LINKSYS®

A Division of Cisco Systems, Inc.

2.4GHz 802.11b

Wireless-B Broadband Router User Guide

WIRELESS

Model No. **BEFW11S4**

CISCO SYSTEMS

•Federal Communication Commission Interference Statement
•This equipment has been tested and found to comply with the limits for a Class B digital device, pursuant to Part 15 of the FCC Rules. These limits are designed to provide reasonable protection against harmful interference in a residential installation. This equipment generates, uses and can radiate radio frequency energy and, if not installed and used in accordance with the instructions, may cause harmful interference to radio communications. However, there is no guarantee that interference will not occur in a particular installation. If this equipment does cause harmful interference to radio or television reception, which can be determined by turning the equipment off and on, the user is encouraged to try to correct the interference by one of the following measures:
•
•-•Reorient or relocate the receiving antenna.
•-•Increase the separation between the equipment and receiver.
•-•Connect the equipment into an outlet on a circuit different from that
•to which the receiver is connected.
•-•Consult the dealer or an experienced radio/TV technician for help.
•
•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. This equipment should be installed and operated with minimum distance 20cm between the radiator & your body.
•This transmitter must not be co-located or operating in conjunction with any other antenna or transmitter.
•
•Linksys declared that BEFW11S4 V4 is limited in CH1~11 by specified firmware controlled in USA.

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How to Use this User Guide

This User Gudie has been designed to make understanding networking with the Wireless-B Broadband Router easier than ever. Look for the following items when reading this User Guide:

This checkmark means there is a note of interest and is something you should pay special attention to while using the Wireless-B Broadband Router.

This exclamation point means there is a caution or warning and is something that could damage your property or the Wireless-B Broadband Router.

This question mark provides you with a reminder about something you might need to do while using the Wireless-B Broadband Router.

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 Linksys Wireless-B Broadband Router. Think of the Linksys Wireless-B Broadband Router as a kind of "splitter" for your Internet connection. Just connect your DSL or Cable Modem to the Router, and all the computers in your household can share the Internet -- all at the same time. You can connect your home computers directly to the Router with Ethernet cables, or put wireless network adapters in them and communicate over radio waves, saving the trouble and expense of running cables through your house.

***LAN** (Local Area Network): The computers and networking products that make up the network in your home or office*

Once your computers are connected to the Router, they can communicate with each other too, sharing resources and files. All your computers can print on a shared printer connected anywhere in the house. And your computers can share all kinds of files -- music, digital pictures, and documents. Keep all your digital music on one computer, and listen to it anywhere in the house. Organize all of your family's digital pictures in one place, to simplify finding the ones you want, and easing backup to CD-R. Play head-to-head computer games within the household, or against Internet opponents. Utilize extra free space on one computer when another's hard drive starts to fill up.

Your home network is secure, too. All wireless communications are protected by 128-bit encryption. The Router helps keep intruders out of your computers.

It's all easier than you think -- the included Setup Wizard takes you through configuring your network, step by step. With the Linksys Wireless-B Broadband Router at the heart of your home network, you don't need to be a networking genius to share printers, files, and your Internet connection -- with or without wires.

What's in this Guide?

This user guide covers the steps for setting up and using the Wireless-B Media Adapter.

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

- Chapter 2: Planning your Wireless Network
  This chapter describes the basics of wireless networking.

- Chapter 3: Getting to Know the Wireless-B Broadband Router
  This chapter describes the physical features of the Router.

- Chapter 4: Connecting the Wireless-B Broadband Router
  This chapter instructs you on how to connect the Router to your network.

- Chapter 5: Configuring the Wireless-B Broadband Router
  This chapter explains how to use the Web-Based Utility to configure the settings on the Wireless-B Broadband Router.

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

- Appendix B: Wireless Security
  This appendix explains the risks of wireless networking and some solutions to reduce the risks.

- Appendix C: Upgrading Firmware
  This appendix instructs you on how to upgrade the firmware on your Router if you should need to do so.

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

- Appendix E: Finding the MAC Address and IP Address for your Ethernet Adapter.
  This appendix describes how to find the MAC address for your computer's Ethenet adapter so you can use the MAC filtering and/or MAC address cloning feature of the Router.

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

- Appendix G: Specifications
  This appendix provides the technical specifications for the Router.

- Appendix H: Warranty Information
  This appendix supplies the warranty information for the Router..

- Appendix I: Regulatory Information
  This appendix supplies the regulatory information regarding the Router..

- Appendix J: 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 LAN is a group of computers, each equipped with one Linksys wireless adapter. Computers in a wireless LAN must be configured to share the same radio channel.

***LAN**: the computers and networking products that make up your local network*

The Linksys wireless adapters provide access to a wired LAN for wireless workstations. An integrated wireless and wired LAN is called an infrastructure configuration. A group of Linksys wireless adapter users and a Wireless-B Broadband Router compose a Basic Service Set (BSS). Each Linksys wireless adapter PC in a BSS can talk to any computer in a wired LAN infrastructure via the Wireless-B Broadband Router.

An infrastructure configuration extends the accessibility of a Linksys wireless adapter PC to a wired LAN, and doubles the effective wireless transmission range for two Linksys wireless adapter PCs. Since the Wireless-B Broadband Router is able to forward data within its BSS, the effective transmission range in an infrastructure LAN is doubled.

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

Roaming

Infrastructure mode also supports roaming capabilities for mobile users. More than one BSS can be configured as an Extended Service Set (ESS). This continuous network allows users to roam freely within an ESS. All PCs equipped with a Linksys wireless adapter within one ESS must be configured with the same ESS ID and use the same radio channel.

Before enabling an ESS with roaming capability, choosing a feasible radio channel and optimum Wireless-B Broadband Router position is recommended. Proper router positioning combined with a clear radio signal will greatly enhance performance.

Network Layout

The Wireless-B Broadband Router is compatible with all 802.11b adapters, such as the PC Card (WPC11) for your laptop computers, PCI Card (WMP11) for your desktop PC, and USB Adapter (WUSB11) for when you want to enjoy USB connectivity. The Router will also communicate with the wireless PrintServer (WPS11) and bridges (WET11).

When you wish to connect your wired network with your wireless network, the Wireless-B Broadband Router's LAN port can be connected to any of Linksys's switches (such as the EZXS55W or EZXS88W).

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 products that work with the Wireless-B Broadband Router.

Chapter 3: Getting to Know the Wireless-B Broadband Router

The Back Panel

The Broadband Router's ports, where the cables are connected, are located on the back panel.

Figure 3-1: The Broadband Router's Back Panel

Reset Button There are two ways to reset the Broadband Router's factory defaults. Either press the **Reset Button**, for approximately ten seconds, or restore the defaults from the Password tab in the Web-based Utility.

Internet The **Internet** port is where you will connect your broadband Internet connection.

1, 2, 3, 4 These ports (1, 2, 3, 4) connect the Broadband Router to your networked PCs and other Ethernet network devices.

Power The **Power** port is where you will connect the power adapter.

Important: Resetting the Broadband Router will erase all of your settings (WEP Encryption, Wireless and LAN settings, etc.) and replace them with the factory defaults. Do not reset the Broadband Router if you want to retain these settings.

The Front Panel

The Router's LEDs, where information about network activity is displayed, are located on the front panel.

Figure 3-2: The Broadband Router's Front Panel

Power Green. The **Power** LED lights up and will stay on while the Router is powered on. When the Router goes through its self-diagnosis mode during every boot-up, this LED will blink, then stop when the diagnosis is complete.

Wireless-B Green. The **Wireless-B** LED lights up when there is a wireless connection. If the LED is blinking, the Broadband Router is actively sending or receiving data over the network.

1, 2, 3, 4 Green. These numbered LEDs, corresponding with the numbered ports on the Broadband Router's back panel, serve two purposes. If the LED is lit up solid, the Broadband Router is connected to a device through that port. A blinking LED indicates network activity over that port.

Internet Green. The **Internet** LED indicates when a connection is made through the Internet port.

Chapter 4: Connecting the Wireless-B Broadband Router

Hardware Installation

1. Locate an optimum location for the Broadband Router. The best place for the Broadband Router is usually at the center of your wireless network, with line of sight to all of your mobile stations.

2. Fix the direction of the antenna. Try to place it in a position that will best cover your wireless network. Normally, the higher you place the antenna, the better the performance will be. The antenna's position enhances the receiving sensitivity.

3. Connect a standard Ethernet network cable to the Broadband Router's Internet port. Then, connect the other end of the Ethernet cable to your Cable or DSL Broadband modem. (See Figure 4-1.)

4. Connect your network PCs or Ethernet devices to one of the Broadband Router's numbered ports with a standard Ethernet network cable. (See Figure 4-2.)

IMPORTANT: Make sure to use the power adapter that is supplied with the Router. Use of a different power adapter could damage the Router.

5. Connect the AC Power Adapter to the Broadband Router's Power Socket and the other end into an electrical outlet. Only use the power adapter supplied with the Broadband Router. Use of a different adapter may result in product damage. (See Figure 4-3.)

Now that the Router is connected, proceed to Chapter 5: Configuring the Wireless-B Broadband Router, for directions on how to set up and configure the Router.

Figure 4-1: Connecting Your Internet Connection

Figure 4-2: Connecting Your Network Devices

Figure 4-3: Connecting the Power

Chapter 5: Configuring the Wireless-B Broadband Router

Overview

The Broadband Router has been designed to be functional right out of the box with the default settings in the Setup Wizard. However, if you'd like to change these settings, use the Router's web-based utility. This chapter will describe each web page in the Utility and each page's key functions. The utility can be accessed via your web browser through use of a computer connected to the Router. For a basic network setup, most users only have to use the following screens of the Utility:

- Basic Setup. On the Basic Setup screen, enter the settings provided by your ISP.
- Management. Click the **Administration** tab and then the **Management** tab. The Router's default password is admin. To secure the Router, change the Password from its default.

There are six main tabs: Setup, Wireless, Security, Applications & Gaming, Administration, and Status. Additional tabs will be available after you click one of the main tabs.

To access the web-based utility, launch Internet Explorer or Netscape Navigator, and enter the Router's default IP address, 192.168.1.1, in the Address field. Then press **Enter**.

A password request page, shown in Figure 5-1 will appear. (non-Windows XP users will see a similar screen.) Leave the User Name field blank. The first time you open the Web-Based Utility, use the default password **admin**. (You can set a new password from the Administration tab's Management screen.) Then click the **OK** button.

Note: The Router is designed to function properly after connecting the Router to your network. This chapter is provided solely for those who wish to perform more advanced configuration or monitoring.

Have You: Enabled TCP/IP on your PCs? PCs communicate over the network with this protocol. Refer to Appendix D: Windows Help for more information on TCP/IP.

Figure 5-1: Password Screen

The Setup Tab - Basic Setup

The first screen that appears displays the Setup tab. This allows you to change the Broadband Router's general settings. Change these settings as described here and click the **Save Settings** button to apply your changes or **Cancel Changes** to cancel your changes.

Figure 5-2: Setup Tab - Basic Setup

Internet Setup

The Internet Setup section configures the Broadband Router to your Internet connection. Most of this information can be obtained through your ISP.

