LINKSYS®
A Division of Cisco Systems, Inc.

Etherfast® Cable/DSL Router with 4-Port Switch

Use this guide to install the following product:

BEFSR41

User Guide

Cisco Systems

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FCC STATEMENT

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

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

EC Declaration of Conformity (Europe)

In compliance with the EMC Directive 89/336/EEC, Low Voltage Directive 73/23/EEC, and Amendment Directive 93/68/EEC, this product meets the requirements of the following standards:

- EN55022 Emission
- EN55024 Immunity

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.

Table of Contents

Chapter 1: Introduction

The Linksys EtherFast Cable/DSL Router

Think of the EtherFast® Cable/DSL Router with 4-Port Switch as a kind of "splitter" for your Internet connection. Just connect your DSL or Cable Modem to the Router, and all the computers in your household can share the Internet—all at the same time. The built-in 4-port switch lets you attach four local PCs directly, or daisy-chain out to more hubs and switches as your network grows.

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

It's all easier than you think—the included Setup Wizard takes you through configuring the Router, step by step. The Router can act as a DHCP server for your network, so your PCs are configured automatically. Universal Plug-and-Play (UPnP) lets specialized Internet applications configure the Router so you don't have to. Built-in Parental Controls help you protect your family while the Router helps keep intruders out of your computers.

With the EtherFast Cable/DSL Router with 4-Port Switch at the heart of your home network, you don't need to be a networking genius to share printers, files, and your high-speed Internet connection.

Features

- Supports Universal Plug-and Play for Easy Configuration
- Supports IPSec and PPTP Pass-through
- Administer and Upgrade the Router Remotely over the Internet
- Configurable as a DHCP Server on Your Network
- Advanced Security Management Function for Port Filtering, MAC Address Filtering, and DMZ Hosting
- Automatically Detects Straight or Cross-over Cable

An Introduction to LANs and the Internet

Simply put, a **router** is a network device that connects two networks together.

In this instance, the Router connects your **Local Area Network (LAN)**, or the group of PCs in your home or office, to the Internet. The Router processes and regulates the data that travels between these two networks.

Think of the Router as a network device with two sides: the first side is made up of your private LAN. The other, public side is the Internet, outside of your home or office.

The Router's NAT technology protects your network of PCs so users on the public, Internet side cannot "see" your PCs. This is how your LAN, or network, remains private. The Router protects your network by inspecting the first packet coming in through the Internet port before delivery to the final destination on the LAN port. The Router inspects Internet port services like the web server, ftp server, or other Internet applications, and, if allowed, it will forward the packet to the appropriate PC on the LAN side.

Remember that the Router's ports connect to two sides: your 10/100 **LAN** port(s) and the **Internet** port. The LAN port(s), as well as the broadband or Internet port, transmit data at 10 Mbps or 100 Mbps.

IP Addresses

What's an IP Address?

IP stands for Internet Protocol. Every device on an IP-based network, including PCs, print servers, and routers, requires an **IP address** to identify its "location," or address, on the network. This applies to both the Internet and LAN connections.

There are two ways of assigning an IP address to your network devices.

Static IP Addresses

A **static IP address** is a fixed IP address that you assign manually to a PC or other device on the network. Since a static IP address remains valid until you disable it, **static IP addressing** ensures that the device assigned it will always have that same IP address until you change it. Static IP addresses are commonly used with network devices such as server PCs or print servers.

Note: Since the Router is a device that connects two networks, it needs two IP addresses—one for the LAN side, and one for the Internet side. In this User Guide, you'll see references to the "Internet IP address" and the "Local or LAN IP address."

Since the Router has NAT security, the only IP address that can be seen from the Internet for your network is the Router's Internet IP address.

However, even this Internet IP address for the Router can be blocked, so that the Router and network seem invisible to the Internet—see the Block Anonymous Internet Requests description under Security => Filter in "Chapter 6: The Router's Web-based Utility."

If you use the Router to share your cable or DSL Internet connection, contact your ISP to find out if they have assigned a static IP address to your account. If so, you will need that static IP address when configuring the Router. You can get the information from your ISP.

Dynamic IP Addresses

A **dynamic IP address** is automatically assigned to a device on the network, such as PCs and print servers. These IP addresses are called "dynamic" because they are only *temporarily* assigned to the PC or device. After a certain time period, they expire and may change. If a PC logs onto the network (or the Internet) and its dynamic IP address has expired, the **DHCP server** will assign it a new dynamic IP address.

For DSL users, many ISPs may require you to log on with a user name and password to gain access to the Internet. This is a dedicated, high-speed connection type called Point to Point Protocol over Ethernet (PPPoE). PPPoE is similar to a dial-up connection, but PPPoE does not dial a phone number when establishing a connection. PPPoE also will provide the Router with a dynamic IP address to establish a connection to the Internet.

DHCP (Dynamic Host Configuration Protocol) Servers

PCs and other network devices using dynamic IP addressing are assigned a new IP address by a **DHCP server**. The PC or network device obtaining an IP address is called the DHCP client. DHCP frees you from having to assign IP addresses manually every time a new user is added to your network.

A DHCP server can either be a designated PC on the network or another network device, such as the Router. By default, the Router's Internet Connection Type is DHCP client.

By default, a DHCP server (LAN side) is enabled on the Router. If you already have a DHCP server running on your network, you *must* disable one of the two DHCP servers. If you run more than one DHCP server on your network, you will experience network errors, such as conflicting IP addresses. To disable DHCP on the Router, see the Basic Setup section in "Chapter 6: The Router's Web-based Utility."

Note: Even if you assign a static IP address to a PC, other PCs can still use DHCP's dynamic IP addressing, as long as the static IP address is not within the DHCP range of the Local IP Address.

If the dynamic IP addressing fails to provide a dynamic IP address, refer to "Appendix A: Troubleshooting."

Network Setup Overview

This user guide covers the basic steps for setting up a network with a router. After going through Chapter 2, "Getting to Know the Router", most users will only need to use the following chapters:

- Chapter 3: Connect the Router
  This chapter instructs you on how to connect the cable or DSL modem to the Router and connect the PC(s) to the Router.

- Chapter 4 Configure the PCs
  This chapter instructs you on how to configure your PC(s) for a DHCP connection, if the network settings are not already set to DHCP.

- Chapter 5: Configure the Router
  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.

When you're finished with the basic steps, then you are ready to connect to the Internet. After the PC(s) can access the Internet through the Router, you can alter the Router's settings further; for example, you can adjust security features and other settings to enable online gaming.

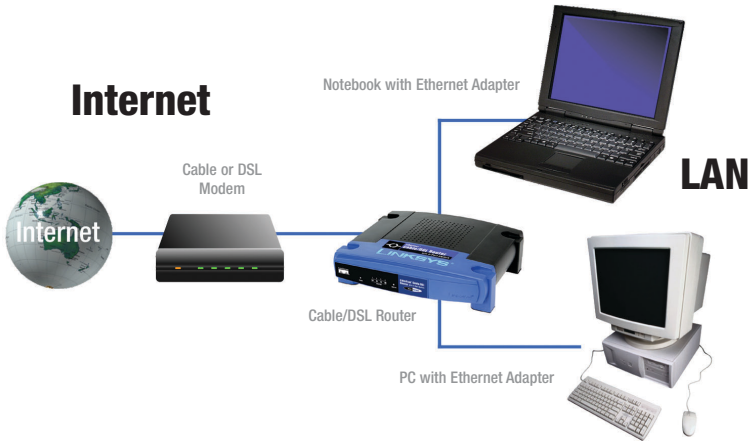

Figure 1-2

Chapter 2: Getting to Know the Router

The Router's Rear Panel

Figure 2-1

The Router's ports, where network cables are connected, and the Reset button are located on the rear panel of the Router, as shown in Figure 2-1.

Internet — The **Internet** port is where you connect your cable or DSL modem through an Ethernet cable. **Your modem connection will not work from any other port.**

Ports 1-4 — These four **Ethernet** ports connect to network devices, such as PCs, print servers, and remote hard drives.

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

The Reset Button

The **Reset** button can be used in one of two ways.

1. If the Router is having problems connecting to the Internet, press the **Reset** button for just a moment with a paper clip or a pencil tip. This clears up any jammed connections, and is similar to pressing the **Reset** button on your PC to reboot it.
2. If you are experiencing extreme problems with the Router and have tried all other troubleshooting measures, press and hold in the **Reset** Button for thirty seconds. This will restore the factory defaults and clear all of the Router's settings, including settings such as IP addresses or a new password.

The Router's Front Panel LEDs

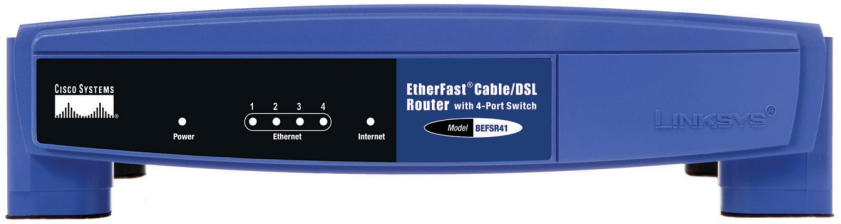

Figure 2-2

Power — *Green*. The **Power** LED lights up when the Router is powered on. If the LED is flickering, the Router is doing a diagnostic test.

Ethernet — *Green*. The **Ethernet** LED serves two purposes. If the LED is continuously lit, the Router is successfully connected to a device through the corresponding port (**1**, **2**, **3** or **4**). If the LED is flashing, the Router is actively sending or receiving data over that port.

Internet — *Green*. The **Internet** LED lights up when a successful connection is made between the Router and your cable or DSL modem.

Proceed to "Chapter 3: Connect the Router."

Chapter 3: Connect the Router

Overview

To set up your network, you will have to configure your networked PCs to accept the IP addresses that the Router assigns them (if applicable), and you will also have to configure the Router with setting(s) provided by your Internet Service Provider (ISP).

The installation technician from your ISP should have left the setup information with you after installing your broadband connection. If not, you can call your ISP to request the data. Once you have the setup information you need for your specific type of Internet connection, you can begin installation and setup of the Router.

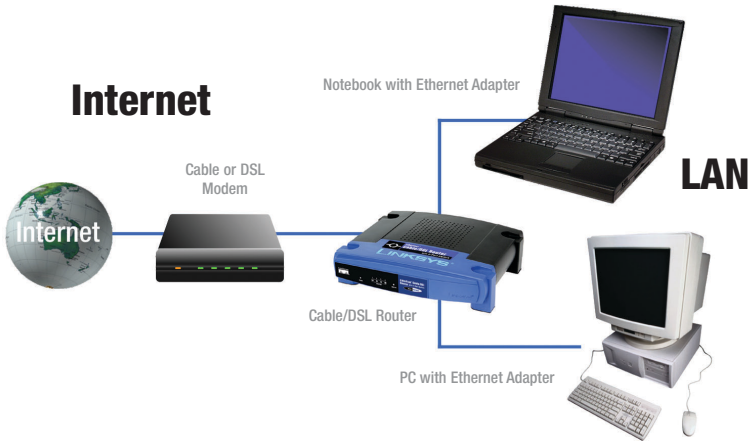

Figure 3-1

Connecting Your Hardware Together and Booting Up

1. Before you begin, make sure that all of your hardware is powered off, including the Router, PCs, hubs, switches, and cable or DSL modem.

2. Connect one end of an Ethernet network cable to one of the ports (labeled **1**, **2**, **3**, or **4**) on the back of the Router, and the other end to a standard port on a network device, e.g., a PC, print server, hub, or switch.

Figure 3-2

Note: A **standard port** is any port that fits an RJ-45 connector. The port must fit the connector on the Ethernet network cable.

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

3. Connect the Ethernet cable from your cable or DSL modem to the **Internet** port on the Router's rear panel. This is the only port that will work for your modem connection.

4. Connect the power adapter to the Power port on the rear panel of the Router, and then plug the power adapter into an electrical outlet.

Figure 3-3

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

Note: You should always plug the Router's power adapter into a surge protecting power strip.

5. Power on the cable or DSL modem.

6. Press the **Reset** button on the Router's rear panel with a paper clip or a pencil. Hold the button in for thirty seconds. This will restore the Router's factory default settings.

Have you checked that the **Ethernet** LEDs for all your LAN connections and the **Internet** LED for your Internet connection light up?

If your **Internet** LED is not lighting up, make sure that all your cables are securely plugged in, and that all of your hardware is powered on properly. Verify that the modem is plugged into the Internet port on the Router.

The Router's hardware installation is now complete.
Go to "Chapter 4: Configure the PCs."

Chapter 4: Configure the PCs

Overview

The instructions in this chapter will help you configure each of your computers to be able to communicate with the Router.

To do this, you need to configure your PC's network settings to obtain an IP (or TCP/IP) address automatically (called DHCP). Computers use IP addresses to communicate with each other across a network or the Internet.

Find out which operating system your computer is running, such as Windows 98, Millennium, 2000, or XP. You will need to know which operating system your computer is running. You can find out by clicking the **Start** button and then going to the **Settings** option. Then click **Control Panel**, and then double-click the **System** icon. If your Start menu doesn't have a Settings option, you're running Windows XP. Click the **Cancel** button when done.

You may need to do this for each computer you are connecting to the Router.

Important: These instructions apply only to Windows 98, Windows Millennium, Windows 2000, or Windows XP machines. By default Windows 98, 2000, Millennium, and XP has TCP/IP installed and set to obtain an IP address automatically.

The next few pages tell you, step by step, how to configure your network settings based on the type of Windows operating system you are using. Make sure that an Ethernet card or adapter has been successfully installed in each PC you will configure Once you've configured your computers, continue to "Chapter 5: Configure the Router."

Configuring Windows 98 and Millennium PCs

1. Click the **Start** button. Click **Settings** and then **Control Panel**. From there, double-click the **Network** icon.

2. On the Configuration tab, select the **TCP/IP line** for the applicable Ethernet adapter, as shown in Figure 4-1. Do not choose a TCP/IP entry whose name mentions DUN, PPPoE, VPN, or AOL. If the word **TCP/IP** appears by itself, select that line. (If there is no TCP/IP line listed, refer to "Appendix D: Installing the TCP/IP Protocol" or your Ethernet adapter's user guide to install TCP/IP now.) Click the **Properties** button.

