

***802.11g Wireless LAN  
Mini-PCI Card***

**User Manual**

**Version: 1.0  
(January, 2004)**

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## **Federal Communications Commission (FCC) Radiation Exposure Statement**

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.

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

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

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

### **FCC Caution**

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

This equipment complies with FCC radiation exposure limits set forth for an uncontrolled environment. In order to avoid the possibility of exceeding the FCC radio frequency exposure limits, human proximity to the antenna shall not be less than 20cm (8 inches) during normal operation.

If the FCC ID is not visible when the module is installed inside another device, then the outside of the device into which the module is installed must also display a label referring to the enclosed module. This exterior label can use wording such as the following: "Contains Transmitter Module FCC ID: NDD9571570411" or "Contains FCC ID: NDD9571570411."

## **R&TTE Compliance Statement**

This equipment complies with all the requirements of DIRECTIVE 1999/5/EC OF THE EUROPEAN PARLIAMENT AND THE COUNCIL of March 9, 1999 on radio equipment and telecommunication terminal Equipment and the mutual recognition of their conformity (R&TTE)

The R&TTE Directive repeals and replaces in the directive 98/13/EEC (Telecommunications Terminal Equipment and Satellite Earth Station Equipment) As of April 8, 2000.

## **Safety**

This equipment is designed with the utmost care for the safety of those who install and use it. However, special attention must be paid to the dangers of electric shock and static electricity when working with electrical equipment. All guidelines of this and of the computer manufacture must therefore be allowed at all times to ensure the safe use of the equipment.

## **EU Countries Intended for Use**

The ETSI version of this device is intended for home and office use in Austria, Belgium, Denmark, Finland, France, Germany, Greece, Ireland, Italy, Luxembourg, the Netherlands, Portugal, Spain, Sweden, and the United Kingdom.

The ETSI version of this device is also authorized for use in EFTA member states: Iceland, Liechtenstein, Norway, and Switzerland.

## **EU Countries Not intended for use**

None.

# CONTENTS

<b>1 INTRODUCTION.....</b>	<b>1</b>
1.1 Features.....	1
1.2 Specifications.....	1
1.3 Package Contents.....	2
<b>2 INSTALLATION PROCEDURE .....</b>	<b>3</b>
<b>3 CONFIGURATION UTILITY .....</b>	<b>5</b>
3.1 Status.....	6
3.2 Site Survey.....	8
3.1.1 Configure the Profile .....	9
3.1.2 Enable WPA .....	12
3.3 Statistics.....	15
3.4 About.....	16
<b>4 TROUBLESHOOTING .....</b>	<b>17</b>

# **1 Introduction**

Thank you for purchasing the 802.11g Wireless LAN Mini-PCI Card. This card complies with IEEE 802.11g standard, which supports up to 54Mbps high-speed wireless network connections. It can also work with IEEE 802.11b devices. When the card connects to 11b devices, the link speed will be up to 11Mbps.

For WLAN security issues, this card supports 64/128/152-bit WEP data encryption that protects your wireless network from eavesdropping. It also provides WPA (Wi-Fi Protected Access) feature that combines IEEE 802.1x and TKIP (Temporal Key Integrity Protocol) technologies. Client users are required to authorize before accessing to APs or AP Routers, and the data transmitted in the network is encrypted/decrypted by a secret key dynamically changed. This card has built-in AES engine which ensure the highest degree of security and authenticity for digital information and it is the most advanced solution defined by IEEE 802.11i for the security in the wireless network.

The power consumption of the card is also very low. Furthermore, this card provides several levels of power saving modes allowing user customizes the way of saving the power from his/her portable or handheld devices.

This card is cost-effective, together with the versatile features; it is the best solution for you to build your wireless network.

## **1.1 Features**

- Works with both IEEE 802.11b and IEEE 802.11g products.
- High-speed transfer data rate - up to 54Mbps.
- High throughput supports multi-media data bandwidth requirement.
- Supports 64/128/152-bit WEP, WPA (TKIP with IEEE 802.1x) and AES functions for high level of security.
- Comply with draft of IEEE 802.11e EDCA and HCF polling for multimedia over WLAN applications.
- Automatic fallback increases data security and reliability.
- Supports the most popular operating system: Windows 98SE/Me/2000/XP.
- Supports Mini-PCI Type III B interface.

