, it is recommended that you begin configuration from “**Basic Settings**” in “**System**” shown below:

**Basic Settings**

Basic Settings.

---

Ethernet DataRate: Auto

Network Modes: Bridge

Device Name : ap27dcc6 (max. 15 characters and no spaces)

Country/Region: United States

Spanning Tree (STP):  Enabled  Disabled

STP Forward Delay: 15 (1~30 seconds)

---

Apply Cancel

Figure 14 Basic System Settings

## Basic Settings

**Ethernet DataRate:** Adjust the data rate of Ethernet connection, including 10/100M full-duplex, half-duplex and Auto.

**Network Mode:** Specify the network mode, including Bridge and Router. It is easy to configure parameters in Bridge Mode; however, users must pay extra attention to the way they configure the device when it is set to Router Mode. For details, please refer to “**IP Settings (Router)**”.

**Device Name:** Specify the device name, which is composed of no more than 15 characters with (0-9), (A-Z), (a-z) or (-).

**Country Region:** The availability of some specific channels and/or operational frequency bands is country dependent.

**Spanning Tree:** Spanning Tree Protocol (STP) is a link management protocol for AP which provides path redundancy while preventing loops in a network. STP allows only one active path at a time between the access points but establish the redundant link as a backup if the initial link fails.

**STP Forward delay:** Enter a value between 1 and 30 seconds. This value is the time that a port waits before changing from Spanning Tree Protocol learning and listening states to forwarding state.

## IP Settings (Bridge)

This is available only under Bridge network mode. Open “**IP Settings (Bridge)**” in “**System**” as below to configure the parameters for LAN which connects to the LAN port of JetWave 2450. In this page, users may change the settings for IP Address, Subnet Mask, and DHCP Server.

### Bridge IP Settings

Use this page to configure the parameters for local area network which connects to the LAN port of your Access Point. Here you may change the setting for IP address, subnet mask, DHCP.

#### IP Address Assignment

- Obtain IP Address Automatically  
 Use Fixed IP Address

IP Address :	<input type="text" value="192.168.10.232"/>
Subnet Mask :	<input type="text" value="255.255.255.0"/>
Gateway Ip Address :	<input type="text" value="0.0.0.0"/>
DNS 1:	<input type="text" value="0.0.0.0"/>
DNS 2:	<input type="text" value="0.0.0.0"/>

**Figure 15 IP Settings (Bridge)**

**Obtain IP Address Automatically:** If a DHCP server exists in your network, you can check this option, thus the JetWave 2450 is able to obtain IP settings automatically from that DHCP server.

**Use Fixed IP Address:** Check this option. You have to specify a static IP address, subnet mask, default gateway and DNS server for JetWave 2450 manually. Make sure the specified IP address is unique on your network in order to prevent IP conflict.

## • IP Settings (Router)

This is available only under Router mode. Open “**IP Settings (Router)**” in “**System**” as below to configure the parameters of JetWave 2450 for accessing the Internet.

## Router IP Settings

Use this page to configure the parameters for accessing to the Internet. Here you may change the access method to Static IP, DHCP, PPPOE.

### WAN Settings:

WAN Access Type:	Static IP
IP Address :	192.168.0.99
Subnet Mask :	255.255.255.0
Default Gateway :	192.168.0.254
DNS 1:	0.0.0.0
DNS 2:	0.0.0.0

### LAN Settings:

IP Address :	192.168.1.1
Subnet Mask :	255.255.255.0
DHCP Server:	Disabled

**Figure 16 IP Settings (Router)**

**WAN Settings:** Specify the Internet access method to Static IP, DHCP or PPPOE. Users must enter WAN IP Address, Subnet Mask, Gateway settings provided by your ISPs.

**LAN Settings:** When DHCP Server is disabled, users can specify IP address and subnet mask for JetWave 2450 manually. Make sure the specified IP address is unique on your network in order to prevent IP conflict. When DHCP Server is enabled, users may specify DHCP IP Address Range, DHCP Subnet Mask, DHCP Gateway and Lease Time (15-44640 minutes).

### Warning:

- In AP mode, JetWave 2450 must establish connection with another wireless device before it is set to Router mode. In Router mode, it is impossible for users to access device via wired port, for WAN is on wired port and LAN is on wireless port. Users can access device through the wireless device connected with JetWave 2450.
- In CPE mode, users can access JetWave 2450 via its wired port, for WAN is on wireless port and LAN is on wired port when device is set to Router mode.
- Bridge mode and AP Repeater mode are similar to AP mode when device is set to Router mode; WAN is on wired port and LAN is on wireless port. Thus users must also connect JetWave 2450 with another wireless device before it is set to Router mode and access JetWave 2450 via the connected wireless device.

# RADIUS Settings

RADIUS (Remote Authentication Dial-In User Service) is a server for remote user authentication and accounting; playing a central role in the network in providing the capabilities of authenticating, authorizing, accounting, auditing, alarming and etc. It allows an organization to maintain user profiles in a central database that all remote servers can share.

Open “**RADIUS Settings**” in “**System**” to make RADIUS configuration.

**RADIUS Settings**

Use this page to set the radius server settings.

---

**Authentication RADIUS Server:**

IP Address

Port

Shared Secret

Reauthentication Time :  Seconds

---

Global-Key Update

every  Seconds

every  x1000 Packets

---

**Figure 17 RADIUS Settings**

- **Authentication RADIUS Server**

This is for RADIUS authentication. It can communicate with RADIUS through IP Address, Port and Shared Secret.

**IP Address**: Enter the IP address of the Radius Server;

**Port**: Enter the port number of the Radius Server;

**Shared Secret**: This secret, which is composed of no more than 31 characters, is shared by the JetWave 2450 and RADIUS during authentication.

**Re-authentication Time**: Set the time interval between two authentications.

**Global-Key Update**: Check this option and specify the time interval between two global-key updates.

# Time Settings

Compliant with NTP, the JetWave 2450 is capable of keeping its time in complete accord with the Internet time. Make configuration in “**Time Settings**” from “**System**”. To use this feature, check “**Enable NTP Client Update**” in advance.

**Time Settings**

You can synchronize System Log's time stamp with a public time server over the Internet.

Current Time : Yr 2000 Mon 1 Day 1 Hr 0 Mn 22 Sec 30

Time Zone Select : (GMT)Greenwich Mean Time: Dublin, Edinburgh, Lisbon, London

Enable NTP client update

NTP server : 192.5.41.41 - North America

Manual IP : 0.0.0.0

Apply Refresh

**Figure 18 Time Settings**

- **Time Zone Select**

Select the time zone from the dropdown list.

- **Time Server**

Select the time server from the “**NTP Server**” dropdown list or manually input the IP address of available time server into “**Manual IP**”.

Hit “**Apply**” to save settings.

# Firewall Settings

The firewall is a system or group of systems that enforce an access control policy between two networks. It may also be defined as a mechanism used to protect a trusted network from an un-trusted network. JetWave 2450 has capabilities of Source IP Filtering, Destination IP Filtering, Source Port Filtering, Destination Port Filtering, Port Forwarding and DMZ. This is available only under Router Mode.

