

# User's ▶▶▶▶▶▶▶▶ manual

## Mini Wireless-G USB 2.0 Network Adapter

HWU54G

HI-SPEED  
SERIES 54G



Website: [www.hawkingtech.com](http://www.hawkingtech.com)

E-Mail: [techsupport@hawkingtech.com](mailto:techsupport@hawkingtech.com)

© Copyright 2004 Hawking Technologies, Inc. All rights reserved.

## **LIMITED WARRANTY**

**Hawking Technology guarantees that every HWU54G Mini Wireless-G USB Network Adapter is free from physical defects in material and workmanship under normal use for two (2) years from the date of purchase. If the product proves defective during this two-year warranty period, call Hawking Customer Service in order to obtain a Return Authorization number. Warranty is for repair or replacement only. Hawking Technology does not issue any refunds. BE SURE TO HAVE YOUR PROOF OF PURCHASE. RETURN REQUESTS CAN NOT BE PROCESSED WITHOUT PROOF OF PURCHASE. When returning a product, mark the Return Authorization number clearly on the outside of the package and include your original proof of purchase.**

**IN NO EVENT SHALL HAWKING TECHNOLOGY'S LIABILITY EXCEED THE PRICE PAID FOR THE PRODUCT FROM DIRECT, INDIRECT, SPECIAL, INCIDENTAL OR CONSEQUENTIAL DAMAGES RESULTING FROM THE USE OF THE PRODUCT, ITS ACCOMPANYING SOFTWARE OR ITS DOCUMENTATION.**

**Hawking Technology makes no warranty or representation, expressed, implied or statutory, with respect to its products or the contents or use of this documentation and all accompanying software, and specifically disclaims its quality, performance, merchantability, or fitness for any particular purpose. Hawking Technology reserves the right to revise or update its products, software, or documentation without obligation to notify any individual or entity. Please direct all inquiries to: [techsupport@hawkingtech.com](mailto:techsupport@hawkingtech.com)**

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

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 on the side near the center, 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 lappads 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.

# CONTENTS

<b>1</b>	<b>INTRODUCTION .....</b>	<b>1</b>
1.1	Features .....	1
1.2	Specifications .....	1
1.3	Package Contents .....	2
<b>2</b>	<b>INSTALLATION PROCEDURE .....</b>	<b>3</b>
<b>3</b>	<b>CONFIGURATION UTILITY .....</b>	<b>7</b>
3.1	General .....	7
3.1.1	Preference Setting .....	9
3.1.2	Site Survey .....	9
3.2	Profiles .....	10
3.2.1	Configure the Profile .....	12
3.2.2	Enable WPA .....	14
3.3	Current Statistics .....	15
3.4	About .....	16
<b>4</b>	<b>TROUBLESHOOTING .....</b>	<b>17</b>

# 1 Introduction

The Hawking Technologies Mini Wireless-G USB 2.0 Network Adapter is designed to be fully compliant with both IEEE 802.11b and IEEE 802.11g wireless networking standards. The HWU54G uses the latest in wireless chip technology and is capable of transferring data wirelessly at speeds up to 54 Mbps! In addition to being a high-speed wireless adapter, the Mini Wireless-G Adapter is the size of a finger. This lets you take the Wireless-G adapter wherever you go so you'll never have to worry about connecting again. The combination of speed and size make this Wireless-G network adapter one of the best on the market.

The Hi-Gain Wireless-G USB Network Adapter supports 64/128-bit WEP data encryption that protects your wireless network from outside intruders. Furthermore, it supports the latest in wireless security, WPA (Wi-Fi Protected Access), a feature that combines IEEE 802.1x and TKIP (Temporal Key Integrity Protocol) technologies. With the WPA feature, users are required to authenticate themselves before accessing APs or AP Routers. The data transmitted within the network is encrypted/decrypted by a secretkey that is dynamically changed.

Whether you are trying to connect to a local hotspot or surfing the web while you read a book in the park, the HWU54G gives the power and versatility to connect anywhere, anytime.

## 1.1 Features

- Complies with IEEE 802.11g (2.4GHz, OFDM) and IEEE 802.11b standards.
- Works with both IEEE 802.11b and IEEE 802.11g products.
- High-speed transfer data rate - up to 54Mbps.
- High throughput supports multimedia data bandwidth requirements.
- Supports 64/128-bit WEP and WPA (TKIP with IEEE 802.1x with) WLAN security.
- Automatic data rate fallback increases data security and reliability.
- Supports the most popular operating systems: Windows 2000/XP.
- Supports USB 2.0/1.1/1.0 interface.

