LINKSYS®

A Division of Cisco Systems, Inc.

2.4GHz 802.11g

Wireless-G

Notebook Adapter

User Guide

WIRELESS

CISCO SYSTEMS

Model No. **WPC54G**

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This User Guide

The User Guide to the Wireless-G Notebook Adapter has been designed to make understanding networking easier than ever. Look for the following items when reading this guide:

This checkmark means there is a note of interest and is something you should pay special attention to while using the Adapter.

This exclamation point means there is a caution or warning and is something that could damage your property or the Adapter.

This question mark provides you with a reminder about something you might need to do while using the Adapter.

In addition to these symbols, there are definitions for technical terms that are presented like this:

word: *definition.*

Also, each figure (diagram, screenshot, or other image) is provided with a figure number and description, like this:

Figure 0-1: Sample Figure Description

Figure numbers and descriptions can also be found in the "List of Figures" section in the “Table of Contents”.

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Chapter 1: Introduction

Welcome

Thank you for choosing the Wireless-G Notebook Adapter. With this Adapter, your wireless networking experience will be faster and easier than ever.

Like all wireless products, the Adapter allows for greater range and mobility within your wireless network. This adapter communicates over the 54Mbps 802.11g wireless standard, which is almost five times faster than 802.11b. But since they share the same 2.4GHz radio band, the Adapter can also communicate with the widely used 11Mbps 802.11b standard.

PCs equipped with wireless cards and adapters can communicate without cumbersome cables. By sharing the same wireless settings, within their transmission radius, they form a wireless network.

The included Setup Wizard will walk you through configuring the adapter to your network's settings, step by step. Then just slide it into your notebook's PC Card slot and enjoy network access with your notebook computer, while retaining true mobility.

Once you're connected, you can keep in touch with your e-mail, access the Internet, and share files and other resources such as printers and network storage with other computers on the network. At home, you can surf the web or use instant messaging to chat with friends while sitting out on the patio. Your wireless connection is protected by the new, industrial-strength security of Wireless Protected Access (WPA).

You'll also be able to connect with any of the growing number of public wireless hotspots springing up in coffee shops, airport lounges, hotels and convention centers. And as those hotspots upgrade to the new high-speed Wireless-G standard, you'll be ready to take advantage of the increased speeds.

Get connected to current-standard 802.11b networks today, and be prepared for the future with the Wireless-G Notebook Adapter from Linksys.

network: *a series of computers or devices connected for the purpose of data sharing, storage, and/or transmission between users.*

adapter: *a device that adds network functionality to your PC.*

802.11b: *an IEEE wireless networking standard that specifies a maximum data transfer rate of 11Mbps and an operating frequency of 2.4GHz.*

802.11g *an IEEE wireless networking standard that specifies a maximum data transfer rate of 54Mbps and an operating frequency of 2.4GHz.*

What's in this Guide?

This user guide covers the steps for setting up and using the Wireless-G Notebook Adapter.

- Chapter 1: Introduction
  This chapter describes the Adapter's applications and this User Guide.

- Chapter 2: Planning Your Wireless Network
  This chapter discusses a few of the basics about wireless networking.

- Chapter 3: Getting to Know the Wireless-G Notebook Adapter
  This chapter describes the physical features of the Adapter.

- Chapter 4: Software Installation and Configuration
  This chapter instructs you on how to install the Adapter's Setup Wizard and Configure the Adapter

- Chapter 5: Hardware Installation
  This chapter shows you how to connect the Adapter to your PC.

- Chapter 6: Using the WLAN Monitor
  This chapter show you how to use the Adapter's WLAN Monitor.

- Appendix A: Troubleshooting
  This appendix describes some problems and solutions, as well as frequently asked questions, regarding installation and use of the Adapter.

- Appendix B: Wireless Security
  This appendix discusses security issues regarding wireless networking and measures you can take to help protect your wireless network.

- Appendix C: Windows Help
  This appendix describes how you can use Windows Help for instructions about networking, such as installing the TCP/IP protocol.

- Appendix D: Glossary
  This appendix gives a brief glossary of terms frequently used in networking.

- Appendix E: Specifications
  This appendix provides the Adapter's technical specifications.

- Appendix F: Warranty Information
  This appendix supplies the Adapter's warranty information.

- Appendix G: Regulatory Information
  This appendix supplies the Adapter's regulatory information.

- Appendix H: Contact Information
  This appendix provides contact information for a variety of Linksys resources, including Technical Support.

Chapter 2: Planning your Wireless Network

Network Topology

A wireless network is a group of computers, each equipped with one wireless adapter. Computers in a wireless network must be configured to share the same radio channel. Several PCs equipped with wireless cards or adapters can communicate with one another to form an ad-hoc network.

Linksys wireless adapters also provide users access to a wired network when using an access point or wireless router. An integrated wireless and wired network is called an infrastructure network. Each wireless PC in an infrastructure network can talk to any computer in a wired network infrastructure via the access point or wireless router.

An infrastructure configuration extends the accessibility of a wireless PC to a wired network, and can double the effective wireless transmission range for two wireless adapter PCs. Since an access point is able to forward data within a network, the effective transmission range in an infrastructure network can be doubled.

Roaming

Infrastructure mode also supports roaming capabilities for mobile users. Roaming means that you can move your wireless PC within your network and the access points will pick up the wireless PC's signal, providing that they both share the same channel and SSID.

Before enabling you consider roaming, choose a feasible radio channel and optimum access point position. Proper access point positioning combined with a clear radio signal will greatly enhance performance.

***topology**: the physical layout of a network.*

***ad-hoc**: a group of wireless devices communicating directly with each other (peer-to-peer) without the use of an access point.*

***infrastructure**: a wireless network that is bridged to a wired network via an access point.*

***roaming**: the ability to take a wireless device from one access point's range to another without losing the connection.*

***ssid**: your wireless network's name.*

Network Layout

Linksys wireless access points and wireless routers have been designed for use with 802.11a, 802.11b, and 802.11g products. With 802.11g products communicating with the 802.11b standard and some products incorporating both “a” and “g”, products using these standards can communicate with each other.

Access points and wireless routers are compatible with 802.11a, 802.11b and 802.11g adapters, such at the PC Cards for your laptop computers, PCI Card for your desktop PC, and USB Adapters for when you want to enjoy USB connectivity. Wireless products will also communicate with the wireless PrintServer.

When you wish to connect your wired network with your wireless network, network ports on access points and wireless routers can be connected to any of Linksys's switches or routers.

With these, and many other, Linksys products, your networking options are limitless. Go to the Linksys website at www.linksys.com for more information about wireless products.

Chapter3:GettingtoKnowtheWireless-GNotebookAdapter

The LED Indicators

The Network Adapter's LEDs display information about network activity.

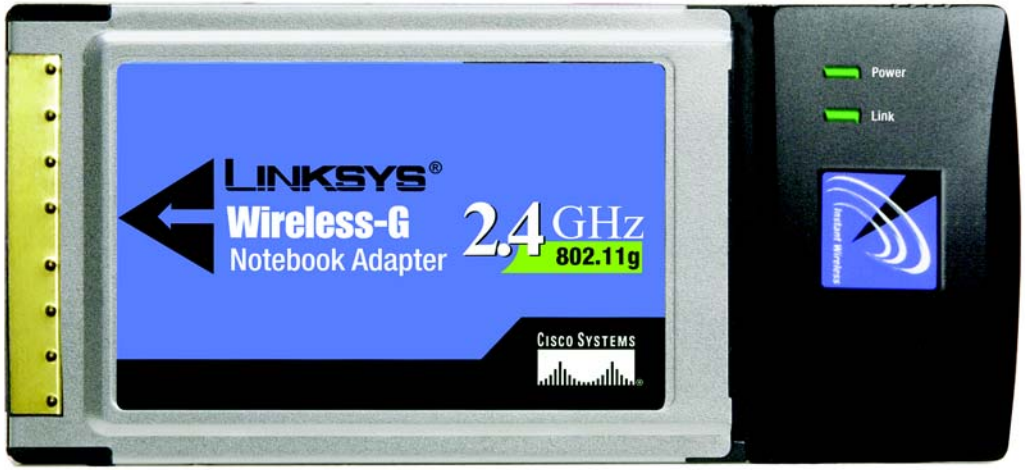

Figure 3-1: Front Panel

Power *Green*. The Power LED lights up when the Adapter is powered on.

