

802.11g Wireless LAN PC Card

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 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 or more of the following measures:

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

FCC Caution

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.

Any changes or modifications not expressly approved by the party responsible for compliance could void the authority to operate equipment.

Federal Communications Commission (FCC) Radiation Exposure Statement

This equipment complies with FCC radiation exposure 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 2.5cm (1 inch) during normal operation.

Federal Communications Commission (FCC) RF Exposure Requirements

SAR compliance has been established in the laptop computer(s) configurations with PCMCIA slot, as tested in the application for Certification, and can be used in laptop computer(s) with substantially similar physical dimensions, construction, and electrical and RF characteristics. Use in other devices such as PDAs or laptops is not authorized. This transmitter is restricted for use with the specific antenna(s) tested in the application for Certification. The antenna(s) used for this transmitter must not be co-located or operating in conjunction with any other antenna or transmitter.

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.

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1 Introduction

Thank you for purchasing the 802.11g Wireless LAN PC 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-bit WEP data encryption that protects your wireless network from eavesdropping. It also supports WPA (Wi-Fi Protected Access) feature technology. 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 dynamically changed secret key.

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.
- Support 64/128-bit WEP and WPA-PSK securities.
- Automatic fallback increases data security and reliability.
- Supports the most popular operating system: Windows 98SE/Me/2000/XP.
- Supports 32-bit Cardbus interface.

1.2 Specifications

- Standard: IEEE 802.11b/g
- Interface: 32-bit Cardbus
- 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-bit WEP Data Encryption and WPA-PSK
- Antenna: Printed Antenna with Diversity System
- Drivers: Windows 98SE/Me/2000/XP
- LEDs: Link, Activity Transmit Power: IEEE 802.11b: 16.50dBm (Peak) / IEEE 802.11g: 15.00dBm (Peak)

- Power Consumption: TX: 400mA, RX: 330mA
- Dimension: 5(H) x 116(W) x 54(D) mmTemperature: 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 PC 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: *The following installation was operated under Windows XP. (Procedures are similar for Windows 98SE/Me/2000.)*

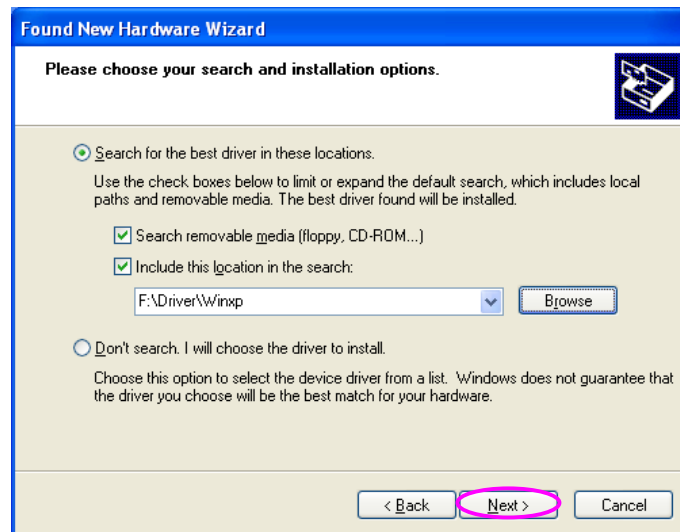
Note2: *If you have installed the Wireless PC Card driver & utility before, please uninstall the old version first.*

I. Install the Driver

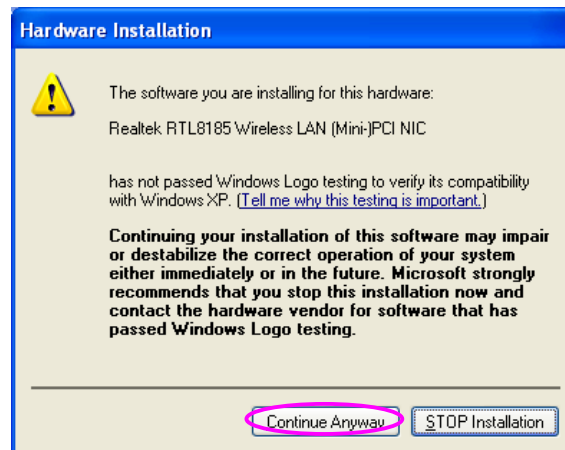
- A. Insert the Installation CD to your CD-ROM Drive.
- B. Insert the PC Card to the slot of your laptop computer, the system will automatically find the device and search for its driver.
- C. Select "Install from a list or specific location (Advanced)" and click "Next".



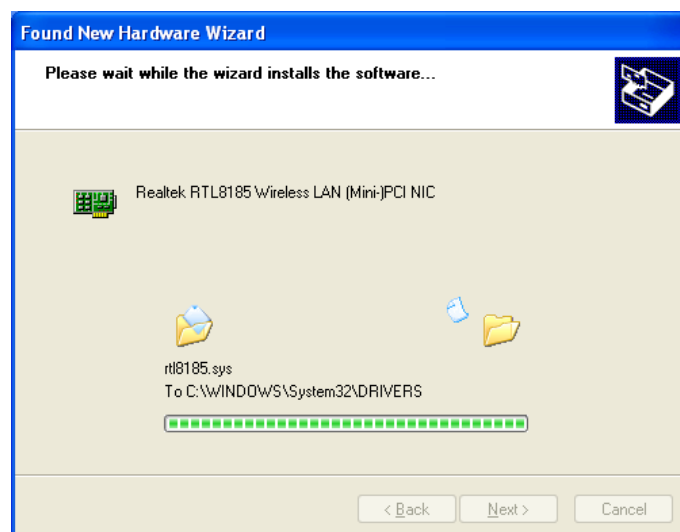
- D. Please select the “Driver\Winxp” folder (select the folder based on your computer’s OS system) and the system will start install the driver.



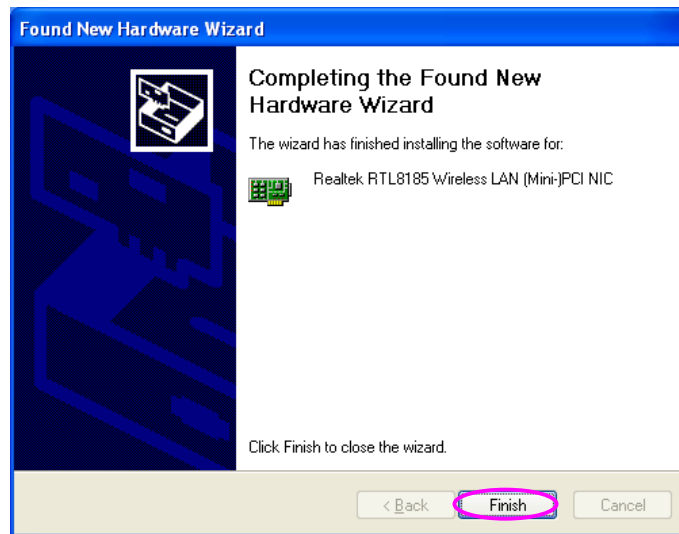
- E. The “Hardware Installation” screen is popped up. Click “Continue Anyway” to continue.



