WLAN a+b+g mini-PCI Module

RZ2009

User Manual

Version: 1.0

March 2004

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 he instructions, may cause harmful interference to radio communications. However, there is no guarantee that interference will not occur in a particular installation. If this equipment does cause harmful interference to radio or television reception, which can be determined by turning the equipment off and on, the user is encouraged to try to correct the interference by one of the following measures:

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

FCC Caution: To assure continued compliance, (example - use only shielded interface cables when connecting to computer or peripheral devices) any changes or modifications not expressly approved by the party responsible for compliance could void the user's authority to operate this 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.

IMPORTANT NOTE:

The device shall not be used in such a manner that the potential for human contact during normal operation is minimized. It is the responsibility of the installer and users of the device to guarantee that the antenna operates at least 20 centimeters (8 inches) from any person. The antenna should not be co-located with any other antenna or transmitter. This is necessary to insure that the product operates in accordance with the FCC RF Guidelines for Human Exposure

Labeling Considerations

The OEM product that employs FCC ID: NN4RZ2009 RF module shall label as below:

“Contains transmitter module FCC ID: NN4RZ2009” or “Contains FCC ID: NN4RZ2009”

Professional Installment

The device must be installed by professionals in accordance with responsible party’s instruction manual.

Modification

Modifications to the device, unless expressly approved by the responsible party, could void the user’s authority to operate the device.

Antenna Type

The device uses a 26dBi Parabolic grid antenna with a specified length of coax cable.

The device uses a 15 dBi WNA-202F Patch antenna with 3 dB cable loss.

The device uses 6 dBi KA-00 Cardioid antenna with 6 dB cable loss.

The device uses a 6 dBi CA-01 Omni antenna with 3 dB cable loss

The device uses 18 dBi YA2418RD Yagi antenna with 10 dB cable loss.

.

Table of Contents

1. Introduction

Thank you for purchasing the WLAN a+b+g mini-PCI Module that provides the easiest way to wireless networking. This User Manual contains detailed instructions in the operation of this product. Please keep this manual for future reference.

System Requirements

- A laptop PC contains:
  - 32 MB memory or greater
  - 300 MHz processor or higher
- Microsoft® Win™2000/ME/98 Second Edition/XP

2. Driver/Utility Installation / Uninstallation

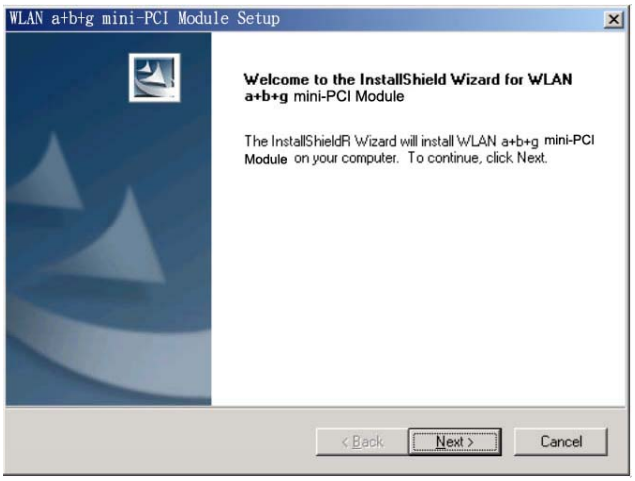
2.1 Installation

Note! The Installation Section in this User Manual describes the first-time installation for Windows. To re-install the driver, please first uninstall the previously installed driver. See Chapter 2.3 “Uninstallation” in this User Manual.

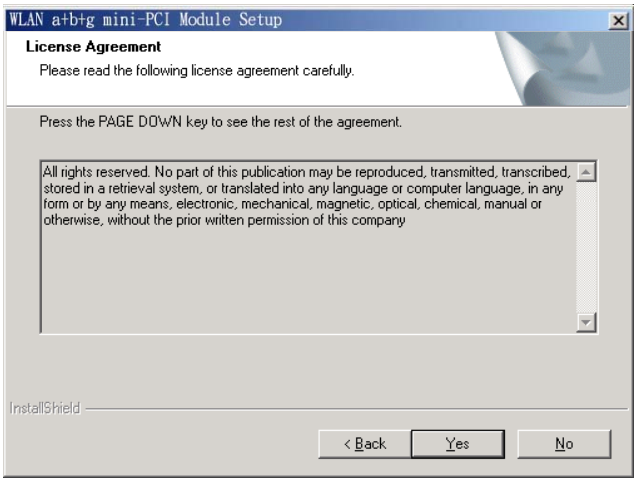
Follow the steps below to complete the driver/utility installation:

1. Insert the **Installation Software CD** into the CD-Rom Drive.

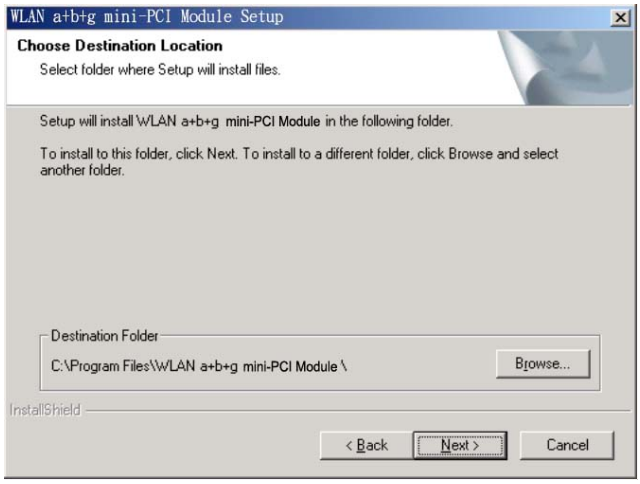
2. Click **“Next”**.



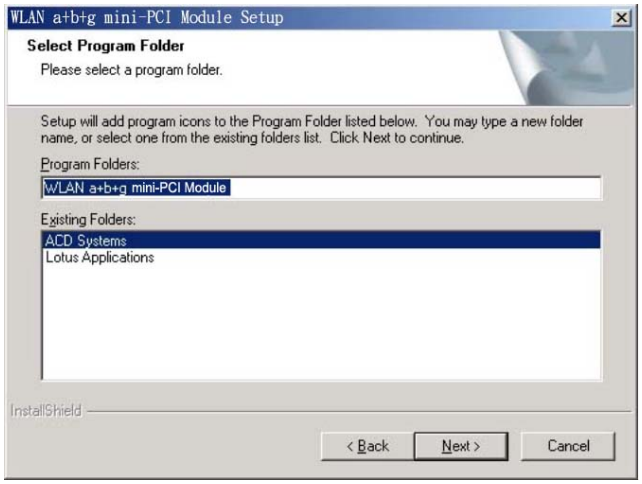
3. Read the **License Agreement** and click **“Yes”**.



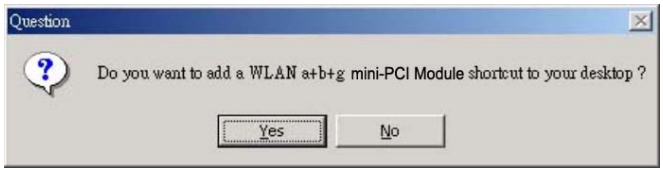
4. Click **“Next”** to continue or click **“Browse”** to choose a destination folder.



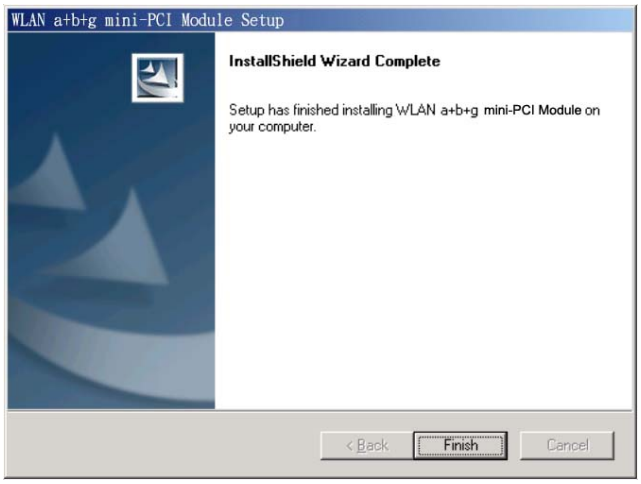
5. Click **“Next”**.