Link *Green*. The Link LED lights up when the Adapter has an active connection.

Chapter 4: Software Installation and Configuration

The Wireless Wireless-G Notebook Adapter Setup Wizard will guide you through the installation procedure. The Setup Wizard will install the WLAN Monitor and driver, as well as configure the Adapter.

NOTE: You must run the Setup Wizard to install the software before installing the hardware.

Insert the **Setup Wizard CD-ROM** into your CD-ROM drive. The Setup Wizard should run automatically, and the *Welcome* screen should appear. If it does not, click the **Start** button and choose **Run**. In the field that appears, enter **D:\setup.exe** (if "D" is the letter of your CD-ROM drive).

On the Welcome screen, you have the following choices:

Install - Click the **Install** button to begin the software installation process.

User Guide - Click the **User Guide** button to open the PDF file of this User Guide.

Exit - Click the **Exit** button to exit the Setup Wizard.

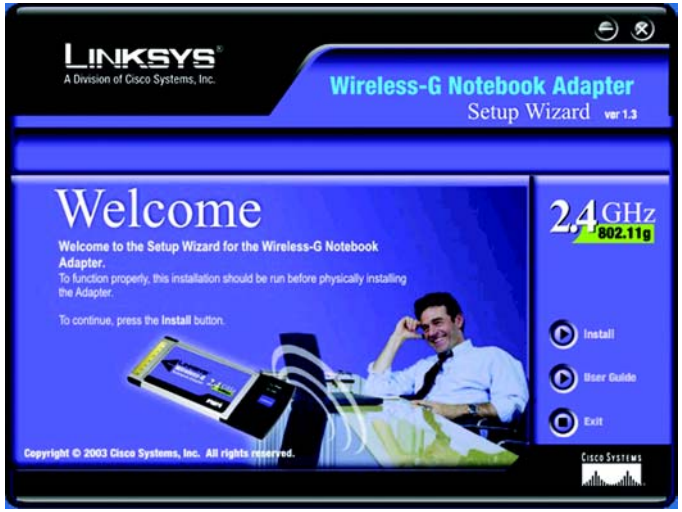

Figure 4-1: The Setup Wizard's Welcome screen

The Installation Procedure

1. To install the Adapter, click the **Install** button on the Welcome screen.

2. After reading the License Agreement, click the **Next** button if you agree, or click the **Cancel** button to end the installation.

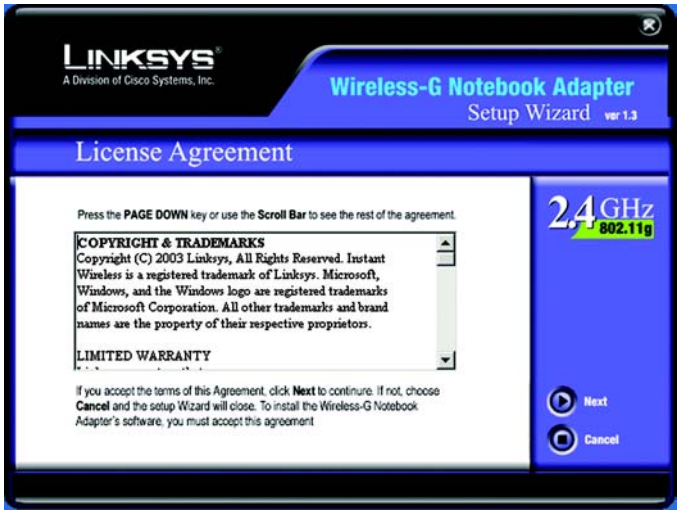

Figure 4-2: The Setup Wizard's License Agreement

3. The Setup Wizard will ask you to choose a network mode. Click the **Infrastructure Mode** radio button if you want your wireless computers to network with computers on your wired network using a wireless access point. Click the **Ad-Hoc Mode** radio button if you want multiple wireless computers to network directly with each other.

   In the SSID field, enter the **SSID** of your wireless network. The SSID must be identical for all devices in the network. The default setting is **linksys** (all lowercase). Click the **Next** button.

NOTE: Network SSIDs should be unique to your network and identical for all devices within the network.

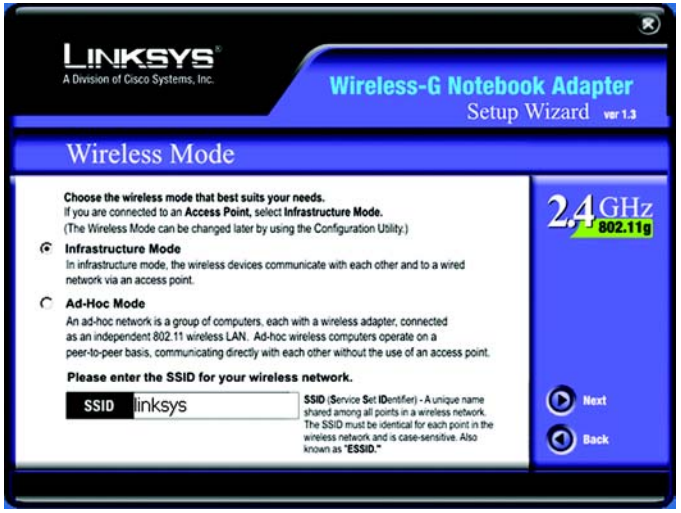

Figure 4-3: The Setup Wizard's Network Mode screen

4. If you chose **Infrastructure Mode**, go to Step 5 now. If you chose **Ad-Hoc Mode**, select the correct operating channel for your network. Then, select the Network Mode from the drop-down menu. Click the Next button, and go to Step 5. Click the Back button to change any settings.

   Channel - The channel you choose should match the channel set on the other devices in your wireless network. If you are unsure about which channel to use, select the default channel (Channel 6).

   Network Mode - Select Mixed Mode, and both Wireless-G and Wireless-B computers will be allowed on the network, but the speed will be reduced. Select G-Only Mode for maximum speed, but no Wireless-B users will be allowed on the network.

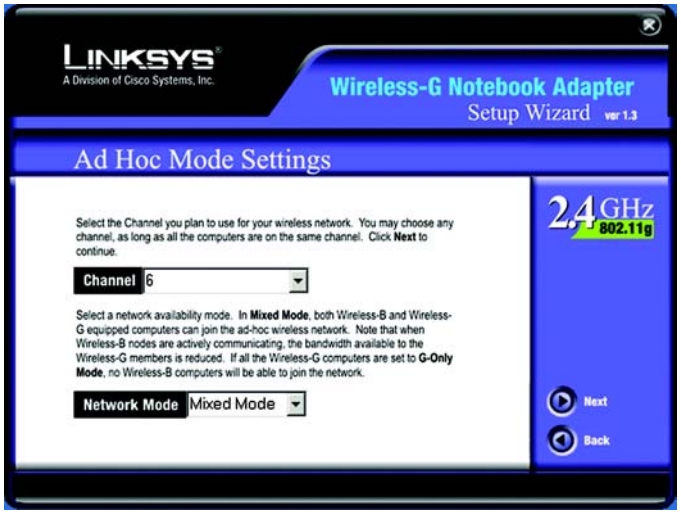

Figure 4-4: The Setup Wizard's Wireless Channels screen

5. The Setup Wizard will ask you to review your settings before it starts to copy files. Click the **Next** button to save these settings, or click the **Back** button to change any settings.

   If you're using Windows 2000, you may see a Windows Digital Signature warning. As this product has been tested to work with Windows, you may continue.