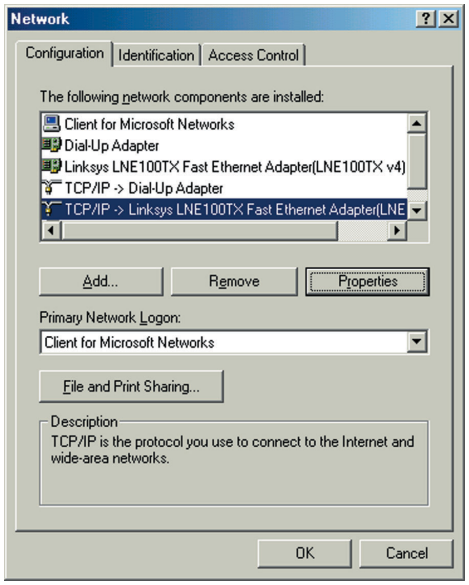

Figure 4-1

3. Click the **IP Address** tab and select **Obtain an IP address automatically**, as shown in Figure 4-2.

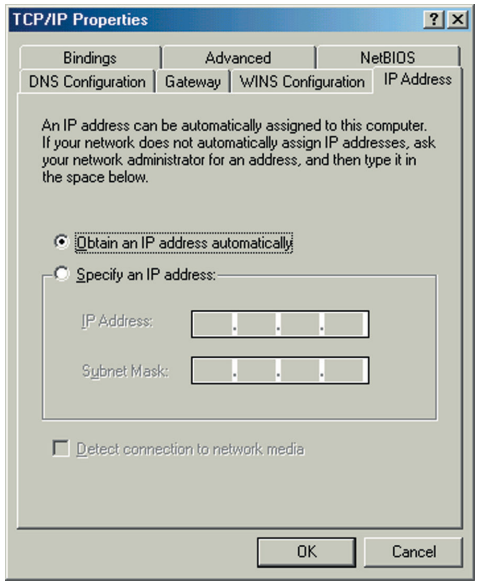

Figure 4-2

4. Now click the **Gateway** tab to ensure that the *Installed Gateway* field is left blank. Click the **OK** button.

5. Click the **OK** button again. Windows may ask you for the original Windows installation disk or additional files. Supply them by pointing to the correct file location, e.g., D:\win98, D:\win9x, c:\windows\options\cabs, etc. (if "D" is the letter of your CD-ROM drive).

6. Windows may ask you to restart your PC. Click the **Yes** button. If Windows does not ask you to restart, restart your computer anyway.

Go to "Chapter 5: Configure the Router."

Configuring Windows 2000 PCs

1. Click the **Start** button. Click **Settings** and then **Control Panel**. From there, double-click the **Network and Dial-up Connections** icon.

2. Select the **Local Area Connection** icon for the applicable Ethernet adapter (usually it is the first Local Area Connection listed). Do not choose a TCP/IP entry whose name mentions DUN, PPPoE, VPN, or AOL. Double-click the **Local Area Connection**.

3. The *Local Area Connection Status* screen will appear, as shown in Figure 4-3. Click the **Properties** button.

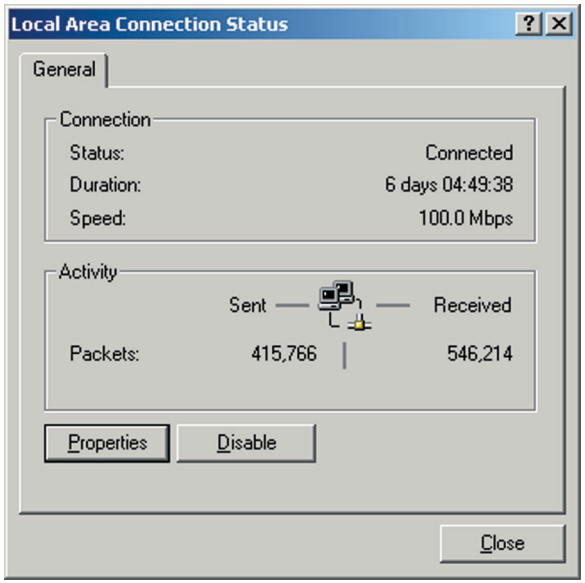

Figure 4-3

4. Select **Internet Protocol (TCP/IP)**, as shown in Figure 4-4, and click the **Properties** button.

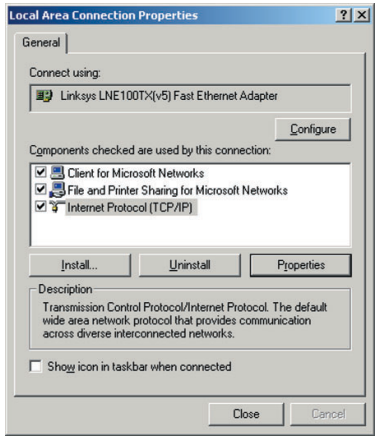

Figure 4-4

5. Select **Obtain an IP address automatically**, as shown in Figure 4-5. Once the new window appears, click the **OK** button. Click the **OK** button again to complete the PC configuration.

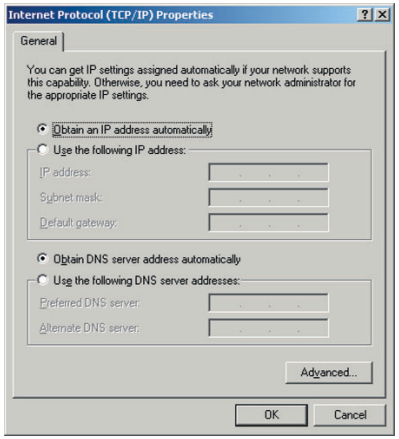

Figure 4-5

6. Restart your computer.

Go to "Chapter 5: Configure the Router."

Configuring Windows XP PCs

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 the **Start** button and then **Control Panel**. From there, click the **Network and Internet Connections** icon and then the **Network Connections** icon.

2. Select the **Local Area Connection** icon for the applicable Ethernet adapter (usually it is the first Local Area Connection listed). Double-click the **Local Area Connection**.

3. The *Local Area Connection Status* screen will appear, as shown in Figure 4-6. Click the **Properties** button.

Figure 4-6

4. Select **Internet Protocol (TCP/IP)**, as shown in Figure 4-7, and click the **Properties** button.

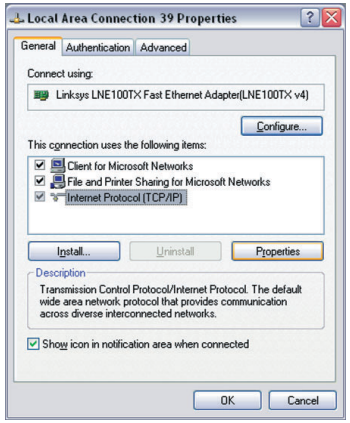

Figure 4-7

5. Select **Obtain an IP address automatically**, as shown in Figure 4-8. Once the new window appears, click the **OK** button. Click the **OK** button again (or the **Close** button if any settings were changed) to complete the PC configuration.

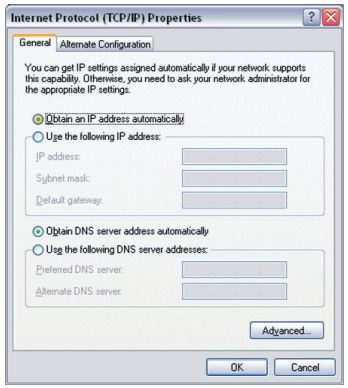

Figure 4-8

6. Restart your computer.

Go to "Chapter 5: Configure the Router."

Chapter 5: Configure the Router

Note: Linksys recommends using the Setup CD for first time installation of the Router and for setting up additional computers. For additional assistance, follow the steps in this chapter.

This chapter will show you how to configure the Router to function in your network and gain access to the Internet through your Internet Service Provider (ISP). Detailed description of the Router's Web-based Utility can be found in "Chapter 6: The Router's Web-based Utility." You will set the Internet Connection Type on the Router's Basic Setup tab based on the information provided by your ISP, who may also require the use of a Host Name and Domain Name. *You will need the setup information from your ISP.* If you do not have this information, please contact your ISP before proceeding.

The instructions from your ISP tell you how to set up your PC for Internet access. Because you are now using the Router to share Internet access among several computers, you will use the setup information to configure the Router instead of your PC. You only need to configure the Router once using the first computer you set up.

1. Open your web browser. Enter **http://192.168.1.1** in the web browser's *Address* field, as shown in Figure 5-1, and press the **Enter** key.

Figure 5-1

2. An *Enter Network Password* window, shown in Figure 5-2, will appear (Windows XP users will see a *Connect to 192.168.1.1* window, shown in Figure 5-3). Leave the *User Name* field empty, and enter **admin** in lowercase letters in the *Password* field (**admin** is the default password). Then, click the **OK** button.

Figure 5-2

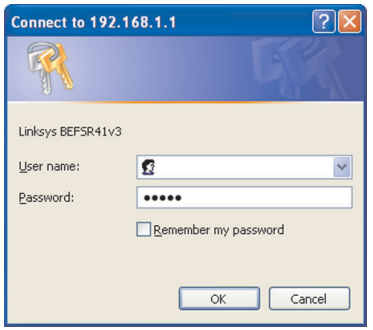

Figure 5-3

IMPORTANT: If you have previously enabled any **Internet-sharing proxy server software** on any of your PCs, you must disable it now.

Some examples of Internet-sharing software are Internet LanBridge, Wingate, ICS, and Sygate. To disable your Internet-sharing software:

- If you are running Netscape Navigator, click **Edit** >> **Preferences** >> **Advanced** >> **Proxies**. Click **Direct Connection to the Internet**.
- If you are running Internet Explorer 5.x or higher, click **Start** >> **Settings** >> **Control Panel** >> **Internet Options** >> **Connections** >> **LAN Settings**. Remove checkmarks from all three boxes. Click the **OK** button to continue.

Also, you must disable any **Internet log-on software** (such as Ivasion Winpoet or Enternet 300) on all of your PCs.

3. The Router supports six connection types: obtain an IP automatically (DHCP), Static IP, PPPoE, RAS, PPTP, and Heart Beat Signal. These types are listed in the drop-down menu for the Internet Connection Type setting of the Internet Setup section. Each *Basic Setup* screen and available features will differ depending on what kind of connection type you select. Proceed to the instructions for the connection type you are using. When you are finished with the Internet Setup section, proceed to step 4.

DHCP or Obtain an IP Address Automatically

If your ISP says that you are connecting through DHCP or a dynamic IP address from your ISP, perform these steps:

A. Select **Obtain an IP automatically** as the Internet Connection Type, as shown in Figure 5-4.

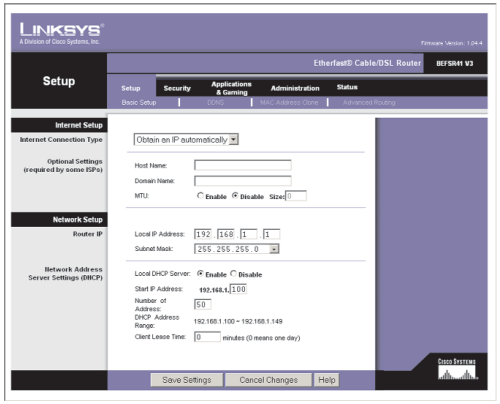

Figure 5-4

B. Click the **Save Settings** button to save this change, or click the **Cancel Changes** button to undo your change. For further help on this tab, click the **Help** button. When you are finished, proceed to step 4.

Static IP Address or Specify an IP Address

If your ISP says that you are connecting through a static or fixed IP address from your ISP, perform these steps:

A. Select **Static IP** as the Internet Connection Type, as shown in Figure 5-5.

B. Enter the IP Address.

C. Enter the **Subnet Mask**.

D. Enter the Default Gateway.

Figure 5-5

E. Enter the DNS in the *Primary DNS* and/or *Secondary DNS* fields. You need to enter at least one DNS address.

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

G. Proceed to step 4.

PPPoE

If your DSL provider says that you are connecting through PPPoE or if you normally enter a user name and password to access the Internet, perform these steps:

Figure 5-6

A. Select **PPPoE** as the Internet Connection Type, as shown in Figure 5-6.

B. Enter the User Name.

C. Enter the Password.

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

E. Click the **Status** tab, and then click the **Connect** button.

F. Proceed to step 4.

RAS (for SingTel)

RAS (shown in Figure 5-7) is a service used in Singapore only. If you are using a RAS connection, check with your ISP for the necessary setup information.

When you are finished, proceed to step 4.

Figure 5-7

PPTP

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

Figure 5-8

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

B. Click the **Status** tab, and then click the **Connect** button.

C. Proceed to step 4.

Heart Beat Signal

Heart Beat Signal (shown in Figure 5-9) 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.

Figure 5-9

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

B. Click the **Status** tab, and then click the **Connect** button.

C. Proceed to step 4.

4. In the Optional Settings section, you may need to provide a host name and domain name for the Router. These fields are usually left blank. If requested by your ISP (usually cable ISPs), complete these two fields.

5. If you haven't already done so, click the **Save Settings** button to save your settings. Close the web browser.

6. Reset the power on your cable or DSL modem.

7. Restart your computers so that they can obtain the Router's new settings.

   If you need advanced setting information, please refer to "Chapter 6: The Router's Web-based Utility" or the Linksys support website at *support.linksys.com*.

   Congratulations! You've successfully configured the Router. Test the setup by opening your web browser from any computer and entering *www.linksys.com/registration*, as shown in Figure 5-10.

Figure 5-10

   If you are unable to reach our website, you may want to review what you did in this section or refer to "Appendix A: Troubleshooting."

Proceed to "Chapter 6: The Router's Web-based Utility" for more details and advanced settings information.

Chapter 6: The Router's Web-based Utility

Overview

For your convenience, use the Router's Web-based Utility to administer it. This chapter will explain all of the functions in this Utility. The Utility can be accessed via Microsoft Internet Explorer or Netscape Navigator through use of a computer connected with an Ethernet cable to the Router.

For a basic network setup, most users only have to use the following screens of the Utility:

- **Basic Setup** On the *Basic Setup* screen, enter the settings provided by your ISP.

- **Management** Click the **Administration** tab and then the **Management** tab. The Router's default password is **admin**. To secure the Router, change the Password from its default.

Navigating the Utility

There are five main tabs: Setup, Security, 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 - To enable the Router's Dynamic Domain Name System (DDNS) feature, complete the fields on this screen.
MAC Address Clone - If you need to clone a MAC address onto the Router, use to this screen.
Advanced Routing - On this screen, you can alter Network Address Translation (NAT), Dynamic Routing, and Static Routing configurations.

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

Applications & Gaming

Port Range Forwarding - To set up public services or other specialized Internet applications on your network, click this tab.

