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2.4GHz
802.11g

Wireless-G

WIRELESS

User Guide

Model No. **WRT54GP2**

CISCO SYSTEMS



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How to Use This User Guide

This User Guide has been designed to make understanding networking with the Wireless-G 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-G Broadband Router.



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



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

Table of Contents

Chapter 1: Introduction	1
Welcome	1
What's in this Guide?	2
Chapter 2: Planning Your Wireless Network	4
Network Topology	4
Ad-Hoc versus Infrastructure Mode	4
Network Layout	4
Chapter 3: Getting to Know the Wireless-G Broadband Router with 2 Phone Ports	6
The Back Panel	6
The Front Panel	7
Chapter 4: Connecting the Wireless-G Broadband Router with 2 Phone Ports	8
Overview	8
Connection Instructions	9
Chapter 5: Configuring the Wireless-G Broadband Router with 2 Phone Ports	10
Overview	10
How to Access the Web-based Utility	12
The Setup Tab - Basic Setup	12
The Setup Tab - DDNS	18
The Setup Tab - MAC Address Clone	19
The Setup Tab - Advanced Routing	20
The Wireless Tab - Basic Wireless Settings	22
The Wireless Tab - Wireless Security	23
The Wireless Tab - Wireless Network Access	25
The Wireless Tab - Advanced Wireless Settings	26
The Security Tab - Filter	27
The Security Tab - VPN Passthrough	29
The Voice Tab - Systems	30
The Voice Tab - Line1 Settings	31
The Voice Tab - Line2 Settings	34
The Applications & Gaming Tab - Port Range Forwarding	37
The Applications & Gaming Tab - Port Triggering	38

Wireless-G Broadband Router with 2 Phone Ports

The Applications & Gaming Tab - UPnP Forwarding	39
The Applications & Gaming Tab - DMZ	41
The Administration Tab - Management	44
The Administration Tab - Log	46
The Administration Tab - Factory Defaults	47
The Administration Tab - Firmware Upgrade	48
The Status Tab - Voice	49
The Status Tab - Router	50
The Status Tab - Local Network	51
The Status Tab - Wireless	52
Appendix A: Troubleshooting	53
Common Problems and Solutions	53
Frequently Asked Questions	61
Appendix B: Wireless Security	69
Security Precautions	69
Security Threats Facing Wireless Networks	69
Appendix C: Upgrading Firmware	72
Appendix D: Windows Help	73
Appendix E: Finding the MAC Address and IP Address for Your Ethernet Adapter	74
Windows 98SE or Me Instructions	74
Windows 2000 or XP Instructions	74
For the Router's Web-based Utility	75
Appendix F: Glossary	76
Appendix G: Specifications	83
Appendix H: Warranty Information	85
Appendix I: Regulatory Information	86
Appendix J: Contact Information	88

List of Figures

Figure 3-1: The Broadband Router's Back Panel	6
Figure 3-2: The Broadband Router's Front Panel	7
Figure 4-1: Router Connection Diagram	8
Figure 4-2: Connect a PC	9
Figure 4-3: Connect a Telephone	9
Figure 4-4: Connect the Cable/DSL Modem	9
Figure 4-5: Connect the Power	9
Figure 5-1: Router's IP Address	12
Figure 5-2: Router Login	12
Figure 5-3: Setup Tab - Basic Setup (Obtain an IP automatically)	12
Figure 5-4: Static IP	13
Figure 5-5: PPPoE	13
Figure 5-6: RAS (for Singtel)	14
Figure 5-7: PPTP	14
Figure 5-8: Heart Beat Signal	15
Figure 5-9: Setup Tab - DDNS (DynDNS.org)	18
Figure 5-10: Setup Tab - DDNS (TZO.com)	18
Figure 5-11: Setup Tab - MAC Clone	19
Figure 5-12: Setup Tab - Advanced Routing	20
Figure 5-13: Routing Table Entry List	21
Figure 5-14: Wireless Tab - Basic Wireless Settings	22
Figure 5-15: Wireless Tab - Wireless Security (WPA Pre-Shared Key)	23
Figure 5-16: Wireless Tab - Wireless Security (WPA RADIUS)	23
Figure 5-17: Wireless Tab - Wireless Security (WEP)	24
Figure 5-18: Wireless Tab - Wireless Network Access	25
Figure 5-19: Wireless Client MAC List	25
Figure 5-20: Wireless Tab - Advanced Wireless Settings	26
Figure 5-21: Security Tab - Filter	27
Figure 5-22: Filtered MAC Address	28
Figure 5-23: Security Tab - VPN Passthrough	29

Figure 5-24: Voice Tab - System	30
Figure 5-25: Voice Tab - Line1	31
Figure 5-26: Voice Tab - Line2	34
Figure 5-27: Applications & Gaming Tab - Port Range Forwarding	37
Figure 5-28: Applications & Gaming Tab - Port Triggering	38
Figure 5-29: Applications & Gaming Tab - UPnP Forwarding	39
Figure 5-30: Applications & Gaming Tab - DMZ	41
Figure 5-31: Applications & Gaming Tab - QoS	42
Figure 5-32: Administration Tab - Management	44
Figure 5-1: Backup & Restore Configuration	45
Figure 5-33: Administration Tab - Log	46
Figure 5-34: Incoming Log Table	46
Figure 5-35: Outgoing Log Table	46
Figure 5-36: Administration Tab - Factory Defaults	47
Figure 5-37: Administration Tab - Firmware Upgrade	48
Figure 5-38: Status Tab - Voice	49
Figure 5-39: Status Tab - Router	50
Figure 5-40: Status Tab - Local Network	51
Figure 5-41: DHCP Active IP Table	51
Figure 5-42: Status Tab - Wireless	52
Figure C-1: Upgrade Firmware	72
Figure E-1: IP Configuration Screen	74
Figure E-2: MAC Address/Adapter Address	74
Figure E-3: MAC Address/Physical Address	74
Figure E-4: MAC Address Filter List	75
Figure E-5: MAC Address Clone	75

Chapter 1: Introduction

Welcome

Thank you for choosing the Linksys Wireless-G Broadband Router. The Wireless-G Broadband Router will allow you to network wirelessly better than ever, sharing Internet access, files and fun, easily and securely.

How does the Wireless-G Broadband Router do all of this? A router is a device that allows access to an Internet connection over a network. With the Wireless-G Broadband Router, this access can be shared over the three switched ports or via the wireless broadcast at either up to 11Mbps for Wireless-B or up to 54Mbps for Wireless-G. In addition, the WPA standard provides greater security opportunities while the whole network is protected through NAT technology. All of these security features, as well as full configurability, are accessed through the easy-to-use browser-based utility.

But what does all of this mean?

Networks are useful tools for sharing Internet access and computer resources. Multiple computers can share Internet access, so you don't need more than one high-speed Internet connection. After you set up your Internet phone service, you can also use your Internet access to make phone calls, even while you're surfing the Internet. Plus, you can access one printer from different computers and access data located on another computer's hard drive. Networks are even used for playing multiplayer video games. So, networks not only are useful in homes and offices, but also can be fun.

PCs on a wired network create a LAN, or Local Area Network. They are connected with Ethernet cables, which is why the network is called "wired".

PCs equipped with wireless cards or adapters can communicate without cumbersome cables. By sharing the same wireless settings, within their transmission radius, they form a wireless network. This is sometimes called a WLAN, or Wireless Local Area Network. The Wireless-G Broadband Router bridges wireless networks of both 802.11b and 802.11g standards and wired networks, allowing them to communicate with each other.

With your networks all connected, wired, wireless, and the Internet, you can now share files and Internet access—and even play games. All the while, the Wireless-G Broadband Router protects your networks from unauthorized and unwelcome users.

To create your network, install and set up the Router. To guide you through the process, Linksys strongly recommends that you run the Setup Wizard on the Setup CD-ROM. If you prefer to manually set up the Router, use the instructions in the Quick Installation or this User Guide to help you. These instructions should be all you need to get the most out of the Wireless-G Broadband Router.

wpa (*wi-fi protected access*): a wireless security protocol using TKIP (Temporal Key Integrity Protocol) encryption, which can be used in conjunction with a RADIUS server

nat (*network address translation*): NAT technology translated IP addresses of a local area network to a different IP address for the Internet

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

browser: an application program that provides a way to look at and interact with all the information on the World Wide Web

lan (*local area network*): the computers and networking products that make up the network in your home or office

ethernet: an IEEE standard network protocol that specifies how data is placed on and retrieved from a common transmission medium

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

What's in this Guide?

This user guide covers the steps for setting up and using the Wireless-G Broadband Router.

- **Chapter 1: Introduction**
This chapter describes the Router'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-G Broadband Router with 2 Phone Ports**
This chapter describes the physical features of the Router.
- **Chapter 4: Connecting the Wireless-G Broadband Router with 2 Phone Ports**
This chapter instructs you on how to connect the Router to your cable or DSL modem, PCs, and telephones (or fax machines).
- **Chapter 5: Configuring the Wireless-G Broadband Router with 2 Phone Ports**
This chapter explains how to configure the Router using your web browser and the Router's Web-based Utility. You will configure the Router using the settings provided by your ISP.
- **Appendix A: Troubleshooting**
This appendix describes some possible problems and solutions, as well as frequently asked questions, regarding installation and use of the 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 the Router should you 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 Ethernet 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.

Wireless-G Broadband Router with 2 Phone Ports

- **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 local area network (WLAN) is exactly like a regular local area network (LAN), except that each computer in the WLAN uses a wireless device to connect to the network. Computers in a WLAN share the same frequency channel and SSID, which is an identification name shared by the wireless devices belonging to the same wireless network.

Ad-Hoc versus Infrastructure Mode

Unlike wired networks, wireless networks have two different modes in which they may be set up: infrastructure and ad-hoc. An infrastructure configuration is a WLAN and wired LAN communicating to each other through an access point. An ad-hoc configuration is wireless-equipped computers communicating directly with each other. Choosing between these two modes depends on whether or not the wireless network needs to share data or peripherals with a wired network or not.

If the computers on the wireless network need to be accessible by a wired network or need to share a peripheral, such as a printer, with the wired network computers, the wireless network should be set up in Infrastructure mode. The basis of Infrastructure mode centers around an access point or wireless router, such as the Wireless-G Broadband Router with 2 Phone Ports, which serves as the main point of communications in a wireless network. The Router transmits data to PCs equipped with wireless network adapters, which can roam within a certain radial range of the Router. You can arrange the Router and multiple access points to work in succession to extend the roaming range, and you can set up your wireless network to communicate with your Ethernet hardware as well.

If the wireless network is relatively small and needs to share resources only with the other computers on the wireless network, then the Ad-Hoc mode can be used. Ad-Hoc mode allows computers equipped with wireless transmitters and receivers to communicate directly with each other, eliminating the need for a wireless router or access point. The drawback of this mode is that in Ad-Hoc mode, wireless-equipped computers are not able to communicate with computers on a wired network. And, of course, communication between the wireless-equipped computers is limited by the distance and interference directly between them.

Network Layout

The Wireless-G Broadband Router with 2 Phone Ports has been specifically designed for use with both your 802.11b and 802.11g products. Now, products using these standards can communicate with each other.