## **1.2 Specifications**

- Standard: IEEE 802.11b/g
- Interface: Mini-PCI Type III B
- Frequency Band: 2.4000 ~ 2.4835GHz (Industrial Scientific Medical Band)
- Modulation: OFDM with BPSK, QPSK, 16QAM, 64QAM (11g)  
BPSK, QPSK, CCK (11b)

- Data Rate: 54/48/36/24/18/12/11/9/6/5.5/2/1Mbps auto fallback
- Security: 64/128/152-bit WEP Data Encryption, WPA, AES and IEEE 802.1x
- Antenna Connector: I-PEX x 2
- Drivers: Windows 98SE/Me/2000/XP
- LEDs: Link/Activity
- Transmit Power: 15dBm~19dBm
- Power consumption: Tx: 370mA, Rx: 310mA
- Receive Sensitivity: 54Mbps OFDM, 10% PER, -72dBm, 11Mbps CCK, 8% PER, -85dBm,  
1Mbps BPSK, 8% PER, -93dBm
- Dimension: 59.6(L) x 44.45(W) mm
- Temperature: 32~131°F (0 ~55°C)
- Humidity: Max. 95% (NonCondensing)
- Certification: FCC, CE

### **1.3 Package Contents**

Before you begin the installation, please check the items of your package. The package should include the following items:

- One Mini-PCI Card
- One CD (Driver/Utility/User's Manual.)
- One Quick Guide

***If any of the above items is missing, contact your supplier as soon as possible.***

## 2 Installation Procedure

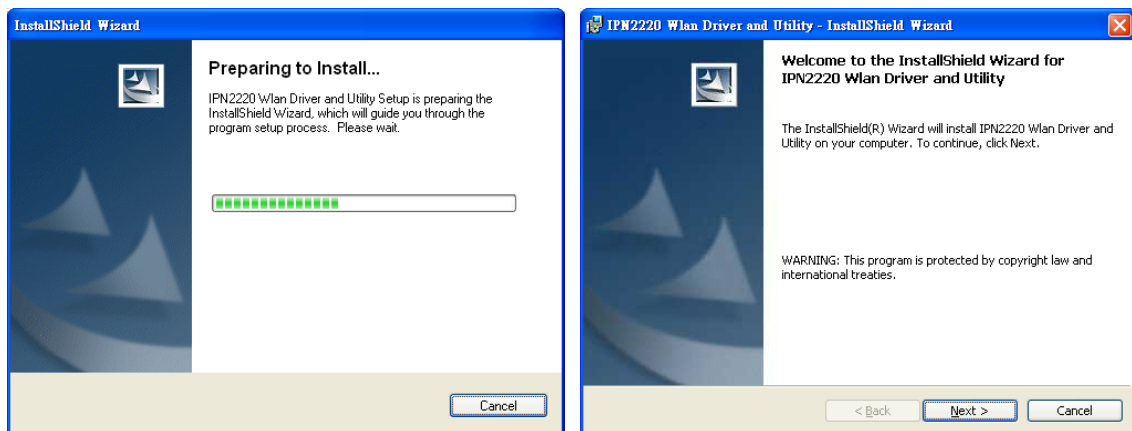
Before you proceed with the installation, please notice following descriptions.

**Note1: Please do not install the card into your laptop computer before installing the software program from the CD.**

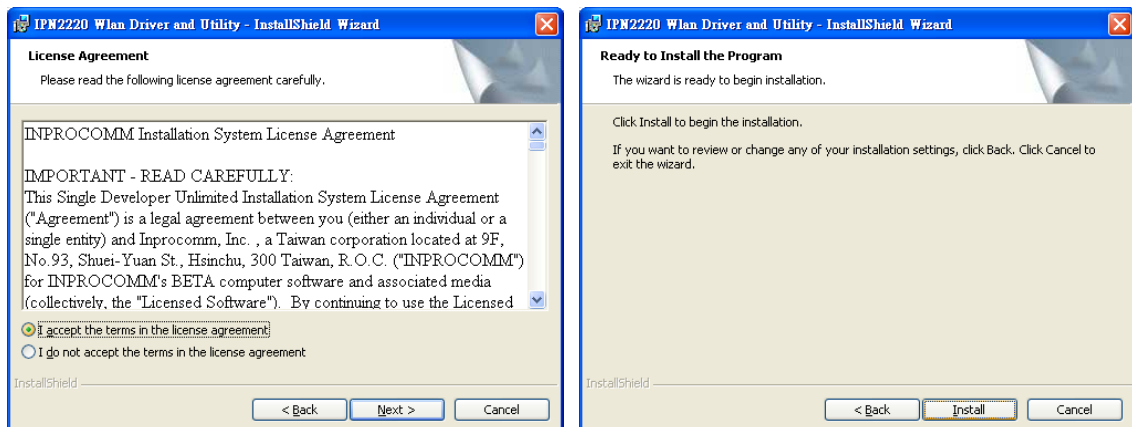
**Note2: The following installation was operated under Windows XP. (Procedures are similar for Windows 98SE/Me/2000.)**

**Note3: If you have installed the Wireless Mini-PCI Card driver & utility before, please uninstall the old version first.**

1. Execute the “setup” program located in the “Driver&Utility” folder of CD. Click “Next” button to continue installation.