- F. The system is installed the driver automatically.



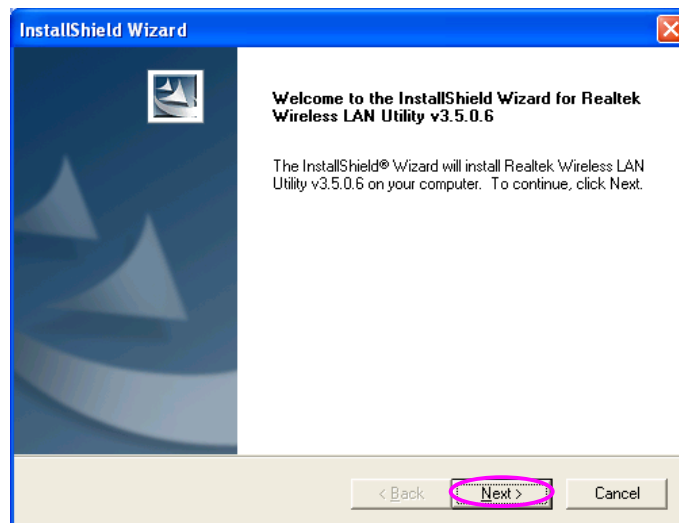
G. Click “Finish’ to complete the driver installation.



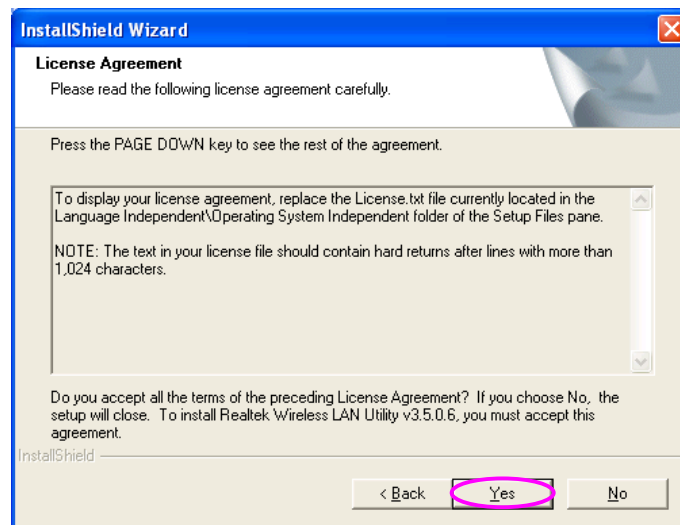
II. Install the Utility

A. Execute “Utility\Setup.exe” from the installation CD.

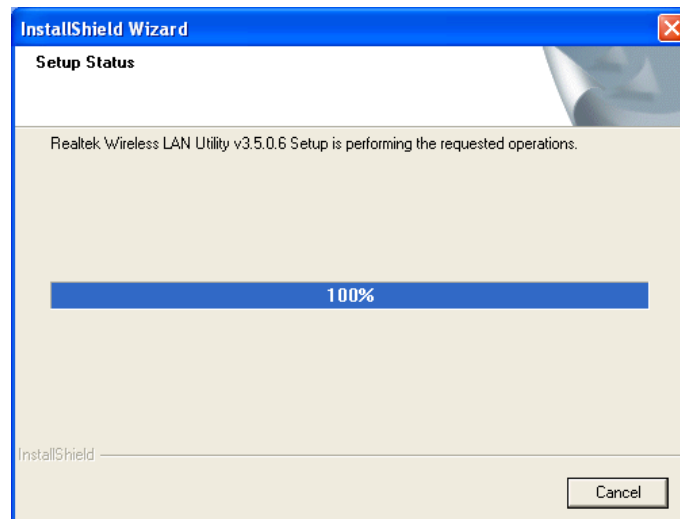
B. The “InstallShield Wizard” is displayed. Click “Next”.



C. Click “Yes” to process the installation if you accept the license agreement.



D. The system starts to install the utility. After the installation, you will see a “Realtek Wireless LAN Utility” icon in your desktop and an icon in the system tray.



III. Use the Configuration Utility

To start configuring the card, double click the icon in the system tray.



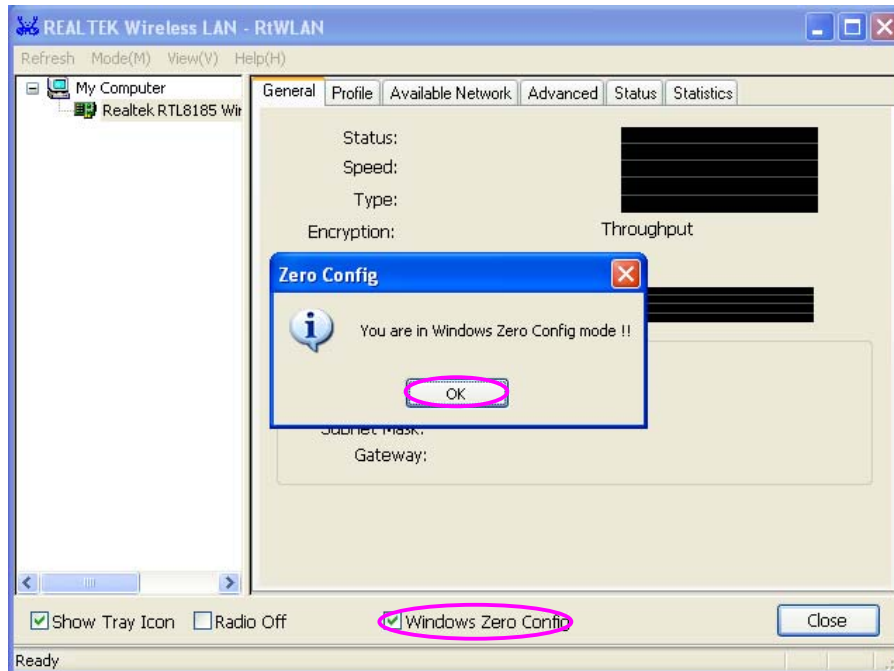
For Windows XP, there is a “Windows Zero Configuration Tool” for you to setup wireless clients. By default, this “Windows Zero Configuration Tool” is enabled. If you want to use the Utility of the card, please follow one of the ways as below.