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

ssid: your wireless network's name

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

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

adapter: a device that adds network functionality to your PC

ethernet: IEEE standard network protocol that specifies how data is placed on and retrieved from a common transmission medium

access point: a 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

Wireless-G Broadband Router with 2 Phone Ports

The Wireless-G Broadband Router with 2 Phone Ports is compatible with all 802.11b and 802.11g adapters, such as the Notebook Adapters (WPC54G, WPC11) for your laptop computers, PCI Adapter (WMP54G, WMP11) for your desktop PC, and USB Adapter (WUSB54G, WUSB11) when you want to enjoy USB connectivity. The Broadband Router will also communicate with the Wireless PrintServer (WPS54GU2, WPS11) and Wireless Ethernet Bridges (WET54G, WET11).

When you wish to connect your wireless network with your wired network, you can use the Broadband Router's three LAN ports. To add more ports, any of the Broadband Router's LAN ports 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-G Broadband Router with 2 Phone Ports.

Chapter 3: Getting to Know the Wireless-G Broadband Router with 2 Phone Ports

The Back Panel

The Router's ports and the Reset button are located on the back panel of the Router.



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

- Internet** The **Internet** port is where you will connect your broadband Internet connection.
- Phone1** For your primary telephone line, the **Phone1** port allows you to connect the Router to your telephone (or fax machine) using an RJ-11 telephone cable.
- Phone2** For your secondary telephone line, the **Phone2** port allows you to connect the Router to your second telephone (or fax machine) using an RJ-11 telephone cable.
- Ethernet 1-3** These three **Ethernet** ports connect to network devices, such as PCs, print servers, or additional switches.
- Reset Button** There are two ways to reset the Router's factory defaults. Either press the **Reset Button**, for approximately five seconds, or restore the defaults from the Administration tab - Factory Defaults in the Router's Web-based Utility.
- Power** The **Power** port is where you will connect the power adapter.



Important: If you reset the Broadband Router, all of your settings, including Internet connection, wireless, and security, will be deleted and replaced with the factory defaults. Do not reset the Broadband Router if you want to retain these settings.

port: the connection point on a computer or networking device used for plugging in cables or adapters

broadband: an always-on, fast Internet connection

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 when the Router is powered on. The LED flashes while the Router is booting up, running a system self-test, or upgrading its firmware.
- WLAN** Green. The **WLAN** LED lights up whenever there is a successful wireless connection. If the LED is flashing, the Router is actively sending or receiving data over the wireless network.
- Ethernet 1-3** Green. The **Ethernet** LED serves two purposes. If the LED is solidly lit, the Router is connected to a device through the corresponding port (Ethernet 1, 2, or 3). If the LED is flashing, the Router is sending or receiving data over that port.
- Phone 1-2** Green. The **Phone** LED serves two purposes. The LED is solidly lit when there is a registered connection to a telephone or fax machine through the corresponding port (Phone1 or Phone2). It is not lit when there is no registered connection. The LED flashes when the phone is being used or an incoming call has been detected.
- Internet** Green. The **Internet** LED lights up when the Router is connected to your cable or DSL modem. If the LED is flashing, the Router is sending or receiving data over the Internet port.

Proceed to “Chapter 4: Connecting the Router.”

Chapter 4: Connecting the Wireless-G Broadband Router with 2 Phone Ports

Overview

To begin installation of the Router, you will connect the Router to your PCs, telephone(s) or fax machine(s), and cable or DSL modem. The following diagram illustrates a basic network setup with wired connections to one desktop PC and telephone and a wireless connection to one notebook PC.

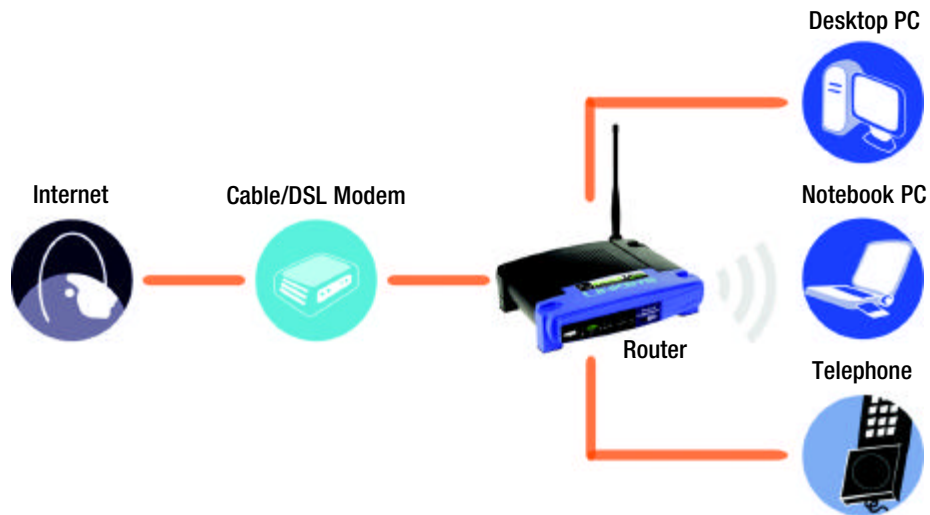


Figure 4-1: Router Connection Diagram

Connection Instructions

1. Before you begin, make sure that all of your hardware is powered off, including the Router, PCs, switches, and cable or DSL modem.
2. Connect one end of an Ethernet network cable to one of the numbered ports on the back of the Router. Connect the other end to an Ethernet port on a network device, e.g., a PC, print server, or switch.

Repeat this step to connect more PCs or other network devices to the Router.

3. If necessary, disconnect the RJ-11 telephone cable of your telephone from the telephone wall jack. Then connect that end to the Router's Phone1 port.



NOTE: Make sure your telephone is set to its tone setting (not pulse).

4. If you have a second Internet phone line, repeat step 3 to connect a telephone or fax machine to the Router's Phone2 port.
5. Connect your cable or DSL modem's Ethernet cable to the Router's Internet port.
6. Power on the cable or DSL modem.
7. Connect the included power adapter to the Router's Power port, and then plug the power adapter into an electrical outlet.

The Power LED on the front panel will light up as soon as the power adapter is connected properly.

8. Power on your PC(s).

Proceed to "Chapter 5: Configuring the Router."



Figure 4-2: Connect a PC



Figure 4-3: Connect a Telephone



Figure 4-4: Connect the Cable/DSL Modem



Figure 4-5: Connect the Power

Chapter 5: Configuring the Wireless-G Broadband Router with 2 Phone Ports

Overview

Linksys recommends using the Setup CD-ROM for first-time installation of the Router. If you do not wish to run the Setup Wizard on the Setup CD-ROM, then you can use the Web-based Utility to configure the Router. For advanced users, you may configure the Router's advanced settings through the Web-based Utility.

This chapter will describe each web page on 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 wireless 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.
- **Wireless.** On the *Basic Wireless Settings* screen, set the basic configuration for your wireless network.

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

Setup

- **Basic Setup.** Enter the Internet connection and network settings on this screen.
- **DDNS.** Enable the Router's Dynamic Domain Name System (DDNS) feature on this screen.
- **MAC Address Clone.** If you need to clone a MAC address onto the Router, use this screen.
- **Advanced Routing.** Alter Network Address Translation (NAT), Dynamic Routing, and Static Routing settings.

Wireless

- **Basic Wireless Settings.** Enter the basic settings for your wireless network on this screen.
- **Wireless Security.** Enable and configure the security settings for your wireless network.

Wireless-G Broadband Router with 2 Phone Ports

- **Wireless Network Access.** To block specific users for wireless network access, set up MAC address filtering.
- **Advanced Wireless.** For advanced users, you can alter data transmission settings on this screen.

Security

- **Filter.** To block specific users from Internet access, you can set up IP address, port, and MAC address filtering.
- **VPN Passthrough.** To enable or disable IPSec, PPPoE, and/or PPTP Passthrough, use this screen.

Voice

- **System.** Enter the STUN (Simple Traversal of UDP through NAT) settings if required by your Internet phone service provider.
- **Line1.** Enter your service account information, and configure the various settings for this phone line.
- **Line2.** If you have a second Internet phone line, then enter your service account information, and configure the various settings for this phone line.

Applications & Gaming

- **Port Range Forwarding.** Set up public services or other specialized Internet applications on your network.
- **Port Triggering.** To set up triggered ranges and forwarded ranges for Internet applications, click this tab.
- **UPnP Forwarding.** Use this screen to alter UPnP forwarding settings.
- **DMZ.** Click this tab to allow one local user to be exposed to the Internet for use of special-purpose services.
- **QoS.** Enable QoS (Quality of Service) to maximize network performance.

Administration

- **Management.** On this screen, alter the Router's password, access privileges, and UPnP settings. You can also back up and restore the Router's configuration if necessary.
- **Log.** If you want to view or save activity logs, click this tab.
- **Factory Defaults.** If you want to restore the Router's factory defaults, then use this screen.
- **Firmware Upgrade.** Click this tab if you want to upgrade the Router's firmware.

Status

- Voice. This screen provides status information about the Internet phone lines.
- Router. This screen provides status information about the Router.
- Local Network. This provides status information about the local network.
- Wireless. Status information about the wireless network is displayed here.

How to Access the Web-based Utility

To access the Web-based Utility of the Router, launch Internet Explorer or Netscape Navigator, and enter the Router's default IP address, **192.168.1.1**, in the *Address* field. Press the **Enter** key.

A screen will appear asking you for your User Name and Password. Leave the *User Name* field blank, and enter **admin** in the *Password* field. Then click the **OK** button.

Make the necessary changes through the Utility. When you have finished making changes to a screen, click the **Save Settings** button to save the changes, or click the **Cancel Changes** button to undo your changes. Help information is shown on the right-hand side of a screen. For additional information, click **More**.

The Setup Tab - Basic Setup

The *Basic Setup* screen is the first screen you see when you access the Web-based Utility.

Internet Setup

The Internet Setup section configures the Router for your Internet connection type. This information can be obtained from your ISP.

Internet Connection Type

The Router supports six connection types: Obtain an IP automatically (DHCP), Static IP, PPPoE, RAS, PPTP, and Heart Beat Signal. Each *Basic Setup* screen and available features will differ depending on what kind of connection type you select.

Obtain an IP automatically

By default, the Router's Internet Connection Type is set to **Obtain an IP automatically**, and it should be used only if your ISP supports DHCP or you are connecting through a dynamic IP address.



Figure 5-1: Router's IP Address

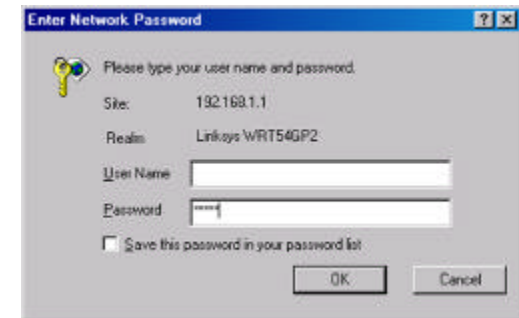


Figure 5-2: Router Login



Figure 5-3: Setup Tab - Basic Setup (Obtain an IP automatically)

Static IP

If you are required to use a permanent IP address, then select **Static IP**.

IP Address. This is the IP address that the Router has, 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 external 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.

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 for end-users. If you use a DSL line, check with your ISP to see if they use PPPoE. If they do, you will have to enable it.

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

Service Name. If provided by your ISP, enter the Service Name.