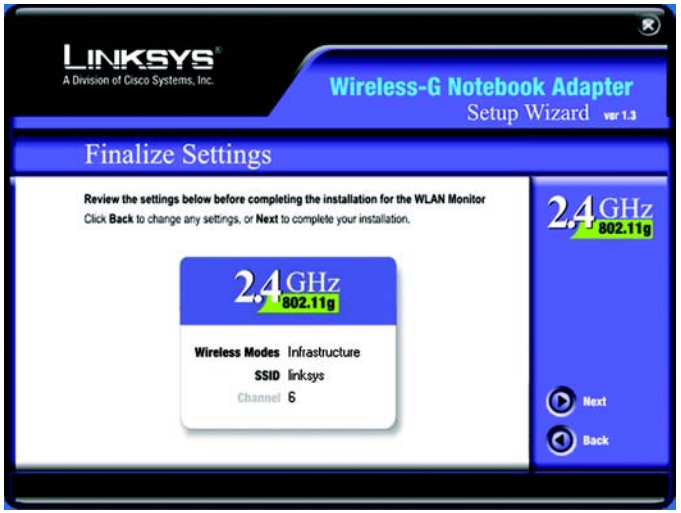

Figure 4-5: The Setup Wizard's Finalize Settings screen

6. After the software has been successfully installed, the Congratulations screen will appear. Click the **Exit** button.

Proceed to "Chapter 5: Hardware Installation."

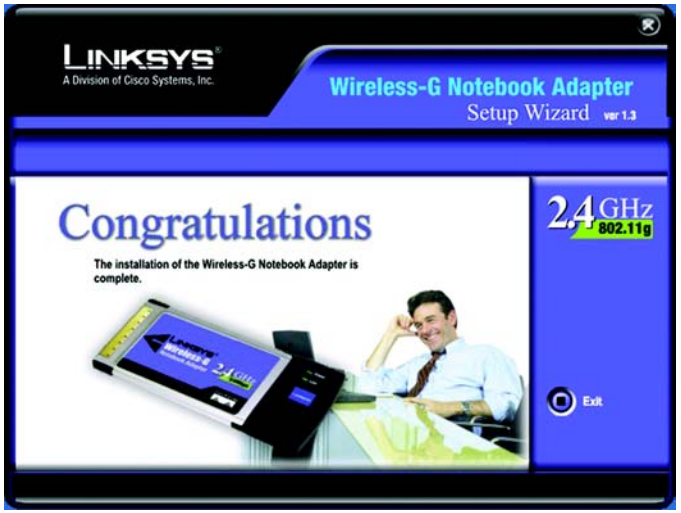

Figure 4-6: The Setup Wizard's Congratulations Screen

Chapter 5: Hardware Installation

NOTE: You must run the Setup Wizard to install the software before installing the hardware.

Connecting the Adapter

1. Turn off your notebook PC.
2. Locate an available CardBus slot on your notebook PC.
3. With the connector pin end facing the CardBus slot and the label facing up, as shown in Figure 5-1, slide the Adapter into the CardBus slot until it locks in place.
4. Restart your notebook PC. The Power LED should light up when the Adapter is installed correctly.
5. For Windows 2000, you may be informed that a digital signature has not been found. this is normal, and it has been verified that the Adapter does work with Windows 2000. Click **Yes** to continue.
6. Windows will begin copying the driver files to your computer. If Windows asks you for the original Windows CD-ROM, insert the CD-ROM, and direct Windows to its correct location (e.g., D:\).

Figure 5-1: How the Adapter installs into your notebook

The installation of the Wireless-G Notebook Adapter is complete.
If you want to check the link information, search for available wireless networks, or make additional configuration changes, go to "Chapter 6: Using the WLAN Monitor."

Chapter 6: Using the WLAN Monitor

Use the WLAN Monitor to check the link information, search for available wireless networks, or create profiles that hold different configuration settings.

Accessing the WLAN Monitor

After installing the Adapter, the Wireless-G Notebook Adapter WLAN Monitor icon will appear in your system tray. Double-click the icon.

The *Link Information* screen will appear. From this screen, you can find out how strong the current wireless signal is and how good the connection's quality is. You can also click the **More Information** button to view additional status information about the current wireless connection. To search for available wireless networks, click the **Site Survey** tab. To perform configuration changes, click the **Profiles** tab.

Figure 6-1: The WLAN Monitor icon

Link Information

The Link Information screen displays network mode, signal strength, and link quality information about the current connection. It also provides a button to click for additional status information.

Ad-Hoc Mode or **Infrastructure Mode** - The screen indicates whether the Adapter is currently working in ad-hoc or infrastructure mode.

Signal Strength - The Signal Strength bar indicates signal strength, from 0 to 100%.

Link Quality - The Link Quality bar indicates the quality of the wireless network connection, from 0 to 100%.

Click the **More Information** button to view additional information about the wireless network connection. (Figure 6-3)

Click the **X** (Close) button in the upper right corner to exit the WLAN Monitor.

Figure 6-2: Link Information

Network Settings

The Networks Settings screen provides information on your current network settings.

State - The status of the wireless network connection.

SSID - The SSID of the wireless network.

Channel - The channel to which the wireless network devices are set.

Security- The status of the security feature.

Network Mode - The wireless mode currently in use.

IP Address - The IP Address of the Adapter.

Subnet Mask - The Subnet Mask of the Adapter.

Default Gateway - The Default Gateway address of the Adapter.

DNS - The DNS address of the Adapter.

MAC - The MAC address of the wireless network's access point.

Figure 6-3: More Information-Network Settings

Click the **Statistics** button to go to the *Network Statistics* screen.

Click the **Back** button to return to the initial *Link Information* screen.

Click the **X** (Close) button in the upper right corner to exit the WLAN Monitor.

Network Statistics

The Networks Statistics screen provides statistics on your current network settings.

Figure 6-4: More Information-Network Statistics

Transmit Rate - The data transfer rate of the current connection.(In Auto mode, the Adapter dynamically shifts to the fastest data transfer rate possible at any given time.)

Receive Rate - The rate that data is received.

Authentication - The current security authentication mode.

Network Mode - The mode of the wireless network currently in use.

Transmit Total - The total number of packets being transmitted.

Receive Total - The total number of packets being received.

Signal to Noise - This tells you the quality of your signal. The higher the number, the better your signal.

Click the **Settings** button to go to the *Settings* screen.

Click the **Back** button to return to the initial *Link Information* screen.

Click the **X** (Close) button in the upper right corner to exit the WLAN Monitor.

Site Survey

The *Site Survey* screen displays a list of infrastructure and ad-hoc networks available for connection in the table on the right. This table shows the network's SSID, Channel, and the quality of the wireless signal the Adapter is receiving. You may click **SSID**, **Channel**, or **Signal**, to sort by that field.

Figure 6-5: Site Survey

Site Information

For each network selected, the following settings are listed:

Network Type - The wireless mode currently in use.

Channel - The channel to which the wireless network devices are set.

Encryption- The status of the encryption security feature.

MAC - The MAC address of the wireless network's access point.

Surveyed at - The time when the wireless network was scanned.

Refresh - Click the Refresh button to perform a new search for wireless devices.

Connect - To connect to one of the networks on the list, select the wireless network, and click the Connect button.

Click the **X** (Close) button in the upper right corner to exit the WLAN Monitor.

Profiles

The *Profiles* screen lets you save different configuration profiles for different network setups. The table on the right displays a list of infrastructure and ad-hoc networks available for connection This table shows the network's profile name and the wireless network's SSID, as set in the connection profile.

Figure 6-6: Profiles

Profile Information

For each profile selected, the following are listed:

Network Mode - The mode of the wireless network currently in use.

Transfer Rate - The Adapter is set to Auto mode, so it will dynamically shift to the fastest data transfer rate possible at any given time.

Channel - The channel to which the wireless network devices are set.

Encryption- The status of the encryption security feature.

Connect - To connect to a wireless network using a specific profile, select the profile, and click the **Connect** button.

Edit - Select a profile, and click the Edit button to change an existing profile.

New - Click the New button to create a new profile. See the next section, "Creating a New Profile," for detailed instructions.

Import - Click the **Import** button to import a profile that has been saved in another location. Select the appropriate file, and click the **Open** button.

Export - Select the profile you want to save in a different location, and click the **Export** button. Direct Windows to the appropriate folder, and click the **OK** button.

Delete - Click the **Delete** button to delete a profile.