First Way

- A. Double click the icon in the system tray.



- B. The utility of the card is displayed and it alerts you that you are in the Windows Zero Configuration mode. Click "OK".



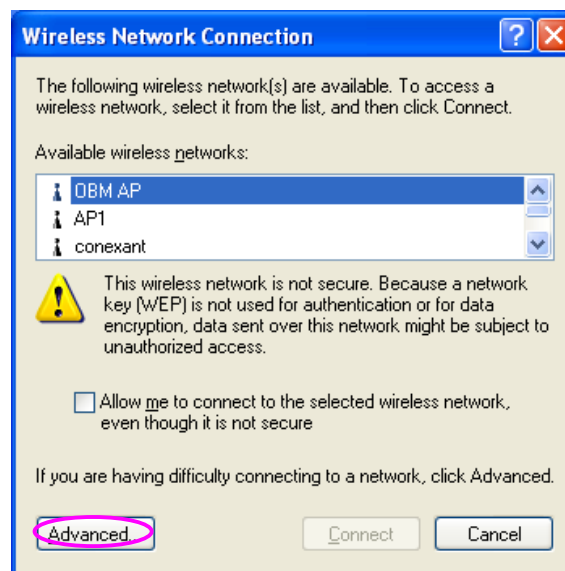
- C. Uncheck "Windows Zero Config" to enable the utility of the card.

Second Way

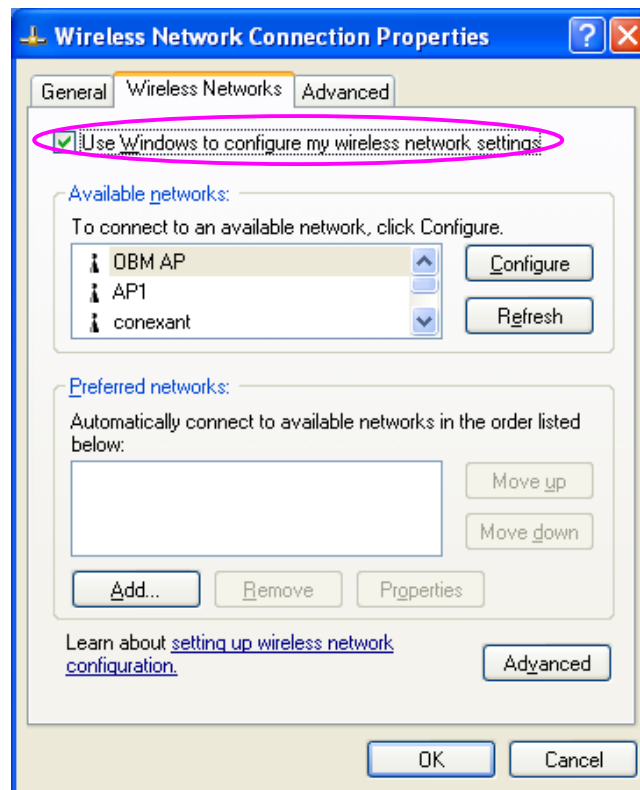
- A. Right-click the icon and select "View Available Wireless Networks".



- B. Click "Advanced".



- C. Uncheck “Use Windows to configure my wireless network settings” to enable the utility for the card.



3 Configuration Utility

The Configuration Utility is a powerful application that helps you configure the Wireless LAN Cardbus Card and monitor the link status and the statistics during the communication process.

The Configuration Utility appears as an icon on the system tray and desktop of Windows. You can open it by double-click on the icon.

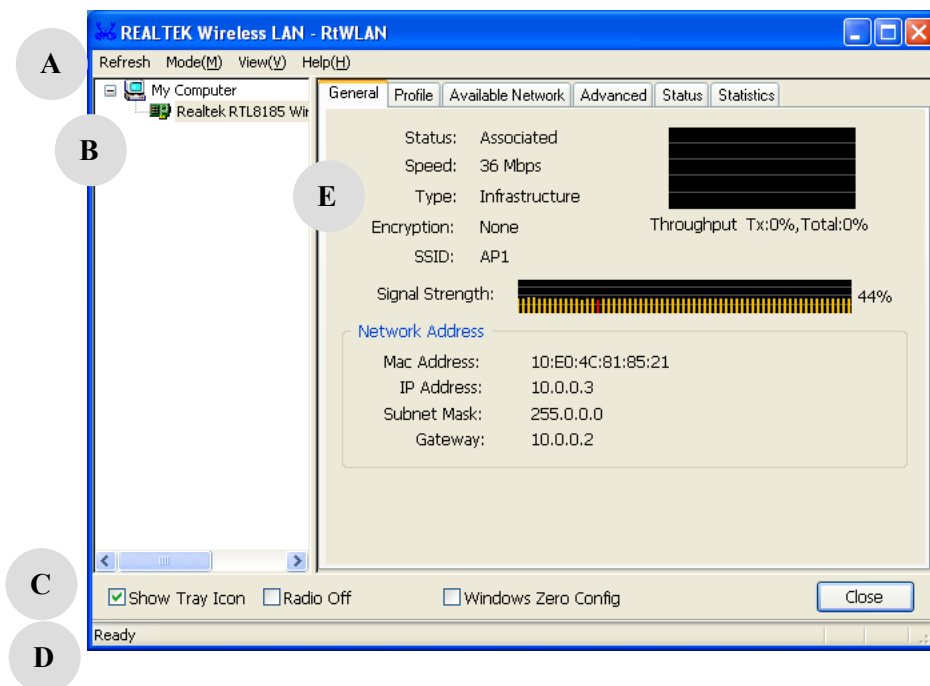


Right click the icon in the system tray there are some items for you to operate the configuration utility.

- Open Config Utility
Select "Open Config Utility" to open the configuration utility.
- About
Select "About" to show the utility information.
- Hide
Select "Hide" to hide the utility in the system tray.