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 - To allow one local user to be exposed to the Internet for use of special-purpose services, use this screen.

Administration

Management - On this screen, alter router access privileges and UPnP settings.

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

Router - This screen provides status information about the Router.

Local Network - This provides status information about the local network.

Quick and Easy Router Administration

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, as shown in Figure 6-1. Press the **Enter** key.

Figure 6-1

A password request page, shown in Figure 6-2 will pop up. (Windows XP users will see a *Connect to 192.168.1.1* window, shown in Figure 6-3). Leave the *User Name* field blank, and enter **admin** in the *Password* field. Then click the **OK** button.

Figure 6-2

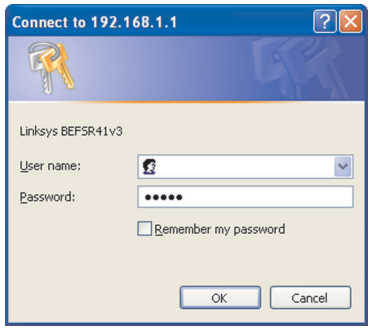

Figure 6-3

When finished making your changes on a tab, click the **Save Settings** button to save the changes, or click the **Cancel Changes** button to undo your changes. For further help on the tab, click the **Help** button.

Basic Setup

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

Internet Setup

Internet Connection Type The Router supports six connection types: Obtain an IP automatically (DHCP), PPPoE, Static IP, PPTP, RAS, 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, as shown in Figure 6-4, and it should be used only if your ISP supports DHCP.

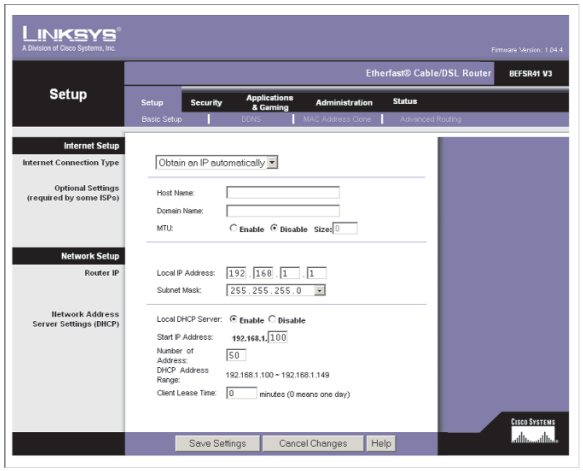

Figure 6-4

Static IP

If you are required to use a permanent IP address, then select **Static IP**, as shown in Figure 6-5.

Figure 6-5

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.

Primary DNS and Secondary DNS 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, as shown in Figure 6-6.

Figure 6-6

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 your connection with your ISP after a specified period of time (Max Idle Time). If you have been disconnected 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 Option and Redial Period This option keeps your PPPoE-enabled Internet access connected indefinitely, even when it sits idle. 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.

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

RAS (for SingTel)

Remote Access Service (RAS) (shown in Figure 6-7) 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.

Figure 6-7

Connect on Demand and Max Idle Time You can configure the Router to cut your connection with your ISP after a specified period of time (Max Idle Time). If you have been disconnected 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 Option and Redial Period This option keeps your RAS-enabled Internet access connected indefinitely, even when it sits idle. To use this option, click the radio button next to **Keep Alive**. The default Redial Period is 30 seconds.

PPTP

Point to Point Tunneling Protocol (PPTP), shown in Figure 6-8, is a service that applies to connections in Europe 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.

Figure 6-8

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 your connection with your ISP after a specified period of time (Max Idle Time). If you have been disconnected 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 Option and Redial Period This option keeps your PPTP-enabled Internet access connected indefinitely, even when it sits idle. 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 (shown in Figure 6-9) 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.

Figure 6-9

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 your connection with your ISP after a specified period of time (Max Idle Time). If you have been disconnected 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 Option and Redial Period This option keeps your PPPoE-enabled Internet access connected indefinitely, even when it sits idle. 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.

Optional Settings

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

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

Network Setup

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

Local IP Address The default value is **192.168.1.1**.

Subnet Mask The default value is **255.255.255.0**.

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

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

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

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

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

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

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

Note: You can test and see if the settings are correct by successfully connecting to the Internet.

DDNS

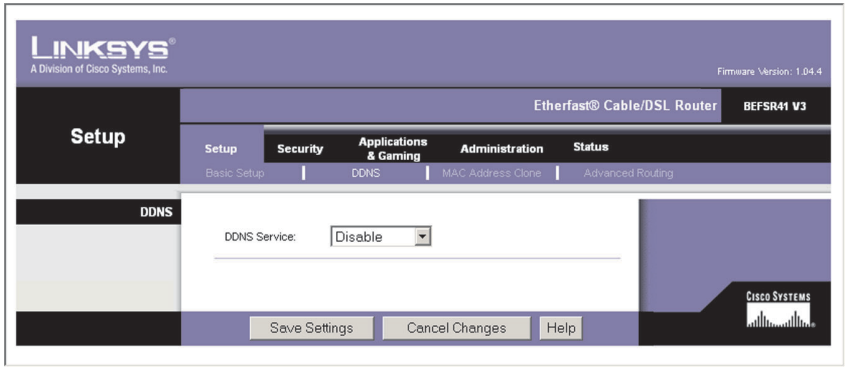

Figure 6-10

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.

DDNS

DDNS Service If your DDNS service is provided by DynDNS.org, then select **DynDNS.org** in 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.

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

DynDNS.org

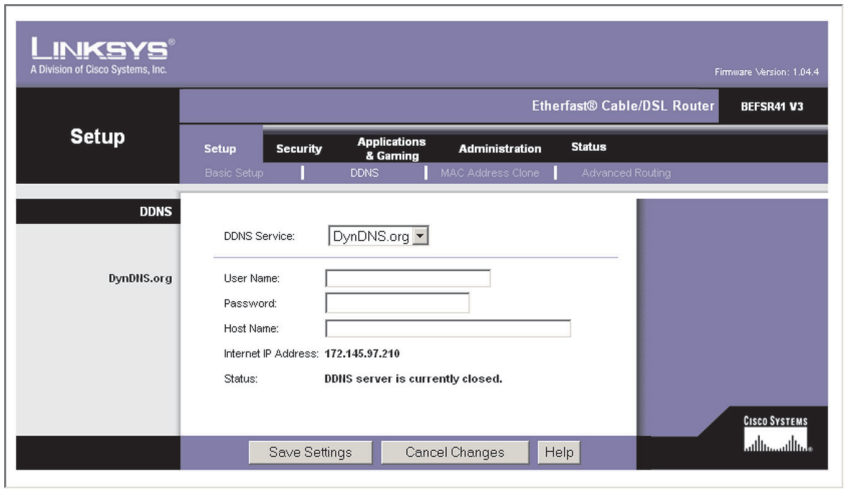

Figure 6-11

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.

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

TZO.com

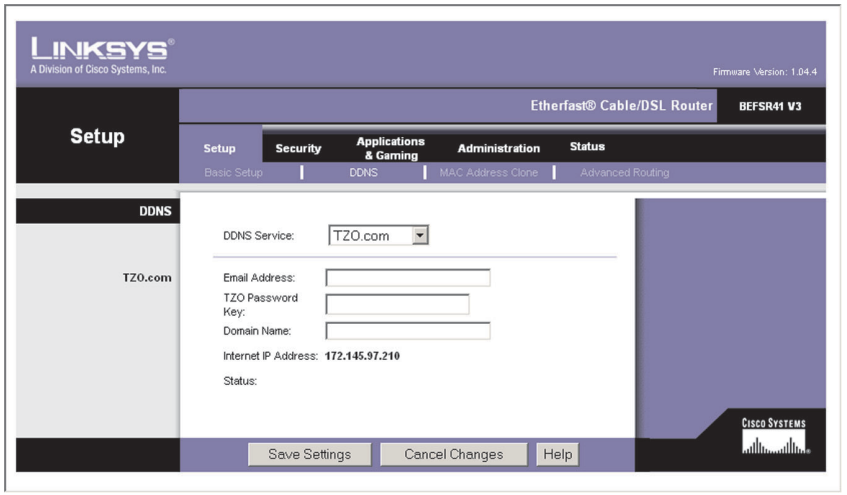

Figure 6-12

Email Address, **TZO Password Key, and Domain Name** Enter the Email Address, TZO Password Key, 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 finished making your changes on this tab, click the **Save Settings** button to save these changes, or click the **Cancel Changes** button to undo your changes. For further help on this tab, click the **Help** button.

MAC Address Clone

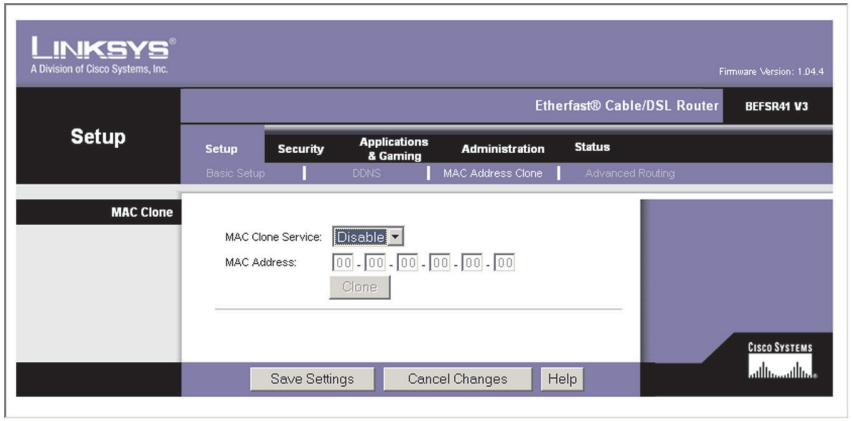

Figure 6-13

The Router's MAC address is a 12-digit code assigned to a unique piece of hardware for identification, like a social security number. If your ISP requires MAC address registration, find your adapter's MAC address by following the instructions in "Appendix D: Finding the MAC Address and IP Address for Your Ethernet Adapter."

MAC Clone

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

MAC Address To manually clone a MAC address, enter the 12 digits of your adapter's MAC address in the on-screen fields (see Figure 6-25). 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 page.

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

Advanced Routing

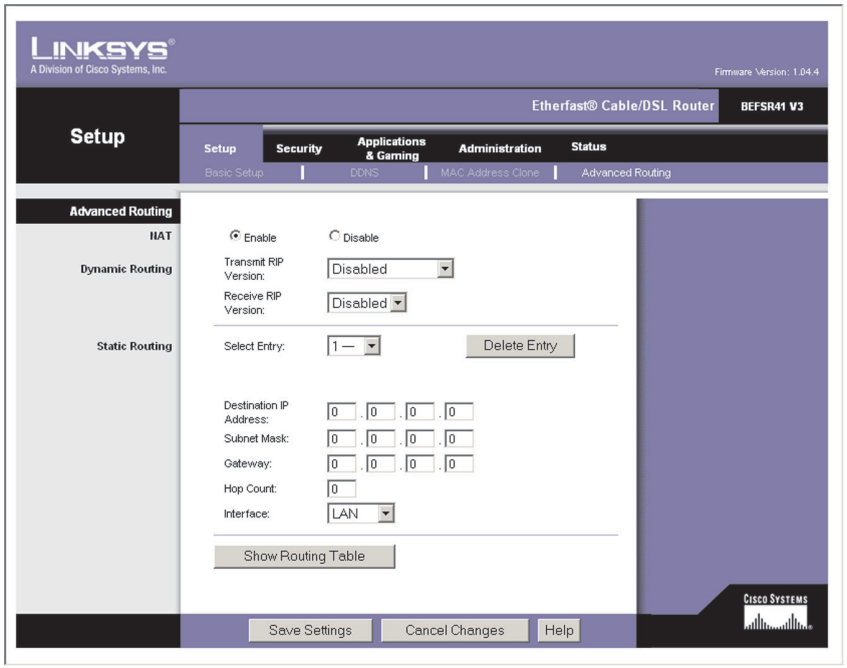

Figure 6-14

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.

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

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 If the Router is connected to more than one network, it may be necessary to set up a static route between them. 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.

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

Destination IP Address The Destination 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. If you are building a route to an entire network, be sure that the network portion of the IP address is set to 0. For example, the Router's standard IP address is 192.168.1.1. Based on this address, the address of the routed network is 192.168.1, with the last digit determining the Router's place on the network. Therefore you would enter the IP address 192.168.1.0 if you wanted to route to the Router's entire network, rather than just to the Router.

Subnet Mask The Subnet Mask (also known as the Network Mask) determines which portion of an IP address is the network portion, and which portion is the host portion. Take, for example, a network in which the Subnet Mask is 255.255.255.0. This determines (by using the values 255) that the first three numbers of a network IP address identify this particular network, while the last digit (from 1 to 254) identifies the specific host.

Gateway This IP address should be 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.

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

Show Routing Table Click the **Show Routing Table** button to open a screen displaying how data is routed through your LAN. 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. See Figure 6-15.