Internet Connection Type

Choose the type of Internet connection your ISP provides from the drop down menu.

- DHCP. By default, the Router's Internet Connection Type is set to **Obtain an IP automatically**, which should be kept only if your ISP supports DHCP or you are connecting through a dynamic IP address. (See Figure 5-3.)

Figure 5-3: DHCP Connection Type

- Static IP. If you are required to use a permanent IP address to connect to the Internet, select **Static IP.**(See Figure 5-4.)

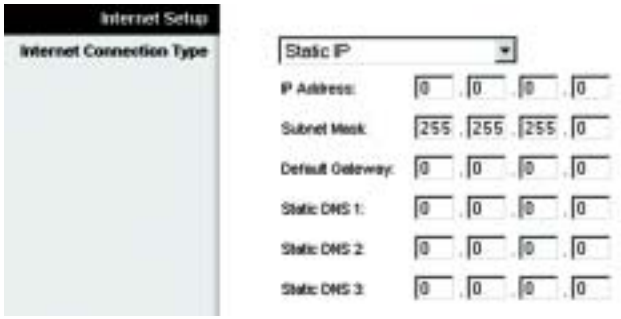

Figure 5-4: Static IP Connection Type

  IP Address. This is the Router's IP address, when seen from the Internet. Your ISP will provide you with the IP Address you need to specify here.

  Subnet Mask. This is the Router's Subnet Mask, as seen by users on the Internet (including your ISP). Your ISP will provide you with the Subnet Mask.

  Default Gateway. Your ISP will provide you with the Default Gateway Address, which is the ISP server's IP address.

  Static DNS 1-3. Your ISP will provide you with at least one DNS (Domain Name System) Server IP Address.

- PPPoE. Some DSL-based ISPs use PPPoE (Point-to-Point Protocol over Ethernet) to establish Internet connections. If you are connected to the Internet through a DSL line, check with your ISP to see if they use PPPoE. If they do, you will have to enable **PPPoE**. (See Figure 5-5.)

  User Name and Password. Enter the User Name and Password provided by your ISP.

  Connect on Demand: Max Idle Time. You can configure the Router to cut the Internet connection after it has been inactive for a specified period of time (Max Idle Time). If your Internet connection has been terminated due to inactivity, Connect on Demand enables the Router to automatically re-establish your connection as soon as you attempt to access the Internet again. If you wish to activate Connect on Demand, click the radio

button. In the Max Idle Time field, enter the number of minutes you want to have elapsed before your Internet connection terminates.

Keep Alive:Redial Period. If you select this option, the Router will periodically check your Internet connection. If you are disconnected, then the Router will automatically re-establish your connection. To use this option, click the radio button next to Keep Alive. In the Redial Period field, you specify how often you want the Router to check the Internet connection. The default Redial Period is 30 seconds.

- RAS. (for SingTel Users) (See Figure 5-6.)

RAS is a service used in Singapore only. If you are using a RAS connection (as shown in Figure 5-6), check with your ISP for the necessary setup information.

- PPTP. Point to Point Tunneling Protocol (**PPTP**), is a service that applies to connections in Europe only. (See Figure 5-7.)

IP Address. This is the Router's IP address, as seen from the Internet. Your ISP will provide you with the IP Address you need to specify here.

Subnet Mask This is the Router's Subnet Mask, as seen by users on the Internet (including your ISP). Your ISP will provide you with the Subnet Mask.

Default Gateway. Your ISP will provide you with the Default Gateway Address.

User Name and Password. Enter the User Name and Password provided by your ISP.

Connect on Demand: Max Idle Time. You can configure the Router to cut the Internet connection after it has been inactive for a specified period of time (Max Idle Time). If your Internet connection has been terminated due to inactivity, Connect on Demand enables the Router to automatically re-establish your connection as soon as you attempt to access the Internet again. If you wish to activate this option, click the radio button next to **Connect on Demand**. In the Max Idle Time field, enter the number of minutes you want to have elapsed before your Internet connection terminates.

Keep Alive: Redial Period. If you select this option, the Router will periodically check your Internet connection. If you are disconnected, then the Router will automatically re-establish your connection. To use this option, click the radio button next to **Keep Alive**. In the Redial Period field, you specify how often you want the Router to check the Internet connection. The default Redial Period is 30 seconds.

- Heart Beat Signal (shown in Figure 5-8) is a service used in Australia only. If you are using a Heart Beat Signal connection, check with your ISP for the necessary setup information. (See Figure 5-8.)

***subnet mask**: An address code that determines the size of the network.*

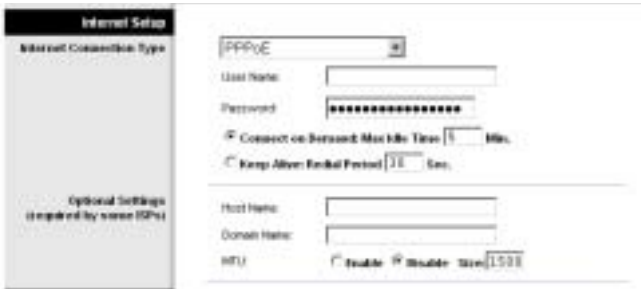

Figure 5-5: PPPoE Connection Type

***static ip address:** a fixed address assigned to a computer or device connected to a network*

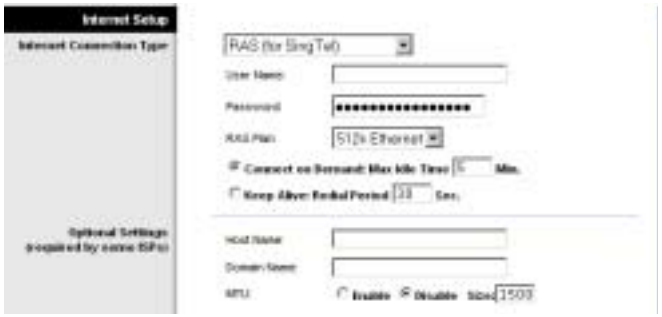

Figure 5-6: RAS Connection Type

Figure 5-7: PPTP Connection Type

Optional Settings (Required by some ISPs)(See Figure 5-9.)

Some of these settings may be required by your ISP. Verify with your ISP before making any changes.

Host Name/Domain Name. These fields allow you to supply a host and domain name for the Router. Some ISPs, usually cable ISPs, require these names as identification. You may have to check with your ISP to see if your broadband Internet service has been configured with a host and domain name. In most cases, leaving these fields blank will work.

MTU. MTU is the Maximum Transmission Unit. It specifies the largest packet size permitted for Internet transmission. The default setting, Enable, allows you to enter the largest packet size that will be transmitted. The recommended size, entered in the Size field, is 1492. You should leave this value in the 1200 to 1500 range. To have the Router automatically select the best MTU for your Internet connection, select **Disable**.

Network Setup

The Network Setup section changes the settings on the network connected to the Router's Ethernet ports. Wireless Setup is performed through the Wireless tab.

Router IP

This presents both the Router's IP Address and Subnet Mask as seen by your network.

Network Address Server Settings (DHCP)

The settings allow you to configure the Router's Dynamic Host Configuration Protocol (DHCP) server function. The Router can be used as a DHCP server for your network. A DHCP server automatically assigns an IP address to each computer on your network. If you choose to enable the Router's DHCP server option, you must configure all of your network PCs to connect to a DHCP server (the Router), and make sure there is no other DHCP server on your network.

Optional Settings

Host Name and Domain Name. These fields allow you to supply a host and domain name for the Router. Some ISPs require these names as identification. You may have to check with your ISP to see if your broadband Internet service has been configured with a host and domain name. In most cases, leaving these fields blank will work.

MTU. The MTU (Maximum Transmission Unit) setting specifies the largest packet size permitted for network transmission. Select Enable and enter the value desired. It is recommended that you leave this value in the 1200 to 1500 range. For most DSL users, it is recommended to use the value 1492. By default, MTU is set at 1500 when disabled.

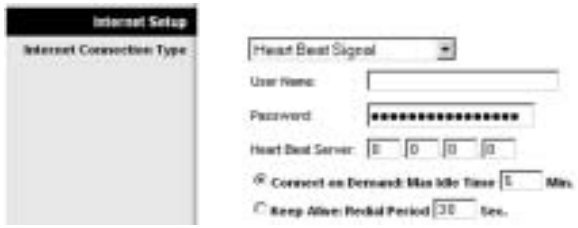

Figure 5-8: Heart Beat Signal Connection Type

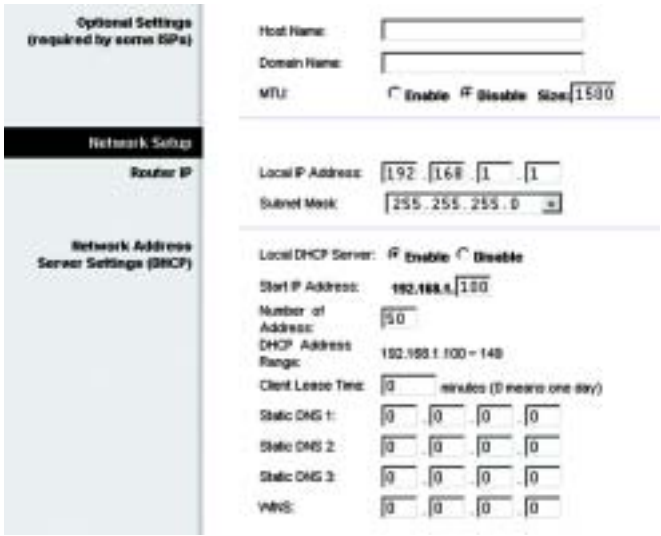

Figure 5-9: Optional Settings

Network Setup

Router IP. The values for the Router's Local IP Address and Subnet Mask are shown here. In most cases, keeping the default values will work.

Local IP Address. The default value is 192.168.1.1.

Subnet Mask. The default value is 255.255.255.0.

Network Address Server Settings (DHCP). A Dynamic Host Configuration Protocol (DHCP) server automatically assigns an IP address to each PC on your network for you. Unless you already have one, it is highly recommended that you leave the Router enabled as a DHCP server.

Local DHCP Server. DHCP is already enabled by factory default. If you already have a DHCP server on your network, set the Router's DHCP option to Disable. If you disable DHCP, remember to assign a static IP address to the Router.

Start IP Address. Enter a value for the DHCP server to start with when issuing IP addresses. This value must be 192.168.1. 2 or greater, because the default IP address for the Router is 192.168.1.1.

Number of Address (Optional). Enter the maximum number of PCs that you want the DHCP server to assign IP addresses to. This number cannot be greater than 253. In order to determine the DHCP IP Address range, add the starting IP address (e.g., 100) to the number of DHCP users. By default, as shown in Figure 6-9, add 100 to 50, and the range is 192.168.1.100 to 192.168.1.149.

DHCP Address Range. The range of DHCP addresses is displayed here.

Client Lease Time. The Client Lease Time is the amount of time a network user will be allowed connection to the Router with their current dynamic IP address. Enter the amount of time, in minutes, that the user will be "leased" this dynamic IP address.