3.1 Utility Overview

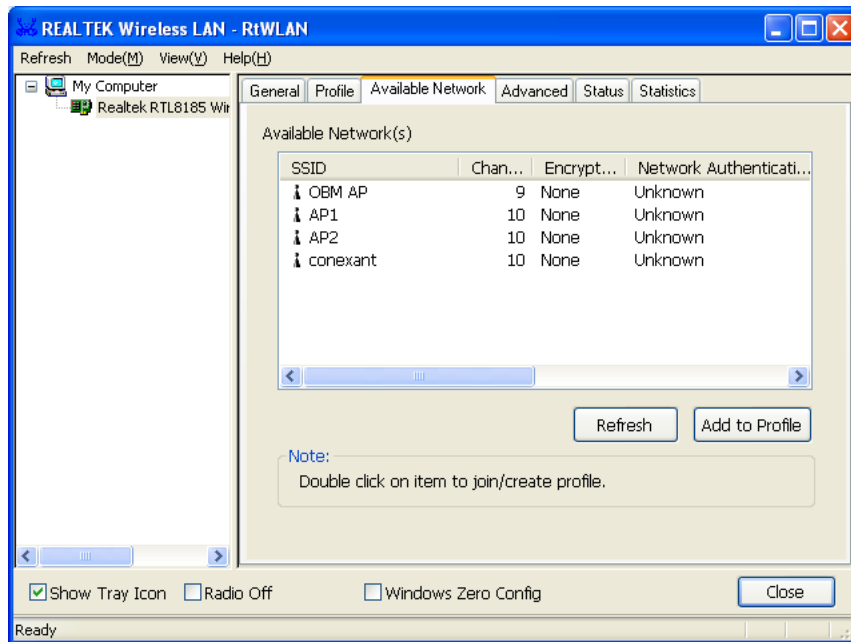
There are several parts in the utility screen. Please refer to the following table for the description.



Parameter	Description
A	Refresh – Refresh card list in the “B” block. Mode – There are two modes: Station and Access Point. If “Station” is selected, the card works as a wireless card. If “Access Point” is selected, the card will work as a wireless AP. View – Enable “Status Bar” and the “D” block in the utility will display the current status of the utility. Help – To check the version of the utility, select this item.
B	This is a list for you to configure several cards in your PC from the utility.
C	Show Tray Icon – To show the icon in the system tray, select the item. Radio Off – This function is for you to turn off or turn on the radio of the card. If the radio is turned off, the card will not work. Windows Zero Config – To configure the card from Windows XP Zero Configuration, check the item.
D	It is the status bar that displays the current status of the utility. To close it, please disable the “Status Bar” in the “View” item.
E	There are several tabs in the block for you to setup the function of the card. Please refer to the description in the following sections.

3.2 Available Network

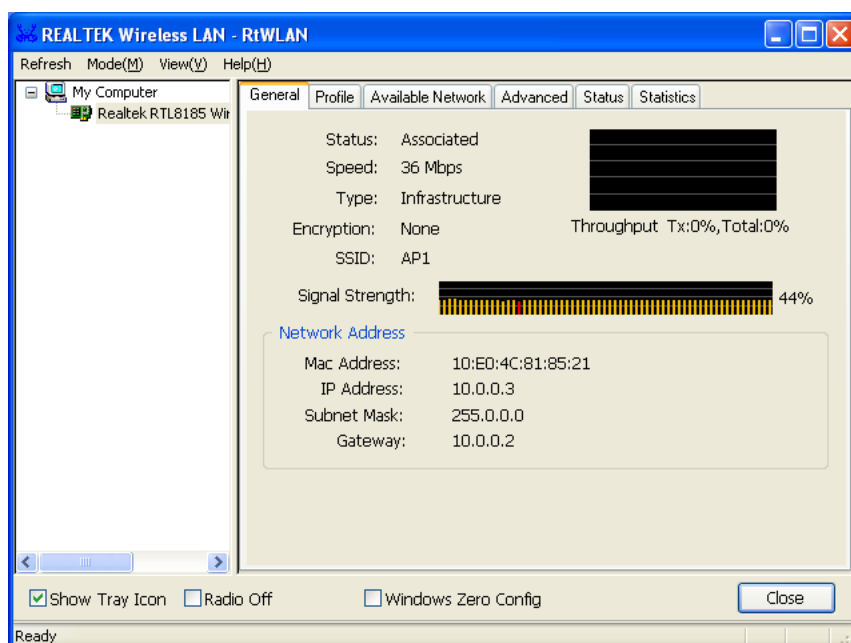
When you open the Configuration Utility, the system will scan all the channels to find all the access points/stations within the accessible range of your card and automatically connect to the wireless network with the highest signal strength. From the “Available Network” tab, all the networks nearby will be listed. You can change the connection to another network.



Parameter	Description
Available Network(s)	This list shows all information of the available wireless networks within the range of your card. The information includes SSID, Channel, Encryption, Network Authentication, Signal and etc. If you want to connect to any network on the list, double-click the selected network.
Refresh	Click "Refresh" to update the available networks list. It is recommended that refresh the list while you have changed the connection network.
Add to Profile	A profile stores the setting of a network, so that you can connect to the network quickly. To add the selected network to a profile, click this button.

3.3 General

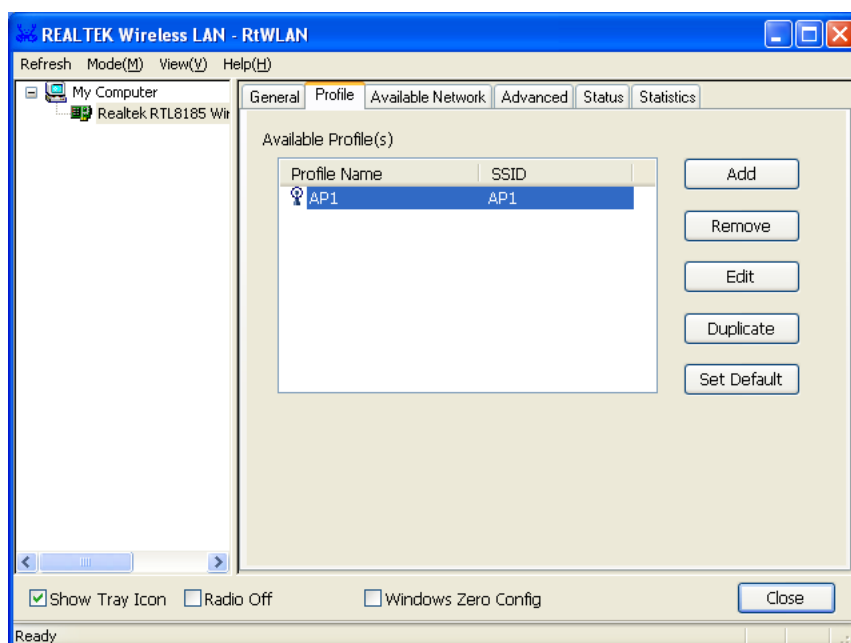
To check the connection status of the card, select “General”. This screen shows the information of Link Speed, Network Type, Encryption Method, SSID, Signal Strength and Network Address of the card.