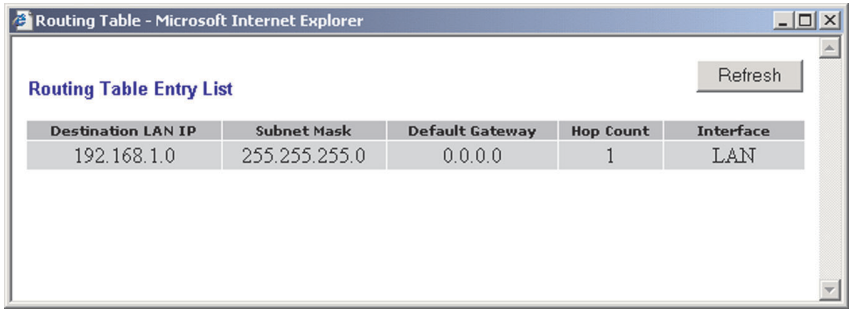

Figure 6-15

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

Filter

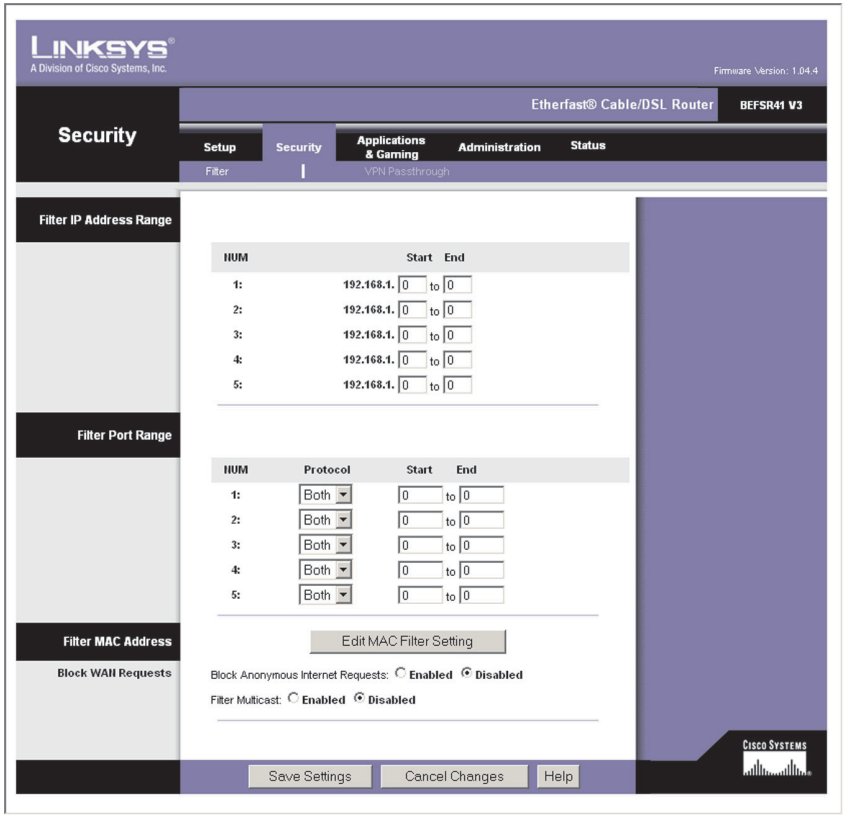

Figure 6-16

When you click the Security tab, you will see the *Filter* screen (see Figure 6-16). Filters block specific internal users from accessing the Internet and block anonymous Internet requests and/or multicasting.

Filter IP Address Range

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

To filter users by network port number, select the protocol you want to filter, **TCP**, **UDP**, or **Both**, in the *Protocol* drop-down box. 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.

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 D: 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 to display Figure 6-17. 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.

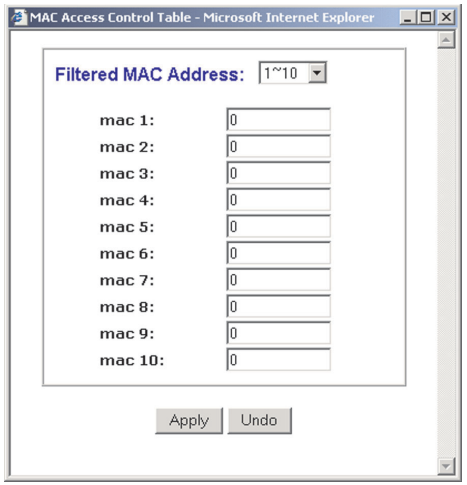

Figure 6-17

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.

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

VPN Passthrough

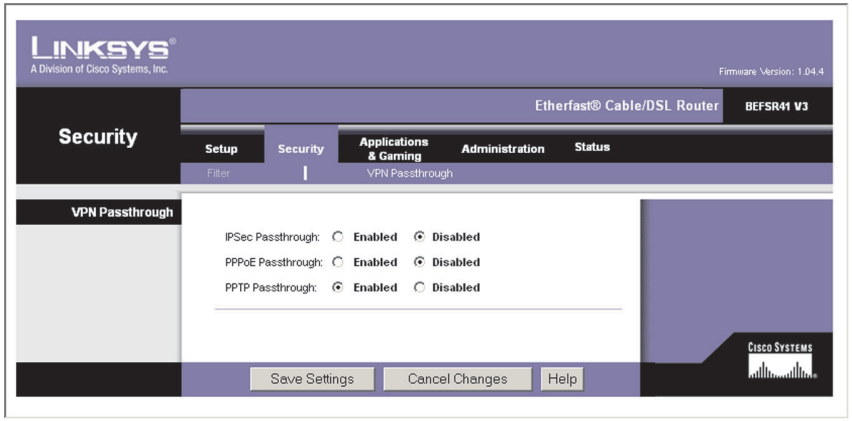

Figure 6-18

The *VPN* screen allows you to enable or disable pass-through for a variety of VPN methods.

VPN PassThrough

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

PPPoE Passthrough PPPoE 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 Point-to-Point Tunneling Protocol Passthrough is the method used to enable VPN sessions to a Windows NT 4.0 or 2000 server. To allow PPTP Passthrough, click the **Enabled** button. To disable PPTP Passthrough, click the **Disabled** button.

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

Port Range Forwarding

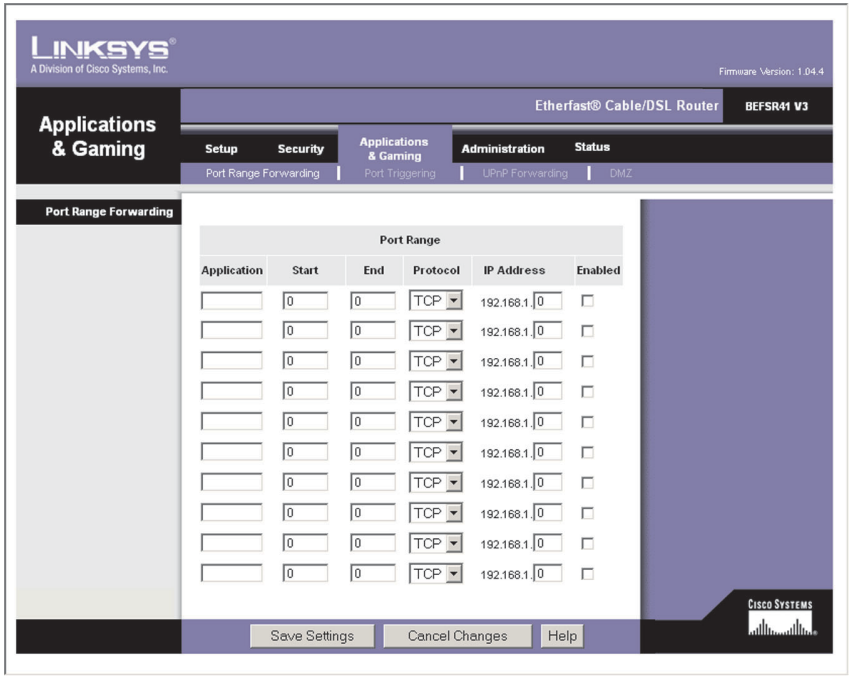

Figure 6-19

When you click the Applications & Gaming tab, you will see the *Port Range Forwarding* screen (see Figure 6-19). 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 video-conferencing 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 ports(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 D: Finding the MAC Address and IP Address for Your Ethernet Adapter."

Enabled Check the **Enabled** 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 finished making your changes on this tab, click the **Save Settings** button to save these changes, or click the **Cancel Changes** button to undo your changes. For further help on this tab, click the **Help** button.

Port Triggering

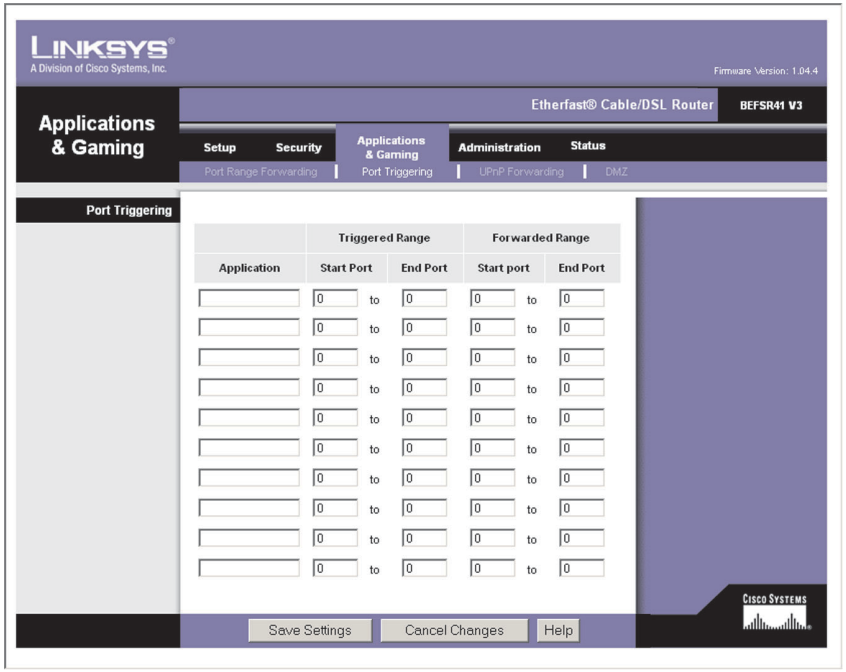

Figure 6-20

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

UPnP Forwarding

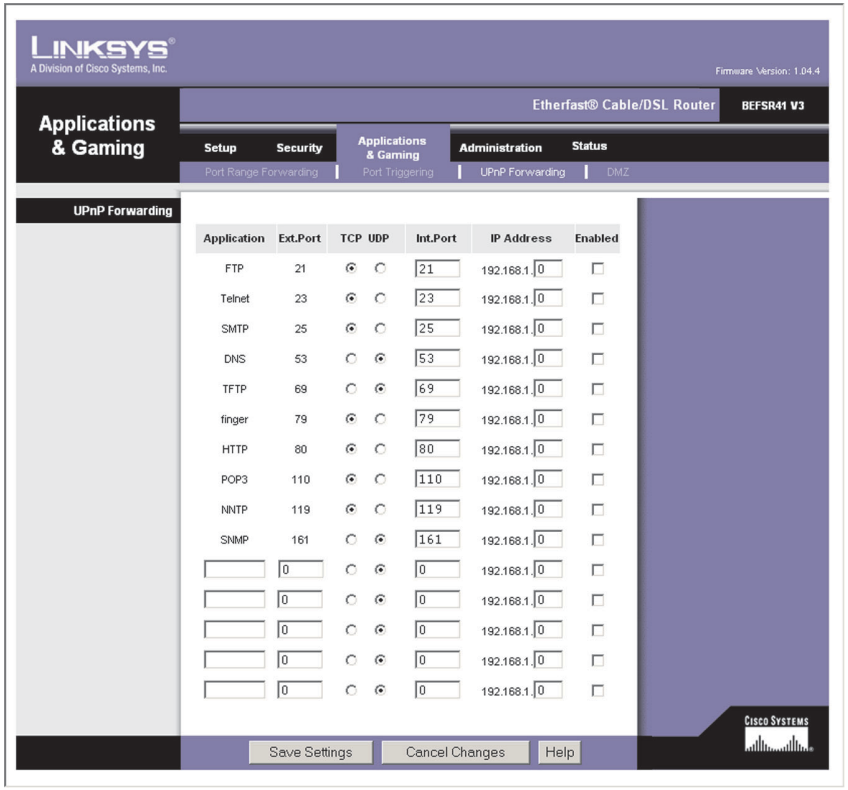

Figure 6-21

The *UPnP* screen displays preset application settings as well as options for customization of port services for other applications.

UPnP Forwarding

Application Ten preset applications are preset. You can specify up to five additional applications in 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.

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 D: 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 **Enable** button is left unchecked. This is disabled (unchecked) by default.

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

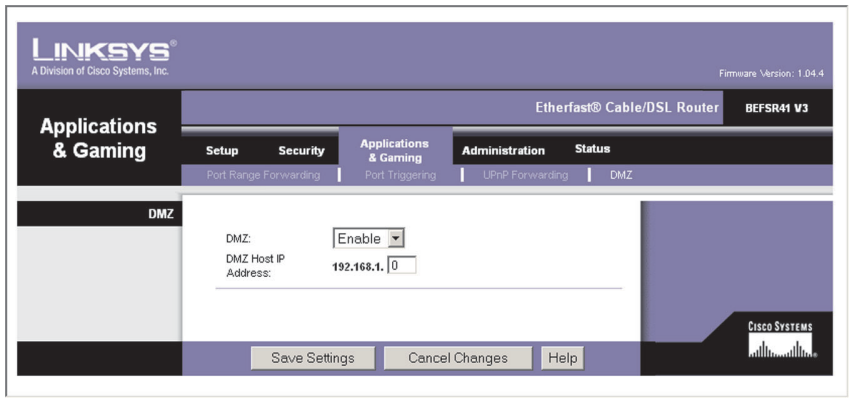

Figure 6-22

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. Whereas Port Range Forwarding can only forward a maximum of 10 ranges of ports, DMZ hosting forwards all the ports for one PC at the same time.

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 D: Finding the MAC Address and IP Address for Your Ethernet Adapter." Deactivate DMZ by entering a **0** in the field.

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

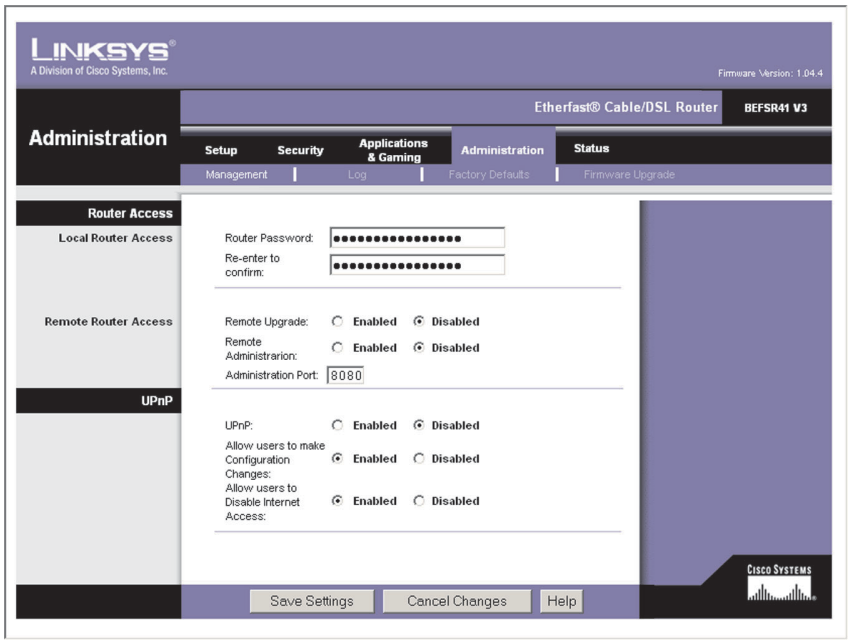

Figure 6-23

The *Management* screen allows you to change the Router's access settings as well as configure the UPnP (Universal Plug and Play) features.