Connect on Demand and Max Idle Time. You can configure the Router to cut the Internet connection after it has been inactive for a specific 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. If you want your Internet connection to remain on at all times, enter **0** in the *Max Idle Time* field. Otherwise, enter the number of minutes you want to have elapsed before your Internet access disconnects.

Keep Alive and Redial Period. This option keeps your PPPoE-enabled Internet access connected indefinitely, even when it sits idle. If you select this option, the Router will periodically check your Internet connection. If the connection is down, then the Router will automatically re-establish the connection. To use this option, click the radio button next to *Keep Alive*. The default Redial Period is 30 seconds.

When you are finished, click the **Save Settings** button. Then click the **Status** tab, and click the **Connect** button to start the connection.



Note: For DSL users, if you need to enable PPPoE support, remember to remove any PPPoE applications that are installed on your PCs.

Figure 5-4: Static IP

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

subnet mask: an address code that determines the size of the network

default gateway: a device that forwards Internet traffic from your local area network

Figure 5-5: PPPoE

pppoe: a type of broadband connection that provides authentication (username and password) in addition to data transport

RAS (for SingTel)

Remote Access Service (RAS) is a service that applies to connections in Singapore only. For users in Singapore, check with Singtel for information on RAS.

User Name and Password. Enter the User Name and Password supplied by Singtel.

RAS Plan. Select the type of plan you have.

Connect on Demand and Max Idle Time. You can configure the Router to cut the Internet connection after it has been inactive for a specific 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. If you want your Internet connection to remain on at all times, enter 0 in the *Max Idle Time* field. Otherwise, enter the number of minutes you want to have elapsed before your Internet access disconnects.

Keep Alive and Redial Period. This option keeps your PPPoE-enabled Internet access connected indefinitely, even when it sits idle. If you select this option, the Router will periodically check your Internet connection. If the connection is down, then the Router will automatically re-establish the connection. To use this option, click the radio button next to *Keep Alive*. The default Redial Period is 30 seconds.

When you are finished, click the **Save Settings** button. Then click the **Status** tab, and click the **Connect** button to start the connection.

PPTP

Point-to-Point Tunneling Protocol (PPTP) is a service that applies to connections in Europe and Israel only.

IP Address. This is the IP address that the Router has, 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 external 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 and Max Idle Time. You can configure the Router to cut the Internet connection after it has been inactive for a specific 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

Figure 5-6: RAS (for Singtel)

Figure 5-7: PPTP

connection as soon as you attempt to access the Internet again. If you wish to activate Connect on Demand, click the radio button. If you want your Internet connection to remain on at all times, enter **0** in the *Max Idle Time* field. Otherwise, enter the number of minutes you want to have elapsed before your Internet access disconnects.

Keep Alive and Redial Period. This option keeps your PPPoE-enabled Internet access connected indefinitely, even when it sits idle. If you select this option, the Router will periodically check your Internet connection. If the connection is down, then the Router will automatically re-establish the connection. To use this option, click the radio button next to *Keep Alive*. The default Redial Period is 30 seconds.

When you are finished, click the **Save Settings** button. Then click the **Status** tab, and click the **Connect** button to start the connection.

Heart Beat Signal

Heart Beat Signal 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.

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

Heart Beat Server. This is the IP address that the Router has, when seen from the Internet. Your ISP will provide you with the IP Address you need to specify here.

Connect on Demand and Max Idle Time. You can configure the Router to cut the Internet connection after it has been inactive for a specific 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. If you want your Internet connection to remain on at all times, enter **0** in the *Max Idle Time* field. Otherwise, enter the number of minutes you want to have elapsed before your Internet access disconnects.

Keep Alive and Redial Period. This option keeps your PPPoE-enabled Internet access connected indefinitely, even when it sits idle. If you select this option, the Router will periodically check your Internet connection. If the connection is down, then the Router will automatically re-establish the connection. To use this option, click the radio button next to *Keep Alive*. The default Redial Period is 30 seconds.

When you are finished, click the **Save Settings** button. Then click the **Status** tab, and click the **Connect** button to start the connection.

Heart Beat Signal

User Name:

Password:

Heart Beat Server:

Connect on Demand: Max Idle Time Min.

Keep Alive: Redial Period Sec.

Figure 5-8: Heart Beat Signal

Optional Settings

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

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.

***packet:** a unit of data sent over a network*

Network Setup

The Network Setup section allows you to change the Router's local network settings.

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)

These 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. Unless you already have one, it is highly recommended that you leave the Router enabled as a DHCP server.

Local DHCP Server. DHCP is 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. Because the default IP address for the Router is 192.168.1.1, the Start IP Address must be 192.168.1. 2 or greater, but smaller than 192.168.1.254. The default Start IP Address is **192.168.1.100**.

Wireless-G Broadband Router with 2 Phone Ports

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. The default is **50**.

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. After the dynamic IP address has expired, the user will be automatically assigned a new dynamic IP address. The default is **0** minutes, which means one day.

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. You can enter 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) converts NetBIOS names to IP addresses. If you use a WINS server, enter that server’s IP address here. Otherwise, leave this field blank.

Time Setting

Select the time zone in which your network functions from this pull-down menu.

When you have finished making changes on this screen, click the **Save Settings** button to save the changes, or click the **Cancel Changes** button to undo your changes. Help information is shown on the right-hand side of a screen. For additional information, click **More**.



Note: To test your settings, connect to the Internet now.

***dynamic ip address:** a temporary IP address assigned by a DHCP server*

The Setup Tab - DDNS

The Router offers a Dynamic Domain Name System (DDNS) feature. DDNS lets you assign a fixed host and domain name to a dynamic Internet IP address. It is useful when you are hosting your own website, FTP server, or other server behind the Router.

Before you can use this feature, you need to sign up for DDNS service at one of two DDNS service providers, DynDNS.org or TZO.com. If you do not want to use this feature, keep the default setting, **Disable**.

DDNS

DDNS Service. If your DDNS service is provided by DynDNS.org, then select **DynDNS.org** from the drop-down menu. If your DDNS service is provided by TZO, then select **TZO.com**. The features available on the *DDNS* screen will vary, depending on which DDNS service provider you use.

DynDNS.org

User Name, Password, and Host Name. Enter the User Name, Password, and Host Name of the account you set up with DynDNS.org.

Internet IP Address. The Router's current Internet IP Address is displayed here. Because it is dynamic, it will change.

Status. The status of the DDNS service connection is displayed here.

TZO.com

E-mail Address, Password, and Domain Name. Enter the Email Address, Password, and Domain Name of the service you set up with TZO.

Internet IP Address. The Router's current Internet IP Address is displayed here. Because it is dynamic, this will change.

Status. The status of the DDNS service connection is displayed here.

When you have finished making changes on this screen, click the **Save Settings** button to save the changes, or click the **Cancel Changes** button to undo your changes. Help information is shown on the right-hand side of a screen. For additional information, click **More**.

ddns: allows the hosting of a website, FTP server, or e-mail server with a fixed domain name (e.g., www.xyz.com) and a dynamic IP address



Figure 5-9: Setup Tab - DDNS (DynDNS.org)



Figure 5-10: Setup Tab - DDNS (TZO.com)

The Setup Tab - MAC Address Clone

A MAC address is a 12-digit code assigned to a unique piece of hardware for identification, like a social security number. 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.

MAC Clone

MAC Clone Service. To use MAC address cloning, select **Enable**.

MAC Address. Enter the MAC Address registered with your ISP. Then click the **Save Settings** button.

Clone. If you want to clone the MAC address of the PC you are currently using to configure the Router, then click the **Clone** button. The Router will automatically detect your PC's MAC address, so you do NOT have to call your ISP to change the registered MAC address to the Router's MAC address. It is recommended that the PC registered with the ISP is used to open the *MAC Address Clone* screen.

When you have finished making changes on this screen, click the **Save Settings** button to save the changes, or click the **Cancel Changes** button to undo your changes. Help information is shown on the right-hand side of a screen. For additional information, click **More**.



Figure 5-11: Setup Tab - MAC Clone

mac address: the unique address that a manufacturer assigns to each networking device.

The Setup Tab - Advanced Routing

The *Advanced Routing* screen allows you to configure the Network Address Translation (NAT), dynamic routing, and static routing settings.

Advanced Routing

NAT. NAT is a security feature that is enabled by default. It enables the Router to translate IP addresses of your local area network to a different IP address for the Internet. To disable NAT, click the **Disable** radio button. (When NAT is disabled, the DHCP server feature is also disabled.)

Dynamic Routing. This feature enables the Router to automatically adjust to physical changes in the network's layout and exchange routing tables with the other router(s). The Router determines the network packets' route based on the fewest number of hops between the source and the destination.

Transmit RIP Version. To use dynamic routing for transmission of network data, select the protocol you want: **RIP1**, **RIP1-Compatible**, or **RIP2**.

Receive RIP Version. To use dynamic routing for reception of network data, select the protocol you want, **RIP1** or **RIP2**.

Static Routing. Use this feature to set up a static router between the Router and another network. (A static route is a pre-determined pathway that network information must travel to reach a specific host or network.) To create a static route, alter the following settings:

Select Entry. Select the number of the static route from the drop-down menu. The Router supports up to 20 static route entries.

Enter Route Name. Enter a name for the static route, using a maximum of 25 alphanumeric characters.

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

Subnet Mask. The Subnet Mask determines which portion of a Destination 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 device on the network, such as PCs, print servers, routers, etc.



Figure 5-12: Setup Tab - Advanced Routing

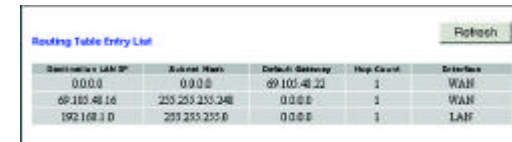
Wireless-G Broadband Router with 2 Phone Ports

Interface. Select **Local** or **Internet**, depending on the location of the static route's final destination.

Delete Entry. If you need to delete a route, select its number from the drop-down menu, and click the **Delete Entry** button.

Show Routing Table. Click the **Show Routing Table** button to open a screen displaying how data is routed through your local network. For each route, the Destination LAN IP address, Subnet Mask, Default Gateway, Hop Count, and Interface are displayed. Click the **Refresh** button to update the information.

When you have finished making changes on this screen, click the **Save Settings** button to save the changes, or click the **Cancel Changes** button to undo your changes. Help information is shown on the right-hand side of a screen. For additional information, click **More**.



Destination LAN IP	Subnet Mask	Default Gateway	Hop Count	Interface
0.0.0.0	0.0.0.0	69.103.48.22	1	WAN
69.103.48.16	255.255.255.248	0.0.0.0	1	WAN
192.168.1.0	255.255.255.0	0.0.0.0	1	LAN

Figure 5-13: Routing Table Entry List

The Wireless Tab - Basic Wireless Settings

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

Wireless Network Mode. From this drop-down menu, you can select the wireless standards running on your network. If you have both 802.11g and 802.11b devices in your network, keep the default setting, **Mixed**. If you have only 802.11g devices, select **G-Only**. If you have only 802.11b devices, select **B-Only**. If you do not have any 802.11g and 802.11b devices in your network, select **Disable**.

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 devices 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, **Enable**. If you do not want to broadcast the Router's SSID, then select **Disable**.