6. Click **“Yes”** to create a shortcut icon on your desktop.



7. Click **“Finish”**.



8. You should now see a shortcut icon on your desktop.

2.2 Additional Setup Processes

During software installation procedure, each operating system may prompt different specific options:

1. **Windows 98SE:** The system will request the original Windows CD during the installation process. When the installation is finished, you'll have to restart your computer.

2. **Windows Me:** Please restart your computer when the installation is finished.

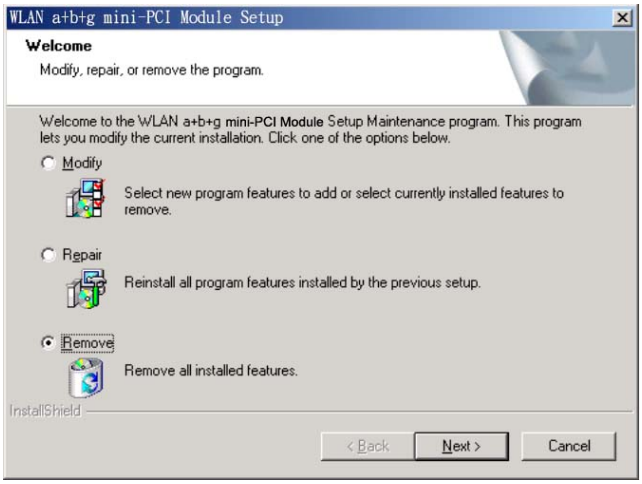
3. **Windows 2000/XP:** Select "Install the software automatically" when the window with this option appears, and then click "Next" to continue installation.

2.3 Uninstallation

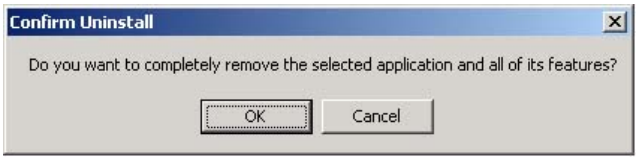
Note! Before uninstallation, please close all running programs.

1. Click Start>Programs>WLAN a+b+g mini-PCI Module >UnInstall WLAN a+b+g mini-PCI Module.

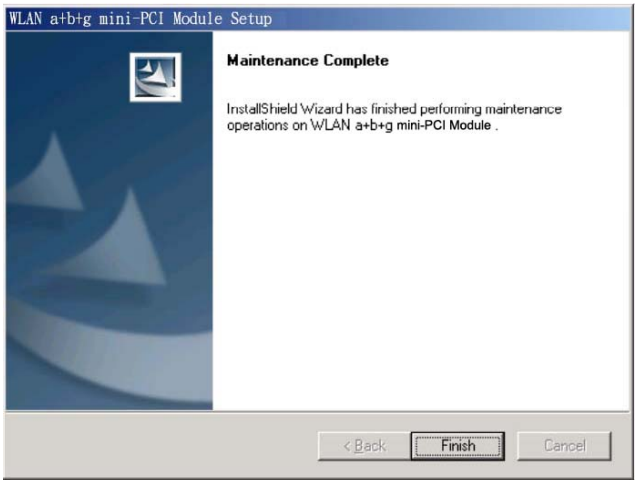
2. Choose **"Remove"**. Click **"Next"**.