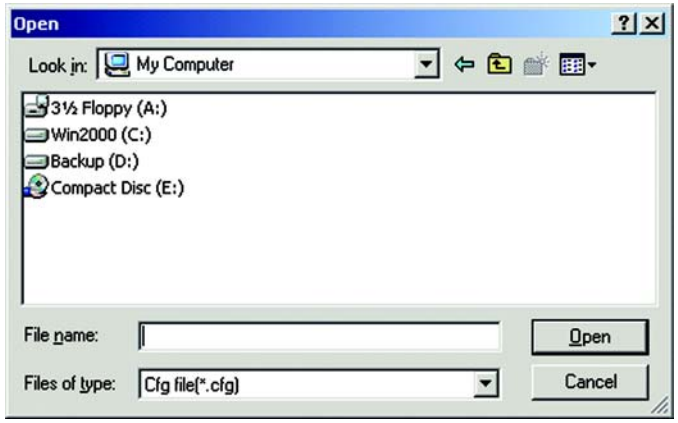

Figure 6-7: Importing a Profile

Click the **X** (Close) button in the upper right corner to exit the WLAN Monitor.

NOTE: If you want to export more than one profile, you have to export them one at a time.

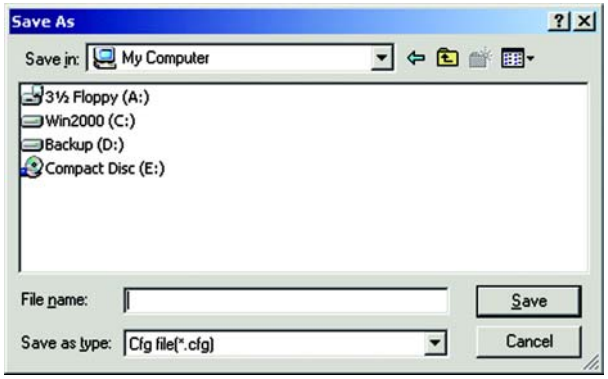

Figure 6-8: Exporting a Profile

Creating a New Profile

1. On the *Profiles* screen, click the **New** button to create a new profile.

Figure 6-9: Creating a New Profile

2. Enter a name for the new profile, and click the **OK** button. Click the **Cancel** button to return to the Profiles screen without entering a name.

Figure 6-10: Enter Profile Name

3. The *Choose a network type* screen shows a choice of two wireless modes. Click the **Infrastructure Mode** radio button if you want your wireless computers to communicate with computers on your wired network via a wireless access point. Click the **Ad-Hoc Mode** radio button if you want multiple wireless computers to communicate directly with each other. Enter the SSID for your network.

   Click the **Next** button to continue or the **Back** button to return to the previous screen.

   Infrastructure Mode - This mode allows wireless and wired networks to communicate through an access point.

   Ad-Hoc Mode - This mode allows wireless-equipped computers to communicate directly with each other. No access point is used.

   SSID - The network name. It must be used for all the devices in your wireless network. It is case sensitive. It should be a unique name to help prevent others from entering your network.

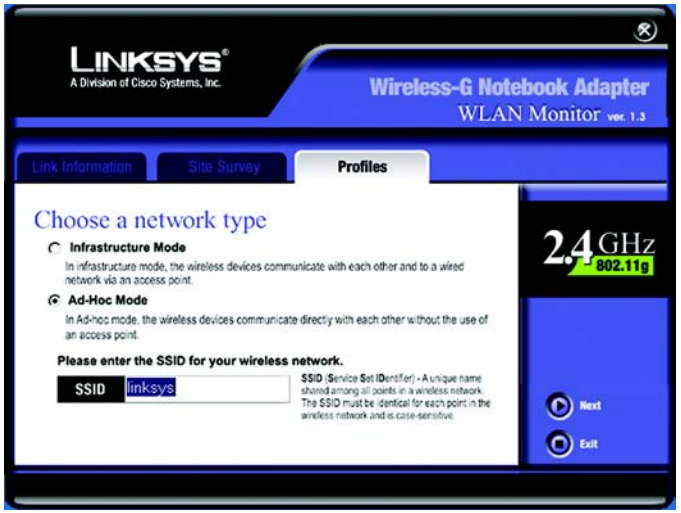

Figure 6-11: Choose a network type

4. The *Wireless Settings* screen will appear. If you chose Infrastructure Mode, go to Step 5 now. If you chose Ad-Hoc Mode, select the correct operating channel for your network from the Channel drop-down menu. Then, select the Network Mode from the drop-down menu. Click the **Next** button, and go to Step 5. Click the **Back** button to change any settings.

   Channel - The channel you choose should match the channel set on the other devices in your wireless network. If you are unsure about which channel to use, select the default channel (Channel 6).

   Network Mode - Select Mixed Mode, and both Wireless-G and Wireless-B computers will be allowed on the network, but the speed may be reduced. Select G-Only Mode for maximum speed, but no Wireless-B users will be allowed on the network. Select B-Only Mode for Wireless-B users only.

Figure 6-12: Wireless Settings for New Profile

5. The *Network Setting* screen will appear next. If your network has a DHCP server, click the radio button next to **Obtain an IP address automatically (DHCP)**. Click the **Next** button to continue, or click the **Cancel** button to return to the *Profiles* screen.

   If your network does not have a DHCP server, click the radio button next to **Specify the IP Setting**. Enter an IP Address, Subnet Mask, Default Gateway, and DNS appropriate for your network. You must specify the IP Address and Subnet Mask on this screen. If you are unsure about the Default Gateway and DNS address, leave these fields empty. Click the **Next** button to continue, or click the **Cancel** button to return to the *Profiles* screen.

   IP Address - This IP Address must be unique to your network.
   Subnet Mask - The Adapter's Subnet Mask must be the same as your wired network's Subnet Mask.
   Default Gateway - Enter the IP address of your network's Gateway here.
   DNS 1 and DNS 2 - Enter the DNS address of your (wired) Ethernet network here

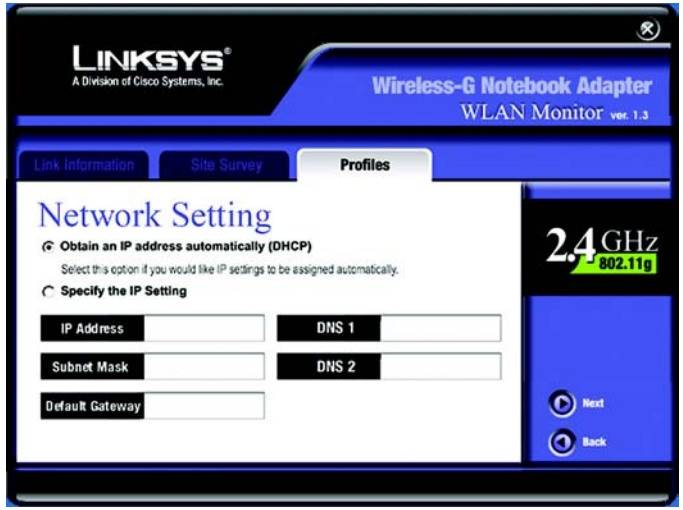

Figure 6-13: Network Setting for New Profile

6. The *Security Setting* screen will appear. Select WEP, WPA-PSK, WPA Radius, or Radius for the Encryption Method. WEP stands for Wired Equivalent Privacy, WPA-PSK stands for Wi-Fi Protected Access Pre-Shared Key, which is a security standard stronger than WEP encryption, and RADIUS stands for Remote Authentication Dial-In User Service. If you don't want to use encryption, select **Disabled**. Then, click the **Next** button to continue or the **Back** button to return to the previous screen.

WEP

WEP - To use WEP encryption, select 64-bits or 128-bit characters from the drop-down menu, and enter a passphrase or key.

Authentication -The default is set to **Auto**, where it auto-detects for **Shared Key** or **Open** system. Shared Key is when both the sender and the recipient share a WEP key for authentication. Open key is when the sender and the recipient do not share a WEP key for authentication. All points on your network must use the same authentication type.

Passphrase - Instead of manually entering a WEP key, you can enter a passphrase in the Passphrase field, so a WEP key is automatically generated. It is case-sensitive and should not be longer than 16 alphanumeric characters. This passphrase must match the passphrase of your other wireless network devices and is compatible with Linksys wireless products only. (If you have any non-Linksys wireless products, enter the WEP key manually on those products.)