When you have finished making changes on this screen, click the **Save Settings** button to save the changes, or click the **Cancel Changes** button to undo your changes. Help information is shown on the right-hand side of a screen. For additional information, click **More**.



Figure 5-14: Wireless Tab - Basic Wireless Settings

The Wireless Tab - Wireless Security

The Wireless Security settings configure the security of your wireless network. There are three wireless security mode options supported by the Router: WPA Pre-Shared Key, WPA RADIUS, and WEP. (WPA stands for Wi-Fi Protected Access, which is a security standard stronger than WEP encryption. WEP stands for Wired Equivalent Privacy, while RADIUS stands for Remote Authentication Dial-In User Service.) These three are briefly discussed here. For detailed instructions on configuring wireless security for the Router, turn to “Appendix B: Wireless Security.”

WPA Pre-Shared Key. WPA gives you one encryption method, TKIP, with dynamic encryption keys. Select **TKIP** from the *WPA Algorithm* drop-down menu. Enter a WPA Shared Key of 8-32 characters. Then enter the Group Key Renewal period, which instructs the Router how often it should change the encryption keys.

WPA RADIUS. This option features WPA used in coordination with a RADIUS server. (This should only be used when a RADIUS server is connected to the Router.) First Select **TKIP** from the *WPA Algorithm* drop-down menu. Enter the RADIUS server’s IP address and port number, along with the WPA Shared Key, which is the key shared between the Router and the server. Last, enter the Group Key Renewal period, which instructs the Router how often it should change the encryption keys.

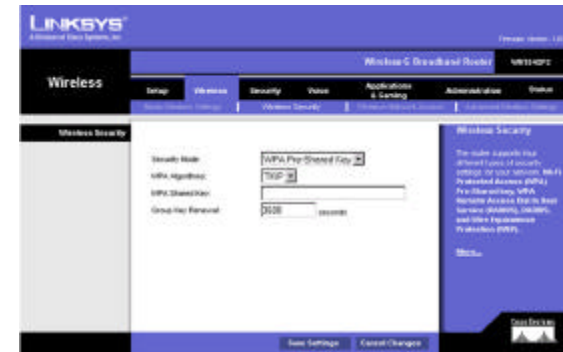


Figure 5-15: Wireless Tab - Wireless Security (WPA Pre-Shared Key)

wpa (wi-fi protected access): a wireless security protocol using TKIP (Temporal Key Integrity Protocol) encryption, which can be used in conjunction with a RADIUS server



Figure 5-16: Wireless Tab - Wireless Security (WPA RADIUS)

radius: a protocol that uses an authentication server to control network access

Wireless-G Broadband Router with 2 Phone Ports

WEP. WEP is a basic encryption method, which is not as secure as WPA. To use WEP, select a level of WEP encryption, **64 bits 10 hex digits** or **128 bits 26 hex digits**. If you want to use a Passphrase, then enter it in the *Passphrase for keys* field and click the **Generate** button. If you want to enter the WEP key manually, then enter it in the *WEP Key* field(s). To indicate which WEP key to use, select the appropriate *Default Key* number.

When you have finished making changes on this screen, click the **Save Settings** button to save the changes, or click the **Cancel Changes** button to undo your changes. Help information is shown on the right-hand side of a screen. For additional information, click **More**.



Figure 5-17: Wireless Tab - Wireless Security (WEP)

wep (*wired equivalent privacy*): a method of encrypting network data transmitted on a wireless network for greater security

The Wireless Tab - Wireless Network Access

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

MAC Filter. To filter wireless users by MAC Address, either permitting or blocking access, click **Enable**. If you do not wish to filter users by MAC Address, select **Disable**.

Deny. Clicking this button will block the wireless access by MAC Address.

Allow. Clicking this button will allow the wireless access by MAC Address.

Select MAC Address from Networked Computers. Clicking this button will open the Wireless Client MAC List. On this screen, you can view users, by MAC Address, to whom you wish to provide or block access. To enable MAC filtering for a specific computer, click the *Enable MAC Filter* checkbox. When you have finished your changes, click the **Save** button. Click the **Cancel** button to cancel your changes. To update the information on the Wireless Client MAC List, click the **Refresh** button.

When you have finished making changes on this screen, click the **Save Settings** button to save the changes, or click the **Cancel Changes** button to undo your changes. Help information is shown on the right-hand side of a screen. For additional information, click **More**.

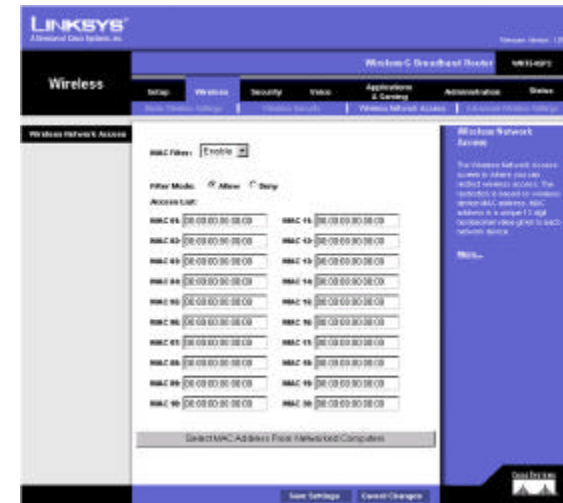


Figure 5-18: Wireless Tab - Wireless Network Access



Figure 5-19: 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 at which the Router can transmit. The Router will advertise its Basic Rate to the other wireless devices in your network, so they know which rates will be used. The Router will also advertise that it will automatically select the best rate for transmission. The default setting is **Default**, when the Router can transmit at all standard wireless rates (1-2Mbps, 5.5Mbps, 11Mbps, 18Mbps, and 24Mbps). Other options are **1-2Mbps**, for use with older wireless technology, and **All**, when the Router can transmit at all wireless rates. The Basic Rate is not the actual rate of data transmission. If you want to specify the Router's rate of data transmission, configure the Transmission Rate setting.

Control Tx Rate. 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 you can select **Auto** to have the Router automatically use the fastest possible data rate and enable the Auto-Fallback feature. Auto-Fallback will negotiate the best possible connection speed between the Router and a wireless client. The default value is **Auto**.

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**, 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.

CTS Protection Mode. CTS (Clear-To-Send) Protection Mode should remain disabled unless you are having severe problems with your Wireless-G products. If these products are not able to transmit to the Router in an environment with heavy 802.11b traffic, then enable CTS Protection Mode. This function boosts the Router's ability to catch all Wireless-G transmissions but will significantly decrease performance.

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 255, 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**.



Figure 5-20: Wireless Tab - Advanced Wireless Settings

cts (clear to send): a signal sent by a wireless device, signifying that it is ready to receive data

beacon interval: data transmitted on your wireless network that keeps the network synchronized

dtim: a message included in data packets that can increase wireless efficiency.

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**.

RTS Threshold. Should you encounter inconsistent data flow, only minor reduction of the default value, **2347**, 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 **2347**.

When you have finished making changes on this screen, click the **Save Settings** button to save the changes, or click the **Cancel Changes** button to undo your changes. Help information is shown on the right-hand side of a screen. For additional information, click **More**.

The Security Tab - Filter

When you click the Security tab, you will see the *Filter* screen. Filters block specific internal users from accessing the Internet and block anonymous Internet requests and/or multicasting.

Filter IP Address Range

You can create up to five different IP Address Range filters. To set up a filter using IP addresses, enter the range of IP addresses you wish to filter in the *Start* and *End* 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

You can create up to five different Port Range filters. To filter users by network port number, select the protocol you want to filter, **TCP**, **UDP**, or **Both**, from the *Protocol* drop-down menu. Enter the port numbers you want to filter in the *Start* and *End* fields. Users connected to the Router will no longer be able to access any port number listed there.

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



Figure 5-21: Security Tab - Filter

Filter MAC Address

This feature blocks computers with specific MAC addresses from going out to the Internet. For information on obtaining a MAC address, go to “Appendix E: Finding the MAC Address and IP Address for Your Ethernet Adapter.” To set the MAC filter, click the **Edit MAC Filter Setting** button.

Edit MAC Filter Setting. Click the **Edit MAC Filter Setting** button. Select the range of MAC address entries in the drop-down box. In each *mac* field, enter the MAC address you want to filter. Click the **Apply** button before closing the window. To cancel changes, click the **Undo** button.

Block WAN Requests

Use these features to enhance your network’s security and filter multicasting.

Block Anonymous Internet Requests. This keeps your network from being “pinged” or detected and reinforces your network security by hiding your network ports, so it is more difficult for intruders to work their way into your network. Select **Enabled** to block anonymous Internet requests, or **Disabled** to allow anonymous Internet requests.

Filter Multicast. Multicasting allows for multiple transmissions to specific recipients at the same time. If multicasting is permitted, then the Router will allow IP multicast packets to be forwarded to the appropriate computers. Select **Enabled** to filter multicasting, or **Disabled** to disable this feature.

Filter Internet NAT Redirection. This feature uses port forwarding to block access to local servers from local networked computers. Select **Enabled** to filter Internet NAT Redirection, or **Disabled** to disable this feature.

When you have finished making changes on this screen, click the **Save Settings** button to save the changes, or click the **Cancel Changes** button to undo your changes. Help information is shown on the right-hand side of a screen. For additional information, click **More**.

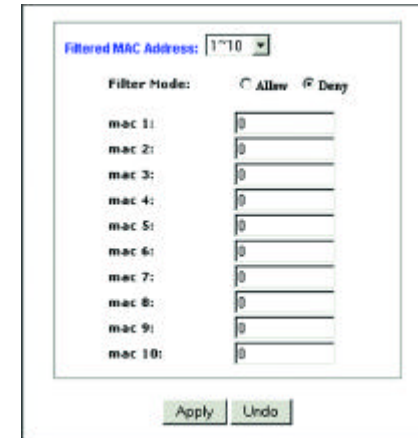


Figure 5-22: Filtered MAC Address

The Security Tab - VPN Passthrough

The *VPN Passthrough* screen allows you to allow VPN tunnels using IPSec, PPPoE, or PPTP protocols to pass through the Router.

VPN Passthrough

IPSec Passthrough. IPSec (Internet Protocol Security) is a suite of protocols used to implement secure exchange of packets at the IP layer. To allow IPSec Passthrough, click the **Enabled** button. To disable IPSec Passthrough, click the **Disabled** button.

PPPoE Passthrough. PPPoE (Point-to-Point over Ethernet) Passthrough allows your PC(s) to use the PPPoE client software provided by your ISP. Some ISPs may request that you use this feature on the Router. To allow PPPoE Passthrough, click the **Enabled** button. To disable PPPoE Passthrough, click the **Disabled** button.

PPTP Pass Through. PPTP (Point-to-Point Tunneling Protocol) Passthrough allows the Point-to-Point (PPP) to be tunneled through an IP network. To allow PPTP Passthrough, click the **Enabled** button. To disable PPTP Passthrough, click the **Disabled** button.

When you have finished making changes on this screen, click the **Save Settings** button to save the changes, or click the **Cancel Changes** button to undo your changes. Help information is shown on the right-hand side of a screen. For additional information, click **More**.



