

Instant Broadband™ Series

EtherFast® Cable/DSL Wireless-Ready Router with 4-Port Switch



Use this Guide to install:

BEFSR41W EtherFast Cable/DSL Wireless-Ready Router with 4-Port Switch

User Guide

 **LINKSYS**™

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Linksys guarantees that every Instant Broadband EtherFast® Cable/DSL Wireless-Ready Router with 4-Port Switch will be free from physical defects in material and workmanship for one year from the date of purchase, when used within the limits set forth in the Specifications chapter of this User Guide. If the product proves defective during this warranty period, call Linksys Technical Support in order to obtain a Return Authorization Number. 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. When returning a product, mark the Return Authorization Number clearly on the outside of the package and include a copy of your original proof of purchase. All customers located outside of the United States of America and Canada shall be held responsible for shipping and handling charges.

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Linksys P.O. Box 18558, Irvine, CA 92623.

FCC STATEMENT

The Instant Broadband EtherFast® Cable/DSL Wireless-Ready Router with 4-Port Switch has been tested and found to comply with the limits for a Class B digital device, pursuant to Part 15 of the FCC Rules. These limits are designed to provide reasonable protection against harmful interference in a residential installation. This equipment generates, uses, and can radiate radio frequency energy and, if not installed and used 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

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Chapter 1: Introduction

The Linksys Cable/DSL Wireless-Ready Router

Congratulations on your purchase of an EtherFast® Cable/DSL Wireless-Ready Router with 4-Port Switch. The EtherFast® Cable/DSL Wireless-Ready Router with 4-Port Switch provides the ideal solution for connecting your network to a high-speed broadband Internet connection and a 10/100 Fast Ethernet backbone, with the option to add wireless capabilities. Configurable as a DHCP server for your existing network, the Router acts as the only externally recognized Internet gateway on your local area network (LAN) and serves as an Internet NAT firewall against unwanted outside intruders. Plus, the Router functions as an Access Point when you add a Wireless Network PC card (not included) to enable wireless connectivity.

A typical router relies on a separate hub or a switch to share its Internet connection, but the Linksys EtherFast® Cable/DSL Wireless-Ready Router with 4-Port Switch channels this connection through the blazing, full duplex speed of its built-in EtherFast® 10/100 4-Port Switch. This cutting-edge combination of wireless-ready router and switch technology eliminates the need to buy an additional hub or switch—just add a Wireless Network PC card to connect the router to your wireless network. Now your entire wireless network can enjoy blazing broadband Internet connections supported by its robust switched backbone. With the dual-function speed and power of the EtherFast® Cable/DSL Wireless-Ready Router with 4-Port Switch, your network will take off at speeds faster than you ever imagined possible.

Features

- Expandable to Support Wireless Networking
- Compatible with Universal Plug and Play (UPnP)
- MAC Address Filtering
- Configurable through Your Networked PC's Web Browser
- Supports IPsec and PPTP Pass-Through
- Internal 4-Port Switch Dramatically Speeds Up Your Gaming
- Able to Act as a DHCP Server for Your Existing Network
- Wireless Capabilities Available with Use of Optional WPC11 (sold separately)
 - Connects to a Broadband Modem, a 10/100 Ethernet Backbone, or a Wireless Network
 - Interoperable with IEEE 802.11b (DSSS) 2.4GHz-Compliant Equipment
 - Provides Roaming, Best Access Point Selection, Load Balancing, and Network Traffic Filtering
 - Long Operating Range Supports up to 91m (Indoors) and up to 457m (Outdoors)
 - Capable of up to 128-Bit WEP Encryption
- Free Technical Support—24 Hours a Day, 7 Days a Week, Toll-Free US Calls
- 1-Year Limited Warranty



Figure 1-1

Package Contents

- One Linksys EtherFast® Cable/DSL Wireless-Ready Router with 4-Port Switch (1)
- One Power Adapter (2)
- One TechHelper CD-ROM (3)
- One User Guide (4)
- Quick Installation (not shown)
- One Registration Card (not shown)

Minimum Requirements

- Network Adapter with Ethernet (UTP CAT 5) Cabling and TCP/IP Protocol Installed per PC
- Internet Explorer 4.0 or Netscape Navigator 4.7 or Higher for Web-Based Configuration
- Cable or DSL Modem with Ethernet Connection and Internet Access
- CD-ROM Drive
- WPC11 for Wireless Connection (sold separately)

Chapter 2: Getting to Know the Cable/DSL Wireless-Ready Router

The Cable/DSL Wireless-Ready Router's Rear Panel

The back panel of the Router is where all of the Router's connections are made.



