WLAN a/b/g/n mini-PCI Module



DNMA-83 User Manual

Version: 1.0

Nov 2007

Copyright Statement

No part of this publication may be reproduced, stored in a retrieval system, or transmitted in any form or by any means, whether electronic, mechanical, photocopying, recording or otherwise without the prior writing of the publisher. Windows[™] 98SE/2000/ME/XP are trademarks of Microsoft[®] Corp. Pentium is trademark of Intel.

All copyright reserved.

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: 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:

This transmitter must not be co-located or operating in conjunction with any other antenna or transmitter.

For product available in the USA/Canada market, only channel 1~11 can be operated. Selection of other channels is not possible.

IMPORTANT NOTE:

This module is intended for OEM integrator. The OEM integrator is still responsible for the FCC compliance requirement of the end product, which integrates this module.

20cm minimum distance has to be able to be maintained between the antenna and the users for the host this module is integrated into. Under such configuration, the FCC radiation exposure limits set forth for an population/uncontrolled environment can be satisfied.

Any changes or modifications not expressly approved by the manufacturer could void the user's authority to operate this equipment.

USERS MANUAL OF THE END PRODUCT:

In the users manual of the end product, the end user has to be informed to keep at least 20cm separation with the antenna while this end product is installed and operated. The end user has to be informed that the FCC radio-frequency exposure guidelines for an uncontrolled environment can be satisfied. The end user has to also be informed that any changes or modifications not expressly approved by the manufacturer could void the user's authority to operate this equipment. If the size of the end product is smaller than 8x10cm, then additional FCC part 15.19 statement is required to be available in the users manual: This device complies with Part 15 of 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.

LABEL OF THE END PRODUCT:

The final end product must be labeled in a visible area with the following " Contains TX FCC ID: NKR-DNMA83". If the size of the end product is larger than 8x10cm, then the following FCC part 15.19 statement has to also be available on the label: This device complies with Part 15 of FCC rules. Operation is subject to the following two conditions: (1) this device may not cause harmful interference and (2) this device must accept any interference received, including interference that may cause undesired operation.

This Class B digital apparatus complies with Canadian ICES-003.

Cet appareil numérique de la classe B conforme á la norme NMB-003 du Canada.

Operation is subject to the following two conditions: (1) this device may not cause interference, and (2) this device must accept any interference, including interference that may cause undesired operation of the device."

For product available in the USA/Canada market, only channel 1~11 can be operated. Selection of other channels is not possible.

This device and its antenna(s) must not be co-located or operation in conjunction with any other antenna or transmitter.

To reduce potential radio interference to other users, the antenna type and its gain should be so chosen that the equivalent isotropically radiated power (e.i.r.p) is not more than that permitted for successful communication.

The OEM integrator is still responsible for the IC compliance requirement of the end product, which integrates this module.

20cm minimum distance has to be able to be maintained between the antenna and the users for the host this module is integrated into. Under such configuration, the IC RSS-102 radiation exposure limits set forth for an population/uncontrolled environment can be satisfied. Any changes or modifications not expressly approved by the manufacturer could void the user's authority to operate this equipment.

USERS MANUAL OF THE END PRODUCT:

In the users manual of the end product, the end user has to be informed to keep at least 20cm separation with the antenna while this end product is installed and operated.

The end user has to be informed that the IC radio-frequency exposure guidelines for an uncontrolled environment can be satisfied. The end user has to also be informed that any changes or modifications not expressly approved by the manufacturer could void the user's authority to operate this equipment. IC statement is required to be available in the users manual: This Class B digital apparatus complies with Canadian ICES-003. 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.

LABEL OF THE END PRODUCT:

The final end product must be labeled in a visible area with the following " Contains TX IC : 4441A-DNMA83

"For the band 5150 – 5250 MHz this equipment must be used indoors only to reduce potential for harmful interference to co-channel mobile satellite systems."

"This device has been designed to operate with the antennas listed below, and having a maximum gain of 5.10 dB. Antennas not included in this list or having a gain greater than 5.10 dB are strictly prohibited for use with this device. The required antenna impedance is 50 ohms."

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

Table of Contents

1. INTRODUCTION 7

2. DRIVER/UTILITY INSTALLATION / UNINSTALLATION 8

| 2.1 INSTALLATION | 8 |
|--------------------------------|----|
| 2.2 Additional Setup Processes | 11 |
| 2.3 UNINSTALLATION | 12 |

3. CONNECTING TO AN EXISTING NETWORK 13

4. CREATING AN AD HOC NEW NETWORK 18

5. MODIFYING A WIRELESS NETWORK 22

| 5.1 INFRASTRUCTURE MODE AND AD HOC MODE | 22 |
|--|-----|
| 5.2 MODIFYING A WIRELESS NETWORK | 23 |
| 5.3 DEFAULT SETTINGS WINDOWS XP ZERO-CONFIGURATION | .30 |

APPENDIX A: FAQ ABOUT WLAN 31

APPENDIX B: SPECIFICATION 33

1. Introduction

Thank you for purchasing the WLAN a/b/g/n 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:

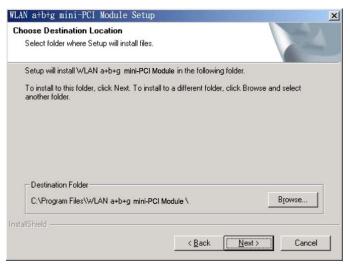
- 1. Insert the Installation Software CD into the CD-Rom Drive.
- 2. Click "Next".

| WLAN a+b+g mini-PCI Module | : Setup | × |
|----------------------------|--|---|
| | Welcome to the InstallShield Wizard for WLAN a+b+g mini-PCI Module The InstallShieldR Wizard will install WLAN a+b+g mini-PCI Module on your computer. To continue, click Next. | |
| | < <u>₿</u> ack. <u>N</u> ext > Cancel | |

3. Read the License Agreement and click "Yes".

| WLAN a+b+g mini-PCI Module Setup |
|--|
| License Agreement Please read the following license agreement carefully. |
| Press the PAGE DOWN key to see the rest of the agreement. |
| All rights reserved. No part of this publication may be reproduced, transmitted, transcribed, stored in a retrieval system, or translated into any language or computer language, in any form or by any means, electronic, mechanical, magnetic, optical, chemical, manual or otherwise, without the prior written permission of this company |
| InstallShield |

4. Click "Next" to continue or click "Browse" to choose a destination folder.



5. Click "Next".

| AN a+b+g mini-PCI Module Setu | qt | |
|--|--------------|------------------|
| Select Program Folder Please select a program folder. | | |
| riedee solder a program folder. | | |
| Setup will add program icons to the Pro name, or select one from the existing for | | ype a new folder |
| Program Folders: | | |
| WLAN a+b+g mini-PCI Module | | |
| Existing Folders: | | |
| ACD Systems | | |
| Lotus Applications | | |
| | | |
| | | |
| | | |
| | | |
| | | |
| 1 | | |
| tallShield | | |
| | | - |
| | < Back Next> | Cancel |