Figure 6-14: Security Setting for New Profile

Transmit Key - The default transmit key number is 1. If your network's access point or wireless router uses transmit key number 2, 3, or 4, select the appropriate number from the *Transmit Key* drop-down box.

Key 1- The WEP key you enter must match the WEP key of your wireless network. If you are using 64-bit WEP encryption, then the key must consist of exactly 10 hexadecimal characters. If you are using 128-bit WEP encryption, then the key must consist of exactly 26 hexadecimal characters. Valid hexadecimal characters are "0" to "9" and "A" to "F".

Figure 6-15: WEP Settings

WPA-PSK

WPA-PSK, Wi-Fi Protected Access-Pre-Shared Key, offers two encryption methods, TKIP and AES, with dynamic encryption keys. Click the **Next** button to continue and the screen in Figure 6-17 appears. Click the **Back** button to return to the previous screen.

Figure 6-16: WPA-PSK Settings

Select the type of algorithm, **TKIP** or **AES**, for the *Encryption Type*. Enter a WPA Shared Key of 8-63 characters in the *Passphrase* field.

Figure 6-17: TKIP Settings

WPA RADIUS.

WPA RADIUS features WPA used in coordination with a RADIUS server. (This should only be used when a RADIUS server is connected to the Router.) WPA Radius offers two encryption methods, TKIP and AES, with dynamic encryption keys. It offers five authentication methods: EAP-TLS, EAP-TTLS, EAP-MD5, EAP-PEAP, and LEAP.

Click the **Next** button to continue and the screen in Figure 6-19 appears. Click the **Back** button to return to the previous screen.

Figure 6-18: WPA RADIUS Settings

Select the type of algorithm, **TKIP** or **AES**, for the *Encryption Type*.

Click the **Next** button to continue. Click the **Back** button to return to the previous screen.

Figure 6-19: TKIP Settings

The screen in Figure 6-20 appears next. Select the *Authentication Method* from the drop-down menu. The options are described below.

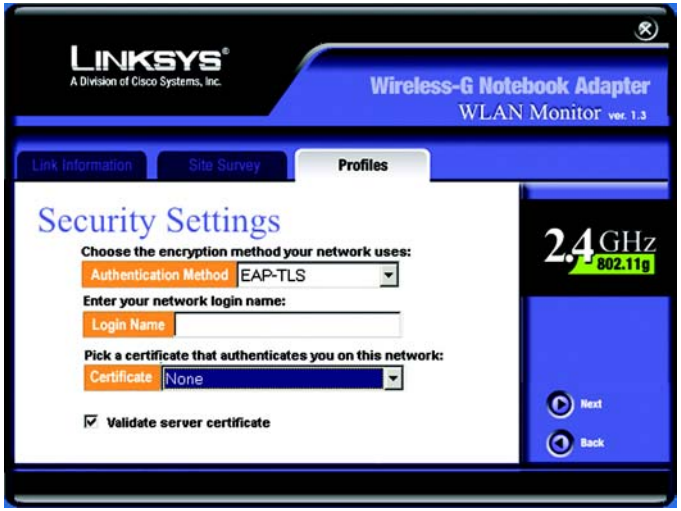

Figure 6-20: EAP-TLS Authentication

EAP-TLS

Enter the Login name of your wireless network in the *Login Name* field. From the *Certificate* drop-down menu, select the certificate you have installed to authenticate you on your wireless network. Select **Validate server cerificate** to make sure that the certificate for the server is valid.

Click the **Next** button to continue. Click the **Back** button to return to the previous screen.

Figure 6-21: EAP-TTLS Authentication

EAP-TTLS

Enter the Login name of your wireless network in the *Login Name* field. Enter the password of your wireless network in the *Password* field. Select **Validate server cerificate** to make sure that the certificate for the server is valid. Select the *TTLS Protocol* from the drop-down menu.

Click the **Next** button to continue. Click the **Back** button to return to the previous screen.

EAP-MD5

Enter the Login name of your wireless network in the *Login Name* field. Enter the password of your wireless network in the *Password* field.

Click the **Next** button to continue. Click the **Back** button to return to the previous screen.

Figure 6-22: EAP-MD5 Authentication

EAP-PEAP

Enter the Login name of your wireless network in the *Login Name* field. Enter the password of your wireless network in the *Password* field. Select **Validate server cerificate** to make sure that the certificate for the server is valid. Then, select the *Peap Inner EAP* from the drop-down menu.

Click the **Next** button to continue. Click the **Back** button to return to the previous screen.

Figure 6-23: EAP-PEAP Authentication

LEAP

Enter the Login name of your wireless network in the *Login Name* field. Enter the password of your wireless network in the *Password* field.

Click the **Next** button to continue. Click the **Back** button to return to the previous screen.

Figure 6-24: EAP-LEAP Authentication

RADIUS

RADIUS features WPA used in coordination with a RADIUS server. (This should only be used when a RADIUS server is connected to the Router.) It offers five authentication methods: EAP-TLS, EAP-TTLS, EAP-MD5, EAP-PEAP, and LEAP.

Click the **Next** button to continue and the screen in Figure 6-19 appears. Click the **Back** button to return to the previous screen.

Figure 6-25: RADIUS Settings

The screen in Figure 6-26 appears next. Select the *Authentication Method* from the drop-down menu. The options are described below.

EAP-TLS

Enter the Login name of your wireless network in the *Login Name* field. From the *Certificate* drop-down menu, select the certificate you have installed to authenticate you on your wireless network. Select **Validate server cerificate** to make sure that the certificate for the server is valid.

Click the **Next** button to continue. Click the **Back** button to return to the previous screen.

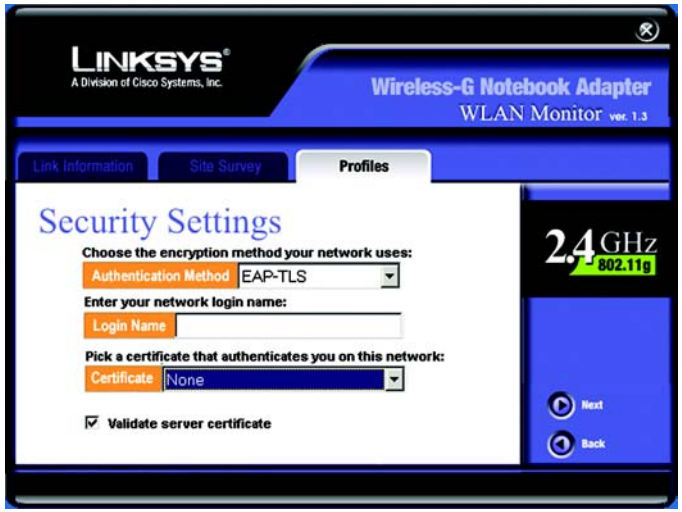

Figure 6-26: EAP-TLS Authentication

EAP-TTLS

Enter the Login name of your wireless network in the *Login Name* field. Enter the password of your wireless network in the *Password* field. Select **Validate server cerificate** to make sure that the certificate for the server is valid. Select the *TTLS Protocol* from the drop-down menu.

Click the **Next** button to continue. Click the **Back** button to return to the previous screen.

Figure 6-27: EAP-TTLS Authentication

EAP-MD5

Enter the Login name of your wireless network in the *Login Name* field. Enter the password of your wireless network in the *Password* field.

Click the **Next** button to continue. Click the **Back** button to return to the previous screen.

Figure 6-28: EAP-MD5 Authentication

EAP-PEAP

Enter the Login name of your wireless network in the *Login Name* field. Enter the password of your wireless network in the *Password* field. Select **Validate server cerificate** to make sure that the certificate for the server is valid. Then, select the *Peap Inner EAP* from the drop-down menu.

Click the **Next** button to continue. Click the **Back** button to return to the previous screen.

Figure 6-29: EAP-PEAP Authentication

LEAP

Enter the Login name of your wireless network in the *Login Name* field. Enter the password of your wireless network in the *Password* field.

Click the **Next** button to continue. Click the **Back** button to return to the previous screen.