**Source IP Filtering:** The source IP filtering gives users the ability to restrict certain types of data packets from your local network to Internet through JetWave 2450. Use of such filters can be helpful in securing or restricting your local network.

**Source IP Filtering**

Entries in this table are used to restrict certain types of data packets from your local network to Internet through the Gateway. Use of such filters can be helpful in securing or restricting your local network.

Enable Source IP Filtering

Local IP Address:

Comment:

Current Filter Table:

Local IP Address	Comment	Select	Edit
------------------	---------	--------	------

**Figure 19 Source IP Filtering**

**Destination IP Filtering:** The destination IP filtering gives you the ability to restrict the computers in LAN from accessing certain websites in WAN according to specified IP addresses.

**Destination IP Filtering**

Entries in this table are used to restrict the computers in LAN from accessing certain websites in WAN according to IP address.

Enable Destination IP Filtering

Destination IP Address :

Comment :

Current Filter Table:

Destination IP Address	Comment	Select	Edit
------------------------	---------	--------	------

**Figure 20 Destination IP Filtering**

**Source Port Filtering:** The source port filtering enable you to restrict certain ports of data packets from your local network to Internet through JetWave 2450. Use of such filters can be helpful in securing or restricting your local network.

## Source Port Filtering

Entries in this table are used to restrict certain ports of data packets from your local network to Internet through the Gateway. Use of such filters can be helpful in securing or restricting your local network.

Enable Source Port Filtering

Port Range :  -

Protocol :

Comment :

Current Filter Table :

Source Port Range	Protocol	Comment	Select	Edit
-------------------	----------	---------	--------	------

**Figure 21 Source Port Filtering**

**Destination Port Filtering:** The destination port filtering enables you to restrict certain ports of data packets from your local network to Internet through JetWave 2450. Use of such filters can be helpful in securing or restricting your local network.

## Destination Port Filtering

Entries in this table are used to restrict certain ports of data packets from your local network to Internet through the Gateway. Use of such filters can be helpful in securing or restricting your local network.

Enable Destination Port Filtering

Port Range :  -

Protocol :

Comment :

Current Filter Table :

Dest Port Range	Protocol	Comment	Select	Edit
-----------------	----------	---------	--------	------

**Figure 22 Destination Port Filtering**

**Port Forwarding:** The port forwarding allows you to automatically redirect common network services to a specific machine behind the NAT firewall. These settings are only necessary if you wish to host some sort of server like a web server or mail server on the private local network behind JetWave 2450's NAT firewall.

### Port Forwarding

Entries in this table allow you to automatically redirect common network services to a specific machine behind the NAT firewall. These settings are only necessary if you wish to host some sort of server like a web server or mail server on the private local network behind your Gateway's NAT firewall.

---

Enable Port Forwarding

IP Address :

Protocol:

Port Range:  -

Comment:

---

Current Port Forwarding Table:

Local IP Address	Protocol	Port Range	Comment	Select	Edit

---

**Figure 23 Port Forwarding**

**DMZ:** A Demilitarized Zone is used to provide Internet services without sacrificing unauthorized access to its local private network. Typically, the DMZ host contains devices accessible to the Internet traffic, such as Web (HTTP) servers, FTP servers, SMTP (e-mail) servers and DNS servers.

### DMZ

A Demilitarized Zone is used to provide Internet services without sacrificing unauthorized access to its local private network. Typically, the DMZ host contains devices accessible to Internet traffic, such as Web (HTTP) servers, FTP servers,SMTP (e-mail) servers and DNS servers.

Enable DMZ

DMZ Host IP Address:

---

**Figure 24 DMZ**

# Basic Wireless Settings

Open “Basic Settings” in “Wireless” as below to make basic wireless configuration.

## Wireless Basic Settings

Use this page to configure the parameters for wireless LAN clients which may connect to your Access Point. Here you may change wireless mode as well as wireless network parameters.

---

Disable Wireless LAN Interface

Wireless Mode :

Wireless Network Name (SSID):

Broadcast SSID:  Enabled  Disabled

802.11 Mode :

HT protect:  Enabled  Disabled

Channel Number:

Antenna:  Internal (8 dBi)  External (N-Type)

Output Power :

Data Rate:

Channel mode:

Extension channel protection mode:

---

Figure 25 Basic Wireless Settings

### • Disable Wireless LAN Interface

Check this option to disable WLAN interface, then the wireless module of JetWave 2450 will stop working and no wireless device can connect to it.

### • Wireless Mode

Four operating modes are available on JetWave 2450.

**Wireless Client:** The JetWave 2450 is able to connect to the AP and thus join the wireless network around it.

**AP:** The JetWave 2450 establishes a wireless coverage and receives connectivity from other wireless devices.

**Bridge:** The JetWave 2450 establishes wireless connectivity with other APs by key-in remote MAC address .If necessary, please refer to the “WDS Setting”.

**AP Repeater:** The JetWave 2450 servers as AP and Bridge at the same time. In other words, the JetWave 2450 can provide connectivity services for CPEs under WDS mode.

- **Wireless Network Name (SSID)**

This wireless network name is shared among all associated devices in your wireless network. Keep it identical on all those devices. Note that the SSID is case-sensitive and can not exceed 32 characters.

- **Broadcast SSID**

Under AP mode, hiding network name is necessary when you are in a wireless environment that may have potential risk. By disabling broadcast SSID, the STA can not scan and find JetWave 2450, so that malicious attack by some illegal STA could be avoided.

- **802.11 Mode**

The JetWave 2450 can communicate with wireless devices of 802.11b/g or 802.11b/g/n. You can also select Auto and make it work under an appropriate wireless mode automatically.

- **HT Protect**

Enable HT (High Throughput) protect to ensure HT transmission with MAC mechanism. Under 802.11n mode, wireless client can be divided into HT STA and Non-HT STA, among which the one with HT protect enabled gets higher throughput.

- **Channel Number**

Channel varies much as the available band differs from country to country. Select a proper operating channel in the drop-down list according to your situation.

- **Antenna**

By default, JetWave 2450 uses its built-in antenna for directional transmission; however, if you prefer to use an external antenna for your case-dependent applications, you can switch from "Internal (8 dBi)" to "External (N-Type)".

 **Note:**

- 
- You are able to choose "External (N-Type)" only when you have well done installing the external antenna; otherwise, it might hurt JetWave 2450 itself.
- 

- **Output Power**

Specify the signal transmission power. The higher the output power is, the wider the signal can cover, but the power consumption will be greater accordingly. Usually "Full" is preferred.

- **Data Rate**

Usually “**Auto**” is preferred. Under this rate, the JetWave 2450 will automatically select the highest available rate to transmit. In some cases, however, like where there is no great demand for speed, you can have a relatively-low transmit rate for compromise of a long distance.

- **Channel Mode**

Two levels are available: 20MHz and 40MHz. The latter one can enhance the data rate more effectively, but takes more bandwidth, thus cause potential interference.

- **Extension Channel Protection Mode**

This is to avoid conflict with other wireless network and boost the ability of your device to catch all 802.11g transmissions. However, it may decrease wireless network performance. Compared to CTS-Self; the transmission amount of CTS-RTS is much lower.

- **Enable MAC Clone**

Available only under wireless client mode, it hides the MAC address of the AP while displays the one of associated wireless client or the MAC address designated manually.