3. Click **"OK"** to start **Uninstall**.

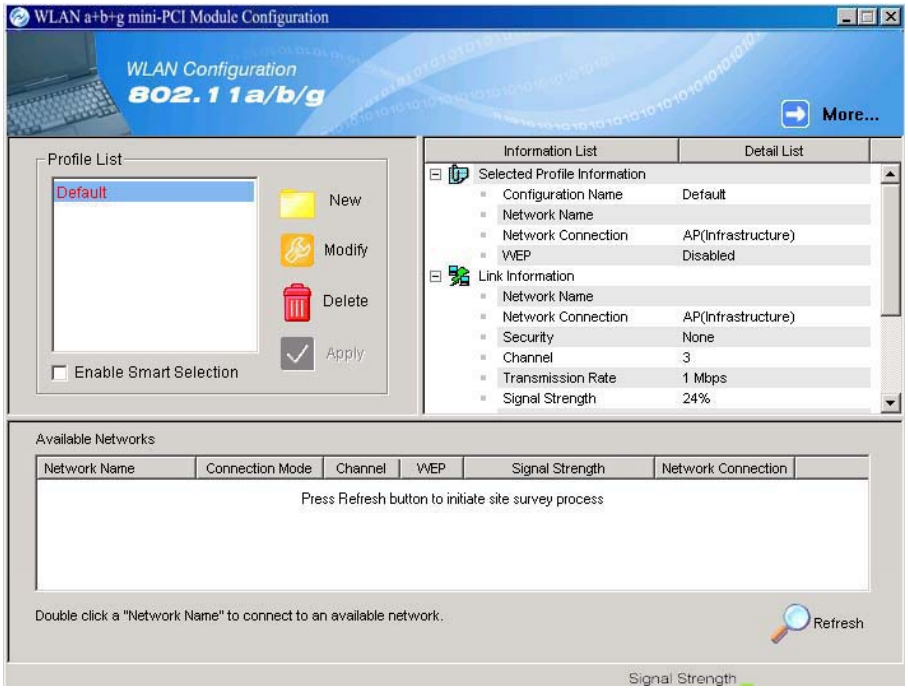


4. Click **"Finish"**. **Uninstall** is now completed.

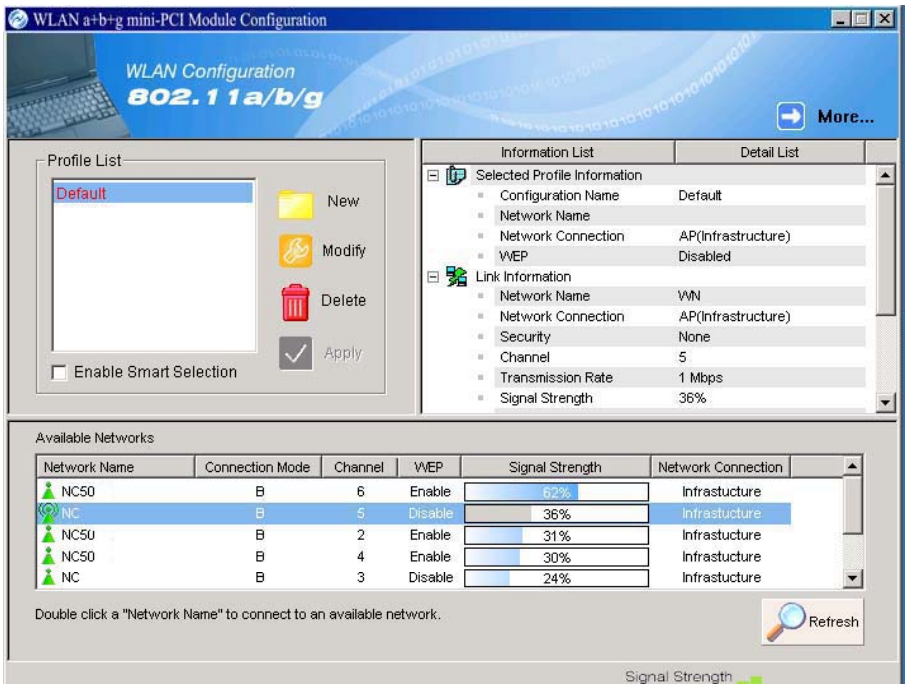


3. Connecting to an Existing Network

1. Double click the shortcut icon of WLAN a+b+g mini-PCI Module on the desktop, and the Configuration window appears.



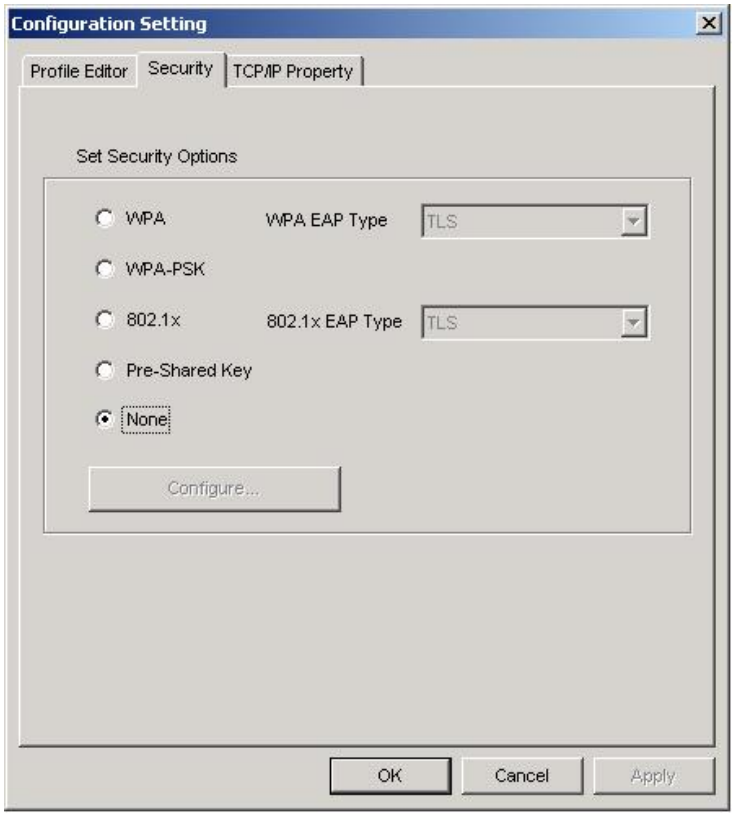
2. Click on the **Refresh** button  to list all available networks.



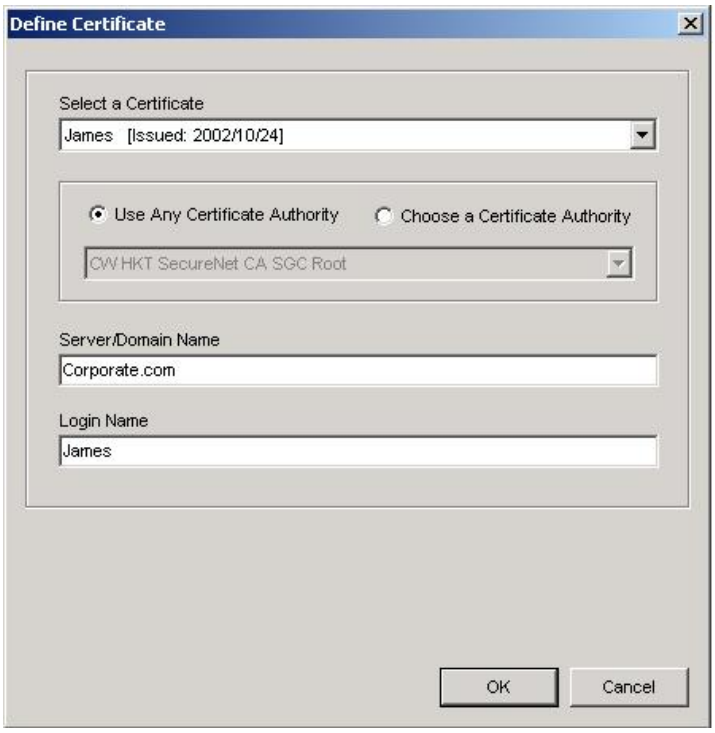
Note! To automatically connect to the network with the strongest signal, select **Enable Smart Selection**. **Any** displays in Profile List.

3. From the list of "Available Networks", choose one network by double clicking the **Network Name**. One of the following dialog boxes appears. Click **"Yes"** to continue.

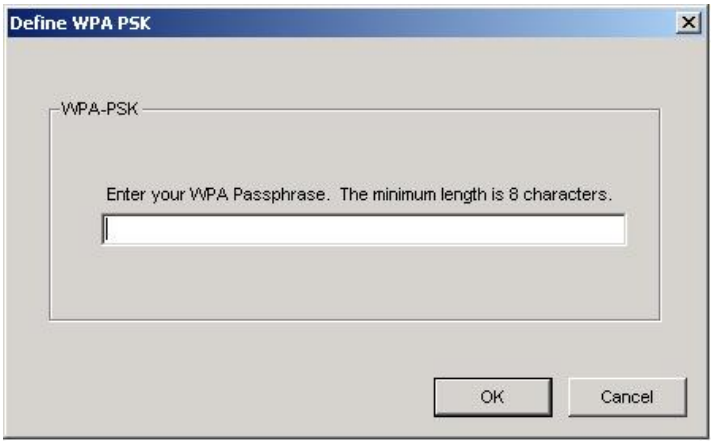
4. If the chosen network has security enabled, the **Security** tab displays. Select the security option used by the network. Contact the network administrator for the correct settings.



5. If selecting **WPA** or **802.1X**, select the EAP type, then click on the **Configure** button to select the certificate.



6. If selecting **WPA-PSK**, click on the **Configure** button to enter the PassPhrase.



7. If selecting **Pre-Shared Key**, click on the **Configure** button to enter the correct Encryption Keys**.**

   Key entry method:

   a.10hex digits: User must enter 10 hexadecimal digits.

   The hexadecimal define is "0-9" and "A-F".

   ex: 123456abc

   b.5 chars: User must enter 5 characters. ex: ab3#@

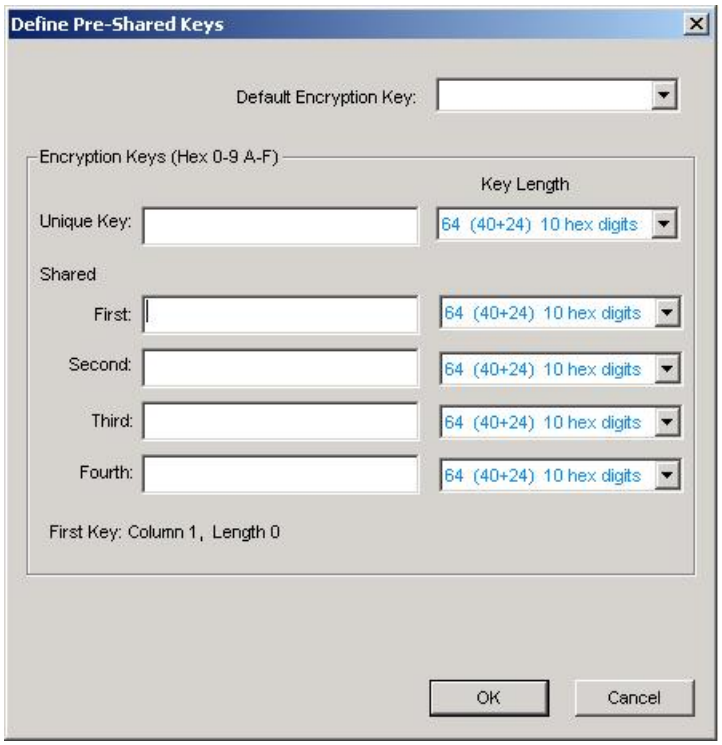
   c.13 chars: User must enter 13 characters.

   ex: ab3#@kf08&kdk

   d.16 chars: User must enter 16 characters.

   ex: ab3#@kf08&kdk456

   For WEP key, please contact with MIS administrator.