6. Click "Yes" to create a shortcut icon on your desktop.

| Question | × |
|----------|--|
| ? | Do you want to add a WLAN a+b+g mini-PCI Module shortcut to your desktop $?$ |
| | <u>Yes</u> <u>N</u> o |

7. Click "Finish".

| WLAN a+b+g mini-PCI Modu | le Setup |
|--------------------------|--|
| | InstallShield Wizard Complete Setup has finished installing WLAN a+b+g mini-PCI Module on your computer. |
| | < Back Finish Cancel |

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

2.2 Additional Setup Processes

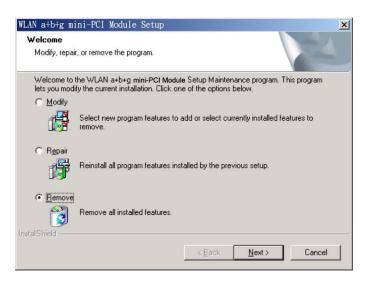
During software installation procedure, each operating system may prompt different specific options:

- 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 <u>Start>Programs>WLAN a+b+g mini-PCI Module >UnInstall WLAN a+b+g</u> <u>mini-PCI Module</u>.
- 2. Choose "Remove". Click "Next".



3. Click "OK" to start Uninstall.



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

| WLAN a+b+g mini-PCI Modul | e Setup |
|---------------------------|--|
| | Maintenance Complete InstallShield Wizard has finished performing maintenance operations on WLAN a+b+g mini-PCI Module . |
| | < Back Finish Cancel |

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.

| | | | _ | Indone alter 1 int | Detail 1 | |
|-------------------|-----------------|---------------|----------------|--|--------------------|--|
| Profile List | | | | Information List | Detail List | |
| Default | | - 20 | | | Default | |
| Delaun | | New | | Configuration Name Network Name | Detault | |
| | | | | Network Name Network Connection | AP(Infrastructure) | |
| | JAN 1 | Modify | | WEP | Disabled | |
| | | | | Link Information | Disabled | |
| | <u> </u> | 201200 | - 36 | Network Name | | |
| | | Delete | | Network Name Network Connection | AP(Infrastructure) | |
| | | | | Security | None | |
| | | Apply | | Channel | 3 | |
| F Enable Smart | t Selection | 1962-02 | | Transmission Rate | 1 Mbps | |
| | | | | Signal Strength | 24% | |
| vailable Networks | | | | | 1 1 | |
| Network Name | Connection Mode | Channel | WEP | Signal Strength | Network Connection | |
| | Pre | ss Refresh bu | utton to initi | ate site survey process | | |

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

| | | | | | | More |
|---|---------------------------|-------------------------|---------------------|--|---|------|
| Profile List | | | | Information List | Detail List | |
| Default | | New Modify Delete | - 1 | Configuration Name Network Name Network Connection WEP Link Information Network Name | Default AP(infrastructure) Disabled VWN | |
| Enable Smar | t Selection | Apply | | Network Connection Security Channel Transmission Rate Signal Strength | AP(infrastructure) None 5 1 Mbps 36% | |
| vailable Networks | | | | Security Channel Transmission Rate Signal Strength | None 5 1 Mbps 36% | |
| vailable Networks | t Selection | Apply Channel 6 | WEP Enable | Security Channel Transmission Rate | None 5 1 Mbps | |
| vailable Networks Network Name | Connection Mode | Channel | | Security Channel Transmission Rate Signal Strength | None 5 1 Mbps 36% | |
| vailable Networks Network Name | Connection Mode B | Channel | Enable [| Security Channel Transmission Rate Signal Strength Signal Strength G2% | None 5 1 Mbps 36% Network Connection | |
| wailable Networks Network Name NC50 | Connection Mode B B | Channel 6 5 | Enable [Disable | Security Channel Transmission Rate Signal Strength Signal Strength 62% 36% | None 5 1 Mbps 36% Network Connection Infrastucture | |

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.

| Connection wizard | Connection wizard | × |
|--|---|--------|
| Network name (SSID) : WN This is a wireless access point. To access this network, click Yes. | Network name (SSID) :NC60 This is a wireless access point. This network requires the use of a network key To access this network, click Yes. | (WEP). |
| Yes Cancel Don't show this wizard next time. | Yes Cancel Don't show this wizard next time. | |

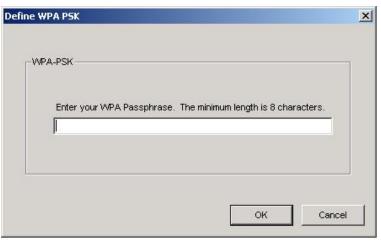
4. If the chosen network has security enabled, the **Security** tab displays. Select the security option used by the network. Contact the network administrator for the correct settings.

| onfiguration Setting | | | |
|-------------------------|-----------------|--------|-------|
| Profile Editor Security | TCP/IP Property | | |
| Set Security Option | กร | | |
| C WPA | WPA EAP Type | TLS | ¥ |
| C WPA-PSK | | | |
| C 802.1x | 802.1× EAP Type | TLS | 7 |
| C Pre-Shared | Кеу | | |
| None | | | |
| Config | ure | | |
| | | | |
| | | | |
| | | | |
| | | | |
| | | _ | 1 |
| | ОК | Cancel | Apply |

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

| Select a Certificate | |
|--|----------------------------------|
| James [Issued: 2002/10/24] | |
| Use Any Certificate Authority | C Choose a Certificate Authority |
| CW HKT SecureNet CA SGC Root | _ |
| Corporate.com | |
| Corporate.com ogin Name | |
| Corporate.com .ogin Name | |
| Corporate.com .ogin Name | |
| Corporate.com .ogin Name | |
| Server/Domain Name Corporate.com Login Name James | |

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.

| | Default Encryption Key: | | | • |
|--------------------|-------------------------|------------|---------------|---|
| Encryption Keys (H | lev Л.9 Δ.F) | | | |
| | | Key Ler | ngth | |
| Unique Key: | | 64 (40+24) | 10 hex digits | • |
| Shared | | | | |
| First: | | 64 (40+24) | 10 hex digits | - |
| Second: | | 64 (40+24) | 10 hex digits | - |
| Third: | | 64 (40+24) | 10 hex digits | - |
| Fourth: | | 64 (40+24) | 10 hex digits | - |
| First Key: Column | 1, Length 0 | | | |
| | | | | |
| | | | | |

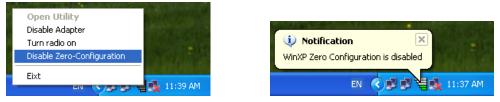
- 8. Click on **OK** (or **Apply** if using the other tabs) when done to save the settings.
- 9. Once connected (the icon 😵 or 😵 in front of the name of the Connected Network), you can check the signal strength from the icon 🗟 in the Windows System Tray.