## 1.2 Specifications

- Standard: IEEE 802.11b/g
- Host Interface: USB 2.0/1.1/1.0
- USB Port: Mini-USB
- 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, WPA (TKIP with IEEE 802.1x)
- Antenna: Internal
- Drivers: Windows 2000/XP
- LEDs: Power, Link Transmit Power: 16 dBm
- 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 USB Wireless-G Adapter
- One Quick Installation Guide
- One CD (Driver/Utility/User Manual)

***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.

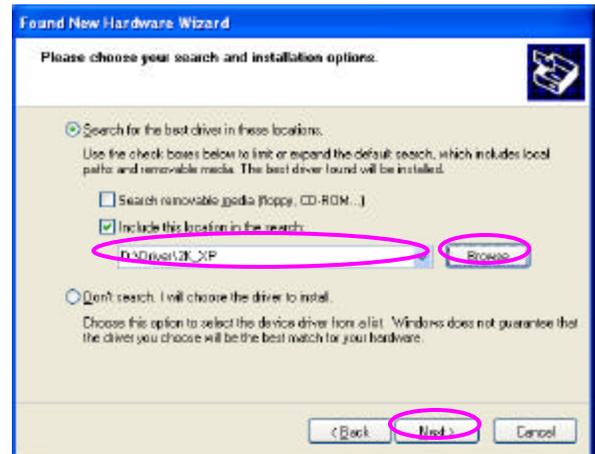
**Note: The following installation was performed under Windows XP. (Procedures are similar for Windows 98SE/Me/2000.)**

### I. Install the Driver

- A. Insert the Installation CD into your CD-ROM driver.
- B. Insert the USB adapter to the USB port of your laptop or desktop PC.



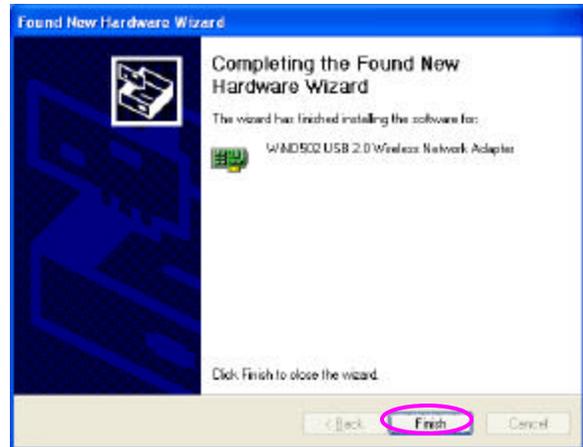
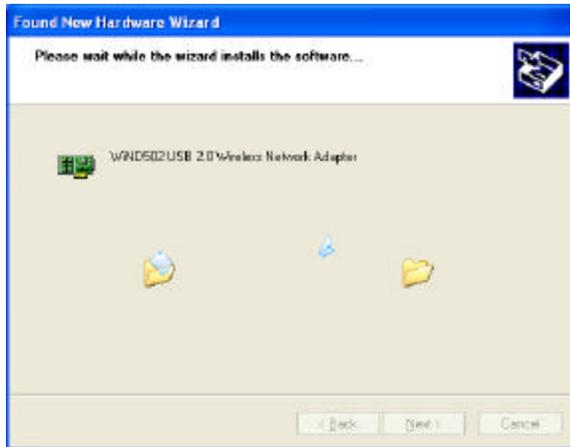
- C. Choose the selection "Install from a list or specific location (Advanced)" and click "Next".



- D. Click "Browse" to search for the driver. Choose the location to "D:\Driver\xx" ("D" is where your CD-ROM Driver, "xx" is the OS system of your computer) and click "Next".



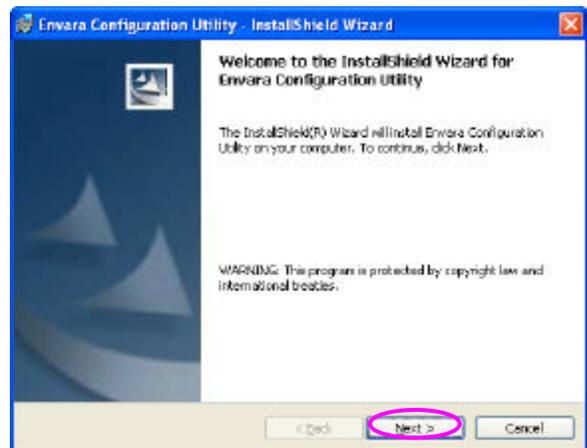
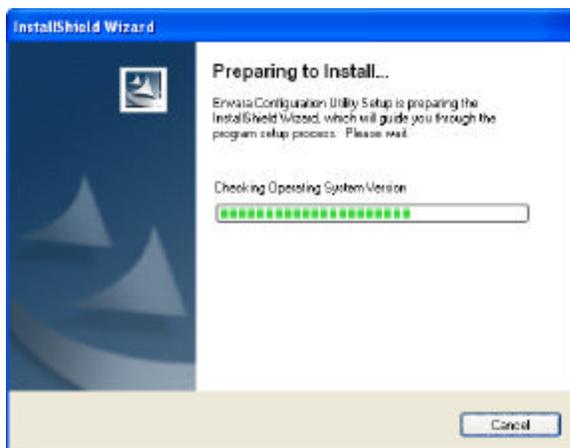
- E. A Windows driver warning message appears, click "Continue Anyway".



