

WLAN 802.11g mini-PCI Module

User Manual

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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.

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1. Introduction

1.1 The WLAN 802.11g mini-PCI Module

802.11g is the 54Mbps wireless networking standard that's almost five times faster than the widely deployed 802.11b products found in homes, businesses, and public wireless hotspots around the country — but since they share the same 2.4GHz radio band, 802.11g devices can also work with existing 11Mbps 802.11b equipment. The new 802.11g mini-PCI Module has both standards built in, so you can connect your notebook to existing 802.11b infrastructure, and also the new screaming fast 802.11g networks. The included Setup Wizard will walk you through configuring the module to your network's settings, step by step.

Once you're connected, you can keep in touch with your e-mail, access the Internet, and share files and other resources such as printers and network storage with other computers on the network, wherever you wander. At home, you can surf the web or use instant messaging to chat with friends while sitting out on the patio. You'll also be able to connect with any of the growing number of public wireless hotspots springing up in coffee shops, airport lounges, hotels and convention centers. And as those hotspots upgrade to the new high-speed 802.11g standard, you'll be ready to take advantage of the increased speeds. Get connected to current-standard 802.11b networks today, and be prepared for the future with the WLAN 802.11g mini-PCI Module.

1.2 Features

- High-speed 802.11g networking for your notebook computer
- Data rates up to 54Mbps -- 5 times faster than 802.11b
- Also interoperates with 802.11b networks (at 11Mbps)
- Wireless security -- up to 128-bit WEP encryption

2. Planning Your Wireless Network

2.1 Network Topology

A wireless local area network (WLAN) is exactly like a regular local area network (LAN), except that each computer in the WLAN uses a wireless device to connect to the network. Computers in a WLAN share the same frequency channel and SSID, which is an identification name for wireless devices.

2.2 Ad-Hoc versus Infrastructure Mode

Unlike wired networks, wireless networks have two different modes in which they may be set up: **infrastructure** and **ad-hoc**. An infrastructure configuration is a WLAN and wired LAN communicating to each other through an access point. An ad-hoc configuration is wireless-equipped computers communicating directly with each other. Choosing between these two modes depends on whether or not the wireless network needs to share data or peripherals with a wired network or not.

If the computers on the wireless network need to be accessed by a wired network or need to share a peripheral, such as a printer, with the wired network computers, the wireless network should be set up in **infrastructure** mode. (See Figure 2-1.) The basis of infrastructure mode centers around an *access point*, which serves as the main point of communications in a wireless network. Access points transmit data to PCs equipped with wireless network cards, which can *roam* within a certain radial range of the access point. Multiple access points can be arranged to work in succession to extend the roaming range, and can be set up to communicate with your Ethernet (wired) hardware as well.

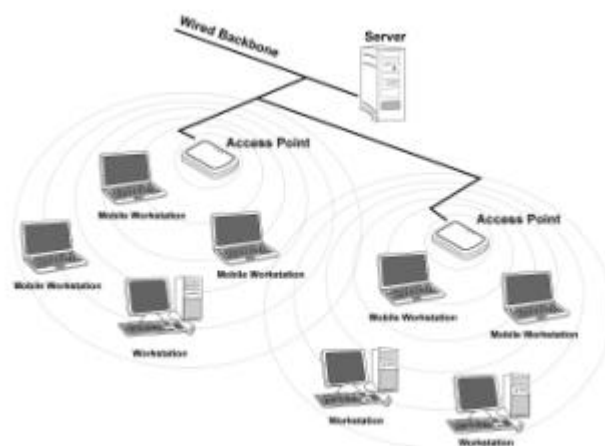


Figure 2-1

If the wireless network is relatively small and needs to share resources only with the other computers on the wireless network, then the **ad-hoc** mode can be used. (See Figure 2-2.) Ad-hoc mode allows computers equipped with wireless transmitters and receivers to communicate directly with each other, eliminating the need for an access point. The drawback of this mode is that, in Ad- Hoc mode, wireless-equipped computers are not able to communicate with computers on a wired network. And, of course, communication between the wireless-equipped computers is limited by the distance and interference directly between them.



Figure 2-2

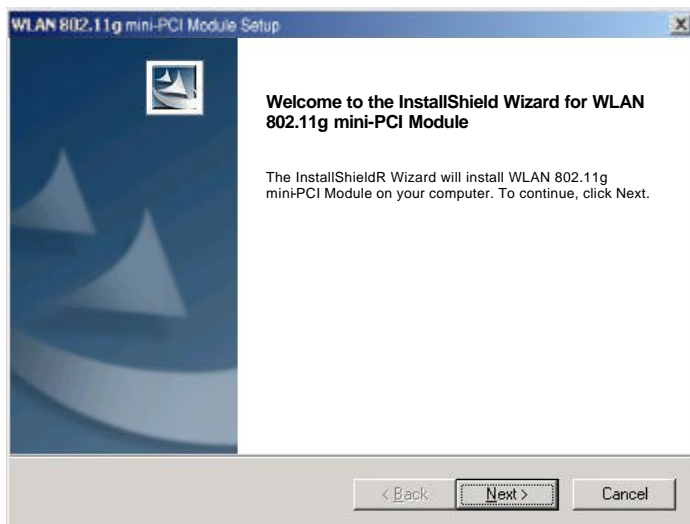
3. Software Installation and Uninstallation

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 3.2 “Uninstallation” section in this User Manual.