Static DNS 1-3.The Domain Name System (DNS) is how the Internet translates domain or website names into Internet addresses or URLs. Your ISP will provide you with at least one DNS server IP Address. If you wish to use another, type that IP Address in one of these fields. You can type up to three DNS server IP Addresses here. The Router will use these for quicker access to functioning DNS servers.

WINS. The Windows Internet Naming Service (WINS) manages each PC's interaction with the Internet. If you use a WINS server, enter that server's IP Address here. Otherwise, leave this blank.

IMPORTANT: Restoring the Access Point's factory default settings will erase all of your settings (WEP Encryption, Wireless and LAN settings, etc.), and replace them with the factory defaults. Do not reset the Access Point if you want to retain these settings.

The Setup Tab - MAC Address Clone

A MAC address is a 12-digit code assigned to a unique piece of hardware for identification. Some ISPs will require you to register a MAC address in order to access the Internet. If you do not wish to re-register the MAC address with your ISP, you may assign the MAC address you have currently registered with your ISP to the Router with the MAC Address Clone feature. (See Figure 5-10.)

MAC Clone Service. To have the MAC Address cloned, select **Enable** from the drop-down menu, otherwise leave it on the default **Disable**.

MAC Address. Enter the MAC Address registered with your ISP here.

Click the **Clone** button to clone the MAC address.

Change these settings as described here and click the **Save Settings** button to apply your changes or **Cancel Changes** to cancel your changes.

Figure 5-10: Setup Tab - MAC Address Clone

The Setup Tab - Advanced Routing

This tab is used to set up the Router's advanced functions. Dynamic Routing will automatically adjust how packets travel on your network. Static Routing sets up a fixed route to another network destination. (See Figure 5-11.)

NAT. Network Address Translation (NAT) technology translates IP addresses of a local area network to a different IP address for the Internet. To enable the NAT function, click **Enable**.

Dynamic Routing. With Dynamic Routing you can enable the Gateway to automatically adjust to physical changes in the network's layout. The Gateway, using the RIP protocol, determines the network packets' route based on the fewest number of hops between the source and the destination. The RIP protocol regularly broadcasts routing information to other Gateways on the network. To enable RIP, click **Enabled**. To disable RIP, click **Disabled**.

- Transmit RIP Version. To transmit RIP messages, select the protocol you want: **RIP1, RIP1-Compatible, or RIP2**. If you don't want to transmit RIP messages, select **None**.
- Receive RIP Version. To receive RIP messages, select the protocol you want: **RIP1** or **RIP2**. If you don't want to receive RIP messages, select **None**.

Static Routing. To set up a static route between the Router and another network, select a number from the Select Entry drop-down list. (A static route is a pre-determined pathway that network information must travel to reach a specific host or network.) Enter the information described below to set up a new static route. (Clicking the **Delete Entry** will delete a static route.)

Destination IP Address. The Destination LAN IP is the address of the remote network or host to which you want to assign a static route.

Subnet Mask. The Subnet Mask determines which portion of a Destination LAN IP address is the network portion, and which portion is the host portion.

Gateway. This is the IP address of the gateway device that allows for contact between the Router and the remote network or host.

Hop Count. This determines the maximum number of steps between network nodes that data packets will travel. A node is any router in the path to the remote network.

Interface. This interface tells you whether the Destination IP Address is on the **Local** (Ethernet and wireless networks) or the **Internet**.

Figure 5-11: Setup Tab - Advanced Routing

Figure 5-12: Setup Tab - Routing Table

Click the **Show Routing Table** button to view the Static Routes you've already set up. For each route, the Destination IP address, Subnet Mask, Gateway, and Interface are displayed . Click the **Refresh** button to update the information. (See Figure 5-12.)

Change these settings as described here and click the **Save Settings** button to apply your changes or **Cancel Changes** to cancel your changes.

The Wireless Tab - Basic Wireless Settings

The basic settings for wireless networking are set on this screen.

Wireless Network Name (SSID). The SSID is the network name shared among all points in a wireless network. The SSID must be identical for all points in the wireless network. It is case-sensitive and must not exceed 32 characters (use any of the characters on the keyboard). Make sure this setting is the same for all points in your wireless network. For added security, you should change the default SSID (linksys) to a unique name.

Wireless Channel. Select the appropriate channel from the list provided to correspond with your network settings. All devices in your wireless network must be broadcast on the same channel in order to function correctly.

Wireless SSID Broadcast. When wireless clients survey the local area for wireless networks to associate with, they will detect the SSID broadcast by the Router. To broadcast the Router's SSID, keep the default setting, **Enabled**. If you do not want to broadcast the Router's SSID, then select **Disabled**.

Figure 5-13: Wireless Tab - Basic Wireless Settings

Change these settings as described here and click the **Save Settings** button to apply your changes or **Cancel Changes** to cancel your changes.

The Wireless Tab - Wireless Security

The Wireless Security settings configure the security of your wireless network. Click the radio button next to **Enable** to enable Wireless Security before choosing your options. Click the radio button next to **Disable** if you need to disable Wireless Security.

There are four wireless security mode options supported by the Router, WPA, RADIUS, and WEP. These four are briefly discussed here.

WPA Pre-Shared Key. WPA gives you two encryption methods, TKIP and AES, with dynamic encryption keys. Select the type of algorithm, **TKIP** or **AES**, enter a Pre-Shared key of 8-32 characters, and enter a Group Key Renewal period, which instructs the Router how often it should change the encryption keys.

Figure 5-14: WPA Pre-Shared Key

WPA Radius. WPA used in coordination with a RADIUS server. (This should only be used when a RADIUS server is connected to the Router.) First, select the type of WPA algorithm, **TKIP** or **AES**. Enter the RADIUS server's IP Address and port number, along with a key shared between the Router and the server. Last, enter a Group Key Renewal period, which instructs the Router how often it should change the encryption keys.

Figure 5-15: WPA Radius

Radius. WEP used in coordination with a RADIUS server. (This should only be used when a RADIUS server is connected to the Router.) First, enter the RADIUS server's IP Address and port number, along with a key shared between the Router and the server. Then, select a level of WEP encryption, and either generate a WEP key through the Passphrase or select a WEP key and a enter the WEP key manually.

- WEP Encryption Level. An acronym for Wired Equivalent Privacy, WEP is an encryption method used to protect your wireless data communications. WEP uses 64-bit or 128-bit keys to provide access control to your network and encryption security for every data transmission. To decode data transmissions, all devices in a network must use an identical WEP key. Higher encryption levels offer higher levels of security, but due to the complexity of the encryption, they may decrease network performance. To enable WEP, select **64 bits (10 hex digits)** (see Figure 5-16) or **128 bits (26 hex digits)**. To disable WEP encryption, keep the default setting, **No Encryption**.

- Passphrase. Instead of manually entering WEP keys, you can enter a passphrase. This passphrase is used to generate one or more WEP keys. It is case-sensitive and should not be longer than 16 alphanumeric characters. (This Passphrase function is compatible with Linksys wireless products only and cannot be used with Windows XP Zero Configuration. If you want to communicate with non-Linksys wireless products or Windows XP Zero Configuration, make a note of the WEP key generated in the Key 1 field, and enter it manually in the wireless client.) After you enter the Passphrase, click the **Generate** button to create WEP keys.

Figure 5-16: Wireless Tab - Radius

- Default Key. Select which WEP key (1-4) will be used when the Gateway sends data. Make sure that the receiving device (wireless client) is using the same key.

- WEP Keys 1-4. WEP keys enable you to create an encryption scheme for wireless network transmissions. If you are not using a Passphrase, then manually enter a set of values. (Do not leave a key field blank, and do not enter all zeroes; they are not valid key values.) If you are using 64-bit WEP encryption, the key must be exactly 10 hexadecimal characters in length. If you are using 128-bit WEP encryption, the key must be exactly 26 hexadecimal characters in length. Valid hexadecimal characters are "0"-"9" and "A"-"F".

WEP. WEP is a basic encryption method, not as secure as WPA. To use WEP, select a level of WEP encryption, and either generate a WEP key through the Passphrase or select a WEP key and a enter the WEP key manually.

- WEP Encryption Level. An acronym for Wired Equivalent Privacy, WEP is an encryption method used to protect your wireless data communications. WEP uses 64-bit or 128-bit keys to provide access control to your network and encryption security for every data transmission. To decode data transmissions, all devices in a network must use an identical WEP key. Higher encryption levels offer higher levels of security, but due to the complexity of the encryption, they may decrease network performance. To enable WEP, select **64 bits (10 hex digits)** (see Figure 5-17) or **128 bits (26 hex digits)**. To disable WEP encryption, keep the default setting, **No Encryption**.

- Passphrase. Instead of manually entering WEP keys, you can enter a passphrase. This passphrase is used to generate one or more WEP keys. It is case-sensitive and should not be longer than 16 alphanumeric characters. (This Passphrase function is compatible with Linksys wireless products only and cannot be used with Windows XP Zero Configuration. If you want to communicate with non-Linksys wireless products or Windows XP Zero Configuration, make a note of the WEP key generated in the Key 1 field, and enter it manually in the wireless client.) After you enter the Passphrase, click the **Generate** button to create WEP keys.

- Default Key. Select which WEP key (1-4) will be used when the Gateway sends data. Make sure that the receiving device (wireless client) is using the same key.

- WEP Keys 1-4. WEP keys enable you to create an encryption scheme for wireless network transmissions. If you are not using a Passphrase, then manually enter a set of values. (Do not leave a key field blank, and do not enter all zeroes; they are not valid key values.) If you are using 64-bit WEP encryption, the key must be exactly 10 hexadecimal characters in length. If you are using 128-bit WEP encryption, the key must be exactly 26 hexadecimal characters in length. Valid hexadecimal characters are "0"-"9" and "A"-"F".

Figure 5-17: Wireless Tab - WEP

Change these settings as described here and click the **Save Settings** button to apply your changes or **Cancel Changes** to cancel your changes.

The Wireless Tab - Wireless Network Access

Wireless network access can be filtered by using the MAC addresses of the wireless devices transmitting within your network's radius.

Wireless Network Access. (See Figure 5-18.) If you select **Allow All**, all computers will be allowed access to the wireless network. To restrict access to the network, select **Restrict Access**. Click the **Wireless Client MAC Address** button, and the screen in Figure 5-19 will appear.

Select the **MAC Address** from the list and click the **Select** box, then click the **Select** button.

Click the **Refresh** button if you want to refresh the screen. Click the **Close** button to return to the previous screen.

When finished making your changes on this tab, click the **Save Settings** button to save these changes, or click the **Cancel Changes** button to undo your changes.

Figure 5-18: Wireless Tab - Wireless Network Access

Figure 5-19: Wireless Tab - Wireless Client MAC List

The Wireless Tab - Advanced Wireless Settings

This tab is used to set up the Router's advanced wireless functions. These settings should only be adjusted by an expert administrator as incorrect settings can reduce wireless performance.

Basic Rate. The Basic Rate setting is not actually one rate of transmission but a series of rates, advertising to the other wireless points in your network at what rates the Router can transmit. At the default setting, the Router will advertise that it will **Automatically select the best rate** for transmission. Other options of rates to advertise are **1-2Mbps**, for use with older wireless technology, and **All**, when you wish to make all rates advertised. The Basic Rate is not the rate transmitted; that is the Transmission Rate.