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".

| Available networks: | |
|---|---------------------------------|
| To connect to an available netw NC60 | Configure |
| ⊘ NC ⊘ datacomPM | Refresh |
| Preferred networks: Automatically connect to availab below: | le networks in the order listed |
| Automatically connect to availab | le networks in the order listed |
| Automatically connect to availab | |

4. Creating an Ad Hoc New Network

NOTE! Ad-hoc mode is available only for 802.11b/g. It is not available for 802.11a. This is a client product and do not have radar detection function specified by FCC. The software will not let you to use ad-hoc under 802.11a.

| | N Configuration D2.11a/b/g | ation | a contraction | | 01010101000000 · |
|--|--|--------------------------------------|--------------------------|---|---|
| | | | 1 | Information List | Detail List |
| Profile List | | | E D | Selected Profile Information | |
| Default | | Marin | - 97 | Configuration Name | Default |
| | | New | | Network Name | |
| | | 100 C 100 C 100 C | | In the second | AD414 |
| | | | | Network Connection | AP(Infrastructure) |
| | 100 | Modify | 10000 | Network Connection WEP | Disabled |
| | 1 | Modify | □ % | | |
| | | Modify Delete | ۵ 🐕 | = WEP | |
| | | | □ % | WEP Link Information | Disabled |
| | | Delete | □ % | WEP Link Information Network Name Network Connection Security | Disabled WN AP(Infrastructure) None |
| | | | - 32 | VVEP Link Information Network Name Network Connection Security Channel | Disabled WN AP(Infrastructure) None 5 |
| Enable Smart | | Delete | □ 33 | VVEP Link Information Network Name Network Connection Security Channel Transmission Rate | Disabled WN AP(Infrastructure) None 5 1 Mbps |
| Enable Smart | | Delete | - 32 | VVEP Link Information Network Name Network Connection Security Channel | Disabled WN AP(Infrastructure) None 5 |
| Enable Smart | | Delete | □ % | VVEP Link Information Network Name Network Connection Security Channel Transmission Rate | Disabled WN AP(Infrastructure) None 5 1 Mbps |
| | | Delete | WEP | VVEP Link Information Network Name Network Connection Security Channel Transmission Rate | Disabled WN AP(Infrastructure) None 5 1 Mbps |
| Available Networks | t Selection | Delete Apply | | WEP Link Information Network Name Network Connection Security Channel Transmission Rate Signal Strength | Disabled VVN AP(Infrastructure) None 5. 1 Mbps 36% |
| Available Networks | t Selection | Delete Apply Channel | VVEP | WEP Link Information Network Name Network Connection Security Channel Transmission Rate Signal Strength | Disabled V/N AP(Infrastructure) None 5 1 Mbps 36% Network Connection |
| Available Networks Network Name NC50 | t Selection | Delete Apply Channel 6 | WEP Enable | WEP Link Information Network Name Network Connection Security Channel Transmission Rate Signal Strength Signal Strength G225 | Disabled VVN AP(Infrastructure) None 5 1 Mbps 36% Vetwork Connection Infrastucture |
| Available Networks Network Name NC50 | t Selection Connection Mode B B | Delete Apply Channel 6 5 | WEP Enable Disable | WEP WEP Link Information Network Name Network Connection Security Channel Transmission Rate Signal Strength Signal Strength | Disabled VVN AP(Infrastructure) None 5 1 Mbps 36% Network Connection Infrastucture Infrastucture |

2. Select the "Profile Editor" tab.

| Profile Items | Content |
|---------------------|--------------------|
| Configuration Name | Default |
| Network Name(SSID1) | |
| Network Name(SSID2) | |
| Network Name(SSID3) | |
| Network Connection | Ad Hoc 💌 |
| Power Saving | AP(Infrastructure) |
| Wireless Mode | CAd Hoc |
| Ad Hoc Net Start | 802.11a |
| 802.11b Range | Normal Range |
| Scan Mode | Auto |
| Transmit Power | Full Power |
| QoS | Disabled |
| Country | UNITED_STATES |
| 2.4 GHz Preamble | Long only |

- 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**.
- 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.
- 6. Click the **Security** tab. If not using security, select **None**.

| | WPA | WPA EAP Type | TLS | Y |
|---|-------------------|-----------------|-----|----------|
| c | WPA-PSK 802.1x | 802.1x EAP Type | TLS | <u>_</u> |
| | Pre-Shared Ke | zγ | | |
| | Configure | s | | |
| | | | | |

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

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

| ine Pre-Shared I | (eys | | |
|--------------------|-------------------------|--------------------------|-----|
| | Default Encryption Key: | | • |
| Encryption Keys (H | lex 0-9 A-F) | | |
| | | Key Length | |
| Unique Key: | | 64 (40+24) 10 hex digits | • |
| Shared | | | |
| First: | | 64 (40+24) 10 hex digits | • |
| Second: | | 64 (40+24) 10 hex digits | • |
| Third: | | 64 (40+24) 10 hex digits | • |
| Fourth: | | 64 (40+24) 10 hex digits | - |
| First Key: Column | 1, Length 0 | | |
| | | | |
| | | | |
| | | | 1 |
| | | OK Can | cel |

9. 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

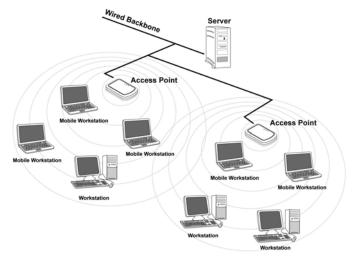
5.1 Infrastructure Mode and Ad Hoc Mode

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

NOTE! Ad-hoc mode is available only for 802.11b/g. It is not available for 802.11a. This is a client product and do not have radar detection function specified by FCC. The software will not let you to use ad-hoc under 802.11a.

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).

NOTE! Ad-hoc mode is available only for 802.11b/g. It is not available for 802.11a. This is a client product and do not have radar detection function specified by FCC. The software will not let you to use ad-hoc under 802.11a.



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

| | Modify |
|--|--------|
|--|--------|



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

| Configuration Setting Profile Editor Security T(| CP/IP Property | × |
|--|--------------------|---|
| Profile Items | | . |
| Configuration Name | Content Default | |
| Network Name(SSID1) | Derault | |
| Network Name(SSID2) | | |
| Network Name(SSID3) | | |
| Network Connection | AP(Infrastructure) | |
| Power Saving | Normal | |
| Wireless Mode | Auto | |
| Ad Hoc Net Start | 802.11a | |
| 802.11b Range | Normal Range | |
| Scan Mode | Auto | |
| Transmit Power | Full Power | |
| QoS | Disabled | |
| Country | UNITED_STATES | |
| 2.4 GHz Preamble | Short and Long | |
| , ▼ Enable Advanced Sett | ng Default | |
| | OK Cancel Apply | |

- **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.

