Wireless LAN Device Series

Multi-Mode AP

ZWA-G220 User's Manual

Version. 1.4.3b (2007.07.31)

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Notice

FCC Warning

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

This device complies with Part 15 of the FCC Rules. Operation is subject to the following two conditions： (1) This device may not cause harmful interference, and (2) this device must accept any interference received, including interference that may cause undesired operation.

The user’s manual or instruction manual for an intentional or unintentional radiator shall caution the user that changes or modifications not expressly approved by the party responsible for compliance could void the user’s authority to operate the equipment.

FCC 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 or more of the following measures：

- Reorient or relocate the receiving antenna.
- Increase the separation between the equipment and receiver.
- Connect the equipment into an outlet on a circuit different from that to which the receiver is connected.
- Consult the dealer or an experienced radio/TV technician for help.

FCC RF 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. For product available in the USA/Canada market, only channel 1~11 can be operated. Selection of other channels is not possible. The antenna(s) used for this transmitter must not be co-located or operating in conjunction with any other antenna or transmitter. Shielded interface cables must be used in order to comply with emission limits.

CE Statement

Hereby, ZINWELL, declares that this device is in compliance with the essential requirement and other relevant provisions of the R&TTE Directive 1999/5/EC.

This device will be sold in the following EEA countries：Austria, Italy, Belgium, Liechtenstein, Denmark, Luxembourg, Finland, Netherlands, France, Norway, Germany, Portugal, Greece, Spain, Iceland, Sweden, Ireland, United Kingdom, Cyprus, Czech Republic, Estonia, Hungary, Latvia, Lithuania, Malta, Slovakia, Poland, Slovenia, Bulgaria, Romania.

Ch 1. ZWA-G220 Installation

Packing List

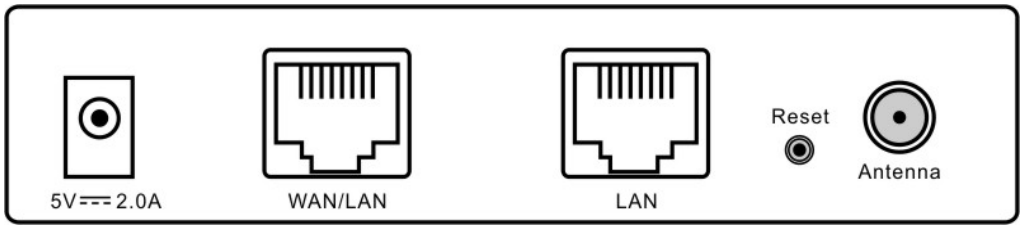
Before you start to install the device, make sure the package contains the following items：

- ZWA-G220 Multi-Mode AP unit * 1
- Power Adapter * 1
- RJ-45 Cable * 1

Multi-Mode AP	Power Adapter

RJ-45 Cable

Back panel connections



From Left to Right:

DC jack: ZW-220 can use power source in DC jack. Please supply the power in

5V and 2A

WAN/LAN: This port could be WAN or LAN port depending on the configuration. It will be WAN port in router mode and LAN port in bridge mode.

LAN: This port is always LAN in ZW-220. In Bridge mode, it bridges to WLAN and “WAN/LAN” port. In Router mode, it bridges to WLAN only, In WISP mode, it bridges to “WAN/LAN” port only.

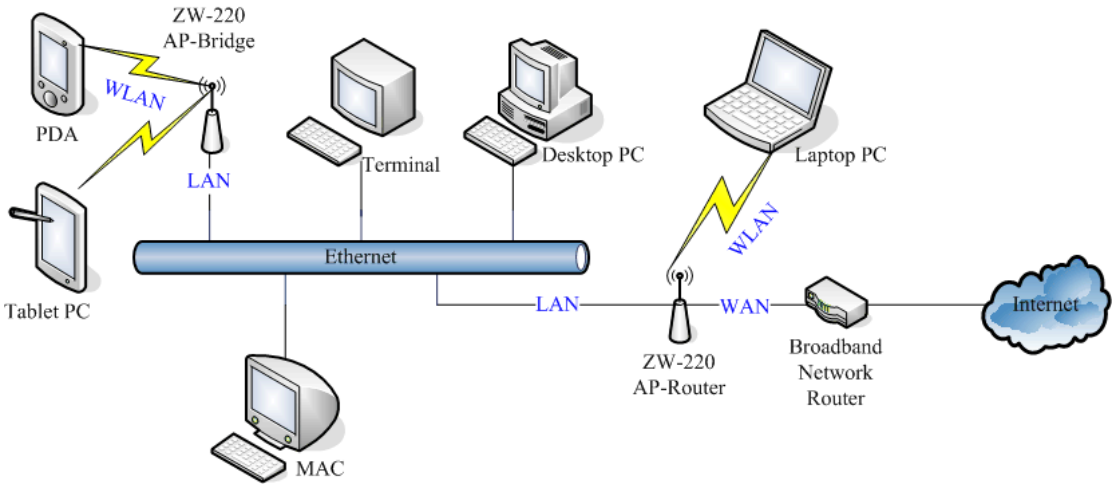
Reset: Press Reset button to revert it to factory default.

Antenna: This SMA Reverse allows the user to connect antenna or RF cable. At least connect an antenna to help ZW-220 to send and receive RF signal.

ZW-220 integrates LNA/PA (Low Noise Amplifier) module and has at lease 3dB RF sensitivity better than the regular WLAN products.

Hardware Installation

Once you check off everything from the package, you can start to install the device. You can use the wall mount hole on the bottom of the device to mount the device on the wall, or just put the device on the desktop. The administrator can refer to the figure below while constructing your WLAN environment.



Ch 2. First Time Configuration

Before Start to Configure

There are two ways to configure the device, one is through web-browser, and the other is through Secure Shell CLI interface. To access the configuration interfaces, make sure you are using a computer connected to the same network as the device. The default IP address of the device is 192.168.2.254, and the subnet-mask is 255.255.255.0.

The device has three operation modes (Router/Bridge/WISP). In bridge mode, also known as AP Client, you can access the device by WLAN (Wireless Local Area Network) and both wired LAN ports. And in router/WISP modes, the device can be accessed by WLAN, LAN and WAN. The default IP addresses for the device are 192.168.2.254 (for LAN), 172.1.1.1(for WAN), so you need to make sure the IP address of your PC is in the same subnet as the device, such as 192.168.2.X (for LAN), 172.1.1.X (for WAN).

Please note that the DHCP server inside the device is default to up and running. Do not have multiple DHCP servers in your network environment, otherwise it will cause abnormal situation.

We also provide an auto-discovery tool which is for finding out the IP of the device. In case, you've forgot the IP of the device or the IP of the device has been changed, you can use the tool to find out the IP of the device even your PC is not in the same subnet as the device is.

Knowing the Network Application

The device can act as the following roles, and it supports WDS (Wireless Distribution System) function.

- Access Point
- WDS mode
- Bridge/Router
- WISP
- AP Client

The device provides 3 different operation modes and the wireless radio of

device can act as AP/Client/WDS. The operation mode is about the communication mechanism between the wired Ethernet NIC and wireless NIC, the following is the types of operation mode.

Router

The wired Ethernet (WAN) port is used to connect with ADSL/Cable modem and the wireless NIC is used for your private WLAN. The other wired Ethernet (LAN) port bridges to the private WLAN. The NAT is existed between WAN and WLAN/LAN and all the wireless and wired clients share the same public IP address through the WAN port to ISP. The default IP configuration for WAN port is static IP. You can access the web server of device through the default WAN IP address 172.1.1.1 and modify the setting base on your ISP requirement.

Bridge

The two wired Ethernet ports and wireless NIC are bridged together. Once the mode is selected, all the WAN related functions will be disabled.

WISP (Wireless ISP)

This mode can let you access the AP of your wireless ISP and share the same public IP address from your ISP to the PCs connecting with both the wired Ethernet ports of the device. To use this mode, first you must set the wireless radio to be client mode connecting to the AP of your ISP as the WAN connection and then you can configure the WAN IP configuration to meet your ISP requirement.

The wireless radio of the device acts as the following roles.

AP (Access Point)

The wireless radio of device serves as communications “hub” for wireless clients and provides a connection to a wired LAN.

AP Client

This mode provides the capability to connect with the other AP using infrastructure/Ad-hoc networking types. With bridge operation mode, you can directly connect one of the wired Ethernet port to your PC and the device becomes a wireless adapter. And with WISP operation mode, you can connect one of the wired Ethernet port to a hub/switch and all the PCs connecting with hub/switch can share the same public IP address from your ISP.

WDS (Wireless Distribution System)

This mode combines up to 8 AP to a single wireless network; the device forwards the packets to another AP with WDS function. When this mode is selected, all the wireless clients can't survey and connect to the device. The device only allows the WDS connection.

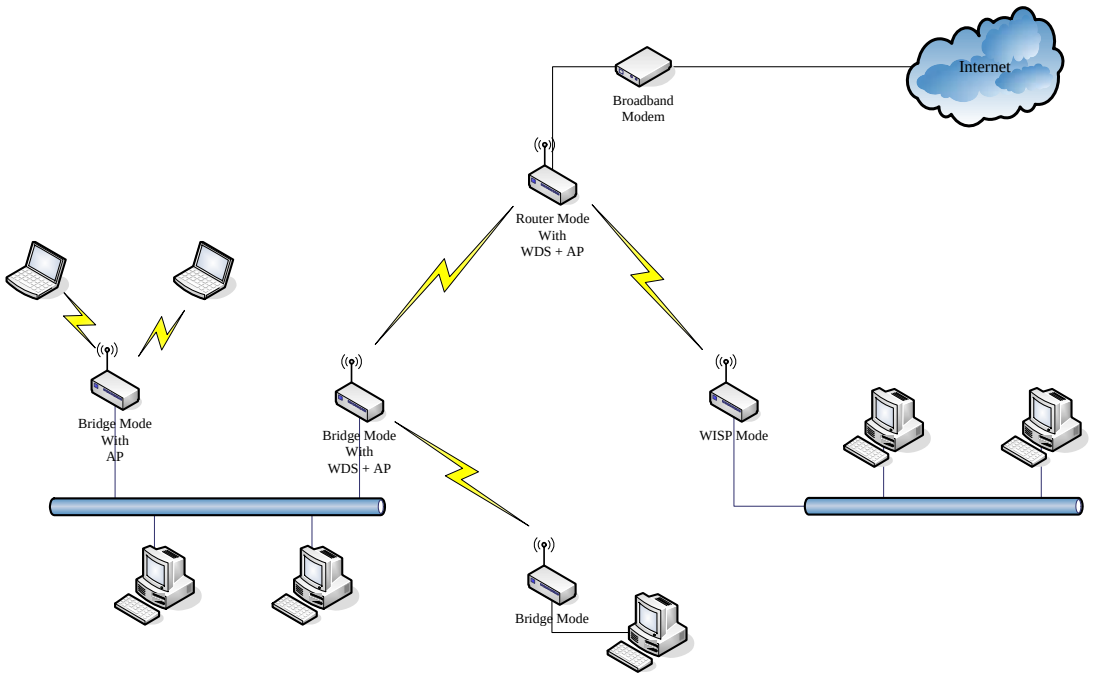
WDS+AP

This mode combines WDS plus AP modes, it not only allows WDS connections but also the wireless clients can survey and connect to the device.

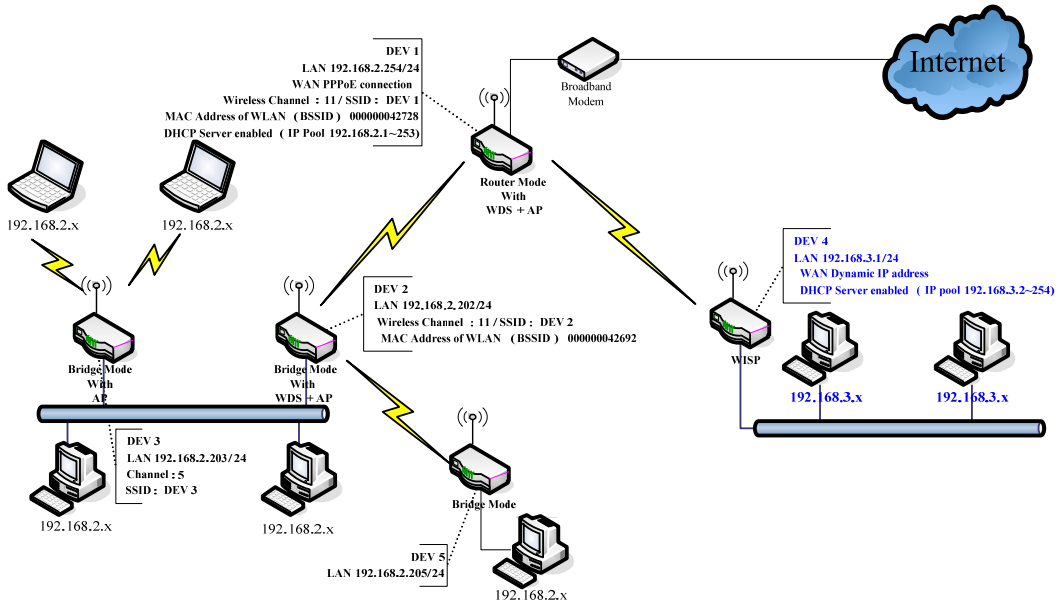
The following table shows the supporting combination of operation and wireless radio modes.

	Bridge	*Router*	*WISP*
AP	V	V	X
WDS	V	V	X
Client	V	X	V
AP+WDS	V	V	X

Hereafter are some topologies of network application for your reference.



