WLAN 802.11a/b/g mini-PCI Module

User Manual

(DCMA-82)

Version: 1.0

Nov. 2006

Copyright Statement

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DCMA-82 Compliances

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

FCC Caution:

Any changes or modifications not expressly approved by the party responsible for compliance could void the users authority to operate this equipment. This device complies with Part15 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.

IEEE 802.11 b or 802.11 g operation of this product in the U.S.A. is firmware-limited to channels 1 through 11.

IMPORTANT NOTE: FCC 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. 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 is country dependent and is firmware programmed at the factory to match the intended destination. The firmware setting is not accessible by the end user.

Wireless 5 GHz Band Statements:

As the Access Point can operate in the 5150-5250 MHz frequency band it is limited by the FCC to indoor use only so as to reduce the potential for harmful interference to co-channel Mobile Satellite systems.

High power radars are allocated as primary users (meaning they have priority) of the 5250-5350 MHz

and 5650-5850 MHz bands. These radars could cause interference and /or damage to the access point when used in Canada.

Wireless 4.9 GHz Band Statements: (please refer to Appendix B for detailed limitation)

Installation and operation requires an approved license from the FCC.

This device is intended only for OEM integrators under the following conditions:

1) The antenna must be installed such that 20 cm is maintained between the antenna and users, and
2) The transmitter module may not be co-located with any other transmitter or antenna,
3) For all products market in US, OEM has to limit the operation channels in CH1 to CH11 for 2.4G bands by supplied firmware programming tool. OEM shall not supply any tool or info to the end-user regarding to Regulatory Domain change.
4) Due to the involvement of FCC part 90(Y) 4.9G safety band operation, the end product must be professional installed and can not be marketed to the general public.

As long as 4 conditions above are met, further transmitter test will not be required. However, the OEM integrator is still responsible for testing their end-product for any additional compliance requirements required with this module installed (for example, digital device emissions, PC peripheral requirements, etc.).

IMPORTANT NOTE:

In the event that these conditions can not be met (for example certain laptop configurations or co-location with another transmitter), then the FCC authorization is no longer considered valid and the FCC ID can not be used on the final product. In these circumstances, the OEM integrator will be responsible for re-evaluating the end product (including the transmitter) and obtaining a separate FCC authorization.

End Product Labeling

This transmitter module is authorized only for use in device where the antenna may be installed such that 20 cm may be maintained between the antenna and users. The final end product must be labeled in a visible area with the following: “Contains FCC ID: NKRDCMA82”.

Manual Information To the End User

The OEM integrator has to be aware not to provide information to the end user regarding how to install or remove this RF module in the user’s manual of the end product that integrates this module. The end user manual shall include all required regulatory information/warning as show in this manual.

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1. Introduction

Thank you for purchasing the WLAN 802.11a/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.

1.1 System Requirements

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

1.2 Features

- Mini-PCI adapter, half size design
- IEEE 802.11a/b/g compatible: allowing inter-operation among multiple vendors
- Support Atheros Super A/G™ Mode
- Provide seamless roaming within the IEEE 802.11 a/b/g WLAN infrastructure
- Site survey function

2. Driver/Utility Installation / Uninstallation

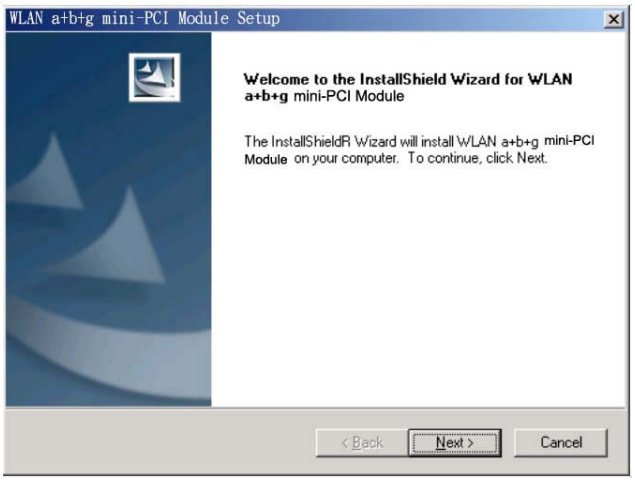
2.1 Installation

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.

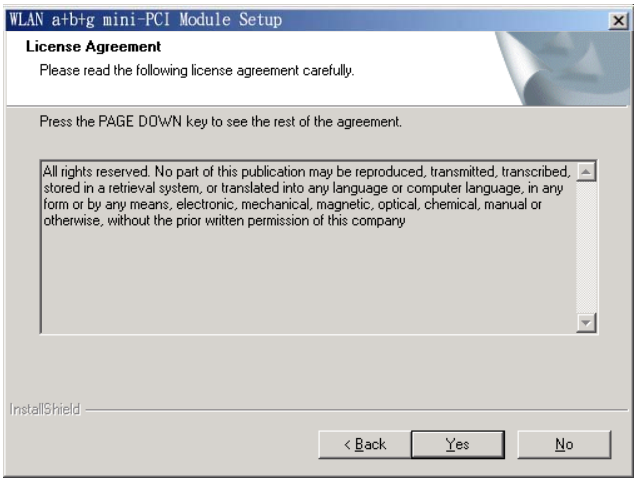
Follow the steps below to complete the driver/utility installation:

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

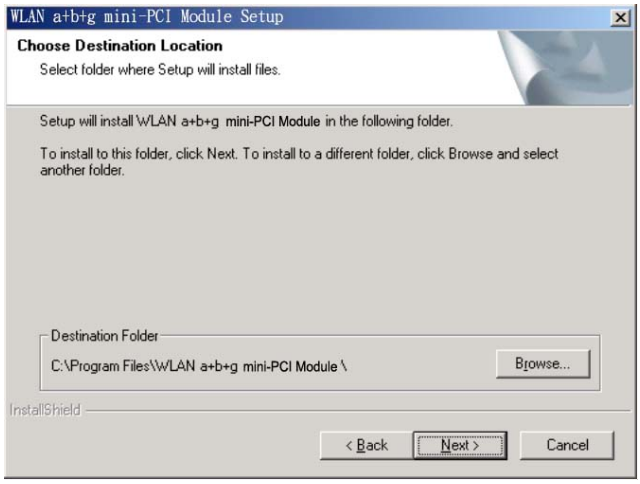
2. Click **“Next”**.



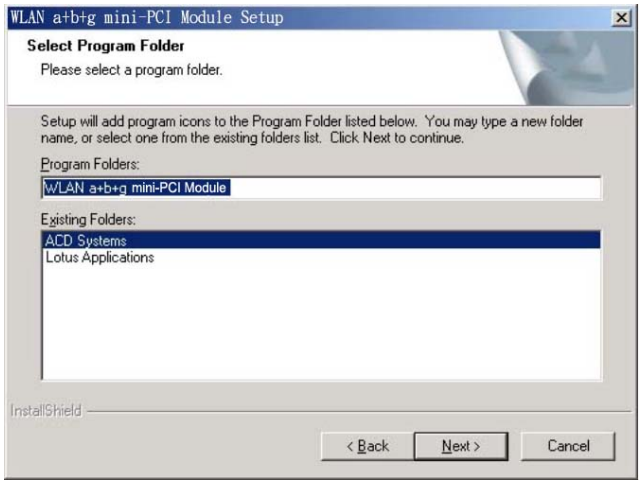
3. Read the **License Agreement** and click **“Yes”**.



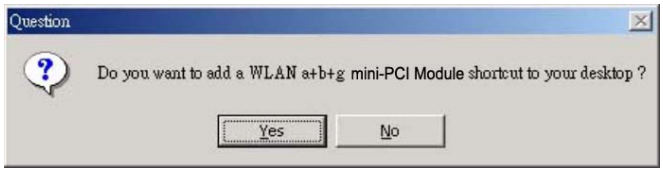
4. Click **“Next”** to continue or click **“Browse”** to choose a destination folder.