Control Tx Rates. The default transmission rate is Auto. The range is from 1 to 54Mbps. The rate of data transmission should be set depending on the speed of your wireless network. You can select from a range of transmission speeds, or keep the default setting, **Auto**, to have the Gateway automatically use the fastest possible data rate and enable the Auto-Fallback feature. Auto-Fallback will negotiate the best possible connection speed between the Gateway and a wireless client.

Preamble Type. The preamble defines the length of the CRC block for communication between the Router and the roaming Network Card. (High network traffic areas should use the shorter preamble type.) Select the appropriate preamble type, **Long Preamble(default)** or **Short Preamble**.

Authentication Type. The default is set to **Auto (default)**, which allows either Open System or Shared Key authentication to be used. With **Open System** authentication, the sender and the recipient do NOT use a WEP key for authentication. With **Shared Key** authentication, the sender and recipient use a WEP key for authentication.

Beacon Interval. The default value is **100**. Enter a value between 1 and 65,535 milliseconds. The Beacon Interval value indicates the frequency interval of the beacon. A beacon is a packet broadcast by the Router to synchronize the wireless network.

DTIM Interval. This value, between 1 and 16384, indicates the interval of the Delivery Traffic Indication Message (DTIM). A DTIM field is a countdown field informing clients of the next window for listening to broadcast and multicast messages. When the Router has buffered broadcast or multicast messages for associated clients, it sends the next DTIM with a DTIM Interval value. Its clients hear the beacons and awaken to receive the broadcast and multicast messages. The default value is **1**.

Fragmentation Threshold. This value specifies the maximum size for a packet before data is fragmented into multiple packets. If you experience a high packet error rate, you may slightly increase the Fragmentation Threshold. Setting the Fragmentation Threshold too low may result in poor network performance. Only minor reduction of the default value is recommended. In most cases, it should remain at its default value of **2346**.

Figure 5-20: Wireless Tab - Advanced Wireless Settings

RTS Threshold. Should you encounter inconsistent data flow, only minor reduction of the default value, **2346**, is recommended. If a network packet is smaller than the preset RTS threshold size, the RTS/CTS mechanism will not be enabled. The Router sends Request to Send (RTS) frames to a particular receiving station and negotiates the sending of a data frame. After receiving an RTS, the wireless station responds with a Clear to Send (CTS) frame to acknowledge the right to begin transmission. The RTS Threshold value should remain at its default value of 2346.

Change these settings as described here and click the **Save Settings** button to apply your changes or **Cancel Changes** to cancel your changes.

The Security Tab - Filter

Filters block specific internal users from accessing the Internet. From the Filters tab, as shown in Figure 5-21, you can set up a filter through an IP address or a network port number.

Filter IP Address Range. To set up a filter using IP addresses, enter the range of IP addresses you wish to filter in the IP address fields. Users who have filtered IP addresses will not be able to access the Internet at all. If you only want to filter one IP address instead of a range of IP addresses, enter the same value into both fields. For instance, if you wish to filter the PC with the IP address of 192.168.1.5, enter 5 into both fields on one line: 192.168.1.5 ~ 192.168.1.5.

Filter Port Range. To filter users by network port number, select a protocol, then enter a network port number or a range of network ports. Enter the port numbers you want to filter in the port numbers fields. Users connected to the Router will no longer be able to access any port number listed there.

Filter MAC Address. This feature filters the Ethernet adapter's specific MAC address from going out to the Internet. To check your Ethernet adapter's MAC address, you can run winipcfg or ipconfig in the command prompt, depending on which Windows operating system you are using. To set the MAC filter, click the **Edit MAC Filter Setting** button. When the screen appears, select the range in the drop-down menu, and in a MAC number field, enter the 12-digit MAC address you want to filter. Click Apply to save the changes, or Undo to undo the changes. For information on obtaining a MAC address, go to Appendix E: Finding the MAC Address and IP Address for Your Ethernet Adapter.

Block WAN Requests. Enable the Block WAN Request feature by checking the radio button beside **Block Anonymous Internet Requests** and you can prevent your network from being "pinged," or detected, by other Internet users. Click Disabled it you want to allow anonymous Internet requests.The Block WAN Request feature also reinforces your network security by hiding your network ports. Both functions of the Block WAN Request

Figure 5-21: Security Tab - Filter

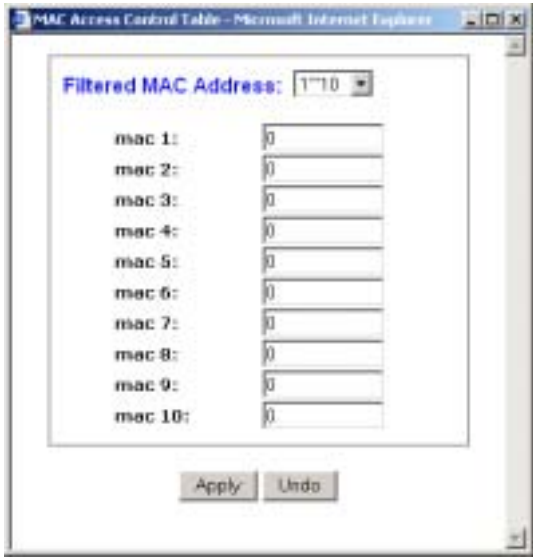

Figure 5-22: Security Tab - MAC Filter

feature make it more difficult for outside users to work their way into your network. This feature is enabled by default.

Filter Multicast. This feature allows for multiple transmissions to specific recipients at the same time. Select **Enabled** to support the feature, or **Disabled** to keep the Router from multicasting.

Change these settings as described here and click the **Save Settings** button to apply your changes or **Cancel Changes** to cancel your changes.

The Security Tab - VPN Passthrough

Use the settings on this tab to allow VPN tunnels in either IPSec or PPTP protocols to pass through the Router's firewall.

IPSec Passthrough. Internet Protocol Security (IPSec) is a suite of protocols used to implement secure exchange of packets at the IP layer. To allow IPSec tunnels to pass through the Router, click the radio button beside **Enabled**. IPSec Passthrough is enabled by default. Click **Disabled** to disable the function.

PPPoE Passthrough. Point-to-Point Protocol over Ethernet allows your PC(s) to use the PPPoE client software provided by your ISP. Some ISPs may request that you use this feature.To allow allow PPPoE Passthrough, click the radio button beside **Enabled**. PPTP Passthrough is enabled by default. Click **Disabled** to disable the function.

PPTP Passthrough. Point-to-Point Tunneling Protocol is the method used to enable VPN sessions to a Windows NT 4.0 or 2000 server. To allow PPTP tunnels to pass through the Router, click the radio button beside **Enabled**. PPTP Passthrough is enabled by default. Click **Disabled** to disable the function.

Change these settings as described here and click the **Save Settings** button to apply your changes or **Cancel Changes** to cancel your changes.

Figure 5-23: Security Tab - VPN Passthrough

The Applications and Gaming Tab - Port Range Forwarding

The Applications and Gaming Tab allows you to set up public services on your network, such as web servers, ftp servers, e-mail servers, or other specialized Internet applications. (Specialized Internet applications are any applications that use Internet access to perform functions such as videoconferencing or online gaming. Some Internet applications may not require any forwarding.) (See Figure 5-24.)

To forward a port, enter the information on each line for the criteria required. Descriptions of each criteria are described here.

Application. In this field, enter the name you wish to give the application. Each name can be up to 12 characters.

Start/End. This is the port range. Enter the number that starts the port range under **Start** and the number that ends the range under **End**.

Protocol. Enter the protocol used for this application, either **TCP** or **UDP**, or **Both**.

IP Address. For each application, enter the IP Address of the PC running the specific application.

Enable. Click the **Enable** checkbox to enable port forwarding for the relevant application.

Figure 5-24: Applications and Gaming Tab - Port Range Forwarding

Change these settings as described here and click the **Save Settings** button to apply your changes or **Cancel Changes** to cancel your changes.

The Applications and Gaming Tab - Port Triggering

Port Triggering

Port Triggering is used for special applications that can request a port to be opened on demand. For this feature, the Gateway will watch outgoing data for specific port numbers. (See Figure 5-25.) The Gateway will remember the IP address of the computer that sends a transmission requesting data, so that when the requested data returns through the Gateway, the data is pulled back to the proper computer by way of IP address and port mapping rules.

- Application. Enter the name you wish to give each application.
- Start Port and End Port. Enter the starting and ending Triggered Range numbers and the Forwarded Range numbers of the port you wish to forward.

When finished making your changes on this tab, click the **Save Settings** button to save these changes, or click the **Cancel Changes** button to undo your changes.

Figure 5-25: Applications and Gaming - Port Triggering

The Applications and Gaming Tab - UPnP Forwarding

UPnP Forwarding

The UPnP Forwarding screen provides options for customization of port services for common applications. (See Figure 5-26.)

When users send this type of request to your network via the Internet, the Gateway will forward those requests to the appropriate computer. Any computer whose port is being forwarded should have its DHCP client function disabled and should have a new static IP address assigned to it because its IP address may change when using the DHCP function.

Choose or enter the Application in the field. Then, enter the External and Internal Port numbers in the fields. Select the type of protocol you wish to use for each application: **TCP** or **UDP**. Enter the IP Address in the field. Click **Enabled** to enable UPnP Forwarding for the chosen application.

When finished making your changes on this tab, click the **Save Settings** button to save these changes, or click the **Cancel Changes** button to undo your changes.

Figure 5-26: Applications and Gaming - UPnP Forwarding

The Applications and Gaming Tab - DMZ

The DMZ feature allows one network user to be exposed to the Internet for use of a special-purpose service such as Internet gaming or videoconferencing. DMZ hosting forwards all the ports at the same time to one PC. The Port Range Forward feature is more secure because it only opens the ports you want to have opened, while DMZ hosting opens all the ports of one computer, exposing the computer to the Internet. (See Figure 5-27.)

Any PC whose port is being forwarded must have its DHCP client function disabled and should have a new static IP address assigned to it because its IP address may change when using the DHCP function.

To expose one PC, select **Enable**. Then, enter the computer's IP address in the DMZ Host IP Address field.

Change these settings as described here and click the **Save Settings** button to apply your changes or **Cancel Changes** to cancel your changes.

Figure 5-27: Applications and Gaming - DMZ

The Administration Tab - Management

This section of the Administration tab allows the network's administrator to manage specific Router functions for access and security.

Local Router Access. You can change the Router's password from here. Enter a new Router password and then type it again in the Re-enter to confirm field to confirm.

IMPORTANT: Enabling remote Administration allows anyone with access to your password to configure the Router from somewhere else on the Internet.

Remote Router Access. This feature allows you to access the Router from a remote location, via the Internet. Remote Upgrade allows you to upgrade your firmware from a remote location. To enable Remote Upgrade, select **Enabled**. Remote Administration allows you to manage the Router from a remote location via the Internet. To enable Remote Administration, select **Enabled**. Enter the Administration Port number you will use to remotely access the Router.

UPnP. UPnP allows Windows XP to automatically configure the Gateway for various Internet applications, such as gaming and videoconferencing. When using UPnP features, select **Enable**. Because allowing this may present a risk to security, this feature is disabled by default. To allow users to make configuration changes, select **Enabled**. To allow users to disable Internet access, select **Enabled**.