Examples of Configuration



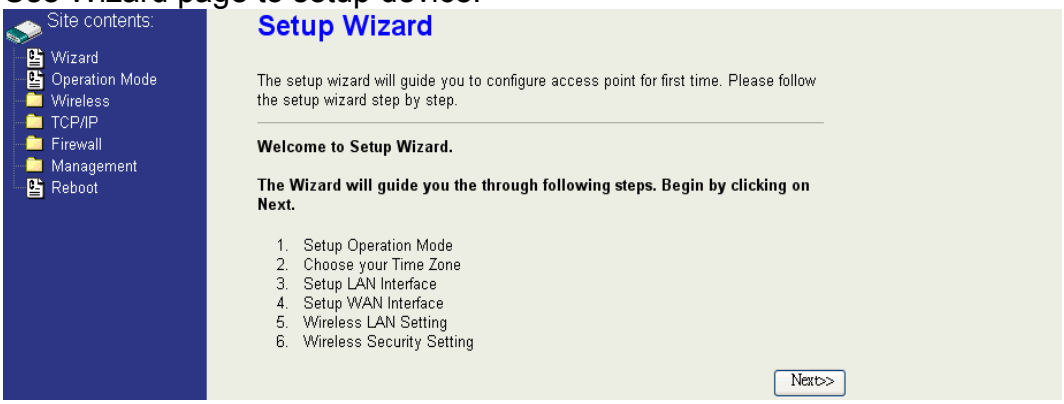
This example demonstrates how to set up a network with different device configurations. There are 2 DHCP servers (DEV1/DEV4) in the network to control the IP configuration of 2 domains (192.168.2.x/192.168.3.x). Once the setting is done, all the PCs can visit Internet through DEV1.

We assume all the devices keep the factory default setting. To make sure that user can continuing press the rest button for more than 5 seconds to restore the factory default setting.

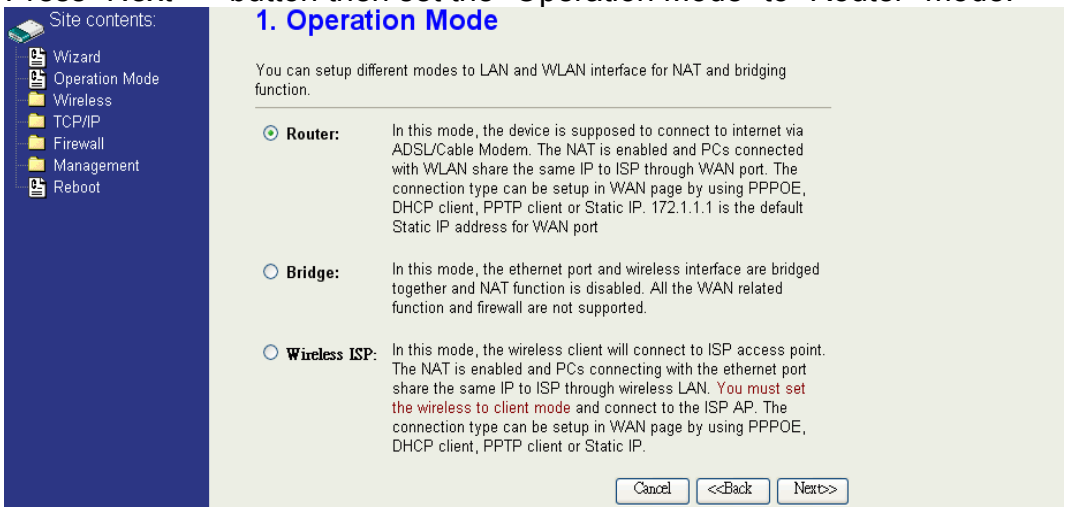
The following descriptions show the steps to configure DEV1 to DEV5.

Configure DEV1:

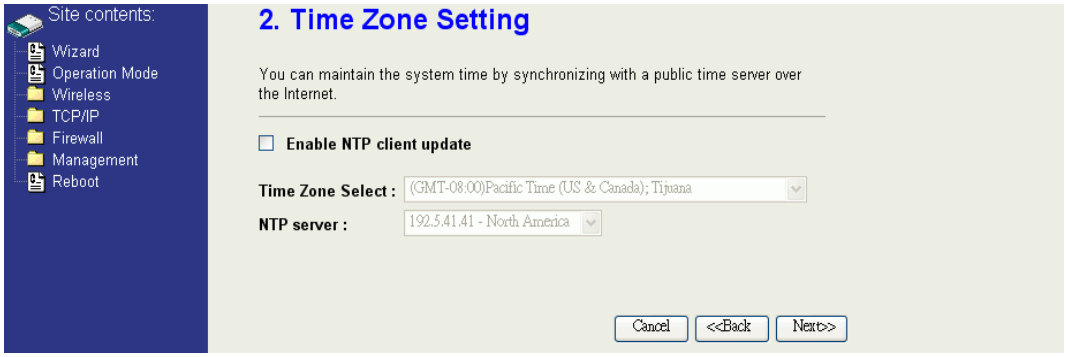
1. Connect the ADSL modem to Ethernet port of device using Ethernet cable.
2. Access the web server (http://192.168.2.254) of device from the wireless station.
3. Use Wizard page to setup device.



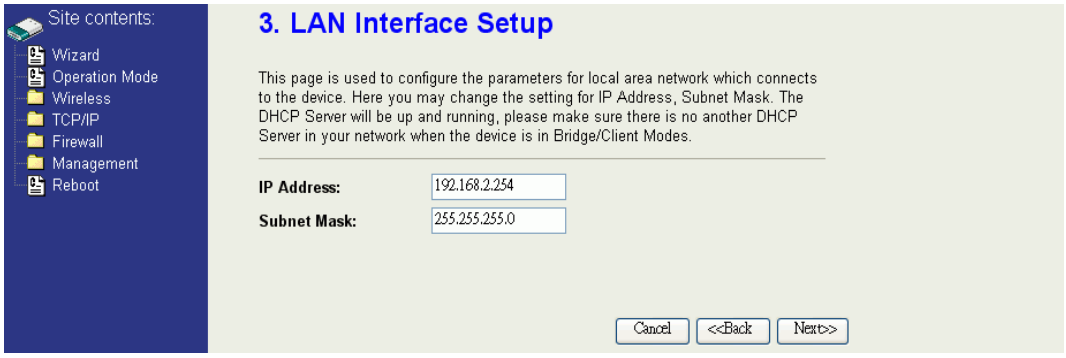
4. Press “Next>>” button then set the “Operation Mode” to “Router” mode.



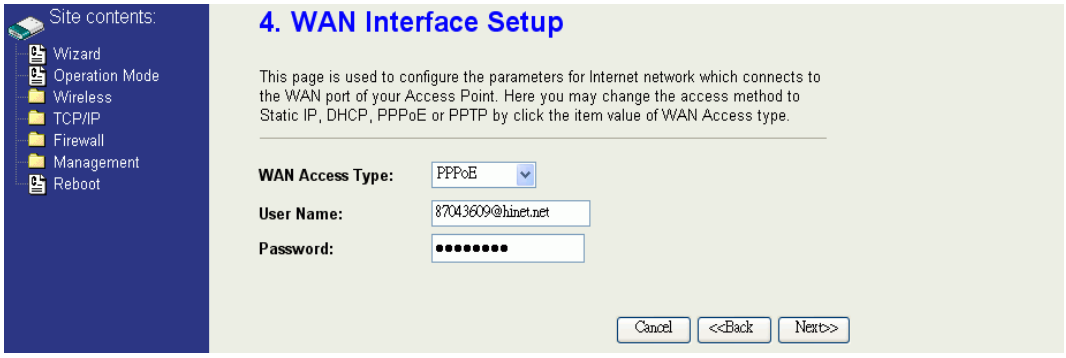
5. Press “Next>>” button then disable “Time Zone” function.



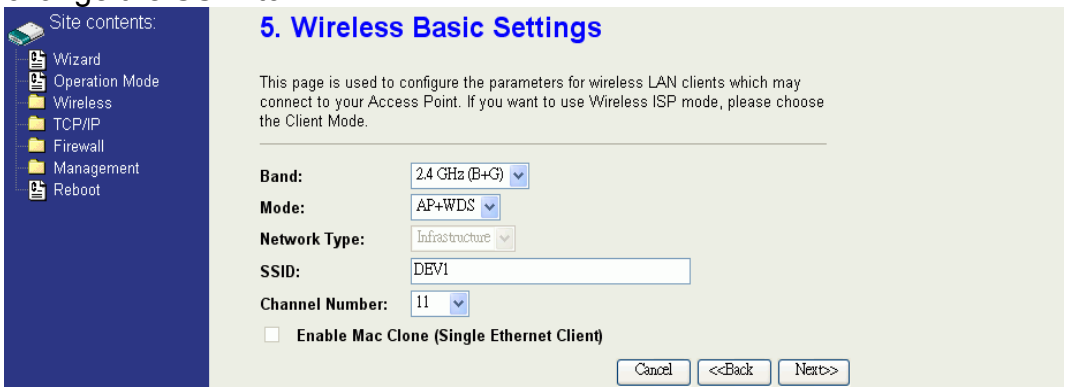
6. Press “Next>>” button then set the IP address of LAN interface.



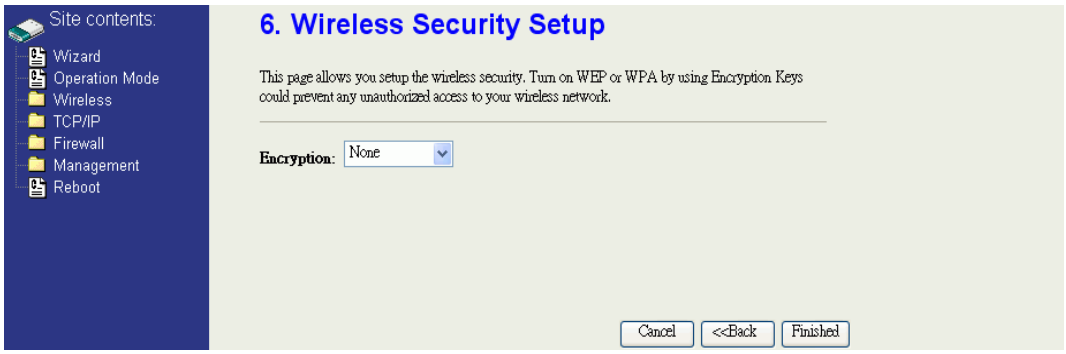
7. Press “Next>>” button then select the “PPPoE” for “WAN Access Type” and fill in the “User Name” and “Password” fields.



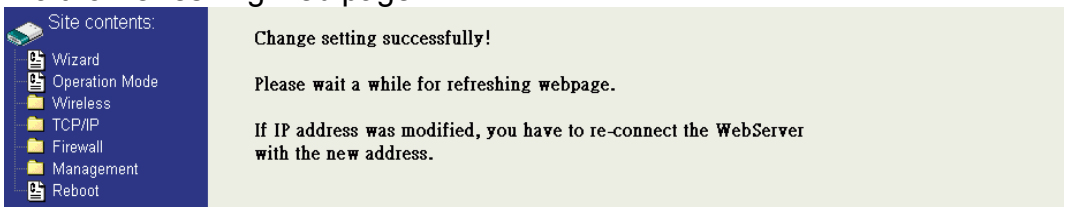
8. Press “Next>>” button then select the “AP+WDS” for “mode” and change the SSID to “DEV1”.



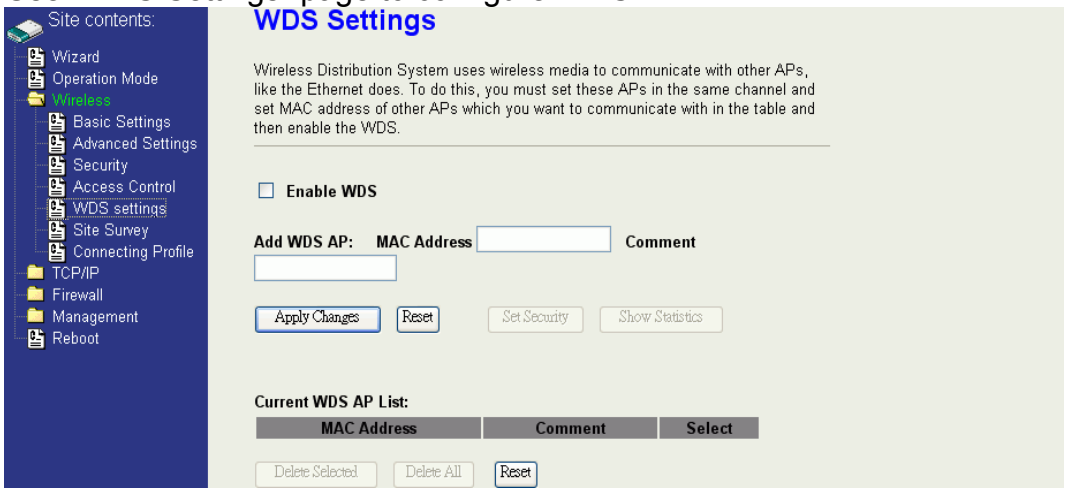
9. Press “Next>>” button then select “None” for “Encryption” then press “Finished” button.