Figure 5-23: Security Tab - VPN Passthrough

vpn: a security measure to protect data as it leaves one network and goes to another over the Internet

ipsec: a VPN protocol used to implement secure exchange of packets at the IP layer

pptp: 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

The Voice Tab - Systems

STUN (Simple Traversal of UDP through NATs) is a protocol that enables Internet phone calls to travel between your local network and the Internet. Not all Internet phone service providers use the STUN protocol; however, if your provider does, then configure the settings on this screen to enable your Internet phone calls. (All the settings should be supplied by your Internet phone service provider.)



NOTE: Depending on your Internet phone service provider's policies, your access to the Router's configuration settings may be restricted, so you may not be able to access the Voice tab of the Web-based Utility.

If your Internet phone service provider sent you the Router, then it may be pre-configured for you, and you do not need to change any settings. However, if you want to make configuration changes, then you should visit the website of your Internet phone service provider and make these changes online. The updated settings will be remotely downloaded to the Router. For more information, refer to the instructions provided by your service provider.

STUN Settings

STUN Server Address. Enter the IP address of the STUN (Simple Traversal of UDP through NATs) server that the Router will use.

RTP Port Range Start. Enter the starting port number of the RTP port range. In most cases, you should keep the default setting, **16384**.

RTP Port Range End. Enter the end port number of the RTP port range. In most cases, you should keep the default setting, **16482**.

When you have finished making changes on this screen, click the **Save Settings** button to save the changes, or click the **Cancel Changes** button to undo your changes. Help information is shown on the right-hand side of a screen. For additional information, click **More**.



Figure 5-24: Voice Tab - System

stun (simple traversal of udp through nats): A protocol that enables specialized applications, such as Internet phone calls, video, and audio, to travel between your local network and the Internet. STUN is a specific type of NAT traversal.

rtp (real-time transport protocol): A protocol that enables specialized applications, such as Internet phone calls, video, and audio, to occur in real time.

The Voice Tab - Line1 Settings

On the *Line1* screen, configure the settings for service on Line 1, which uses the PHONE1 port of the Router.



NOTE: Depending on your Internet phone service provider's policies, your access to the Router's configuration settings may be restricted, so you may not be able to access the Voice tab of the Web-based Utility.

If your Internet phone service provider sent you the Router, then it may be pre-configured for you, and you do not need to change any settings. However, if you want to make configuration changes, then you should visit the website of your Internet phone service provider and make these changes online. The updated settings will be remotely downloaded to the Router. For more information, refer to the instructions provided by your service provider.

Subscriber Information

Display Name. Enter the name you wish displayed for caller ID purposes. (This field is optional.)

User ID. Enter your ID name or number. Refer to the instructions your provider gave you.

Authentication User Name. Enter the user name used to access your service. Refer to the instructions your provider gave you.

Authentication Password. Enter the password used to access your service. Refer to the instructions your provider gave you.

Registration/Proxy Server. Enter the IP address of your provider's registration or proxy server. Refer to the instructions your provider gave you.

NAT Traversal Settings

NAT Traversal. The NAT (Network Address Translation) Traversal setting allows you to select the method that will enable Internet phone calls to travel between your local network and the Internet. Select the setting required by your Internet phone service provider, **STUN**, **Use NAT Aware Outbound Proxy**, or **NONE**.

If you selected STUN, then complete the fields on the *Voice - System* screen. If you selected Use NAT Aware Outbound Proxy, then complete the *NAT Aware Proxy Address* field.

NAT Aware Proxy Address. Enter the IP address of the NAT (Network Address Translation) aware proxy server that the Router will use. This information should be supplied by your Internet phone service provider.



Figure 5-25: Voice Tab - Line1

nat (network address translation) traversal: A method of enabling specialized applications, such as Internet phone calls, video, and audio, to travel between your local network and the Internet. STUN is a specific type of NAT traversal.

Call Forward Settings

Cfwd All Dest. If you want to forward all calls to a specific telephone number, then complete this field. Enter the number that will receive all phone calls.

Cfwd Busy Dest. If your phone is busy, then you can forward incoming phone calls to a specific telephone number. Enter the number that will receive phone calls when your phone is busy.

Cfwd No Ans Dest. If you are not answering your phone, then you can forward incoming phone calls to a specific telephone number. Enter the number that will receive phone calls when there is no answer from your phone.

Cfwd No Ans Delay. If you are not answering your phone, then you can forward incoming phone calls to another phone number after a specific period of time. In the field provided, enter the number of seconds you want your phone to ring before the call is forwarded to the telephone number you specified in the *Cfwd No Ans Dest* field.

Speed Dial Settings

Speed Dial 2-9. In each field, enter the phone number that you want to assign to the corresponding number on your phone's keypad.

Supplementary Service Settings

Call Waiting. If you want to enable call waiting for all calls, keep the default, **Yes**. Otherwise, select **No**.

Block Caller ID. If you want to block caller ID for all calls, select **Yes**. Otherwise, keep the default, **No**.

Caller ID. If you want to use caller ID, keep the default, **Yes**. Otherwise, select **No**.

Do Not Disturb. If you do not wish to be disturbed, select **Yes**. Otherwise, keep the default, **No**.

Call Waiting Caller ID. If you want to enable caller ID for all phone calls using call waiting, then keep the default, **Yes**. Otherwise, select **No**.

Distinctive Ring. If you want to use distinctive ring tones for specific caller numbers, select **Yes**. Otherwise, keep the default, **No**.

Distinctive Ring Settings

Ring 1-8 Caller. You can assign a caller number to a distinctive ring and call waiting tone. In each field, enter the caller number that you want to activate the corresponding distinctive ring and call waiting tone.

Voice Quality Settings

Voice Quality. Select the quality level you want to use for your voice calls, **Best (G.711u Requires 64k Bandwidth)**, **Good (G.711a Requires 64k Bandwidth)**, **Good (G.726-40 Requires 40k Bandwidth)**, **Good (G.726-32 Requires 32k Bandwidth)**, **Best (G.729 Requires 8k Bandwidth)**, **Normal (G.726-24 Requires 24k Bandwidth)**, **Normal (G.726-16 Requires 16k Bandwidth)**, or **Normal (G.723 Requires 7k Bandwidth)**. Make sure the selected setting requires less than the available upstream bandwidth of your Internet connection. In most cases you should keep the default, **Best (G.711u Requires 64k Bandwidth)**.

When you have finished making changes on this screen, click the **Save Settings** button to save the changes, or click the **Cancel Changes** button to undo your changes. Help information is shown on the right-hand side of a screen. For additional information, click **More**.

The Voice Tab - Line2 Settings

On the *Line1* screen, configure the settings for service on Line 1, which uses the PHONE1 port of the Router.



NOTE: Depending on your Internet phone service provider's policies, your access to the Router's configuration settings may be restricted, so you may not be able to access the Voice tab of the Web-based Utility.

If your Internet phone service provider sent you the Router, then it may be pre-configured for you, and you do not need to change any settings. However, if you want to make configuration changes, then you should visit the website of your Internet phone service provider and make these changes online. The updated settings will be remotely downloaded to the Router. For more information, refer to the instructions provided by your service provider.

Subscriber Information

Display Name. Enter the name you wish displayed for caller ID purposes. (This field is optional.)

User ID. Enter your ID name or number. Refer to the instructions your provider gave you.

Authentication User Name. Enter the user name used to access your service. Refer to the instructions your provider gave you.

Authentication Password. Enter the password used to access your service. Refer to the instructions your provider gave you.

Registration/Proxy Server. Enter the IP address of your provider's registration or proxy server. Refer to the instructions your provider gave you.

NAT Traversal Settings

NAT Traversal. The NAT (Network Address Translation) Traversal setting allows you to select the method that will enable Internet phone calls to travel between your local network and the Internet. Select the setting required by your Internet phone service provider, **STUN**, **Use NAT Aware Outbound Proxy**, or **NONE**.

If you selected STUN, then complete the fields on the *Voice - System* screen. If you selected Use NAT Aware Outbound Proxy, then complete the *NAT Aware Proxy Address* field.

NAT Aware Proxy Address. Enter the IP address of the NAT (Network Address Translation) aware proxy server that the Router will use. This information should be supplied by your Internet phone service provider.



Figure 5-26: Voice Tab - Line2

Call Forward Settings

Cfwd All Dest. If you want to forward all calls to a specific telephone number, then complete this field. Enter the number that will receive all phone calls.

Cfwd Busy Dest. If your phone is busy, then you can forward incoming phone calls to a specific telephone number. Enter the number that will receive phone calls when your phone is busy.

Cfwd No Ans Dest. If you are not answering your phone, then you can forward incoming phone calls to a specific telephone number. Enter the number that will receive phone calls when there is no answer from your phone.

Cfwd No Ans Delay. If you are not answering your phone, then you can forward incoming phone calls to another phone number after a specific period of time. In the field provided, enter the number of seconds you want your phone to ring before the call is forwarded to the telephone number you specified in the *Cfwd No Ans Dest* field.

Speed Dial Settings

Speed Dial 2-9. In each field, enter the phone number that you want to assign to the corresponding number on your phone's keypad.

Supplementary Service Settings

Call Waiting. If you want to enable call waiting for all calls, keep the default, **Yes**. Otherwise, select **No**.

Block Caller ID. If you want to block caller ID for all calls, select **Yes**. Otherwise, keep the default, **No**.

Caller ID. If you want to use caller ID, keep the default, **Yes**. Otherwise, select **No**.

Do Not Disturb. If you do not wish to be disturbed, select **Yes**. Otherwise, keep the default, **No**.

Call Waiting Caller ID. If you want to enable call waiting for all caller ID phone calls, then keep the default, **Yes**. Otherwise, select **No**.

Distinctive Ring. If you want to use distinctive ring tones for specific caller numbers, select **Yes**. Otherwise, keep the default, **No**.

Distinctive Ring Settings

Ring 1-8 Caller. You can assign a caller number to a distinctive ring and call waiting tone. In each field, enter the caller number that you want to activate the corresponding distinctive ring and call waiting tone.

Voice Quality Settings

Voice Quality. Select the quality level you want to use for your voice calls, **Best (G.711u Requires 64k Bandwidth)**, **Good (G.711a Requires 64k Bandwidth)**, **Good (G.726-40 Requires 40k Bandwidth)**, **Good (G.726-32 Requires 32k Bandwidth)**, **Best (G.729 Requires 8k Bandwidth)**, **Normal (G.726-24 Requires 24k Bandwidth)**, **Normal (G.726-16 Requires 16k Bandwidth)**, or **Normal (G.723 Requires 7k Bandwidth)**. Make sure the selected setting requires less than the available upstream bandwidth of your Internet connection. In most cases you should keep the default, **Best (G.711u Requires 64k Bandwidth)**.

When you have finished making changes on this screen, click the **Save Settings** button to save the changes, or click the **Cancel Changes** button to undo your changes. Help information is shown on the right-hand side of a screen. For additional information, click **More**.

The Applications & Gaming Tab - Port Range Forwarding

When you click the Applications & Gaming tab, you will see the *Port Range Forwarding* screen. Port Range Forwarding sets 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.) When users send this type of request to your network via the Internet, the Router will forward those requests to the appropriate PC.

Before using forwarding, you should assign a static IP address to the designated PC.

If you need to forward all ports to one PC, click the **DMZ** tab.

Port Range Forwarding

Port Range

To add a server using Port Range Forwarding, complete the following fields:

Application. Enter the name of the application.

Start and End. Enter the number or range of external port(s) used by the server or Internet application. Check with the Internet application software documentation for more information.