Figure 5-28: Administration Tab - Management

To back up or restore a configuration, click the **Backup and Restore** button and the screen in Figure 5-29 will appear.

To back up a configuration, click the **Backup** button. To restore a configuration, click the **Browse** button to find the file, then click the **Restore** button.

Change these settings as described here and click the **Save Settings** button to apply your changes or **Cancel Changes** to cancel your changes.

Figure 5-29: Backup & Restore

The Administration Tab - Log

The Router can keep logs of all traffic for your Internet connection. To disable the Log function, select **No**. To monitor traffic between the network and the Internet, select **Yes**. When you wish to view the logs, click **Incoming Log** or **Outgoing Log**, depending on which you wish to view.

Logviewer IP Address. Logviewer IP Address uses a logviewer program installed in a PC. Enter the IP Address of the PC running the logviewer. The logviewer program is included on the Setup CD-ROM.

Change these settings as described here and click the **Save Settings** button to apply your changes or **Cancel Changes** to cancel your changes.

Figure 5-30: Administration Tab - Log

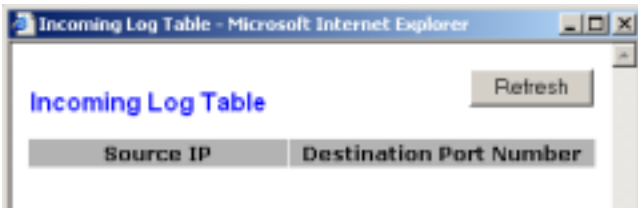

Figure 5-31: Log Table

The Administration Tab - Firmware Upgrade

IMPORTANT: Upgrading the firmware could eraseall of your settings (WEP Encryption, Wireless and LAN settings, etc.), and replace them with the factory defaults. Linksys recommends that you back up your configuration settings before you upgrade the firmware.

Figure 5-32: Administration Tab - Firmware Upgrade

Firmware can be upgraded by following these instructions. Do not upgrade your firmware unless you are experiencing problems with the Router. You can lose your settings when you upgrade the firmware, so Linksys recommends that you back up your settings first. You can back up your configuration from the Management screen of the Administration tab.

To upgrade your firmware:

Download the firmware from Linksys's website at **www.linksys.com**.

Enter the location of the firmware's file or click the **Browse** button to find the file. Then, click the **Upgrade** button to upgrade the firmware.

For more information about upgrading firmware, refer to "Appendix C: Upgrading Firmware".

The Administration Tab - Factory Defaults

Click the **Yes** button to reset all configuration settings to their default values, and then click the **Save Settings** button. Any settings you have saved will be lost when the default settings are restored. This feature is disabled by default. Click the **Cancel Changes** button to cancel your changes.

IMPORTANT: Restoring the Router's factory default settings will erase all of your settings (WEP Encryption, Wireless and LAN settings, etc.), and replace them with the factory defaults. Do not reset the Router if you want to retain these settings.

Figure 5-33: Administration Tab - Factory Defaults

The Status Tab - Router

The Router screen on the Status Tab displays the Router's current status.

Figure 5-34: Status Tab - Router

Firmware Version. This is the Router's current firmware.

MAC Address. This is the Router's MAC Address, as seen by your ISP.

Login Type. The status of the connection is displayed only for PPPoE, RAS, PPTP, or Heart Beat Signal connections. For these dial-up style connections, there is a Connect button to click if there is no connection and you want to establish an Internet connection, and a Disconnect button to disconnect the Internet connection.

Internet IP Address. The Router's Internet IP Address is displayed here.

Subnet Mask and Default Gateway. The Router's Subnet Mask and Default Gateway address are displayed here for DHCP and static IP connections.

Primary DNS and Secondary DNS. Shown here are the DNS (Domain Name System) IP addresses currently used by the Router.

DHCP Release. Available for a DHCP connection, click the **DHCP Release** button to release the current IP address of the device connected to the Router's Internet port.

DHCP Renew. Available for a DHCP connection, click the **DHCP Renew** button to replace the current IP address—of the device connected to the Router's Internet port—with a new IP address.

Change these settings as described here and click the **Save Settings** button to apply your changes or **Cancel Changes** to cancel your changes.

The Status Tab - Local Network

The Local Network screen on the Status Tab displays the status of your network.

Local MAC Address. This is the Router's MAC Address, as seen on your local, Ethernet network.

IP Address. This shows the Router's IP Address, as it appears on your local, Ethernet network.

Subnet Mask. When the Router is using a Subnet Mask, it is shown here.

DHCP Server. If you are using the Router as a DHCP server, that will be displayed here.

DHCP Client Table. Clicking this button will open a screen to show you which PCs are utilizing the Router as a DHCP server. You can delete PCs from that list, and sever their connections, by checking a **Delete** box and clicking the **Delete** button. Click the **Refresh** button to refresh the screen.

Figure 5-35: Status Tab - Local Network

Figure 5-36: Status Tab - DHCP Active IP Table

Appendix A: Troubleshooting

This appendix consists of two parts: "Common Problems and Solutions" and "Frequently Asked Questions." Provided are possible solutions to problems that may occur during the installation and operation of the Router. Read the descriptions below to help you solve your problems. If you can't find an answer here, check the Linksys website at www.linksys.com.

Common Problems and Solutions

1. I need to set a static IP address on a PC.

You can assign a static IP address to a PC by performing the following steps:

- For Windows 98 and Me:
  1. Click **Start**, **Settings**, and **Control Panel**. Double-click **Network**.
  2. In The following network components are installed box, select the TCP/IP-> associated with your Ethernet adapter. If you only have one Ethernet adapter installed, you will only see one TCP/IP line with no association to an Ethernet adapter. Highlight it and click the Properties button.
  3. In the TCP/IP properties window, select the IP address tab, and select Specify an IP address. Enter a unique IP address that is not used by any other computer on the network connected to the Router. Make sure that each IP address is unique for each PC or network device.
  4. Click the **Gateway** tab, and in the New Gateway prompt, enter 192.168.1.1, which is the default IP address of the Router. Click the Add button to accept the entry.
  5. Click the **DNS** tab, and make sure the DNS Enabled option is selected. Enter the Host and Domain names (e.g., John for Host and home for Domain). Enter the DNS entry provided by your ISP. If your ISP has not provided the DNS IP address, contact your ISP to get that information or go to its website for the information.
  6. Click the **OK** button in the TCP/IP properties window, and click Close or the OK button for the Network window.
  7. Restart the computer when asked.
- For Windows 2000:
  1. Click **Start**, **Settings**, and **Control Panel**. Double-click **Network and Dial-Up Connections**.
  2. Right-click the Local Area Connection that is associated with the Ethernet adapter you are using, and select the Properties option.
  3. In the Components checked are used by this connection box, highlight Internet Protocol (TCP/IP), and click the **Properties** button. Select **Use the following IP address** option.
  4. Enter a unique IP address that is not used by any other computer on the network connected to the Router.
  5. Enter the Subnet Mask, 255.255.255.0.
  6. Enter the Default Gateway, 192.168.1.1 (Router's default IP address).

7. Toward the bottom of the window, select Use the following DNS server addresses, and enter the Preferred DNS server and Alternative DNS server (provided by your ISP). Contact your ISP or go on its website to find the information.
8. Click the **OK** button in the Internet Protocol (TCP/IP) Properties window, and click the **OK** button in the Local Area Connection Properties window.
9. Restart the computer if asked.

- For Windows XP:

The following instructions assume you are running Windows XP with the default interface. If you are using the Classic interface (where the icons and menus look like previous Windows versions), please follow the instructions for Windows 2000.

1. Click **Start** and **Control Panel**.
2. Click the **Network and Internet Connections** icon and then the **Network Connections** icon.
3. Right-click the **Local Area Connection** that is associated with the Ethernet adapter you are using, and select the Properties option.
4. In the **This connection uses the following items** box, highlight **Internet Protocol (TCP/IP)**. Click the **Properties** button.
5. Enter a unique IP address that is not used by any other computer on the network connected to the Router.
6. Enter the Subnet Mask, 255.255.255.0.
7. Enter the Default Gateway, 192.168.1.1 (Router's default IP address).
8. Toward the bottom of the window, select Use the following DNS server addresses, and enter the Preferred DNS server and Alternative DNS server (provided by your ISP). Contact your ISP or go on its website to find the information.
9. Click the **OK** button in the Internet Protocol (TCP/IP) Properties window. Click the **OK** button in the Local Area Connection Properties window.

2. I want to test my Internet connection.

A. Check your TCP/IP settings.

For Windows 98, Me, 2000, and XP:

- Refer to "Chapter 5: Configuring the Wireless-B Broadband Router" for details. Make sure Obtain IP address automatically is selected in the settings.

B. Open a command prompt.

For Windows 98 and Me:

- Click **Start** and **Run**. In the Open field, type in command. Press the **Enter** key or click the **OK** button.

For Windows 2000 and XP:

- Click **Start** and **Run**. In the Open field, type cmd. Press the **Enter** key or click the **OK** button. In the command prompt, type ping 192.168.1.1 and press the Enter key.
- If you get a reply, the computer is communicating with the Router.
- If you do NOT get a reply, please check the cable, and make sure Obtain an IP address automatically is selected in the TCP/IP settings for your Ethernet adapter.

C. In the command prompt, type ping followed by your Internet or Internet IP address and press the **Enter** key. The Internet or Internet IP Address can be found on the Status screen of the Router's web-based utility. For example, if your Internet or Internet IP address is 1.2.3.4, you would enter ping 1.2.3.4 and press the Enter key.

- If you get a reply, the computer is connected to the Router.
- If you do NOT get a reply, try the ping command from a different computer to verify that your original computer is not the cause of the problem.

D. In the command prompt, type ping www.yahoo.com and press the **Enter** key.

- If you get a reply, the computer is connected to the Internet. If you cannot open a webpage, try the ping command from a different computer to verify that your original computer is not the cause of the problem.
- If you do NOT get a reply, there may be a problem with the connection. Try the ping command from a different computer to verify that your original computer is not the cause of the problem.

5. I am not getting an IP address on the Internet with my Internet connection.

- Refer to "Problem #2, I want to test my Internet connection" to verify that you have connectivity.
  1. If you need to register the MAC address of your Ethernet adapter with your ISP, please see "Appendix E: Finding the MAC address and IP Address for Your Ethernet Adapter." If you need to clone the MAC address of your Ethernet adapter onto the Router, see the System section of "Chapter 5: Configuring the Wireless-B Broadband Router" for details.
  2. Make sure you are using the right Internet connection settings. Contact your ISP to see if your Internet connection type is DHCP, Static IP Address, or PPPoE (commonly used by DSL consumers). Please refer to the Setup section of "Chapter 5: Configuring the Wireless-B Broadband Router" for details on Internet connection settings.
  3. Make sure you have the right cable. Check to see if the Internet column has a solidly lit Link/Act LED.
  4. Make sure the cable connecting from your cable or DSL modem is connected to the Router's Internet port. Verify that the Status page of the Router's web-based utility shows a valid IP address from your ISP.
  5. Turn off the computer, Router, and cable/DSL modem. Wait 30 seconds, and then turn on the Router, cable/DSL modem, and computer. Check the Status tab of the Router's web-based utility to see if you get an IP address.