## Site Survey

Under wireless client mode, the JetWave 2450 is able to perform site survey, through which, information on the available access points will be detected.

Open “**Basic Settings**” in “**Wireless**”, by clicking the “**Site Survey**” button beside “**Wireless Mode**” option, the wireless site survey window will popup with a list of available wireless networks around. Select the AP you would like to connect and click “**Selected**” to establish connection. The wireless site survey window can also be viewed by opening the “**Site Survey**” page in “**Tools**”.

### Wireless Site Survey

This page provides tool to scan the wireless network. If any Access Point or IBSS is found, you could choose to connect it manually when client mode is enabled.

Select	SSID	Channel	MAC Address	Wireless Mode	Signal Strength	Security
<input type="radio"/>	HPL_03	1	00:12:0e:49:67:5e	b/g	-80	NONE
<input type="radio"/>	chainlink	1	00:0f:3d:e1:23:fa	b/g	-86	NONE
<input type="radio"/>	chiang	1	00:1e:8c:70:e3:f9	b/g	-87	WPA
<input checked="" type="radio"/>	KorenixAP	6	00:14:85:d8:66:ca	b/g	-62	NONE
<input type="radio"/>	corega	6	00:0a:79:a1:96:ed	b/g	-78	NONE
<input type="radio"/>	HTC	6	00:0b:86:38:dc:e0	b/g	-86	NONE
<input type="radio"/>	HTCGUEST	6	00:0b:86:38:dc:e1	b/g	-85	NONE

Figure 26 Site Survey

# Chapter 4 Advanced Settings

## Advanced Wireless Settings

Open “Advanced Settings” in “Wireless” to make advanced wireless settings.

### Wireless Advanced Settings

These settings are only for more technically advanced users who have a sufficient knowledge about wireless LAN. These settings should not be changed unless you know what effect the changes will take.

WMM Support:	<input checked="" type="radio"/> Enabled	<input type="radio"/> Disabled
A-MPDU aggregation:	<input checked="" type="radio"/> Enabled	<input type="radio"/> Disabled
A-MSDU aggregation:	<input type="radio"/> Enabled	<input checked="" type="radio"/> Disabled
Short GI:	<input checked="" type="radio"/> Enabled	<input type="radio"/> Disabled
RTS Threshold:	<input type="text" value="2346"/>	(1-2346)
Fragment Threshold:	<input type="text" value="2346"/>	(256-2346)
Beacon Interval:	<input type="text" value="100"/>	(20-1024 ms)
DTIM Interval:	<input type="text" value="1"/>	(1-255)
Preamble Type:	<input type="radio"/> Long	<input checked="" type="radio"/> Short
IGMP Snooping:	<input checked="" type="radio"/> Enabled	<input type="radio"/> Disabled
Wireless Separation:	<input type="radio"/> Enabled	<input checked="" type="radio"/> Disabled
RIFS:	<input checked="" type="radio"/> Enabled	<input type="radio"/> Disabled
Link Intergration:	<input type="radio"/> Enabled	<input checked="" type="radio"/> Disabled
Max. Station Num:	<input type="text" value="32"/>	(0-32)
Space In Meter:	<input type="text" value="0"/>	(0-15000m)

---

**Flow Control**

Enable Traffic Shaping

Incoming Traffic Limit:  kbit/s

©

Figure 27 Advanced Wireless Settings

#### • WMM Support

WMM (Wi-Fi Multimedia) is a subset of 802.11e. It allows wireless communication to define a priority limit on the basis of data type under AP mode only, thus those time-sensitive data, like video/audio data, may own a higher priority than common one. To enable WMM, the wireless client should support it.

#### • A-MPDU/A-MSDU Aggregation

The data rate of your AP except wireless client mode could be enhanced greatly with this option enabled; however, if your wireless clients don't support A-MPDU/A-MSDU aggregation, it is recommended not to enable it.

- **Short GI**

Under 802.11n mode, enable it to obtain better data rate if there is no negative compatibility issue.

- **RTS Threshold**

The JetWave 2450 sends RTS (Request to Send) frames to certain receiving station and negotiates the sending of a data frame. After receiving an RTS, that STA responds with a CTS (Clear to Send) frame to acknowledge the right to start transmission. The setting range is 0 to 2346 in byte.

- **Fragmentation Length**

Specify the maximum size in byte for a packet before data is fragmented into multiple packets. Setting it too low may result in poor network performance. Leave it at its default of 2346 is recommended.

- **Beacon Interval**

Specify the frequency interval to broadcast packets. Enter a value between 20 and 1024.

- **DTIM Interval**

DTIM, which stands for Delivery Traffic Indication Message, is contained in the data packets. It is for enhancing the wireless transmission efficiency. The default is set to 1. Enter a value between 1 and 255.

- **Preamble Type**

It defines some details on the 802.11 physical layer. “**Long**” and “**Short**” are available.

- **IGMP Snooping**

IGMP snooping is the process of listening to IGMP network traffic. By enabling IGMP snooping, the AP will listen to IGMP membership reports, queries and leave messages to identify the ports that are members of multicast groups. Multicast traffic will only be forwarded to ports identified as members of the specific multicast group or groups.

- **Wireless Separation**

Wireless separation is an ideal way to enhance the security of network transmission. Under the mode except wireless client mode, enable “**Wireless Separation**” can prevent the communication among associated wireless clients.

- **RIFS**

RIFS (Reduced Interframe Spacing) is a means of reducing overhead and thereby increasing network efficiency.

- **Link Integration**

Available under AP/Bridge/AP repeater mode, it monitors the connection on the Ethernet port by checking “**Enabled**”. It can inform the associating wireless clients as soon as the disconnection occurs.

- **Max. Station Num**

Available only under AP mode, it defines the maximum amount of wireless clients allowed to be connected.

- **Space in Meter/ACK Timeout**

To decrease the chances of data retransmission at long distance, the JetWave 2450 can automatically adjust proper ACK timeout value by specifying distance of the two nodes.

- **Flow Control**

It allows the administrator to specify the incoming and outgoing traffic limit by checking “**Enable Traffic Shaping**”. This is only available in Router mode.

 **Note:**

- 
- We strongly recommended you leave most advanced settings at their defaults except “Distance in Meters” adjusted the parameter for real distance; any modification on them may negatively impact the performance of your wireless network.
-

# Wireless Security Settings

To prevent unauthorized radios from accessing data transmitting over the connectivity, the JetWave 2450 provides you with rock solid security settings.

## Security Settings

Open “**Security Settings**” in “**Wireless**” as below:

**Security Settings**  
Custom WLAN's security profile settings.

Network Authentication: Open System ▼  
Data Encryption: None ▼  
Key Type: Hex ▼  
Default Tx Key: Key 1 ▼  
WEP Passphrase:    
Encryption Key 1:   
Encryption Key 2:   
Encryption Key 3:   
Encryption Key 4:

**Figure 28 Security Settings**

### • Network Authentication

**Open System**: It allows any device to join the network without performing any security check.

**Shared Key**: Data encryption and key are required for wireless authentication.

**Legacy 802.1x**: As an IEEE standard for port-based Network Access Control, it provides the rights to access the wireless network and wired Ethernet. With User and PC identity, centralized authentication as well as dynamic key management, it controls the security risk of wireless network to the lowest. To serve the 802.1x, at least one EAP type should be supported by the RADIUS Server, AP and wireless client.