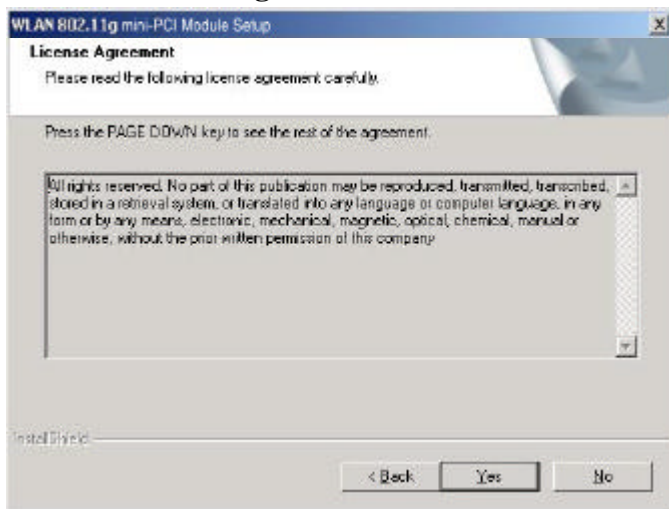
3.1 Setup Wizard Installation

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

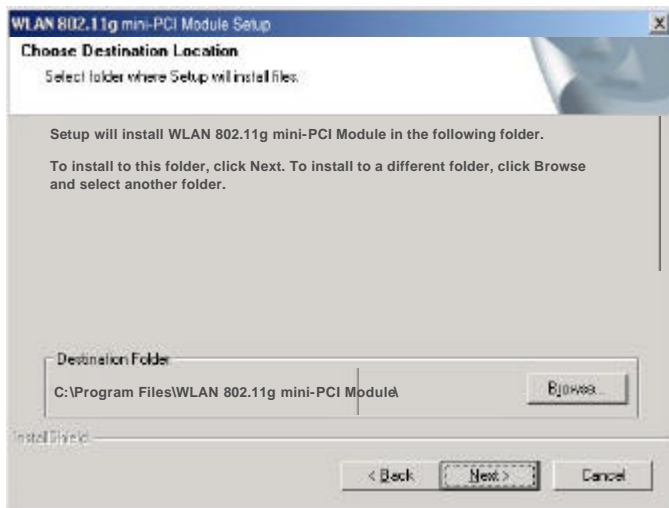
1. Insert the **Installation Software CD** into the CD-Rom Drive.
2. Click “**Next**”.



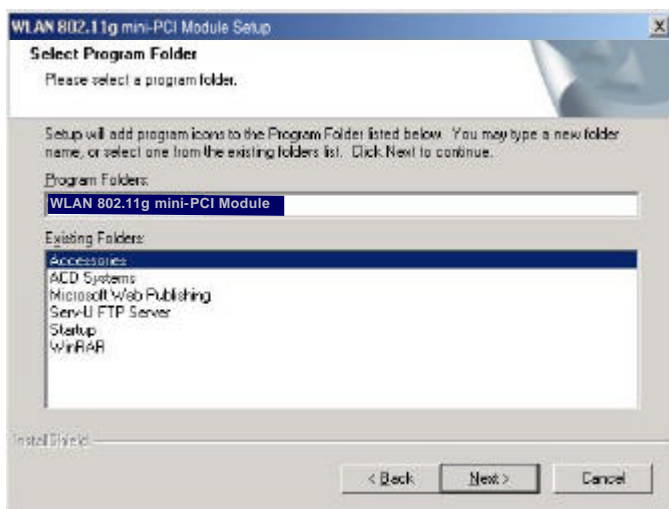
3. Read the **License Agreement** and click **“Yes”**.



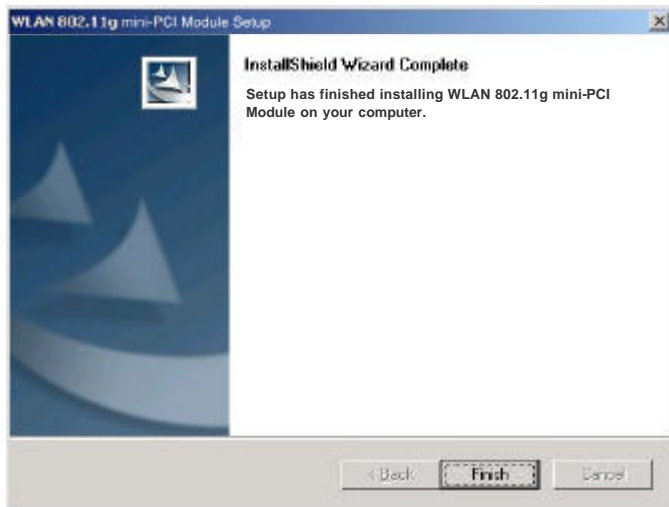
4. Click **“Next”** to continue or click **“Browse”** to choose a destination folder.



5. Click **“Next”**.




6. Click “**Finish**”.



7. The Windows Operating System will find the new hardware and automatically install it. (For Windows 98SE or Windows Me, please restart your computer before inserting the Adatper).



8. You may now see the WLAN 802.11g mini-PCI Module shortcut  on windows system tray.



3.2 Additional Setup Processes

During software installation procedure, each operating system may prompt different specific options. Mostly, you will be asked to add some necessary protocols and to edit some networking settings.

1. **Windows 98SE:** The system may request the original Windows CD during the installation process. Please check with the network administrator for

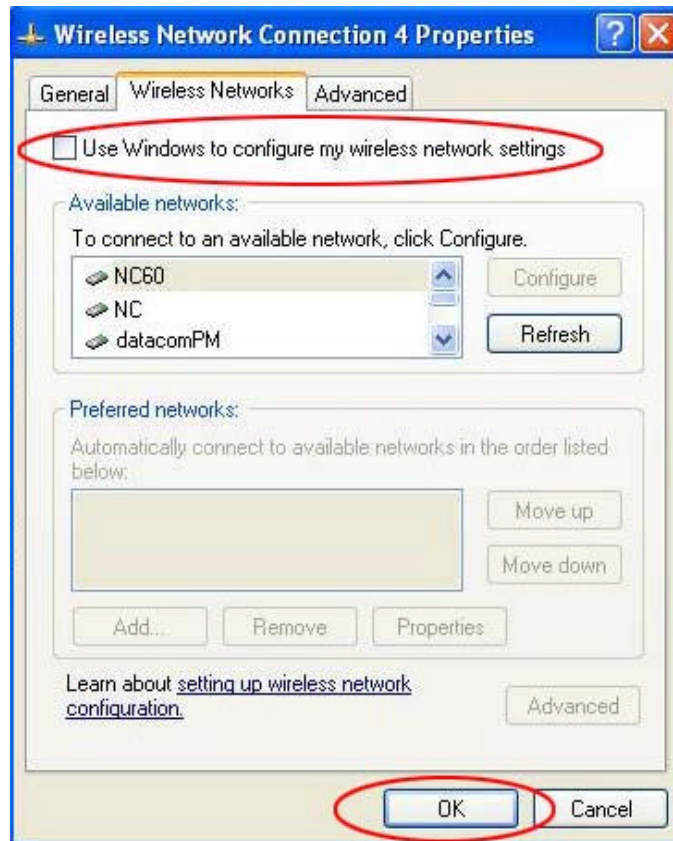
the values of the settings. When the installation is finished, you'll have to restart your computer.