8. Click on **OK** (or **Apply** if using the other tabs) when done to save the settings.

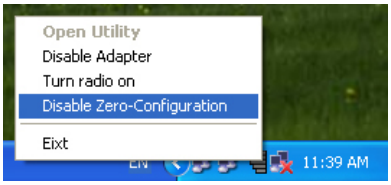
9. Once connected (the icon or in front of the name of the Connected Network), you can check the signal strength from the icon in the Windows System Tray.

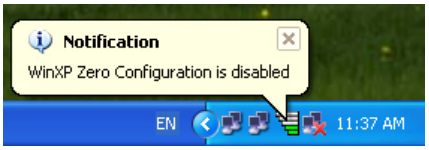
Additional Note for Windows XP

In Windows XP, it is recommended that you use the WLAN a+b+g mini-PCI Module Configuration Utility. Before using the Utility, please follow the steps below to disable the Windows XP Zero Configuration:

Option 1:

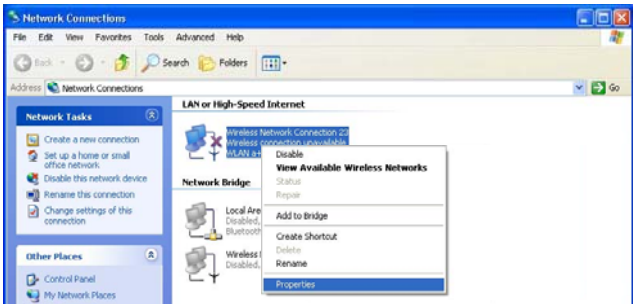
1. Double click the shortcut icon to open the Utility.
2. From the Windows System Tray, you should see the signal icon. Right-click it and select “Disable Zero-Configuration”.



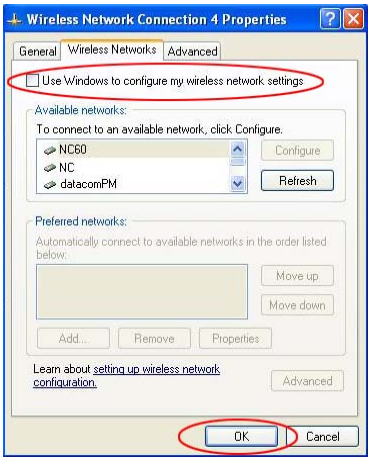


Option 2:

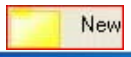
1. Go to “Control Panel” and double click “Network Connections”.
2. Right-click “Wireless Network Connection” of “WLAN a+b+g mini-PCI Module”, and select “Properties”.

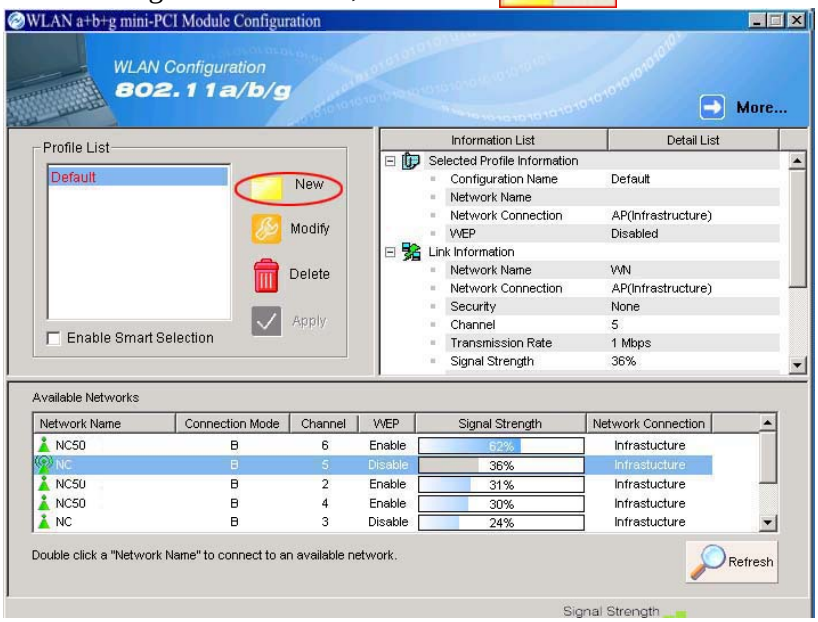


3. Select “Wireless Networks” tab, and uncheck the check box of “Use Windows to configure my wireless network settings”, and then click “OK”.

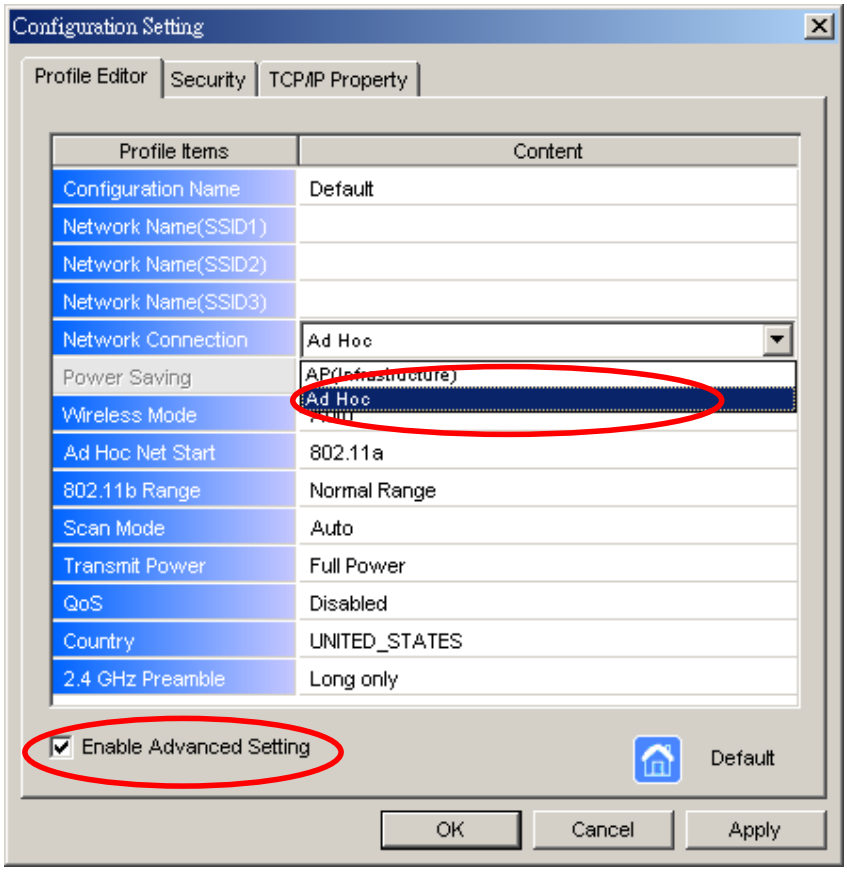


4. Creating an Ad Hoc New Network

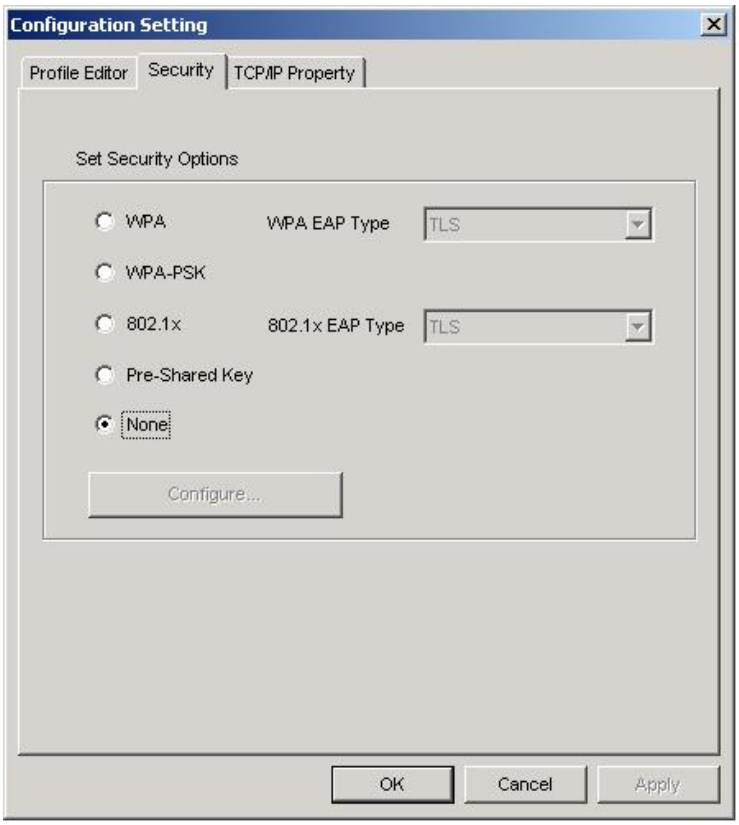
1. In the Configuration window, click **New** 