Figure 6-30: LEAP Authentication

7. The *Confirm New Settings* screen will appear next showing the new settings. To save the new settings, click the **Yes** button. To edit the new settings, click the **Back** button.

Figure 6-31: Confirm New Settings for New Profile

8. The *Congratulations* screen will appear next. Click **Activate new settings now** to implement the new settings immediately and return to the *Link Information* screen. Click **Activate new settings later** to keep the current settings active and return to the *Profiles* screen.

You have successfully created a connection profile.

Click the X (Close) button in the upper right corner to exit the WLAN Monitor.

Figure 6-32: Congratulations for New Profile

Appendix A: Troubleshooting

This appendix consists of two parts: “Common Problems and Solutions” and “Frequently Asked Questions.” This appendix provides solutions to problems that may occur during the installation and operation of the Wireless-G Notebook Adapter. Read the description below to solve your problems. If you can't find an answer here, check the Linksys website at *www.linksys.com*.

Common Problems and Solutions

1. ***My computer does not recognize the Wireless-G Notebook Adapter.***
   Make sure that the Wireless-G Notebook Adapter is properly inserted into the PC Card slot.

2. ***The Wireless-G Notebook Adapter does not work properly.***
   Reinsert the Wireless-G Notebook Adapter into the notebook or desktop’s USB port.
   For Windows 98SE or Me, right-click on **My Computer**, and select **Properties**. Select the **Device Manager** tab, and click on the **Network Adapter**. You will find the Wireless-G Notebook Adapter if it is installed successfully. If you see a yellow exclamation mark, the resources may be conflicting and you must follow the steps below:
   - Uninstall the driver software from your PC.
   - Restart your PC and repeat the hardware and software installation as specified in this User Guide.

3. ***I cannot communicate with the other computers linked via Ethernet in the Infrastructure configuration.***
   Make sure that the notebook or desktop is powered on.
   Make sure that the Wireless-G Notebook Adapter is configured with the same SSID and WEP settings as the other computers in the Infrastructure configuration.

Frequently Asked Questions

Can I run an application from a remote computer over the wireless network?
This will depend on whether or not the application is designed to be used over a network. Consult the application's user guide to determine if it supports operation over a network.

Can I play computer games with other members of the wireless network?
Yes, as long as the game supports multiple players over a LAN (local area network). Refer to the game's user guide for more information.

What is the IEEE 802.11b standard?
It is one of the IEEE standards for wireless networks. The 802.11b standard allows wireless networking hardware from different manufacturers to communicate, provided that the hardware complies with the 802.11b standard. The 802.11b standard states a maximum data transfer rate of 11Mbps and an operating frequency of 2.4GHz.

mbps: *one million bits per second; a unit of measurement for data transmission.*

What IEEE 802.11b features are supported?
The product supports the following IEEE 802.11b functions:

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

fragmentation: *breaking a packet into smaller units when transmitting over a network medium that cannot support the original size of the packet.*

What is ad-hoc mode?
When a wireless network is set to ad-hoc mode, the wireless-equipped computers are configured to communicate directly with each other. The ad-hoc wireless network will not communicate with any wired network.

What is infrastructure mode?
When a wireless network is set to infrastructure mode, the wireless network is configured to communicate with a wired network through a wireless access point.

What is roaming?
Roaming is the ability of a portable computer user to communicate continuously while moving freely throughout an area greater than that covered by a single access point. Before using the roaming function, the workstation must make sure that it is the same channel number with the access point of dedicated coverage area.

To achieve true seamless connectivity, the wireless LAN must incorporate a number of different functions. Each node and access point, for example, must always acknowledge receipt of each message. Each node must

maintain contact with the wireless network even when not actually transmitting data. Achieving these functions simultaneously requires a dynamic RF networking technology that links access points and nodes. In such a system, the user's end node undertakes a search for the best possible access to the system. First, it evaluates such factors as signal strength and quality, as well as the message load currently being carried by each access point and the distance of each access point to the wired backbone. Based on that information, the node next selects the right access point and registers its address. Communications between end node and host computer can then be transmitted up and down the backbone.

As the user moves on, the end node's RF transmitter regularly checks the system to determine whether it is in touch with the original access point or whether it should seek a new one. When a node no longer receives acknowledgment from its original access point, it undertakes a new search. Upon finding a new access point, it then re-registers, and the communication process continues.

What is ISM band?

The FCC and their counterparts outside of the U.S. have set aside bandwidth for unlicensed use in the ISM (Industrial, Scientific and Medical) band. Spectrum in the vicinity of 2.4 GHz, in particular, is being made available worldwide. This presents a truly revolutionary opportunity to place convenient high-speed wireless capabilities in the hands of users around the globe.

ism band: *radio bandwidth utilized in wireless transmissions.*

What is Spread Spectrum?

Spread Spectrum technology is a wideband radio frequency technique developed by the military for use in reliable, secure, mission-critical communications systems. It is designed to trade off bandwidth efficiency for reliability, integrity, and security. In other words, more bandwidth is consumed than in the case of narrowband transmission, but the trade-off produces a signal that is, in effect, louder and thus easier to detect, provided that the receiver knows the parameters of the spread-spectrum signal being broadcast. If a receiver is not tuned to the right frequency, a spread-spectrum signal looks like background noise. There are two main alternatives, Direct Sequence Spread Spectrum (DSSS) and Frequency Hopping Spread Spectrum (FHSS).

spread spectrum: *wideband radio frequency technique used for more reliable and secure data transmission.*

dsss: *Frequency transmission with a redundant bit pattern resulting in a lower probability of information being lost in transit.*

What is DSSS? What is FHSS? And what are their differences?

Frequency-Hopping Spread-Spectrum (FHSS) uses a narrowband carrier that changes frequency in a pattern that is known to both transmitter and receiver. Properly synchronized, the net effect is to maintain a single logical channel. To an unintended receiver, FHSS appears to be short-duration impulse noise. Direct-Sequence Spread-Spectrum (DSSS) generates a redundant bit pattern for each bit to be transmitted. This bit pattern is called a chip (or chipping code). The longer the chip, the greater the probability that the original data can be recovered. Even if one or more bits in the chip are damaged during transmission, statistical techniques embedded in the radio can recover the original data without the need for retransmission. To an unintended receiver, DSSS appears as low power wideband noise and is rejected (ignored) by most narrowband receivers.

Would the information be intercepted while transmitting on air?

WLAN features two-fold protection in security. On the hardware side, as with Direct Sequence Spread Spectrum technology, it has the inherent security feature of scrambling. On the software side, WLAN offers the encryption function (WEP) to enhance security and access control.

What is WEP?

WEP is Wired Equivalent Privacy, a data privacy mechanism based on a shared key algorithm, as described in the IEEE 802.11 standard.

Appendix B: Wireless Security

Linksys wants to make wireless networking as safe and easy for you as possible. The current generation of Linksys products provide several network security features, but they require specific action on your part for implementation. So, keep the following in mind whenever you are setting up or using your wireless network.

Security Precautions

The following is a complete list of security precautions to take (at least steps 1 through 5 should be followed):

1. Change the default SSID.
2. Disable SSID Broadcast.
3. Change the default password for the Administrator account.
4. Enable MAC Address Filtering.
5. Change the SSID periodically.
6. Use the highest encryption algorithm possible. Use WPA if it is available. Please note that this may reduce your network performance.
7. Change the WEP encryption keys periodically.

Note: Some of these security features are available only through the network router or access point. Refer to the router or access point's documentation for more information.

Security Threats Facing Wireless Networks

Wireless networks are easy to find. Hackers know that in order to join a wireless network, wireless networking products first listen for "beacon messages". These messages can be easily decrypted and contain much of the network's information, such as the network's SSID (Service Set Identifier). Here are the steps you can take:

Change the administrator's password regularly. With every wireless networking device you use, keep in mind that network settings (SSID, WEP keys, etc.) are stored in its firmware. Your network administrator is the only person who can change network settings. If a hacker gets a hold of the administrator's password, he, too, can change those settings. So, make it harder for a hacker to get that information. Change the administrator's password regularly.