Figure 2-1

WAN

The WAN (Wide Area Network) Port is where you will connect your cable or DSL modem.

Ports 1-4

These four LAN (Local Area Network) ports are where you will connect networked devices, such as PCs, print servers, and any other Ethernet devices you want to put on your network. These ports will auto-detect the use of crossover or straight RJ-45 cables.

Power

The Power Port is where you will connect the included AC Power adapter.

PCMCIA Slot

This is where you can connect the optional wireless PC card (not included) for wireless features.

The Wireless-PC Card



The Wireless PC Card (not included)



To add wireless capabilities, a WPC11 (sold separately) is required. Power off the Router. Insert the WPC11 in the manner shown above in the warning label. Push the WPC11 into the BEFSR41W until it is securely held in place by the PCMCIA Slot.



Figure 2-2

The Reset Button

The Reset Button



To use the **Reset** button:

Unplug the power adapter from the Router. Then, plug the power adapter back into the Router. Press the **Reset** button. The **Diag** LED will flash after three seconds.

To restore the factory default settings, Unplug the power adapter from the Router. Press the **Reset** button and hold for three seconds while plugging the power adapter back into the Router.

The Cable/DSL Wireless-Ready Router's Front Panel LEDs



Figure 2-3

Diag

Red. The Diag LED illuminates when the Router goes through its self-diagnosis mode during boot-up and restart. It will turn off upon successful completion of the diagnosis. If this LED stays on for an abnormally long period of time, refer to the Troubleshooting section. During firmware upgrades, this will also flash.

Power

Green. The Power LED illuminates when the Router is powered on.

Full/Col

Green. The Full/Col LED also serves two purposes. If this LED is continuously illuminated, the connection made through the corresponding port is successfully running in Full Duplex mode. If the LED is flickering, the connection is experiencing collisions. Infrequent collisions are normal. If this LED is flickering too often, there may be a problem with your connection. Check the Troubleshooting section if you think there is a problem.

Link/Act

Green. The Link/Act LED serves two purposes. If the LED is continuously illuminated, the Router is successfully connected to a device through the corresponding port (1, 2, 3 or 4). If the LED is flickering, the Router is actively sending or receiving data over that port.

100

Orange. The 100 LED illuminates when a successful 100Mbps connection is made through the corresponding port.

WLAN	<i>Green.</i> The WLAN LED illuminates when a wireless network is active.
WAN	<i>Green.</i> The WAN LED illuminates when a successful connection is made between the Router and your Broadband device or network. When blinking, the Router is sending or receiving data over the broadband port.

Chapter 3: Connecting the Cable/DSL Wireless-Ready Router to Your Network

Overview

Unlike a simple hub or switch, the setup of the Cable/DSL Wireless-Ready Router consists of more than simply plugging everything together. Because the Router acts as a DHCP server, you will have to set some values within the Router, and also configure your networked PCs to accept the IP Addresses the Router chooses to assign them.

You will need the following values from your ISP in order to install the Cable/DSL Wireless-Ready Router:

- PPPoE with username and password (for some DSL users)
- Your broadband-configured PC's static Internet IP Address (if applicable)
- Your broadband-configured PC's Computer Name and Workgroup Name
- Your Subnet Mask
- Your Default Gateway
- Your Primary DNS IP address

If your broadband access installer did not leave you this information, call your ISP and they will be able to supply you with it.

About Static & Dynamic IP Addresses

Static IP Addresses A static IP address is an IP address permanently assigned to a computer in a TCP/IP network. Static IP addresses are usually assigned to networked devices that are consistently accessed by multiple users, such as server PCs, or a print server. If you are using your Router to share your cable or DSL Internet connection, contact your ISP to see if they have assigned your home a static IP address. You will need that address during your Router's configuration.

Dynamic IP Addresses A dynamic IP address is an IP address that is automatically assigned to a client station (computer, printer, etc.) in a TCP/IP network. Dynamic IP addresses are typically assigned by a DHCP server, which can be a computer on the network or another piece of hardware, such as the Router. A dynamic IP address might change every time your computer connects to the network.

DHCP (Dynamic Host Configuration Protocol) DHCP is software that automatically assigns IP addresses to client stations logging on to a TCP/IP network. DHCP eliminates having to manually assign permanent IP addresses to every device on your network. DHCP software typically runs in servers and is also found in network devices such as Routers.