Parameter	Description
Status	It will show the connection status of the card.
Speed	It shows the current speed
Type	Infrastructure – This operation mode requires the presence of an 802.11 Access Point. All communication is done via the Access Point or Router. IBSS – Select this mode if you want to connect to another wireless stations in the Wireless LAN network without through an Access Point or Router.
Encryption	It displays the encryption setting of the current connection including None, WEP or TKIP.
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.
Signal Strength	It indicates the wireless signal strength
Network Address	It shows the MAC, IP address and other information of the card.

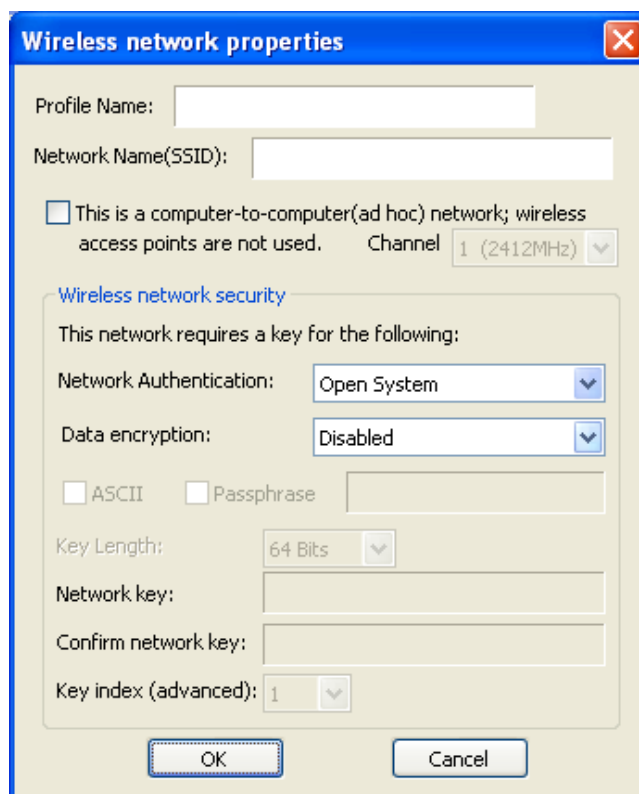
3.4 Profile

The “Profiles List” is for you to manage the networks you connect to frequently. You are able to Add/Remove/Edit/Duplicate/Set Default to manage a profile.



Parameter	Description
Available Profile(s)	This list shows the preferred networks for the wireless connection. You can add, remove, edit, duplicate the preferred networks or set one of the networks as the default connection.
Add/ Remove/ Edit Button	Click these buttons to add/ delete/ edit the selected profiles.
Duplicate	If you like to build up the new profile with the same settings as the current profile, then you can select this feature.
Set Default	To designate a profile as the default network for the connection from the available profiles list, click the button.

3.4.1 Configure the Profile



The image shows a Windows-style dialog box titled "Wireless network properties". It contains several input fields and options for configuring a wireless network profile. At the top, there are fields for "Profile Name:" and "Network Name(SSID):". Below these is a checkbox labeled "This is a computer-to-computer(ad hoc) network; wireless access points are not used." with a "Channel" dropdown set to "1 (2412MHz)". A section titled "Wireless network security" contains the text "This network requires a key for the following:". Below this, "Network Authentication:" is set to "Open System" and "Data encryption:" is set to "Disabled". There are checkboxes for "ASCII" and "Passphrase" (the latter is disabled). "Key Length:" is set to "64 Bits". There are input fields for "Network key:" and "Confirm network key:". At the bottom of the security section, "Key index (advanced):" is set to "1". "OK" and "Cancel" buttons are at the bottom of the dialog.

Parameter	Description
Profile Name	Define a recognizable profile name for you to identify the different networks.
Network Name (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 card and then only the device with the same SSID can interconnect to the card.
This is a computer-to-computer (ad hoc) network; wireless access points are not used.	There are two kinds of network type described as follows. Infrastructure – This operation mode requires the presence of an 802.11 Access Point. All communication is done via the Access Point or Router. Ad Hoc – Connect to another wireless cards in the Wireless LAN network without through an Access Point or Router. If this item is selected, the card will work in Ad Hoc mode.

Parameter	Description
Channel	This setting is only available for Ad Hoc mode. Select the number of the radio channel used for the networking. The channel setting should be the same with the network you are connecting to.
Network Authentication	This setting has to be consistent with the wireless networks that the card intends to connect. Open System – No authentication is needed among the wireless network. Shared Key – Only wireless stations using a shared key (WEP Key identified) are allowed to connecting each other. WPA-PSK –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 wireless stations in the 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. The encryption method supported by the card is TKIP.
Data Encryption	Disabled – Disable the WEP Data Encryption. WEP – Enable the WEP Data Encryption. When the item is selected, you have to continue setting the WEP Encryption keys. TKIP – 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. Note: All devices in the network should use the same encryption method to ensure the communication.
ASCII	WEP Key can be ASCII format. Alphanumeric values or signs are allowed to be the WEP key. It is more recognizable for user.
Passphrase	It is a text string with a maximum of 32 alphanumeric characters, for example: "Test". The WEP Key is based upon the Passphrase determined by you. This passphrase may not work with other vendors' products due to possible incompatibility with other vendors' passphrase generators. You must use the same passphrase or WEP key settings for all wireless computers within the network.

Parameter	Description
Key Length	There are two kinds of key lengths: 64-bit and 128-bit. Larger key length will provide higher level of security, but the throughput will be lower.
Network Key	The keys are used to encrypt data transmitted in the wireless network. Fill the text box by following the rules below. 64-bit – Input 10-digit Hex values as the encryption keys. For example: “0123456aef”. 128-bit – Input 26-digit Hex values as the encryption keys. For example: “01234567890123456789abcdef”.
Confirm Network Key	Enter the same network key to confirm.
Key Index (Advanced)	Select one of the four keys to be the data encryption key.

3.4.2 Enable WPA in Windows XP

Wi-Fi Protected Access (WPA) is a specification of standards-based, interoperable security enhancement that strongly increases 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.