**WPA with RADIUS**: With warrant (username, password and etc.) offered by user, this kind of authentication can be realized with specific RADIUS server. This is the common way to be adopted in large enterprise network.

**WPA2 with RADIUS**: As a new version of WPA, only all the clients support WPA2, can it be available. If it is selected, AES encryption and RADIUS server is required.

**WPA&WPA2 with RADIUS**: It provides options of WPA (TKIP) or WPA2 (AES) for the client. If it is selected, the data encryption type must be TKIP + AES and the RADIUS server must be set.

**WPA-PSK**: It is a simplified WPA mode with no need for specific authentication server. In this so-called WPA Pre-Shared Key, all you have to do is just pre-enter a key in each WLAN node and this is the common way to be adopted in large and middle enterprise as well as residential network.

**WPA2-PSK**: As a new version of WPA, only all the clients support WPA2, can it be available. If it is selected, the data encryption can only be AES and the passphrase is required.

**WPA-PSK&WPA2-PSK**: It provides options of WPA (TKIP) or WPA2 (AES) encryption for the client. If it is selected, the data encryption can only be TKIP + AES and the passphrase is required.

#### • **Data Encryption**

If data encryption is enabled, the key is required and only sharing the same key with other wireless devices can the communication be established.

**None**: Available only when the authentication type is open system.

**64 bits WEP**: It is made up of 10 hexadecimal numbers.

**128 bits WEP**: It is made up of 26 hexadecimal numbers.

**152 bits WEP**: It is made up of 32 hexadecimal numbers.

**TKIP**: Temporal Key Integrity Protocol, which is a kind of dynamic encryption, is co-used with WPA-PSK, etc.

**AES**: Advanced Encryption Standard, it is usually co-used with WPA2-PSK, WPA, WPA2, etc.

**TKIP + AES**: It allows for backwards compatibility with devices using TKIP.

#### **Note:**

- 
- We strongly recommend you enable wireless security on your network!
  - Only setting the same Authentication, Data Encryption and Key in the JetWave 2450 and other associated wireless devices, can the communication be established!
-

## Access Control

The Access Control appoints the authority to wireless client on accessing JetWave 2450, thus a further security mechanism is provided. This function is available only under AP mode.

Open “**Access Control**” in “**Wireless**” as below.

**Wireless Access Control**

If you choose 'Allowed Listed', only those clients whose wireless MAC addresses are in the access control list will be able to connect to your Access Point. When 'Deny Listed' is selected, these wireless clients on the list will not be able to connect the Access Point.

---

Access Control Mode:

MAC Address:

---

MAC Address	Select	Edit
-------------	--------	------

**Figure 29 Access Control**

### • Access Control Mode

If you select “**Allow Listed**”, only those clients whose wireless MAC addresses are in the access control list will be able to connect to your AP. While when “**Deny Listed**” is selected, those wireless clients on the list will not be able to connect the AP.

### • MAC Address

Enter the MAC address of the wireless client that you would like to list into the access control list, click “**Apply**” then it will be added into the table at the bottom.

### • Delete Selected/All

Check the box before one or more MAC addresses of wireless client(s) that you would like to cancel, and click “**Delete Selected**” or “**Delete All**” to cancel that access control rule.

## WDS Settings

Extend the range of your network without having to use cables to link the Access Points by using the Wireless Distribution System (WDS): Put simply, you can link the Access Points wirelessly. Open “WDS Settings” in “Wireless” as below:

### WDS Settings

Wireless Distribution System uses wireless media to communicate with other APs, like the Ethernet does. To do this, you must set these APs in the same channel and set MAC addresses of other APs which you want to communicate with in the table and then enable the WDS. This function can work only in Bridge and AP Repeater mode.

---

Local MAC Address:	<input type="text" value="00:12:77:20:fa:bc"/>
Remote AP MAC Address1:	<input type="text"/>
Remote AP MAC Address2:	<input type="text"/>
Remote AP MAC Address3:	<input type="text"/>
Remote AP MAC Address4:	<input type="text"/>

---

**Figure 30 WDS Settings**

Enter the MAC address of another AP you wirelessly want to connect to into the appropriate field and click “**Apply**” to save settings.

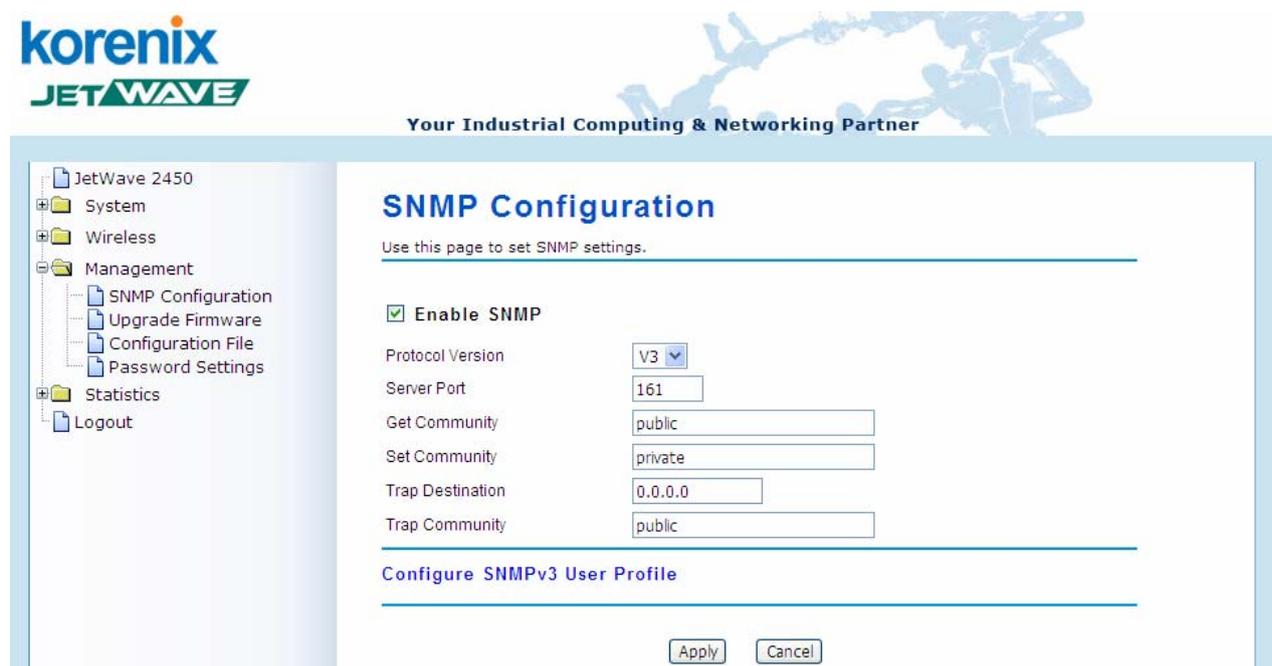
 **Note:**

- 
- WDS Settings is available only under Bridge and AP Repeater Mode.
-

# Chapter 5 Management

## SNMP Management

The JetWave 2450 supports SNMP for convenient remote management. Open “**SNMP Configuration**” in “**Management**” shown below. Set the SNMP parameters and obtain MIB file before remote management.