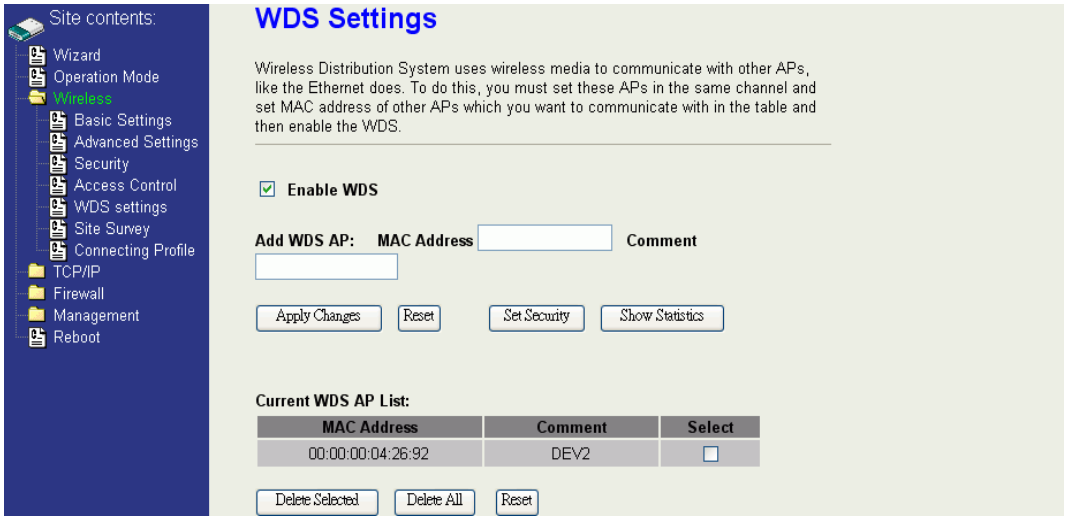
10. Wait for refreshing web page.



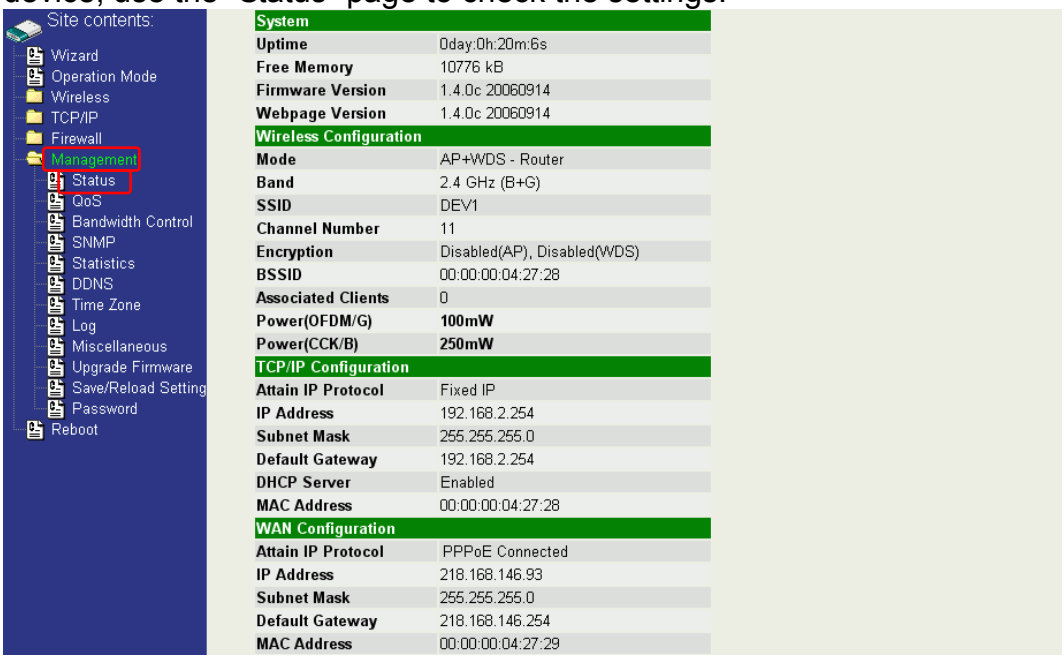
11. Use “WDS Settings” page to configure WDS.



12. Enable WDS function and add the BSSID of DEV2 to “Current WDS AP List”.



13. Since we access the device by wireless connection, it may temporarily disconnect when applying the WDS setting. After re-connecting to the device, use the “Status” page to check the settings.



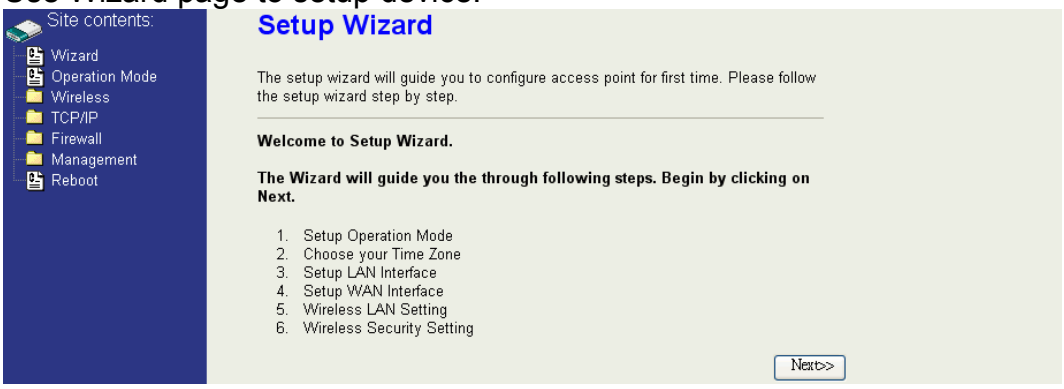
Configure DEV2:

1. Access the web server (http://192.168.2.254) of device from the Ethernet port.

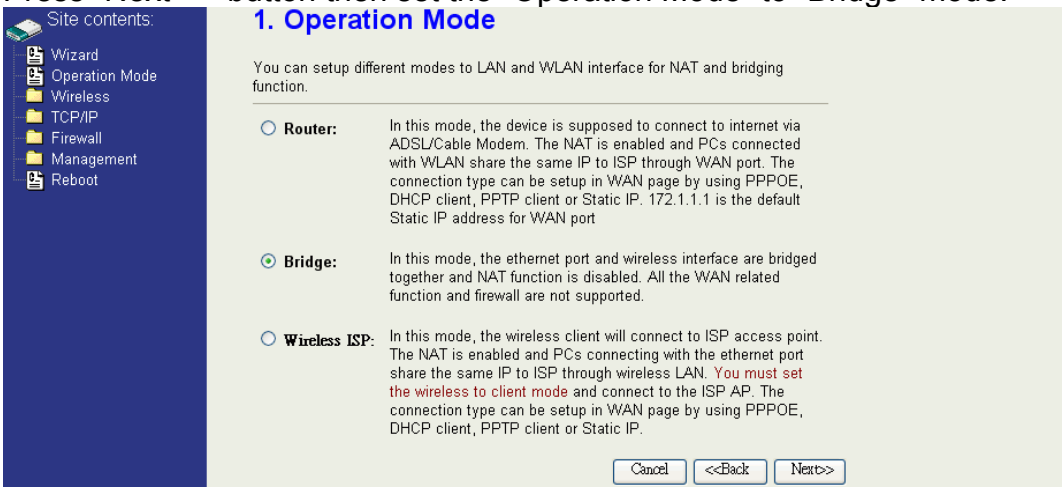
Caution

If you configure multiple devices in the same PC, since the devices have the same default IP address but different MAC addresses, it may cause you not able to access the web server of device. If the situation happens, please try to clean the ARP table of your PC by DOS command "arp –d" then you can access the web server of device using the default IP address.

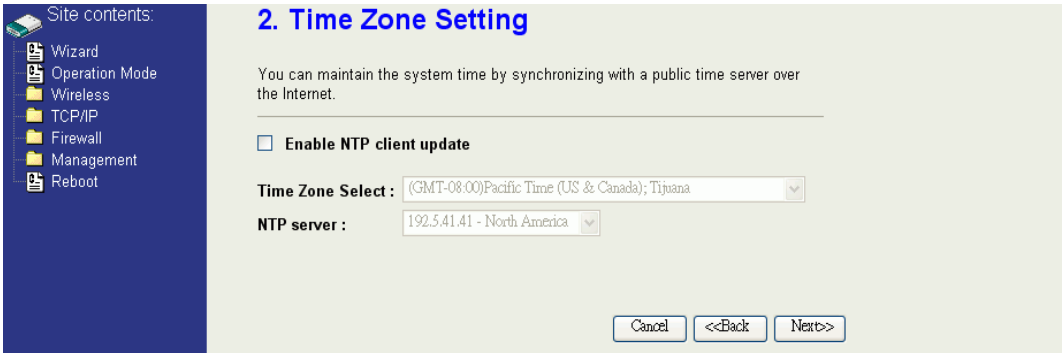
2. Use Wizard page to setup device.



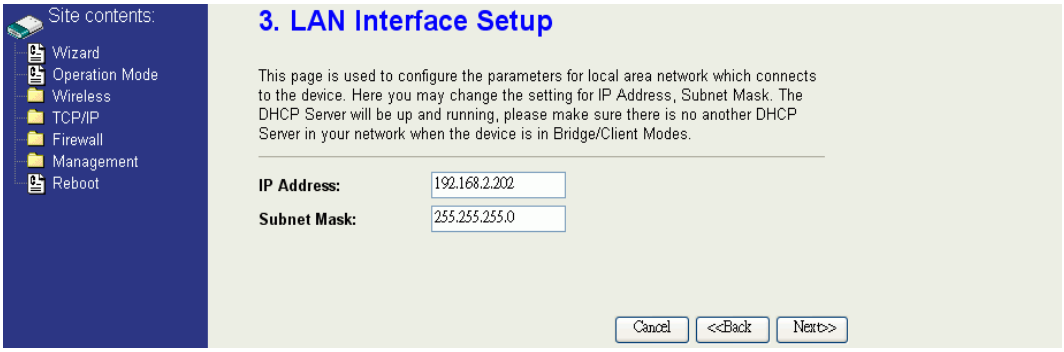
3. Press "Next>>" button then set the "Operation Mode" to "Bridge" mode.



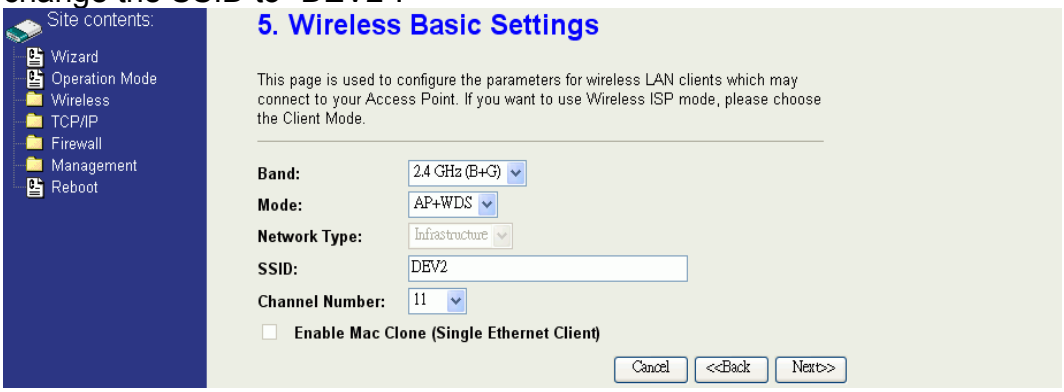
4. Press "Next>>" button then disable "Time Zone" function.



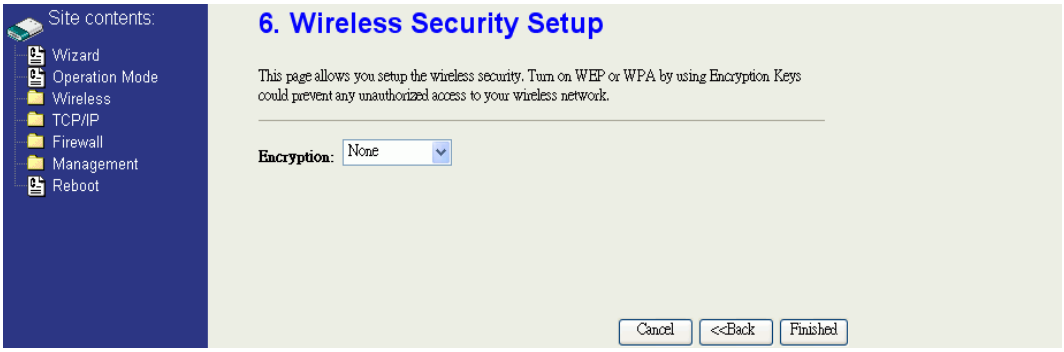
5. Press “Next>>” button then set the IP address of LAN interface.



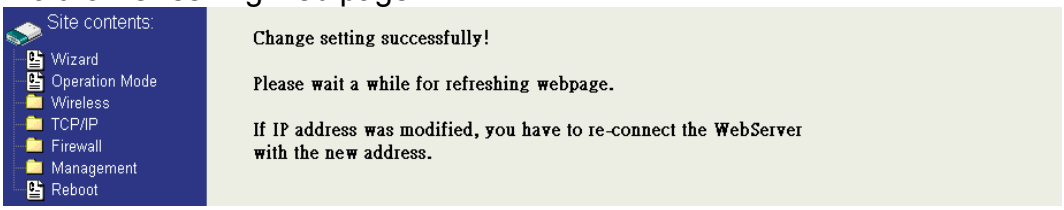
6. Press “Next>>” button then select the “AP+WDS” for “mode” and change the SSID to “DEV2”.