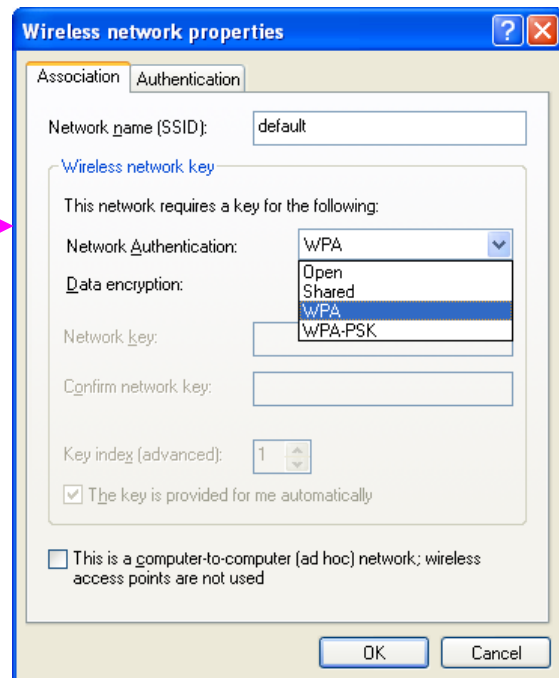
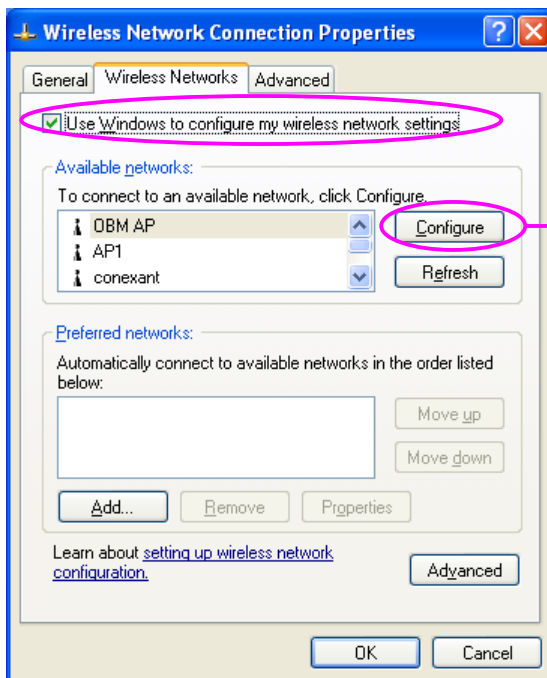
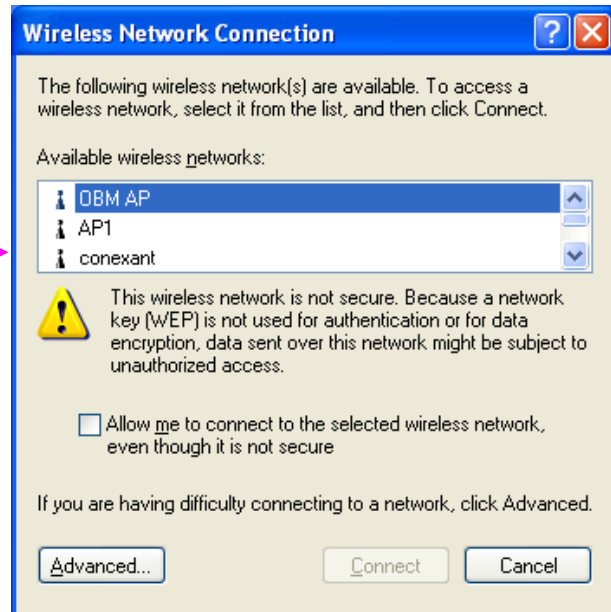
There are two types of WPA security: WPA-PSK (no server) and WPA (with server). WPA requires a Radius Server to complete the authentication among wireless stations and Access Points. Typically, this mode is used in an enterprise environment. WPA-PSK uses a so-called pre-shared key as the security key. A pre-shared key is a password that each wireless station uses the same key to access the network. Typically, this mode will be used in a home environment.

To enable the WPA function in Windows XP, the following software systems are required:

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".

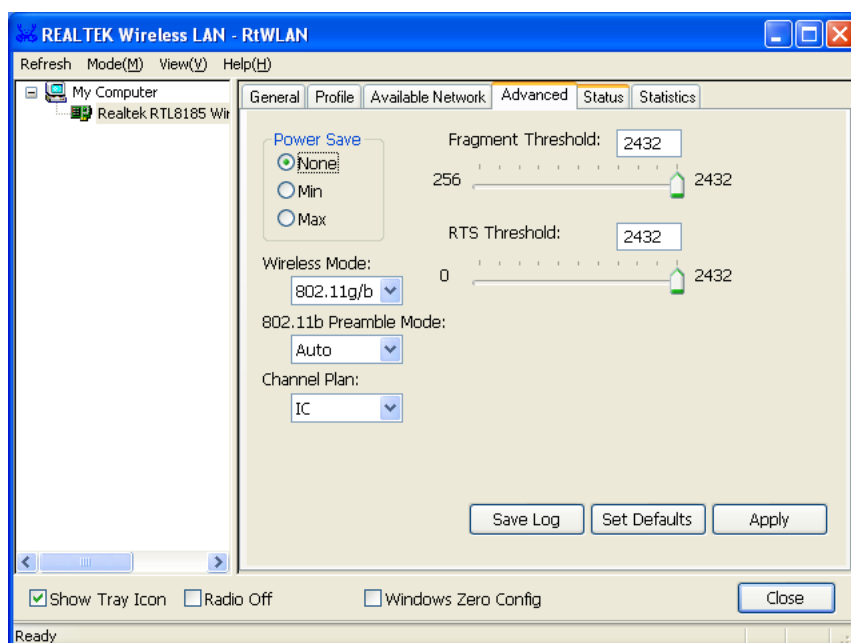


3. Press "Configure" button to configure the WPA function for the current network.

Parameter	Description
Network Authentication	Open –No authentication is needed among the wireless network. Shared – Only wireless stations using a shared key (WEP Key identified) are allowed to connecting each other. WPA – 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. WPA-PSK – 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.
Data Encryption	Disabled – No encryption is needed. WEP – In WPA or WPA-PSK mode, WEP is also able to be the encryption method for the transmission data. TKIP – 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. AES – 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. Note: All devices in the network should use the same encryption method to ensure the communication.

3.5 Advanced

The “Advanced” option enables you to configure more advanced settings, for example: Power Save, wireless mode and etc.