Protocol. Select the protocol **TCP** or **UDP**, or select **Both**.

IP Address. Enter the IP address of the server that you want the Internet users to be able to access. To find the IP address, go to “Appendix E: Finding the MAC Address and IP Address for Your Ethernet Adapter.”

Enable. Check the **Enable** box to enable the services you have defined. Port Range Forwarding will not function if the Enabled button is left unchecked. This is disabled (unchecked) by default.

When you have finished making changes on this screen, click the **Save Settings** button to save the changes, or click the **Cancel Changes** button to undo your changes. Help information is shown on the right-hand side of a screen. For additional information, click **More**.



Figure 5-27: Applications & Gaming Tab - Port Range Forwarding

tcp: a network protocol for transmitting data that requires acknowledgement from the recipient of data sent

udp: a network protocol for transmitting data that does not require acknowledgement from the recipient of the data that is sent.

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

The Applications & Gaming Tab - Port Triggering

The *Port Triggering* screen allows the Router to watch outgoing data for specific port numbers. The IP address of the computer that sends the matching data is remembered by the Router, so that when the requested data returns through the Router, the data is pulled back to the proper computer by way of IP address and port mapping rules.

Port Triggering

Application. Enter the application name of the trigger.

Triggered Range

For each application, list the triggered port number range. Check with the Internet application documentation for the port number(s) needed.

Start Port. Enter the starting port number of the Triggered Range.

End Port. Enter the ending port number of the Triggered Range.

Forwarded Range

For each application, list the forwarded port number range. Check with the Internet application documentation for the port number(s) needed.

Start Port. Enter the starting port number of the Forwarded Range.

End Port. Enter the ending port number of the Forwarded Range.

When you have finished making changes on this screen, click the **Save Settings** button to save the changes, or click the **Cancel Changes** button to undo your changes. Help information is shown on the right-hand side of a screen. For additional information, click **More**.



Figure 5-28: Applications & Gaming Tab - Port Triggering

The Applications & Gaming Tab - UPnP Forwarding

The *UPnP Forwarding* screen displays preset application settings as well as options to customize port services for other applications.

UPnP Forwarding

Application. Ten applications are preset. For custom applications, enter the name of your application in one of the available fields.

The preset applications are among the most widely used Internet applications. They include the following:

FTP (File Transfer Protocol). A protocol used to transfer files over a TCP/IP network (Internet, UNIX, etc.). For example, after developing the HTML pages for a website on a local machine, they are typically uploaded to the web server using FTP.

Telnet. A terminal emulation protocol commonly used on Internet and TCP/IP-based networks. It allows a user at a terminal or computer to log onto a remote device and run a program.

SMTP (Simple Mail Transfer Protocol). The standard e-mail protocol on the Internet. It is a TCP/IP protocol that defines the message format and the message transfer agent (MTA), which stores and forwards the mail.

DNS (Domain Name System). The way that Internet domain names are located and translated into IP addresses. A domain name is a meaningful and easy-to-remember “handle” for an Internet address.

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

Finger. A UNIX command widely used on the Internet to find out information about a particular user, such as a telephone number, whether the user is currently logged on, and the last time the user was logged on. The person being “fingered” must have placed his or her profile on the system in order for the information to be available. Fingering requires entering the full user@domain address.

HTTP (HyperText Transport Protocol). The communications protocol used to connect to servers on the World Wide Web. Its primary function is to establish a connection with a web server and transmit HTML pages to the client web browser.

POP3 (Post Office Protocol 3). A standard mail server commonly used on the Internet. It provides a message store that holds incoming e-mail until users log on and download it. POP3 is a simple system with little selectivity. All pending messages and attachments are downloaded at the same time. POP3 uses the SMTP messaging protocol.



Figure 5-29: Applications & Gaming Tab - UPnP Forwarding

Wireless-G Broadband Router with 2 Phone Ports

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

SNMP (Simple Network Management Protocol). A widely used network monitoring and control protocol. Data is passed from SNMP agents, which are hardware and/or software processes reporting activity in each network device (hub, router, bridge, etc.) to the workstation console used to oversee the network. The agents return information contained in a MIB (Management Information Base), which is a data structure that defines what is obtainable from the device and what can be controlled (turned off, on, etc.).

Ext. Port. Enter the number of the external port used by the server in the *Ext. Port* column. Check with the Internet application documentation for more information.

TCP or UDP. Select the protocol **UDP** or **TCP** for each application. You cannot select both protocols.

Int. Port. Enter the number of the internal port used by the server in the *Int. Port* column. Check with the Internet application software documentation for more information.

IP Address. Enter the IP address of the server that you want the Internet users to be able to access. To find the IP address, go to “Appendix E: Finding the MAC Address and IP Address for Your Ethernet Adapter.”

Enabled. Check the **Enabled** box to enable the service you have defined. UPnP Forwarding will not function if the Enabled button is left unchecked. This is disabled (unchecked) by default.

When you have finished making changes on this screen, click the **Save Settings** button to save the changes, or click the **Cancel Changes** button to undo your changes. Help information is shown on the right-hand side of a screen. For additional information, click **More**.

The Applications & Gaming Tab - DMZ

The *DMZ* screen allows one local user to be exposed to the Internet for use of a special-purpose service such as Internet gaming and videoconferencing. DMZ hosting forwards all the ports at the same time to one PC. The Port Range Forwarding 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.

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.

DMZ

DMZ. To use this feature, select **Enable**. To disable DMZ hosting, select **Disable**.

DMZ Host IP Address. To expose one PC, enter the computer's IP address. To get the IP address of a computer, refer to "Appendix E: Finding the MAC Address and IP Address for Your Ethernet Adapter." Deactivate DMZ by entering a **0** in the field.

When you have finished making changes on this screen, click the **Save Settings** button to save the changes, or click the **Cancel Changes** button to undo your changes. Help information is shown on the right-hand side of a screen. For additional information, click **More**.



Figure 5-30: Applications & Gaming Tab - DMZ

The Applications & Gaming Tab - QoS

Quality of Service (QoS) ensures better service to high-priority types of network traffic, which may involve demanding, real-time applications, such as Internet phone calls or videoconferencing.

Application-based QoS

Application-based QoS manages information as it is transmitted and received. Depending on the settings of the *QoS* screen, this feature will assign information a high or low priority for the five preset applications and three additional applications that you specify.

Enabled/Disabled. To use application-based QoS, select **Enable**. Otherwise, keep the default, **Disable**.

High priority/Low priority. For each application, select **High priority** or **Low priority**.

FTP (File Transfer Protocol). A protocol used to transfer files over a TCP/IP network (Internet, UNIX, etc.). For example, after developing the HTML pages for a website on a local machine, they are typically uploaded to the web server using FTP.

HTTP (HyperText Transport Protocol). The communications protocol used to connect to servers on the World Wide Web. Its primary function is to establish a connection with a web server and transmit HTML pages to the client web browser.

Telnet. A terminal emulation protocol commonly used on Internet and TCP/IP-based networks. It allows a user at a terminal or computer to log onto a remote device and run a program.

SMTP (Simple Mail Transfer Protocol). The standard e-mail protocol on the Internet. It is a TCP/IP protocol that defines the message format and the message transfer agent (MTA), which stores and forwards the mail.

POP3 (Post Office Protocol 3). A standard mail server commonly used on the Internet. It provides a message store that holds incoming e-mail until users log on and download it. POP3 is a simple system with little selectivity. All pending messages and attachments are downloaded at the same time. POP3 uses the SMTP messaging protocol.

Specific Port#. You can add three additional applications by entering their respective port numbers in the *Specific Port#* fields.

Port-based QoS

Port-based QoS allows you to prioritize performance for three of the Router's ports, LAN Ports 1-3. Port-based QoS does not require support from your ISP because the prioritized ports are LAN ports going out to your network.



Figure 5-31: Applications & Gaming Tab - QoS

Wireless-G Broadband Router with 2 Phone Ports

Enable/Disable. To use port-based QoS, select **Enable**. Otherwise, keep the default, **Disable**.

For each port, specify the Priority, Flow Control setting, Ingress Frame Type, and Ingress Rate Limit.

Priority. Select the port's priority level, **High** or **Low**.

Flow Control. If you want the Router to control the transmission of data between network devices, select **Enable**. To disable this feature, select **Disable**.

Incoming Frame Type. To apply QoS to all frames, select **All Frames**. To apply QoS to broadcast frames only, select **Broadcast** (QoS will not be applied to unicast or multicast frames).

Incoming Rate Limit. This setting limits the incoming bandwidth. To use this feature, select **8M**, **4M**, **2M**, **1M**, **512K**, **256K**, or **128K** (M stands for Mbps, while K stands for kbps). If you do not want to use this feature, keep the default, **Disable**.

Voice QoS

This setting allows you to limit the outgoing bandwidth for the application- or port-based QoS policies in use, so you can control how much bandwidth a particular application is allowed to use.

Enable/Disable. To limit outgoing bandwidth for the QoS policies in use, select **Enable**. Otherwise, select **Disable**.

QoS Upstream Rate. If you want the Router to automatically detect the QoS upstream rate, keep the default, **Auto Detect**. The rate will be automatically displayed. If you want to manually set the maximum QoS upstream rate, select **Manual**. Then enter the maximum speed in kbps; the default is **512** kbps.

When you have finished making changes on this screen, click the **Save Settings** button to save the changes, or click the **Cancel Changes** button to undo your changes. Help information is shown on the right-hand side of a screen. For additional information, click **More**.

The Administration Tab - Management

When you click the Administration tab, you will see the *Management* screen. This screen allows you to change the Router's access settings as well as configure the UPnP (Universal Plug and Play) features.

Router Access

Local Router Access

To ensure the Router's security, you will be asked for your password when you access the Router's Web-based Utility. The default password is **admin**.

Router Password. It is recommended that you change the default password to one of your choice.

Re-enter to confirm. Re-enter the Router's new Password to confirm it.

Remote Router Access

This feature allows you to access the Router from a remote location, via the Internet.

Remote Upgrade. Remote Upgrade allows you to upgrade the Router's firmware from a remote location. To enable this feature, click the **Enabled** radio button. Remote Administration must be activated before you can access the Router from a remote location.

Remote Administration. This feature allows you to manage the Router from a remote location, via the Internet. To enable Remote Administration, click the **Enabled** radio button.

Administration Port. Enter the port number you will use to remotely access the Router.



Note: When you are in a remote location and wish to manage the Router, enter *http://<Internet IP Address>:port*. Enter the Router's specific Internet IP address in place of *<Internet IP Address>*, and enter the Administration Port number in place of the word *port*.

UPnP

UPnP. UPnP allows Windows XP and Windows Me to automatically configure the Router for various Internet applications, such as gaming and videoconferencing.

Allow users to make configuration changes. When enabled, this feature allows you to make manual changes while still using the UPnP feature.



Figure 5-32: Administration Tab - Management

Wireless-G Broadband Router with 2 Phone Ports

Allow users to disable Internet access. When enabled, this feature allows you to prohibit any and all Internet connections.

Backup and Restore

Backup and Restore. Click this button to back up or restore your configuration. Click the **Backup** button to back up the configuration. To restore your configuration, click the **Browse** button to find the file, and then click the **Restore** button.