SSID. There are several things to keep in mind about the SSID:

1. Disable Broadcast

2. Make it unique

3. Change it often

Most wireless networking devices will give you the option of broadcasting the SSID. While this option may be more convenient, it allows anyone to log into your wireless network. This includes hackers. So, don't broadcast the SSID.

Wireless networking products come with a default SSID set by the factory. (The Linksys default SSID is "linksys".) Hackers know these defaults and can check these against your network. Change your SSID to something unique and not something related to your company or the networking products you use.

Change your SSID regularly so that any hackers who have gained access to your wireless network will have to start from the beginning in trying to break in.

MAC Addresses. Enable MAC Address filtering. MAC Address filtering will allow you to provide access to only those wireless nodes with certain MAC Addresses. This makes it harder for a hacker to access your network with a random MAC Address.

WEP Encryption. Wired Equivalent Privacy (WEP) is often looked upon as a cure-all for wireless security concerns. This is overstating WEP's ability. Again, this can only provide enough security to make a hacker's job more difficult.

There are several ways that WEP can be maximized:

1. Use the highest level of encryption possible

2. Use "Shared Key" authentication

3. Change your WEP key regularly

WPA. Wi-Fi Protected Access (WPA) is the newest and best available standard in Wi-Fi security. Three modes are available: Radius-PSK, WPA Radius, and Radius. Radius-PSK gives you a choice of two encryption methods: TKIP (Temporal Key Integrity Protocol), which utilizes a stronger encryption method and incorporates Message Integrity Code (MIC) to provide protection against hackers, and AES (Advanced Encryption System), which utilizes a symmetric 128-Bit block data encryption. WPA RADIUS offers two encryption methods, TKIP and AES, with dynamic encryption keys. RADIUS (Remote Authentication Dial-In User Service) utilizes a RADIUS server for authentication.

Important: Always remember that each device in your wireless network MUST use the same encryption method and encryption key or your wireless network will not function properly.

WPA-PSK. If you do not have a RADIUS server, Select the type of algorithm, TKIP or AES, and enter a password in the Passphrase field of 8-63 characters.

WPA RADIUS. WPA used in coordination with a RADIUS server. (This should only be used when a RADIUS server is connected to the Router or other device.) WPA Radius offers two encryption methods, TKIP and AES, with dynamic encryption keys.

RADIUS. WEP used in coordination with a RADIUS server. (This should only be used when a RADIUS server is connected to the Router or other device.)

Implementing encryption may have a negative impact on your network's performance, but if you are transmitting sensitive data over your network, encryption should be used.

These security recommendations should help keep your mind at ease while you are enjoying the most flexible and convenient technology Linksys has to offer.

Appendix C: Windows Help

All wireless products require Microsoft Windows. Windows is the most used operating system in the world and comes with many features that help make networking easier. These features can be accessed through Windows Help and are described in this appendix.

TCP/IP

Before a computer can communicate with an access point or wireless router, TCP/IP must be enabled. TCP/IP is a set of instructions, or protocol, all PCs follow to communicate over a network. This is true for wireless networks as well. Your PCs will not be able to utilize wireless networking without having TCP/IP enabled. Windows Help provides complete instructions on enabling TCP/IP.

Shared Resources

If you wish to share printers, folder, or files over your network, Windows Help provides complete instructions on utilizing shared resources.

Network Neighborhood/My Network Places

Other PCs on your network will appear under Network Neighborhood or My Network Places (depending upon the version of Windows you're running). Windows Help provides complete instructions on adding PCs to your network.

Appendix D: Glossary

802.11b - An IEEE wireless networking standard that specifies a maximum data transfer rate of 11Mbps and an operating frequency of 2.4GHz.

Adapter - A device that adds network functionality to your PC.

Ad-hoc - A group of wireless devices communicating directly with each other (peer-to-peer) without the use of an access point.

Backbone - The part of a network that connects most of the systems and networks together, and handles the most data.

Bandwidth - The transmission capacity of a given device or network.

Bit - A binary digit.

Boot - To start a device and cause it to start executing instructions.

CSMA/CA (**C**arrier **S**ense **M**ultiple **A**ccess/**C**ollision **A**voidance) - A method of data transfer that is used to prevent data collisions.

Default Gateway - A device that forwards Internet traffic from your local area network.

DHCP (**D**ynamic **H**ost **C**onfiguration **P**rotocol) - A networking protocol that allows administrators to assign temporary IP addresses to network computers by "leasing" an IP address to a user for a limited amount of time, instead of assigning permanent IP addresses.

DNS (**D**omain **N**ame **S**erver) - The IP address of your ISP's server, which translates the names of websites into IP addresses.

DSSS (**D**irect-**S**equence **S**pread-**S**pectrum) - Frequency transmission with a redundant bit pattern resulting in a lower probability of information being lost in transit.

Encryption - Encoding data transmitted in a network.

Ethernet - IEEE standard network protocol that specifies how data is placed on and retrieved from a common transmission medium.

Fragmentation -Breaking a packet into smaller units when transmitting over a network medium that cannot support the original size of the packet.

Hardware - The physical aspect of computers, telecommunications, and other information technology devices.

IEEE (The **I**nstitute of **E**lectrical and **E**lectronics **E**ngineers) - An independent institute that develops networking standards.

Infrastructure - A wireless network that is bridged to a wired network via an access point.

IP (**I**nternet **P**rotocol) - A protocol used to send data over a network.

IP Address - The address used to identify a computer or device on a network.

ISM band - Radio bandwidth utilized in wireless transmissions.

ISP (**I**nternet **S**ervice **P**rovider) - A company that provides access to the Internet.

LAN - The computers and networking products that make up your local network.

MAC (**M**edia **A**ccess **C**ontrol) **Address** - The unique address that a manufacturer assigns to each networking device.

Mbps (**M**ega**B**its **P**er **S**econd) - One million bits per second; a unit of measurement for data transmission.

Network - A series of computers or devices connected for the purpose of data sharing, storage, and/or transmission between users.

Node - A network junction or connection point, typically a computer or work station.

Packet - A unit of data sent over a network.

Passphrase - Used much like a password, a passphrase simplifies the WEP encryption process by automatically generating the WEP encryption keys for Linksys products.

Port - The connection point on a computer or networking device used for plugging in cables or adapters.

Roaming - The ability to take a wireless device from one access point's range to another without losing the connection.

Router - A networking device that connects multiple networks together.

RTS (**R**equest **T**o **S**end) - A networking method of coordinating large packets through the RTS Threshold setting.

Server - Any computer whose function in a network is to provide user access to files, printing, communications, and other services.

Software - Instructions for the computer. A series of instructions that performs a particular task is called a "program".

Spread Spectrum - Wideband radio frequency technique used for more reliable and secure data transmission.

SSID (**S**ervice **S**et **ID**entifier) - Your wireless network's name.

Subnet Mask - An address code that determines the size of the network.

Switch - 1. A data switch that connects computing devices to host computers, allowing a large number of devices to share a limited number of ports. 2. A device for making, breaking, or changing the connections in an electrical circuit.

TCP (**T**ransmission **C**ontrol **P**rotocol) - A network protocol for transmitting data that requires acknowledgement from the recipient of data sent.

TCP/IP (**T**ransmission **C**ontrol **P**rotocol/**I**nternet **P**rotocol) - A set of instructions PCs use to communicate over a network.

Throughput - The amount of data moved successfully from one node to another in a given time period.

Topology - The physical layout of a network.

WEP (**W**ired **E**quivalent **P**rivacy) - A method of encrypting network data transmitted on a wireless network for greater security.

WLAN (**W**ireless **L**ocal **A**rea **N**etwork) - A group of computers and associated devices that communicate with each other wirelessly.