**Figure 31 SNMP Configuration**

- **Enable SNMP**

Check this box to enable SNMP settings.

- **Protocol Version**

Select the SNMP version, and keep it identical on the JetWave 2450 and the SNMP manager.

- **Server Port**

Change the server port for a service if needed; however you have to use the same port to use that service for remote management.

- **Get Community**

Specify the password for the incoming Get and GetNext requests from the management station. By default, it is set to public and allows all requests.

- **Set Community**

Specify the password for the incoming Set requests from the management station. By default, it is set to private.

- **Trap Destination**

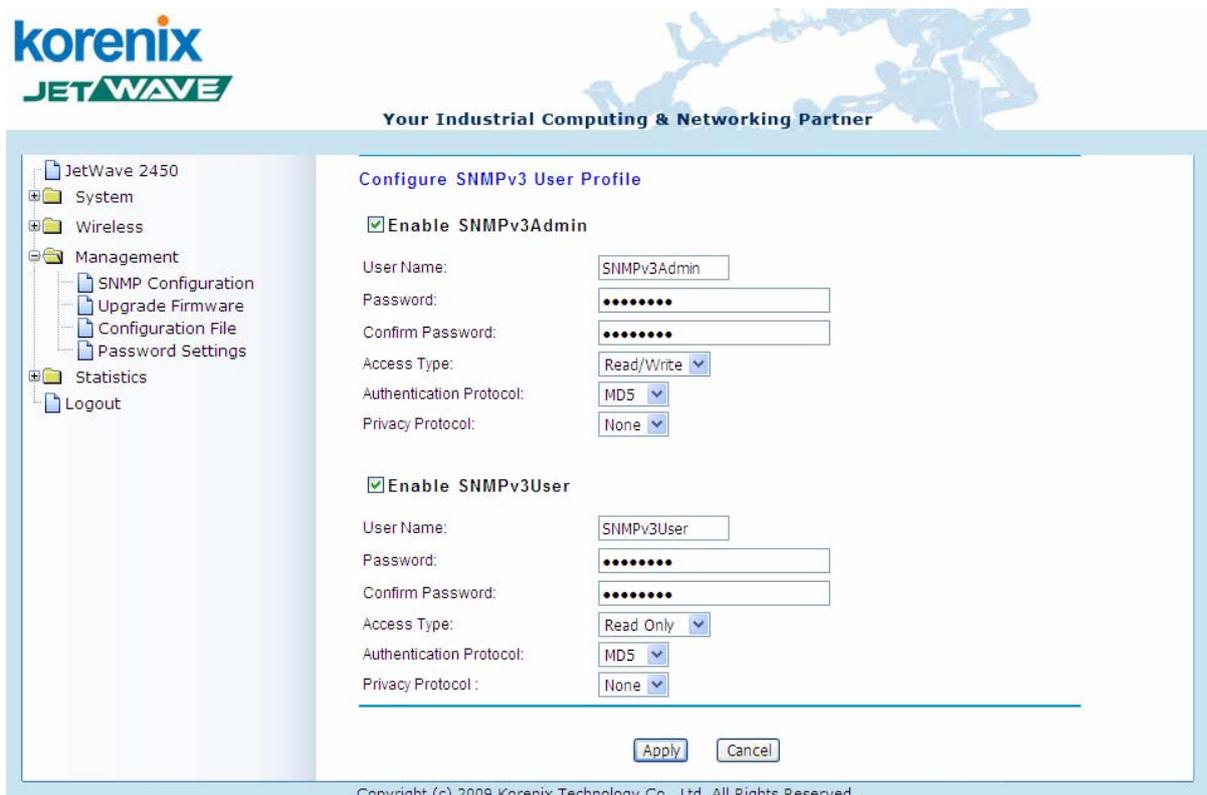
Specify the IP address of the station to send the SNMP traps to.

- **Trap Community**

Specify the password sent with each trap to the manager. By default, it is set to public and allows all requests.

## Configure SNMPv3 User Profile

For SNMP protocol version 3, you can click “**Configure SNMPv3 User Profile**” in blue to set the details of SNMPv3 user. Check “**Enable SNMPv3 Admin/User**” in advance and make further configuration.



**Figure 32 Configure SNMPv3 User Profile**

- **User Name**

Specify a user name for the SNMPv3 administrator or user. Only the SNMP commands carrying this user name are allowed to access the JetWave 2450.

- **Password**

Specify a password for the SNMPv3 administrator or user. Only the SNMP commands carrying this password are allowed to access the JetWave 2450.

- **Confirm Password**

Input that password again to make sure it is your desired one.

- **Access Type**

Select “**Read Only**” or “**Read and Write**” accordingly.

- **Authentication Protocol**

Select an authentication algorithm. SHA authentication is stronger than MD5 but is slower.

- **Privacy Protocol**

Specify the encryption method for SNMP communication. None, DES and None are available.

**None:** No encryption is applied.

**DES:** Data Encryption Standard, it applies a 58-bit key to each 64-bit block of data.

## Password

From “**Password Settings**” in “**Management**”, you can change the password to manage your JetWave 2450. Enter the new password respectively in “**New Password**” and “**Confirm Password**” fields; click “**Apply**” to save settings.

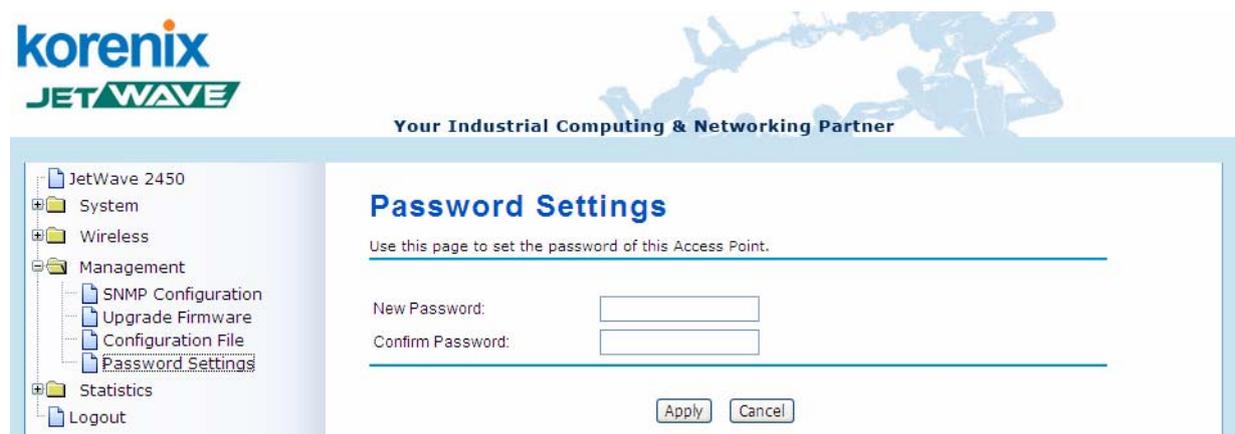


Figure 33 Password

 **Note:**

- The password is case-sensitive and its length can not exceed 19 characters!