Connecting Your Hardware Together and Booting Up

Once you are sure that you have the above values on hand, you can begin the installation and setup of your Cable/DSL Wireless-Ready Router.

1. Power everything down, including your PCs, your Cable or DSL modem and the Router.
2. Connect a Network cable from one of your PCs' Ethernet ports to one of the LAN Ports on the back of the Router. Do the same with all the PCs you wish to connect to the Router.
3. Connect the network cable from your Cable or DSL modem to the WAN port on the back of the Router.
4. Connect the power-adaptor cable to the Power port on the back of the Router, then plug the other end into a power outlet.
 - The Power LED will illuminate green as soon as the power adapter is connected.
 - The Diag LED will illuminate red for a few seconds while the Router goes through its internal diagnostic test. The LED will turn off when the self-test is complete.
5. Power on the Cable or DSL modem. Verify that the power is on by checking the WAN LED on the front of the Router. The Link LED will illuminate if the power is on and the modem is ready.

6. To use the Reset button: While holding down the Reset button, unplug the power adapter from the Router. Wait three seconds while continuing to hold down the Reset button. Then plug the power adapter back into the Router. The Diag LED will flash twice. During the second flash, release the Reset button. This will restore all the defaults.
7. Power on your PC.

The Hardware Installation is complete. Continue to the next page to configure your PCs and Router.



Note: Some ISPs—most notably some cable providers—configure their networks so that you do not have to enter a full Internet address into your web browser or e-mail application to reach your home page or receive your e-mail. If your Internet home page address is something very simple, such as “www”, rather than “www.linksys.com”, or your e-mail server's address is something similar to “e-mail” or “pop3”, rather than “pop.mail.linksys.com”, you won't be able to properly configure your Router until you determine the actual Internet addresses of your Web and e-mail connections.

You **must** obtain this information prior to connecting the Router to your network. You can obtain this information by contacting your ISP, or you can turn to the section of the Appendix on **How to Obtain Your ISP's E-mail & Web Addresses**.

Configuring Your PCs to Connect to the Cable/DSL Wireless-Ready Router

Now that your Router is physically installed, you will have to configure your PCs to accept the IP addresses that your Router will provide. If using the default Windows TCP/IP network configuration, no changes are required; just restart your PC so it will obtain an IP address from the Cable/DSL Wireless-Ready Router.



These instructions apply only to Windows 95, 98 and Millennium machines. For TCP/IP setup under Windows NT, Windows 2000, or Windows XP, please refer to your Microsoft Windows documentation.

1. Click the **Start** button, select **Settings**, then **Control Panel**.
2. Double-click the **Network** icon.
3. In the **Configuration** window, select the **TCP/IP** protocol line that has been associated with your network card/adaptor. (See Figure 3-1.)

Note: If the TCP/IP protocol is not configured on your PC, go to the Appendix for TCP/IP installation instructions now.

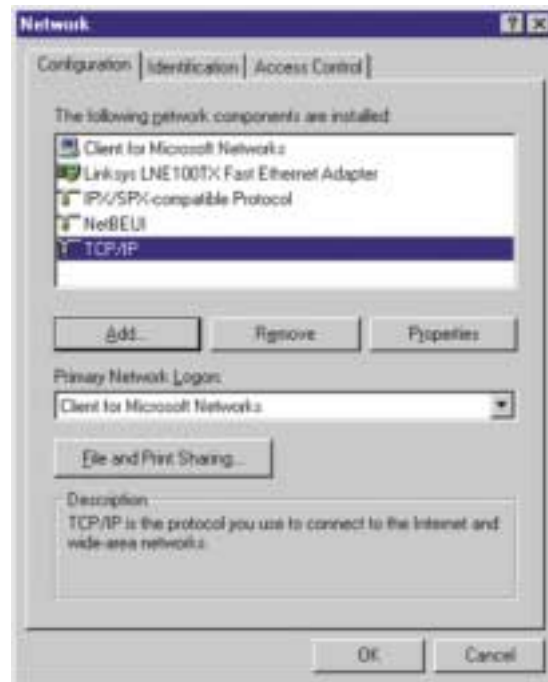


Figure 3-1

4. Click the **Properties** button, and then choose the **IP Address** tab. Select **Obtain an IP address automatically**. (See Figure 3-2.) Click on the **Gateway** tab and make sure that all fields there are empty. Click **OK**.