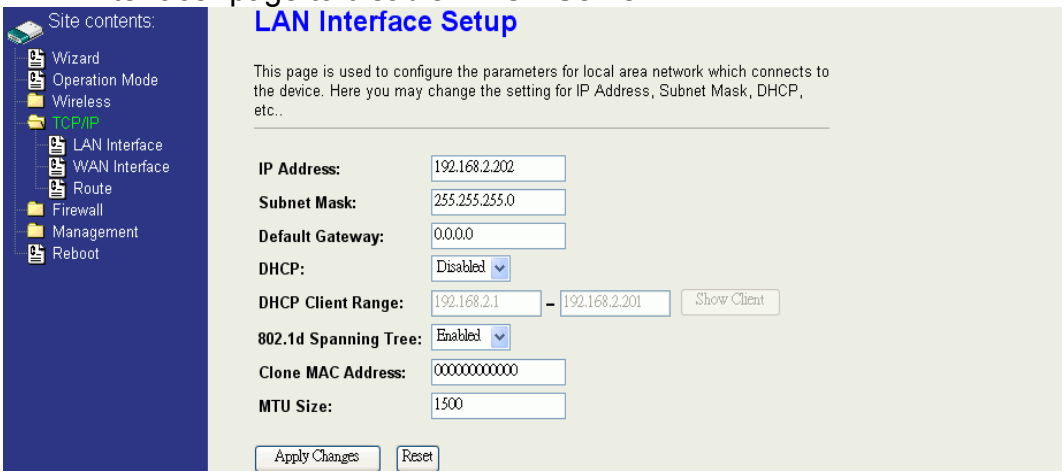
7. Press “Next>>” button then select “None” for “Encryption” then press “Finished” button.



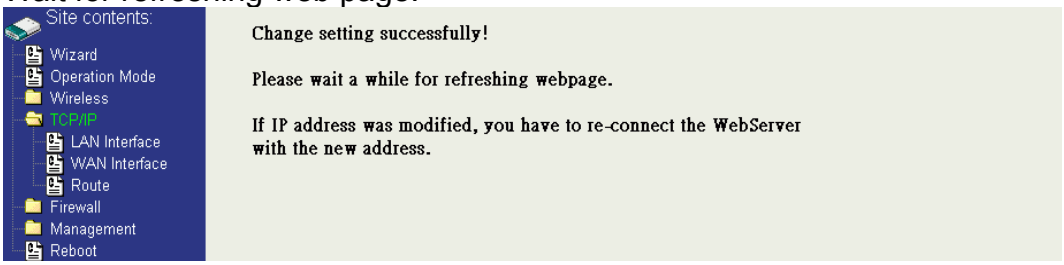
8. Wait for refreshing web page.



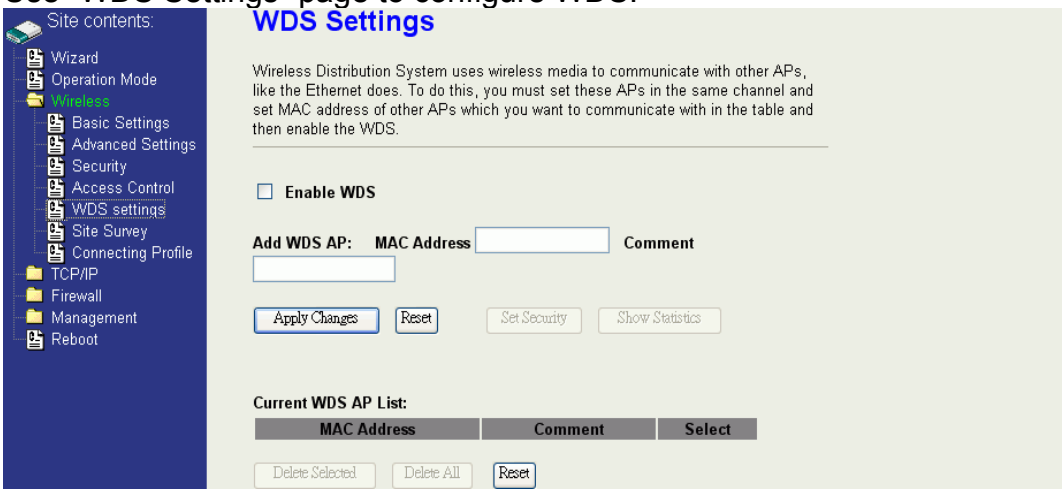
9. Access the web server by new IP address “192.168.2.202” then use “LAN Interface” page to disable DHCP Server.



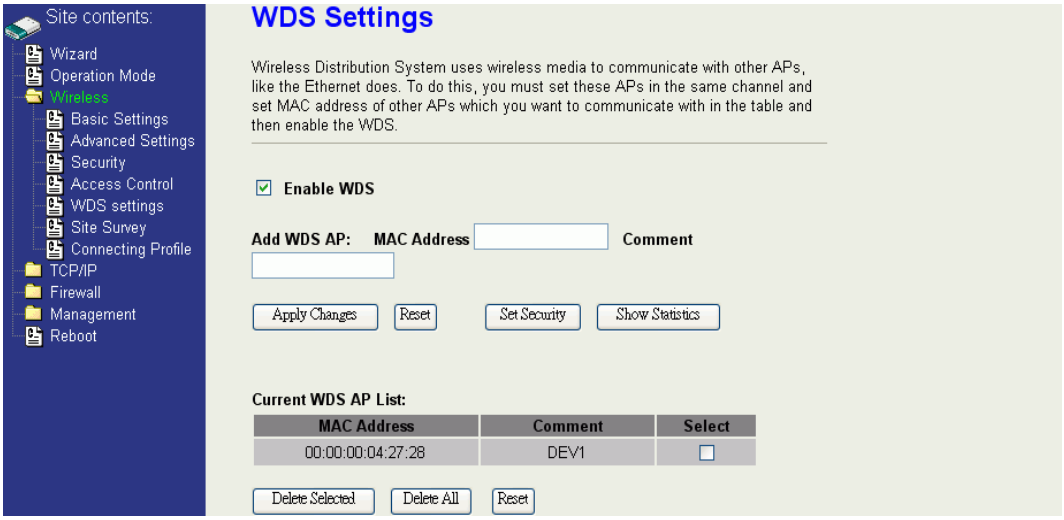
10. Wait for refreshing web page.



11. Use “WDS Settings” page to configure WDS.



12. Enable WDS function and add the BSSID of DEV1 to “Current WDS AP List”.



13. Use the “Status” page to check the settings.

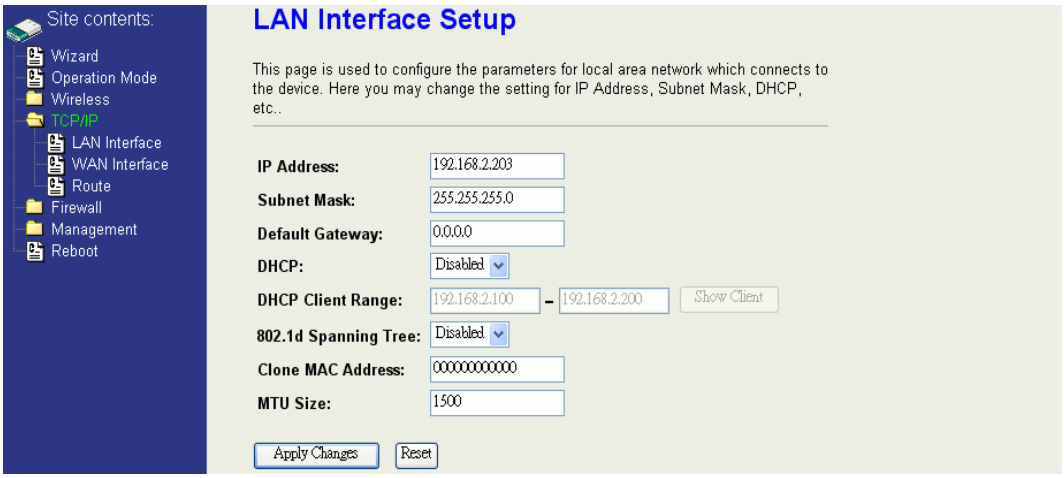
Configure DEV3:

1. Access the web server (http://192.168.2.254) of device from the Ethernet port.

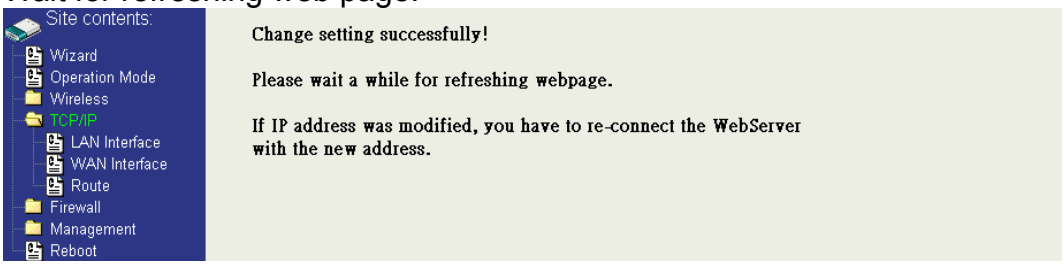
Caution

If you configure multiple devices in the same PC, since the devices have the same default IP address but different MAC addresses, it may cause you not able to access the web server of device. If the situation happens, please try to clean the ARP table of your PC by DOS command “arp –d” then you can access the web server of device using the default IP address.

2. Use “LAN Interface” page to set the IP address of LAN interface and disable DHCP server.



3. Wait for refreshing web page.



4. Access the web server by new IP address “192.168.2.203” then use “Basic Settings” page to change SSID and CHANNEL.

5. Use the “Status” page to check the settings.

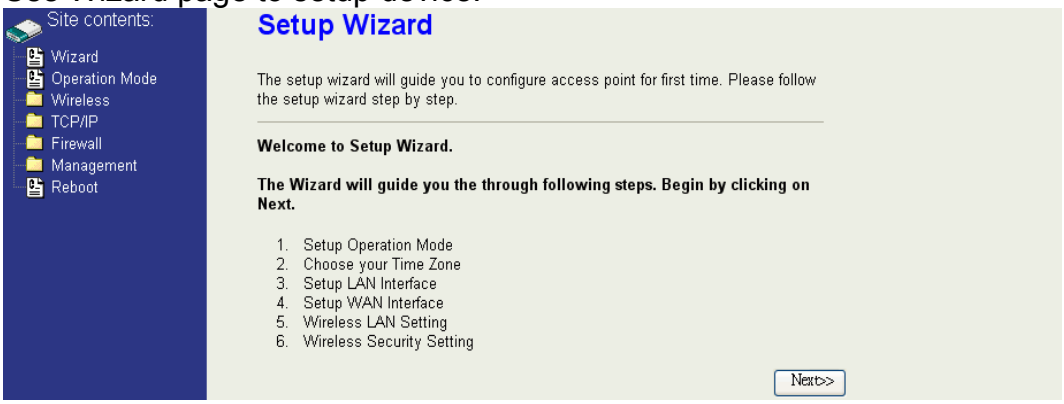
Configure DEV4:

1. Access the web server (http://192.168.2.254) of device from the Ethernet port.

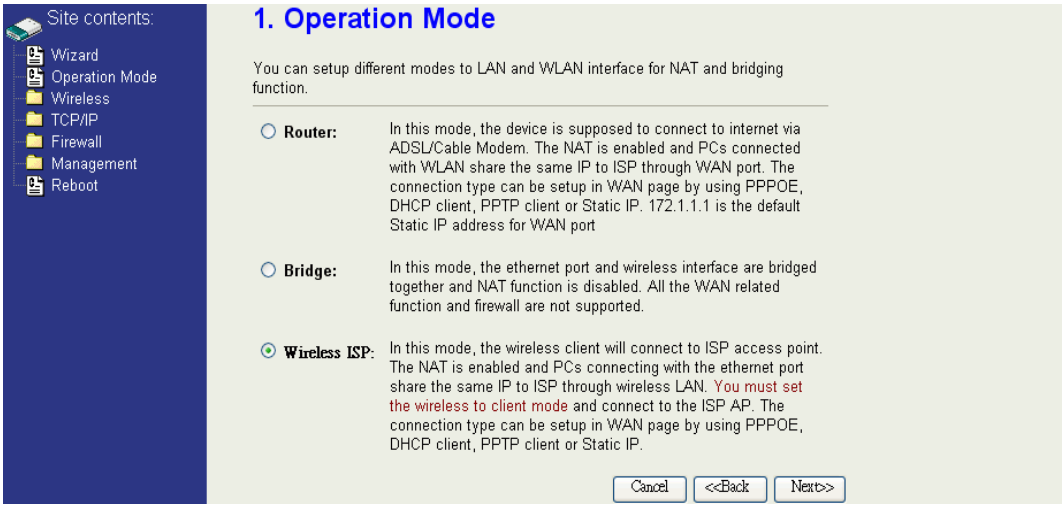
Caution

If you configure multiple devices in the same PC, since the devices have the same default IP address but different MAC addresses, it may cause you unable to access the web server of device. If the situation happens, please try to clean the ARP table of your PC by DOS command “arp –d” then you can access the web server of device using the default IP address.