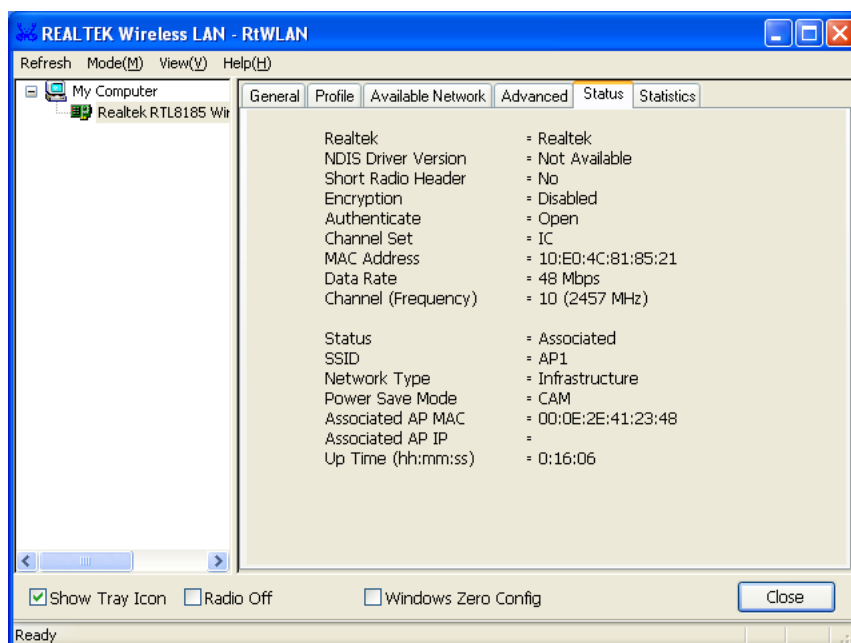


Parameter	Description
Power Save	None – The card will always set in active mode. Min – Enable the card in the power saving mode when it is idle, but some components of the card are still alive. In this mode, the power consumption is larger than “Max” mode. Max – Enable the card in the power saving mode when it is idle.
Wireless Mode	802.11 b – This card can be compatible with both 802.11g and 802.11b wireless stations. If there are only 802.11b wireless stations in the network, you can set the card to this mode. 802.11 g/b – If you have a mix of 802.11b and 802.11g wireless stations in your network, it is recommended to setting the card to this mode.

Parameter	Description
802.11b Preamble Mode	The preamble defines the length of the CRC block for communication among the wireless stations. 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 stations that the card is connecting to. Note that the parameter is only active in the Ad Hoc operation mode.
Channel Plan	The available channel differs from different countries. For example: USA (FCC) is channel 1-11, Europe (ETSI) is channel 1-13. The operating frequency channel will be restricted to the country user located by firmware before importing.
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 2432 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 2432 bytes. Minor change is recommended.
Save Log	Save the setting of the card to the designated file.
Set Defaults	Let the setting values return to default.
Apply	Confirm the settings in the “Advanced“.

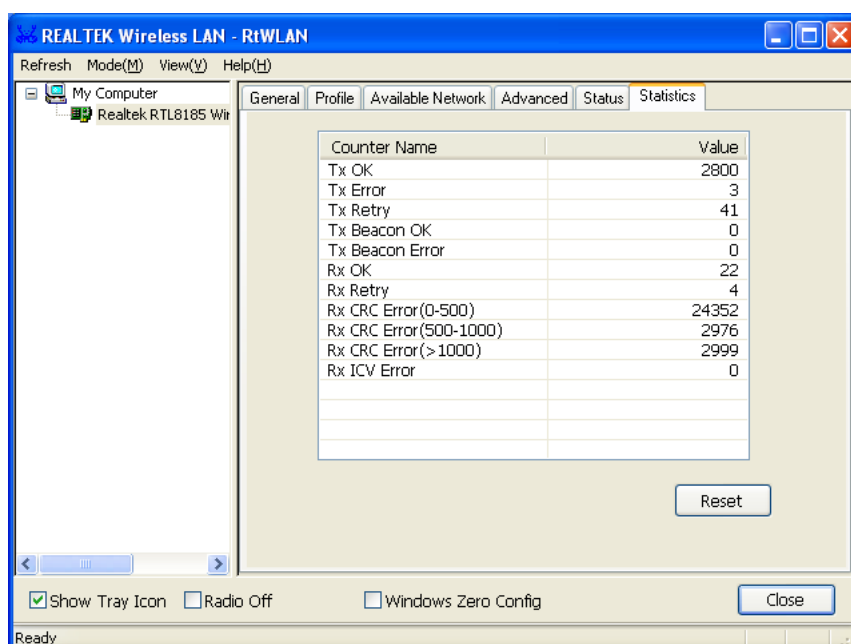
3.6 Status

This screen shows the information of manufacturer, driver version, settings of the wireless network the card is connecting to, linking time and link status. If you don't ensure the status of the card and the network you are connecting, please go to the screen for more details.



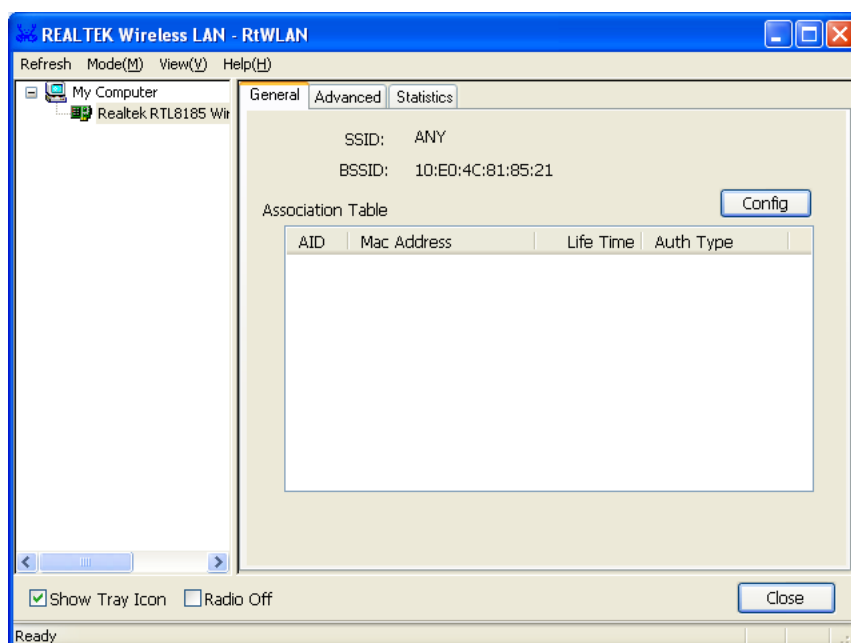
3.7 Statistics

You can get the real time information about the packet transmission and receiving status during wireless communication from the screen. If you want to recount the statistics value, please click "Reset".