NOTE! Ad-hoc mode is available only for 802.11b/g. It is not available for 802.11a. This is a client product and do not have rador detection function specified by FCC. The software will not let you to use ad-hoc under 802.11a.

Ad Hoc Net Start: Specifies a band to establish an Ad Hoc network if no matching SSID is found. Options available are the following: 802.11b and 802.11g.

NOTE! Ad-hoc mode is available only for 802.11b/g. It is not available for 802.11a. This is a client product and do not have radar detection function specified by FCC. The software will not let you to use ad-hoc under 802.11a.

- 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).
- 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.*

| onfiguration Setting | | | |
|-------------------------|-----------------|--------|----------|
| Profile Editor Security | TCP/IP Property | | |
| Set Security Optior | ıs | | |
| C WPA | WPA EAP Type | LS | * |
| C WPA-PSK | | | |
| O 802.1× | 802.1× EAP Type | LS | <u> </u> |
| C Pre-Shared | Key | | |
| None | | | |
| Configu | ire | | |
| - | | | |
| | | | |
| | | | |
| | | | |
| | | 7 | 1 |
| | OK | Cancel | Apply |

- 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.

| James [Issued: 2002/10/24] Use Any Certificate Authority CW HKT SecureNet CA SGC Root Server/Domain Name Corporate.com Login Name James | Choose a Certificate Authority |
|--|--------------------------------|
| CW HKT SecureNet CA SGC Root Server/Domain Name Corporate.com | Choose a Certificate Authority |
| Server/Domain Name Corporate.com ogin Name | <u>×</u> |
| Corporate.com .ogin Name | |
| | |
| | |
| | |
| | |
| | |
| | |

- 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.

| | | <i></i> | | | |
|--------------------|--------------|---------|---------|---------------|---|
| Encryption Keys (H | lex 0-9 A-F) | | Key Le | ngth | |
| Unique Key: | | 64 | (40+24) | 10 hex digits | • |
| Shared | | | | | |
| First: | | 64 | (40+24) | 10 hex digits | Ŧ |
| Second: | | 64 | (40+24) | 10 hex digits | • |
| Third: | | 64 | (40+24) | 10 hex digits | Ŧ |
| Fourth: | | 64 | (40+24) | 10 hex digits | + |
| First Key: Column | 1, Length 0 | | | | |
| | | | | | |

- 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.

| Profile Editor | Security Setting | TCP/IP Prope | erty | | | | | |
|----------------|--|---------------|--------|------------|------------|------|---|---|
| capabilit | ı get IP settings as y. Otherwise, you ate IP settings | | | | | | | |
| | ain an IP address a | | | | | | | |
| _ € Use | the following IP a | ldress — | | | | | | |
| IF | address: | | | 53 | () | 3 | | |
| s | ubnet mask : | | | 33 | ÷) | 3 | | |
| D | efault gateway: | | | 5 3 | ÷) | 2 | | |
| C Obt | ain DNS server ad | dress automat | ically | | | | | |
| r 🖲 Use | the following DNS | server addres | ss | | | | | |
| P | referred DNS serv | er: | | - 24 | | - 24 | - | |
| م | lternate DNS serv | er: | Ĺ | 9 | • | 24 | | |
| | | | | | | | | |
| | | | | | | | | |
| | | | 17 | | | | | - |

- 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**.
- 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.