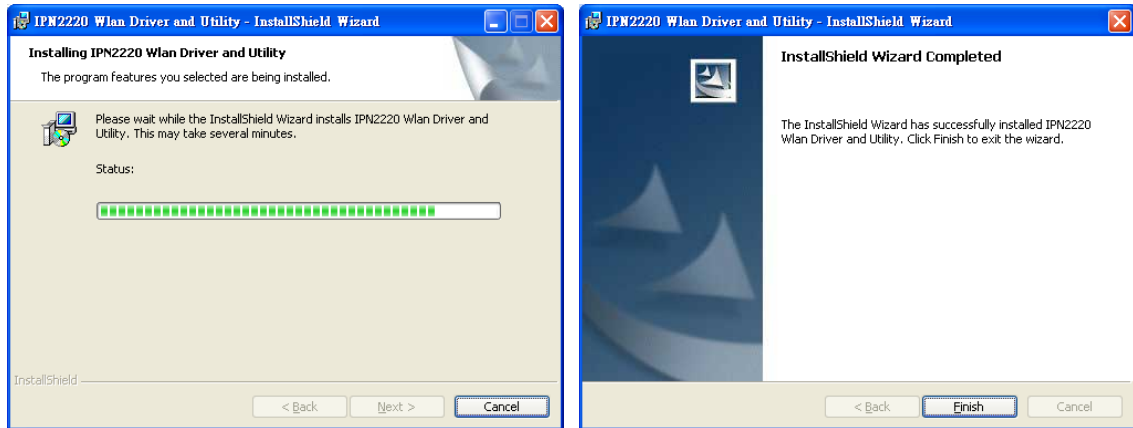


2. Review the “License Agreement”. Select “I accept the terms in the license agreement”, then click “Next” button. Click “Install” button from “Ready to Install the Program” screen, the system will install the driver and utility of the card automatically.



3. Click “Yes” button while the “Digital Signature Not Found” screen popped up. Click “Finish” button to complete the installation.





4. When the installation is done, install the Mini-PCI Card into the Mini-PCI slot of your laptop computer.
5. The system will automatically detect the card as a new device and display “Found New Hardware Wizard” dialog box. Follow the installation wizard to complete the device setup step by step.
6. After completing the installation, a new icon will be displayed in the system tray at the bottom of the screen. Click the icon and start using the WLAN Mini-PCI Card.



## 3 Configuration Utility

The Configuration Utility is a powerful application that helps you configure the Mini-PCI card and monitor the link status and the statistics during the communication process.

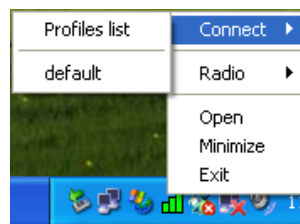
The Wireless LAN Configuration Utility appears as an icon on the system tray of Windows while the card is running. You can open it by clicking on the icon.



The icon is appeared as bar diagram with different color and level for representing different connection status. While the station is not associated with other wireless stations or AP, the icon will appear as an empty (blank) bar diagram. Once it is associated, it will appear as different color for different level of signal strength. There are 3 levels of icons to represent the signal strength, the green one (signal strength from 100%-50%), the yellow one (50%-25%), and the red one (below 25%).

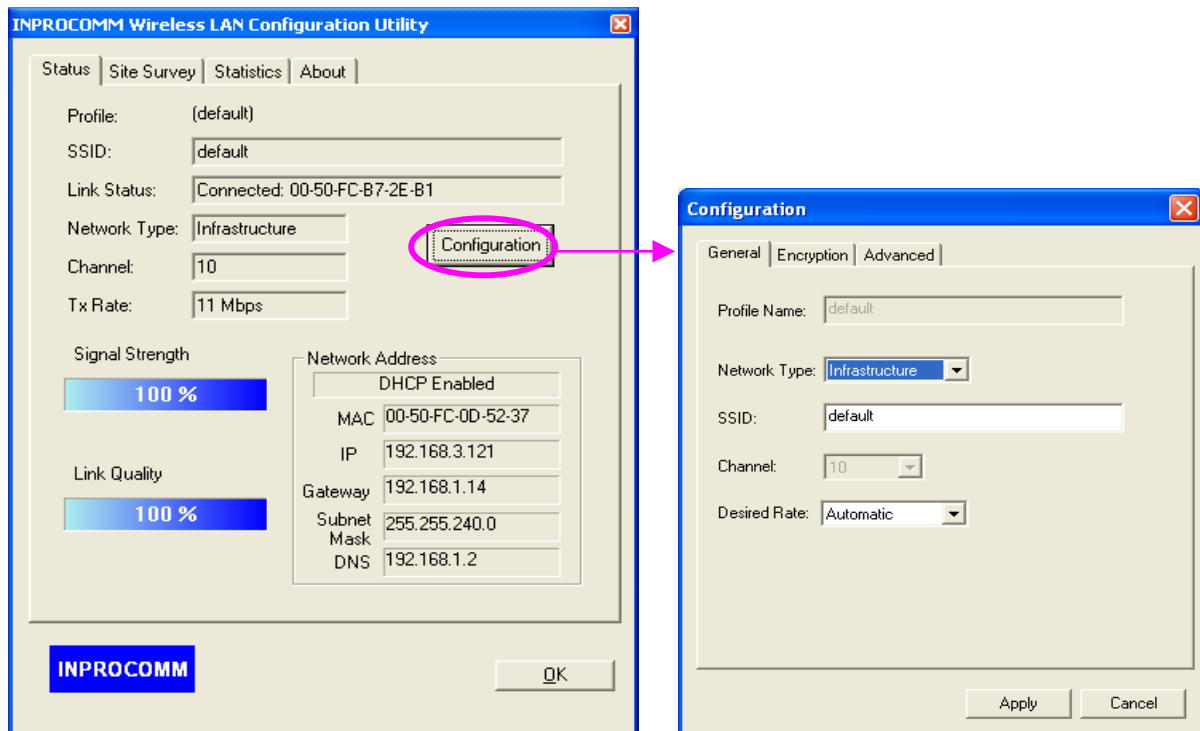
Right click the icon, there are some quick setup items for you to operate the configuration utility.