# Upgrade Firmware

Open “Firmware Upload” in “Management” and follow the steps below to upgrade firmware locally or remotely through JetWave 2450’s Web:



Figure 34 Upgrade Firmware

- Click “**Browse**” to select the firmware file you would like to load;
- Click “**Upload**” to start the upload process;
- Wait a moment, the system will reboot after successful upgrade.

 **Note:**

- 
- Do NOT cut the power off during upgrade, otherwise the system may crash!
- 

# Backup/ Retrieve Settings

It is strongly recommended you back up configuration information in case of something unexpected. If tragedy hits your device, you may have an access to restore the important files by the backup. All these can be done by the local or remote computer. Open “Configuration File” in “Management” as below:

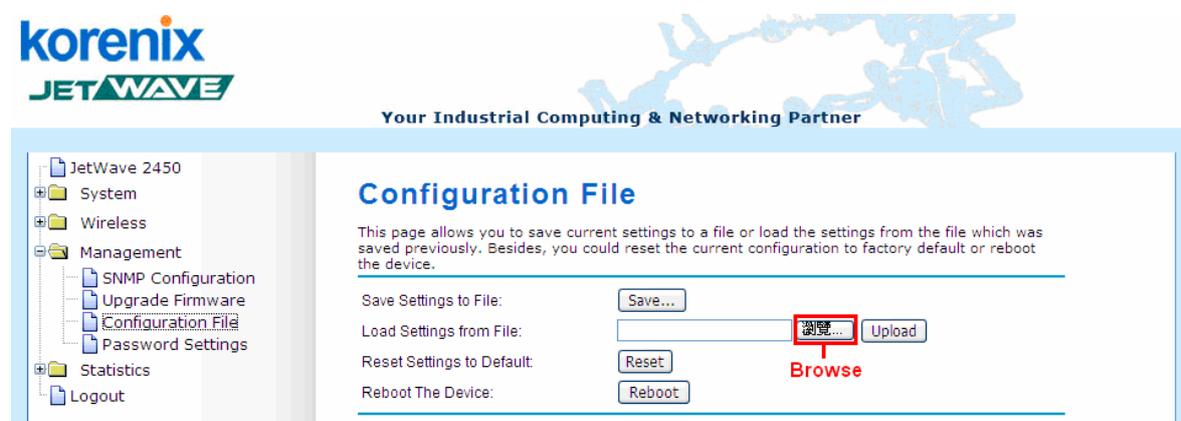


Figure 35 Backup/Retrieve Settings

- **Backup Settings**

By clicking “**Save**” a dialog box will popup. Save it, then the configuration file like ap.cfg will be saved to your local computer.

- **Retrieve Settings**

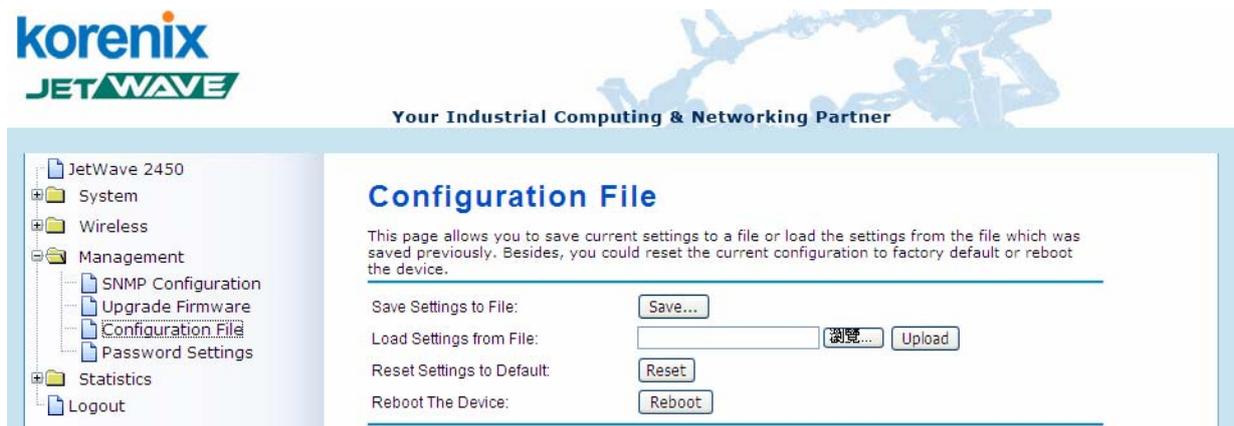
By clicking “**Browse**” a file selection menu will appear, select the file you want to load, like ap.cfg; Click “**Upload**” to load the file. After automatically rebooting, new settings are applied.

## Restore Factory Default Settings

The JetWave 2450 provides two ways to restore the factory default settings:

- **Restore factory default settings via Web**

From “**Configuration File**”, clicking “**Reset**” will eliminate all current settings and reboot your device, then default settings are applied.



**Figure 36 Restore Settings**

- **Restore factory default settings via RS-232**

If software in JetWave 2450 is unexpectedly crashed and no longer reset the unit via Web, you may do hardware reset via the reset button.

## Reboot

You can reboot your JetWave 2450 from “**Configuration File**” in “**Management**” as below:

Click “**Reboot**” and hit “**Yes**” upon the appeared prompt to start reboot process. This takes a few minutes.

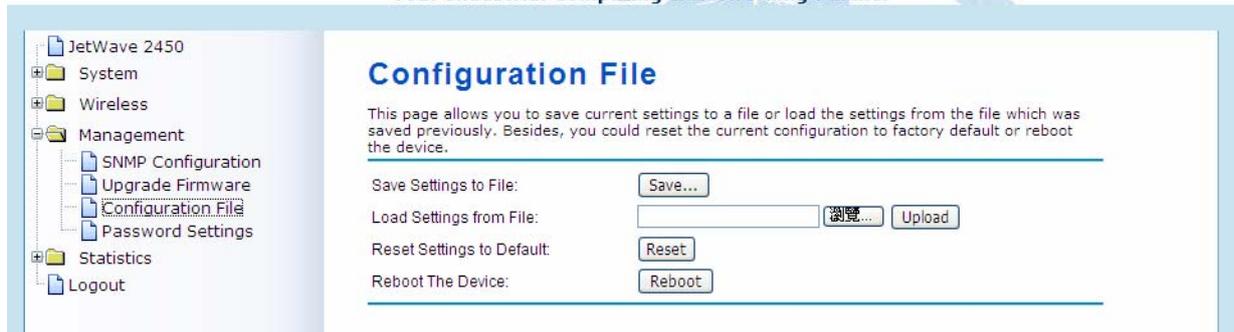


Figure 37 Reboot

## System Log

System log is used for recording events occurred on the JetWave 2450, including station connection, disconnection, system reboot and etc.

Open “**System Log**” in “**Tools**” as below.

### System Log

Use this page to set remote log server and show the system log.