2. **Windows Me:** Please check with the network administrator for the values of the settings. Please restart your computer when the installation is finished.
3. **Windows 2000:** Please check with the network administrator for the values of the settings. Select "Install the software automatically" when the window with this option appears, and then click "Next" to continue installation.
4. **Windows XP:** Select "Install the software automatically" when the window with this option appears, and then click "Next" to continue installation. Note that before using the WLAN 802.11g mini-PCI Module Utility, please disable the Windows XP Zero-Configuration first.

3.3 Disable Windows XP Zero-Configuration

In Windows XP, it is recommended that you use the WLAN 802.11g mini-PCI Module Utility. Right after the installation, before opening the Utility, please follow the steps below to disable the Windows XP Zero Configuration:

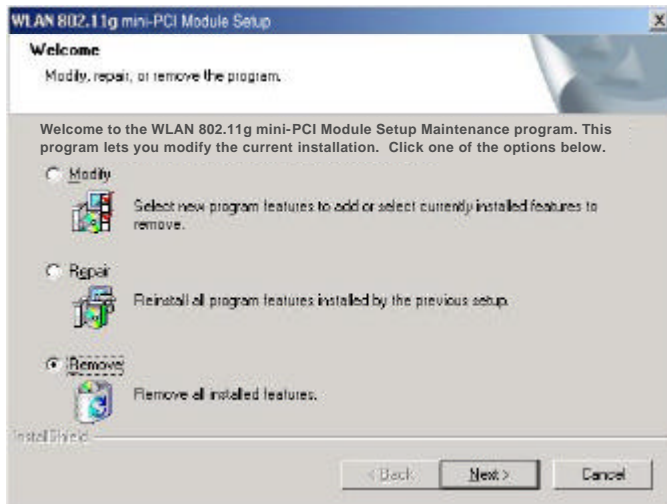
- 1 Go to “Control Panel” and double click “Network Connections”.
- 2 Right-click “Wireless Network Connection” of WLAN 802.11g mini-PCI Module, and select “Properties”.
- 3 Select “Wireless Networks” tab, and uncheck the check box of “Use Windows to configure my wireless network settings”, and then click “OK”.



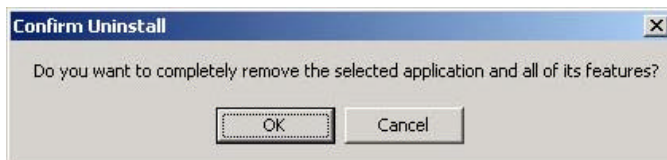
3.4 Uninstallation

Note! Before uninstallation, please close all running programs.

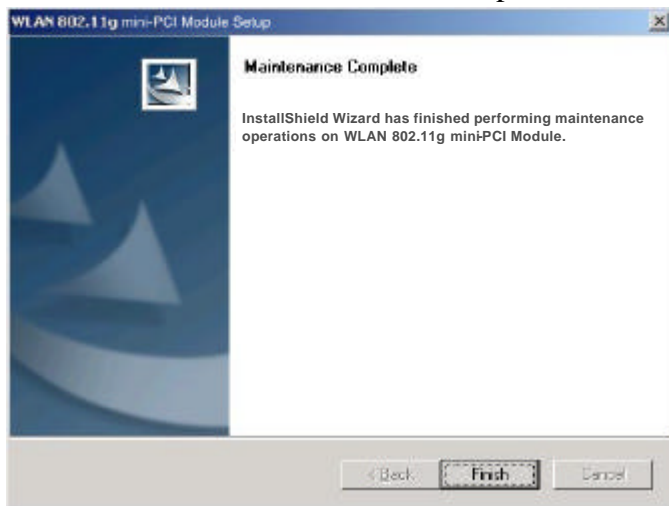
1. Click Start>Programs>WLAN 802.11g mini-PCI Module>Uninstall WLAN 802.11g mini-PCI Module.
2. Choose **“Remove”**. Click **“Next”**.



3. Click **“OK”** to start **Uninstall**.



4. Click **“Finish”**. **Uninstall** is now completed.




4. Using the Configuration Utility

4.1 Overview

Use the Configuration Utility to search for available wireless networks, connect to wireless network, or check the link status.

4.2 Accessing the Configuration Utility

1. After software installation, the WLAN 802.11g mini-PCI Module Configuration Utility icon will appear in your system tray. In Windows XP, please first close the XP Zero Configuration function. (Please refer to chapter 3.3) Doubleclick the icon .
2. This Tab will appear with listing the available network. Please select the appropriate network and click “**Connect**” to connect to the wireless network. You may click “**Advanced**” to have advanced setting as next page.

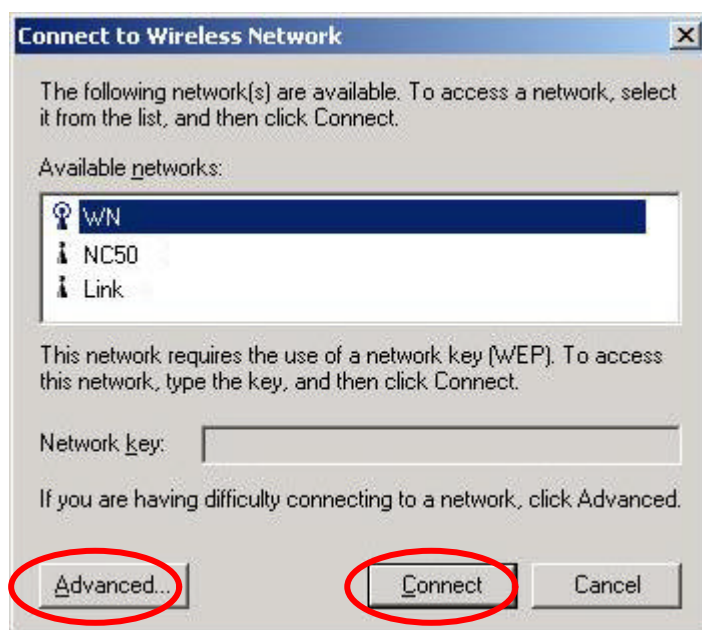


Fig. 4-1

Note: If the network you choose is WEP enable, please contact with the Network Administrator for Network Key.