- Connect  
A profiles list is shown up, you may review the networks you ever connect to from the list. If you want to connect to one of the networks immediately, click the network.
- Radio  
Select "On" to enable the card, select "Off" to disable the card temporarily.
- Open  
Click "Open" to maximum the screen of the Configuration Utility tool.
- Minimize  
Click "Minimize" to minimize the screen of the Configuration Utility tool.
- Exit  
Click "Exit" to close the Configuration Utility tool.



### 3.1 Status

From the “Status” screen, you can view all the information of the network you are connecting to. To change the configuration parameters of the network, press the “Configuration” button.



Parameter	Description
Profile	Display the network the card is connecting to.
SSID	<p>The SSID (up to 32 printable ASCII characters) is the unique name identified in a WLAN. The ID prevents the unintentional merging of two co-located WLANs.</p> <p>Only the wireless devices with the same SSID can interconnect.</p>
Link Status	Display “Scanning”, “Connected” or “Disconnected” status while the card is connecting to the network.
Network Type	There are two sorts of network types: Infrastructure and Ad Hoc. This column shows the current network type.
Channel	Display the number of the radio channel used for the networking.
Tx Rate	From the column, you can know the transmission rate of the network. The maximum transmission rate is 54Mbps.

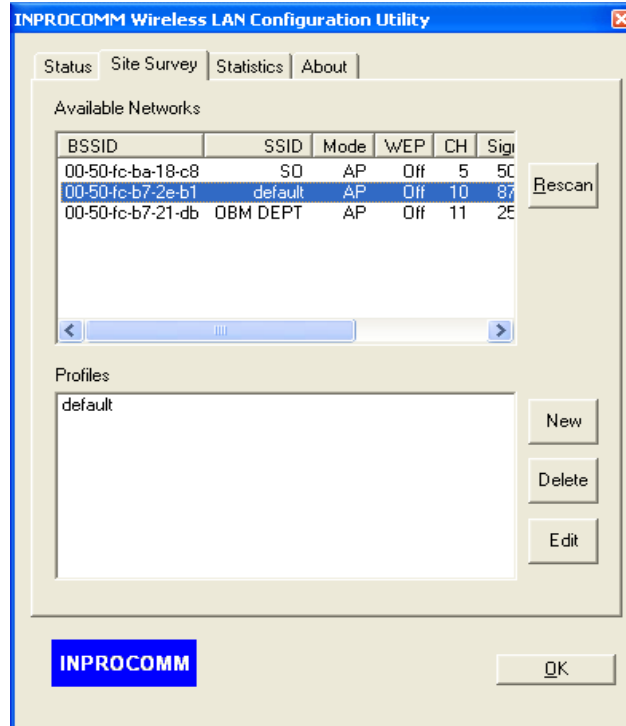
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Parameter	Description
Signal Strength	This bar shows the signal strength level. The higher percentage shown in the bar, the more radio signal been received by the card. This indicator helps to find the proper position of the wireless device for quality network operation.
Link Quality	This bar indicates the quality of the link. The higher the percentage, the better the quality.
Network Address	Network Address section shows the current Network status such as the MAC address of the card, DHCP (Enable or not), IP address, Gateway Address, Subnet Mask address, and DNS server address that you can easily monitor these settings without the "IPCONFIG" provided by Windows.
Configuration Button	Press "Configuration" button to configure the network that the card is connecting to. Please refer to section 3.2 for detail description.

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### 3.2 Site Survey

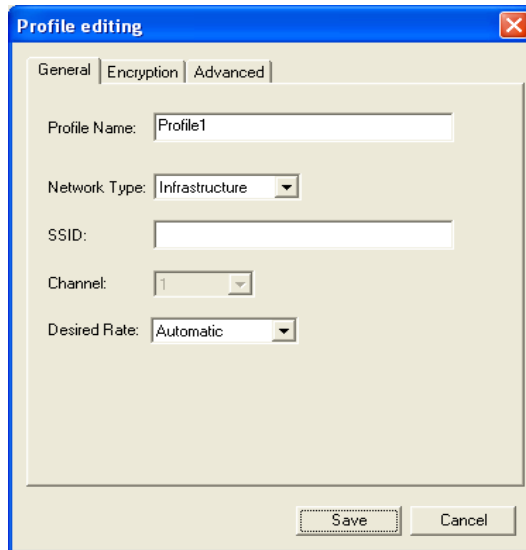
By choosing the “Site Survey” option, you can scan all the channels to find all the access points/stations within the accessible range of your card. You can also create your own profiles list to connect to the network you designated quickly.