Appendix E: Specifications

Standards	IEEE 802.11g, IEEE 802.11b
Channels	11 Channels (USA, Canada) 13 Channels (Europe) 14 Channels (Japan)
LEDs	Power, Link
Transmit Power	15 dBm
Protocols	802.11b: CCK (11 Mbps), DQPSK (2 Mbps), DBPSK (1 Mbps); 802.11g: OFDM
Network Protocols	TCP/IP, IPX/SPX, NetBEUI
Security Features	WEP, AES, TKIP, 802.1x
WEP Key Bits	64, 128 Bit
Dimensions	4.53" x 2.13" x 0.30" (115 mm x 54 mm x 7.5 mm)
Unit Weight	1.66 oz. (0.047 kg.)
Certifications	FCC
Operating Temp.	32ºF to 131ºF (0ºC to 55ºC)
Storage Temp.	-13ºF to 158ºF (-25ºC to 70ºC)
Operating Humidity	5% to 95%, Non-Condensing
Storage Humidity	5% to 95%, Non-Condensing

Appendix F: Warranty Information

LIMITED WARRANTY

Linksys warrants to You that, for a period of three years (the “Warranty Period”), your Linksys Product will be substantially free of defects in materials and workmanship under normal use. Your exclusive remedy and Linksys' entire liability under this warranty will be for Linksys at its option to repair or replace the Product or refund Your purchase price less any rebates. This limited warranty extends only to the original purchaser.

If the Product proves defective during the Warranty Period call Linksys Technical Support in order to obtain a Return Authorization Number, if applicable. BE SURE TO HAVE YOUR PROOF OF PURCHASE ON HAND WHEN CALLING. If You are requested to return the Product, mark the Return Authorization Number clearly on the outside of the package and include a copy of your original proof of purchase. RETURN REQUESTS CANNOT BE PROCESSED WITHOUT PROOF OF PURCHASE. You are responsible for shipping defective Products to Linksys. Linksys pays for UPS Ground shipping from Linksys back to You only. Customers located outside of the United States of America and Canada are responsible for all shipping and handling charges.

ALL IMPLIED WARRANTIES AND CONDITIONS OF MERCHANTABILITY OR FITNESS FOR A PARTICULAR PURPOSE ARE LIMITED TO THE DURATION OF THE WARRANTY PERIOD. ALL OTHER EXPRESS OR IMPLIED CONDITIONS, REPRESENTATIONS AND WARRANTIES, INCLUDING ANY IMPLIED WARRANTY OF NON-INFRINGEMENT, ARE DISCLAIMED. Some jurisdictions do not allow limitations on how long an implied warranty lasts, so the above limitation may not apply to You. This warranty gives You specific legal rights, and You may also have other rights which vary by jurisdiction.

This warranty does not apply if the Product (a) has been altered, except by Linksys, (b) has not been installed, operated, repaired, or maintained in accordance with instructions supplied by Linksys, or (c) has been subjected to abnormal physical or electrical stress, misuse, negligence, or accident. In addition, due to the continual development of new techniques for intruding upon and attacking networks, Linksys does not warrant that the Product will be free of vulnerability to intrusion or attack.

TO THE EXTENT NOT PROHIBITED BY LAW, IN NO EVENT WILL LINKSYS BE LIABLE FOR ANY LOST DATA, REVENUE OR PROFIT, OR FOR SPECIAL, INDIRECT, CONSEQUENTIAL, INCIDENTAL OR PUNITIVE DAMAGES, REGARDLESS OF THE THEORY OF LIABILITY (INCLUDING NEGLIGENCE), ARISING OUT OF OR RELATED TO THE USE OF OR INABILITY TO USE THE PRODUCT (INCLUDING ANY SOFTWARE), EVEN IF LINKSYS HAS BEEN ADVISED OF THE POSSIBILITY OF SUCH DAMAGES. IN NO EVENT WILL LINKSYS’ LIABILITY EXCEED THE AMOUNT PAID BY YOU FOR THE PRODUCT. The foregoing limitations will apply even if any warranty or remedy provided under this Agreement fails of its essential purpose. Some jurisdictions do not allow the exclusion or limitation of incidental or consequential damages, so the above limitation or exclusion may not apply to You.

Please direct all inquiries to: Linksys, P.O. Box 18558, Irvine, CA 92623.

Appendix G: Regulatory Information

FCC STATEMENT

This equipment has been tested and found to comply with the limits for a Class B digital device, pursuant to Part 15 of the FCC Rules. These limits are designed to provide reasonable protection against harmful interference in a residential installation. This equipment generates, uses and can radiate radio frequency energy and, if not installed and used in accordance with the instructions, may cause harmful interference to radio communications. However, there is no guarantee that interference will not occur in a particular installation. If this equipment does cause harmful interference to radio or television reception, which can be determined by turning the equipment off and on, the user is encouraged to try to correct the interference by one of the following measures.

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

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.

FCC Caution: Any changes or modifications not expressly approved by the party responsible for compliance could void the user's authority to operate this equipment.

IMPORTANT NOTE:
FCC Radiation Exposure Statement:
This equipment complies with FCC radiation exposure limits set forth for an uncontrolled environment. End users must follow the specific operating instructions for satisfying RF exposure compliance.

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

Linksys declared that WPC54G V5 is limited in CH1~11 from 2400 to 2483.5 MHz by specified firmware controlled in USA.

This equipment has been SAR-evaluated for use in notebooks with side slot configuration.

CANADA STATEMENT

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

To prevent radio interference to the licensed service, this device is intended to be operated indoors and away from windows to provide maximum shielding. Equipment (or its transmit antenna) that is installed outdoors is subject to licensing.

EC DECLARATION OF CONFORMITY (EUROPE)

Linksys declares that the Wireless-G Notebook Adapter conforms to the specifications listed below, following the provisions of the European R&TTE directive 1999/5/EC:

EN 301 489-1, 301 489-17 General EMC requirements for Radio equipment.

EN 609 50 Safety

EN 300-328-1, EN 300-328-2 Technical requirements for Radio equipment.

Caution: This equipment is intended to be used in all EU and EFTA countries. Outdoor use may be restricted to certain frequencies and/or may require a license for operation. Contact local Authority for procedure to follow.

Note: Combinations of power levels and antennas resulting in a radiated power level of above 100 mW equivalent isotropic radiated power (EIRP) are considered as not compliant with the above mentioned directive and are not allowed for use within the European community and countries that have adopted the European R&TTE directive 1999/5/EC.

For more details on legal combinations of power levels and antennas, contact Linksys Corporate Compliance.
Linksys vakuuttaa täten että Wireless-G Notebook Adapter tyyppinen laite on direktiivin 1999/5/EY oleellisten vaatimusten ja sitä koskevien näiden direktiivien muiden ehtojen mukainen.

Linksys Group déclare la Passerelle ADSL sans fil-B est conforme aux conditions essentielles et aux dispositions relatives à la directive 1999/5/EC.

Belgique:
Dans le cas d'une utilisation privée, à l'extérieur d'un bâtiment, au-dessus d'un espace public, aucun enregistrement n'est nécessaire pour une distance de moins de 300m. Pour une distance supérieure à 300m un enregistrement auprès de l'IBPT est requise. Pour une utilisation publique à l'extérieur de bâtiments, une licence de l'IBPT est requise. Pour les enregistrements et licences, veuillez contacter l'IBPT.

France:
2.4 GHz Bande : les canaux 10, 11, 12, 13 (2457, 2462, 2467, et 2472 MHz respectivement) sont complétement libres d'utilisation en France (en utilisation intérieur). Pour ce qui est des autres canaux, ils peuvent être soumis à autorisation selon le départment. L'utilisation en extérieur est soumis à autorisation préalable et très restreint. Vous pouvez contacter l'Autorité de Régulation des Télécommunications (http://www.art-telecom.fr) pour de plus amples renseignements.

Appendix H: Contact Information

Need to contact Linksys? Visit us online for information on the latest products and updates to your existing products at:	http://www.linksys.com or ftp.linksys.com
Can't find information about a product you want to buy on the web? Do you want to know more about networking with Linksys products? Give our advice line a call at:	800-546-5797 (LINKSYS)
Or fax your request in to:	949-261-8868
If you experience problems with any Linksys product, you can call us at:	800-326-7114
Don't wish to call? You can e-mail us at:	support@linksys.com
If any Linksys product proves defective during its warranty period, you can call the Linksys Return Merchandise Authorization department for obtaining a Return Authorization Number at: (Details on Warranty and RMA issues can be found in the Warranty Information section in this Guide.)	949-261-1288