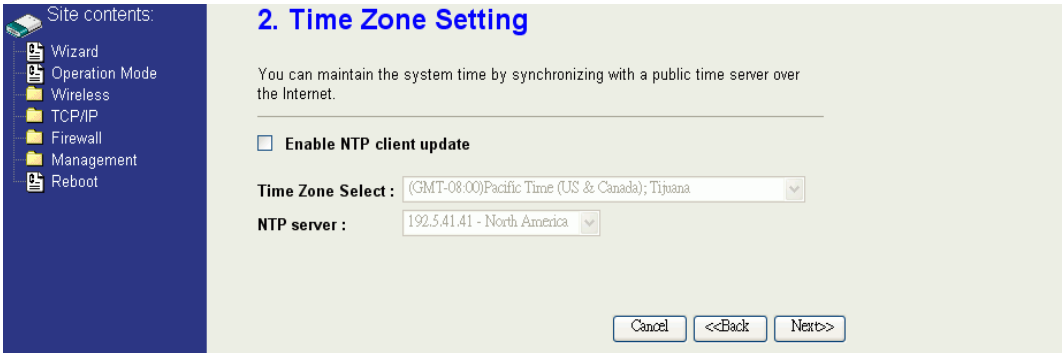
2. Use Wizard page to setup device.



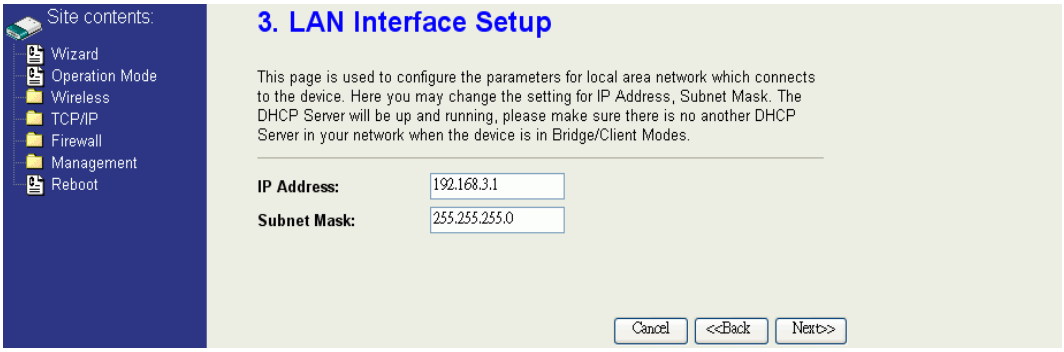
3. Press “Next>>” button then set the “Operation Mode” to “Wireless ISP” mode.



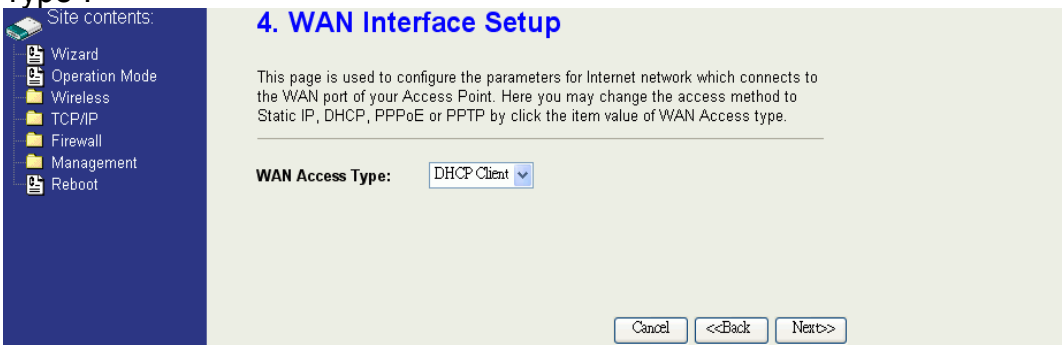
4. Press “Next>>” button then disable “Time Zone” function.



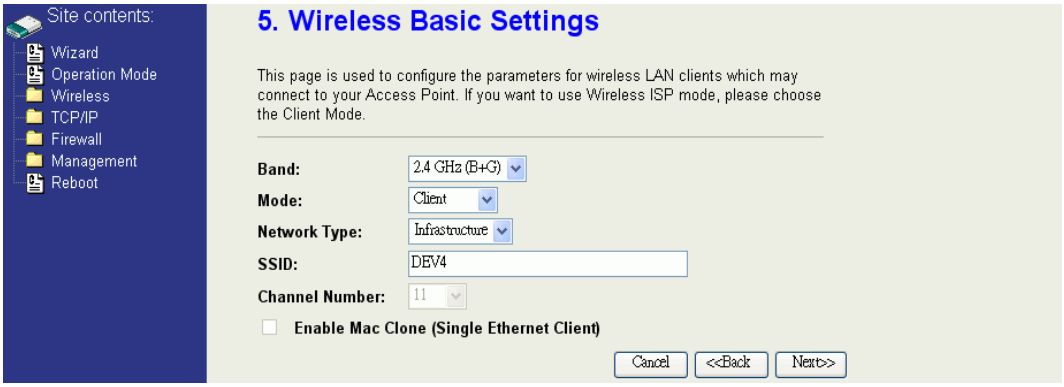
5. Press “Next>>” button then set the IP address of LAN interface.



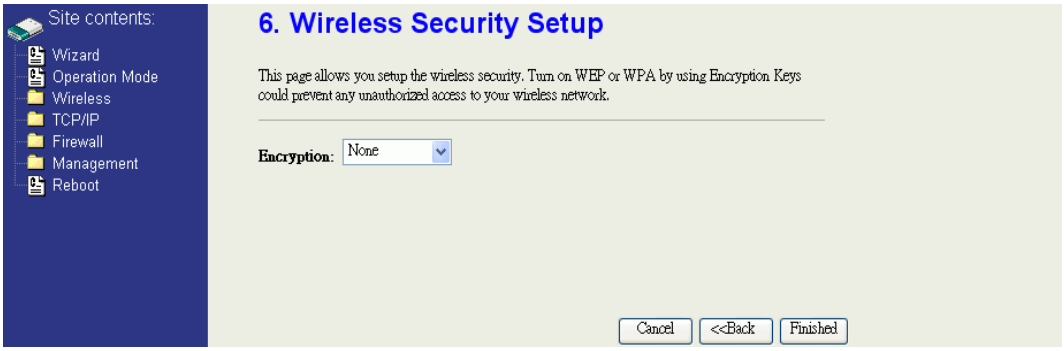
6. Press “Next>>” button then select the “DHCP Client” for “WAN Access Type”.



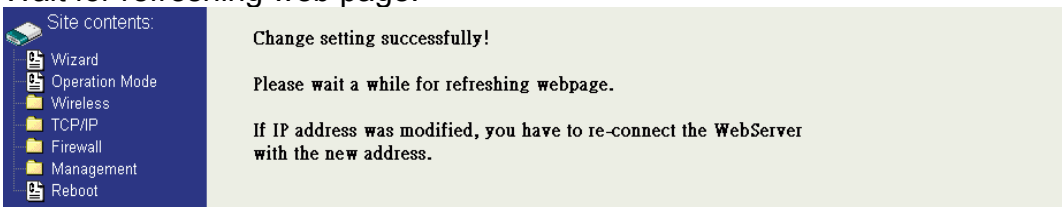
7. Press “Next>>” button then select the “Client” for “mode” and change the SSID to “DEV4”.



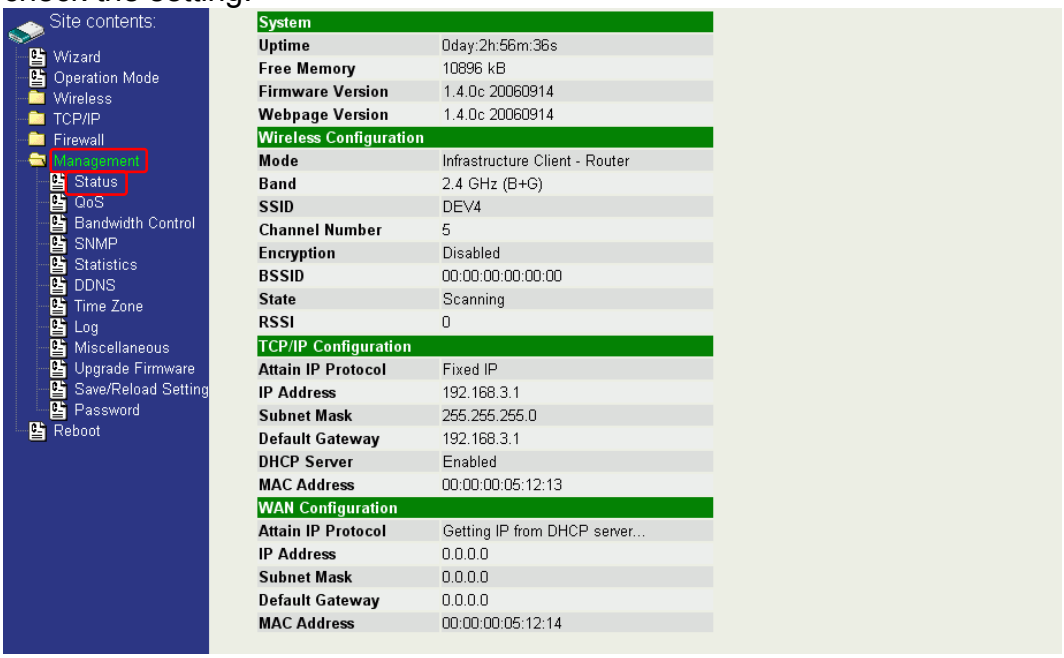
8. Press “Next>>” button then select “None” for “Encryption” then press “Finished” button.



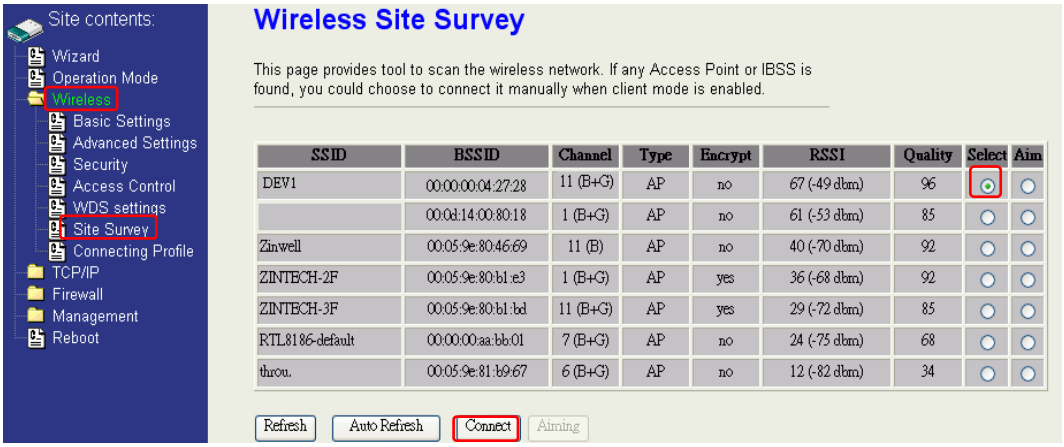
9. Wait for refreshing web page.



10. Change the IP address of your PC to 192.168.3.x then access the web server by the new IP address “192.168.3.1” and use “Status” page check the setting.



11. If the “State” of “Wireless Configuration” is not “Connected” or you want to refresh the “RSSI “, please use “Site Survey” page to re-connect a AP.



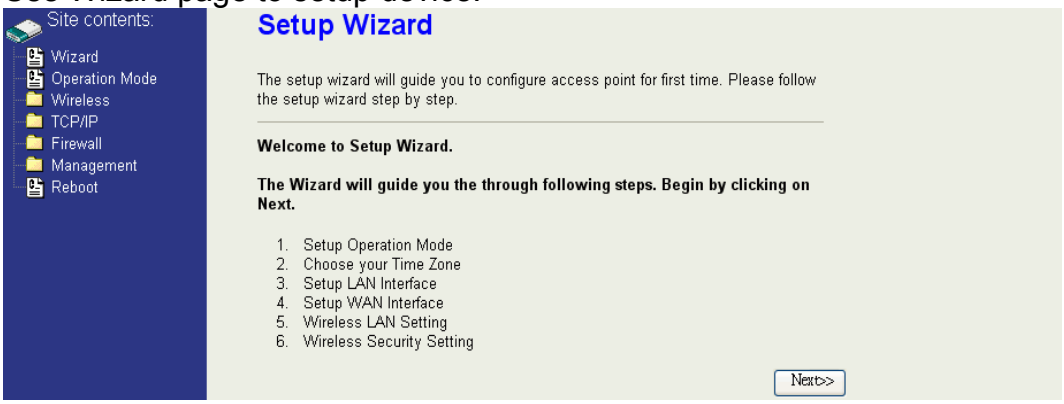
Configure DEV5:

1. Access the web server (http://192.168.2.254) of device from the Ethernet port.

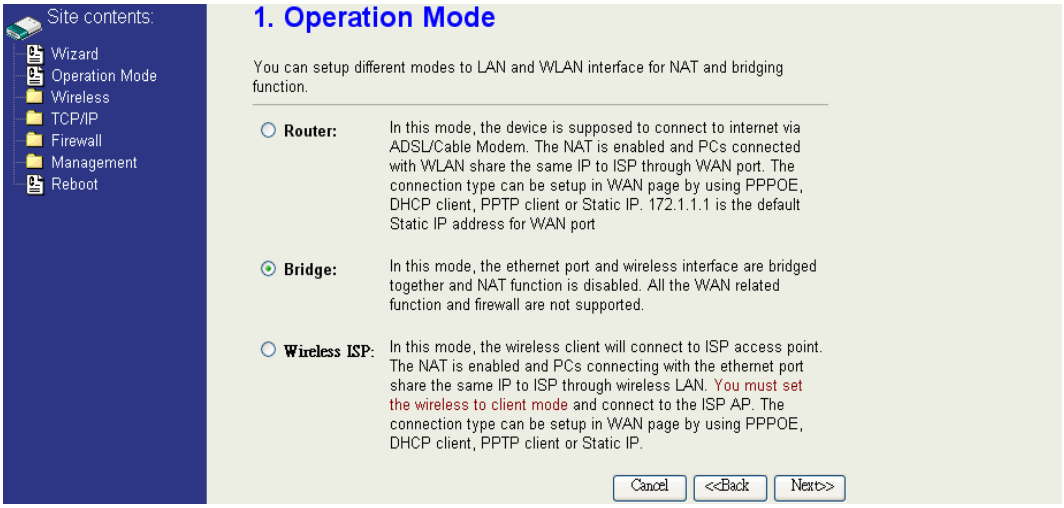
Caution

If you configure multiple devices in the same PC, since the devices have the same default IP address but different MAC addresses, it may cause you unable to access the web server of device. If the situation happens, please try to clean the ARP table of your PC by DOS command “arp –d” then you can access the web server of device using the default IP address.