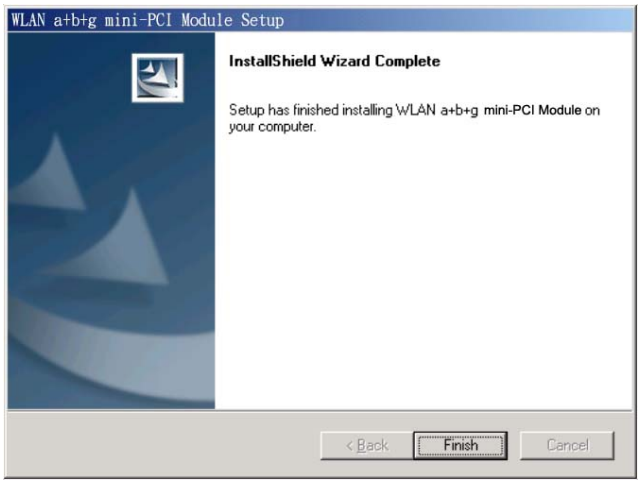
5. Click **“Next”**.



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.

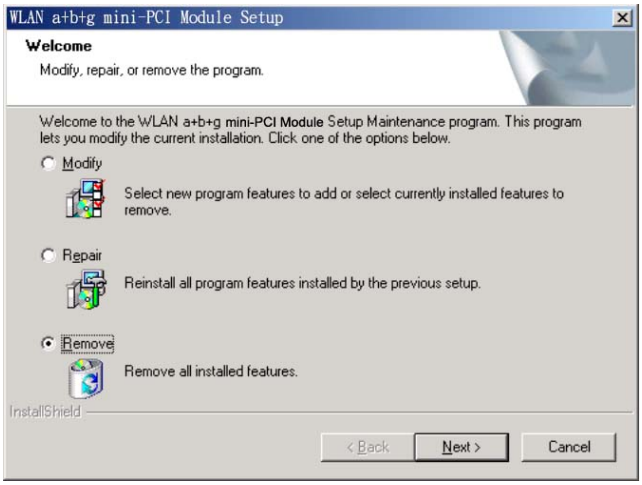
3. **Windows 2000/XP:** Select "Install the software automatically" when the window with this option appears, and then click "Next" to continue installation.

2.3 Uninstallation

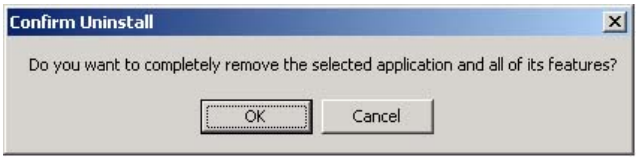
Note! Before uninstallation, please close all running programs.

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

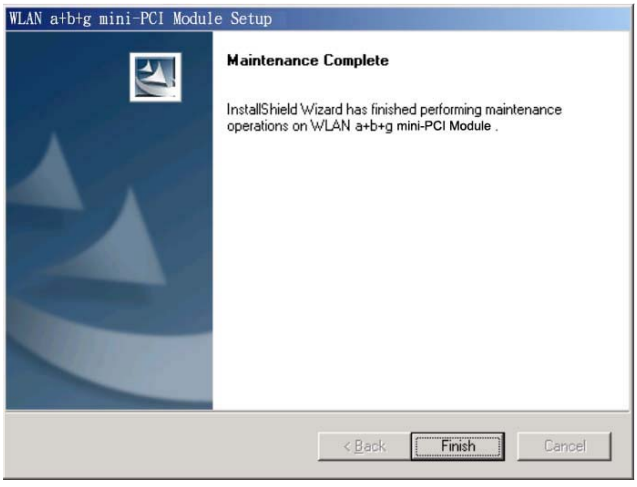
2. Choose **"Remove"**. Click **"Next"**.