Note: Once connected, the WLAN 802.11g mini-PCI Module shortcut will

become 

3. Select “Advanced” in previous page, and you will enter this window.

In **Wireless Networks** Tab:

-**Enable Radio**: Choose “Enable Radio” to enable radio. You usually are requested to uncheck Enable Radio while in the airplane or in the hospital. User can also find this function on system tray menu.

-**Available networks**: List all the available networks, and you can choose the appropriated network and click “**Configure**”. The selected network will be listed in Preferred networks. Click “**OK**” to connect to the wireless network.

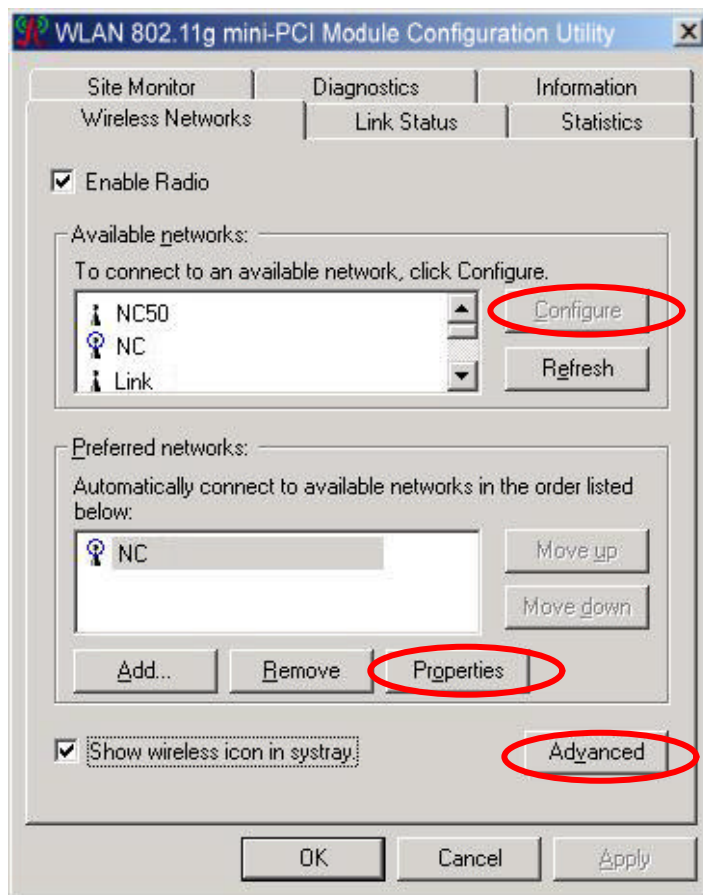


Fig. 4-2

4. Click “**Advanced**” button in Fig. 4-2.
5. You may select “**Automatically connect to non-preferred network**” in Fig. 4-3 to activate this function, if needed. It will connect to the available network automatically. Click “**Close**”.



Fig. 4-3

6. Click "**Properties**" in Fig. 4-2.
7. If the selected Network is **WEP enabled**, you need to enter **Network Key** in Fig. 4-4. Contact with the Network Administrator for Network Key.