Parameter	Description
Available Networks	This list shows all available wireless networks within range of your computer. “Available Networks” list the information of the network including the BSSID, SSID, Mode, WEP (On/Off), Channel, Signal Strength and Support Rates. If you want to connect to any networks on the list, double-click the item on the list, and the card will automatically connect to the selected network.
Rescan Button	Click “Rescan” button to collect the information of all the wireless networks nearby.
Profiles	This profile list shows all the profiles (Up to 32 sets) with its configurations currently stored in the program. If you want to change the connection to another profile, double-click the profile you intend to connect. You can press Add, Delete and Edit buttons next to list to configure the profile list.

### 3.1.1 Configure the Profile

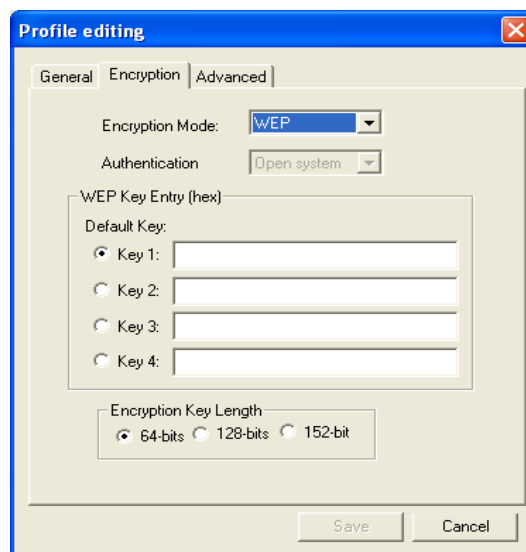
When you press Add or Edit button, the “Profile Editing” screen will be popped up. In the screen, there are three pages including General, Encryption, and Advanced.



#### General

Parameter	Description
Profile Name	Select a recognizable profile name for you to identify the different networks.
Network Type	<b>Infrastructure</b> – This operation mode requires the presence of an 802.11 Access Point. All communication is done via the Access Point. <b>Ad-Hoc</b> – Select this mode if you want to connect to another wireless stations in the Wireless LAN network without through an Access Point.
SSID	The SSID (up to 32 printable ASCII characters) is the unique name identified in a WLAN. The ID prevents the unintentional merging of two co-located WLANs.  You may specify a SSID for the adapter and then only the device with the same SSID can interconnect to the adapter.
Channel	This setting is only available for Ad Hoc mode. The channel setting should be the same with the network you are connecting to.

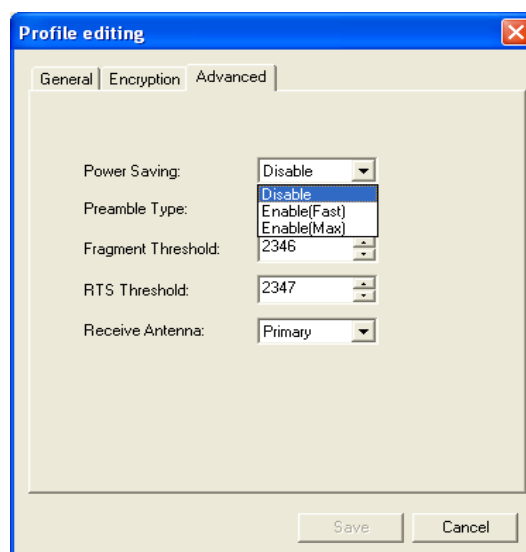
Parameter	Description
Desired Rate	<p>There are several options including Automatic/1/2/5.5/11/6/9/12/18/24/36/48/54Mbps for you to select. When the “Automatic” is selected, the device will choose the most suitable transmission rate automatically. The higher data rate you designated in the network, the shorter distance is allowed between the card and the wireless stations.</p> <p>When the network type is in Ad Hoc mode, the maximum data rate is 11Mbps (11b) so that there are only “Automatic/1/2/5.5/11Mbps” options you can select. If you want to enable the data rate up to 54Mbps (11g), please follow steps listed below.</p> <ol style="list-style-type: none"> <li>1. Go to “Network Connections”.</li> <li>2. Right Click the “Wireless Network Connection” and select “Properties”.</li> <li>3. From the pop-up screen, press “Configure” button.</li> <li>4. Enter into “Advanced” page of the “Properties” screen.</li> <li>5. Change the setting of “Ad Hoc Operational Mode” from “Wi-Fi 802.11g Mode” to “IEEE 802.11g Mode”.</li> </ol>