Router Password

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 enabled 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 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.

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

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

Log

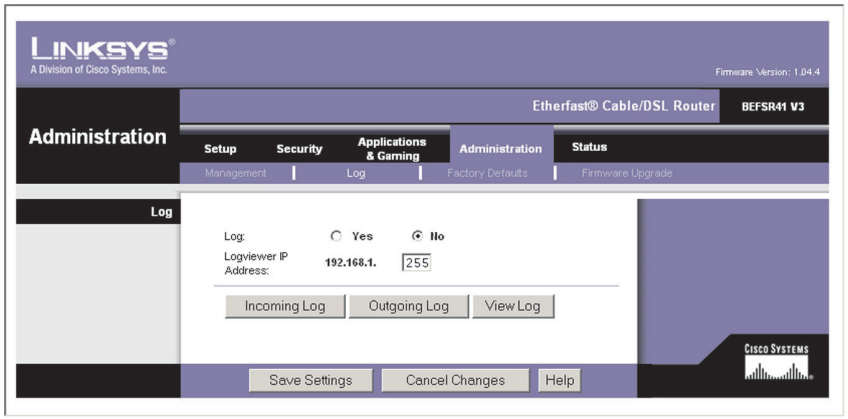

Figure 6-24

When you click the Administration tab, you will see the *Log* screen (see Figure 6-24). 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 have 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. See Figure 6-25.

Figure 6-25

Outgoing Log Click the **Outgoing Log** button to view a temporary log of all 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. See Figure 6-26.

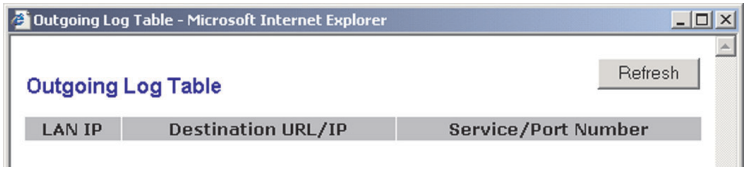

Figure 6-26

View Log Click the **View Logs** button to display a log of all activities and to access a drop-down menu of various logs to view (see Figure 6-27).

Figure 6-27

From the drop-down menu, select the log you wish to view: **All**, **System Log**, or **Access Log**. When you select All, you will see a log of all activities, a combination of the System and Access Logs. The System Log displays a list of cold and warm starts, web login successes and failures, and packet filtering policies, while the Access Log shows all data traffic.

Clear To clear a log, click the **Clear** button.

Refresh To update a log, click the **Refresh** button.

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

Factory Defaults

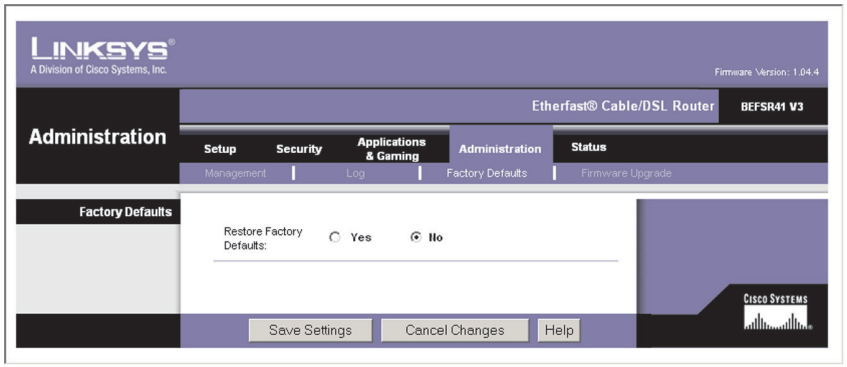

Figure 6-28

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

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.

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.

Click the **Save Settings** button to restore the factory defaults, or click the **Cancel Changes** button to undo your change. For further help on this tab, click the **Help** button.

Firmware Upgrade

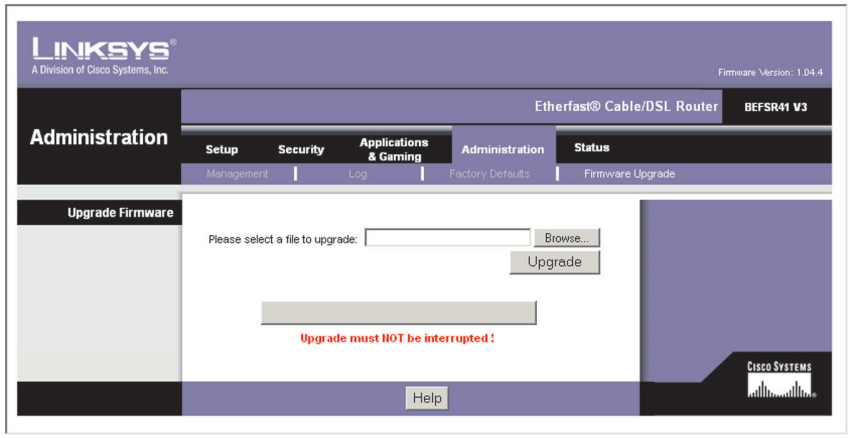

Figure 6-29

The *Firmware Upgrade* screen allows you to upgrade the Router's firmware.

Note: By upgrading the Router's firmware, you may lose the Router's 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.

For further help on this tab, click the **Help** button.

Router

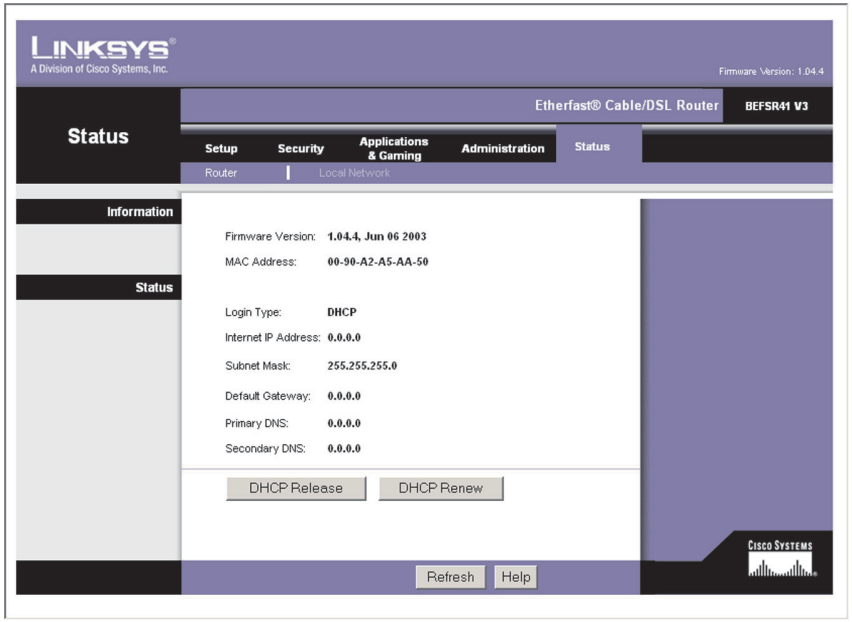

Figure 6-30

When you click the Status tab, you will see the *Router* screen (see Figure 6-30). It displays information about the Router and its settings.

Note: The information provided and buttons available may vary depending on the Router's settings.

Information

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

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 re-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.

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

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

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

Click the **Refresh** button to update the on-screen information. For further help on this tab, click the **Help** button.

Local Network

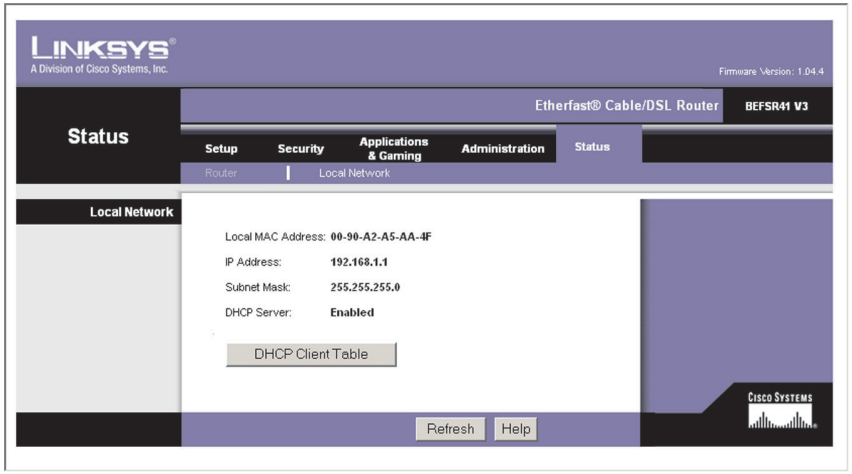

Figure 6-31

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

Local Network

Local 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, shown in Figure 6-32, lists the DHCP Server IP Address, Client Hostnames, IP Addresses, and MAC Addresses. Click the **Refresh** button to update the information.

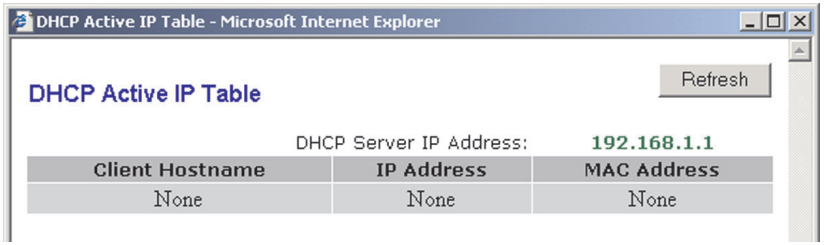

Figure 6-32

Click the **Refresh** button to update the on-screen information. For further help on this tab, click the **Help** button.

Appendix A: Troubleshooting

Common Problems and Solutions

This appendix consists of two parts: "Common Problems and Solutions" and "Frequently Asked Questions." Provided are possible solutions to problems regarding the installation and operation of the Router. If your situation is described here, the problem should be solved by applying the corresponding solution. If you can't find an answer here, check the Linksys website at *www.linksys.com*.

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

The Router, by default, assigns an IP address range of 192.168.1.100 to 192.168.1.150 using the DHCP server on the Router. To set a static IP address, you can only use the ranges 192.168.1.2 to 192.168.1.99 and 192.168.1.151 to 192.168.1.254. Each PC or network device that uses TCP/IP must have a unique address to identify itself in a network. If the IP address is not unique to a network, Windows will generate an IP conflict error message. You can assign a static IP address to a PC by performing the following steps:

For Windows 98 and Millennium:

A. Click **Start**, **Settings**, and **Control Panel**. Double-click **Network**.
B. 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.
C. 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. You can only use an IP address in the ranges 192.168.1.2 to 192.168.1.99 and 192.168.1.151 to 192.168.1.254. Make sure that each IP address is unique for each PC or network device.
D. 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.
E. 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.
F. Click the **OK** button in the *TCP/IP properties* window, and click **Close** or the **OK** button for the Network window.
G. Restart the computer when asked.

For Windows 2000:

A. Click **Start**, **Settings**, and **Control Panel**. Double-click **Network and Dial-Up Connections**.
B. Right-click the **Local Area Connection** that is associated with the Ethernet adapter you are using, and select the **Properties** option.
C. 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.
D. Enter a unique **IP address** that is not used by any other computer on the network connected to the Router. You can only use an IP address in the ranges 192.168.1.2 to 192.168.1.99 and 192.168.1.151 to 192.168.1.254.
E. Enter the Subnet Mask, **255.255.255.0**.
F. Enter the Default Gateway, **192.168.1.1** (Router's default IP address).
G. 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.
H. Click the **OK** button in the *Internet Protocol (TCP/IP) Properties* window, and click the **OK** button in the *Local Area Connection Properties* window.
I. Restart the computer if asked.

For Windows XP:

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

A. Click **Start** and **Control Panel**.
B. Click the **Network and Internet Connections** icon and then the **Network Connections** icon.
C. Right-click the **Local Area Connection** that is associated with the Ethernet adapter you are using, and select the **Properties** option.
D. In the *This connection uses the following items* box, highlight **Internet Protocol (TCP/IP)**. Click the **Properties** button.
E. Enter a unique **IP address** that is not used by any other computer on the network connected to the Router. You can only use an IP address in the ranges 192.168.1.2 to 192.168.1.99 and 192.168.1.151 to 192.168.1.254.
F. Enter the Subnet Mask, **255.255.255.0**.
G. Enter the Default Gateway, **192.168.1.1** (Router's default IP address).
H. 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.
I. Click the **OK** button in the *Internet Protocol (TCP/IP) Properties* window. Click the **OK** button in the *Local Area Connection Properties* window.

2. I want to test my Internet connection.

A. Check your TCP/IP settings.

For Windows 98 and Millennium:
Refer to "Appendix D: Installing the TCP/IP Protocol" and "Chapter 4: Configure the PCs" for details. Make sure **Obtain IP address automatically** is selected in the settings.

For Windows 2000:

- Click **Start**, **Settings**, and **Control Panel**. Double-click **Network and Dial-Up Connections**.
- Right-click the **Local Area Connection** that is associated with the Ethernet adapter you are using, and select the **Properties** option.
- In the *Components checked are used by this connection* box, highlight **Internet Protocol (TCP/IP)**, and click the **Properties** button. Make sure that **Obtain an IP address automatically** and **Obtain DNS server address automatically** are selected.
- Click the **OK** button in the *Internet Protocol (TCP/IP) Properties* window, and click the **OK** button in the Local Area Connection Properties window.
- Restart the computer if asked.

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

- Click **Start** and **Control Panel**.
- Click the **Network and Internet Connections** icon and then the **Network Connections** icon.
- Right-click the **Local Area Connection** that is associated with the Ethernet adapter you are using, and select the **Properties** option.
- In the *This connection uses the following items* box, highlight **Internet Protocol (TCP/IP)**, and click the **Properties** button. Make sure that **Obtain an IP address automatically** and **Obtain DNS server address automatically** are selected.

- Click the **OK** button in the *Internet Protocol (TCP/IP) Properties* window, and click the **OK** button in the *Local Area Connection Properties* window.
- Restart the computer if asked.

B. Open a command prompt.
- For **Windows 98** and **Millennium**, please click **Start** and **Run**. In the Open field, type in **command**. Press the **Enter** key or click the **OK** button.
- For **Windows 2000** and **XP**, please click **Start** and **Run**. In the Open field, type **cmd**. Press the **Enter** key or click the **OK** button.