6. I am not able to access the Setup page of the Router's web-based utility.

- Refer to "Problem #2, I want to test my Internet connection" to verify that your computer is properly connected to the Router.
  1. Refer to "Appendix E: Finding the MAC Address and IP address for Your Ethernet Adapter" to verify that your computer has an IP Address, Subnet Mask, Gateway, and DNS.
  2. Set a static IP address on your system; refer to "Problem #1: I need to set a static IP address."
  3. Refer to "Problem #10: I need to remove the proxy settings or the dial-up pop-up window (for PPPoE users)."

7. I need to set up a server behind my Router and make it available to the public.

To use a server like a web, ftp, or mail server, you need to know the respective port numbers they are using. For example, port 80 (HTTP) is used for web; port 21 (FTP) is used for FTP, and port 25 (SMTP outgoing) and port 110 (POP3 incoming) are used for the mail server. You can get more information by viewing the documentation provided with the server you installed.

- Follow these steps to set up port forwarding through the Router's web-based utility. We will be setting up web, ftp, and mail servers.
  1. Access the Router's web-based utility by going to http://192.168.1.1 or the IP address of the Router. Go to the Applications & Gaming => Port Forwarding tab.
  2. Enter any name you want to use for the Customized Application.
  3. Enter the External Port range of the service you are using. For example, if you have a web server, you would enter the range 80 to 80.
  4. Check the protocol you will be using, TCP and/or UDP.
  5. Enter the IP address of the PC or network device that you want the port server to go to. For example, if the web server's Ethernet adapter IP address is 192.168.1.100, you would enter 100 in the field provided. Check "Appendix E: Finding the MAC Address and IP Address for Your Ethernet Adapter" for details on getting an IP address.
  6. Check the Enable option for the port services you want to use. Consider the example below:

Customized Application	External Port	TCP	UDP	IP Address	Enable
Web server	80 to 80	X	X	192.168.1.100	X
FTP server	21 to 21	X		192.168.1.101	X
SMTP (outgoing)	25 to 25	X	X	192.168.1.102	X
POP3 (incoming)	110 to 110	X	X	192.168.1.102	X

When you have completed the configuration, click the **Save Settings** button.

8. I need to set up online game hosting or use other Internet applications.

If you want to play online games or use Internet applications, most will work without doing any port forwarding or DMZ hosting. There may be cases when you want to host an online game or Internet application. This would require you to set up the Router to deliver incoming packets or data to a specific computer. This also applies to the Internet applications you are using. The best way to get the information on what port services to use is to go to the website of the online game or application you want to use. Follow these steps to set up online game hosting or use a certain Internet application:

1. Access the Router's web interface by going to http://192.168.1.1 or the IP address of the Router. Go to the Applications & Gaming => Port Forwarding tab.
2. Enter any name you want to use for the Customized Application.

3. Enter the External Port range of the service you are using. For example, if you want to host Unreal Tournament (UT), you would enter the range 7777 to 27900.
4. Check the protocol you will be using, TCP and/or UDP.
5. Enter the IP address of the PC or network device that you want the port server to go to. For example, if the web server's Ethernet adapter IP address is 192.168.1.100, you would enter 100 in the field provided. Check "Appendix E: Finding the MAC Address and IP Address for Your Ethernet Adapter" for details on getting an IP address.
6. Check the **Enable** option for the port services you want to use. Consider the example below:

Customized Application	External Port	TCP	UDP	IP Address	Enable
UT	7777 to 27900	X	X	192.168.1.100	X
Halflife	27015 to 27015	X	X	192.168.1.105	X
PC Anywhere	5631 to 5631		X	192.168.1.102	X
VPN IPSEC	500 to 500		X	192.168.1.100	X

When you have completed the configuration, click the **Save Settings** button.

9. I can't get the Internet game, server, or application to work.

If you are having difficulties getting any Internet game, server, or application to function properly, consider exposing one PC to the Internet using DeMilitarized Zone (DMZ) hosting. This option is available when an application requires too many ports or when you are not sure which port services to use. Make sure you disable all the forwarding entries if you want to successfully use DMZ hosting, since forwarding has priority over DMZ hosting. (In other words, data that enters the Router will be checked first by the forwarding settings. If the port number that the data enters from does not have port forwarding, then the Router will send the data to whichever PC or network device you set for DMZ hosting.)

- Follow these steps to set DMZ hosting:
  1. Access the Router's web-based utility by going to http://192.168.1.1 or the IP address of the Router. Go to the Applications & Gaming => Port Forwarding tab.
  2. Disable or remove the entries you have entered for forwarding. Keep this information in case you want to use it at a later time.
  3. Go to the Applications & Gaming => DMZ tab.
  4. Select Enable next to DMZ. In the DMZ Host IP Address field, enter the IP address of the computer you want exposed to the Internet. This will bypass the NAT technology for that computer. Please refer to "Appendix E: Finding the MAC Address and IP Address for Your Ethernet Adapter" for details on getting an IP address.
- Once completed with the configuration, click the **Apply** button.

10. I forgot my password, or the password prompt always appears when I am saving settings to the Router.

- Reset the Router to factory default by pressing the Reset button for 10 seconds and then releasing it. If you are still getting prompted for a password when saving settings, then perform the following steps:
  1. Access the Router's web-based utility by going to http://192.168.1.1 or the IP address of the Router. Enter the default password admin, and click the Administrations => Management tab.
  2. Enter a different password in the Router Password field, and enter the same password in the second field to confirm the password.
  3. Click the **Save Settings** button.

11. I am a PPPoE user, and I need to remove the proxy settings or the dial-up pop-up window.

If you have proxy settings, you need to disable these on your computer. Because the Router is the gateway for the Internet connection, the computer does not need any proxy settings to gain access. Please follow these directions to verify that you do not have any proxy settings and that the browser you use is set to connect directly to the LAN.

- For Microsoft Internet Explorer 5.0 or higher:
  1. Click **Start, Settings**, and **Control Panel**. Double-click Internet Options.
  2. Click the **Connections** tab.
  3. Click the **LAN settings** button and remove anything that is checked.
  4. Click the **OK** button to go back to the previous screen.
  5. Click the option **Never dial a connection**. This will remove any dial-up pop-ups for PPPoE users.
- For Netscape 4.7 or higher:
  1. Start **Netscape Navigator**, and click **Edit**, **Preferences**, **Advanced**, and **Proxies**.
  2. Make sure you have Direct connection to the Internet selected on this screen.
  3. Close all the windows to finish.

12. To start over, I need to set the Router to factory default.

Hold the **Reset** button for 10 seconds and then release it. This will return the password, forwarding, and other settings on the Router to the factory default settings. In other words, the Router will revert to its original factory configuration.

13. I need to upgrade the firmware.

In order to upgrade the firmware with the latest features, you need to go to the Linksys website and download the latest firmware at www.linksys.com.

- Follow these steps:
  1. Go to the Linksys website at http://www.linksys.com and download the latest firmware.
  2. To upgrade the firmware, follow the steps in "Appendix C: Upgrading Firmware."

14. The firmware upgrade failed, and/or the Power LED is flashing.

The upgrade could have failed for a number of reasons. Follow these steps to upgrade the firmware and/or make the Power LED stop flashing:

- If the firmware upgrade failed, use the TFTP program (it was downloaded along with the firmware). Open the pdf that was downloaded along with the firmware and TFTP program, and follow the pdf's instructions.
- Set a static IP address on the PC; refer to "Problem #1, I need to set a static IP address." Use the following IP address settings for the computer you are using:
  IP Address: 192.168.1.50
  Subnet Mask: 255.255.255.0
  Gateway: 192.168.1.1
- Perform the upgrade using the TFTP program or the Router's web-based utility through its System tab.

15. My DSL service's PPPoE is always disconnecting.

PPPoE is not actually a dedicated or always-on connection. The DSL ISP can disconnect the service after a period of inactivity, just like a normal phone dial-up connection to the Internet.

- There is a setup option to "keep alive" the connection. This may not always work, so you may need to re-establish connection periodically.
  1. To connect to the Router, go to the web browser, and enter http://192.168.1.1 or the IP address of the Router.
  2. Enter the password, if asked. (The default password is admin.)
  3. On the Setup screen, select the option **Keep Alive**, and set the Redial Period option at 20 (seconds).
  4. Click the **Save Settings** button.
  5. Click the **Status** tab, and click the **Connect** button.
  6. You may see the login status display as Connecting. Press the F5 key to refresh the screen, until you see the login status display as Connected.
- Click the **Save Settingsy** button to continue.
- If the connection is lost again, follow steps 1- 6 to re-establish connection.

16. I can't access my e-mail, web or I am getting corrupted data from the Internet.

The Maximum Transmission Unit (MTU) setting may need to be adjusted. By default, the MTU is set at 1500. For most DSL users, it is strongly recommended to use MTU 1492.

- If you are having some difficulties, perform the following steps:
  1. To connect to the Router, go to the web browser, and enter http://192.168.1.1 or the IP address of the Router.
  2. Enter the password, if asked. (The default password is admin.)
  3. Look for the MTU option, and select **Manual**. In the Size field, enter 1492.
  4. Click the **Save Settings** button to continue.
- If your difficulties continue, change the Size to different values. Try this list of values, one value at a time, in this order, until your problem is solved:
  1462, 1400, 1362, 1300

17. The Power LED keeps flashing.

The Power LED flashes when the device is first powered up. Meantime, the system will boot up itself and check for proper operation. After finishing the checking procedure, the LED stays solid to show that the system is working fine. If the LED keeps flashing after this time, the device is not working properly. Try to flash the firmware by assigning a static IP address to the computer, and then upgrade the firmware. Try using the following settings, IP Address: 192.168.1.50 and Subnet Mask: 255.255.255.0.

18. When I enter a URL or IP address, I get a time-out error or am prompted to retry.

- Check if other PCs work. If they do, ensure that your workstation's IP settings are correct (IP Address, Subnet Mask, Default Gateway, and DNS). Restart the computer that is having a problem.
- If the PCs are configured correctly, but still not working, check the Router. Ensure that it is connected and powered on. Connect to it and check its settings. (If you cannot connect to it, check the LAN and power connections.)
- If the Router is configured correctly, check your Internet connection (DSL/cable modem, etc.) to see if it is working correctly. You can remove the Router to verify a direct connection.
- Manually configure the TCP/IP settings with a DNS address provided by your ISP.
- Make sure that your browser is set to connect directly and that any dial-up is disabled. For Internet Explorer, click **Tools**, **Internet Options**, and then the **Connection** tab. Make sure that Internet Explorer is set to **Never dial a connection**. For Netscape Navigator, click **Edit**, **Preferences**, **Advanced**, and **Proxy**. Make sure that Netscape Navigator is set to **Direct connection to the Internet**.

Frequently Asked Questions

What is the maximum number of IP addresses that the Router will support?

The Router will support up to 253 IP addresses.

Is IPSec Pass-Through supported by the Router?