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

DNMA-83, Product Specification, 802.11N a/b/g mini-PCI Module

| Main Chipset > Atheros [®] A R9160, A R9106 Chipset > Prequency > Europe: 2.400 - 2.483 GHz, 5.15 - 5.25 GHz, 5.72 - 5.825 GHz Prequency > Japan: 2.400 - 2.483 GHz, 5.15 - 5.35 GHz, 5.47 - 5.725 GHz > Japan: 2.400 - 2.483 GHz, 5.15 - 5.35 GHz, 5.47 - 5.725 GHz > China: 2.400 - 2.483 GHz, 5.725 - 5.85 GHz > S02:11n a/b/g DSSS (DBPSK, DQPSK, CCK) OFDM (BPSK, QPSK, 16-QAM, 64-QAM) DSSS (Differential Binary Phase Shift Keying 1Mbps), DQPSK (Differential Quaternary Phase Shift Keying 1Mbps), and OFDM (Orthogonal Frequency Division Multiplexing with BPSK for 6.9Mbps \ QPSK for 12,18Mbps \ 16QAM for 24,36Mbps \ 64QAM for 48,54Mbps) Host > 802.11n b/g US/Canada: 11 (1 - 11) Major Europe: 19 non-overlapping channels (36,40,44,852,56,60,64; 149,153,157,161) 3, Japan: 11b: 14 (1-13 or 14 th), 11g: 13 (1 - 13) France: 4 (10 - 13) Japan: 11b: 14 (1-13 or 14 th), 11g: 13 (1 - 13) France: 4 (10 - 13) Japan: 11b: 14 (1-13 or 14 th), 11g: 13 (1 - 13) France: 4 (10 - 13) Japan: 11b: 14 (1-13 or 14 th), 11g: 13 (1 - 13) France: 4 (10 - 13) Japan: 11b: 14 (1-13 or 14 th), 1 | | |
|--|------------|---|
| > USA: 2.400 - 2.483GHz, 5.15 ~ 5.25GHz, 5.725 - 5.825GHz Frequency > Europe: 2.400 ~ 2.483GHz, 5.15 ~ 5.35GHz, 5.47 ~ 5.725GHz > Japan: 2.400 ~ 2.483GHz, 5.15 ~ 5.35GHz, 5.47 ~ 5.725GHz > Japan: 2.400 ~ 2.483GHz, 5.725 ~ 5.85GHz > China: 2.400 ~ 2.483GHz, 5.725 ~ 5.85GHz > Subscription > Subscription > Japan: 2.400 ~ 2.483GHz, 5.725 ~ 5.85GHz > Subscription > China: 2.400 ~ 2.483GHz, 5.725 ~ 5.85GHz > Subscription > China: 2.400 ~ 2.483GHz, 5.725 ~ 5.85GHz > Subscription > Subscription > China: 2.400 ~ 2.483GHz, 5.725 ~ 5.85GHz > Subscription > Subscret > Subscription <td>Main</td> <td>> Atheros[®] AR9160, AR9106</td> | Main | > Atheros [®] AR9160, AR9106 |
| Frequency range> Europe: 2.400 ~ 2.483GHz, 5.15 ~ 5.35GHz, 5.47 ~ 5.725GHz > Japan: 2.400 ~ 2.483GHz, 5.15 ~ 5.35GHz, 5.47 ~ 5.725GHz > China: 2.400 ~ 2.483GHz, 5.725 ~ 5.85GHzModulation | Chipset | |
| range> Japan: 2.400 - 2.497GHz, 5.15 - 5.35GHz, 5.47 - 5.725GHz> China: 2.400 - 2.483GHz, 5.725 - 5.85GHz> 802.11n a/b/gDSSS (DBPSK, DQPSK, CCK) OFDM (BPSK, QPSK, 16-QAM, 64-QAM)DSSS (Direct Sequence Spread Spectrum) with DBPSK (Differential Binary Phase Shift Keying 1Mbps), DQPSK (Differential Quaternary Phase Shift Keying 2Mbps), and CCK (Complementary Code Keying 5.5&11Mbps), and OFDM (Orthogonal Frequency Division Multiplexing with BPSK for 6,9Mbps \ QPSK for 12,18Mbps \ 16QAM for 24,36Mbp \ 64QAM for 48,54Mbps)Host interface> Mini-PC1 form factor; Mini-PCI Version 1.0 type 3AWajor European country: 13 (1 - 13) France: 4 (10 - 13) Japan: 19 non-overlapping channels (36,40,44,48,52,56,60,64; 149,153,157,161) 2). Europe: 19 non-overlapping channels (149,153,157,161,165)Operation voltage> 3.3V +/.5% | | > USA: 2.400 ~ 2.483GHz, 5.15 ~ 5.25GHz, 5.725 ~ 5.825GHz |
| > China: 2.400 - 2.483GHz, 5.725 - 5.85GHz > 802.11n a/b/g DSSS (DBPSK, DQPSK, CCK) OFDM (BPSK, QPSK, 16-QAM, 64-QAM) DSSS (Differential Binary Phase Shift Keying 1Mbps), DQPSK (Differential Quaternary Phase Shift Keying 2Mbps), and CCK (Complementary Code Keying 5.5&11Mbps), and OFDM (Orthogonal Frequency Division Multiplexing with BPSK for 6.9Mbps \ QPSK for 12,18Mbps \ 16QAM for 24,36Mbps \ 64QAM for 48,54Mbps) Host > Mini-PCI form factor; Mini-PCI Version 1.0 type 3A interface > 802.11n b/g US/Canada: 11 (1 ~ 11) Major European country: 13 (1 ~ 13) France: 4 (10 ~ 13) Japan: 11b: 14 (1-13 or 14 th), 11g: 13 (1 ~ 13) France: 4 (10 ~ 13) Japan: 11b: 14 (1-13 or 14 th), 11g: 13 (1 ~ 13) Support > 802.11n a 1). US/Canada: 12 non-overlapping channels (36,40,44,48,52,56,60,64; 149,153,157,161) 2). Europe: 19 non-overlapping channels (36,40,44,48,52,56,60,64; 149,153,157,161) 2). Europe: 19 non-overlapping channels (36,40,44,48,52,56,60,64; 149,153,157,161) 3). Japan: 19 non-overlapping channels (36,40,44,48,52,56,60,64; 100,104,108,112,116,120,124,128,132,136,140) 3). Japan: 19 non-overlapping channels (149,153,157,161,165) Operation voltage > 3.3V +/.5% | Frequency | Europe: 2.400 ~ 2.483GHz, 5.15 ~ 5.35GHz, 5.47 ~ 5.725GHz |
| Modulation > 802.11n a/b/g DSSS (DBPSK, DQPSK, CCK) OFDM (BPSK, QPSK, 16-QAM, 64-QAM) DSSS (Direct Sequence Spread Spectrum) with DBPSK (Differential Binary Phase Shift Keying 1Mbps), DQPSK (Differential Quaternary Phase Shift Keying 2Mbps), and CCK (Complementary Code Keying 5.5&11Mbps), and OFDM (Orthogonal Frequency Division Multiplexing with BPSK for 6,9Mbps \ QPSK for 12,18Mbps \ 16QAM for 24,36Mbps \ 64QAM for 48,54Mbps) Host > Mini-PCI form factor; Mini-PCI Version 1.0 type 3A interface > 802.11n b/g US/Canada: 11 (1 - 11) Major European country: 13 (1 - 13) France: 4 (10 - 13) Japan: 11b: 14 (1-13 or 14 th), 11g: 13 (1 - 13) Channels Support > 802.11n a 1). US/Canada: 12 non-overlapping channels (36,40,44,48,52,56,60,64; 149,153,157,161) 2). Europe: 19 non-overlapping channels (36,40,44,48,52,56,60,64; 100,104,108,112,116,120,124,128,132,136,140) 3). Japan: 19 non-overlapping channels (36,40,44,48,52,56,60,64; 100,104,108,112,116,120,124,128,132,136,140) 4). China: 5 non-overlapping channels (149,153,157,161,165) Operation > 3.3V +/-5% 3.3V +/-5% | range | Japan: 2.400 ~ 2.497GHz, 5.15 ~ 5.35GHz, 5.47 ~ 5.725GHz |
| Modulation techniqueDSSS (DBPSK, DQPSK, CCK) OFDM (BPSK, QPSK, 16-QAM, 64-QAM) DSSS (Direct Sequence Spread Spectrum) with DBPSK (Differential Binary Phase Shift Keying 1Mbps), DQPSK (Differential Quaternary Phase Shift Keying 2Mbps), and CCK (Complementary Code Keying 5.5&11Mbps), and OFDM (Orthogonal Frequency Division Multiplexing with BPSK for 6.9Mbps \ QPSK for 12,18Mbps \ 16QAM for 24,36Mbps \ 64QAM for 48,54Mbps)Host interface> Mini-PCI form factor; Mini-PCI Version 1.0 type 3AWisiUS/Canada: 11 (1 - 11) Major European country: 13 (1 - 13) France: 4 (10 - 13) Japan: 11b: 14 (1-13 or 14 th), 11g: 13 (1 - 13) China: 13 (1 - 13) > 802.11n a 1). US/Canada: 12 non-overlapping channels (36,40,44,48,52,56,60,64; 149,153,157,161) 2). Europe: 19 non-overlapping channels (36,40,44,48,52,56,60,64; 100,104,108,112,116,120,124,128,132,136,140) 3). Japan: 19 non-overlapping channels (36,40,44,48,52,56,60,64; 100,104,108,112,116,120,124,128,132,136,140) 4). China: 5 non-overlapping channels (149,153,157,161,165)Operation voltage> 3.3V +/5% | | > China: 2.400 ~ 2.483GHz, 5.725 ~ 5.85GHz |