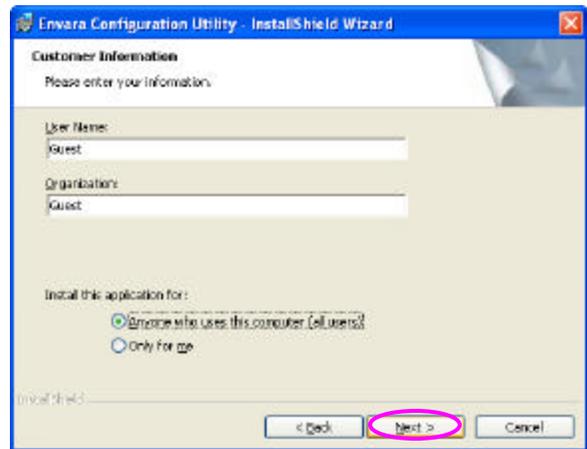
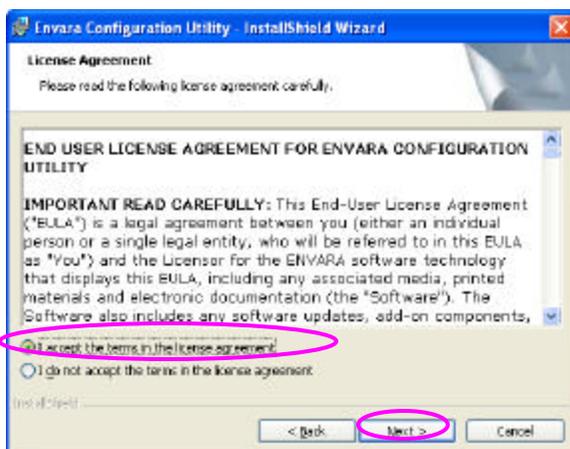
F. The wizard will install the driver automatically. Click "Finish" to complete the installation.

## II. Install the Utility

A. Execute the "Utility\setup.exe" program from the installation CD.

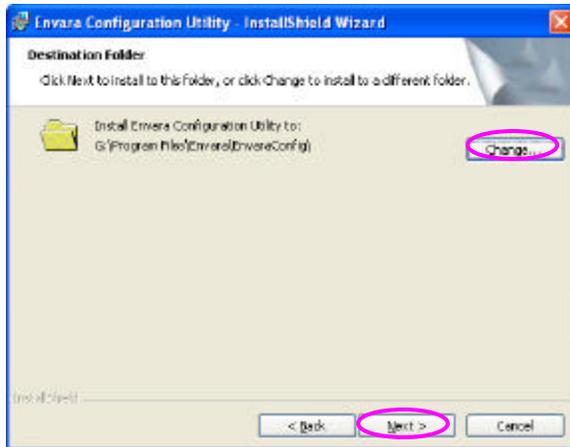


B. The InstallShield Wizard box will appear, click "Next" to continue.

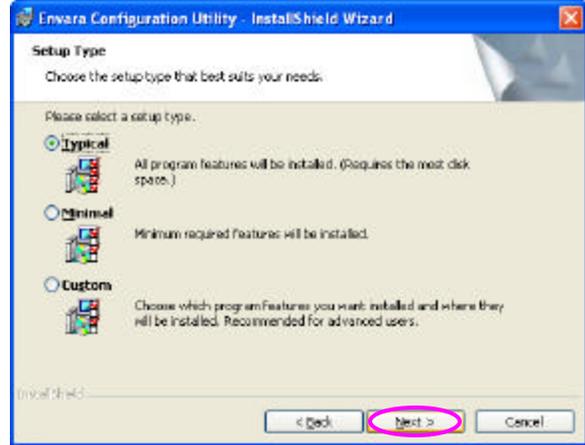


C. Choose the selection "I accept the terms in the license agreement" and click "Next".

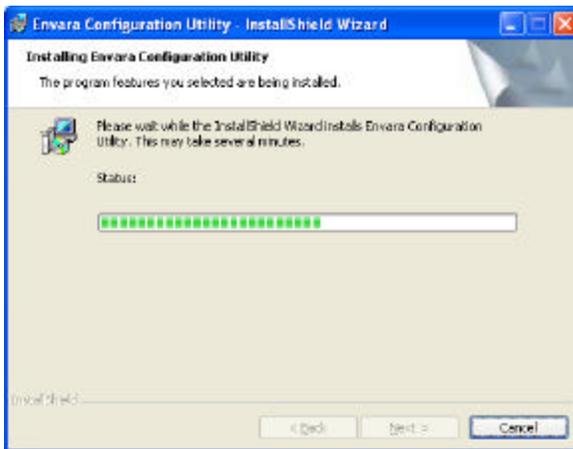
D. Enter your "User Name" and "Organization" which is only for reference, then click "Next".