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

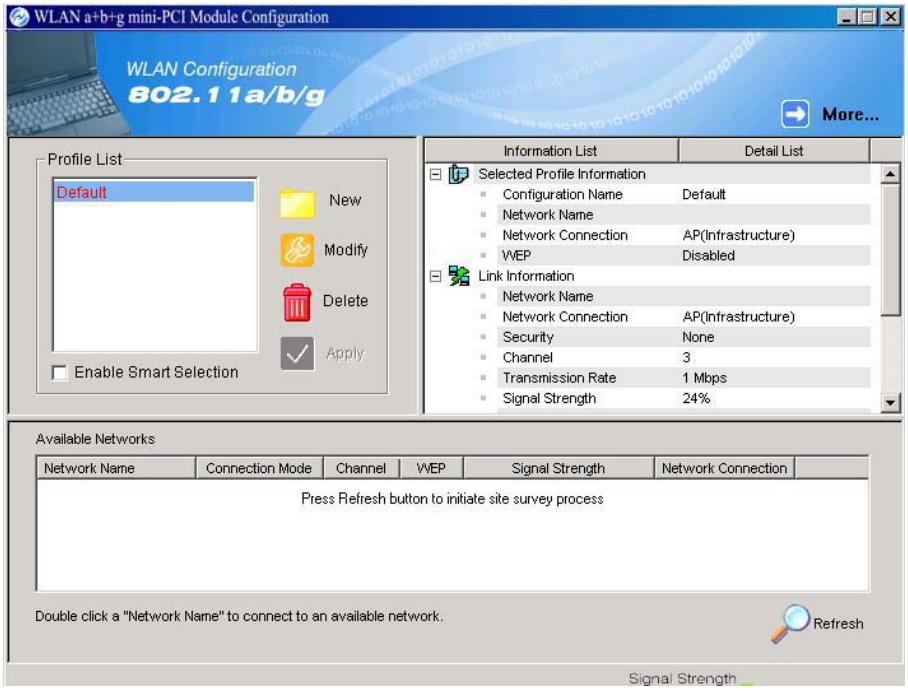


4. Click **"Finish"**. **Uninstall** is now completed.



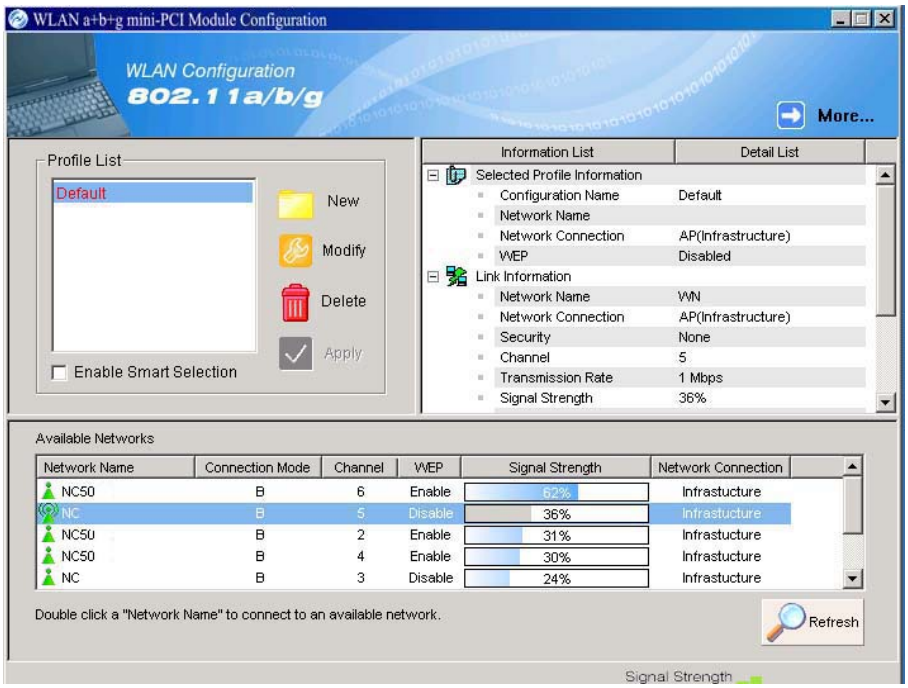
3. Connecting to an Existing Network

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

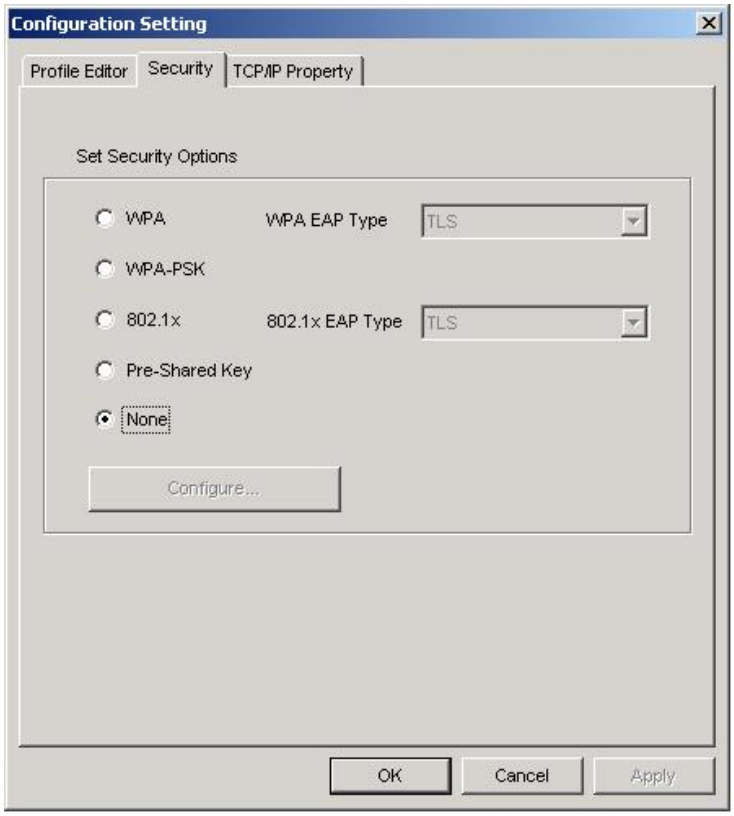
to list all available networks.



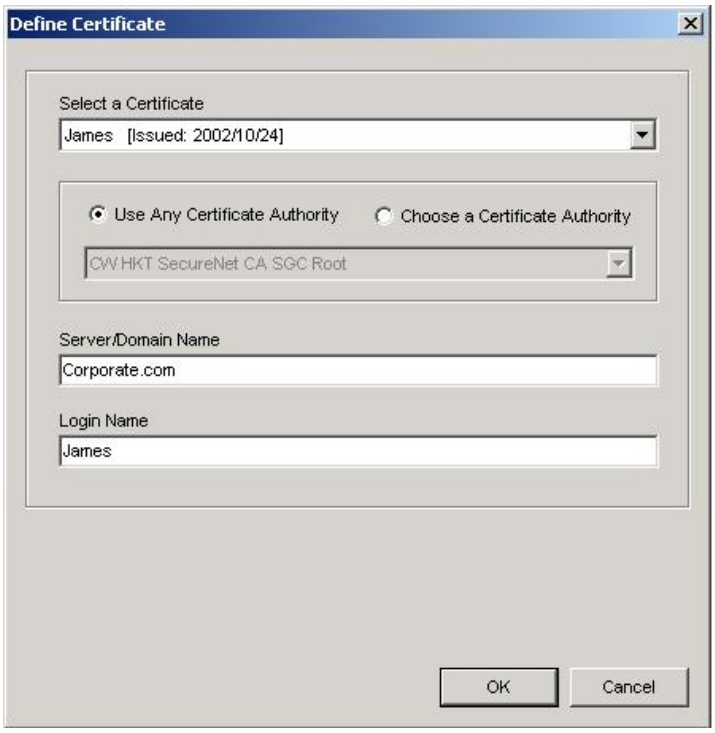
Note! To automatically connect to the network with the strongest signal, select **Enable Smart Selection**. **Any** displays in Profile List.

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.

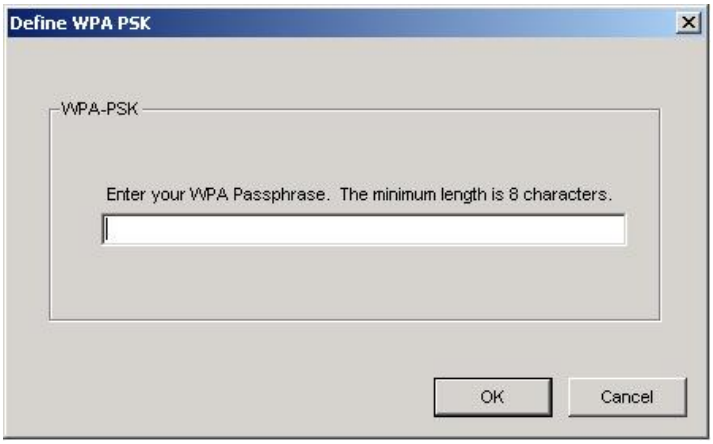
4. If the chosen network has security enabled, the **Security** tab displays. Select the security option used by the network. Contact the network administrator for the correct settings.



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#@

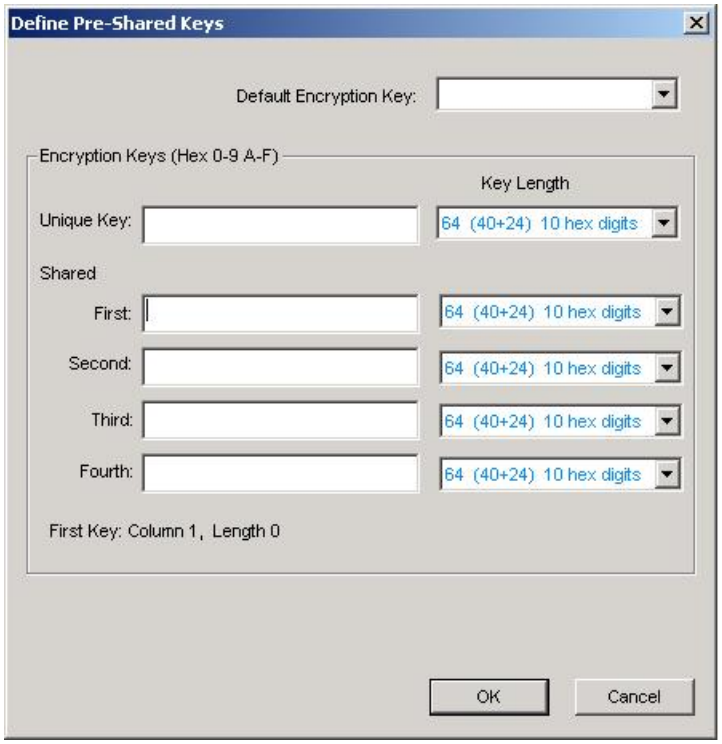
   c.13 chars: User must enter 13 characters.

   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.

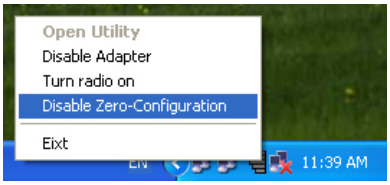
9. Once connected (the icon or in front of the name of the Connected Network), you can check the signal strength from the icon in the Windows System Tray.

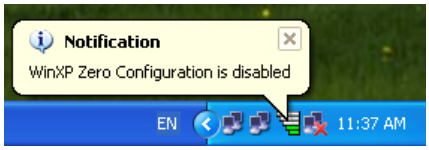
Additional Note for Windows XP

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:

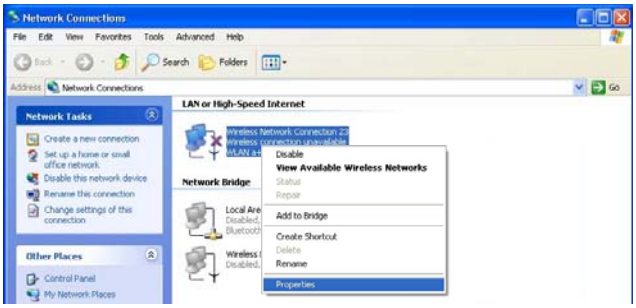
1. Double click the shortcut icon to open the Utility.
2. From the Windows System Tray, you should see the signal icon. Right-click it and select “Disable Zero-Configuration”.