## Encryption

Parameter	Description
Encryption Mode	<p><b>None</b> – Disable the WEP Data Encryption.</p> <p><b>WEP</b> – Enable the WEP Data Encryption. When the item is selected, you have to continue setting the WEP Key Length and the encryption keys.</p>

Parameter	Description
Authentication	<p>This setting has to be consistent with the wireless networks that the card intends to connect.</p> <p><b>Open System</b> – No authentication is needed among the wireless network.</p> <p><b>Shared Key</b> – Only wireless stations using a shared key (WEP Key identified) are allowed to connecting each other.</p> <p><b>Auto Switch</b> – Auto switch the authentication algorithm depending on the wireless networks that the card is connecting to.</p>
Default Key (Key1 ~ Key4)	<p>Select the default encryption key from Key 1 to Key 4 by selected the radio button. The WEP keys are used to encrypt data transmitted in the wireless network. Fill the text box by following the rules below.</p> <p><b>64-bit</b> – Input 10-digit Hex values (in the “A-F”, “a-f” and “0-9” range) as the encryption keys. For example: “0123456aef”.</p> <p><b>128-bit</b> – Input 26-digit Hex values (in the “A-F”, “a-f” and “0-9” range) as the encryption keys. For example: “01234567890123456789abcdef”.</p> <p><b>152-bit</b> – Input 32-digit Hex values (in the “A-F”, “a-f” and “0-9” range) as the encryption keys. For example: “012345678901234567890abcdefabcdef”.</p>
Encryption Key Length	<p>You may select the 64-bit, 128-bit or 152-bit to encrypt transmitted data. Larger key length will provide higher level of security, but the throughput will be lower.</p>





## Advanced

Parameter	Description
Power Saving	<p><b>Disable</b> – The card will always set in active mode.</p> <p><b>Enable (Fast)</b> – Enable the card in the power saving mode when it is idle, but some components of the card is still alive. In this mode, the power consumption is larger than “Max“ mode.</p> <p><b>Enable (Max)</b> – Enable the card in the power saving mode when it is idle.</p>
Preamble Type	The preamble defines the length of the CRC block for communication among the wireless networks. There are three mode including Long, Short and Auto. High network traffic areas should use the shorter preamble type. If “Auto“ mode is selected, the card will auto switch the preamble mode depending on the wireless networks card is connecting to.
Fragment Threshold	The value defines the maximum size of packets; any packet size larger than the value will be fragmented. If you have decreased this value and experience high packet error rates, you can increase it again, but it will likely decrease overall network performance. Select a setting within a range of 256 to 2346 bytes. Minor change is recommended.
RTS Threshold	Minimum packet size required for an RTS (Request To Send). For packets smaller than this threshold, an RTS is not sent and the packet is transmitted directly to the wireless network. Select a setting within a range of 0 to 2347 bytes. Minor change is recommended.
Receive Antenna	Define the receive antenna. If “Diversity“ is selected, the card will auto switch to the antenna with high signal strength to receive data.

### 3.1.2 Enable WPA

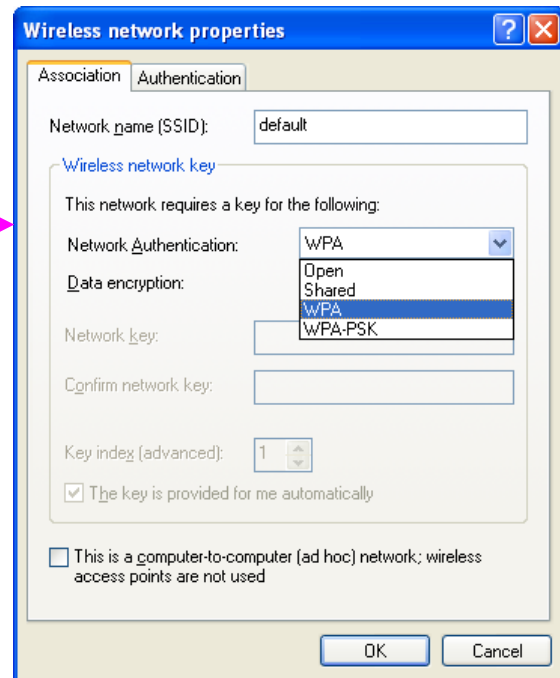
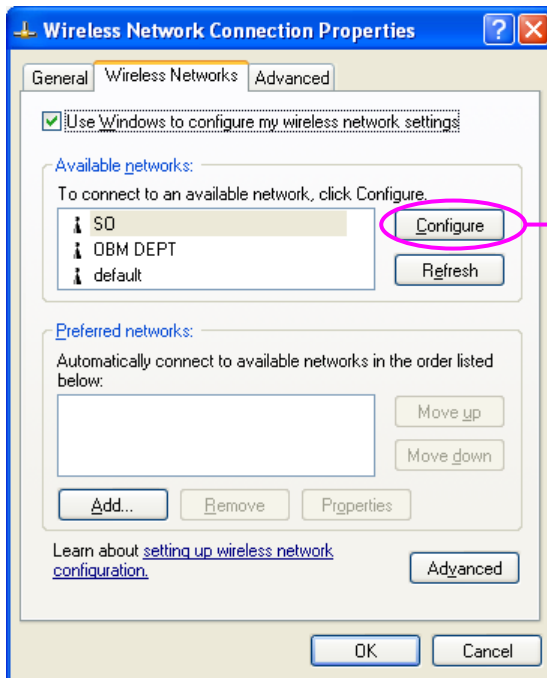
Wi-Fi Protected Access (WPA) is a specification of standards-based, interoperable security enhancements that strongly increase the level of data protection (encryption) and access control (authentication) for existing and future wireless LAN systems. The technical components of WPA include Temporal Key Integrity Protocol (TKIP) for dynamic key exchange, and 802.1x for authentication.