E. If you want to change the destination folder, click "Change", or click "Next" to continue.



F. There is no difference among the three-setup types. Click "Next" directly.

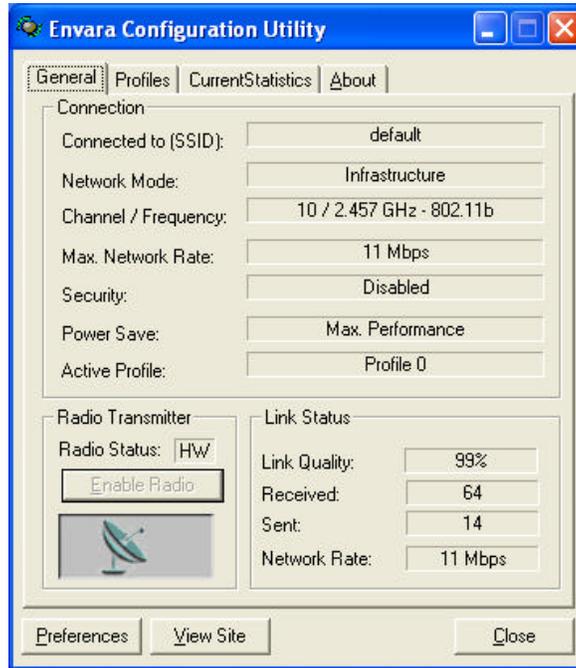


G. The wizard will install the driver automatically. Click "Finish" to complete the installation.



### III. Using the Utility

Go to Start\All Programs\Envara Configuration Utility and select "EnvaraGui". This will load the Wireless Utility.



## 3 Configuration Utility

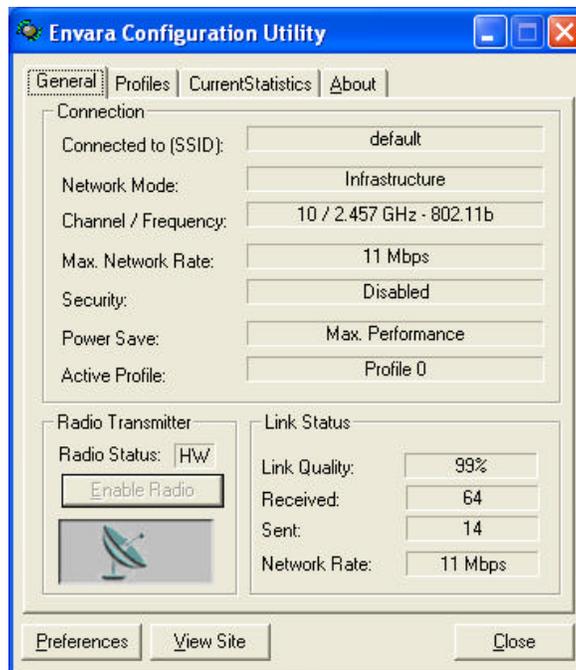
The Configuration Utility is a powerful application that helps you configure the adapter and monitor the link status and the statistics during the communication process.

However, there are some restrictions on the utility. Before using the utility, you should study and learn them.

1. If you want to connect to an 11g (54Mbps) network, please ensure to install the adapter to a PC or laptop with an USB 2.0 interface. This adapter can only support 11b when connected to a USB 1.1/1.0 port on your computer.
2. This adapter will only work in 11b (11Mbps) mode when Ad Hoc mode has been selected as the network type. (Defined by the Wi-Fi organization). If you want to enable the data rate up to 54Mbps (11g), please follow steps listed below.
  - A. Go to "Network Connections".
  - B. Right Click the "Wireless Network Connection" and select "Properties".
  - C. From the pop-up screen, click "Configure".
  - D. Enter into "Advanced" page of the "Properties" screen.
  - E. Change the setting of "IBSS Originator Phy-Mode" from "802.11b" to "802.11g".

### 3.1 General

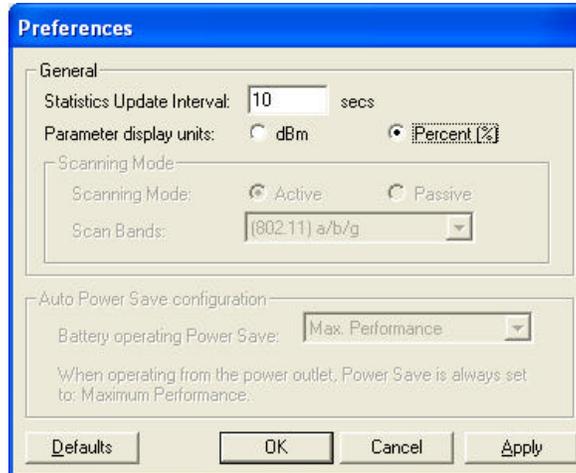
From the "General" screen, you can view all the information of the network you are connecting to.