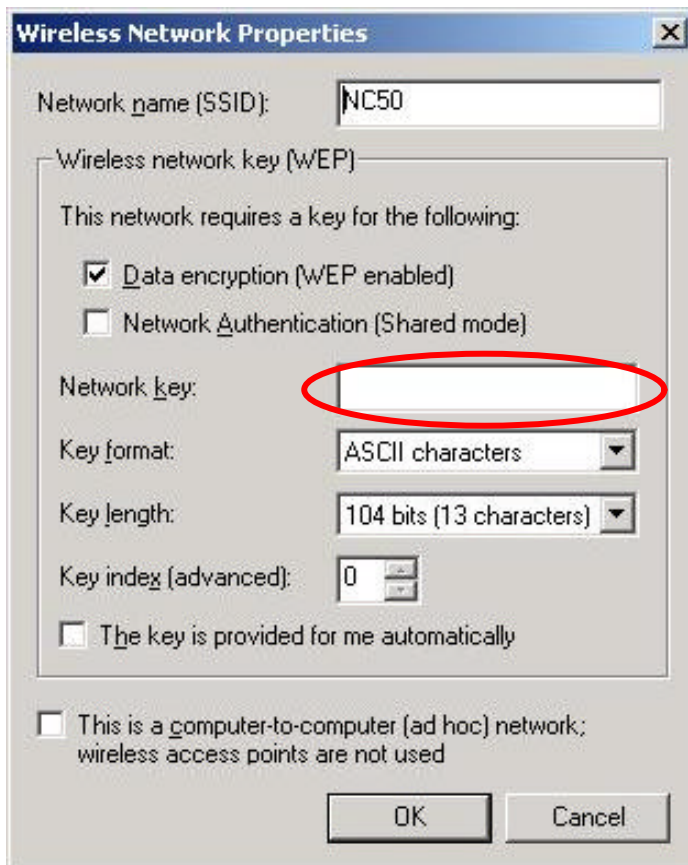


Fig. 4-4

8. Select the chosen item in Fig. 4-5 to switch the network to **ad hoc mode**.

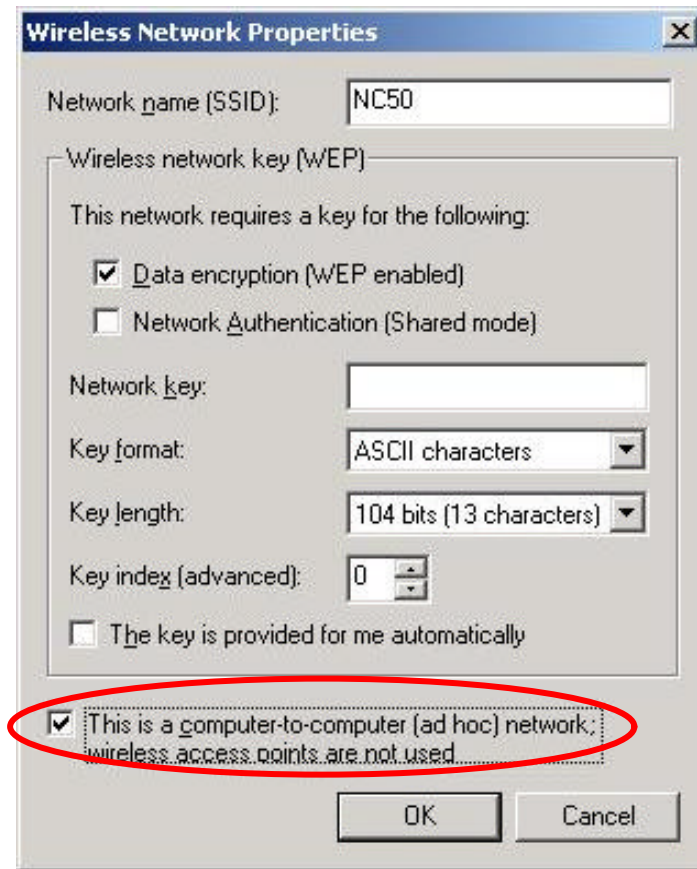
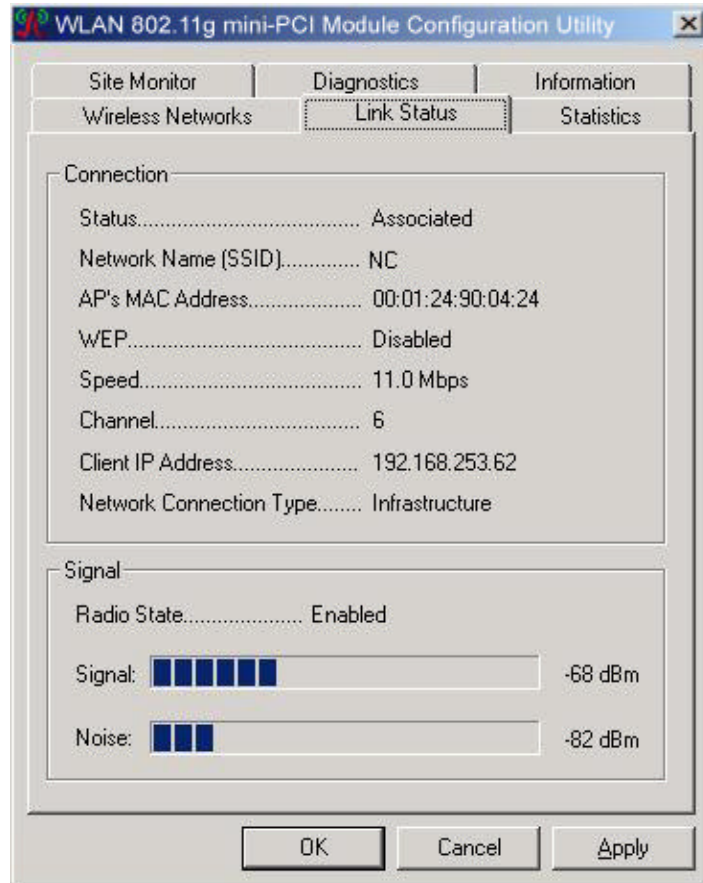


Fig. 4-5

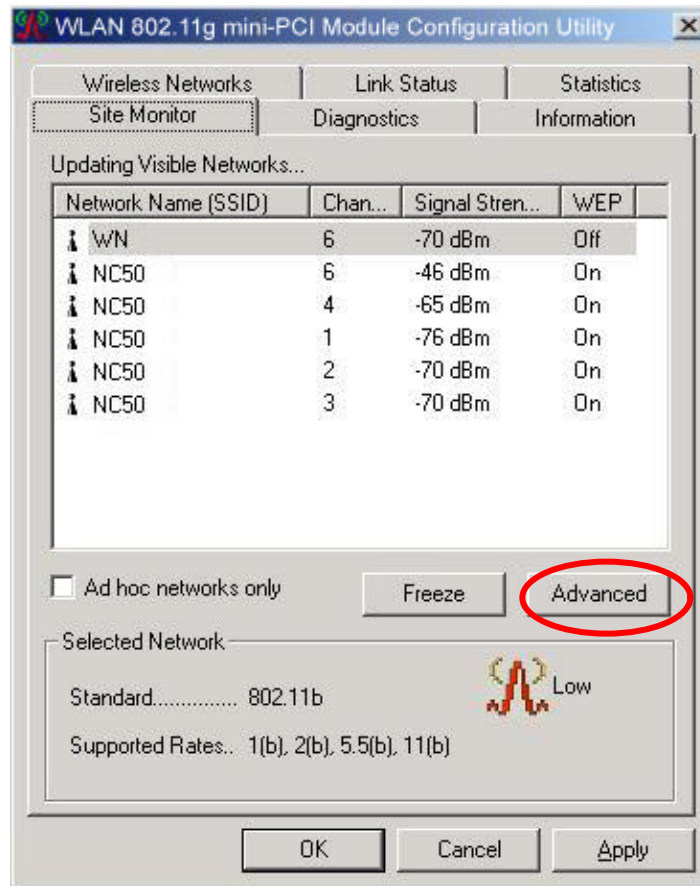
4.3 Link Status

The Link Status tab shows information of Linked Network Name, Current Channel, Current Transmission Rate, Own MAC Address, Current Connection State, Wireless Network Adapter IP Address, Network Connection Type and Signal Strength.