| Modulation techniqueOFDM (BPSK, QFSK, 16-QAM, 64-QAM)Modulation techniqueDSSS (Direct Sequence Spread Spectrum) with DBPSK (Differential Binary Phase Shift Keying 1Mbps), DQPSK (Differential Quaternary Phase Shift Keying 2Mbps), and CCK (Complementary Code Keying 5.5&11Mbps), and OFDM (Orthogonal Frequency Division Multiplexing with BPSK for 6,9Mbps \ QPSK for 12,18Mbps \ 16QAM for 24,36Mbps \ 64QAM for 48,54Mbps)Host interface> Mini-PCI form factor; Mini-PCI Version 1.0 type 3AWist Major European country: 13 (1 ~ 13)France: 4 (10 ~ 13) Japan: 11b: 14 (1~13 or 14 th), 11g: 13 (1~13)France: 4 (10 - 13) Japan: 11b: 14 (1~13 or 14 th), 11g: 13 (1~13)Channels supportSupportANUS/Canada: 12 non-overlapping channels (36,40,44,48,52,56,60,64; 149,153,157,161) 2). Europe: 19 non-overlapping channels (36,40,44,48,52,56,60,64; 100,104,108,112,116,120,124,128,132,136,140) 3). Japan: 19 non-overlapping channels (36,40,44,48,52,56,60,64; 100,104,108,112,116,120,124,128,132,136,140) 4). China: 5 non-overlapping channels (149,153,157,161,165)Operation voltage> 3.3V +/5% | | > 802.11n a/b/g |
| Modulation techniqueDSSS (Direct Sequence Spread Spectrum) with DBPSK (Differential Binary Phase Shift Keying 1Mbps), DQPSK (Differential Quaternary Phase Shift Keying 2Mbps), and CCK (Complementary Code Keying 5.5&11Mbps), and OFDM (Orthogonal Frequency Division Multiplexing with BPSK for 6,9Mbps \ QPSK for 12,18Mbps \ 16QAM for 24,36Mbps \ 64QAM for 48,54Mbps)Host interface> Mini-PCI form factor; Mini-PCI Version 1.0 type 3AGenerationUS/Canada: 11 (1 ~ 11) Major European country: 13 (1 ~ 13) France: 4 (10 ~ 13) Japan: 11b: 14 (1-13 or 14 th), 11g: 13 (1 ~ 13) China: 13 (1 ~ 13)Channels support802.11n a 1). US/Canada: 12 non-overlapping channels (36,40,44,48,52,56,60,64; 149,153,157,161) 2). Europe: 19 non-overlapping channels (36,40,44,48,52,56,60,64; 100,104,108,112,116,120,124,128,132,136,140) 3). Japan: 19 non-overlapping channels (36,40,44,48,52,56,60,64; 100,104,108,112,116,120,124,128,132,136,140) 4). China: 5 non-overlapping channels (149,153,157,161,165)Operation voltage> 3.3V +/-5% | | DSSS (DBPSK, DQPSK, CCK) |
| Modulation technique DBPSK (Differential Binary Phase Shift Keying 1Mbps), DQPSK (Differential Quaternary Phase Shift Keying 2Mbps), and CCK (Complementary Code Keying 5.5&11Mbps), and OFDM (Orthogonal Frequency Division Multiplexing with BPSK for 6,9Mbps × QPSK for 12,18Mbps × 16QAM for 24,36Mbps × 64QAM for 48,54Mbps) Host > Mini-PCI form factor; Mini-PCI Version 1.0 type 3A interface > 802.11n b/g US/Canada: 11 (1 - 11) Major European country: 13 (1 ~ 13) France: 4 (10 ~ 13) Japan: 11b: 14 (1-13 or 14 th), 11g: 13 (1 ~ 13) Channels China: 13 (1 ~ 13) support > 802.11n a 1). US/Canada: 12 non-overlapping channels (36,40,44,48,52,56,60,64; 149,153,157,161) 2). Europe: 19 non-overlapping channels (36,40,44,48,52,56,60,64; 149,153,157,161) 3). Japan: 19 non-overlapping channels (36,40,44,48,52,56,60,64; 149,153,157,161) 3). Japan: 19 non-overlapping channels (36,40,44,48,52,56,60,64; 100,104,108,112,116,120,124,128,132,136,140) 3). Japan: 19 non-overlapping channels (36,40,44,48,52,56,60,64; 100,104,108,112,116,120,124,128,132,136,140) 4). China: 5 non-overlapping channels (149,153,157,161,165) Operation voltage > 3.3V +/-5% | | OFDM (BPSK, QPSK, 16-QAM, 64-QAM) |
| DBPSK (Differential Binary Phase Shift Keying 1Mbps), DQPSK (Differential Quaternary Phase Shift Keying 2Mbps), and CCK (Complementary Code Keying 5.5&11Mbps), and OFDM (Orthogonal Frequency Division Multiplexing with BPSK for 6,9Mbps \ QPSK for 12,18Mbps \ 16QAM for 24,36Mbps \ 64QAM for 48,54Mbps)Host interface> Mini-PCI form factor; Mini-PCI Version 1.0 type 3AMost interface> 802.11n b/gUS/Canada: 11 (1 ~ 11) Major European country: 13 (1 ~ 13) France: 4 (10 ~ 13) Japan: 11b: 14 (1-13 or 14 th), 11g: 13 (1 ~ 13) China: 13 (1 ~ 13)France: 4 (10 - 13) Japan: 11b: 14 (1-13 or 14 th), 11g: 13 (1 ~ 13) China: 13 (1 ~ 13)Support Discussion> 802.11n a 1). US/Canada: 12 non-overlapping channels (36,40,44,48,52,56,60,64; 149,153,157,161) 2). Europe: 19 non-overlapping channels (36,40,44,48,52,56,60,64; 100,104,108,112,116,120,124,128,132,136,140) 3). Japan: 19 non-overlapping channels (149,153,157,161,165)Operation voltage> 3.3V +/-5% | Modulation | DSSS (Direct Sequence Spread Spectrum) with |
| DQPSK (Differential Quaternary Phase Shift Keying 2Mbps), and CCK (Complementary Code Keying 5.5&11Mbps), and OFDM (Orthogonal Frequency Division Multiplexing with BPSK for 6,9Mbps \ QPSK for 12,18Mbps \ 16QAM for 24,36Mbps \ 64QAM for 48,54Mbps)Host interface> Mini-PCI form factor; Mini-PCI Version 1.0 type 3AUS/Canada: 11 (1 ~ 11) Major European country: 13 (1 ~ 13) France: 4 (10 ~ 13) Japan: 11b: 14 (1~13 or 14 th), 11g: 13 (1 ~ 13) China: 13 (1 ~ 13)Channels support802.11n a 1). US/Canada: 12 non-overlapping channels (36,40,44,48,52,56,60,64; 149,153,157,161) 2). Europe: 19 non-overlapping channels (36,40,44,48,52,56,60,64; 100,104,108,112,116,120,124,128,132,136,140) 3). Japan: 19 non-overlapping channels (149,153,157,161,165)Operation voltage> 3.3V +/.5% | | DBPSK (Differential Binary Phase Shift Keying 1Mbps), |
| OFDM (Orthogonal Frequency Division Multiplexing with BPSK for 6,9Mbps > QPSK for 12,18Mbps > 16QAM for 24,36Mbps > 64QAM for 48,54Mbps)Host interface> Mini-PCI form factor; Mini-PCI Version 1.0 type 3AUS/Canada: 11 (1 ~ 11)Major European country: 13 (1 ~ 13)France: 4 (10 ~ 13) Japan: 11b: 14 (1~13 or 14 th), 11g: 13 (1 ~ 13)Channels support> 802.11n a 1). US/Canada: 12 non-overlapping channels (36,40,44,48,52,56,60,64; 149,153,157,161) 2). Europe: 19 non-overlapping channels (36,40,44,48,52,56,60,64; 100,104,108,112,116,120,124,128,132,136,140) 3). Japan: 19 non-overlapping channels (149,153,157,161,165)Operation voltage> 3,3V +/-5% | technique | DQPSK (Differential Quaternary Phase Shift Keying 2Mbps), and |
| I2,18Mbps × 16QAM for 24,36Mbps × 64QAM for 48,54Mbps) Host > Mini-PCI form factor; Mini-PCI Version 1.0 type 3A interface > 802.11n b/g US/Canada: 11 (1 ~ 11) Major European country: 13 (1 ~ 13) France: 4 (10 ~ 13) Japan: 11b: 14 (1~13 or 14 th), 11g: 13 (1 ~ 13) Channels Support > 802.11n a 1). US/Canada: 12 non-overlapping channels (36,40,44,48,52,56,60,64; 149,153,157,161) 2). Europe: 19 non-overlapping channels (36,40,44,48,52,56,60,64; 149,153,157,161) 2). Europe: 19 non-overlapping channels (36,40,44,48,52,56,60,64; 149,153,157,161) 2). Europe: 19 non-overlapping channels (36,40,44,48,52,56,60,64; 149,153,157,161) Operation > 3.3V +/-5% | | CCK (Complementary Code Keying 5.5&11Mbps), and |