Parameter	Description
Connected to (SSID)	Displays the wireless network that the adapter is connecting to.
Network Mode	There are two network types: Infrastructure and Ad Hoc. This field shows the current network type.
Channel / Frequency	Display the radio channel and the frequency in use by the adapter.
Max. Network Rate	This field shows the maximum link rate of the network, that is 54Mbps for 802.11g and 11Mbps for 11b.
Security	Display the security setting of the network. "Disabled" means there is no security setting on the network.
Power Save	This field displays the power save scheme for the adapter (that is Max performance/Max battery life/Auto).
Active Profile	This field shows the current connection profile.
Radio Status	This field shows the transmitter's status (On or Off).
Enable Radio Button	This button is used to enable and disable radio transmission.
Link Quality	The higher the percentage, the better the connection to the AP.
Received	This field shows the current received baud rate (measured in Kbytes/sec).
Sent	This field shows the current sent baud rate (measured in Kbytes/sec).
Network Rate	The data rate in this field varies from one wireless environment to another. It displays the current data rate at that point in time so that you may adjust the direction of the adapter or distance from other wireless stations.
Preferences Button	If you want to change the unit of link quality or the update interval for transmitted and received data, click this button to change the settings.
View Site Button	To view the available wireless networks nearby, click the "View Site" button.

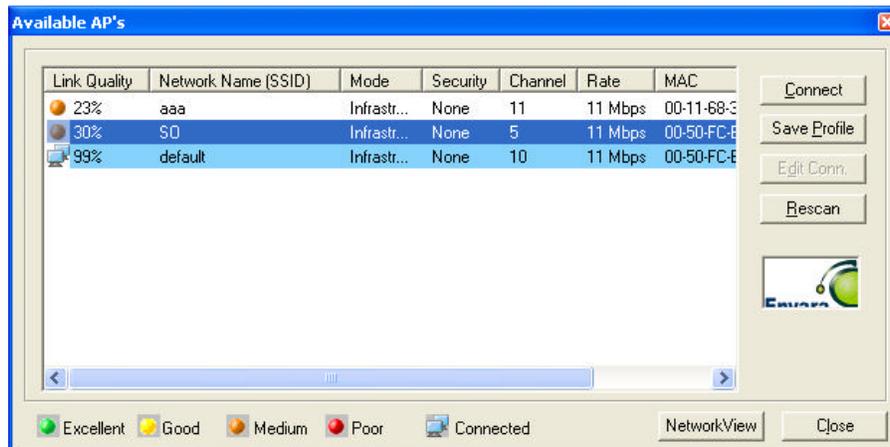
### 3.1.1 Preference Setting

This preference screen enables you to change the unit used to measure link quality or the time interval used to refresh the data. The default settings is “10” for “Statistics Update Interval” and “Percent” for “Parameter Display Units”. If you want to set up as default values, click “Defaults”.



### 3.1.2 Site Survey

This screen shows all wireless networks nearby. If you want to connect to any network on the list, double-click the item on the list or click “Connect”, and the adapter will automatically connect to the selected network.

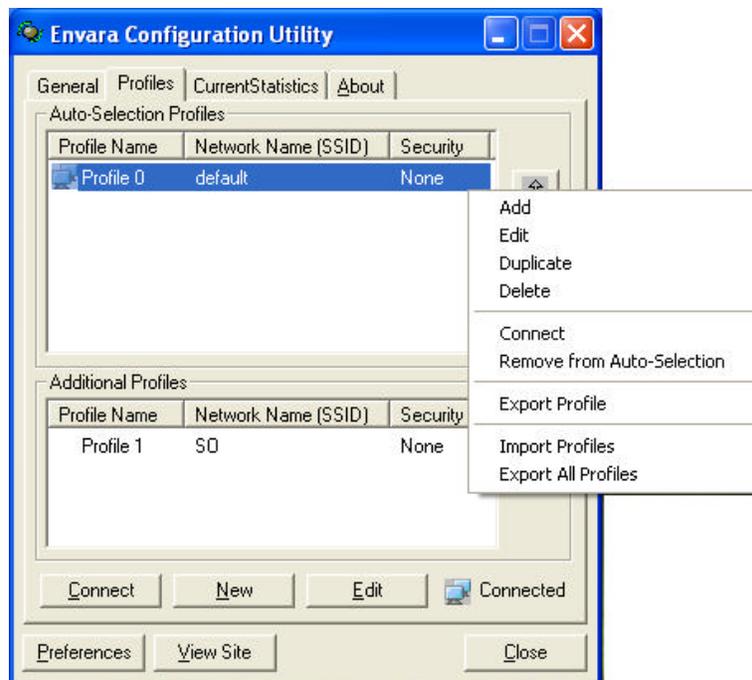


Parameter	Description
Available Networks/AP 's List	The list displays the information of wireless networks including Link Quality, Network Name, Mode, Security, etc. This information will help you decide which network you want to connect to.