#### Remote Syslog Server:

Enable Remote Syslog

IP Address

Port

#	Time	Source	Message
1	00:00:14	00:12:77:27:DC:00	WLAN service started.
2	00:00:15	00:12:77:27:DC:00	WLAN service stopped.
3	00:00:15	00:12:77:27:DC:00	WLAN service started.
4	00:00:15	00:12:77:27:DC:00	WLAN service stopped.
5	00:00:15	00:12:77:27:DC:00	WLAN service started.
6	00:00:17	00:12:77:27:DC:00	WLAN service stopped.
7	00:00:17	00:12:77:27:DC:00	WLAN service started.
8	00:02:08	N/A	WEB: Authorized user "adm n" from 192.168.1.93.

Figure 38 System Log

#### Remote Syslog Server

**Enable Remote Syslog:** Enable System log or not.

**IP Address:** Specify the IP address of the server.

**Port:** Specify the port number of the server.

# Chapter 6 Status

## View JetWave 2450 Basic Information

Open “**Information**” in “**Status**” to check the basic information of JetWave 2450, which is read only. Click “**Refresh**” at the bottom to have the real-time information.

### Information

This page shows the current status and some basic settings of the device.

#### System Information

Device Name	ap27dcc6
MAC Address	00:12:77:27:dc:c7
Country/Region	United States
Firmware Version	1.0.6 CE

#### LAN Settings

IP Address	192.168.10.232
Subnet Mask	255.255.255.0
Gateway IP Address	0.0.0.0
MAC Address	00:12:77:27:dc:c7

#### Wireless Settings

Operation Mode	AP
Wireless Mode	802.11b/g/n
WLAN SSID	Wireless

Figure 39 Basic Information

## Association List

Open “**Association List**” in “**Connection**” from “**Status**” to check the information of associated wireless clients. All is read only. Click “**Refresh**” at the bottom to view the current association list.

### Association List

This table shows the MAC Address, IP Address and RSSI for each associated wireless client.

MAC Address	IP Address	RSSI	Association Time
None	---	---	---

Refresh

Figure 40 Connection

# View Network Flow Statistics

Open “**Network Flow**” in “**Status**” to check the data packets received on and transmitted from the wireless and Ethernet ports. Click “**Refresh**” to view current statistics.

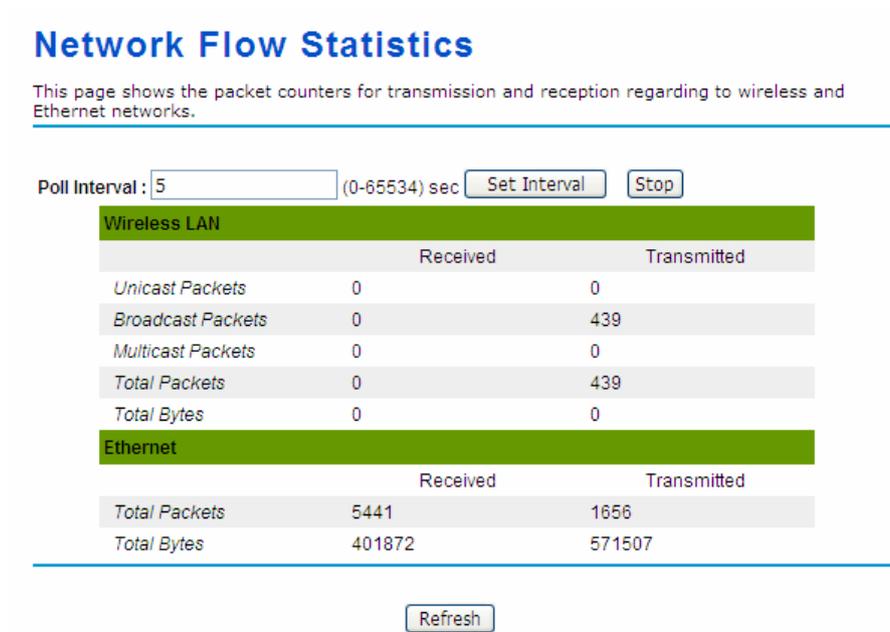


Figure 41 Network Flow Statistics

## • Poll Interval

Specify the refresh time interval in the box beside “**Poll Interval**” and click “**Set Interval**” to save settings. “**Stop**” helps to stop the auto refresh of network flow statistics.

# View Bridge Table

Open “**Bridge Table**” in “**Status**” as below. Click “**Refresh**” to view current connected status..

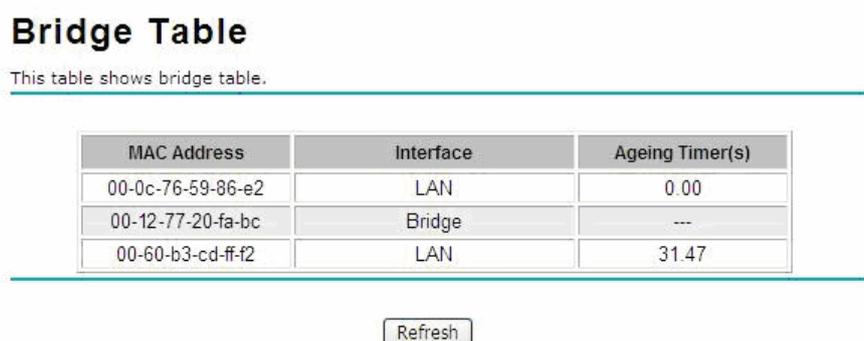
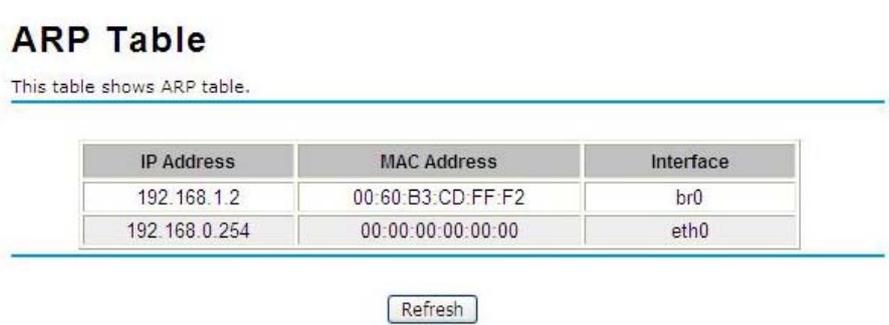


Figure 42 Bridge Table

# View ARP Table

Open “ARP Table” in “Status” as below. Click “Refresh” to view current table.



**ARP Table**

This table shows ARP table.

IP Address	MAC Address	Interface
192.168.1.2	00:60:B3:CD:FF:F2	br0
192.168.0.254	00:00:00:00:00:00	eth0

Refresh

Figure 43 ARP Table

# View Active DHCP Client Table

Open “DHCP Client List” in “Status” as below to check the assigned IP address, MAC address and time expired for each DHCP leased client. Click “Refresh” to view current table.



**Active DHCP Client Table**

This table shows the assigned IP address, MAC address and time expired for each DHCP leased client.

IP Address	MAC Address	Time Expired(s)
192.168.1.16	00:60:b3:cd:ff:f2	431995

Refresh

Figure 44 DHCP Client Table

# Chapter 7 Troubleshooting

This chapter provides troubleshooting procedures for basic problems with the JetWave 2450. For warranty assistance, contact your service provider or distributor for the process.