| Host interface > Mini-PCI form factor; Mini-PCI Version 1.0 type 3A Wini-PCI form factor; Mini-PCI Version 1.0 type 3A US/Canada: 11 (1 ~ 11) Major European country: 13 (1 ~ 13) France: 4 (10 ~ 13) Japan: 11b: Ib: 14 (1~13 or 14 th), Ib: 12 (1 ~ 13) Channels S02.11n a 1). US/Canada: 12 (1 ~ 13) Support 802.11n a 1). US/Canada: 12 non-overlapping channels (36,40,44,48,52,56,60,64; 100,104,108,112,116,120,124,128,132,136,140) 3). Japan: 19 non-overlapping channels (36,40,44,48,52,56,60,64; 100,104,108,112,116,120,124,128,132,136,140) 3). Japan: 19 non-overlapping channels (149,153,157,161,165) Operation voltage > 3.3V +/-5% | | OFDM (Orthogonal Frequency Division Multiplexing with BPSK for 6,9Mbps、 QPSK for |
| interface interface > 802.11n b/g US/Canada: 11 (1 ~ 11) Major European country: 13 (1 ~ 13) France: 4 (10 ~ 13) Japan: 11b: 14 (1~13 or 14 th), 11g: 13 (1 ~ 13) Channels Support * 802.11n a 1). US/Canada: 12 non-overlapping channels (36,40,44,48,52,56,60,64; 149,153,157,161) 2). Europe: 19 non-overlapping channel (36,40,44,48,52,56,60,64; 149,153,157,161) 3). Japan: 19 non-overlapping channels (36,40,44,48,52,56,60,64; 149,153,157,161) 3). Japan: 19 non-overlapping channels (36,40,44,48,52,56,60,64; 149,153,157,161) 4). China: 5 non-overlapping channels (149,153,157,161,165) Operation voltage | | 12,18Mbps 、 16QAM for 24,36Mbps 、 64QAM for 48,54Mbps) |
| > 802.11n b/g US/Canada: 11 (1 ~ 11) Major European country: 13 (1 ~ 13) France: 4 (10 ~ 13) Japan: 11b: 14 (1~13 or 14 th), 11g: 13 (1 ~ 13) Channels China: 13 (1 ~ 13) support > 802.11n a 1). US/Canada: 12 non-overlapping channels (36,40,44,48,52,56,60,64; 149,153,157,161) 2). Europe: 19 non-overlapping channels (36,40,44,48,52,56,60,64; 100,104,108,112,116,120,124,128,132,136,140) 3). Japan: 19 non-overlapping channels (36,40,44,48,52,56,60,64; 100,104,108,112,116,120,124,128,132,136,140) 4). China: 5 non-overlapping channels (149,153,157,161,165) Operation voltage > 3.3V +/-5% | Host | Mini-PCI form factor; Mini-PCI Version 1.0 type 3A |
| $\begin{array}{ c c c c c c c c c c c c c c c c c c c$ | interface | |
| $\begin{array}{l lllllllllllllllllllllllllllllllllll$ | | > 802.11n b/g |
| France: 4 (10 ~ 13) Japan: 11b: 14 (1~13 or 14 th), 11g: 13 (1 ~ 13) Channels support > 802.11n a 1). US/Canada: 12 non-overlapping channels (36,40,44,48,52,56,60,64; 149,153,157,161) 2). Europe: 19 non-overlapping channel (36,40,44,48,52,56,60,64; 100,104,108,112,116,120,124,128,132,136,140) 3). Japan: 19 non-overlapping channels (36,40,44,48,52,56,60,64; 100,104,108,112,116,120,124,128,132,136,140) 4). China: 5 non-overlapping channels (149,153,157,161,165) Operation voltage | | US/Canada: 11 (1 ~ 11) |
| Channels Japan: 11b: 14 (1~13 or 14 th), 11g: 13 (1 ~ 13) Channels China: 13 (1 ~ 13) support > 802.11n a 1). US/Canada: 12 non-overlapping channels (36,40,44,48,52,56,60,64; 149,153,157,161) 2). Europe: 19 non-overlapping channel (36,40,44,48,52,56,60,64; 100,104,108,112,116,120,124,128,132,136,140) 3). Japan: 19 non-overlapping channels (36,40,44,48,52,56,60,64; 100,104,108,112,116,120,124,128,132,136,140) 4). China: 5 non-overlapping channels (149,153,157,161,165) Operation voltage | | Major European country: 13 (1 ~ 13) |
| Channels China: 13 (1 ~ 13) support > 802.11n a 1). US/Canada: 12 non-overlapping channels (36,40,44,48,52,56,60,64; 149,153,157,161) 2). Europe: 19 non-overlapping channel (36,40,44,48,52,56,60,64; 100,104,108,112,116,120,124,128,132,136,140) 3). Japan: 19 non-overlapping channels (36,40,44,48,52,56,60,64; 100,104,108,112,116,120,124,128,132,136,140) 4). China: 5 non-overlapping channels (149,153,157,161,165) Operation voltage | | France: 4 (10 ~ 13) |
| support > 802.11n a 1). US/Canada: 12 non-overlapping channels (36,40,44,48,52,56,60,64; 149,153,157,161) 2). Europe: 19 non-overlapping channel (36,40,44,48,52,56,60,64; 100,104,108,112,116,120,124,128,132,136,140) 3). Japan: 19 non-overlapping channels (36,40,44,48,52,56,60,64; 100,104,108,112,116,120,124,128,132,136,140) 4). China: 5 non-overlapping channels (149,153,157,161,165) Operation voltage | | Japan: 11b: 14 (1~13 or 14 th), 11g: 13 (1 ~ 13) |
| 1). US/Canada: 12 non-overlapping channels (36,40,44,48,52,56,60,64; 149,153,157,161) 2). Europe: 19 non-overlapping channel (36,40,44,48,52,56,60,64; 100,104,108,112,116,120,124,128,132,136,140) 3). Japan: 19 non-overlapping channels (36,40,44,48,52,56,60,64; 100,104,108,112,116,120,124,128,132,136,140) 4). China: 5 non-overlapping channels (149,153,157,161,165) Operation voltage | Channels | China: 13 (1 ~ 13) |
| 2). Europe: 19 non-overlapping channel (36,40,44,48,52,56,60,64; 100,104,108,112,116,120,124,128,132,136,140) 3). Japan: 19 non-overlapping channels (36,40,44,48,52,56,60,64; 100,104,108,112,116,120,124,128,132,136,140) 4). China: 5 non-overlapping channels (149,153,157,161,165) Operation voltage > 3.3V +/-5% | support | > 802.11n a |
| 100,104,108,112,116,120,124,128,132,136,140) 3). Japan: 19 non-overlapping channels (36,40,44,48,52,56,60,64; 100,104,108,112,116,120,124,128,132,136,140) 4). China: 5 non-overlapping channels (149,153,157,161,165) Operation voltage | | 1). US/Canada: 12 non-overlapping channels (36,40,44,48,52,56,60,64; 149,153,157,161) |
| 3). Japan: 19 non-overlapping channels (36,40,44,48,52,56,60,64; 100,104,108,112,116,120,124,128,132,136,140) 4). China: 5 non-overlapping channels (149,153,157,161,165) Operation voltage | | 2). Europe: 19 non-overlapping channel (36,40,44,48,52,56,60,64; |
| 100,104,108,112,116,120,124,128,132,136,140) 4). China: 5 non-overlapping channels (149,153,157,161,165) Operation > 3.3V +/-5% | | 100,104,108,112,116,120,124,128,132,136,140) |
| 4). China: 5 non-overlapping channels (149,153,157,161,165) Operation voltage > 3.3V +/-5% | | 3). Japan: 19 non-overlapping channels (36,40,44,48,52,56,60,64; |
| Operation voltage > 3.3V +/-5% | | 100,104,108,112,116,120,124,128,132,136,140) |
| voltage > 3.3V +/-5% | | 4). China: 5 non-overlapping channels (149,153,157,161,165) |
| Operation > 802.11a | - | > 3.3V +/-5% |
| | Operation | > 802.11a |