WPA function is enabled in the following software system:

1. Windows XP Service Pack 1 with Windows XP Support Patch for Wi-Fi Protected Access program in addition.
2. Configure the card by Wireless built-in utility (Wireless Zero Configuration).



1. From here, right click the icon to select “View Available Wireless Networks”.
2. Press “Advanced” button from “Wireless Network Connection”.

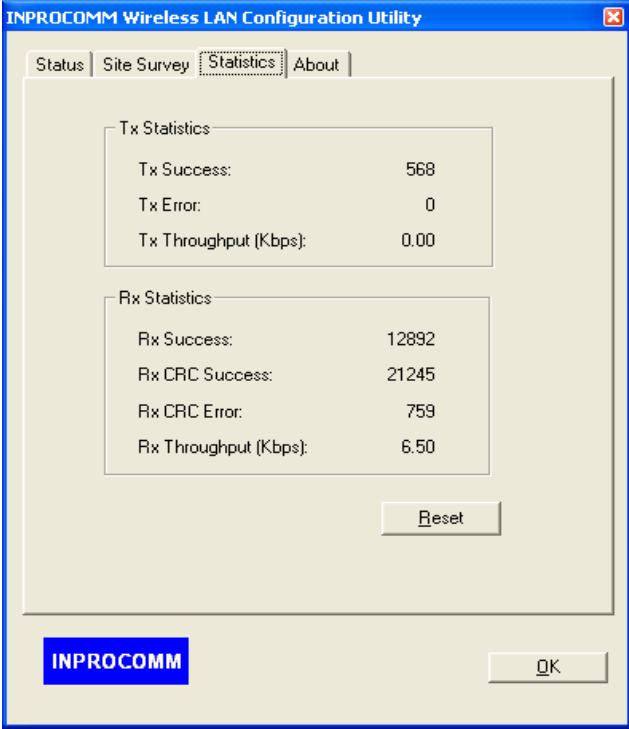


3. Press “Configure” button to configure the WPA function for the current network.

Parameter	Description
Network Authentication	<p><b>Open</b> –No authentication is needed among the wireless network.</p> <p><b>Shared</b> – Only wireless stations using a shared key (WEP Key identified) are allowed to connecting each other.</p> <p><b>WPA</b> – This mode is for enterprise with an authentication server (Radius Server), WPA-enabled access point, and a WPA-enabled client. Once WPA is enabled, all clients and access points on the network must be WPA-enabled in order to access the network.</p> <p><b>WPA-PSK</b> – It is a special mode designed for home and small business users who do not have access to network authentication servers. In this mode, known as Pre-Shared Key, the user manually enters the starting password in their access point or gateway, as well as in each PC on the wireless network. WPA takes over automatically from that point, keeping unauthorized users that don't have the matching password from joining the network, while encrypting the data traveling between authorized devices.</p>
Data Encryption	<p><b>WEP</b> – In WPA or WPA-PSK mode, WEP is also able to be the encryption method for the transmission data.</p> <p><b>TKIP</b> – TKIP (Temporal Key Integrity Protocol) changes the temporal key every 10,000 packets (a packet is a kind of message transmitted over a network.) This insures much greater security than the standard WEP security.</p> <p><b>AES</b> – AES has been developed to ensure the highest degree of security and authenticity for digital information and it is the most advanced solution defined by IEEE 802.11i for the security in the wireless network.</p> <p>Note: All devices in the network should use the same encryption method to ensure the communication.</p>