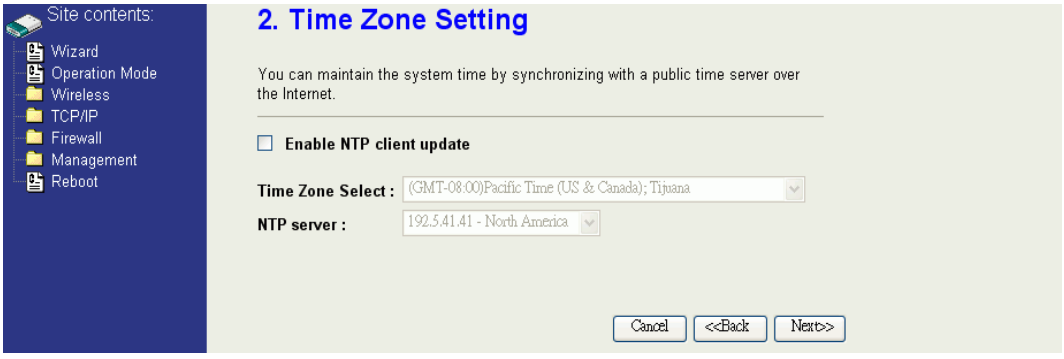
2. Use Wizard page to setup device.



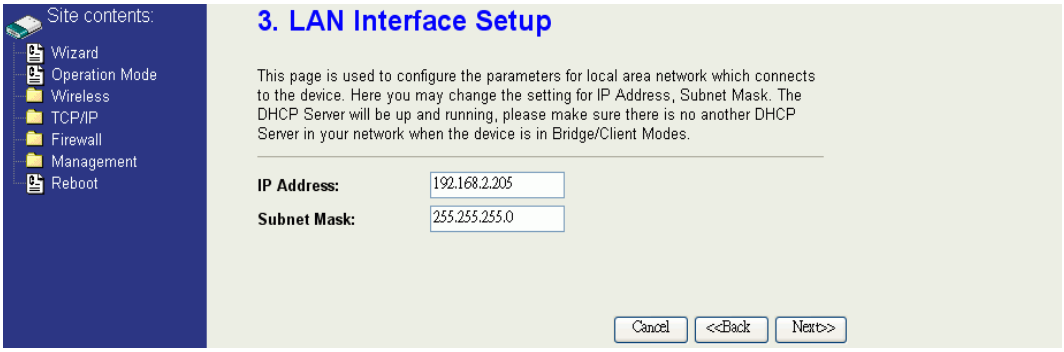
3. Press “Next>>” button then set the “Operation Mode” to “Wireless ISP” mode.



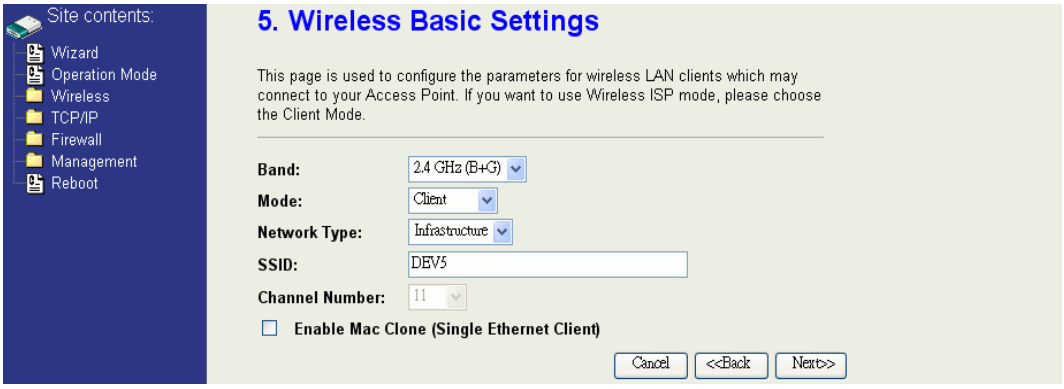
4. Press “Next>>” button then disable “Time Zone” function.



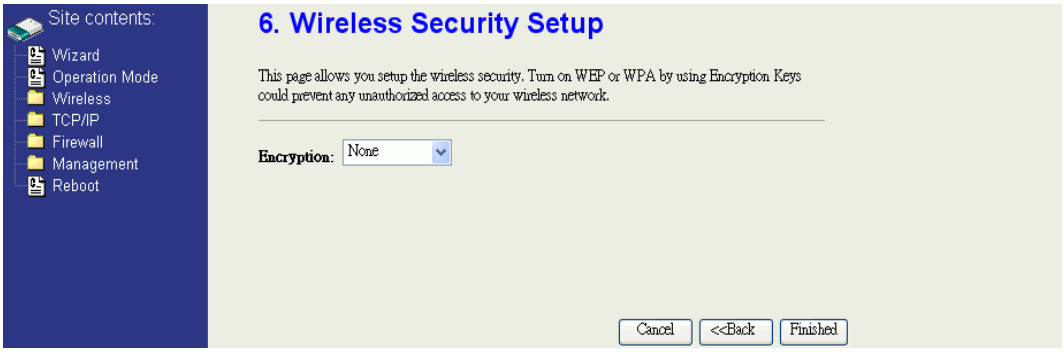
5. Press “Next>>” button then set the IP address of LAN interface.



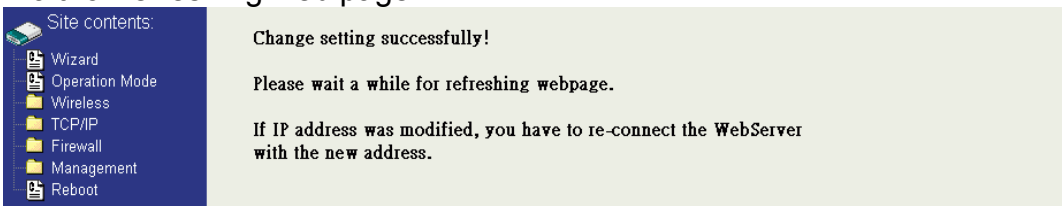
6. Press “Next>>” button then select the “Client” for “mode” and change the SSID to “DEV5”.



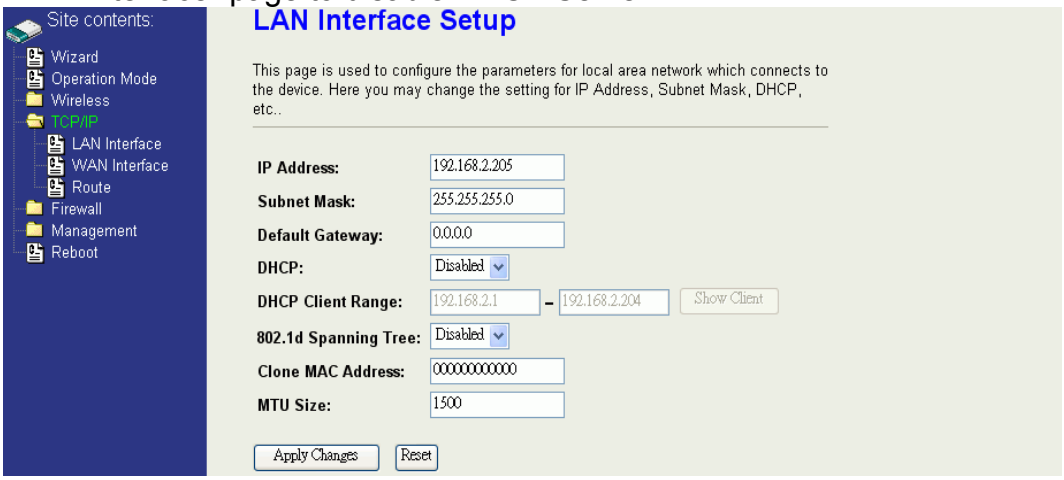
7. Press “Next>>” button then select “None” for “Encryption” then press “Finished” button.



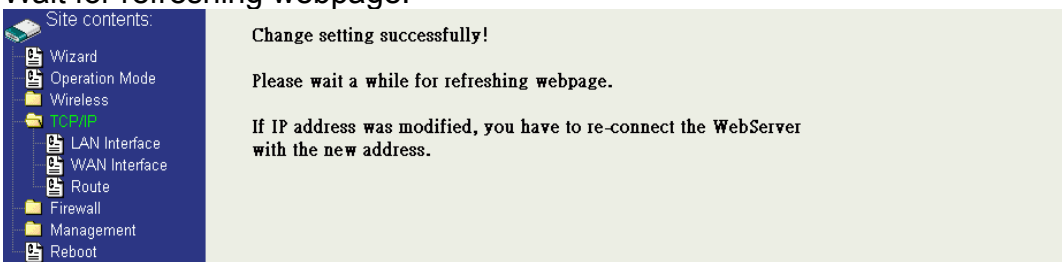
8. Wait for refreshing web page.



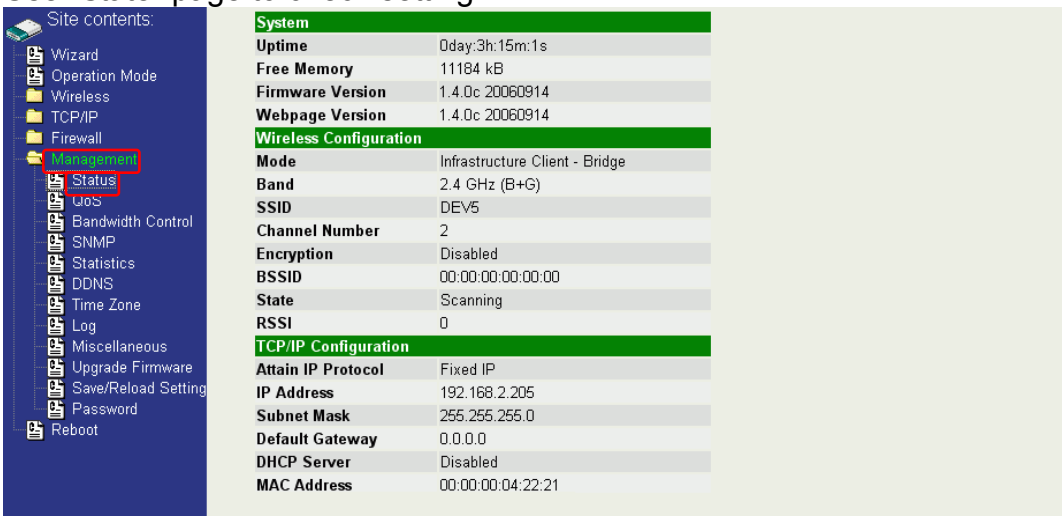
9. Access the web server by the new IP address “192.168.2.205” and use “LAN Interface” page to disable DHCP Server.



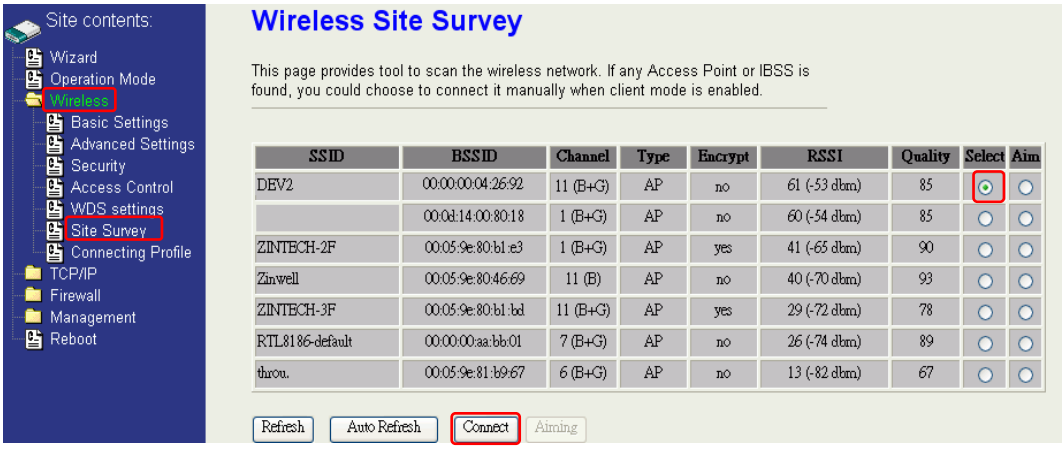
10. Wait for refreshing webpage.



11. Use “State” page to check setting.



12. If the “State” of “Wireless Configuration” is not “Connected” or you want to refresh the “RSSI “, please use “Site Survey” page to re-connect a AP.



Basic Settings

Disable Wireless LAN Interface

Disable the wireless interface of device

Band:

The device supports 2.4GHz(B), 2.4GHz(G) and 2.4GHz(B+G) mixed modes.

Mode:

The radio of device supports different modes as following:

1. AP

   The radio of device acts as an Access Point to serves all wireless clients to join a wireless local network.