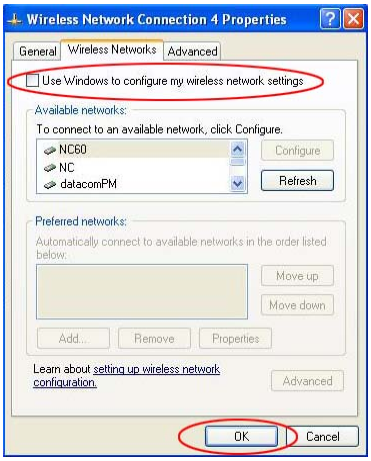


Option 2:

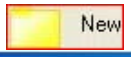
1. Go to “Control Panel” and double click “Network Connections”.
2. Right-click “Wireless Network Connection” of “WLAN a+b+g mini-PCI Module”, and select “Properties”.

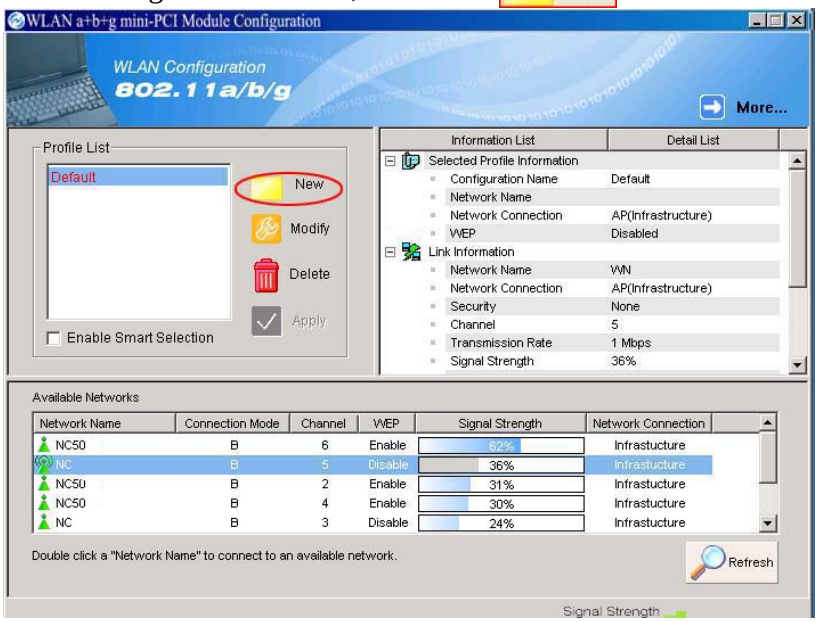


3. Select “Wireless Networks” tab, and uncheck the check box of “Use Windows to configure my wireless network settings”, and then click “OK”.

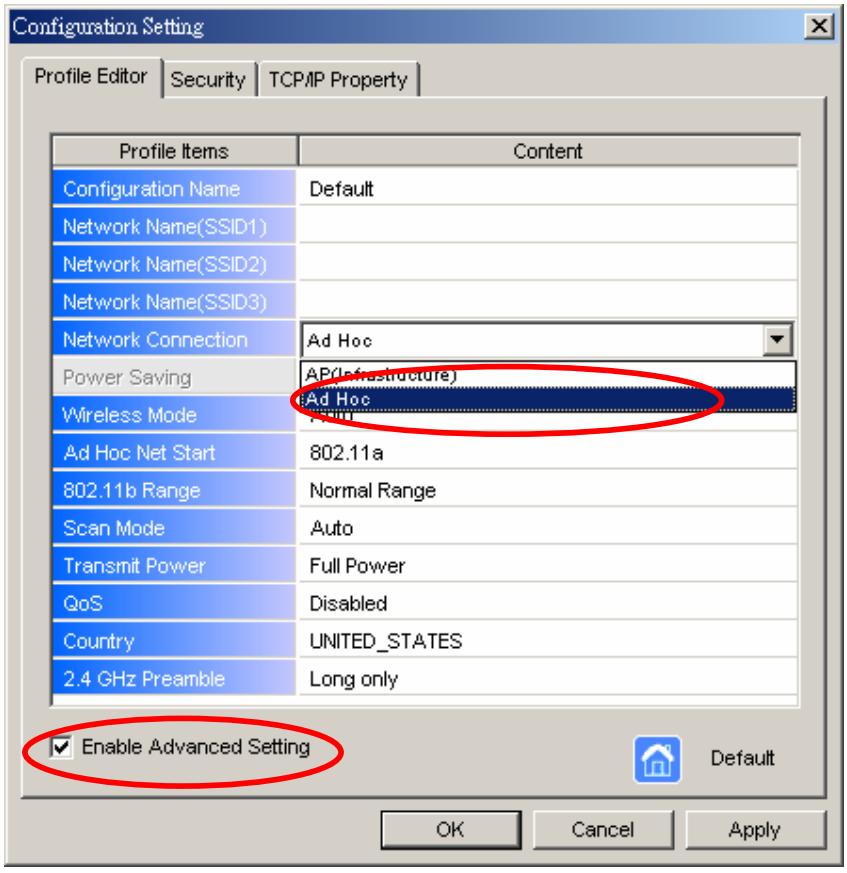


4. Creating an Ad Hoc New Network

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



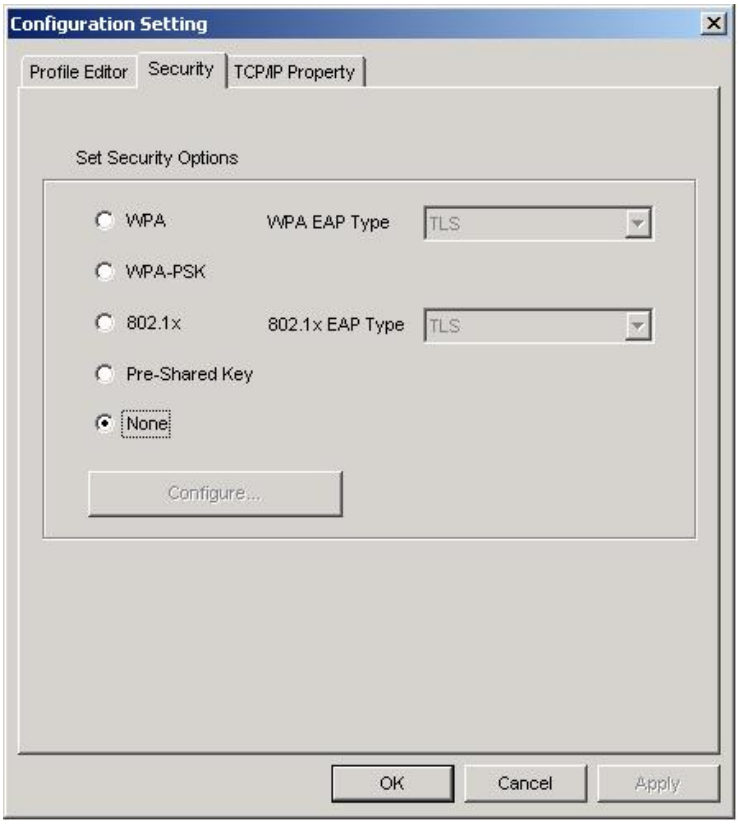
2. Select the “Profile Editor” tab.



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.

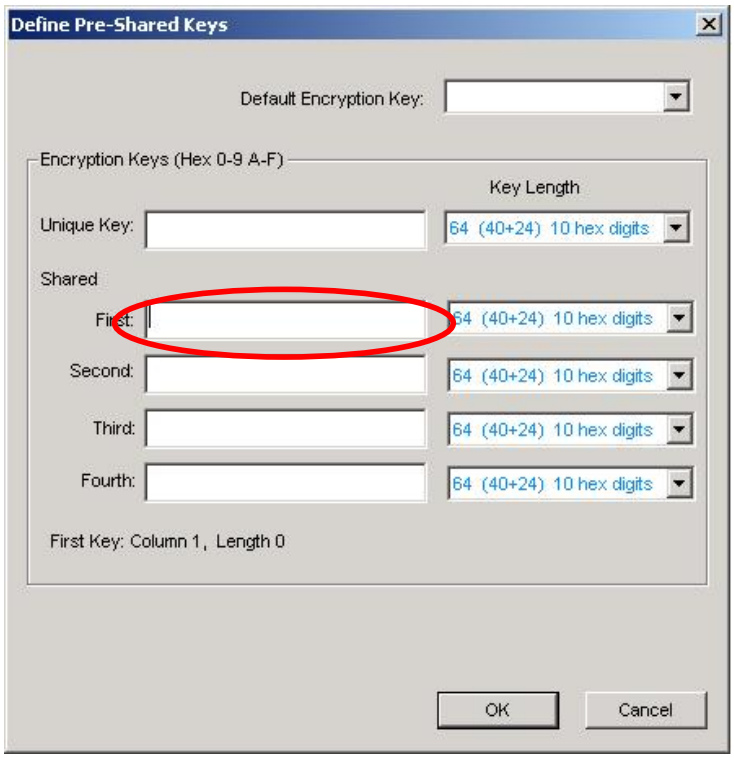
   ALERT! Different countries have different regulations that affect which channels can be used. You should always choose the country where you are physically located to avoid using an illegal channel.
6. Click **OK** (or **Apply** if using the other tabs) to save the settings.