3.8 Software AP

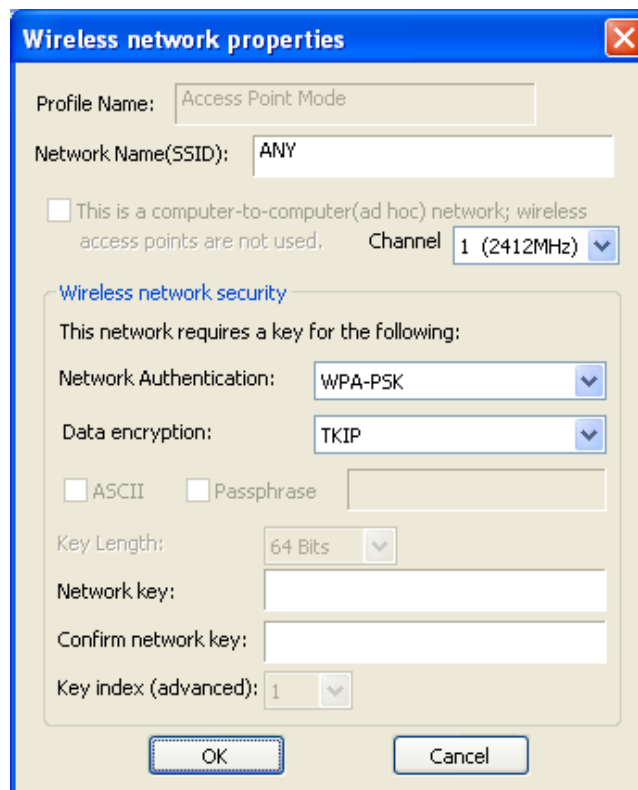
This card can run as a wireless AP. The relative configurations of the AP including channel, SSID, WEP encryption and so on are described as follows.



Parameter	Description
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. The default SSID of the AP is "ANY". Wireless cards connect to the AP should set up the same SSID as the AP.
BSSID	Display the MAC address of the card.
Associate Table	All the wireless cards connected to the software AP will be displayed in the list.
Config	Click "Config" for setting more configuration of the AP.

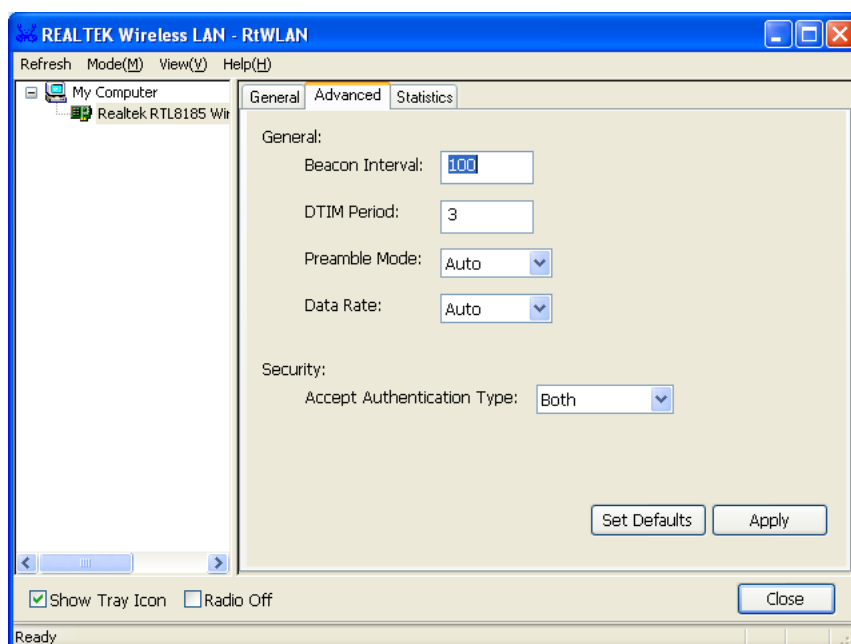
3.8.1 AP Properties Setting

Please refer to Section 3.4.1 for the setting of the parameters for AP. Note that Ad Hoc mode is not enabled for AP.



Notes: The operating frequency channel will be restricted to the country user located by firmware before importing.

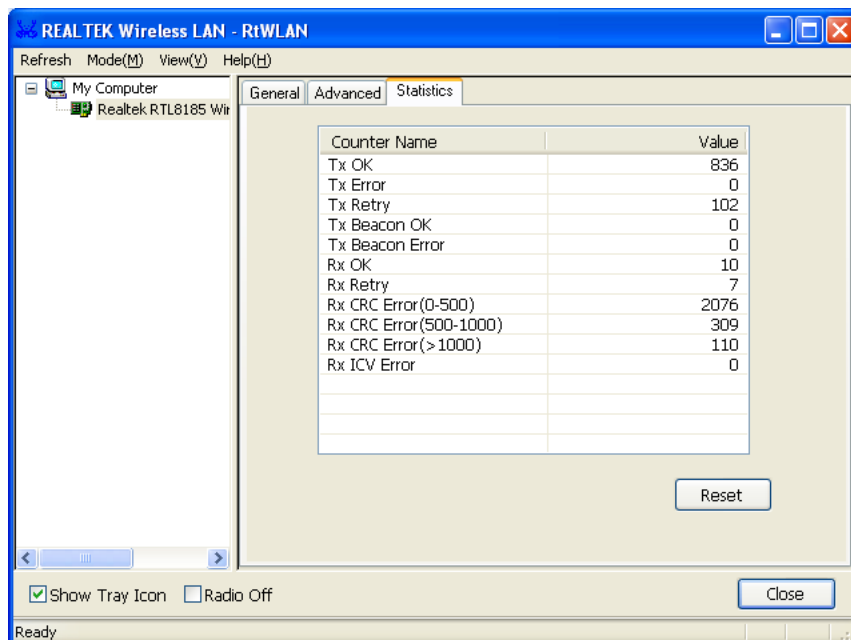
3.8.2 AP Advanced



Parameter	Description
Beacon Interval	Beacon Interval that specifies the duration between beacon packets (milliseconds). The range for the beacon period is between 20-1000 milliseconds with a typical value of 100.
DTIM Period	Determines the interval the Access Point will send its broadcast traffic. Default value is 3 beacons.
Preamble Mode	The preamble defines the length of the CRC block for communication among the wireless stations. 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 AP will auto switch the preamble mode depending on the wireless cards.
Data Rate	There are several options including Auto/1/2/5.5/11Mbps for you to select. When the "Auto" is selected, the AP will choose the most suitable transmission rate automatically.
Accept Authentication Type	The wireless network supports two subtypes of network authentication services: Open System and Shared Key. Under Open System authentication, any wireless cards can request authentication. Under Shared Key authentication, only wireless cards using a shared key (WEP Key) are allowed to request authentication. If "Both" is selected, the AP can adjust the authentication type automatically.
Set Defaults	Set the setting values return to defaults.
Apply	Confirm the settings in the "Advanced".

3.8.3 AP Statistics

You can get the real time information about the packet transmission and receiving status during wireless communication from the screen. If you want to recount the statistics value, please click "Reset".



4 Troubleshooting

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

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 card, 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).