C. 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.

D. In the command prompt, type **ping** *followed by your Internet IP address* and press the **Enter** key. The Internet IP Address can be found in the web inter-face of the Router. For example, if your Internet IP address is 1.2.3.4, you would enter **ping 1.2.3.4** and press the **Enter** key.
- If you get a reply, the computer is connected to the Router.
- If you do NOT get a reply, try the ping command from a different computer to verify that your original computer is not the cause of the problem.

E. In the command prompt, type **ping www.yahoo.com** and press the **Enter** key.
- If you get a reply, the computer is connected to the Internet. If you cannot open a webpage, try the ping command from a different computer to verify that your original computer is not the cause of the problem.
- If you do NOT get a reply, there may be a problem with the connection. Try the ping command from a different computer to verify that your original computer is not the cause of the problem.

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

A. Refer to "Problem #2, I want to test my Internet connection" to verify that you have connectivity.

B. If you need to register the MAC address of your Ethernet adapter with your ISP, please see "Appendix D: 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 MAC Address Clone section of "Chapter 6: The Router's Web-based Utility" for details.

C. Make sure you are using the right Internet 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 Basic Setup section of "Chapter 6: The Router's Web-based Utility" for details on Internet Connection Type settings.

D. Make sure you have the right cable. Check to see if the Internet LED is solidly lit.

E. 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.

F. 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.

4. I am not able to access the Router's Web-based Utility Setup page.

A. Refer to "Problem #2, I want to test my Internet connection" to verify that your computer is properly connected to the Router.

B. Refer to "Appendix D: 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.

C. Set a static IP address on your system; refer to "Problem #1: I need to set a static IP address."

D. Refer to "Problem #10: I need to remove the proxy settings or the dial-up pop-up window (for PPPoE users)."

5. I can't get my Virtual Private Network (VPN) to work through the Router.

Access the Router's web interface by going to **http://192.168.1.1** or the **IP address** of the Router, and go to the **Security => VPN Passthrough** tab. Make sure you have IPsec pass-through and/or PPTP pass-through enabled.

VPNs that use IPSec with the ESP (Encapsulation Security Payload known as protocol 50) authentication will work fine. At least one IPSec session will work through the Router; however, simultaneous IPSec sessions *may* be possible, depending on the specifics of your VPNs.

VPNs that use IPSec and AH (Authentication Header known as protocol 51) are incompatible with the Router. AH has limitations due to occasional incompatibility with the NAT standard.

Change the IP address for the Router to another subnet to avoid a conflict between the VPN IP address and your local IP address. For example, if your VPN server assigns an IP address 192.168.1.X (X is a number from 1 to 254) and your local LAN IP address is 192.168.1.X (X is the same number used in the VPN IP address), the Router will have difficulties routing information to the right location. If you change the Router's IP address to 192.168.2.1, that should solve the problem. Change the Router's IP address through the Basic Setup tab of the Web-based Utility. If you assigned a static IP address to any computer or network device on the network, you need to change its IP address accordingly to 192.168.2.Y (Y being any number from 1 to 254). Note that each IP address must be unique within the network.

Your VPN may require port 500/UDP packets to be passed to the computer that is connecting to the IPSec server. Refer to "Problem #7, I need to set up online game hosting or use other Internet applications" for details.

Check the Linksys website at *www.linksys.com* for more information.

6. I need to set up a server behind my Router.

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.

A. 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 Range Forwarding** tab.
B. Enter any name you want to use for the Application.
C. Enter the port range of the service you are using. For example, if you have a web server, you would enter the range 80 to 80.
D. Select the protocol you will be using, **TCP** or **UDP**, or select **Both**.
E. 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 D: Finding the MAC Address and IP Address for Your Ethernet Adapter" for details on getting an IP address.
F. Check the **Enabled** 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.

7. 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:

A. 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 Range Forwarding** tab.
B. Enter any name you want to use for the Application.
C. Enter the port range of the service you are using. For example, if you have a web server, you would enter the range 80 to 80.
D. Select the protocol you will be using, **TCP** or **UDP**, or select **Both**.
E. 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 D: Finding the MAC Address and IP Address for Your Ethernet Adapter" for details on getting an IP address.
F. Check the **Enabled** 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.

8. 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:

A. 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 Range Forwarding** tab.
B. Disable or remove the entries you have entered for forwarding. Keep this information in case you want to use it at a later time.
C. Click the **DMZ** tab.
D. Enter the Ethernet adapter's IP address of the computer you want exposed to the Internet. This will bypass the NAT security for that computer. Please refer to "Appendix D: Finding the MAC Address and IP Address for Your Ethernet Adapter" for details on getting an IP address.

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

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

Reset the Router to factory default by pressing the **Reset** button for 30 seconds and then releasing it. If you are still getting prompted for a password when saving settings, then perform the following steps:

A. Access the Router's web interface by going to **http://192.168.1.1** or the **IP address** of the Router. Enter the default password **admin**, and click the **Administration => Management** tab.
B. Enter a different password in the *Router Password* field, and enter the same password in the second field to confirm the password.
C. Click the **Save Settings** button.

10. 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:

A. Click **Start**, **Settings**, and **Control Panel**. Double-click **Internet Options**.
B. Click the **Connections** tab.
C. Click the **LAN settings** button and remove anything that is checked.
D. Click the **OK** button to go back to the previous screen.
E. Click the option **Never dial a connection**. This will remove any dial-up pop-ups for PPPoE users.

For Netscape 4.7 or higher:

A. Start **Netscape Navigator**, and click **Edit**, **Preferences**, **Advanced**, and **Proxies**.
B. Make sure you have **Direct connection to the Internet** selected on this screen.
C. Close all the windows to finish.

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

Hold the **Reset** button for up to 30 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.

12. 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:

A. Go to the Linksys website at **http://www.linksys.com** and download the latest firmware.
B. To upgrade the firmware, follow the steps in the Upgrade section found in "Chapter 6: The Router's Web-based Utility."

13. The firmware upgrade failed.

The upgrade could have failed for a number of reasons. Follow these steps to upgrade the firmware:

A. 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.
B. Set a static IP address on the PC; refer to "Problem #1, I need to set a static IP address." Use the following IP address settings for the computer you are using:

    IP Address: 192.168.1.50
    Subnet Mask: 255.255.255.0
    Gateway: 192.168.1.1

C. Perform the upgrade using the TFTP program or the Router's Web-based Utility through its Administration => Upgrade tab.

14. 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.

A. To connect to the Router, go to the web browser, and enter **http://192.168.1.1** or the **IP address** of the Router.
B. Enter the **password**, if asked. (The default password is **admin**.)
C. On the Basic Setup tab, select the option **Keep Alive**, and set the **Redial Period** option at **20** (seconds).
D. Click the **Save Settings** button.
E. Click the **Status** tab, and click the **Connect** button.
F. 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**.

If the connection is lost again, follow steps E and F to re-establish connection.

15. I can't access my email, web, or VPN, 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:

A. To connect to the Router, go to the web browser, and enter **http://192.168.1.1** or the IP address of the Router.
B. Enter the password, if asked. (The default password is **admin**.)
C. On the Basic Setup tab, look for the MTU option, and select **Enable**. In the Size field, enter **1492**.
D. Click the **Save Settings** button to continue.

If your difficulties continue, change the *Size* to different values. Try this list of values, one value at a time, in this order, until your problem is solved:

1462
1400
1362
1300

16. I need to use port triggering.

Port triggering looks at the outgoing port services used and will trigger the Router to open a specific port, depending on which port an Internet application uses. Follow these steps:

A. To connect to the Router, go to the web browser, and enter **http://192.168.1.1** or the **IP address** of the Router.
B. Enter the password, if asked. (The default password is **admin**.)
C. Click the **Applications & Gaming => Port Triggering** tab, and click the **Port Trigger** button.
D. Enter any name you want to use for the Application Name.
E. Enter the Start and End Ports of the Triggered Port Range. Check with your Internet application provider for more information on which outgoing port services it is using.
F. Enter the Start and End Ports of the Forwarded Port Range. Check with your Internet Application provider for more information on which incoming port services are required by the Internet application.

17. 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 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 with a DNS address provided by your ISP.
- Make sure that your browser is set to connect directly and that any dial-up is disabled. For Internet Explorer, click **Tools**, **Internet Options**, and then the **Connection** tab. Make sure that Internet Explorer is set to **Never dial a connection**. For Netscape Navigator, click **Edit**, **Preferences**, **Advanced**, and **Proxy**. Make sure that Netscape Navigator is set to **Direct connection to the Internet**.

Frequently Asked Questions

What is the maximum number of IP addresses that the Router will support? The Router will support up to 253 IP addresses.

Is IPSec Passthrough supported by the Router? Yes, enable or disable IPSec Passthrough on the Security => VPN Passthrough tab.

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 the LAN.

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

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

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

I set up an Unreal Tournament Server, but others on the LAN cannot join. What do I need to do? If you have a dedicated Unreal Tournament server running, you need to create a static IP for each of the LAN computers and forward ports 7777, 7778, 7779, 7780, 7781, and 27900 to the IP address of the server. You can also use a port forwarding range of 7777 to 27900. If you want to use the UT Server Admin, forward another port (8080 usually works well but is used for remote admin. You may have to disable this.), and 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 for thirty seconds. 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. The Router's firmware can be upgraded with TFTP programs. If the Router's Internet connection is working well, there is

no need to download a newer firmware version, unless that version contains new features that you would like to use. Downloading a more current version of Router firmware will not enhance the quality or speed of your Internet connection, and may disrupt your current connection stability.

Will the Router function in a Macintosh environment? Yes, but the Router's setup pages are accessible only through Internet Explorer 5.0 or Netscape Navigator 5.0 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 D: 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.

Does the Router replace a modem? Is there a cable or DSL modem in the Router? No, this version of the Router must work in conjunction with a cable or DSL modem.

Which modems are compatible with the Router? The Router is compatible with virtually any cable or DSL modem that supports Ethernet.

What is the maximum number of VPN sessions allowed by the Router? The maximum number depends on many factors. At least one IPSec session will work through the Router; however, simultaneous IPSec sessions *may* be possible, depending on the specifics of your VPNs.

How big is the memory buffer on the Router? 1MB buffer and 512KB flash.

How can I check whether I have static or DHCP IP Addresses? Consult your ISP to obtain this information.

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

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

Appendix B: Glossary

10BaseT - An Ethernet standard that uses twisted wire pairs.

100BaseTX - IEEE physical layer specification for 100 Mbps over two pairs of Category 5 UTP or STP wire.

1000BASE-T - Provides half-duplex (CSMA/CD) and full-duplex 1000 Mbps Ethernet service over Category 5 links as defined by ANSI/TIA/EIA-568-A. Topology rules for 1000BASE-T are the same as those used for 100BASE-T. Category 5 link lengths are limited to 100 meters by the ANSI/TIA/EIA-568-A cabling standard. Only one CSMA/CD repeater will be allowed in a collision domain.

Adapter - Printed circuit board that plugs into a PC to add to capabilities or connectivity to a PC. In a networked environment, a network interface card (NIC) is the typical adapter that allows the PC or server to connect to the intranet and/or Internet.

Auto-negotiate - To automatically determine the correct settings. The term is often used with communications and networking. For example, Ethernet 10/100 cards, hubs, and switches can determine the highest speed of the node they are connected to and adjust their transmission rate accordingly.

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 facility, in terms of how much data the facility can transmit in a fixed amount of time; expressed in bits per second (bps).

Bit – A binary digit. The value—0 or 1—used in the binary numbering system. Also, the smallest form of data.

Boot – To cause the computer to start executing instructions. Personal computers contain built-in instructions in a ROM chip that are automatically executed on startup. These instructions search for the operating system, load it, and pass control to it.

Bottleneck – A traffic slowdown that results when too many network nodes try to access a single node, often a server node, at once.

Bridge - A device that interconnects different networks together.

Broadband - A data-transmission scheme in which multiple signals share the bandwidth of a medium. This allows the transmission of voice, data, and video signals over a single medium. Cable television uses broadband techniques to deliver dozens of channels over one cable.

Browser - A browser is an application program that provides a way to look at and interact with all the information on the World Wide Web or PC. The word "browser" seems to have originated prior to the Web as a generic term for user interfaces that let you browse text files online.

Cable Modem - A device that connects a computer to the cable television network, which in turn connects to the Internet. Once connected, cable modem users have a continuous connection to the Internet. Cable modems feature asymmetric transfer rates: around 36 Mbps downstream (from the Internet to the computer), and from 200 Kbps to 2 Mbps upstream (from the computer to the Internet).

CAT 3 - ANSI/EIA (American National Standards Institute/Electronic Industries Association) Standard 568 is one of several standards that specify "categories" (the singular is commonly referred to as "CAT") of twisted pair cabling systems (wires, junctions, and connectors) in terms of the data rates that they can sustain. CAT 3 cable has a maximum throughput of 16 Mbps and is usually utilized for 10BaseT networks.

CAT 5 - ANSI/EIA (American National Standards Institute/Electronic Industries Association) Standard 568 is one of several standards that specify "categories" (the singular is commonly referred to as "CAT") of twisted pair cabling systems (wires, junctions, and connectors) in terms of the data rates that they can sustain. CAT 5 cable has a maximum throughput of 100 Mbps and is usually utilized for 100BaseTX networks.

CPU (**C**entral **P**rocessing **U**nit) - The computing part of the computer. Also called the "processor," it is made up of the control unit and ALU.

CSMA/CD (**C**arrier **S**ense **M**ultiple **A**ccess/**C**ollision **D**etection) - The LAN access method used in Ethernet. When a device wants to gain access to the network, it checks to see if the network is quiet (senses the carrier). If it is not, it waits a random amount of time before retrying. If the network is quiet and two devices access the line at exactly the same time, their signals collide. When the collision is detected, they both back off and each waits a random amount of time before retrying.

Daisy Chain - Connected in series, one after the other. Transmitted signals go to the first device, then to the second, and so on.

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

Data Packet - One frame in a packet-switched message. Most data communications is based on dividing the transmitted message into packets. For example, an Ethernet packet can be from 64 to 1518 bytes in length.

Default Gateway - The routing device used to forward all traffic that is not addressed to a station within the local subnet.