   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.

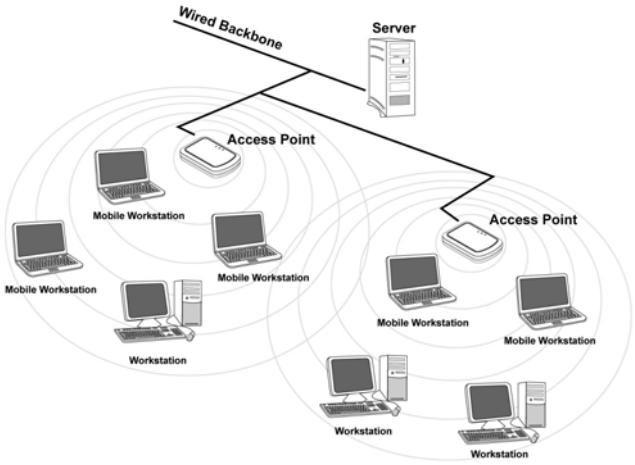
5. Modifying a Wireless Network

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).



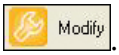
Ad Hoc Mode

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 

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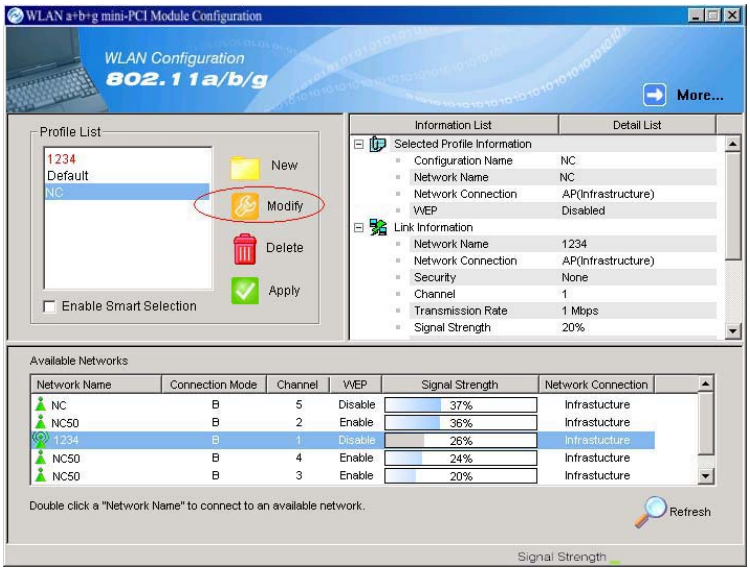
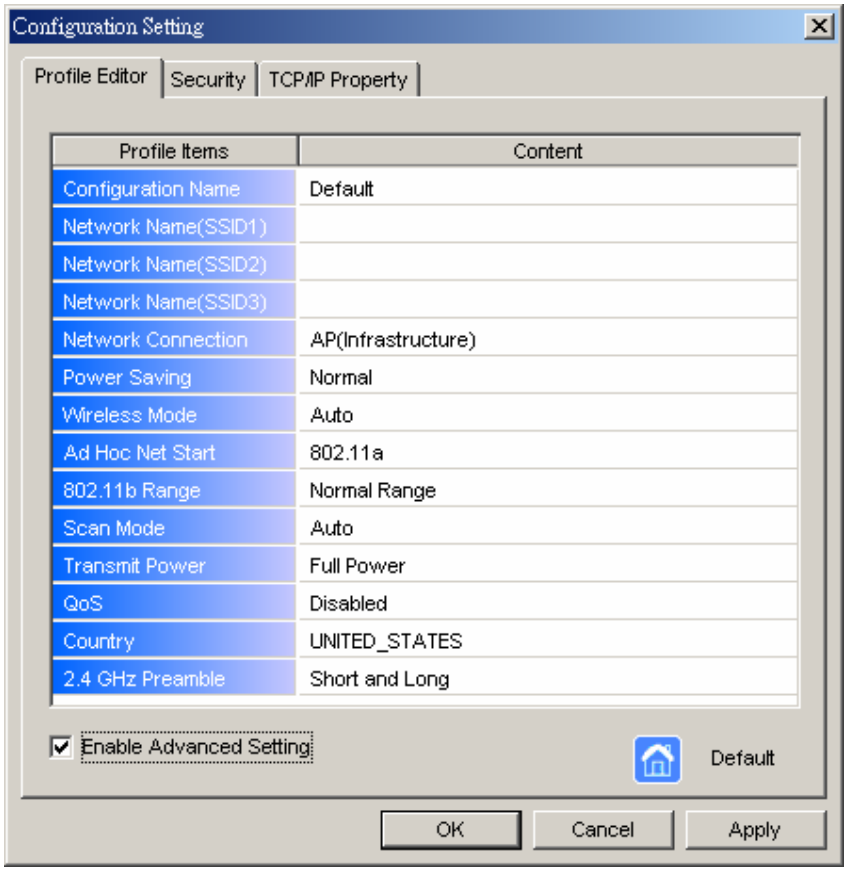


3. Select **Profile Editor** tab and edit the settings. Click **OK** to save the modifications.



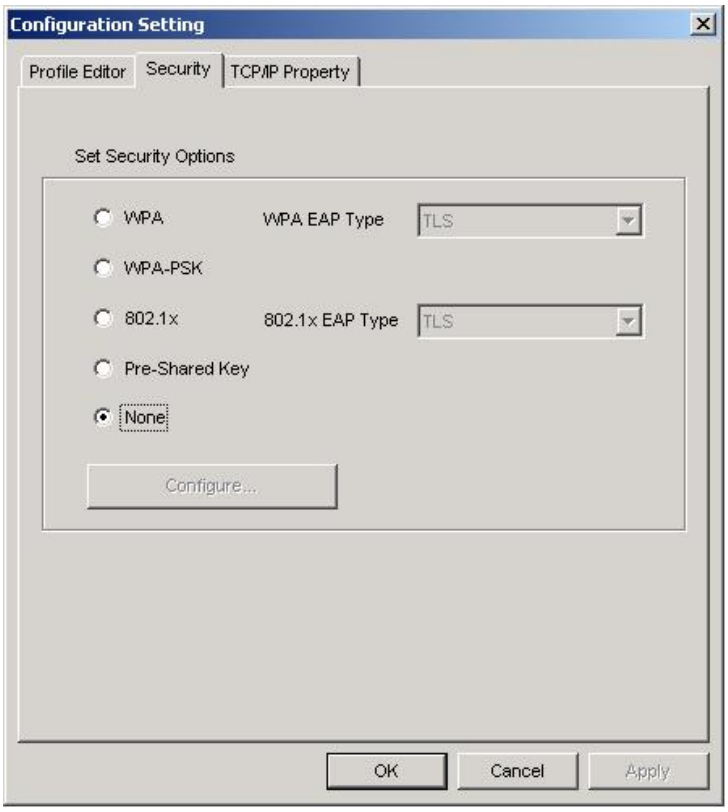
- **Configuration Name:** This name identifies the configuration. This name should be unique.
- **Network Name (SSID1) (SSID2) (SSID3):** The name of the wireless network. This name cannot be longer than 32 characters. If the field is set to be "ANY" or is left blank, your computer will connect to an 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.