| distance | Outdoor: 50 m @54Mbps, 300 m @6Mbps | | | |
|-------------------|---|--|--|--|
| (Depends on | Indoor: 30 m @54Mbps, 100 m @6Mbps | | | |
| antenna | > 802.11b | | | |
| performance) | Outdoor: 150 m @11Mbps, 300 m @1Mbps | | | |
| | Indoor: 30 m @11Mbps, 100 m @1Mbps | | | |
| | ≻ 802.11g | | | |
| | Outdoor: 50 m @54Mbps, 300 m @6Mbps | | | |
| | Indoor: 30 m @54Mbps, 100 m @6Mbps | | | |
| | ➢ 802.11n | | | |
| | Outdoor: 250 m @6.5Mbps (MCS0: 1 Nss/20MHz BW) | | | |
| | 30 m @130Mbps (MCS15: 2 Nss/20MHz BW) | | | |
| | 30 m @300Mbps (MCS15: 2 Nss/40MHz BW) | | | |
| | Indoor: 100 m @6.5Mbps (MCS0: 1 Nss/20MHz BW) | | | |
| | 20 m @130Mbps (MCS15: 2 Nss/20MHz BW) | | | |
| | 20 m @300Mbps (MCS15: 2 Nss/40MHz BW) | | | |
| Operation | | | | |
| OS | Linux Kernel 2.6.15 or later, Windows [®] 2K(TBD), XP(TBD), Vista(TBD) | | | |
| supported | | | | |
| РСВ | > 50.8mm (L/H) x 59.6mm (W) x 1.0mm (T) | | | |
| Dimension | | | | |
| | > 64-bit, 128-bit, 152-bit WEP Encryption | | | |
| Security | > 802.1x Authentication | | | |
| | > AES-CCM & TKIP Encryption | | | |
| Operation mode | > Infrastructure & Ad-hoc mode (TBD) | | | |
| | > 802.11b: 1, 2, 5.5, 11Mbps | | | |
| | | | | |
| | > 802.11g: 6, 9, 12, 18, 24, 36, 48, 54Mbps | | | |
| Transfer data | ➢ 802.11n: @800GI(400GI) | | | |
| rate | • 20MHz BW | | | |
| | 1 Nss: 65(72.2)Mbps maximal | | | |
| | 2 Nss: 130(144.444)Mbps maximal | | | |
| | • 40MHz BW | | | |
| | 1 Nss: 135(150)Mbps maximal | | | |
| | 2 Nss: 270(300)Mbps maximal | | | |
| Operation | $> 0^{\circ} \sim 60^{\circ} \text{ C}$ | | | |
| temperature | | | | |

| Storage temperature | $> -20^{\circ} \sim 80^{\circ} \text{ C}$ |
|---|--|
| Wi-Fi [®] Alliance [®] | > WECA Compliant |
| WHQL | Microsoft [®] 2K, XP Compliant |
| FAA | > S/W audio On/Off support |
| EMC certificate | FCC part 15 (USA) IC RSS210 (Canada) TELEC (Japan) ETSI, EN301893, EN60950 (Europe) VCCI CLASS B |
| Media access protocol | > CSMA/CA with ACK architecture 32-bit MAC |
| Antenna connector | > 3 x SMT Ultra-miniature coaxial connectors |