Parameter	Description
Connect Button	Select one of the networks from the list and click "Connect", the adapter will connect to the network automatically. You can also right click the network and select "Connect".
Save Profile Button	Save the selected network as a profile. This profile will be listed in the profiles list table so that you can easily connect to that specific network without using the "Site Survey". You can also right click the SSID and select "Save as Profile".
Edit Connect Button	If the network you are trying to connect to has a different WEP security setting, you can click this button to update the settings of the adapter. Note that the WEP setting has to be the same with the network. You can also right click the connection network and select "Edit Connect".
Rescan Button	Click the "Rescan" button to refresh the data of all wireless networks nearby.
AP View/Network View Button	This button will change the way the available networks are displayed. "Network View" displays the network information simply.

### 3.2 Profiles

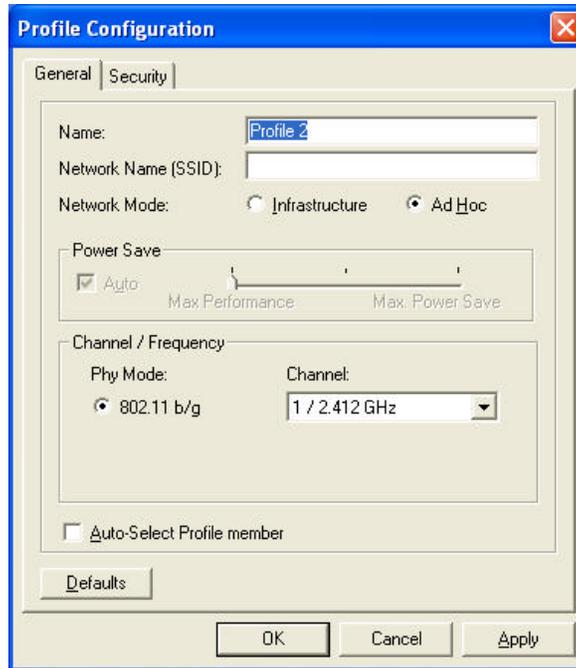
The Profiles let you easily manage the wireless networks that you frequently connect to. Simply save the settings of the different wireless networks you frequent and select the saved profile each time you connect to them. The Profiles save you time and make connecting easier.



Parameter	Description
Auto-Selection Profiles	<p>If a profile is set as an Auto-Selection profile the utility will attempt to automatically connect the adapter to the respective profile in the order they are listed in the Profile list. All networks that you have previously connected to will be listed. If you want to connect to one of the profiles in the list, double-click the item on the list or right click the network and select "Connect".</p>
Additional Profiles	<p>You can create additional profiles here as other selections. The adapter will not connect to the additional profiles in the list automatically.</p> <p>If you want to change the connection to one of the profiles, double-click the profile or select the profile and click "Connect". You can click "New" and "Edit" to configure the profile list.</p>
Right Click Function List	<p><b>Add</b> – Add a new profile in the list.</p> <p><b>Edit</b> – Edit the selected profile.</p> <p><b>Duplicate</b> – Copy the same profile to the list.</p> <p><b>Delete</b> – Delete the selected profile.</p> <p><b>Connect</b> – Connect to the profile.</p> <p><b>Add/Remove to/from Auto-Selection</b> – Add the profile to the "Auto-Selection Profiles" or remove it from "Auto-Selection Profiles" to "Additional Profiles".</p> <p><b>Export Profile</b> – Save the profile as a new file.</p> <p><b>Import Profiles</b> – Import the profile file to the list.</p> <p><b>Export All Profiles</b> – Save all the profiles as a new file.</p>

### 3.2.1 Configure the Profile

When you click “New” or “Edit” in the Profiles page the “Profile Configuration” screen will appear. In this screen, there are two pages: General and Security.