When you have finished making changes on this screen, click the **Save Settings** button to save the changes, or click the **Cancel Changes** button to undo your changes. Help information is shown on the right-hand side of a screen. For additional information, click **More**.

Backup & Restore Configuration

Backup
Backup

Restore
Please select a configuration file to restore: Browse...

Restore

NOTICE !!
Currently, the Restore will backup only the VLS and state.

Figure 5-1: Backup & Restore Configuration

The Administration Tab - Log

When you click the Administration tab, you will see the *Log* screen. It provides you with a log of all incoming and outgoing URLs or IP addresses for your Internet connection.

Log

Log. To access activity logs, select the **Yes** radio button. With logging enabled, you can choose to view temporary logs or keep a permanent record using the Logviewer software. Click the **No** button to disable this function.

Logviewer IP Address. For a permanent record of these logs, Logviewer software must be used. This software is downloadable from the Linksys website, www.linksys.com. The Logviewer saves all incoming and outgoing activity in a permanent file on your PC's hard drive. In the *Logviewer IP Address* field, enter the fixed IP address of the PC running the Logviewer software. The Router will now send updated logs to that PC.

Incoming Log. Click the **Incoming Log** button to view a temporary log of the Source IP addresses and Destination Port Numbers for all the incoming Internet traffic. Click the **Refresh** button to update the log.

Outgoing Log. Click the **Outgoing Log** button to view a temporary log of all the URLs and IP addresses of Internet sites that users on your network have accessed. The LAN IP address, Destination URL/IP, and Service/Port Number for each site are listed. Click the **Refresh** button to update the log.

When you have finished making changes on this screen, click the **Save Settings** button to save the changes, or click the **Cancel Changes** button to undo your changes. Help information is shown on the right-hand side of a screen. For additional information, click **More**.



Figure 5-33: Administration Tab - Log



Figure 5-34: Incoming Log Table



Figure 5-35: Outgoing Log Table

The Administration Tab - Factory Defaults

The *Factory Defaults* screen allows you to restore the Router's configuration to its factory default settings.

Factory Defaults

Restore Factory Defaults. To clear all of the Router's settings and reset them to its factory defaults, click the **Yes** radio button.



Note: Do not restore the factory defaults unless you are having difficulties with the Router and have exhausted all other troubleshooting measures. Once the Router is reset, you will have to re-enter all of your configuration settings.

Click the **Save Settings** button to save the changes, or click the **Cancel Changes** button to undo your changes. Help information is shown on the right-hand side of a screen. For additional information, click **More**.



Figure 5-36: Administration Tab - Factory Defaults

The Administration Tab - Firmware Upgrade

The *Firmware Upgrade* screen allows you to upgrade the Router's firmware. Do not upgrade the firmware unless you are experiencing problems with the Router or the new firmware has a feature you want to use.



Note: The Router will lose all of the settings you have customized. Before you upgrade its firmware, write down all of your custom settings. After you upgrade its firmware, you will have to re-enter all of your configuration settings.

Before upgrading the firmware, download the Router's firmware upgrade file from the Linksys website, www.linksys.com. Then extract the file.

Upgrade Firmware

Please select a file to upgrade. In the field provided, enter the name of the extracted firmware upgrade file, or click the **Browse** button to find this file.

Upgrade. After you have selected the appropriate file, click the **Upgrade** button, and follow the on-screen instructions.

Help information is shown on the right-hand side of a screen. For additional information, click **More**.



Figure 5-37: Administration Tab - Firmware Upgrade

firmware: the programming code that runs a networking device

download: to receive a file transmitted over a network

upgrade: to replace existing software or firmware with a newer version

The Status Tab - Voice

When you click the Status tab, you will see the *Voice* screen, which displays information about your Internet phone line(s).

Information

Voice Version. This shows the version number of the voice firmware currently installed on the Router.

Line1 Status

Registration Status. This indicates whether or not this phone line is registered with your Internet phone service provider. If the phone line is not registered, then you should register it with your Internet phone service provider. If the registration status indicates that the registration has failed, then refer to “Appendix A: Troubleshooting.”

Call1 Status. The status of the active phone call is shown here.

Call2 Status. If you are using call waiting, the status of the incoming phone call is shown here.

Line2 Status

Registration Status. This indicates whether or not this phone line is registered with your Internet phone service provider. If the phone line is not registered, then you should register it with your Internet phone service provider. If the registration status indicates that the registration has failed, then refer to “Appendix A: Troubleshooting.”

Call1 Status. The status of the active phone call is shown here.

Call2 Status. If you are using call waiting, the status of the incoming phone call is shown here.

For help information, click **More**.



Figure 5-38: Status Tab - Voice

The Status Tab - Router

The *Router* screen displays information about the Router and its current settings. The on-screen information will vary depending on the Internet Connection Type selected on the *Setup* screen.

Information

Firmware Version. This shows the installed version and date of the firmware.

Current Time. The current time and date are displayed here.

MAC Address. The MAC Address of the Router's Internet interface is displayed here.

Status

Login Type. This indicates the type of Internet connection you are using.

Login Status. 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.

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.

DNS 1-3. 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.

Click the **Refresh** button to update the on-screen information. Help information is shown on the right-hand side of a screen. For additional information, click **More**.



Figure 5-39: Status Tab - Router

The Status Tab - Local Network

The *Local Network* screen displays information about the local network.

Local Network

MAC Address. The MAC Address of the Router's LAN (local area network) interface is displayed here.

IP Address. The Router's local IP Address is shown here.

Subnet Mask. The Router's Subnet Mask is shown here.

DHCP Server. The status of the DHCP server is displayed here.

DHCP Client Table. Click the **DHCP Clients Table** button to view a list of PCs that have been assigned IP addresses by the Router. The *DHCP Active IP Table* screen lists the DHCP Server IP Address, Client Hostnames, IP Addresses, MAC Addresses, and Interfaces. Click the **Delete** checkbox to delete a DHCP client listing. Click the **Refresh** button to update the information.

Click the **Refresh** button to update the on-screen information. Help information is shown on the right-hand side of a screen. For additional information, click **More**.



Figure 5-40: Status Tab - Local Network



Figure 5-41: DHCP Active IP Table

The Status Tab - Wireless

The *Wireless* screen displays status information about your wireless network.

Wireless

MAC Address. The MAC Address of the Router's wireless network interface is displayed here.

Mode. As selected from the Wireless tab, this will display the wireless mode (Mixed, G-Only, or Disabled) used by the network.

SSID. As entered on the Wireless tab, this will display the wireless network name or SSID.

DHCP Server. The status of the DHCP server is displayed here.

Channel. As entered on the Wireless tab, this will display the channel on which your wireless network is broadcasting.

Encryption Function. As selected on the Wireless Security tab, this will display what type of encryption the Router uses for security.

Click the **Refresh** button to update the on-screen information. Help information is shown on the right-hand side of a screen. For additional information, click **More**.



Figure 5-42: Status Tab - Wireless

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 don’t hear a dial tone, and the PHONE1 (or PHONE2) LED is not lit.

Go through this checklist until your problem is solved:

- Make sure the telephone is plugged into the appropriate port, Phone 1 or Phone 2.
- Disconnect and re-connect the RJ-11 telephone cable between the Router and telephone.
- Make sure your telephone is set to its tone setting (not pulse).
- Make sure your network has an active Internet connection. Try to access the Internet, and check to see if the Router’s Internet LED is lit. If you do not have a connection, power off your network devices, including the Router and cable/DSL modem. Wait 30 seconds, and power on the cable/DSL modem first. Then power on the Router and other network devices.
- Verify your account information and confirm that the phone line is registered with your Internet phone service provider.

2. The Status - Voice screen of the Web-based Utility says that the registration for my Internet phone line has failed.

Go through this checklist until your problem is solved:

- Make sure your network has an active Internet connection. Try to access the Internet, and check to see if the Router’s Internet LED is lit. If you do not have a connection, power off your network devices, including the Router and cable/DSL modem. Wait 30 seconds, and power on the cable/DSL modem first. Then power on the Router and other network devices.
- Verify your account information and confirm that the phone line is registered with your Internet phone service provider.
- Make sure that your cable or DSL modem is supported by your Internet phone service provider.

3. I’m trying to access the Router’s Web-based Utility, but I do not see the login screen. Instead, I see a screen saying, “404 Forbidden.”

If you are using Windows Explorer, perform the following steps until you see the Web-based Utility’s login screen (Netscape Navigator will require similar steps):

1. Click **File**. Make sure *Work Offline* is NOT checked.

2. Press **CTRL + F5**. This is a hard refresh, which will force Windows Explorer to load new webpages, not cached ones.
3. Click **Tools**. Click **Internet Options**. Click the **Security** tab. Click the **Default level** button. Make sure the security level is Medium or lower. Then click the **OK** button.

4. 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 98SE 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.

Wireless-G Broadband Router with 2 Phone Ports

- 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.

5. *I want to test my Internet connection.*

A Check your TCP/IP settings.

For Windows 98SE, Me, 2000, and XP:

- Refer to Windows Help for details. Make sure Obtain IP address automatically is selected in the settings.

B Open a command prompt.

For Windows 98SE and Me:

- Click **Start** and **Run**. In the Open field, type **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 WAN IP address and press the **Enter** key. The Internet or WAN IP Address can be found on the Status screen of the Router's web-based utility. For example, if your Internet or WAN 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.

Wireless-G Broadband Router with 2 Phone Ports

- 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.

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

- Refer to “Problem #5, I want to test my Internet connection” to verify that you have connectivity.
- 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-G Broadband Router with 2 Phone Ports” for details.
- 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-G Broadband Router with 2 Phone Ports” for details on Internet connection settings.
- Make sure you have the right cable. Check to see if the Internet column has a solidly lit Link/Act LED.
- 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.
- 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.

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

- Refer to “Problem #5, I want to test my Internet connection” to verify that your computer is properly connected to the Router.
- 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.
- Set a static IP address on your system; refer to “Problem #4: I need to set a static IP address.”
- Refer to “Problem #12: I need to remove the proxy settings or the dial-up pop-up window (for PPPoE users).”

8. 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.

Wireless-G Broadband Router with 2 Phone Ports

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:

Application	Start and End	Protocol	IP Address	Enabled
Web server	80 to 80	Both	192.168.1.100	X
FTP server	21 to 21	TCP	192.168.1.101	X
SMTP (outgoing)	25 to 25	Both	192.168.1.102	X
POP3 (incoming)	110 to 110	Both	192.168.1.102	X

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

9. 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:

Application	Start and End	Protocol	IP Address	Enabled
UT	7777 to 27900	Both	192.168.1.100	X
Halflife	27015 to 27015	Both	192.168.1.105	X
PC Anywhere	5631 to 5631	UDP	192.168.1.102	X
VPN IPSEC	500 to 500	UDP	192.168.1.100	X

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

10. 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.
5. Once completed with the configuration, click the **Save Settings** button.

11. 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.

12. 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.

13. 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.

14. 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."

15. 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 #4, 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 Administration tab of the Router's web-based utility.

16. 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 Settings** button to continue.
- If the connection is lost again, follow steps 1- 6 to re-establish connection.

17. 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.

Wireless-G Broadband Router with 2 Phone Ports

- 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

18. 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.

19. 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

How do I make a phone call?

Pick up your phone and dial 1 + area code + phone number. You must dial 1 and the area code for all calls, even local ones.

Can I make calls if my Internet connection is down?