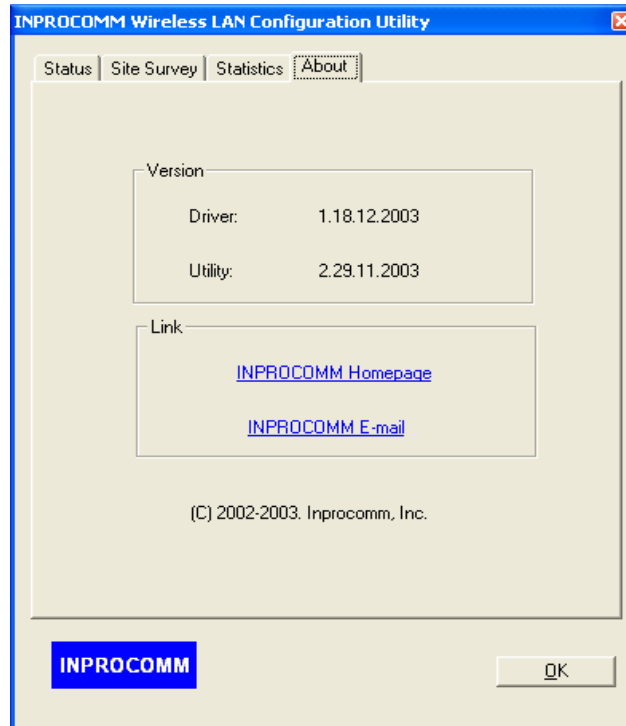
### 3.3 Statistics

This option enables you to view the available statistic information with its Tx counts (Tx success, Tx error), Tx Throughput, and its Rx counts (Rx success, Rx error), Rx Throughput. You may reset the counters by pressing its RESET button.



### 3.4 About

By choosing this option, you can view basic information about the Utility such as the Driver and Utility Version. And you can click the hyperlink to connect the website for the information of the wireless chipset vendor.



## **4 Troubleshooting**

This chapter provides solutions to problems usually encountered during the installation and operation of the adapter.

### **1. What is the IEEE 802.11g standard?**

802.11g is the new IEEE standard for high-speed wireless LAN communications that provides for up to 54 Mbps data rate in the 2.4 GHz band. 802.11g is quickly becoming the next mainstream wireless LAN technology for the home, office and public networks.

802.11g defines the use of the same OFDM modulation technique specified in IEEE 802.11a for the 5 GHz frequency band and applies it in the same 2.4 GHz frequency band as IEEE 802.11b. The 802.11g standard requires backward compatibility with 802.11b.

The standard specifically calls for:

- A. A new physical layer for the 802.11 Medium Access Control (MAC) in the 2.4 GHz frequency band, known as the extended rate PHY (ERP). The ERP adds OFDM as a mandatory new coding scheme for 6, 12 and 24 Mbps (mandatory speeds), and 18, 36, 48 and 54 Mbps (optional speeds). The ERP includes the modulation schemes found in 802.11b including CCK for 11 and 5.5 Mbps and Barker code modulation for 2 and 1 Mbps.
- B. A protection mechanism called RTS/CTS that governs how 802.11g devices and 802.11b devices interoperate.

### **2. What is the IEEE 802.11b standard ?**

The IEEE 802.11b Wireless LAN standard subcommittee, which formulates the standard for the industry. The objective is to enable wireless LAN hardware from different manufactures to communicate.

### **3. What does IEEE 802.11 feature support ?**

The product supports the following IEEE 802.11 functions:

- CSMA/CA plus Acknowledge Protocol
- Multi-Channel Roaming
- Automatic Rate Selection
- RTS/CTS Feature
- Fragmentation
- Power Management

### **4. What is Ad-hoc ?**

An Ad-hoc integrated wireless LAN is a group of computers, each has a Wireless LAN adapter, Connected as an independent wireless LAN. Ad hoc wireless LAN is applicable at a departmental scale for a branch or SOHO operation.

### **5. What is Infrastructure ?**

An integrated wireless and wireless and wired LAN is called an Infrastructure configuration. Infrastructure is applicable to enterprise scale for wireless access to central database, or wireless application for mobile workers.

**6. What is BSS ID ?**

A specific Ad hoc LAN is called a Basic Service Set (BSS). Computers in a BSS must be configured with the same BSS ID.

**7. What is WEP ?**

WEP is Wired Equivalent Privacy, a data privacy mechanism based on a 40 bit shared key algorithm, as described in the IEEE 802 .11 standard.

**8. What is TKIP?**

TKIP is a quick-fix method to quickly overcome the inherent weaknesses in WEP security, especially the reuse of encryption keys. TKIP is involved in the IEEE 802.11i WLAN security standard, and the specification might be officially released by early 2003.

**9. What is AES?**

AES (Advanced Encryption Standard), a chip-based security, has been developed to ensure the highest degree of security and authenticity for digital information, wherever and however communicated or stored, while making more efficient use of hardware and/or software than previous encryption standards. It is also included in IEEE 802.11i standard. Compare with AES, TKIP is a temporary protocol for replacing WEP security until manufacturers implement AES at the hardware level.

**10. Can Wireless products support printer sharing ?**

Wireless products perform the same function as LAN products. Therefore, Wireless products can work with Netware, Windows 2000, or other LAN operating systems to support printer or file sharing.

**11. 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 series offer the encryption function (WEP) to enhance security and Access Control. Users can set it up depending upon their needs.

**12. 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 is, 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.

### **13. What is Spread Spectrum ?**

Spread Spectrum technology is a wideband radio frequency technique developed by the military for use in reliable, secure, mission-critical communication 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).