Yes, it is a built-in feature that the Router automatically enables.

Where is the Router installed on the network?

In a typical environment, the Router is installed between the cable/DSL modem and the LAN. Plug the Router into the cable/DSL modem's Ethernet port.

Does the Router support IPX or AppleTalk?

No. TCP/IP is the only protocol standard for the Internet and has become the global standard for communications. IPX, a NetWare communications protocol used only to route messages from one node to another, and AppleTalk, a communications protocol used on Apple and Macintosh networks, can be used for LAN to LAN connections, but those protocols cannot connect from the Internet to a LAN.

Does the Internet connection of the Router support 100Mbps Ethernet?
The Router's current hardware design supports up to 100Mbps Ethernet on its Internet port; however, the Internet connection speed will vary depending on the speed of your broadband connection. The Router also supports 100Mbps over the auto-sensing Fast Ethernet 10/100 switch on the LAN side of the Router.

What is Network Address Translation and what is it used for?
Network Address Translation (NAT) translates multiple IP addresses on the private LAN to one public address that is sent out to the Internet. This adds a level of security since the address of a PC connected to the private LAN is never transmitted on the Internet. Furthermore, NAT allows the Router to be used with low cost Internet accounts, such as DSL or cable modems, when only one TCP/IP address is provided by the ISP. The user may have many private addresses behind this single address provided by the ISP.

Does the Router support any operating system other than Windows 98, Windows Millennium, Windows 2000, or Windows XP?
Yes, but Linksys does not, at this time, provide technical support for setup, configuration or troubleshooting of any non-Windows operating systems.

Does the Router support ICQ send file?
Yes, with the following fix: click ICQ menu -> preference -> connections tab->, and check I am behind a firewall or proxy. Then set the firewall time-out to 80 seconds in the firewall setting. The Internet user can then send a file to a user behind the Router.

I set up an Unreal Tournament Server, but others on the LAN cannot join. What do I need to do?
If you have a dedicated Unreal Tournament server running, you need to create a static IP for each of the LAN computers and forward ports 7777, 7778, 7779, 7780, 7781, and 27900 to the IP address of the server. You can also use a port forwarding range of 7777 ~ 27900. If you want to use the UT Server Admin, forward another port. (Port 8080 usually works well but is used for remote admin. You may have to disable this.) Then in the [UWeb.WebServer] section of the server.ini file, set the ListenPort to 8080 (to match the mapped port above) and ServerName to the IP assigned to the Router from your ISP.

Can multiple gamers on the LAN get on one game server and play simultaneously with just one public IP address?
It depends on which network game or what kind of game server you are using. For example, Unreal Tournament supports multi-login with one public IP.

How do I get Half-Life: Team Fortress to work with the Router?
The default client port for Half-Life is 27005. The computers on your LAN need to have "+clientport 2700x" added to the HL shortcut command line; the x would be 6, 7, 8, and on up. This lets multiple computers connect to the same server. One problem: Version 1.0.1.6 won't let multiple computers with the same CD key connect at

the same time, even if on the same LAN (not a problem with 1.0.1.3). As far as hosting games, the HL server does not need to be in the DMZ. Just forward port 27015 to the local IP address of the server computer.

How can I block corrupted FTP downloads?
If you are experiencing corrupted files when you download a file with your FTP client, try using another FTP program.

The web page hangs; downloads are corrupt, or nothing but junk characters are being displayed on the screen. What do I need to do?
Force your Ethernet adapter to 10Mbps or half duplex mode, and turn off the "Auto-negotiate" feature of your Ethernet adapter as a temporary measure. (Please look at the Network Control Panel in your Ethernet adapter's Advanced Properties tab.) Make sure that your proxy setting is disabled in the browser. Check our website at www.linksys.com for more information.

If all else fails in the installation, what can I do?
Reset the Router by holding down the reset button until the Power LED fully turns on and off. Reset your cable or DSL modem by powering the unit off and then on. Obtain and flash the latest firmware release that is readily available on the Linksys website, www.linksys.com.

How will I be notified of new Router firmware upgrades?
All Linksys firmware upgrades are posted on the Linksys website at www.linksys.com, where they can be downloaded for free. To upgrade the Router's firmware, use the System tab of the Router's web-based utility. If the Router's Internet connection is working well, there is no need to download a newer firmware version, unless that version contains new features that you would like to use. Downloading a more current version of Router firmware will not enhance the quality or speed of your Internet connection, and may disrupt your current connection stability.

Will the Router function in a Macintosh environment?
Yes, but the Router's setup pages are accessible only through Internet Explorer 4.0 or Netscape Navigator 4.0 or higher for Macintosh.

I am not able to get the web configuration screen for the Router. What can I do?
You may have to remove the proxy settings on your Internet browser, e.g., Netscape Navigator or Internet Explorer. Or remove the dial-up settings on your browser. Check with your browser documentation, and make sure that your browser is set to connect directly and that any dial-up is disabled. Make sure that your browser is set to connect directly and that any dial-up is disabled. For Internet Explorer, click Tools, Internet Options, and then the Connection tab. Make sure that Internet Explorer is set to Never dial a connection. For Netscape Navigator, click Edit, Preferences, Advanced, and Proxy. Make sure that Netscape Navigator is set to Direct connection to the Internet.

What is DMZ Hosting?
Demilitarized Zone (DMZ) allows one IP address (computer) to be exposed to the Internet. Some applications require multiple TCP/IP ports to be open. It is recommended that you set your computer with a static IP if you want to use DMZ Hosting. To get the LAN IP address, see "Appendix E: Finding the MAC Address and IP Address for Your Ethernet Adapter."

If DMZ Hosting is used, does the exposed user share the public IP with the Router?
No.

Does the Router pass PPTP packets or actively route PPTP sessions?
The Router allows PPTP packets to pass through.

Is the Router cross-platform compatible?
Any platform that supports Ethernet and TCP/IP is compatible with the Router.

How many ports can be simultaneously forwarded?
Theoretically, the Router can establish 520 sessions at the same time, but you can only forward 10 ranges of ports.

What are the advanced features of the Router?
The Router's advanced features include Advanced Wireless settings, Filters, Port Forwarding, Routing, and DDNS.

How do I get mIRC to work with the Router?
Under the Port Forwarding tab, set port forwarding to 113 for the PC on which you are using mIRC.

Can the Router act as my DHCP server?
Yes. The Router has DHCP server software built-in.

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 documentation to determine if it supports operation over a network.

What is the IEEE 802.11g standard?
It is one of the IEEE standards for wireless networks. The 802.11g standard allows wireless networking hardware from different manufacturers to communicate, provided that the hardware complies with the 802.11g standard. The 802.11g standard states a maximum data transfer rate of 54Mbps and an operating frequency of 2.4GHz.

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

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.

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).

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.

Will the information be intercepted while it is being transmitted through the 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 64-bit or 128-bit shared key algorithm, as described in the IEEE 802.11 standard.

What is a MAC Address?

The Media Access Control (MAC) address is a unique number assigned by the manufacturer to any Ethernet networking device, such as a network adapter, that allows the network to identify it at the hardware level. For all practical purposes, this number is usually permanent. Unlike IP addresses, which can change every time a computer logs onto the network, the MAC address of a device stays the same, making it a valuable identifier for the network.

How do I reset the Router?

Press the Reset button on the back panel for about ten seconds. This will reset the Router to its default settings.

How do I resolve issues with signal loss?
There is no way to know the exact range of your wireless network without testing. Every obstacle placed between the Router and a wireless PC will create signal loss. Lead glass, metal, concrete floors, water and walls will inhibit the signal and reduce range. Start with the Router and your wireless PC in the same room and move it away in small increments to determine the maximum range in your environment.

You may also try using different channels, as this may eliminate interference affecting only one channel.

I have excellent signal strength, but I cannot see my network.
WEP is probably enabled on the Router, but not on your wireless adapter (or vice versa). Verify that the same WEP keys and levels (64 or 128) are being used on all nodes of your wireless network.

How many channels/frequencies are available with the Router?
There are eleven available channels, ranging from 1 to 11 (in North America).

If your questions are not addressed here, refer to the Linksys website, www.linksys.com.

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.

For information on implementing these security features, refer to "Chapter 5: Configuring the Wireless-B Broadband Router."

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.

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.

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 a "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. Two modes are available: Pre-Shared Key and RADIUS. Pre-Shared Key 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. RADIUS (Remote Authentication Dial-In User Service) utilizes a RADIUS server for authentication and the use of dynamic TKIP, AES, or WEP.

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 Pre-Shared Key. If you do not have a RADIUS server, Select the type of algorithm, TKIP or AES, enter a password in the Pre-Shared key field of 8-64 characters, and enter a Group Key Renewal period time between 0 and 99,999 seconds, which instructs the Router how often it should change the encryption keys.

WPA RADIUS. WPA used in coordination with a RADIUS server. (This should only be used when a RADIUS server is connected to the Router.) First, select the type of WPA algorithm, **TKIP** or **AES**. Enter the RADIUS server's IP Address and port number, along with a key shared between the Router and the server. Last, enter a Group Key Renewal period, which instructs the Router how often it should change the 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.) First, enter the RADIUS server's IP Address and port number, along with a key shared between the Router and the server. Then, select a WEP key and a level of WEP encryption, and either generate a WEP key through the Passphrase or enter the WEP key manually.

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: Upgrading Firmware

The Access Point's firmware is upgraded through the Web-Utility's Help tab. Follow these instructions:

1. Download the firmware from Linksys's website at **www.linksys.com**.
2. Go to the Firmware Upgrade screen from the Web-Utility's Administration tab, and the Upgrade Firmware screen, shown in Figure C-1, will appear.
3. Enter the location of the firmware's file or click the **Browse** button to find the file.
4. Then, click the **Upgrade** button to upgrade the firmware.

Figure C-1: Upgrade Firmware

Appendix D: Windows Help

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 the 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 E: Finding the MAC Address and IP Address for Your Ethernet Adapter

This section describes how to find the MAC address for your computer's Ethernet adapter so you can use the MAC filtering and/or MAC address cloning feature of the Router. You can also find the IP address of your computer's Ethernet adapter. This IP address is used for the Router's filtering, forwarding, and/or DMZ features. Follow the steps in this appendix to find the adapter's MAC or IP address in Windows 98, Me, 2000, or XP.

Windows 98 or Me Instructions

1. Click **Start** and **Run**. In the *Open* field, enter **winipcfg**. Then press the **Enter** key or the **OK** button.
2. When the *IP Configuration* screen appears, select the Ethernet adapter you have connected to the Router via a CAT 5 Ethernet network cable. See Figure E-1.
3. Write down the Adapter Address as shown on your computer screen (see Figure E-2). This is the MAC address for your Ethernet adapter and is shown as a series of numbers and letters.

   The MAC address/Adapter Address is what you will use for MAC address cloning or MAC filtering.

   The example in Figure E-3 shows the Ethernet adapter's IP address as 192.168.1.100. Your computer may show something different.

Note: The MAC address is also called the Adapter Address.

Figure E-1: IP Configuration Screen

Figure E-2: MAC Address/Adapter Address

Windows 2000 or XP Instructions

1. Click **Start** and **Run**. In the *Open* field, enter **cmd**. Press the **Enter** key or click the **OK** button.
2. At the command prompt, enter **ipconfig /all**. Then press the **Enter** key.