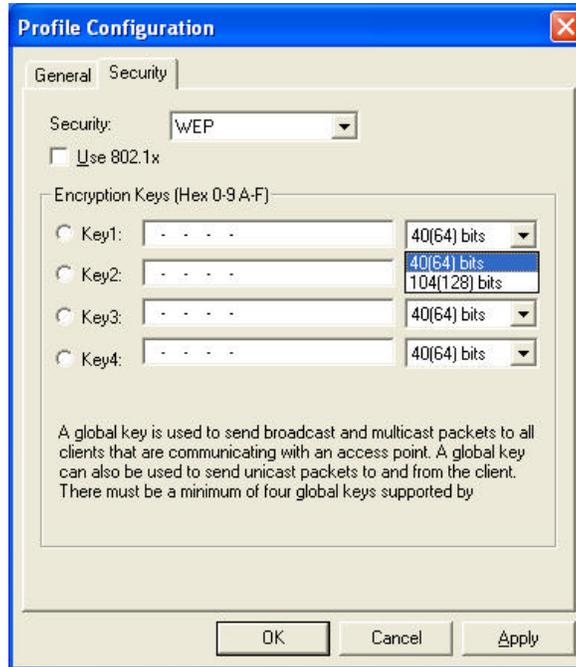


#### General

Parameter	Description
Name	Change the name of your Profile for easier identification.
Network Name (SSID)	<p>The SSID (up to 32 printable ASCII characters) is the unique name identify a wireless network. The ID prevents the unintentional merging of two co-located WLANs.</p> <p>You may specify a SSID for the adapter so that it will only connect to a network when that specific SSID is present.</p>
Network Mode	<p><b>Infrastructure</b> – This operation mode requires the presence of an 802.11 Access Point. All communication is done via the Access Point.</p> <p><b>Ad-Hoc</b> – Select this mode if you want to connect to another wireless station in the Wireless LAN network without an Access Point.</p>
Power Save	Enable the adapter to enter power saving mode when it is idle.
Channel / Frequency	This setting is only available for Ad Hoc mode. The channel setting should be the same with the network you are connecting to.

Auto-Select Profile Member	If you select the check box, this profile will be put in the “Auto-Selection Profiles” list.
----------------------------	--

Parameter	Description
Defaults	The default values are Ad Hoc mode and channel one. If you want to set up to default, click this button.



### Encryption

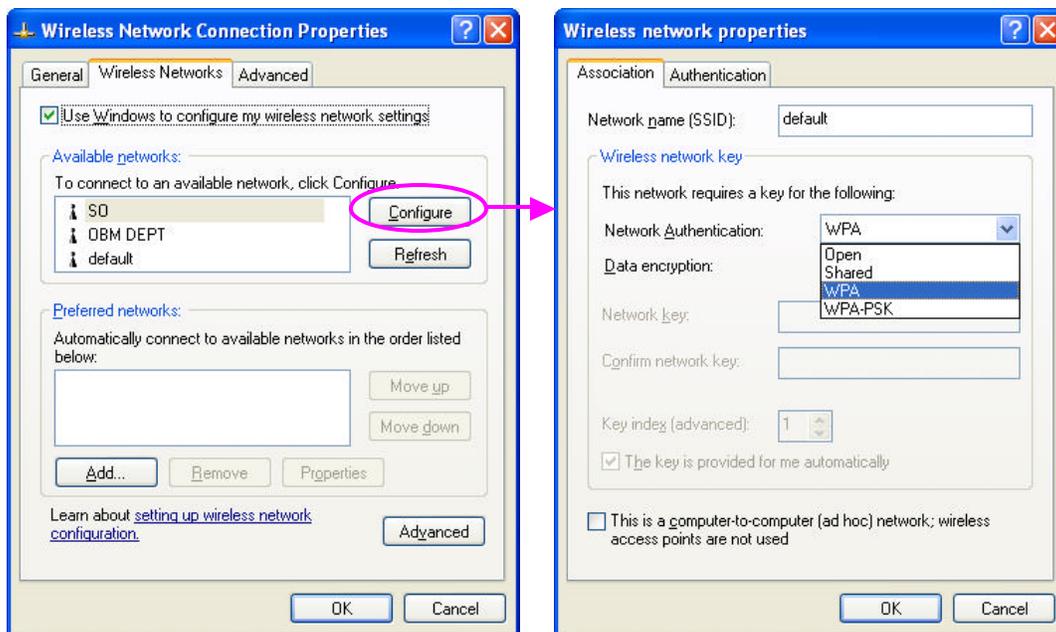
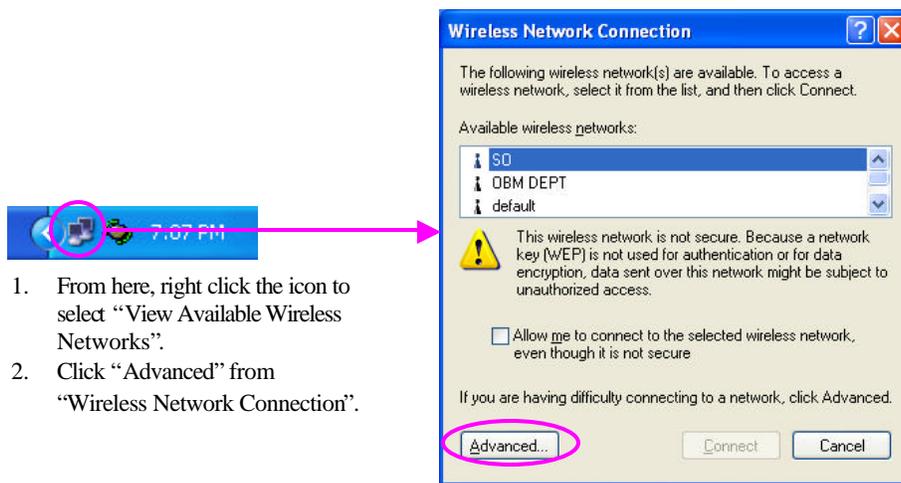
Parameter	Description
Security	<p><b>None</b> – Disable the WEP Data Encryption.</p> <p><b>WEP</b> – Enable the WEP Data Encryption. When the item is selected, you have to continue setting the WEP Key Length and the encryption keys.</p>
Use 802.1x	This function is not activated yet. It will not implement if you enable it.
Encryption Key (Key1 ~ Key4)	<p>Select the default encryption key from Key 1 to Key 4 by using the selected radio button. The WEP keys are used to encrypt data transmitted on 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>