2. Select the “Profile Editor” tab.

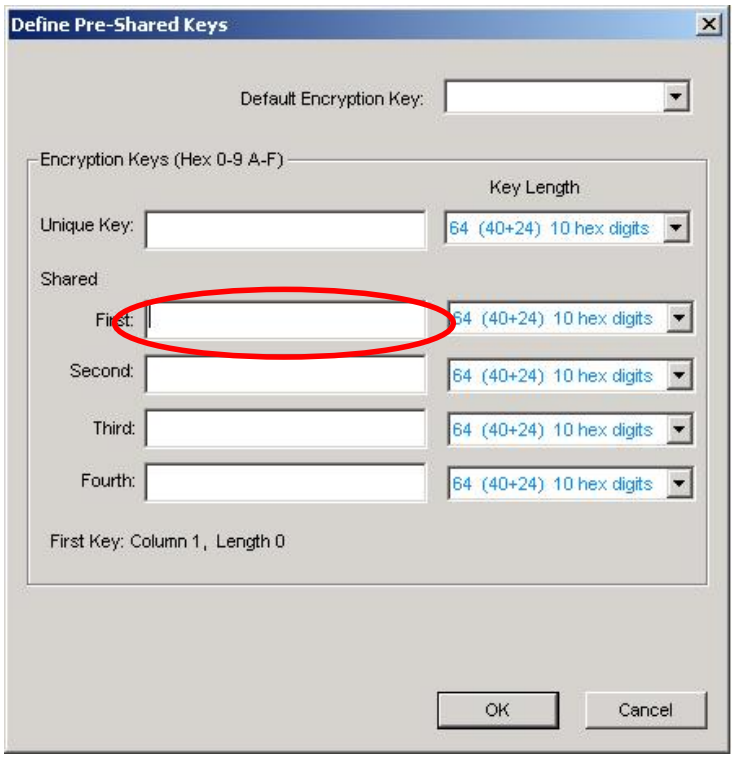


3. Choose the check box of **Enable Advanced Setting** to edit all settings.
4. If joining or creating an Ad-Hoc network, choose **Ad Hoc**.
5. If the correct country is not selected, select the country where the computer is located.
   ALERT! Different countries have different regulations that affect which channels can be used. You should always choose the country where you are physically located to avoid using an illegal channel.
6. Click **OK** (or **Apply** if using the other tabs) to save the settings.
   For details of each setting, refer to **Modifying a Wireless Network on page 20**.
7. Click the **Security** tab. If not using security, select **None**.



8. If security is used, select **Pre-Shared Key** and click on the **Configure** button.

9. Enter an encryption key in the **Shared: First** field.



10. Click **OK** (or **Apply** if using the other tabs) to save the settings. The new **Network Name** is listed in the **Profile List**.
    The driver does not allow channel selection in Ad-Hoc mode. Instead, the driver starts with an initial channel then checks channel status. If the channel is busy, the driver automatically uses a different channel.

For details of each setting, please see chapter 5.

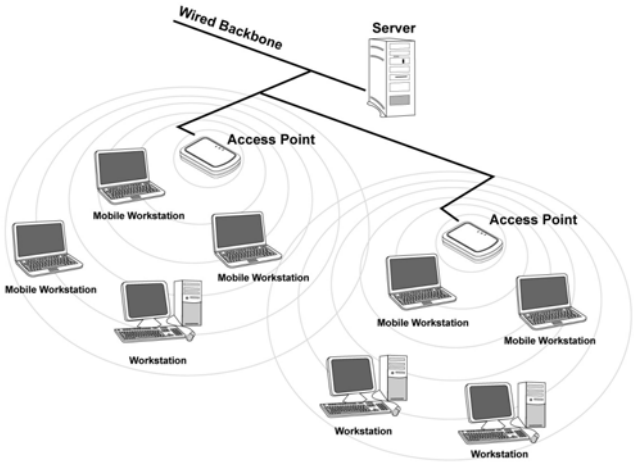
5. Modifying a Wireless Network

5.1 Infrastructure Mode and Ad Hoc Mode

You can set the Wireless Network Adapter to work in either **Infrastructure mode** or **Ad Hoc mode**.

Infrastructure Mode

In infrastructure mode, devices communicate with each other by first going through an Access Point (AP). Wireless devices can communicate with each other or can communicate with a wired network. When one AP is connected to wired network and a set of wireless stations, it is referred to as a BSS (Basic Service Set).



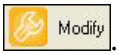
Ad Hoc Mode

Ad-hoc mode is also called “peer-to-peer mode” or “Independent Basic Service Set (IBSS)”. In ad hoc mode, devices communicate directly with each other without using an Access Point (AP).