DHCP (**D**ynamic **H**ost **C**onfiguration **P**rotocol) - A protocol that lets network administrators centrally manage and automate the assignment of Internet Protocol (IP) addresses in an organization's network. Using the Internet's set of protocol (TCP/IP), each machine that can connect to the Internet needs a unique IP address. When an organization sets up its computer users with a connection to the Internet, an IP address must be assigned to each machine. Without DHCP, the IP address must be entered manually at each computer and, if computers move to another location in another part of the network, a new IP address must be entered. DHCP lets a network administrator supervise and distribute IP addresses from a central point and automatically sends a new IP address when a computer is plugged into a different place in the network.

DHCP uses the concept of a "lease" or amount of time that a given IP address will be valid for a computer. The lease time can vary depending on how long a user is likely to require the Internet connection at a particular location. It's especially useful in education and other environments where users change frequently. Using very short leases, DHCP can dynamically reconfigure networks in which there are more computers than there are available IP addresses.
DHCP supports static addresses for computers containing Web servers that need a permanent IP address.

DMZ - (**D**e**M**ilitarized **Z**one) allows one IP address (or 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 address if you want to use DMZ Hosting.

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

Domain - A subnetwork comprised of a group of clients and servers under the control of one security database. Dividing LANs into domains improves performance and security.

Download - To receive a file transmitted over a network. In a communications session, download means receive, and upload means transmit.

Driver - A workstation or server software module that provides an interface between a network interface card and the upper-layer protocol software running in the computer; it is designed for a specific NIC, and is installed during the initial installation of a network-compatible client or server operating system.

DSSS (**D**irect-**S**equence **S**pread-**S**pectrum) - 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.

Dynamic IP Address - An IP address that is automatically assigned to a client station in a TCP/IP network, typically by a DHCP server. Network devices that serve multiple users, such as servers and printers, are usually assigned static IP addresses.

Dynamic Routing - The ability for a router to forward data via a different route based on the current conditions of the communications circuits. For example, it can adjust for overloaded traffic or failing lines and is much more flexible than static routing, which uses a fixed forwarding path.

Ethernet - IEEE standard network protocol that specifies how data is placed on and retrieved from a common transmission medium. Has a transfer rate of 10 Mbps. Forms the underlying transport vehicle used by several upper-level protocols, including TCP/IP and XNS.

Fast Ethernet - A 100 Mbps technology based on the 10Base-T Ethernet CSMA/CD network access method.

Firewall - A firewall is a set of related programs, located at a network gateway server, that protects the resources of a network from users from other networks. (The term also implies the security policy that is used with the programs.) An

enterprise with an intranet that allows its workers access to the wider Internet installs a firewall to prevent outsiders from accessing its own private data resources and for controlling what outside resources to which its own users have access.

Basically, a firewall, working closely with a router, examines each network packet to determine whether to forward it toward its destination.

Firmware - Programming that is inserted into programmable read-only memory, thus becoming a permanent part of a computing device.

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

FTP (**F**ile **T**ransfer **P**rotocol) - 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.

FTP includes functions to log onto the network, list directories, and copy files. It can also convert between the ASCII and EBCDIC character codes. FTP operations can be performed by typing commands at a command prompt or via an FTP utility running under a graphical interface such as Windows. FTP transfers can also be initiated from within a Web browser by entering the URL preceded with ftp://.

Unlike e-mail programs in which graphics and program files have to be "attached," FTP is designed to handle binary files directly and does not add the overhead of encoding and decoding the data.

Full Duplex - The ability of a device or line to transmit data simultaneously in both directions.

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 - Hardware is the physical aspect of computers, telecommunications, and other information technology devices. The term arose as a way to distinguish the "box" and the electronic circuitry and components of a computer from

the program you put in it to make it do things. The program came to be known as the software.

Hub - The device that serves as the central location for attaching wires from workstations. Can be passive, where there is no amplification of the signals; or active, where the hubs are used like repeaters to provide an extension of the cable that connects to a workstation.

IEEE - The Institute of Electrical and Electronics Engineers. The IEEE describes itself as "the world's largest technical professional society—promoting the development and application of electrotechnology and allied sciences for the benefit of humanity, the advancement of the profession, and the well-being of our members."

The IEEE fosters the development of standards that often become national and international standards. The organization publishes a number of journals, has many local chapters, and has several large societies in special areas, such as the IEEE Computer Society.

IP Address - In the most widely installed level of the Internet Protocol (IP) today, an IP address is a 32-binary digit number that identifies each sender or receiver of information that is sent in packets across the Internet. When you request an HTML page or send e-mail, the Internet Protocol part of TCP/IP includes your IP address in the message (actually, in each of the packets if more than one is required) and sends it to the IP address that is obtained by looking up the domain name in the Uniform Resource Locator you requested or in the e-mail address you're sending a note to. At the other end, the recipient can see the IP address of the Web page requestor or the e-mail sender and can respond by sending another message using the IP address it received.

IPCONFIG - A utility that provides for querying, defining and managing IP addresses within a network. A commonly used utility, under Windows NT and 2000, for configuring networks with static IP addresses.

IPSec - IPSec (**I**nternet **P**rotocol **Sec**urity) is a developing standard for security at the network or packet processing layer of network communication. A big advantage of IPSec is that security arrangements can be handled without requiring changes to individual user computers.

IRQ (**I**nterrupt **R**e**Q**uest) - A hardware interrupt on a PC. There are 16 IRQ lines used to signal the CPU that a peripheral event has started or terminated. Except for PCI devices, two devices cannot use the same line.

ISP - An ISP (Internet service provider) is a company that provides individuals and companies access to the Internet and other related services such as website building and virtual hosting.

LAN - A local area network (LAN) is a group of computers and associated devices that share a common communications line and typically share the resources of a single processor or server within a small geographic area (for example, within an office building).

Latency - The time delay between when the first bit of a packet is received and the last bit is forwarded.

MAC Address - The MAC (Media Access Control) 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.

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

mIRC - mIRC runs under Windows and provides a graphical interface for logging onto IRC servers and listing, joining, and leaving channels.

Motherboard - A motherboard is the physical arrangement in a computer that contains the computer's basic circuitry and components.

NAT - NAT (Network Address Translation) is the translation of an Internet Protocol address (IP address) used within one network to a different IP address known within another network. One network is designated the inside network and the other is the outside.

NetBEUI (**NetB**IOS **E**xtended **U**ser **I**nterface) - The transport layer for NetBIOS. NetBIOS and NetBEUI were originally part of a single protocol suite that was later separated. NetBIOS sessions can be transported over NetBEUI, TCP/IP, and IPX/SPX protocols.

NetBIOS - The native networking protocol in DOS and Windows networks. Although originally combined with its transport layer protocol (NetBEUI), NetBIOS today provides a programming interface for applications at the session layer (layer 5). NetBIOS can ride over NetBEUI, its native transport, which is not routable, or over TCP/IP and IPX/SPX, which are routable protocols.

NetBIOS computers are identified by a unique 15-character name, and Windows machines (NetBIOS machines) periodically broadcast their names over the network so that Network Neighborhood can catalog them. For TCP/IP networks, NetBIOS names are turned into IP addresses via manual configuration in an LMHOSTS file or a WINS server.

There are two NetBIOS modes. The Datagram mode is the fastest mode, but does not guarantee delivery. It uses a self-contained packet with send and receive name, usually limited to 512 bytes. If the recipient device is not listening for messages, the datagram is lost. The Session mode establishes a connection until broken. It guarantees delivery of messages up to 64KB long.

Network - A system that transmits any combination of voice, video, and/or data between users.

Network Mask - also known as the "Subnet Mask."

NIC (**N**etwork **I**nterface **C**ard) - A board installed in a computer system, usually a PC, to provide network communication capabilities to and from that computer system. Also called an adapter.

Notebook (PC) - A notebook computer is a battery-powered personal computer generally smaller than a briefcase that can easily be transported and conveniently used in temporary spaces such as on airplanes, in libraries, at temporary offices, and at meetings. A notebook computer, sometimes called a laptop computer, typically weighs less than five pounds and is three inches or less in thickness.

Packet Filtering - Discarding unwanted network traffic based on its originating address or range of addresses or its type (e-mail, file transfer, etc.).

Partitioning - To divide a resource or application into smaller pieces.

PCI (**P**eripheral **C**omponent **I**nterconnect) - A peripheral bus commonly used in PCs, Macintoshes and workstations. It was designed primarily by Intel and first appeared on PCs in late 1993. PCI provides a high-speed data path between the CPU and peripheral devices (video, disk, network, etc.). There are typically three or four PCI slots on the motherboard. In a Pentium PC, there is generally a mix of PCI and ISA slots or PCI and EISA slots. Early on, the PCI bus was known as a "local bus."

PCI provides “plug and play” capability, automatically configuring the PCI cards at startup. When PCI is used with the ISA bus, the only thing that is generally required is to indicate in the CMOS memory which IRQs are already in use by ISA cards. PCI takes care of the rest.

PCI allows IRQs to be shared, which helps to solve the problem of limited IRQs available on a PC. For example, if there were only one IRQ left over after ISA devices were given their required IRQs, all PCI devices could share it. In a PCI-only machine, there cannot be insufficient IRQs, as all can be shared.

PCMCIA - The PCMCIA (Personal Computer Memory Card International Association) is an industry group organized in 1989 to promote standards for a credit card-size memory or I/O device that would fit into a personal computer, usually a notebook or laptop computer.

Ping (**P**acket **IN**ternet **G**roper) - An Internet utility used to determine whether a particular IP address is online. It is used to test and debug a network by sending out a packet and waiting for a response.

Plug-and-Play - The ability of a computer system to configure expansion boards and other devices automatically without requiring the user to turn off the system during installation.

Port - A pathway into and out of the computer or a network device such as a switch or router. For example, the serial and parallel ports on a personal computer are external sockets for plugging in communications lines, modems, and printers.

Port Mirroring - Port mirroring, also known as a roving analysis port, is a method of monitoring network traffic that forwards a copy of each incoming and outgoing packet from one port of a network switch to another port where the packet can be studied. A network administrator uses port mirroring as a diagnostic tool or debugging feature, especially when fending off an attack. It enables the administrator to keep close track of switch performance and alter it if necessary. Port mirroring can be managed locally or remotely.

PPPoE (**P**oint to **P**oint **P**rotocol **o**ver **E**thernet) - A method used mostly by DSL providers for connecting personal computers to a broadband modem for Internet access. It is similar to how a dial-up connection works but at higher speeds and quicker access.

PPTP (**P**oint-to-**P**oint **T**unneling **P**rotocol) - A protocol (set of communication rules) that allows corporations to extend their own corporate network through private “tunnels” over the public Internet. Effectively, a corporation uses a wide-area network as a single large local area network. A company no longer needs to lease its own lines for wide-area communication but can securely use the public networks. This kind of interconnection is known as a virtual private network (VPN).

PrintServer - A hardware device that enables a printer to be located anywhere in the network.

RIP (**R**outing **I**nformation **P**rotocol) **-** A simple routing protocol that is part of the TCP/IP protocol suite. It determines a route based on the smallest hop count between source and destination. RIP is a distance vector protocol that routinely broadcasts routing information to its neighboring routers and is known to waste bandwidth. AppleTalk, DECnet, TCP/IP, NetWare, and VINES all use incompatible versions of RIP.

RJ-11 (**R**egistered **J**ack-**11**) - A telephone connector that holds up to six wires. The RJ-11 is the common connector used to plug a telephone into a wall.

RJ-45 - A connector similar to a telephone connector that holds up to eight wires, used for connecting Ethernet devices.

Router - Protocol-dependent device that connects subnetworks together. Routers are useful in breaking down a very large network into smaller subnetworks; they introduce longer delays and typically have much lower throughput rates than bridges.

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

Software - Instructions for the computer. A series of instructions that performs a particular task is called a “program.” The two major categories of software are “system software” and “application software.” System software is made up of control programs such as the operating system and database management system (DBMS). Application software is any program that processes data for the user.

A common misconception is that software is data. It is not. Software tells the hardware how to process the data.

SOHO (**S**mall **O**ffice/**H**ome **O**ffice) - Market segment of professionals who work at home or in small offices.

Static IP Address - A permanent IP address that is assigned to a node in a TCP/IP network.

Static Routing - Forwarding data in a network via a fixed path. Static routing cannot adjust to changing line conditions as can dynamic routing.

Storage - The semi-permanent or permanent holding place for digital data.

STP (**S**hielded **T**wisted **P**air) - Telephone wire that is wrapped in a metal sheath to eliminate external interference.

Subnet Mask - The method used for splitting IP networks into a series of subgroups, or subnets. The mask is a binary pattern that is matched up with the IP address to turn part of the host ID address field into a field for subnets.

Swapping - Replacing one segment of a program in memory with another and restoring it back to the original when required.

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

TCP (**T**ransmission **C**ontrol **P**rotocol) - A method (protocol) used along with the Internet Protocol (IP) to send data in the form of message units between computers over the Internet. While IP takes care of handling the actual delivery of the data, TCP takes care of keeping track of the individual units of data (called packets) that a message is divided into for efficient routing through the Internet.

TCP/IP - Transmission Control Protocol/Internet Protocol (TCP/IP) is the basic communication language or protocol of the Internet. It can also be used as a communications protocol in a private network (either an intranet or an extranet). When you are set up with direct access to the Internet, your computer is provided with a copy of the TCP/IP program just as every other computer that you may send messages to or get information from also has a copy of TCP/IP.

TFTP (**T**rivial **F**ile **T**ransfer **P**rotocol) - A version of the TCP/IP FTP protocol that has no directory or password capability.

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

Topology - A network's topology is a logical characterization of how the devices on the network are connected and the distances between them. The most common network devices include hubs, switches, routers, and gateways. Most large networks contain several levels of interconnection, the most important of which include edge connections, backbone connections, and wide-area connections.

TX Rate – Transmission Rate.

UDP (**U**ser **D**atagram **P**rotocol) - A communications method (protocol) that offers a limited amount of service when messages are exchanged between computers in a network that uses the Internet Protocol (IP). UDP is an alternative to the Transmission Control Protocol (TCP) and, together with IP, is sometimes referred to as UDP/IP. Like the Transmission Control Protocol, UDP uses the Internet Protocol to actually get a data unit (called a datagram) from one computer to another. Unlike TCP, however, UDP does not provide the service of dividing a message into packets (datagrams) and reassembling it at the other end. Specifically, UDP doesn't provide sequencing of the packets that the data arrives in. This means that the application program that uses UDP must be able to make sure that the entire message has arrived and is in the right order. Network applications that want to save processing time because they have very small data units to exchange (and therefore very little message reassembling to do) may prefer UDP to TCP.