## Q 1. How to know the MAC address of JetWave 2450?

MAC Address distinguishes itself by the unique identity among network devices. For Korenix products, the MAC Address is **001277-XXXXXX**. There are two ways available to know it.

- Each device has a label posted with the MAC address. Please refer to below.

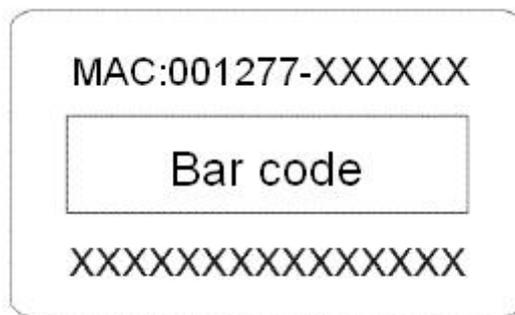


Figure 15 MAC Address

- On the JetWave 2450 Web-based management interface, you can view the MAC Address from "View JetWave 2450 Basic Information".

## Q 2. What if I would like to reset the unit to default settings?

You may restore factory default settings in "**Configuration File**" from "**Management**".

## Q 3. What if I would like to backup and retrieve my configuration settings?

You may do the backup by generating a configuration file or retrieve the settings you have backed up previously in "**Configuration File**" from "**Management**".

## Q 4. What if I can not access the Web-based management interface?

Please check the followings:

- Check whether the power supply is OK; Try to power on the unit again.
- Check whether the IP address of PC is correct (in the same network segment as the unit);
- Login the unit via other browsers such as Firefox.
- Hardware reset the unit.

**Q 5. What if the wireless connection is not stable after associating with an AP under wireless client mode?**

- Since the JetWave 2450 comes with a built-in directional antenna, it is recommended make the JetWave 2450 face to the direction where the AP is to get the best connection quality.
- In addition, you can start “**Site Survey**” in “**Wireless Basic Settings**” to check the signal strength. If it is weak or unstable (The smaller the number is, the weaker the signal strength is.), please join other available AP for better connection.

# Appendix A. ASCII

WEP can be configured with a 64-bit or 128-bit Shared Key (hexadecimal number or ASCII). As defined, hexadecimal number is represented by 0-9, A-F or a-f; ASCII is represented by 0-9, A-F, a-f or punctuation. Each one consists of two-digit hexadecimal.

**Table 2 ASCII**

ASCII Character	Hex Equivalent						
!	21	9	39	Q	51	i	69
"	22	:	3A	R	52	j	6A
#	23	;	3B	S	53	k	6B
\$	24	<	3C	T	54	l	6C
%	25	=	3D	U	55	m	6D
&	26	>	3E	V	56	n	6E
'	27	?	3F	W	57	o	6F
(	28	@	40	X	58	p	70
)	29	A	41	Y	59	q	71
*	2A	B	42	Z	5A	r	72
+	2B	C	43	[	5B	s	73
,	2C	D	44	\	5C	t	74
-	2D	E	45	]	5D	u	75
.	2E	F	46	^	5E	v	76
/	2F	G	47	_	5F	w	77
0	30	H	48	`	60	x	78
1	31	I	49	a	61	y	79
2	32	J	4A	b	62	z	7A
3	33	K	4B	c	63	{	7B
4	34	L	4C	d	64		7C
5	35	M	4D	e	65	}	7D
6	36	N	4E	f	66	~	7E
7	37	O	4F	g	67		
8	38	P	50	h	68		

# Appendix B. GPL Declamation

## PUBLIC SOFTWARE DECLAMATION

In the software we delivered, there may contains some public software, if it is, please read below carefully:

### 1. Definition

“**Public Software**”, when applicable, shall mean that portion of the Licensed Software, in source code form, set forth in the below Table, and provided under the terms set forth in the Section 5, the indicated website, the complete license terms can be found.

“Public Software” shall mean each of:

- (a) any computer code that contains, or is derived in any manner (in whole or in part) from, any computer code that is distributed as open source software (e.g. Linux) or similar licensing or distribution models; and
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**Table 3 Public Software Name and Description**

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Busybox		<a href="http://www.busybox.net/downloads/busybox-1.01.tar.bz2">http://www.busybox.net/downloads/busybox-1.01.tar.bz2</a>	GNU GENERAL PUBLIC LICENSE Version 2	<a href="http://www.gnu.org/licenses/old-licenses/gpl-2.0.html">http://www.gnu.org/licenses/old-licenses/gpl-2.0.html</a>
brctl	Copyright (C) 2000 Lennert Buytenhek	<a href="http://nchc.dl.sourceforge.net/s">http://nchc.dl.sourceforge.net/s</a>	GNU GENERAL PUBLIC LICENSE Version 2	<a href="http://www.gnu.org/licenses/old-licenses/gpl-2.0.ht">http://www.gnu.org/licenses/old-licenses/gpl-2.0.ht</a>

		sourceforge/bridge/bridge-utils-1.0.6.tar.gz		ml
dropbear	Copyright (c) 2002-2006 Matt Johnston Portions copyright (c) 2004 Mihnea Stoenescu	http://matt.ucc.asn.au/dropbear/dropbear-0.51.tar.bz2	GNU GENERAL PUBLIC LICENSE Version 2	http://www.gnu.org/licenses/old-licenses/gpl-2.0.html
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wpa_supplicant	Copyright (c) 2003-2005, Jouni Malinen <jkmaline@cc.hut.fi> and contributors	http://hostap.epitest.fi/releases/wpa_supplicant-0.4.7.tar.gz	GNU GENERAL PUBLIC LICENSE Version 2	http://www.gnu.org/licenses/old-licenses/gpl-2.0.html
mtdutil		ftp://ftp.uk.linux.org/pub/people/dwmw2/mtd/cvs/mtd/util/	GNU GENERAL PUBLIC LICENSE Version 2	http://www.gnu.org/licenses/old-licenses/gpl-2.0.html
ntpclient	Copyright 1997, 1999, 2000, 2003 Larry Doolittle	http://doolittle.icarus.com/ntpclient/ntpclient_2003_194.tar.gz	GNU GENERAL PUBLIC LICENSE Version 2	http://www.gnu.org/licenses/old-licenses/gpl-2.0.html
procps	Author: Albert Cahalan, Michael K. Johnson, Jim Warner, etc.	http://procps.sourceforge.net/procps-3.2.7.tar.gz	GNU GENERAL PUBLIC LICENSE Version 2 GNU LIBRARY GENERAL PUBLIC LICENSE Version 2	http://www.gnu.org/licenses/old-licenses/gpl-2.0.html http://www.gnu.org/licenses/old-licenses/library.html
vsftpd	Author: Chris Evans	ftp://vsftpd.beasts.org/users/ce	GNU GENERAL PUBLIC LICENSE Version 2	http://www.gnu.org/licenses/old-licenses/gpl-2.0.ht

		vans/vsftpd-1.1.2.tar.gz		ml
linux		ftp://ftp.kernel.org/pub/linux/kernel/v2.6/linux-2.6.20.3.tar.bz2	GNU GENERAL PUBLIC LICENSE Version 2	<a href="http://www.gnu.org/licenses/old-licenses/gpl-2.0.html">http://www.gnu.org/licenses/old-licenses/gpl-2.0.html</a>