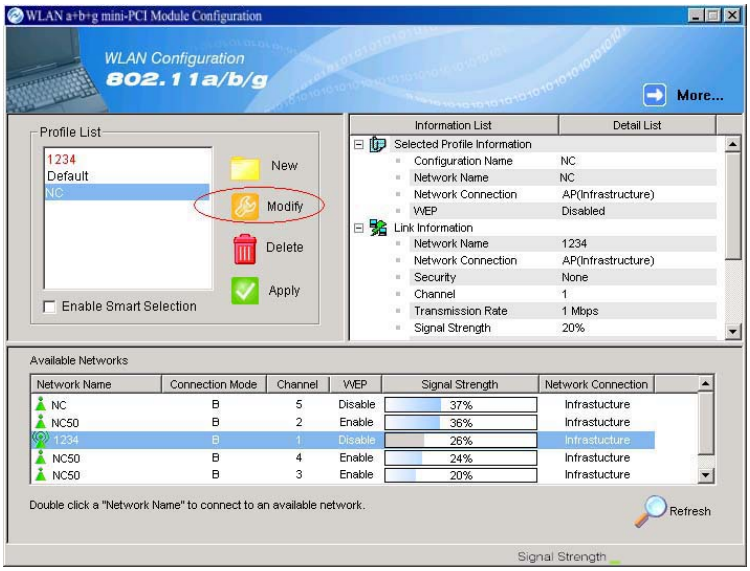
5.2 Modifying a Wireless Network

1. Open “WLAN a+b+g mini-PCI Module Configuration” by double clicking the shortcut icon on the desktop.

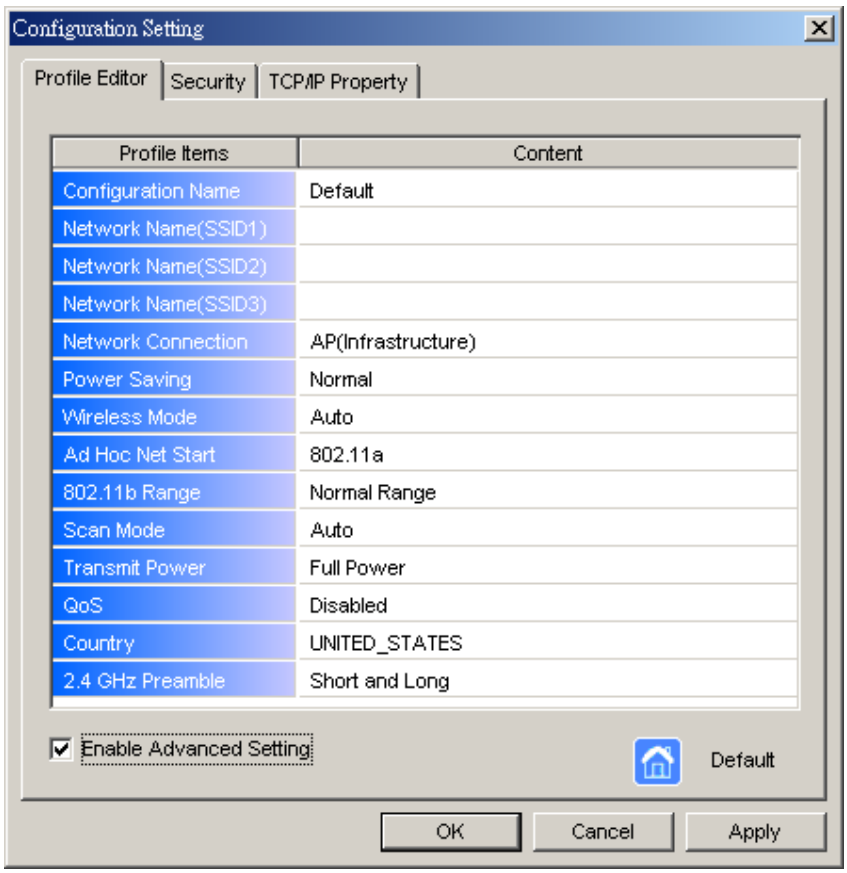
   Note! If there’s no network name listed in the “Profile List”, click **Refresh** button and double click a Network Name from **Available Networks**. The chosen Network Name is listed in the Profile List.

2. From the Profile List, select one Profile and click **Modify** button 

.



3. Select **Profile Editor** tab and edit the settings. Click **OK** to save the modifications.



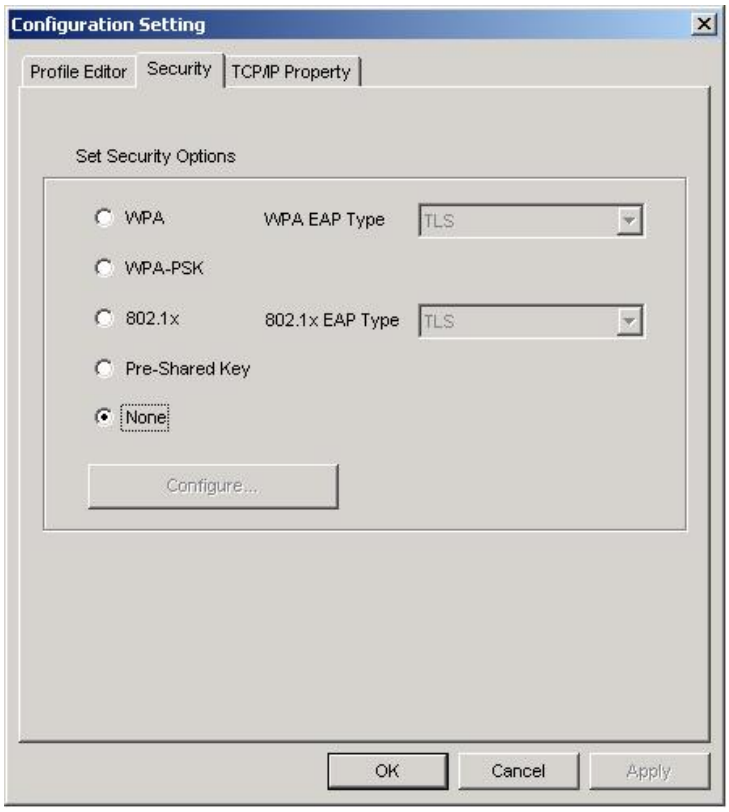
- **Configuration Name:** This name identifies the configuration. This name should be unique.
- **Network Name (SSID1) (SSID2) (SSID3):** The name of the wireless network. This name cannot be longer than 32 characters. If the field is set to be "ANY" or is left blank, your computer will connect to an AP with the best signal strength.
- **Network Connection:** Specifies the mode of the network. Two options are "Infrastructure" and "Ad Hoc".
- **Power Saving:** Minimizes power consumption while maintaining network connectivity and high data transfer performance. In **Ad Hoc** mode, **Power Savings** function cannot be enabled. The power management options are:
  - **Off**: PC Card is powered up at all times.
  - **Normal**: PC Card sleeps less often and stays asleep for a shorter period.
  - **Maximum**: PC Card sleeps more frequently and stays asleep as much as possible.
- **Wireless Mode:** Three options are "802.11b", "802.11a", "802.11g",
- "Super A", "Super G" or "Auto". "Auto" allows the use of either 802.11a,

802.11g or 802.11b mode.

- **Ad Hoc Net Start:** Specifies a band to establish an Ad Hoc network if no matching SSID is found. Four options are available: 802.11b, 802.11a, 802.11aTurbo and 802.11g.
- **802.11b Range:** Options are **Normal Range** and **Extended Range**. This function can let user to determine the transfer range in 802.11b mode. Extended Range can prolong the transfer range with a lower data transmitting rate.
- **Scan Mode:** Options are **Active Scan**, **Passive Scan** and **Auto**. In Active Scan, the driver sends out the probe request frames from each channel and collects the response frames from the responding. In Passive Scan, the driver scan each requested channel, listening the beacons on each channel.
- **Transmit Power:** This setting allows you to change the output power of the PC Card to increase or decrease the coverage area.
- **QoS:** Disables or enables the PC Card to cooperate in a network using QoS (Quality of Service).
- **Country:** Select the country where this PC Card will operate.
  ALERT! Different countries have different regulations that affect which channels can be used. You should always choose the country where you are physically located to avoid using an illegal channel.
- **2.4 GHz Preamble:** Allows Ad-Hoc compatibility with other 2.4 GHz devices. Two options are **Short and Long** and **Long only**. Use **Long Only** when configuring the client for an 802.11b RoamAbout AP wireless network.

4. Select **Security** tab and choose the security mode.

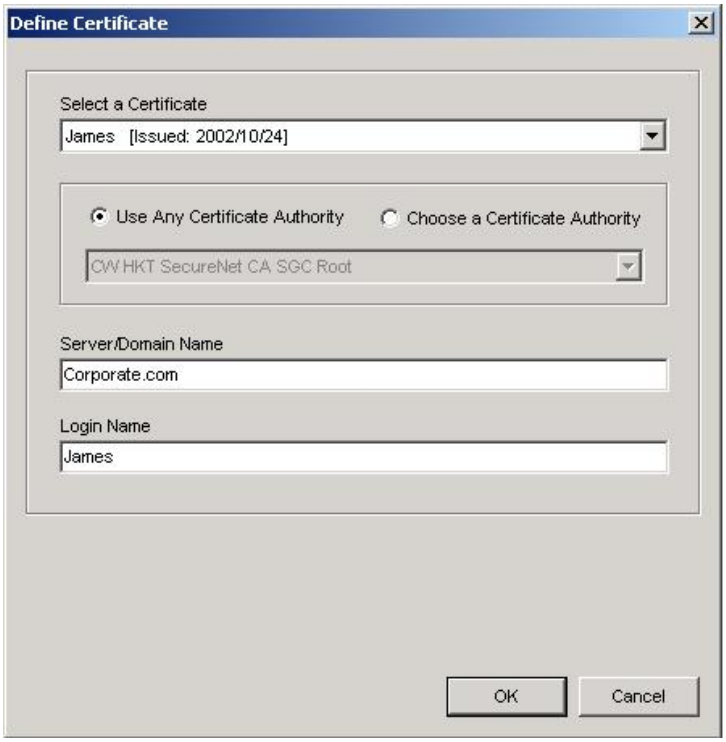
Note! *Check with your Network Administrator for the security features supported by your AP.*



- **WPA:** Enables the use of WiFi protected Access (WPA). This option requires IT administration.
  - **a)** Select **WPA** to open the WPA EAP drop-down menu. The options includes TLS and PEAP.
  - **b)** Click on the **Configure** button and complete the configuration information in the Define Certificate dialog.
- **WPA-PSK:** Enables the WPA-Pre Shared Key (PSK). Click on the **Configure** button and complete the configuration information in the WPA Passphrase dialog.
- **802.1x:** Enables 802.1x security. This option requires IT administration.
  - **a)** Select **802.1x** to open the 802.1x EAP drop-down menu. The options include TLS and PEAP.
  - **b)** Click on the **Configure** button and complete the configuration information in the Define Certificate dialog.