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

Upload - To send a file transmitted over a network. In a communications session, upload means transmit, and download means receive.

URL (**U**niform **R**esource **L**ocator) - The address that defines the route to a file on the Web or any other Internet facility. URLs are typed into the browser to access Web pages, and URLs are embedded within the pages themselves to provide the hypertext links to other pages.

UTP - Unshielded twisted pair is the most common kind of copper telephone wiring. Twisted pair is the ordinary copper wire that connects home and many business computers to the telephone company. To reduce crosstalk or electromagnetic induction between pairs of wires, two insulated copper wires are twisted around each other. Each signal on twisted pair requires both wires. Since some telephone sets or desktop locations require multiple connections, twisted pair is sometimes installed in two or more pairs, all within a single cable.

VLAN (**V**irtual **LAN**) - A logical association that allows users to communicate as if they were physically connected to a single LAN, independent of the actual physical configuration of the network.

Virtual Server - Multiple servers that appear as one server, or one system image, to the operating system or for network administration.

Wake-on-LAN - Wake on LAN is a technology that allows a network professional to remotely power on a computer or to wake it up from *sleep mode*.

WAN - A communications network that covers a wide geographic area, such as a state or country.

WEP (**W**ired **E**quivalent **P**rivacy) - A data privacy mechanism based on a 64-bit shared key algorithm, as described in the IEEE 802.11 standard.

WINIPCFG - Configuration utility based on the Win32 API for querying, defining, and managing IP addresses within a network. A commonly used utility for configuring networks with static IP addresses.

Workgroup - Two or more individuals that share files and databases.

Appendix C: Installing the TCP/IP Protocol

Follow these instructions to install the TCP/IP protocol on one of your PCs *only* after a network card has been successfully installed inside the PC. These instructions are for Windows 98 and Windows Me. For TCP/IP setup under Windows 2000 and XP, see your Windows documentation or the Help feature.

1. Click the **Start** button. Choose **Settings** and then **Control Panel**.

2. Double-click the **Network** icon to bring up your Network window. Select the **Configuration** tab, as shown in Figure C-1.

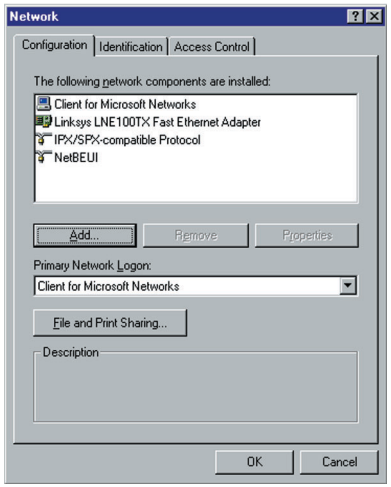

Figure C-1

3. Click the **Add** button**.**

4. Double-click **Protocol**.

5. Highlight **Microsoft** under the list of manufacturers.

6. Find and double-click **TCP/IP** in the list to the right (see Figure C-2).

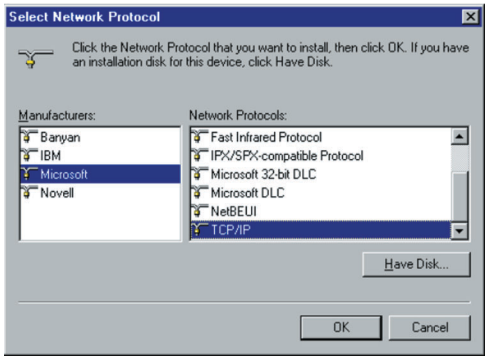

Figure C-2

7. After a few seconds, the main Network window will appear. The TCP/IP Protocol should now be listed, as shown in Figure C-3.

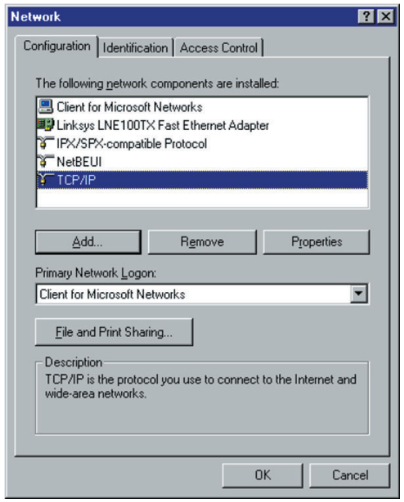

Figure C-3

8. Click the **OK** button. Windows may ask for original Windows installation files. Supply them as needed, e.g., c:\windows\options\cabs or D:\win98.

9. Windows will ask you to restart the PC. Click the **Yes** button.

The TCP/IP installation is now complete.

Appendix D: Finding the MAC Address and IP Address for Your Ethernet Adapter

This section describes how to find the MAC address for your Ethernet adapter to do either MAC Filtering or MAC Address Cloning for the Router and ISP. You can also find the IP address of your computer's Ethernet adapter. The IP address is used for filtering, forwarding, and DMZ. Follow the steps in this appendix to find the MAC address or IP address for your adapter in Windows 98, Me, 2000, and XP.

For Windows 95, 98, and Me:

1. Click on **Start** and **Run**. In the *Open* field, enter **winipcfg**, as shown in Figure D-1. Then press the **Enter** key or the **OK** button.

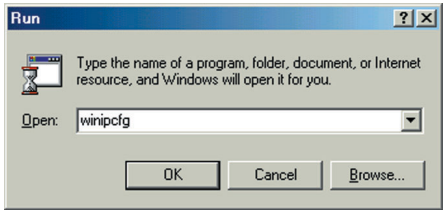

Figure D-1

2. When the IP Configuration window appears, select the Ethernet adapter you are using to connect to the Router via a CAT 5 Ethernet cable, as shown in Figure D-2.

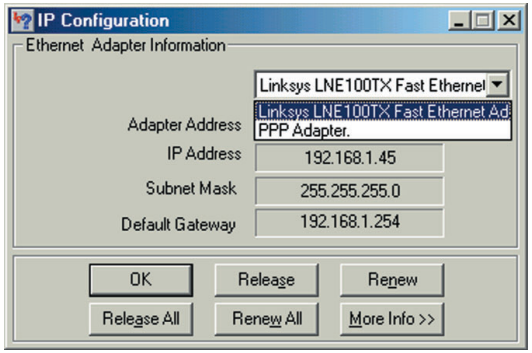

Figure D-2

3. Write down the Adapter Address as shown on your computer screen (see Figure D-3). This is the MAC address for your Ethernet adapter and will be 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.

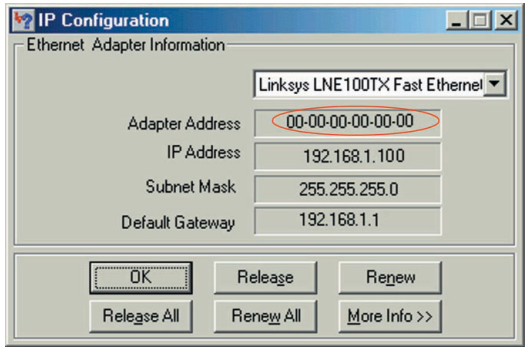

Figure D -3

The example in Figure D-3 shows the IP address of your Ethernet adapter as 192.168.1.100. Your computer may show something different.

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

For Windows 2000 and XP:

The following steps show an alternative way of obtaining the MAC address and IP address for your Ethernet adapter.

1. Click on **Start** and **Run**. In the *Open* field, enter **cmd**, as shown in Figure D-4. Press the **Enter** key or click the **OK** button.

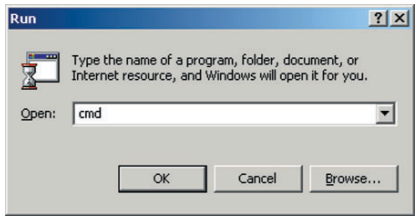

Figure D-4

2. In the command prompt, enter **ipconfig /all**. Then press the **Enter** key.

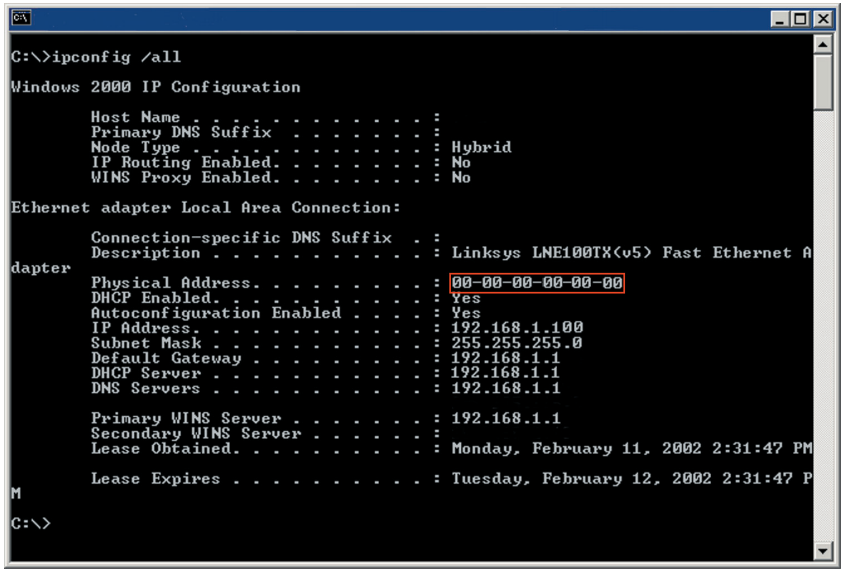

Figure D-5

3. Write down the Physical Address as shown on your computer screen (Figure D-5); it is the MAC address for your Ethernet adapter. This will appear as a series of letters and numbers.

   The MAC address/Physical Address is what you will use for MAC Address Cloning or MAC Filtering.

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

The example in Figure D-5 shows the IP address of your Ethernet adapter as 192.168.1.100. Your computer may show something different.

When entering the information using the Router's Web-based Utility, you will type the 12-digit MAC address in this format, XXXXXXXXXXXX WITHOUT the hyphens for MAC Filtering. See Figure D-6.

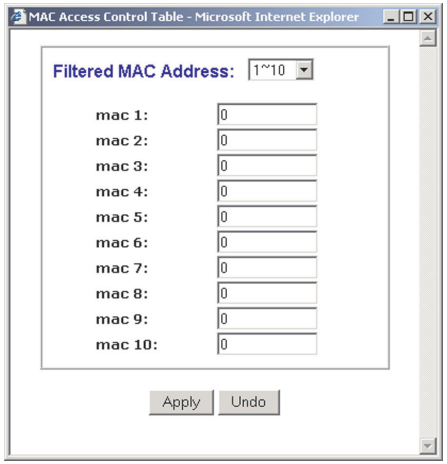

Figure D-6

When entering information for MAC Address Cloning, type the 12-digit MAC address (see Figure D-7).

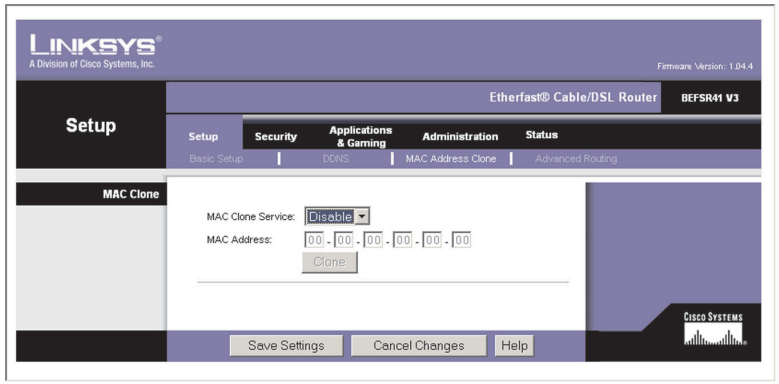

Figure D-7

Appendix E: Specifications

Standards	IEEE 802.3 (10BaseT), IEEE 802.3u (100BaseTX)
Ports	One 10/100 RJ-45 Port for Broadband Modem Four 10/100 RJ-45 Switched Ports
Cabling Type	Ethernet Category 5
LED Indicators	Power, Ethernet, Internet
UPnP able/cert	Yes
OS Support	Windows 98SE/Me/2000/XP
Network Protocols	TCP/IP, NetBEUI, IPX/SPX

Environmental

Dimensions	7.32" x 6.06" x 1.89" (186 mm x 154 mm x 48 mm)
Unit Weight	12.28 oz. (0.35 kg)
Power Input	External, 9V AC, 1000 mA
Certifications	FCC, CE
Operating Temperature	0°C to 40°C (32°F to 104°F)
Storage Temperature	-20°C to 70°C (-4°F to 158°F)
Operating Humidity	10% to 85%, Non-Condensing
Storage Humidity	5% to 90%, Non-Condensing

Appendix F: Warranty Information

BE SURE TO HAVE YOUR PROOF OF PURCHASE AND A BARCODE FROM THE PRODUCT'S PACKAGING ON HAND WHEN CALLING. RETURN REQUESTS CANNOT BE PROCESSED WITHOUT PROOF OF PURCHASE.

IN NO EVENT SHALL LINKSYS'S LIABILITY EXCEED THE PRICE PAID FOR THE PRODUCT FROM DIRECT, INDIRECT, SPECIAL, INCIDENTAL, OR CONSEQUENTIAL DAMAGES RESULTING FROM THE USE OF THE PRODUCT, ITS ACCOMPANYING SOFTWARE, OR ITS DOCUMENTATION. LINKSYS DOES NOT OFFER REFUNDS FOR ANY PRODUCT.

LINKSYS OFFERS CROSS SHIPMENTS, A FASTER PROCESS FOR PROCESSING AND RECEIVING YOUR REPLACEMENT. LINKSYS PAYS FOR UPS GROUND ONLY. ALL CUSTOMERS LOCATED OUTSIDE OF THE UNITED STATES OF AMERICA AND CANADA SHALL BE HELD RESPONSIBLE FOR SHIPPING AND HANDLING CHARGES. PLEASE CALL LINKSYS FOR MORE DETAILS.

Appendix G: Contact Information

For help with the installation or operation of the EtherFast Cable/DSL Router, contact Linksys Technical Support at one of the phone numbers or Internet addresses below.

Sales Information	800-546-5797 (1-800-LINKSYS)
Technical Support	800-326-7114
RMA (Return Merchandise Authorization) Issues	www.linksys.com (or call 949-271-5461)
Fax	949-265-6655
E-mail	support@linksys.com
Web site	http://www.linksys.com
FTP site	ftp://ftp.linksys.com

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