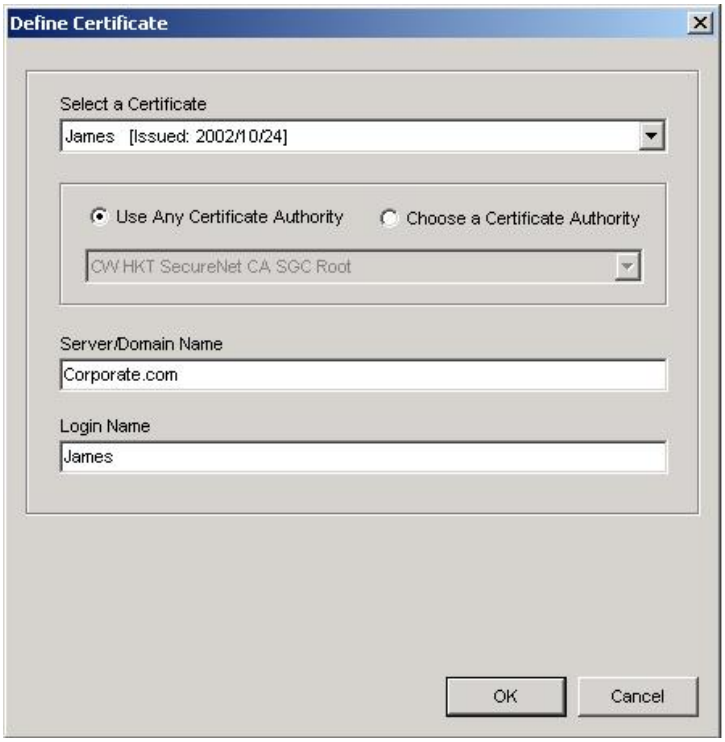
   Note! *Check with your Network Administrator for the security features supported by your AP.*



- **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.

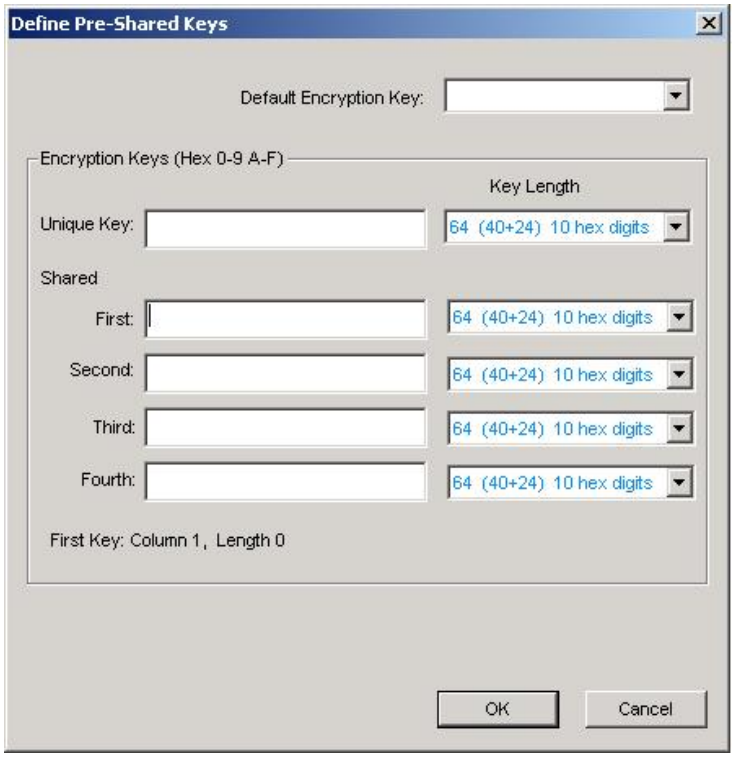
- **Pre-Shared Key:** Enables the use of pre-shared keys that are defined on the AP and the station.
  a) Select the **Pre-Shared Key** radio button.
  b) Click on the **Configure** button and complete the configuration information in the Define Certificate dialog.
- **None:** No security.

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.

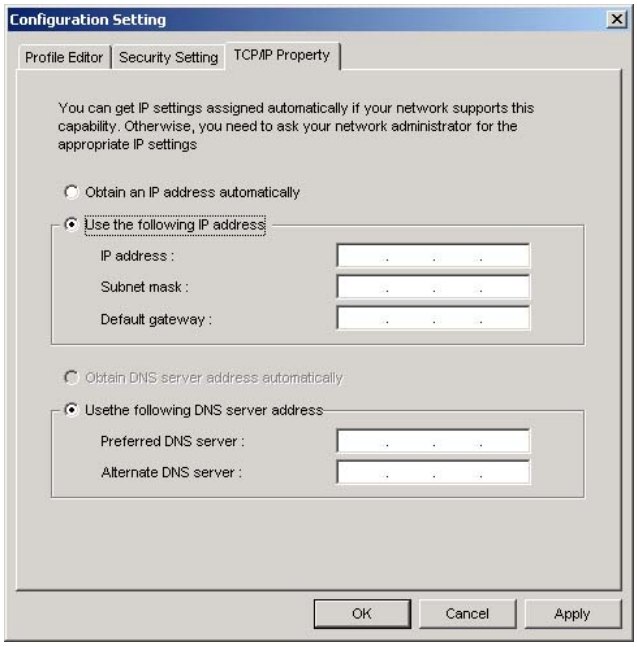


- **Key Entry Method:** Determines the entry method for the key. Hexadecimal (0-9, A-F) or ASCII text (all keyboard characters).
- **Default Encryption Key:** Allows you to choose one encryption key (First, Second, Third, or Fourth) as the transmit key, which encrypts transmissions from the PC Card.
- **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.

Market Specifications for model DCMA-82 High Power, Industry

WLAN 802.11a/g Mini-PCI Adapter (MMCX/F.UL)

< Version V1.1>

1/30/2007

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Revision History

Edition #	Reason for revision	Issue date	Author
0.1	● **Initial Draft Document**	**2006/3/15**	**Lydia Tsai**
0.2	● **Modify Output Power** ● **Modify Power Consumption** ● **Modify Operation Distance**	**2006/10/12**	**Abber Lee**
1.0	● **Add detail Model Name and description** ● **Modify Feature List & Dimension** ● **Modify Operation & Storage Temperature**	**2006/10/24**	**Lydia Tsai**
1.1	● **Change G mode output power fm 23dBm to 23.5dBm at 6, 9, 12, 18Mbps; fm 22.5dBm to 22 at 36Mbps; fm 20dBm to 22.5 at 48Mbps**	**2007/1/30**	**Lydia Tsai**

Feature List

1. **High Power Design, peak power up to 30dBm**
2. **RoHS compliant product**
3. **Atheros AR5414A, MAC/BB/Radio single chip solution supports super mode**
4. **RF connector: 2*MMCX or 2*F.UL**
5. **Heat sink design provide reliable high power RF performance**
6. **Screw hole reserved for assembly with AP main board for AP application**
7. **High speed for wireless LAN connection: IEEE802.11b 11Mbps data rate by incorporating Direct Sequence Spread Spectrum (DSSS); IEEE802.11a 54Mbps data rate with Orthogonal Frequency Division Multiplexing (OFDM) and up to 108Mbps with Turbo mode; IEEE802.11g 54Mbps date rate with OFDM (108Mbps in Turbo mode) and 11Mbps with DSSS. Provide seamless roaming within the IEEE 802.11a/b WLAN infrastructure**
8. **IEEE 802.11a/b/g compatible: allowing inter-operation among multiple vendors**
9. **Support Atheros Super A/G™ Mode**
10. **Provide seamless roaming within the IEEE 802.11 a/b/g WLAN infrastructure**
11. **Site survey function**
12. **Support MicroSoft Windows XP, 2000**
13. **Interoperability – Complying with WiFi**
14. **Extended range supporting**
15. **Support 802.1x, AES-CCM & TKIP, Power Saving Mode**
16. **64/128/152-bit WEP Encryption**
17. **802.11e standard compatible bursting**
18. **Wireless multimedia enhancements quality of service support (QoS)**