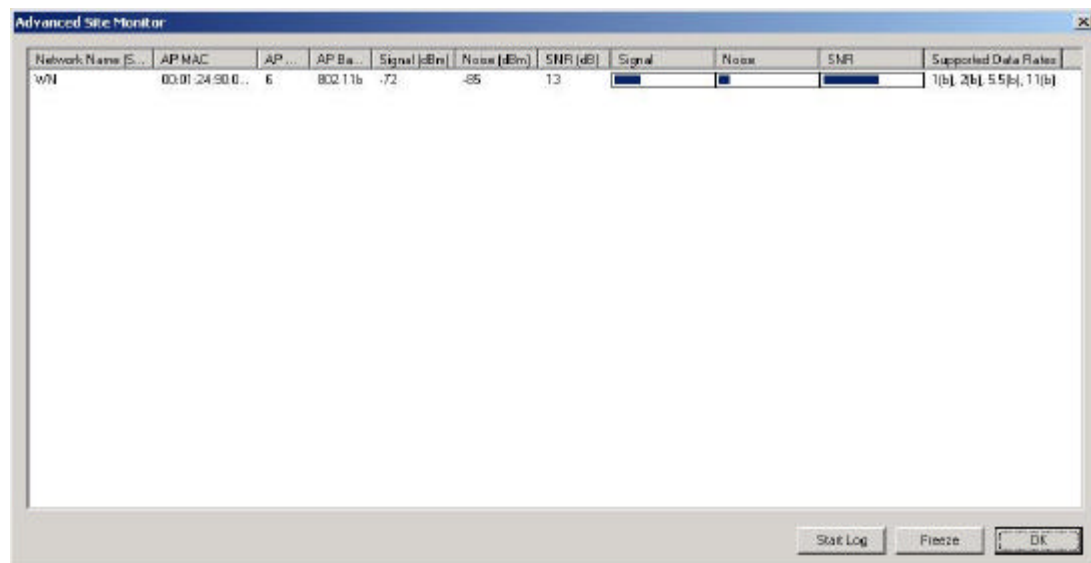


4.4 Site Monitor

This tab gives you the information of all the available Access Points in the network, such as their signal strength and WEP status, so that you can select the Access Point with the strongest signal for better performance.

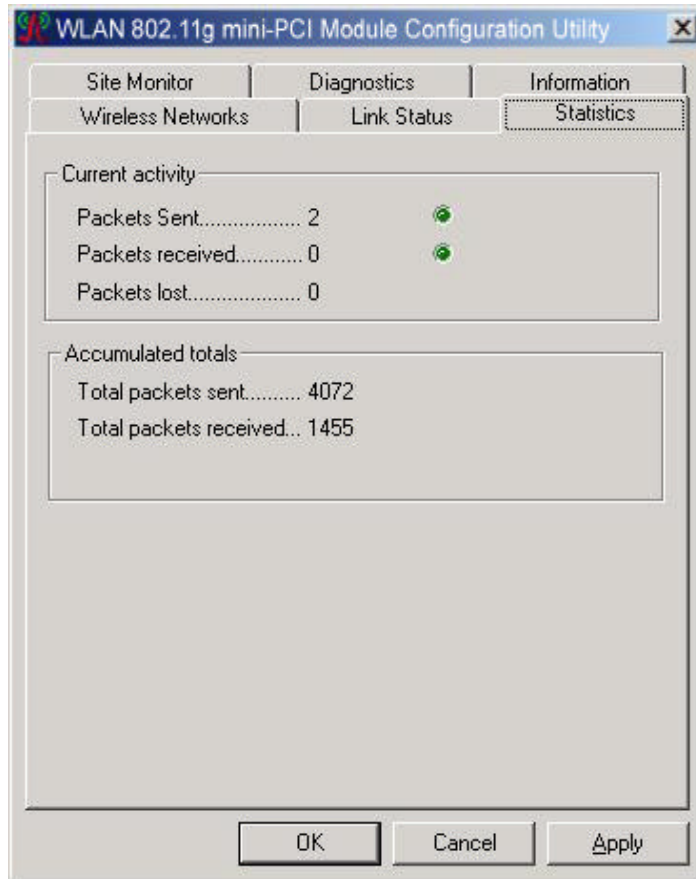


You may select the appropriated “**Network Name**” and click “**Advanced**” to see the detailed information.



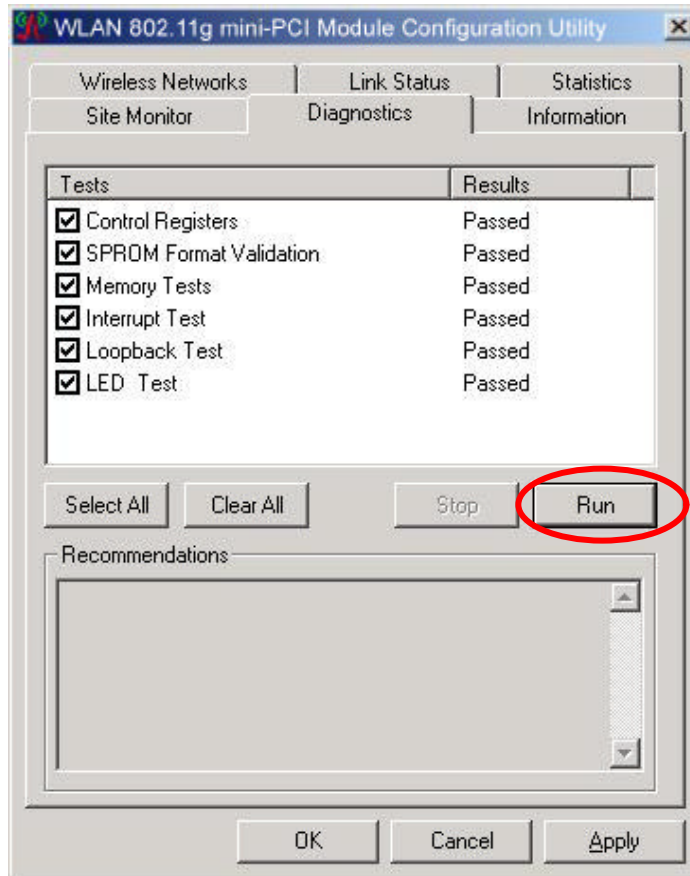
4.5 Statistics

This tab describes the Current Activity of the connection, such as Packet Sent and Received.