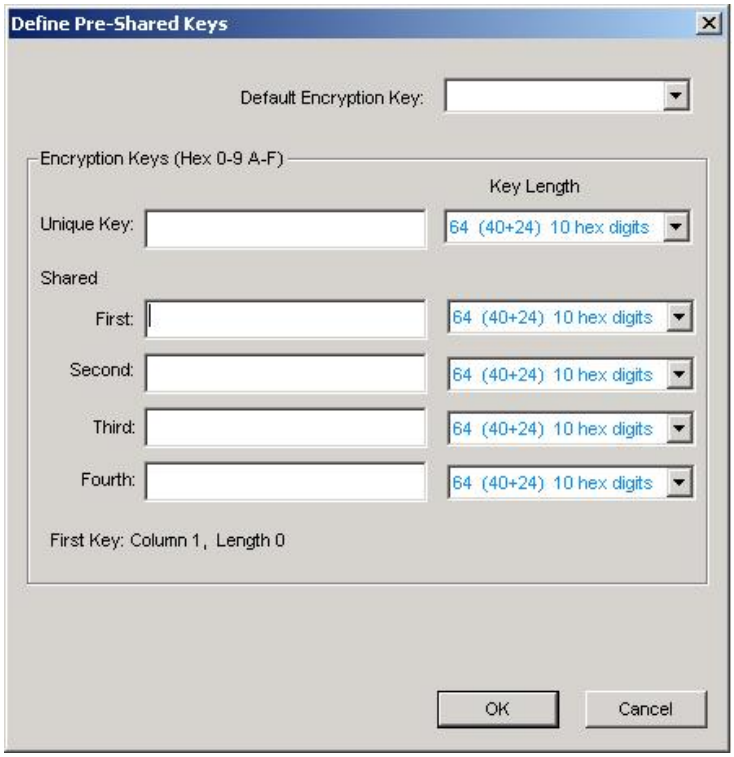
- **Pre-Shared Key:** Enables the use of pre-shared keys that are defined on the AP and the station.
  a) Select the **Pre-Shared Key** radio button.
  b) Click on the **Configure** button and complete the configuration information in the Define Certificate dialog.
- **None:** No security.

5. Define the Certificate.



- **Select a Certificate:** Select the Certificate to Authenticate to the RADIUS server from the drop-down menu.
- **Use any Certificate Authority:** The Default Setting. Select this radio button to use any Certificate Authority (CA) for authentication.
- **Choose a Certificate Authority:** Select this radio button to choose the desired Certificate Authority for authentication from the drop-down menu.
- **Server/Domain Name:** The the RADIUS server name or the domain name used for the network access.
- **Login Name:** The username used to log into the server or domain.
- **Define User Information (PEAP)**: Click on the **Define User Information** button and complete the configuration information in the Define User Information dialog.

6. If selecting **WPA-PSK**, click on the **Configure** button to enter the PassPhrase. The PassPhrase must be a minimum of 8 printable ASCII characters. The PassPhrase should be at least 20 characters to make it more difficult for an attacker to decipher the key.
7. If selecting **Pre-Shared Key**, click on the **Configure** button to enter the Encryption Keys.When finished, click **OK**. For WEP key, please contact with MIS administrator.

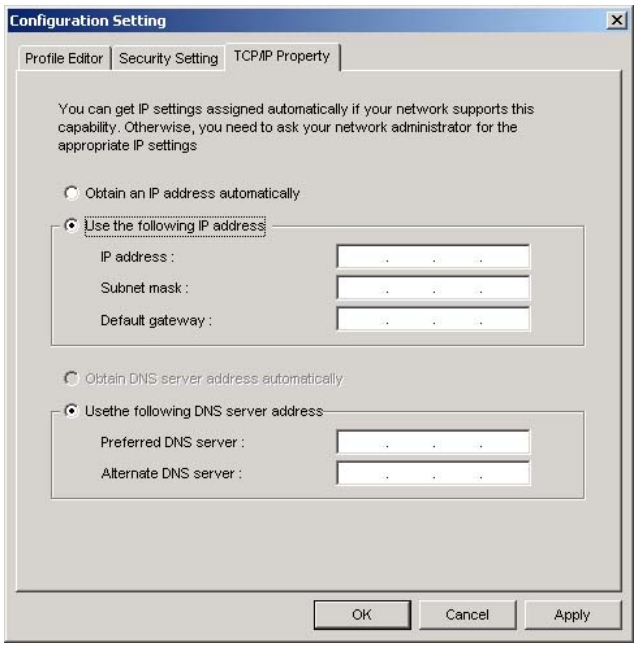


- **Key Entry Method:** Determines the entry method for the key. Hexadecimal (0-9, A-F) or ASCII text (all keyboard characters).
- **Default Encryption Key:** Allows you to choose one encryption key (First, Second, Third, or Fourth) as the transmit key, which encrypts transmissions from the PC Card.
- **Unique Key:** Defines the per-session encryption key for the current network configuration. Not used in Ad-Hoc mode.
- **Shared Keys:** Use these fields to enter the wireless network's encryption keys. The keys must be in the correct position (First, Second, Third, or Fourth).
- **Key Length:** Defines the length of each encryption key.
  - o For 40/64 bit (enter 10 digits for hexadecimal or 5 characters for ASCII)
  - o For 104/128 bit (Enter 26 digits for hexadecimal or 13 characters for ASCII)

When the length is changed, the number of available characters in the field automatically changes. If a previously entered key is too long, the key is automatically truncated to fit. If the key length is increased again, the key does not update to the previous value.

8. Click **OK** to save the settings.

9. Select “TCP/IP Property” tab. Enter the settings and click “OK” to save the settings.



- If the network uses DHCP server, choose **Obtain an IP address automatically**.
- If the network does not use DHCP server, choose **Use the following IP address** to set the relative settings. For the IP configuration information, please contact the network administrator.

5.3 Default Settings Windows XP Zero-Configuration

You may also choose the default parameters and directly proceed to Windows XP zero-configuration through the steps below:

1. Go to “Control Panel” and open “Network Connections”.
2. Right-click the Wireless Network Connection of “WLAN a+b+g mini-PCI Module”, and make sure this connection is **Enabled**.
3. Right-click the Wireless Network Connection of “WLAN a+b+g mini-PCI Module”, and then click “Properties”.
4. Select “Wireless Networks” tab and select “Use Windows to configure my wireless network settings” check box.

Note! Clear the check box of “Use Windows to configure my wireless network settings” will disable automatic wireless network configuration.

5.4 Super A/G Setting

The Super A/G features do not require station configuration as the command are handled during auto-negotiation.

1. User can double click the AP that set in Super A/G mode in the site survey list, the configuration tool would auto connect to that AP.
2. User can manually create a new profile, and then modify the profile setting by changing the “wireless Mode” to “Super A” or “Super G”.

Appendix A: FAQ about WLAN

1. Can I run an application from a remote computer over the wireless network?

This will depend on whether or not the application is designed to be used over a network. Consult the application's user guide to determine whether it supports operation over a network.

2. Can I play computer games with other members of the wireless network?

Yes, as long as the game supports multiple players over a LAN (local area network). Refer to the game's user guide for more information.