19. Support for IEEE 802.11e,h,I and j standards

DCMA-82 Market Product Specification,
WLAN 802.11a/b/g® Mini-PCI Adapter

Item	Key specifications
Main Chipset	➢ DCMA-82, AR5414 BGA Single Chip (with Super AG function)
Frequency Band	➢ **A Mode:** 5.15~5.25 & 5.725~ 5.85 GHz for US 4.9~5.35 GHz for Japan 5.15~5.35 & 5.47~5.725 GHz for ETSI 5.725~5.85 GHz for China 4.94~4.989Ghz for US safety band ➢ **B/G Mode:** 2400~2483.5 MHz (for US, Canada, EU, China and Japan)
Modulation technique	➢ **802.11 a/b/g** DSSS (DBPSK, DQPSK, CCK) OFDM (BPSK,QPSK, 16-QAM, 64-QAM)
Host interface	➢ Mini-PCI form factor; Mini-PCI Version 1.0 type 3A
Channels support	➢ **802.11b/g** US/Canada: 11 (1 ~ 11) Major European country: 13 (1 ~ 13) France: 4 (10 ~ 13) Japan: 11b: 14 (1~13 or 14th), 11g: 13 (1 ~ 13) China: 13 (1 ~ 13) ➢ **802.11a** 1). US/Canada: 8 non-overlapping channels (5.15~5.25GHz, 5.725~5.825GHz) 2). Europe: 19 non-overlapping channel (5.15~5.35GHz, 5.47~5.725GHz) 3). Japan: 8 non-overlapping channels (5.15~5.35GHz) 4). China: 5 non-overlapping channels (5.725 ~ 5.85GHz)
Operation voltage	➢ 3.3V +/- 10%
Power consumption	➢ A Mode: Cont. Tx: 1100mA (typical)~1300mA (max) Cont. Rx: 250mA (typical)~270mA (max) Stand by: 280mA (typical)~290mA (max) ➢ B Mode: Cont. Tx: 730mA (typical)~780mA (max) Cont. Rx: 200mA (typical)~220mA (max) Stand by: 230mA (typical)~240mA (max) ➢ G Mode: Cont. Tx: 730mA (typical)~780mA (max) Cont. Rx: 240mA (typical)~260mA (max) Stand by: 280mA (typical)~290mA (max) ➢ Power saving: 40mA (typical)

Output power	➢ A Mode: +22.5dBm at 6, 9, 12, 18Mbps +21.5dBm at 36Mbps +19dBm at 48Mbps +18dBm at 54Mbps ➢ B Mode: +24dBm at 1,2, 5.5, and 11Mbps ➢ G Mode: +23.5dBm at 6, 9, 12, 18Mbps +22dBm at 36Mbps +20.5dBm at 48Mbps +19.5dBm at 54Mbps
Operation distance	➢ **802.11a** Outdoor: 85m@54Mbps, 350m@6Mbps Indoor: 25m@54Mbps, 60m@6Mbps ➢ **802.11b** Outdoor: 350m@11Mbps, 400m@1Mbps Indoor: 45m@11Mbps, 70m@1Mbps ➢ **802.11g** Outdoor: 90m@54Mbps, 400m@6Mbps Indoor: 30m@54Mbps, 65m@6Mbps
Operation System supported	➢ Windows® 98SE, ME, 2K, XP, NT4.0
Dimension	➢ 59.6mm(L) * 50.8mm (W) * 7.5mm (H)
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** 11b: 11, 5.5, 2, 1 Mbps, auto-fallback, 11g: 54, 48, 36, 24, 18, 12, 9, 6Mbps, auto-fallback ➢ **802.11g (Super mode)** up to 108 Mbps ➢ **802.11a (Normal mode)** 54, 48, 36, 24, 18, 12, 9, 6Mbps, auto-fallback ➢ **802.11a (Super mode)** 108,96,72,54, 48,36,24,18,12 Mbps, auto-fallback
Operation temperature	➢ 0^o ~ 70^o C
Storage temperature	➢ -10^o ~ 80^o C
Wi-Fi® Alliance	➢ WECA Compliant
WHQL	➢ Microsoft® 2K, XP Complaint
FAA	➢ S/W radio On/Off support

EMC certificate	➢ FCC part 15 (USA) ➢ ETSI, EN301893, EN60950 (Europe)
Media access protocol	➢ CSMA/CA with ACK architecture 32-bit MAC
Advance Function	➢ Super AG ➢ Extended Range ➢ Support JumpStart V1.0 on Microsoft® 2K, XP
Antenna connector	➢ 2 x SMT Ultra-miniature coaxial connectors

Appendix B: Wireless 4.9 GHz Band Statements

1. Background Information on the 4.9 GHz Public Safety Band (PSB)

The Federal Communication Commission (FCC) has allocated 50 megahertz (MHz) of spectrum in the 4940-4990 MHz band (4.9 GHz band) for fixed and mobile wireless data communications, designating the band for use in support of public safety (Public Safety Band, PSB). Specifically, the Commission adopted two emission masks limiting interference potential for the band, one for low power and one for high-power operations. These changes will allow public safety licensees to leverage commercial off-the-shelf (COTS) technologies available for the U-NII and ITS frequency bands. The FCC action allows for a nationwide focus on homeland security, and will ensure that all state and federal agencies possess the required communications resources to adequately protect the public.

This allocation will provide public safety users the additional spectrum required to support broadband applications such as high-speed data transitions and video over wireless, which in turn enhances local area networks for incident monitoring and supervision. The spectrum can also be used to support the dispatch operations communications as well as safety vehicle communications. Public safety agencies will be able to implement on-scene wireless networks for streaming video, rapid Internet and database access, and transfers of large files such as maps, building layouts, medical files, and missing person images. It also allows these agencies to establish temporary or permanent links to support surveillance operations. This allocation gives every jurisdiction in the country access to spectrum for deployable, interoperable, broadband communications.

The spirit behind the creation of the band was to allow the public safety organizations access to inexpensive hardware already available for the ISM bands, but in a section of the spectrum that is not available to the general public.

1.1. Key Facts of the 4.9 GHz PSB band

- The FCC allocates the 4.9 GHz band for fixed and mobile communication.
- The FCC designates the 4.9 GHz band for use solely in the support of public safety encompassing the protection of life, health and property.
- Users must be a state or local government entity or non-government entity authorized by a local or state public safety entity.
- Provide services that are not commercially available to the public.
- The FCC rules allow a maximum total power output of 33 dBm (2 W) per channel and a maximum antenna gain of 9 dBi for a maximum EIRP of 42 dBm.
- Public safety agencies can apply for licenses to use the spectrum within their areas of jurisdiction.
- The FCC rules permit broadband mobile operations, fixed hotspot use and temporary fixed links.
- Fixed point-to-point operations are also permitted but this use requires a separate license from the FCC for each station.
- The FCC rules prohibit use for services that are made commercially available to the public.
- The new looser emissions mask is designed to allow users to utilize off the shelf technology to significantly reduce cost and time.

1.2. Eligibility for 4.9 GHz PSB Use

All state and local government entities that provide public safety services, this is defined as their primary focus being the protection for the safety of life, health, or property; are eligible to apply for a 4.9-GHz license. The control of the licensing is being managed at the state and local level to facilitate priority and availability of the 4.9 GHz band. Entities that do not meet these eligibility requirements, but that provide services in support of public safety, such as private infrastructure

companies, can negotiate sharing agreements with license holders.

1.3. 4.9 GHz PSB Frequency Band Plan

The 4.9 GHz band ranges from 4940.5-4989.5 MHz and can be segregated out using 1, 5, 10, 15, and 20 MHz of bandwidth.

1.4. 4.9 GHz PSB Licensing Requirements

A 4.9 GHz band license gives the licensee authority to operate on any authorized channel in this band within the applicant's legal jurisdiction such as city, county, or state. The 4.9 GHz band is shared by all licensees, who must coordinate their usage of the band with other licensees within their areas of authority. The 4.9 GHz licenses are granted for a 10-year term.

The license gives authority to construct and operate:

- Any number of base stations anywhere within the area authorized by the license
- Base and mobile units, including portable and handheld units

A 4940-4990 MHz band license does not give the licensee authority to operate permanent fixed point-to-point stations. Licensees choosing to operate such fixed stations must license them individually on a site-by-site basis. Such fixed operation will be authorized only on a secondary, non-interference basis to base, mobile and temporary fixed operations.