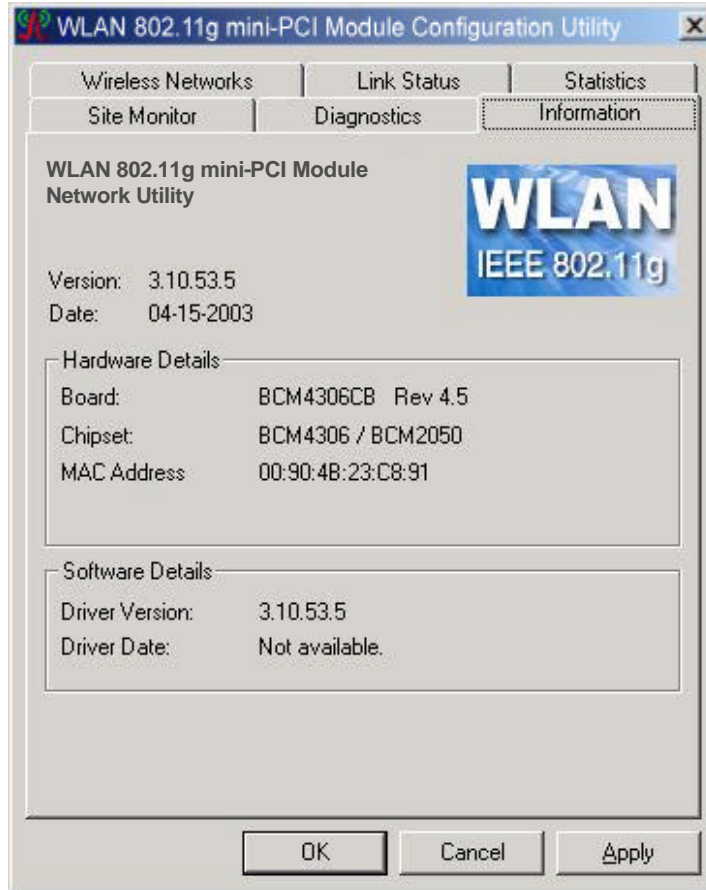
4.6 Diagnostics

Click “**Run**” button to check errors in hardware, firmware, and software of your WLAN 802.11g mini-PCI Module. In case of any errors occur, please print it out to present to your dealer or distributor.



4.7 Information

This tab provides you the version information of Firmware, Driver and Utility.



Appendix A: FAQ

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 if 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.

9. What is ISM band?

The FCC and their counterparts outside of the U.S. have set aside bandwidth for

unlicensed use in the ISM (Industrial, Scientific and Medical) band. Spectrum in the vicinity of 2.4 GHz, in particular, is being made available worldwide. This presents a truly revolutionary opportunity to place convenient high-speed wireless capabilities in the hands of users around the globe.

10. What is the IEEE 802.11g standard?

Approved in June, 2003 as an IEEE standard for wireless local area networks (WLANs), 802.11g offers wireless transmission over relatively short distances at up to 54 megabits per second (Mbps) compared with the 11 megabits per second of the 802.11b (Wi-Fi) standard. Like 802.11b, 802.11g operates in the 2.4 GHz range and is thus compatible with it.

Appendix B: Glossary

802.11b – One of the IEEE standards of wireless networking hardware. Products that adhere to a specific IEEE standard will work with each other, even if they are manufactured by different companies. The 802.11b standard specifies a maximum data transfer rate of 11Mbps, an operating frequency of 2.4GHz, and WEP encryption for security. 802.11b networks are also referred to as Wi-Fi networks.

802.11g – Refers to the proposed extension of the IEEE 802.11 standard for wireless networking, which has not been ratified by IEEE. The 802.11g specifications specifies a maximum data transfer rate of 54Mbps using OFDM modulation, an operating frequency of 2.4GHz, backward compatibility with IEEE 802.11b devices and WEP encryption for security.

Ad-hoc Network - An ad-hoc network is a group of computers, each with a wireless adapter, connected as an independent 802.11 wireless LAN. Ad-hoc wireless computers operate on a peer-to-peer basis, communicating directly with each other without the use of an access point. Ad-hoc mode is also referred to as an Independent Basic Service Set (IBSS) or as peer-to-peer mode, and is useful at a departmental scale or SOHO operation.

CTS (Clear To Send) – An RS-232 signal sent from the receiving station to the transmitting station that indicates it is ready to accept data.

Default Gateway - The router used to forward all traffic that is not addressed to a station within the local subnet.

DHCP (Dynamic Host Configuration Protocol)- A protocol that lets network administrators manage centrally and automate the assignment of Internet Protocol (IP) addresses in an organization's network. Using the Internet's set of protocol (TCP/IP), each machine that can connect to the Internet needs a unique IP address. When an organization sets up its computer users with a connection to the Internet, an IP address must be assigned to each machine. Without DHCP, the IP address must be entered manually at each computer and, if computers move to another location in another part of the network, new IP address must be entered. DHCP lets a network administrator supervise and distribute IP address from a central point and automatically sends a new IP address when a computer is plugged into a different place in the network.

DHCP uses the concept of a “lease” or amount of time that a given IP address will be valid for a computer. The lease time can vary depending on how long a user is likely to require the Internet connection at a particular location. It’s especially useful in education and other environments where users change frequently. Using very short lease, DHCP can dynamically reconfigure networks in which there are more computers than there are available IP address.

DHCP supports static addresses for computers containing Web servers that need a permanent IP address.

DNS – The domain name system (DNS) is the way that Internet domain name are located and translated into Internet Protocol (IP) addresses. A domain name is a meaningful and easy-to-remember “handle” for an Internet address.

DSSS (Direct-Sequence Spread Spectrum) – DSSS generates a redundant bit pattern for all transmitted data. This bit pattern is called a chip (or chipping code). Even if one or more bits in the chip are damaged during transmission, statistical techniques embedded in the receiver 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. However, to an intended receiver (i.e. another wireless LAN endpoint), the DSSS signal is recognized as the only valid signal, and interference is inherently rejected (ignored).

Dynamic IP Address – An IP address that is automatically assigned to a client station in a TCP/IP network, typically by a DHCP server. Network devices that serve multiple users, such as servers and printers, are usually assigned static IP addresses.

ESS (Extended Service Set) – A set of more than two or more BSSs (multiple access points) forming a single network.

Firmware – Code that is written onto read-only memory (ROM) or programmable read-only memory (PROM). Once firmware has been written onto the ROM or PROM, it is retained even when the device is turned off.

IEEE – The Institute of Electrical and Electronics Engineers. The IEEE describes itself as “the world’s largest technical professional society – promoting the development and application of electro-technology and allied sciences for the benefit of humanity, the advancement of the profession, and the wellbeing of our members.” The IEEE fosters the development of standards that often become national and

international standards. The organization publishes a number of journals, has many local chapters, and several large societies in special areas, such as the IEEE Computer Society.