2. Client

   Support Infrastructure and Ad-hoc network types to act as a wireless adapter.

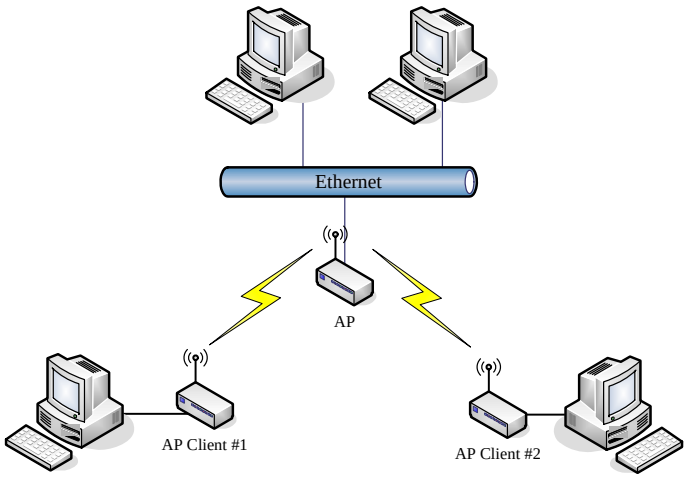
3. WDS

   Wireless Distribution System, this mode joins to a WDS network which combines up to 8 WDS-AP, only devices with WDS function supported can connect to it, all the wireless clients can't survey and connect the device when the mode is selected.

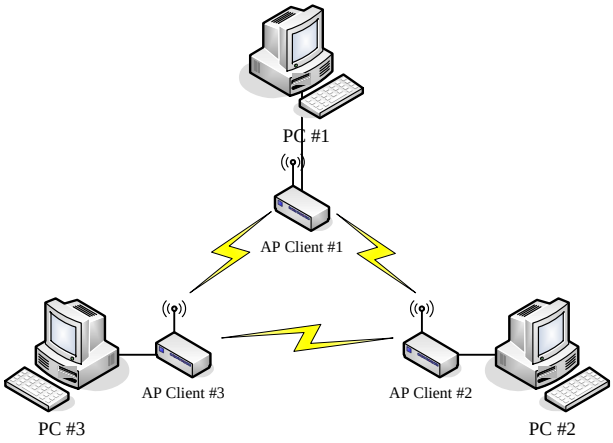
4. AP+WDS

   Support both AP and WDS functions, the wireless clients and devices with WDS function supported can survey and connect to it.

- ***Infrastructure***:
  This type requires the presence of 802.11b/g Access Point. All communication is done via the Access Point.



- ***Ad Hoc***:
  This type provides a peer-to-peer communication between wireless stations. All the communication is done from Client to Client without any Access Point involved. Ad Hoc networking must use the same SSID and channel for establishing the wireless connection.



In client mode, the device can't support the Router mode function including Firewall and WAN settings.

SSID:

The SSID is a unique identifier that wireless networking devices use to establish and maintain wireless connectivity. Multiple access point/bridges on a network or sub-network can use the same SSID. SSIDs are case sensitive and can contain up to 32 alphanumeric characters. Do not include spaces in your SSID.

Channel Number

The following table is the available frequencies (in MHz) for the 2.4-GHz radio:

Channel No.	Frequency	Country Domain
1	2412	Americas, EMEA, Japan, and China
2	2417	Americas, EMEA, Japan, and China
3	2422	Americas, EMEA, Japan, Israel, and China
4	2427	Americas, EMEA, Japan, Israel, and China
5	2432	Americas, EMEA, Japan, Israel, and China
6	2437	Americas, EMEA, Japan, Israel, and China
7	2442	Americas, EMEA, Japan, Israel, and China
8	2447	Americas, EMEA, Japan, Israel, and China
9	2452	Americas, EMEA, Japan, Israel, and China
10	2457	Americas, EMEA, Japan, and China
11	2462	Americas, EMEA, Japan, and China
12	2467	EMEA and Japan
13	2472	EMEA and Japan
14	2484	Japan only

※ EMEA (Europe, the Middle East and Africa).

When set to “Auto”, the device will find the least-congested channel for use.

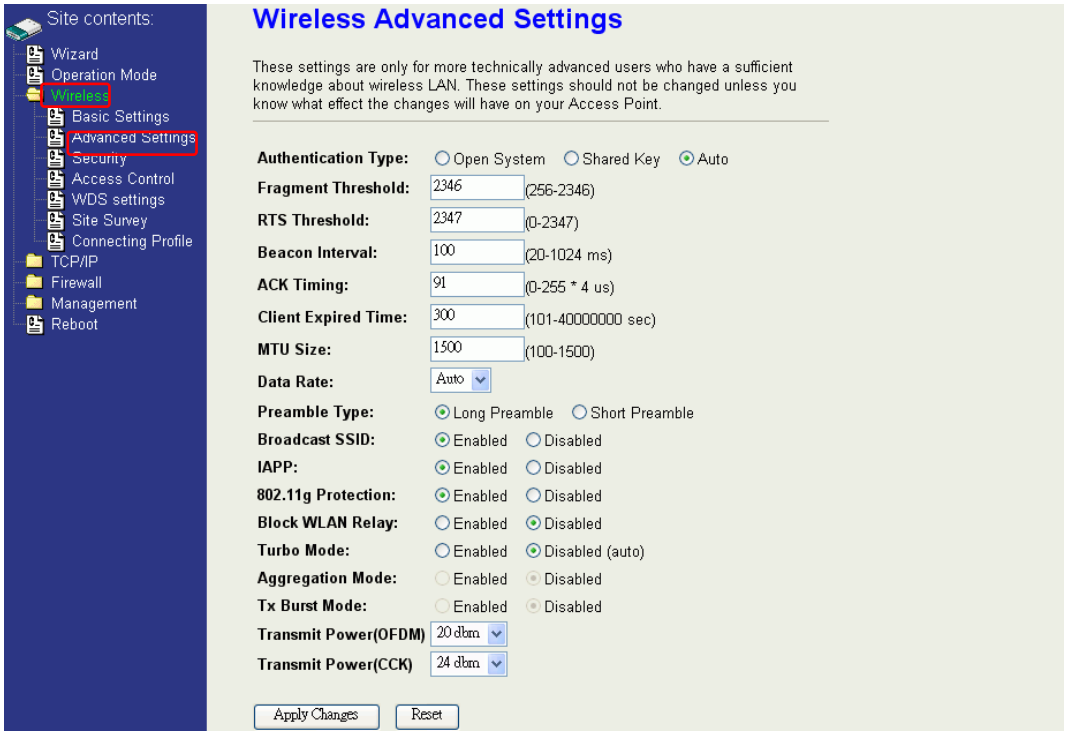
Associated Client

Show the information of active wireless client stations that connected to the device.

Advanced Settings

These settings are only for more technically advanced users who have sufficient knowledge about wireless LAN. These settings should not be changed unless you know what effect the changes will have on your device. The default setting is optimized for the normal operation. For specific application, setting configuration will required highly attention to reach optimistic condition.

Note：
Any unreasonable value change to default setting will reduce the throughput of the device.



Authentication Type

The device supports two Authentication Types “Open system” and “Shared Key”. When you select “Share Key”, you need to setup “WEP” key in “Security” page (See the next section). The default setting is “Auto”. The wireless client can associate with the device by using one of the two types.

Fragment Threshold

The fragmentation threshold determines the size at which packets are fragmented (sent as several pieces instead of as one block). Use a low setting in areas where communication is poor or where there is a great deal of radio interference. This function will help you to improve the network performance.

RTS Threshold

The RTS threshold determines the packet size at which the radio issues a request to send (RTS) before sending the packet. A low RTS Threshold setting can be useful in areas where many client devices are associating with the device, or in areas where the clients are far apart and can detect only the device and not each other. You can enter a setting ranging from 0 to 2347 bytes.

Beacon Interval

The beacon interval is the amount of time between access point beacons in mini-seconds. The default beacon interval is 100.

ACK Timing

Acknowledgement Timing, is the amount of time that device wait client's response. This concept is related to EIFS (Extended Inter-Frame Space). The EIFS interval shall begin while the device is idle after detection of the erroneous frame. The EIFS is defined to provide enough time for another device to acknowledge what was, to this device, an incorrectly received frame before this device commences transmission. The default setting of ACK timing is 0. You may need to change this value due to the environment or distance.

Client Expired Time

The client expired time determines time interval the client need to re-associate with the device while client is idle. The default client expired time is 300 sec.

MTU Size

Maximum Transmission Unit, the default MTU size is 1500. The MTU setting controls the maximum Ethernet packet size your PC will send. Why a limit? Because although larger packets can be constructed and sent, your ISP and Internet backbone routers and equipment will fragment any larger than their limit, then these parts are re-assembled by the target equipment before reading. This fragmentation and re-assembly is not optimal. You may need to change the MTU for optimal performance of your wireless LAN traffic.

Data Rate

The standard IEEE 802.11b/11g supports 1, 2, 5.5, 11 / 6, 9, 12, 18, 24, 36, 48 and 54 Mbps data rates. You can choose the rate that the device uses for data transmission. The default value is "auto". The device will use the highest possible selected transmission rate.

Broadcast SSID

Broadcasting the SSID will let your wireless clients find the device automatically. If you are building a public Wireless Network, disable this function can provide better security. Every wireless stations located within the coverage of the device must connect this device by manually configure the

SSID in your client settings.

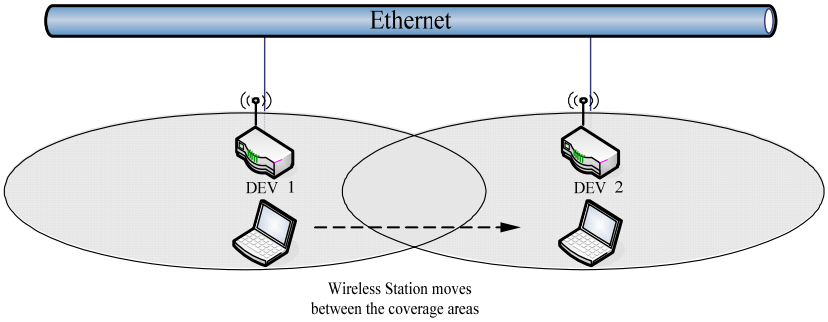
IAPP (Inter-Access Point Protocol)

This function will let Wireless Stations roam among a network environment with multiple devices. Wireless Stations are able to switch from one device to another as they move between the coverage areas. Users can have more wireless working range. An example is as the following figure.

You should comply with the following instructions to roam among the wireless coverage areas.

Note： **For implementing the roaming function, the setting MUST comply the following two items.**

- All the devices must be in the same subnet network and the SSID must be the same.
- If you use the 802.1x authentication, you need to have the user profile in these devices for the roaming station.



Block WLAN Relay (Isolate Client)

The device supports isolation function. If you are building a public Wireless Network, enable this function can provide better security. The device will block packets between wireless clients (relay). All the wireless clients connected to the device can't see each other.

Transmit Power

The default transmit power of this device is 26.65dBm for CCK (802.11b) and 21.96dBm for OFDM (802.11g). In case of decrease the wireless distance and coverage of this device, turn down the power level for CCK and OFDM. For CCK, 4 levels are available to turn down the power from default 26.65dBm to 25.65, 24.65, 23.65,22.65dBm. For OFDM, 3 levels are available to turn down the power from default 21.96dBm to 20.96, 19.96, 18.96dBm.

If you want to restore the wireless distance and coverage of the device, select a higher level or the default level of transmit power.

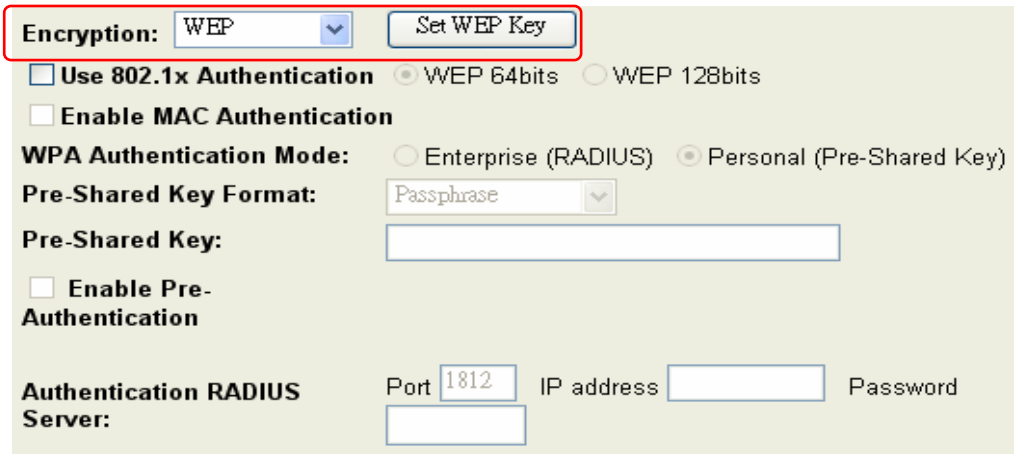
Configuring Wireless Security

This device provides complete wireless security function include WEP, 802.1x, WPA-TKIP, WPA2-AES and WPA2-Mixed in different mode (see the Security Support Table).

The default security setting of the encryption function is disabled. Choose your preferred security setting depending on what security function you need.