1.5. 4.9 GHz PSB Peak Power Limits

The transmitting power of radios operating in the 4940-4990 MHz band must not exceed the following maximum limits:

Channel Bandwidth in MHz	Class A peak output power in dBm	Class B peak output power in dBm
1	20	7
5	27	14
10	30	17
15	31.8	18.8
20	33	20

1.6. 4.9 GHz PSB Emission Mask

The FCC has adopted two emission masks for use in the 4.9 GHz band. The first being DSRC-A, is a mask strictly for low-power applications. The second being

the DSRC-C mask is strictly for high-power applications. The DSRC-A mask is identical to the mask defined in the widely used 802.11Wi-Fi standard, which is most commonly used in-home wireless LANs and consumer hotspots. These 802.11 devices are readily available for purchase and significantly reduce cost and time to market for wireless deployments. Higher power units that are above 20 dBm of output power are required for deploying mobile networks and need to employ the DSRC-C mask.

2. DCMA-82 4.9 GHz PSB Introduction

DCMA-82 is now certified to operate under Part 90, Subpart Y of the FCC Rules to operate as a high power device in the 4.9 GHz PSB band with 10 and 20MHz channel bandwidths. DCMA-82 itself as module product and will be bundled with server products. The 4.9GHz products will have separate ordering codes and will be available only to customers who have applied and received authorization by the FCC to use the public safety band. These products will be marketed separately than our other wireless products. All other wireless products shipped will not offer the possibility to use the 4.9GHz public safety band to the customer and installer.

- 20 MHz bandwidth settings may operate at signaling rates up to 54 Mbps,
- 10 MHz bandwidth settings may operate at signaling rates up to 54/2 (27) Mbps

Notes: Professional Installation Guidelines

DCMA-82 was tested for compliance to the Federal Communication Commission (FCC) rules part 15.247 and 4.9GHz complies with Part 90. Due to the coexistence of non-licensed and licensed transmitter in the same module, the final products which incorporate this module are subject to professional installation and the installer has to make sure that the final installation will comply with the applicable rule parts.

Tested antennas and their corresponding maximum output power setting.

Antenna list:

For 2.4GHz							
No.	Brand Name	Model No.	Gain (dBi)	Cable Loss (dB)	Net Gain (dB)	Antenna Type	Connector
1	* Wistron Neweb Corp.	DBA-SSMA-01	1.29	0.5	0.79	dipole	RSMA
2	CUSHCRUFT	SRSM2400MRA	2	0.5	1.5	dipole	RSMA
Note: For 2.4GHz antennas, **antenna 2** was selected as representative antenna for the test.							
For 5GHz							
No.	Brand Name	Model No.	Gain (dBi)	Cable Loss (dB)	Net Gain (dB)	Antenna Type	Connector
A	* Wistron Neweb Corp.	DBA-SSMA-01	2.06	0.9	1.16	dipole	RSMA
B	CUSHCRUFT	SRSM5150MRA	2	0.9	1.1	dipole	RSMA
C	** HUBER+ SUHNER	SPA 5500/40/14/O/V_C	13.5	0.9	12.6	panel	SMA
Note: 1. For 5GHz antennas, **antenna A and C** were selected as representative antennas for the test. 2. "*" is a Dual Band antenna can be used in both 2.4GHz and 5GHz. 3. "**" is an Outdoor Antenna it can only be used in point-to-point applications.							

1. 802.11g 2.4GHz Installation Requirements

The table below is maximum allowed conducted output power for tested antenna (No 1 & 2) for 2.4G band.

802.11b

CHANNEL	CHANNEL FREQUENCY (MHz)	PEAK POWER OUTPUT (mW)	PEAK POWER OUTPUT (dBm)	PEAK POWER LIMIT (dBm)	PASS/FAIL
1	2412	70.795	18.5	30	PASS
6	2437	234.423	23.7	30	PASS
11	2462	223.872	23.5	30	PASS

802.11g

CHANNEL	CHANNEL FREQUENCY (MHz)	PEAK POWER OUTPUT (mW)	PEAK POWER OUTPUT (dBm)	PEAK POWER LIMIT (dBm)	PASS/FAIL
1	2412	95.499	19.8	30	PASS
6	2437	363.078	25.6	30	PASS
11	2462	141.254	21.5	30	PASS

802.11g Turbo

CHANNEL	CHANNEL FREQUENCY (MHz)	PEAK POWER OUTPUT (mW)	PEAK POWER OUTPUT (dBm)	PEAK POWER LIMIT (dBm)	PASS/FAIL
6	2437	79.433	19.0	30	PASS

2. 802.11a 5GHz Installation Requirements

The table below is maximum allowed conducted output power for specified antennas for 5G band. (note: Antenna B share same power table as A)

5.15-5.25G band (applicable to both antenna A & B)

CHANNEL	CHANNEL FREQUENCY (MHz)	PEAK POWER OUTPUT (dBm)	PEAK POWER OUTPUT (mW)	PEAK POWER LIMIT (dBm)	26dBc Occupied Bandwidth (MHz)	PASS/FAIL
1	5180	14.52	28.314	17	25.76	PASS
4	5240	14.37	27.353	17	24.88	PASS

Turbo

CHANNEL	CHANNEL FREQUENCY (MHz)	PEAK POWER OUTPUT (dBm)	PEAK POWER OUTPUT (mW)	PEAK POWER LIMIT (dBm)	26dBc Occupied Bandwidth (MHz)	PASS/FAIL
1	5210	14.76	29.923	17	45.12	PASS

5.7G (applicable to both antenna A & B)

Antenna A (Gain : 2.06 dBi) + Antenna Cable (0.9dB loss)

CHANNEL	CHANNEL FREQUENCY (MHz)	PEAK POWER OUTPUT (mW)	PEAK POWER OUTPUT (dBm)	PEAK POWER LIMIT (dBm)	PASS/FAIL
1	5745	363.078	25.6	30	PASS
3	5785	331.131	25.2	30	PASS
5	5825	363.078	25.6	30	PASS

Turbo

Antenna A (Gain : 2.06 dBi) + Antenna Cable (0.9dB loss)

CHANNEL	CHANNEL FREQUENCY (MHz)	PEAK POWER OUTPUT (mW)	PEAK POWER OUTPUT (dBm)	PEAK POWER LIMIT (dBm)	PASS/FAIL
1	5760	380.189	25.8	30	PASS
2	5800	263.027	24.2	30	PASS

Antenna C (Gain : 13.0 dBi) + Antenna Cable (0.9dB loss)

CHANNEL	CHANNEL FREQUENCY (MHz)	PEAK POWER OUTPUT (mW)	PEAK POWER OUTPUT (dBm)	PEAK POWER LIMIT (dBm)	PASS/FAIL
1	5745	245.471	23.9	30	PASS
3	5785	331.131	25.2	30	PASS
5	5825	363.078	25.6	30	PASS

Turbo

Antenna C (Gain : 13.0 dBi) + Antenna Cable (0.9dB loss)

CHANNEL	CHANNEL FREQUENCY (MHz)	PEAK POWER OUTPUT (mW)	PEAK POWER OUTPUT (dBm)	PEAK POWER LIMIT (dBm)	PASS/FAIL
1	5760	380.189	25.8	30	PASS
2	5800	263.027	24.2	30	PASS

Note: The 13.5 dBi antenna is for point-to-point application only.

3. 4.9GHz Installation Requirements

The table below is maximum allowed conducted output power for tested antennas for 4.9G band under part 90 subpart Y.

For 10M Bandwidth channel

CHANNEL FREQUENCY (MHz)	PEAK POWER OUTPUT (mW)	PEAK POWER OUTPUT (dBm)	PEAK POWER LIMIT (dBm)	PASS/FAIL
4945	279.254	24.46	30	PASS
4965	284.446	24.54	30	PASS
4985	291.743	24.65	30	PASS

For 20M Bandwidth channel

CHANNEL FREQUENCY (MHz)	PEAK POWER OUTPUT (mW)	PEAK POWER OUTPUT (dBm)	PEAK POWER LIMIT (dBm)	PASS/FAIL
4950	464.515	26.67	33	PASS
4965	467.735	26.70	33	PASS
4980	476.431	26.78	33	PASS

Note: The 13.5 dBi antenna is for point-to-point application only.

4. RF Exposure Installation Requirements

All antennas have to be installed to keep at least 20cm from all end-users.