Infrastructure Network – An Infrastructure network is a group of computers or other devices, each with a wireless adapter, connected as an 802.11 wireless LAN. In infrastructure mode, the wireless devices communicate with each other and to a wired network by first going through an access point. An infrastructure wireless network connected to a wired network is referred to as a Basic Service Set (BSS). A set of two or more BSS in a single network is referred to as an Extended Service Set (ESS). Infrastructure mode is useful at a corporation scale, or when it is necessary to connect the wired and wireless networks.

IP Address – In the most widely installed level of the Internet Protocol (IP) today, an IP address is a 32 – binary digit number that identifies each sender or receiver of information that is sent in packet across the Internet. When you request an HTML page or send e-mail, the Internet Protocol part of TCP/IP includes your IP address in the message (actually, in each of the packets if more than one is required) and sends it to the IP address that is obtained by looking up the domain name in the Uniform Resource Locator you requested or in the e-mail address you're sending a note to. At the other end, the recipient can see the IP address of the Web page requester or the e-mail sender and can respond by sending another message using the IP address it received.

IPCONFIG – A utility that provides for querying, defining and managing IP addresses within a network. A commonly used utility, under Windows NT and 2000, for configuring networks with static IP addresses.

ISP – An ISP (Internet service provider) is a company that provides individuals and companies access to the Internet and other related services such as Web site building and virtual hosting.

LAN – A local area network (LAN) is a group of computers and associated devices that share a common communications line and typically share the resource of a single processor or server within a small geographic area (for example, within an office building).

MAC Address – The MAC (Media Access Control) address is your computer's

unique hardware number.

mIRC – mIRC runs under Windows and provides a graphical interface for logging onto IRC servers and listing, joining and leaving channels.

Network Mask – also known as the “Subnet Mask”.

OFDM – Developed for wireless applications, Orthogonal Frequency Division Multiplexing (OFDM) technology offers superior performance-increased data rates and more reliable transmissions- than previous technologies, such as DSSS. OFDM is a scheme in which numerous signals of different frequencies are combined to form a single signal for transmission on the medium. OFDM works by breaking one high-speed data stream into a number of lower-speed data streams, which are then transmitted in parallel. Each lower speed stream is used to modulate a sub-carrier. Essentially, this creates a multi-carrier transmission by dividing a wide frequency band or channel into a number of narrower frequency bands or sub-channels. OFDM is also used for other applications, including powerline networking.

Roaming - In an infrastructure mode wireless network, this refers to the ability to move out of one access point's range and into another and transparently reassociate and reauthenticate to the new access point. This reassociation and reauthentication should occur without user intervention and ideally without interruption to network connectivity. A typical scenario would be a location with multiple access points, where users can physically relocate from one area to another and easily maintain connectivity.

SSID (Service Set Identifier) - An identification name that wireless devices use to make connections. In order for wireless devices to communicate, they must all be set to the same channel and they all must use the same SSID. For instance, if you are using an access point to connect two computers using wireless devices, the access point and each of the wireless devices must use the same SSID. Even if they are set to the same channel, they cannot communicate unless the SSID is the same.

Static IP Address - A permanent IP address that is assigned to a node in a TCP/IP network.

Subnet Mask - The method used for splitting IP networks into a series of subgroups, or subnets. The mask is a binary pattern that is matched up with the IP address to turn

part of the host ID address field into a field for subnets.

TCP (Transmission Control Protocol) - A method (protocol) used along with the IP (Internet Protocol) to send data in the form of message units (datagram) between network devices over a LAN or WAN. While IP takes care of handling the actual delivery of the data (routing), TCP takes care of keeping track of the individual units of data (called packets) that a message is divided into for efficient delivery over the network. TCP is known as a "connection oriented" protocol due to requiring the receiver of a packet to return an acknowledgment of receipt to the sender of the packet resulting in transmission control.

TCP/IP (Transmission Control Protocol/Internet Protocol) - The basic communication language or set of protocols for communications over a network (developed specifically for the Internet). TCP/IP defines a suite or group of protocols and not only TCP and IP.

UDP (User Datagram Protocol) - A method (protocol) used along with the IP (Internet Protocol) to send data in the form of message units (datagram) between network devices over a LAN or WAN. While IP takes care of handling the actual delivery of the data (routing), UDP takes care of keeping track of the individual units of data (called packets) that a message is divided into for efficient delivery over the network. UDP is known as a "connection-less" protocol due to NOT requiring the receiver of a packet to return an acknowledgment of receipt to the sender of the packet (as opposed to TCP). **WEP (Wired Equivalent Privacy)** - A data privacy mechanism based on a 64-bit shared key algorithm, as described in the IEEE 802.11b standard. **WINIPCFG** - Configuration utility based on the Win32 API for querying, defining and managing IP addresses within a network. A commonly used utility under Windows 95, 98SE, and Me.

WLAN (Wireless Local Area Network) - A group of computers and associated devices that communicate with each other wirelessly.

Appendix C: Specification

| Items | Contents |
|--------------------------------------|--|
| 1. Modulation type | 11g:DSSS&OFDM;11b:DSSS |
| 2. Procedure to modulation off | Use Broadcom MFG Tool to transmit signal in single carrier mode |
| 3. Number of channels | 11g:11 channels for FCC 11b: 11 channels for FCC |
| 4. Carrier frequency of each channel | 11b&11g:11channels 2.412,2.417,2.422,2.472,432,2.437,2.442,2.447,2.452,2.457,2.462GHz |
| 5. Bandwidth of each channel | 11g: 16.44MHz 11b :11.12MHz |
| 6. L.O. frequency of receiver | 2412~2462MHz |
| 7. Transmitter or Transceiver * | Transceiver |
| 8. Power Rating (DC/AC, Volt rating) | 3.3Vdc/550mA Max |
| 9. Maximum output power to Antenna | 11b:17.57dBm 11g:19.78dBm |
| 10. Duty Cycle | 100% test mode |
| 11. Basic function of product | Wireless data communication |
| 12. I/O Port or data cable if any | MiniPCI |
| 14. Operation temperature range | 0 ~ 75 degree C |