No. Your high-speed Internet connection must be active when you make Internet phone or fax calls.

Can I make calls while I'm browsing the Internet?

Yes. You can make Internet phone or fax calls while browsing the Internet.

Wireless-G Broadband Router with 2 Phone Ports

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 98SE, 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 Administration 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,

Wireless-G Broadband Router with 2 Phone Ports

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.

Wireless-G Broadband Router with 2 Phone Ports

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 802.11b standard?

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

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 IEEE 802.11g features are supported?

The product supports the following IEEE 802.11g functions:

- CSMA/CA plus Acknowledge protocol
- OFDM 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

Wireless-G Broadband Router with 2 Phone Ports

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.

What is WEP?

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

What is WPA?

WPA is Wi-Fi Protected Access, a wireless security protocol that can be used in conjunction with a RADIUS server.

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 five 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.

Wireless-G Broadband Router with 2 Phone Ports

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 6: Configuring the Wireless-G 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.

Wireless-G Broadband Router with 2 Phone Ports

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

1. Disable Broadcast
2. Make it unique
3. Change it often

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

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

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

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

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

There are several ways that WEP can be maximized:

1. Use the highest level of encryption possible
2. Use "Shared Key" authentication
3. Change your WEP key regularly

WPA. Wi-Fi Protected Access (WPA) is the newest and best available standard in Wi-Fi security. Two modes are available: Pre-Shared Key and RADIUS. Pre-Shared Key gives you one encryption methods: TKIP (Temporal Key Integrity Protocol), which utilizes a stronger encryption method and incorporates Message Integrity Code (MIC) to provide protection against hackers.



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.

Wireless-G Broadband Router with 2 Phone Ports

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 or other device 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 or other device.) 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 device and the server. Last, enter a Group Key Renewal period, which instructs the device how often it should change the encryption keys.

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

You can use the Router's Web-based Utility to upgrade the firmware; however, if you do so, you will lose the settings you have configured on the Router. Before you upgrade its firmware, write down all of your custom settings. After you upgrade its firmware, you will have to re-enter all of your configuration settings.

To upgrade the Router's firmware, follow these instructions:

1. Download the Router's firmware upgrade file from the Linksys website, www.linksys.com.
2. Extract the file on your computer.
3. Click the **Administration** tab and then the **Firmware Upgrade** tab of the Router's Web-based Utility.
4. On the *Upgrade Firmware* screen, enter the location of the extracted firmware upgrade file, or click the **Browse** button to find this file.
5. Click the **Upgrade** button, and follow the on-screen instructions.



Figure C-1: Upgrade Firmware

Appendix D: Windows Help

Almost all Linksys 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 Broadband 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 98SE or Me Instructions

1. Click **Start** and **Run**. In the *Open* field, enter **winiipcfg**. 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 the *IP Configuration* screen.
3. Write down the Adapter Address as shown on your computer screen. 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.



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

The example displaying the Adapter Address and IP Address shows the Ethernet adapter's IP address as 192.168.1.100. Your computer may show something different.

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; 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.



Figure E-1: IP Configuration Screen

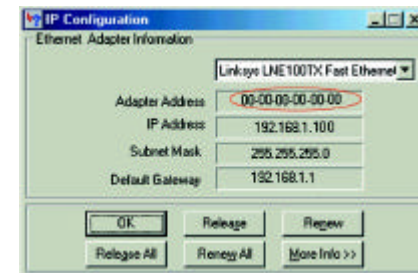


Figure E-2: MAC Address/Adapter Address

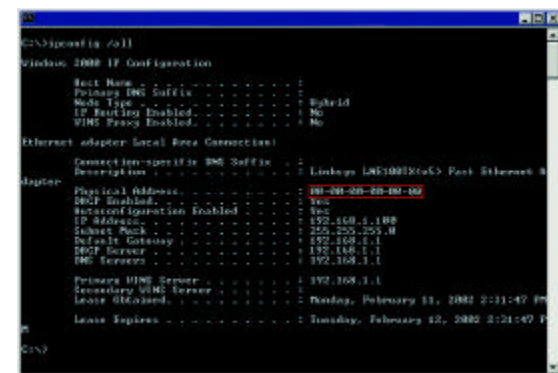


Figure E-3: MAC Address/Physical Address

Wireless-G Broadband Router with 2 Phone Ports



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

The example displaying the Physical Address and IP Address shows the Ethernet adapter's IP address as 192.168.1.100. Your computer may show something different.

For the Router's Web-based Utility

For MAC filtering, enter a 12-digit MAC address in each MAC field provided, including the colons.

For MAC address cloning, enter a 12-digit MAC address in the MAC Address fields provided, two digits per field.



Figure E-4: MAC Address Filter List



Figure E-5: MAC Address Clone

Appendix F: Glossary

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

802.11g - A 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 - A 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 - 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.

AES (Advanced Encryption Standard) - A security method that uses symmetric 128-bit block data encryption.

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 - Data transmitted on your wireless network that keeps the network synchronized.

Bit - A binary digit.

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

Bridge - A device that connects different networks.

Broadband - An always-on, fast Internet connection.

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

Buffer - A shared or assigned memory area that is used to support and coordinate different computing and networking activities so one isn't held up by the other.

Byte - A unit of data that is usually eight bits long

Wireless-G Broadband Router with 2 Phone Ports

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 collisions.

CTS (Clear To Send) - A signal sent by a wireless device, signifying 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) - Allows the hosting of a website, FTP server, or e-mail server with a fixed domain name (e.g., www.xyz.com) and a dynamic IP address.

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

DHCP (Dynamic Host Configuration Protocol) - A networking protocol that allows administrators to assign temporary IP addresses to network computers by “leasing” an IP address to a user for a limited amount of time, instead of assigning permanent IP addresses.

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) - Frequency transmission with a redundant bit pattern resulting in a lower probability of information being lost in transit.

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.

Wireless-G Broadband Router with 2 Phone Ports

EAP (Extensible Authentication Protocol) - A general authentication protocol used to control network access. Many specific authentication methods work within this framework.

EAP-PEAP (Extensible Authentication Protocol-Protected Extensible Authentication Protocol) - A mutual authentication method that uses a combination of digital certificates and another system, such as passwords.

EAP-TLS (Extensible Authentication Protocol-Transport Layer Security) - A mutual authentication method that uses digital certificates.

Encryption - Encoding data transmitted in a network.

Ethernet - A networking 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 - A set of related programs located at a network gateway server that protects the resources of a network from users from other networks.

Firmware - The programming code that runs a networking device.

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 protocol used to transfer files over a TCP/IP network.

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

Gateway - A device that interconnects networks with different, incompatible communications protocols.

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.

Infrastructure - A wireless network that 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.

Wireless-G Broadband Router with 2 Phone Ports

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 bandwidth utilized in wireless transmissions.

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

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

LEAP (Lightweight Extensible Authentication Protocol) - A mutual authentication method that uses a username and password system.

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.

mIRC - An Internet Relay Chat program that runs under Windows.

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.

NAT (Network Address Translation) Traversal - A method of enabling specialized applications, such as Internet phone calls, video, and audio, to travel between your local network and the Internet. STUN is a specific type of NAT traversal.

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) - Frequency transmission that separates the data stream into a number of lower-speed data streams, which are then transmitted in parallel to prevent information from being lost in transit.

Packet - A unit of data sent over a network.

Wireless-G Broadband Router with 2 Phone Ports

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 mail server commonly used on the Internet.

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

Power over Ethernet (PoE) - A technology enabling an Ethernet network cable to deliver both data and power.

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.

RADIUS (Remote Authentication Dial-In User Service) - A protocol that uses an authentication server to control network access.

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.

RTP (Real-time Transport Protocol) - A protocol that enables specialized applications, such as Internet phone calls, video, and audio, to occur in real time.

RTS (Request To Send) - A networking method of coordinating large packets through the RTS Threshold setting.

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

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".

Wireless-G Broadband Router with 2 Phone Ports

SOHO (Small Office/Home Office) - Market segment of professionals who work at home or in small offices.

SPI (Stateful Packet Inspection) Firewall - A technology that inspects incoming packets of information before allowing them to enter the network.

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.

STUN (Simple Traversal of UDP through NATs) - A protocol that enables specialized applications, such as Internet phone calls, video, and audio, to travel between your local network and the Internet. STUN is a specific type of NAT traversal.

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

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

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

TCP/IP (Transmission Control Protocol/Internet Protocol) - A set of instructions PCs use to communicate over a network.

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 has no directory or password capability.

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

TKIP (Temporal Key Integrity Protocol) - a wireless encryption protocol that provides dynamic encryption keys for each packet transmitted.

Topology - The physical layout of a network.

TX Rate - Transmission Rate.

Wireless-G Broadband Router with 2 Phone Ports

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 network data transmitted on a wireless network for greater security.

WINIPCFG - A Windows 98 and Me 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.

WPA (Wi-Fi Protected Access) - a wireless security protocol using TKIP (Temporal Key Integrity Protocol) encryption, which can be used in conjunction with a RADIUS server.

Appendix G: Specifications

Model	WRT54GP2
Standards	IEEE 802.11b, IEEE 802.11g, IEEE 802.3, H.323
Ports	Internet, LAN, Phone, Power
Button	Reset
Cabling Type	UTP Cat 5, UTP Cat 3
LEDs	Power, WLAN, Ethernet (1-3), Phone (1-2), Internet
Transmit Power	16.5 dBm
UPnP able/cert	Able
Security Features	WEP
WEP Key Bits	64-Bit, 128-Bit
Dimensions (W x H x D)	7.28" x 1.97" x 7.28" (185 mm x 50 mm x 185 mm)
Unit Weight	13.3 oz. (0.38 kg)
Power	12V 1A
Certifications	FCC, IC-03
Operating Temp.	32° ~ 104° F (0° ~ 40° C)
Storage Temp.	-4° ~ 140° F (-20° ~ 60° C)

Wireless-G Broadband Router with 2 Phone Ports

Operating Humidity 10% ~ 85% Non Condensing

Storage Humidity 5% ~ 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 USA.

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 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.

The equipment version marketed in the US is restricted to the usage of channels 1-11 only.

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 this product 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.

Wireless-G Broadband Router with 2 Phone Ports

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 dieses produkt tyyppinen laite on direktiivin 1999/5/EY oleellisten vaatimusten ja sitä koskevien näiden direktiivien muiden ehtojen mukainen.

Linksys déclare que le produit est conforme aux conditions essentielles et aux dispositions relatives à la directive 1999/5/EC.

Belgique:

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

France:

2.4 GHz Bande : les canaux 10, 11, 12, 13 (2457, 2462, 2467, et 2472 MHz respectivement) sont complètement libres d'utilisation en France (en utilisation intérieur). Pour ce qui est des autres canaux, ils peuvent être soumis à autorisation selon le département. 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.

SAFETY NOTICES

Caution: To reduce the risk of fire, use only No.26 AWG or larger telecommunication line cord.

Do not use this product near water, for example, in a wet basement or near a swimming pool.

Avoid using this product during an electrical storm. There may be a remote risk of electric shock from lightning.

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](ftp://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:
Or fax your request in to:

800-546-5797 (LINKSYS)
949-823-3002

If you experience problems with any Linksys product, you can call us at:
Don't wish to call? You can e-mail us at:

800-326-7114
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.)

949-823-3000