3. What is Spread Spectrum?

Spread Spectrum technology is a wideband radio frequency technique developed by the military for use in reliable, secure, mission-critical communications systems. It is designed to trade off bandwidth efficiency for reliability, integrity, and security. In other words, more bandwidth is consumed than in the case of narrowband transmission, but the trade-off produces a signal that is, in effect, louder and thus easier to detect, provided that the receiver knows the parameters of the spread-spectrum signal being broadcast. If a receiver is not tuned to the right frequency, a spread-spectrum signal looks like background noise. There are two main alternatives, Direct Sequence Spread Spectrum (DSSS) and Frequency Hopping Spread Spectrum (FHSS).

4. What is DSSS? What is FHSS? And what are their differences?

Frequency-Hopping Spread-Spectrum (FHSS) uses a narrowband carrier that changes frequency in a pattern that is known to both transmitter and receiver. Properly synchronized, the net effect is to maintain a single logical channel. To an unintended receiver, FHSS appears to be short-duration impulse noise. Direct-Sequence Spread-Spectrum (DSSS) generates a redundant bit pattern for each bit to be transmitted. This bit pattern is called a chip (or chipping code). The longer the chip, the greater the probability that the original data can be recovered. Even if one or more bits in the chip are damaged during transmission, statistical techniques embedded in the radio can recover the original data without the need for retransmission. To an unintended receiver, DSSS appears as low power wideband noise and is rejected (ignored) by most narrowband receivers.

5. Would the information be intercepted while transmitting on air?

WLAN features two-fold protection in security. On the hardware side, as with Direct Sequence Spread Spectrum technology, it has the inherent security feature of scrambling. On the software side, WLAN offers the encryption function (WEP) to enhance security and access control.

6. What is WEP?

WEP is Wired Equivalent Privacy, a data privacy mechanism based on a 64-bit or 128-bit shared key algorithm, as described in the IEEE 802.11 standard.

7. What is infrastructure mode?

When a wireless network is set to infrastructure mode, the wireless network is configured to communicate with a wired network through a wireless access point.

8. What is roaming?

Roaming is the ability of a portable computer user to communicate continuously while moving freely throughout an area greater than that covered by a single access point. Before using the roaming function, the workstation must make sure that it is the same channel number with the access point of dedicated coverage area.

To achieve true seamless connectivity, the wireless LAN must incorporate a number of different functions. Each node and access point, for example, must always acknowledge receipt of each message. Each node must maintain contact with the wireless network even when not actually transmitting data. Achieving these functions simultaneously requires a dynamic RF networking technology that links access points and nodes. In such a system, the user's end node undertakes a search for the best possible access to the system. First, it evaluates such factors as signal strength and quality, as well as the message load currently being carried by each access point and the distance of each access point to the wired backbone. Based on that information, the node next selects the right access point and registers its address. Communications between end node and host computer can then be transmitted up and down the backbone. As the user moves on, the end node's RF transmitter regularly checks the system to determine whether it is in touch with the original access point or whether it should seek a new one. When a node no longer receives acknowledgment from its original access point, it undertakes a new search. Upon finding a new access point, it then re-registers, and the communication process continues.

Appendix B: Specification

Item	Key specifications
Frequency range	➢ U-NII: 2.412 ~ 2.462Ghz, 2.400 – 2.483GHz, ➢ Europe: 2.412 ~2.472Ghz, 5.15~ 5.35Ghz, 5.47 ~ 5.725Ghz 2.400 – 2.483GHz ➢ Japan: 2.412 ~ 2.484Ghz, 5.15 ~ 5.25Ghz 2.400 – 2.483GHz, 4.90 – 5.091GHz, 5.15 – 5.25GHz ➢ China: 2.412 ~ 2.472Ghz, 5.725 ~5.85Ghz 2.400 – 2.483GHz
Modulation technique	➢ **802.11b/g** DSSS (DBPSK, DQPSK, CCK) OFDM for data rate > 20 Mbps ➢ **802.11a** OFDM(BPSK,QPSK, 16-QAM, 64-QAM)
Channels support	➢ **802.11b/g** US/Canada: 11 (1 ~ 11) Major European country: 13 (1 ~ 13) France: 4 (10 ~ 13) Japan: 14 (1~13 or 14th) China: 13 (1 ~ 13) ➢ **802.11a** 1). US/Canada:12 non-overlapping channels (5.15 ~ 5.35GHz, 5.725 ~ 5.825GHz) 2). Europe: 19 non-overlapping channel (5.15 ~ 5.35GHz, 5.47 ~ 5.725GHz) 3). Japan: 4 non-overlapping channels (5.15 ~ 5.25GHz) 4). China : 5 non-overlapping channels (5.15 ~ 5.85GHz)
Operation voltage	➢ 3.3V +/- 5%
Power consumption	**802.11a** / **802.11b** / **802.11g** ➢ Continuous Tx: 490~510mA @18dBm / 570~590mA @18dBm / 610~640mA@18dBm ➢ Continuous Rx: 340~350mA / 360~380mA / 420~440mA ➢ FTP Tx: 420~440mA / 510~530mA / 530~545mA ➢ FTP Rx: 400~420mA / 470~485mA / 490~510mA ➢ Standby mode: 360~380mA / 440~450mA / 450~470mA ➢ Power saving mode: 50mA / 50mA / 50mA ➢ RF Kill: 40mA / 40mA / 40mA
Output power	➢ **802.11b/g** 18 dBm peak power ➢ **802.11a** 1). US : 5.150 – 5.250: 15 dBm 5.250 – 5.350: 18 dBm 5.470 – 5.725: not allowed 5.725 – 5.825: 17 dBm 2). Europe 5.150 – 5.250 and 5.250 – 5.350: 18 dBm 5.470 – 5.725: 17 dBm 5.725 – 5.825: Not allowed. 3). Japan 5.150 – 5.250: 18 dBm 5.250 – 5.350: not allowed 5.470 – 5.725: not allowed 5.725 – 5.825: not allowed

Item	Key specifications
Operation distance	➢ **802.11a** Outdoor: 40m@72Mbps,85m@54Mbps,250m@48Mbps,310m@36Mbps Indoor:20m@72Mbps,25m@54Mbps,35m@48Mbps,40m@36Mbps ➢ **802.11b** Outdoor:300m@11Mbps,465m@5.5Mbps,500m@2Mbps,515m@1Mbps Indoor: 60m@11Mbps,70m@5.5Mbps,83m@2Mbps,85m@1Mbps ➢ **802.11g** Outdoor: 82m@54Mbps,100m@48Mbps,300m@36Mbps Indoor:20m@54Mbps,25m@48Mbps,35m@36Mbps
Operation System supported	➢ Windows® 98SE, ME, 2K, XP
Security	➢ 64-bit,128-bit, 152-bit WEP Encryption ➢ 802.1x Authentication ➢ AES-CCM & TKIP Encryption
Operation mode	➢ Infrastructure & Ad-hoc mode
Transfer data rate	➢ **802.11b/g** 11, 5.5, 2, 1 Mbps, auto-fallback, up to 54 Mbps ➢ **802.11g (Super mode)** up to 108 Mbps ➢ **802.11a (Normal mode)** 54, 48, 36, 24, 18, 12, 9, 6Mbps, auto-fallback ➢ **802.11a (Turbo mode)** 108,96,72,48,36,24,18,12 Mbps, auto-fallback
Operation temperature	➢ $0^o \sim 70^o$ C
Storage temperature	➢ $-20^o \sim 80^o$ C
Wi-Fi® Alliance	➢ WECA Compliant
WHQL	➢ Microsoft® 2K, XP Complaint
FAA	➢ S/W audio On/Off support
EMC certificate	➢ FCC part 15 (USA) ➢ IC RSS210 (Canada) ➢ Telec (Japan) ➢ ETSI, EN301893, EN60950 (Europe)
Media access protocol	➢ CSMA/CA with ACK architecture 32-bit MAC
Type of Used Cables	➢ 150mm Shielded Coaxial Cable. Insertion Loss 0.7dB