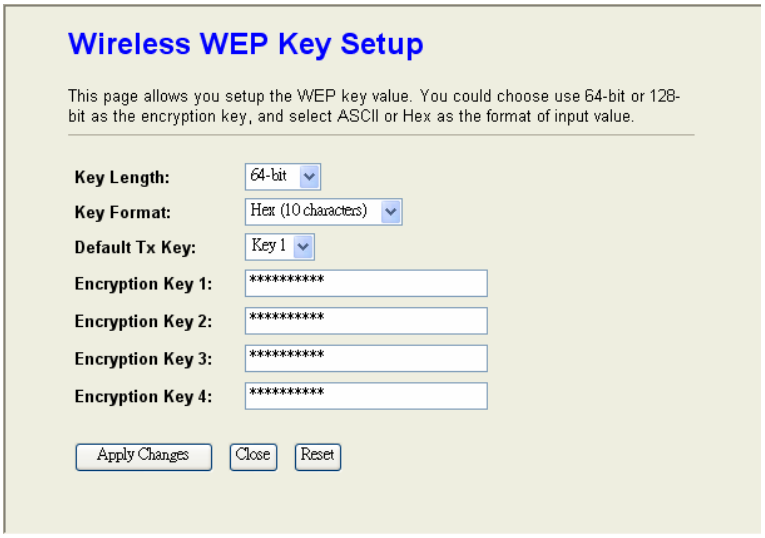
WEP Encryption Setting

Wired Equivalent Privacy (WEP) is implemented in this device to prevent unauthorized access to your wireless network. The WEP setting must be as same as each client in your wireless network. For more secure data transmission, you can change encryption type to “WEP” and click the “Set WEP Key” button to open the “Wireless WEP Key setup” page.



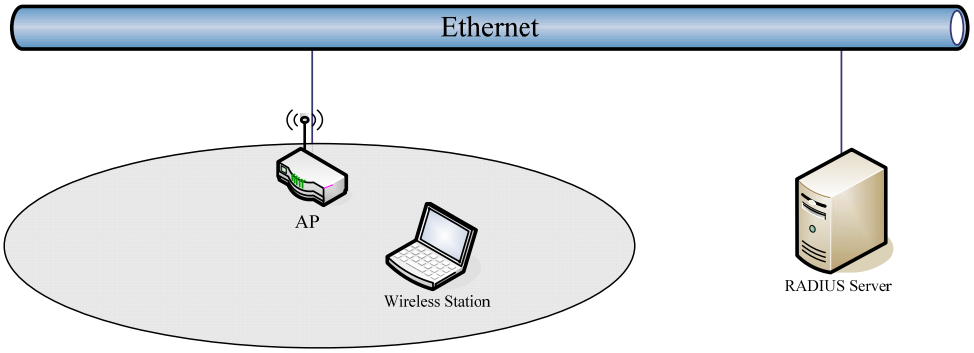
When you decide to use the WEP encryption to secure your WLAN, please refer to the following setting of the WEP encryption:

- 64-bit WEP Encryption：64-bit WEP keys are as same as the encryption method of 40-bit WEP. You can input 10 hexadecimal digits (0~9, a~f or A~F) or 5 ACSII chars.
- 128-bit WEP Encryption：128-bit WEP keys are as same as the encryption method of 104-bit WEP. You can input 26 hexadecimal digits (0~9, a~f or A~F) or 10 ACSII chars.
- The Default Tx Key field decides which of the four keys you want to use in your WLAN environment.

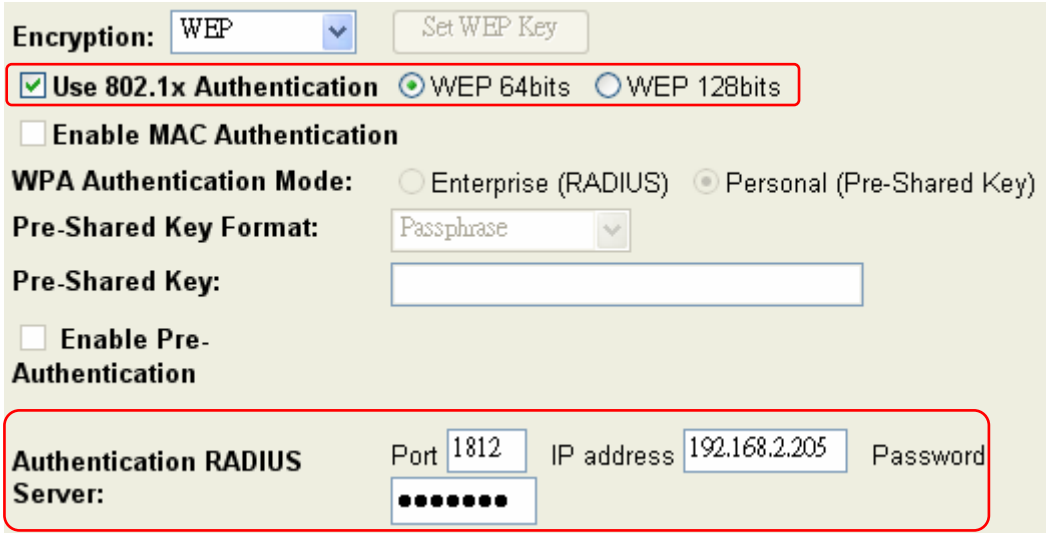


WEP Encryption with 802.1x Setting

The device supports external RADIUS Server that can secure networks against unauthorized access. If you use the WEP encryption, you can also use the RADIUS server to check the admission of the users. By this way every user must use a valid account before accessing the Wireless LAN and requires a RADIUS or other authentication server on the network. An example is shown as following.



You should choose WEP 64 or 128 bit encryption to fit with your network environment first. Then add user accounts and the target device to the RADIUS server. In the device , you need to specify the IP address、Password (Shared Secret) and Port number of the target RADIUS server.



WPA Encryption Setting

WPA feature provides a high level of assurance for end-users and administrators that their data will remain private and access to their network restricted to authorized users. You can choose the WPA encryption and select the Authentication Mode.

WPA Authentication Mode

This device supports two WPA modes. For personal user, you can use the Pre-shared Key to enhance your security setting. This mode requires only an access point and client station that supports WPA-PSK. For Enterprise, authentication is achieved via WPA RADIUS Server. You need a RADIUS or other authentication server on the network.

- **Enterprise (RADIUS):**

  When WPA Authentication mode is Enterprise (RADIUS), you have to add user accounts and the target device to the RADIUS Server. In the device , you need to specify the IP address、Password (Shared Secret) and Port number of the target RADIUS server.

- **Pre-Share Key:**

  This mode requires only an access point and client station that supports WPA-PSK. The WPA-PSK settings include Key Format, Length and Value. They must be as same as each wireless client in your wireless network. When Key format is Passphrase, the key value should have 8~63 ACSII chars. When Key format is Hex, the key value should have 64 hexadecimal digits (0~9, a~f or A~F).

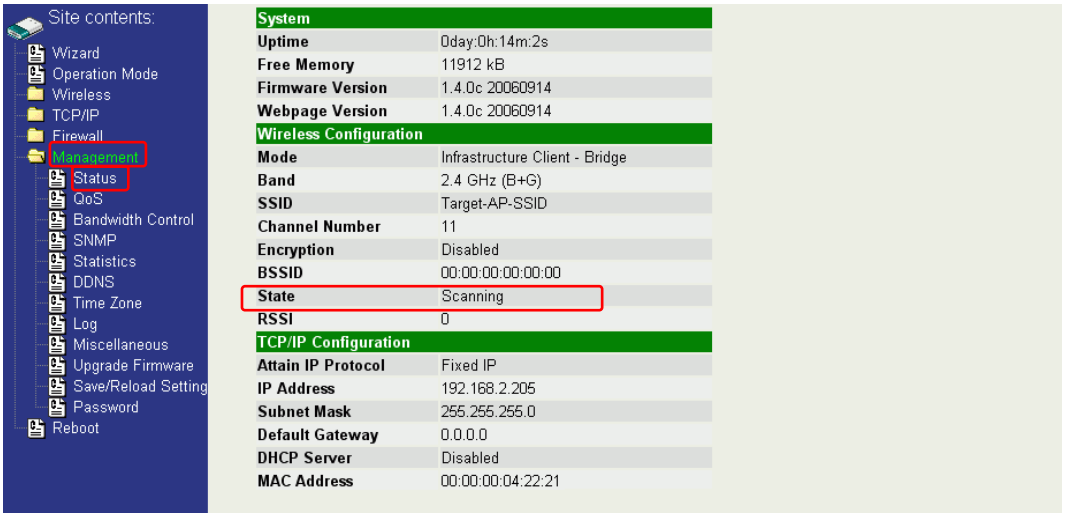
Configuring as WLAN Client Adapter

This device can be configured as a wireless Ethernet adapter. In this mode, the device can connect to the other wireless stations (Ad-Hoc network type) or Access Point (Infrastructure network type) and you don't need to install any driver.

Quick start to configure

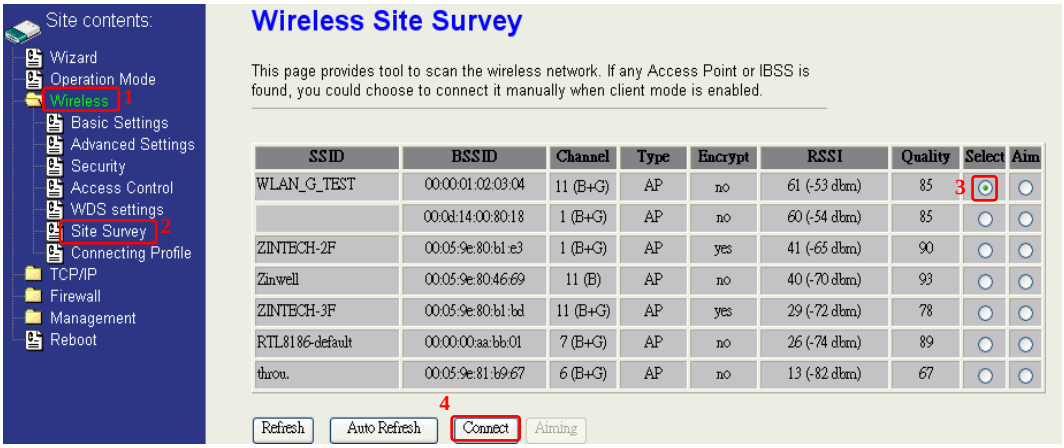
Step 1. In "Basic Settings" page, change the Mode to "Client" mode. And key in the SSID of the AP you want to connect then press "Apply Changes" button to apply the change.

Step 2. Check the state of connection in "Status" web page



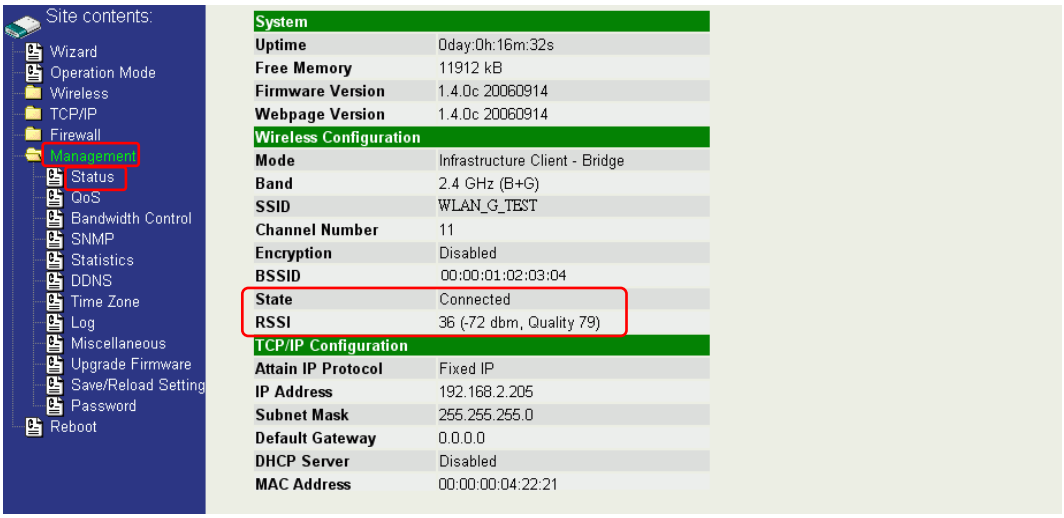
The alternative way to configure as following:

Step 1. In “Wireless Site Survey” page, select one of the SSIDs you want to connect and then press “Connect” button to establish the link.



Step 2. If the linking is established successfully. It will show the message “Connect successfully”. Then press “OK”.

Step 3. Then you can check the linking information in “Status” page.



Note :

If the available network requires authentication and data encryption, you need to setup the authentication and encryption before step1 and all the settings must be as same as the Access Point or Station. About the detail authentication and data encryption settings, please refer the security section.

Authentication Type

In client mode, the device also supports two Authentication Types “Open system” and “Shared Key”. Although the default setting is “Auto”, not every Access Points can support “Auto” mode. If the authentication type on the Access Point is knew by user, we suggest to set the authentication type as same as the Access Point.

Data Encryption

In client mode, the device supports WEP and WPA Personal/Enterprise except WPA2 mixed mode data encryption. About the detail data encryption settings, please refer the security section.

MAC Clone for Single Ethernet Client

Enable/Disable Mac Clone (Single Ethernet Client) in Wireless-Basic Settings page determines whether the Ethernet Client use it’s own MAC address or AP-Client’s MAC address to transmit data. Enable MAC Clone, the single Ethernet client can use its own MAC address. Disable MAC Clone, the single Ethernet client must to use AP-Client’s MAC address.

While you use this device act as AP-Client and only one host connect to this device via Ethernet, you need to check this option in this page, otherwise the other device can’t recognize your host behind AP-Client. If you use hub/switch connect multi-device to this AP-Client, you should uncheck this option.