3. Write down the Physical Address as shown on your computer screen (Figure E-3); it is the MAC address for your Ethernet adapter. This appears as a series of numbers and letters.

   The MAC address/Physical Address is what you will use for MAC address cloning or MAC filtering.

Note: The MAC address is also called the Physical Address.

   The example in Figure E-3 shows the Ethernet adapter's IP address as 192.168.1.100. Your computer may show something different.

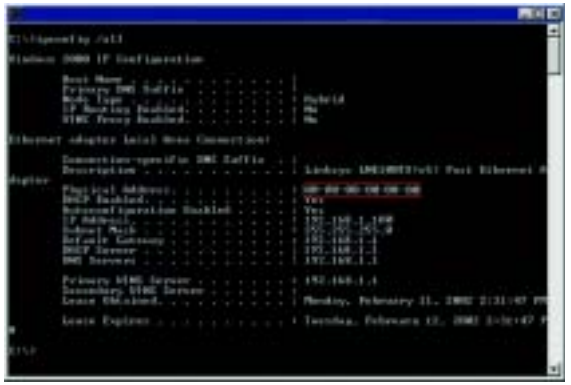

Figure E-3: MAC Address/Physical Address

For the Router's Web-based Utility

The MAC Address Clone screen is located on the Setup tab.

MAC Clone Service. To enable the function so you can clone a MAC address, select Enable from the drop-down list.

For MAC address cloning, enter the 12-digit MAC address in the *MAC Address* fields provided, two digits per field. See Figure E-5.

Figure E-4: MAC Address Clone

Appendix F: Glossary

802.11a - An IEEE wireless networking standard that specifies a maximum data transfer rate of 54Mbps and an operating frequency of 5GHz.

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, an operating frequency of 2.4GHz, and backward compatibility with 802.11b devices.

Access Point - Device that allows wireless-equipped computers and other devices to communicate with a wired network. Also used to expand the range of a wireless network.

Adapter - This is 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.

Beacon Interval - The frequency interval of the beacon, which is a packet broadcast by a router to synchronize a wireless network.

Bit - A binary digit.

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

Bridge - A device that connects two different kinds of local networks, such as a wireless network to a wired Ethernet network.

Broadband - An always-on, fast Internet connection.

Browser - A browser is an application program that provides a way to look at and interact with all the information on the World Wide Web.

Buffer - A block of memory that temporarily holds data to be worked on later when a device is currently too busy to accept the data.

Cable Modem - A device that connects a computer to the cable television network, which in turn connects to the Internet.

CSMA/CA (Carrier Sense Multiple Access/Collision Avoidance) - A method of data transfer that is used to prevent data loss in a network.

CTS (Clear To Send) - A signal sent by a device to indicate that it is ready to receive data.

Daisy Chain - A method used to connect devices in a series, one after the other.

Database - A collection of data that is organized so that its contents can easily be accessed, managed, and updated.

DDNS (Dynamic Domain Name System) - The capability of having a website, FTP, or e-mail server-with a dynamic IP address-use a fixed domain name.

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

DHCP (Dynamic Host Configuration Protocol) - A protocol that lets one device on a local network, known as a DHCP server, assign temporary IP addresses to the other network devices, typically computers.

DMZ (Demilitarized Zone) - Removes the Router's firewall protection from one PC, allowing it to be "seen" from the Internet.

DNS (Domain Name Server) - The IP address of your ISP's server, which translates the names of websites into IP addresses.

Domain - A specific name for a network of computers.

Download - To receive a file transmitted over a network.

DSL (Digital Subscriber Line) - An always-on broadband connection over traditional phone lines.

DSSS (Direct-Sequence Spread-Spectrum) - A type of radio transmission technology that includes a redundant bit pattern to lessen the probability of data lost during transmission. Used in 802.11b networking.

DTIM (Delivery Traffic Indication Message) - A message included in data packets that can increase wireless efficiency.

Dynamic IP Address - A temporary IP address assigned by a DHCP server.

Encryption - Encoding data to prevent it from being read by unauthorized people.

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

Finger - A program that tells you the name associated with an e-mail address.

Firewall - Security measures that protect the resources of a local network from intruders.

Firmware - 1. In network devices, the programming that runs the device. 2. Programming loaded into read-only memory (ROM) or programmable read-only memory (PROM) that cannot be altered by end-users.

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

FTP (File Transfer Protocol) - A standard protocol for sending files between computers over a TCP/IP network and the Internet.

Full Duplex - The ability of a networking device to receive and transmit data simultaneously.

Gateway - A system that interconnects networks.

Half Duplex - Data transmission that can occur in two directions over a single line, but only one direction at a time.

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

HTTP (HyperText Transport Protocol) - The communications protocol used to connect to servers on the World Wide Web.

IEEE (The Institute of Electrical and Electronics Engineers) - An independent institute that develops networking standards.

Infrastructure - Currently installed computing and networking equipment.

Infrastructure Mode - Configuration in which a wireless network is bridged to a wired network via an access point.

IP (Internet Protocol) - A protocol used to send data over a network.

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

IPCONFIG - A Windows 2000 and XP utility that displays the IP address for a particular networking device.

IPSec (Internet Protocol Security) - A VPN protocol used to implement secure exchange of packets at the IP layer.

ISM band - Radio band used in wireless networking transmissions.

ISP (Internet Service Provider) - A company that provides access to the Internet.

LAN (Local Area Network) - The computers and networking products that make up the network in your home or office.

MAC (Media Access Control) Address - The unique address that a manufacturer assigns to each networking device.

Mbps (Megabits Per Second) - One million bits per second; a unit of measurement for data transmission.

Multicasting - Sending data to a group of destinations at once.

NAT (Network Address Translation) - NAT technology translates IP addresses of a local area network to a different IP address for the Internet.

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

NNTP (Network News Transfer Protocol) - The protocol used to connect to Usenet groups on the Internet.

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

OFDM (Orthogonal Frequency Division Multiplexing) - A type of modulation technology that separates the data stream into a number of lower-speed data streams, which are then transmitted in parallel. Used in 802.11a, 802.11g, and powerline networking.

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.

Ping (Packet INternet Groper) - An Internet utility used to determine whether a particular IP address is online.

POP3 (Post Office Protocol 3) - A standard protocol used to retrieve e-mail stored on a mail server.

Port - 1. The connection point on a computer or networking device used for plugging in a cable or an adapter. 2. The virtual connection point through which a computer uses a specific application on a server.

PPPoE (Point to Point Protocol over Ethernet) - A type of broadband connection that provides authentication (username and password) in addition to data transport.

PPTP (Point-to-Point Tunneling Protocol) - A VPN protocol that allows the Point to Point Protocol (PPP) to be tunneled through an IP network. This protocol is also used as a type of broadband connection in Europe.

Preamble - Part of the wireless signal that synchronizes network traffic.

RJ-45 (Registered Jack-45) - An Ethernet connector that holds up to eight wires.

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, such as a local network and the Internet.

RTS (Request To Send) - A packet sent when a computer has data to transmit. The computer will wait for a CTS (Clear To Send) message before sending data.

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

SMTP (Simple Mail Transfer Protocol) - The standard e-mail protocol on the Internet.

SNMP (Simple Network Management Protocol) - A widely used network monitoring and control protocol.

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 (Service Set IDentifier) - Your wireless network's name.

Static IP Address - A fixed address assigned to a computer or device that is connected to a network.

Static Routing - Forwarding data in a network via a fixed path.

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

Switch - 1. Device that is the central point of connection for computers and other devices in a network, so data can be shared at full transmission speeds. 2. A device for making, breaking, or changing the connections in an electrical circuit.

TCP/IP (Transmission Control Protocol/Internet Protocol) - A network protocol for transmitting data that requires acknowledgement from the recipient of data sent.

Telnet - A user command and TCP/IP protocol used for accessing remote PCs.

TFTP (Trivial File Transfer Protocol) - A version of the TCP/IP FTP protocol that uses UDP and has no directory or password capability.

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

Topology - The physical layout of a network.

TX Rate - Transmission Rate.

UDP (User Datagram Protocol) - A network protocol for transmitting data that does not require acknowledgement from the recipient of the data that is sent.

Upgrade - To replace existing software or firmware with a newer version.

Upload - To transmit a file over a network.

URL (Uniform Resource Locator) - The address of a file located on the Internet.

VPN (Virtual Private Network) - A security measure to protect data as it leaves one network and goes to another over the Internet.

WAN (Wide Area Network) - The Internet.

WEP (Wired Equivalent Privacy) - A method of encrypting data transmitted on a wireless network for greater security.

WINIPCFG - A Windows 98 and Millennium utility that displays the IP address for a particular networking device.

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

Appendix G: Specifications

Standards	IEEE 802.3, IEEE 802.3u, IEEE 802.11b
Protocols	TCP/IP, NetBEUI, IPX/SPX
Channels	11 Channels (US, Canada), 13 Channels (Europe) 14 Channels (Japan)
Ports	One 10/100 RJ-45 port for Cable/DSL Modem Connection Four 10/100 RJ-45 Switched ports
Speed	10/100Mbps (Half Duplex) 20/200 (Full Duplex)
Cabling Type	UTP Category 5 or better
LEDs	Power, Internet, Ethernet, Wireless-B
Warranty	1-Year Limited
Dimensions	7.31" x 6.16" x 1.88" (186 mm x 154 mm x 48 mm)
Unit Weight	16 oz. (0.45 kg)
Power	External, 12V DC, 1A
Certifications	FCC, CE, WiFi, UPnP
Operating Temp	0ºC to 40ºC (32ºF to 104ºF)
Storage Temp	-20ºC to 70ºC (-4ºF to 158ºF)
Operating Humidity	10% to 85%, Non-Condensing
Storage Humidity	5% to 90%, Non-Condensing

Appendix H: 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 I: Regulatory Information

FCC STATEMENT

This product has been tested and complies with the specifications 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 according to 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 is found by turning the equipment off and on, the user is encouraged to try to correct the interference by one or more of the following measures:

- Reorient or relocate the receiving antenna
- Increase the separation between the equipment or devices
- Connect the equipment to an outlet other than the receiver's
- Consult a dealer or an experienced radio/TV technician for assistance

FCC Radiation Exposure Statement
This equipment complies with FCC radiation exposure limits set forth for an uncontrolled environment. This equipment should be installed and operated with minimum distance 20cm between the radiator and your body.

INDUSTRY CANADA (CANADA)

This Class B digital apparatus complies with Canadian ICES-003.
Cet appareil numérique de la classe B est conforme à la norme NMB-003 du Canada.
The use of this device in a system operating either partially or completely outdoors may require the user to obtain a license for the system according to the Canadian regulations.

EC DECLARATION OF CONFORMITY (EUROPE)

Linksys declares that the Wireless-B Broadband Router 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-B Broadband Router tyyppinen laite on direktiivin 1999/5/EY oleellisten vaatimusten ja sitä koskevien näiden direktiivien muiden ehtojen mukainen.

- Linksys Group déclare le Routeur d'accès 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 F:

  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 department. 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 J: 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