### 3.2.2 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:

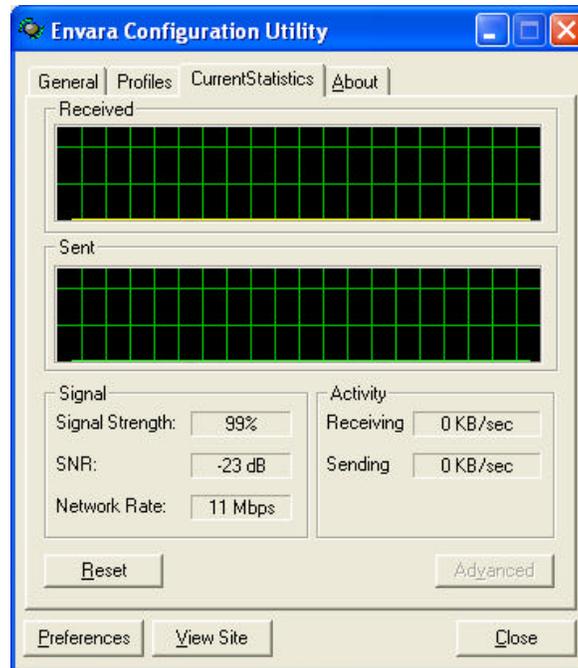
1. Windows XP Service Pack 1 with Windows XP Support Patch for Wi-Fi Protected Access program in addition.
2. Configure the card by Wireless built-in utility (Wireless Zero Configuration).



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 users 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>Note: All devices in the network should use the same encryption method to ensure the communication.</p>

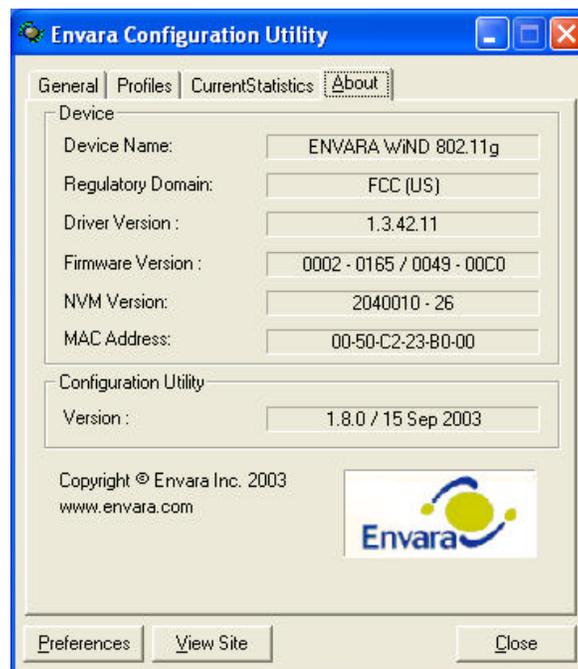
### 3.3 Current Statistics

This option enables you to view the signal strength and the statistical information of successful Tx and Rx baud rate. You may reset the counters by clicking “Reset”. The “SNR” indicates the rate of noise and signal in the environment, the bigger of the value, the better the signal strength.



### 3.4 About

By choosing this option, you can view basic information such as the Driver, Firmware 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. Why can't the USB adapter work or only work in 11b mode while connect to USB 2.0 port?

If this situation occurs, please upgrade the driver of your USB port. This problem may be the compatibility issue with the old driver of the USB port.

### 2. 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 is backwards compatible 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.

### 3. 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.

### 4. 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

### 5. 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.

**6. 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.

**7. 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.

**8. 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.

**9. 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.

**10. 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.

**11. 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.

**12. 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.

**13. 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.

#### **14. 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).