Figure 3-2

5. The Network Properties window will reappear. Click **OK**. All client settings are complete. Windows may ask for original Windows installation files, which can be found on your Windows CD-ROM (i.e.: D:\win98, D:\win95, D:\win9x - where "D" is the letter of your CD-ROM drive) or possibly on your hard drive (c:\windows\options\cabs.)
6. Windows will ask you to restart your PC. Click **Yes**.

Repeat steps 1-6 for each PC on your network. When all PCs are configured, continue on to set up the Router using the Router's Web-based Utility.

Chapter 4: Adding Wireless Capabilities to Your Router

Now that your Cable/DSL Wireless-Ready Router is wired into your network, you can make your Router wireless. You can also wait until a later time. You will need a WPC11 Wireless PC Card (sold separately.)

1. Power off the Router.



Make sure to insert the WPC11 Wireless PC Card in the direction shown in the warning label below.

2. Locate the PCMCIA slot on the back of the Router. Insert the Wireless PC Card into the PCMCIA slot in the direction shown in Figure 4-1. It is very important to install it with the LEDs facing up and in the correct direction or damage to the Router can occur. Push the Wireless PC Card into the slot until it is securely in place.



Figure 4-1

3. Configure the wireless functions of the web utility using the following instructions. (Refer to Chapter 6 for more information.)

- A. Access the web utility by opening your web browser and typing **http://192.168.1.1** in the browser's Address box. (This number is the default IP address of your Router.) Press **Enter**. (See Figure 4-2.)



Figure 4-2

- B. After entering the address into the web browser, a password request page will pop up. (See Figure 4-3.) Leave the User Name field empty, but type **admin** into the Password field.



Figure 4-3

- C. The basic Setup screen is the first screen you will see when you access the utility, but is the only one you need to set up your Wireless PC Card. (See Figure 4-4.) If you have already installed and set up your router, you have already seen this screen and have already properly configured all of the screen's values. More detailed explanations and instructions can be found by clicking the page's **Help** button. To clear any values you've entered, click **Cancel** and re-enter the information. To apply any settings that you have changed, click the **Apply** button. Once all settings are correct, click **Continue**.

Note: The Setup page shown in this graphic may differ from yours.

Figure 4-4

The following section will provide information on setting up your wireless connection once you have the Wireless PC Card.

- **ESSID** The ESSID is the unique name that is shared among all points in a wireless network. The ESSID must be identical for all points in the network. It is case sensitive and must not exceed 32 characters. Make sure that all points in the network are the same. Verify that you are using the correct ESSID.

- **Access Control** Provides access to your network for other PCs. You'll need to enter the MAC Address, then click on **Add** for any PC that you want to add. Click on **Apply** when finished.
- **Channel** Select the appropriate channel from the list provided to correspond with your network settings, between 1 and 11. All points in your wireless network must use the same channel in order to function correctly. Verify that the correct channel is selected.
- **WEP (Mandatory/Disable).** In order to utilize WEP encryption, select **Mandatory**. If you do not wish to utilize WEP encryption, make sure **Disable** is selected. See the Section on **Setting WEP Encryption** for more information.
- **WEP Key Setting** When WEP Encryption is Enabled, press this button to modify the WEP Key Settings. See the Section on **Setting WEP Encryption** for more information.

If you haven't done so already, to apply any settings that you have changed, click the **Apply** button. Once all settings are correct, click **Continue**.

Chapter 5: Configuring Your Network with the Cable/DSL Wireless-Ready Router

Configuring the Cable/DSL Wireless-Ready Router

Now that your Cable/DSL Wireless-Ready Router is wired into your network, you can begin configuring your system.

Note: If your Windows system supports UPnP, Windows will offer to create a desktop shortcut to the Router. Click **OK** to create the desktop icon, then double-click on the icon to connect to the Router. Otherwise, connect to the Router manually, as follows.

1. Open your web browser and type **http://192.168.1.1** in the browser's Address box. (See Figure 5-1.) This number is the default IP address of your Router. Press **Enter**.

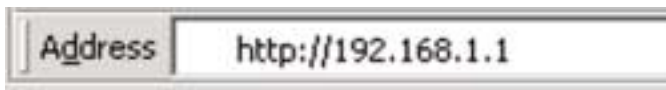


Figure 5-1

Note: If you have previously enabled an Internet Sharing Proxy Service on any of your PCs, you must disable it now.

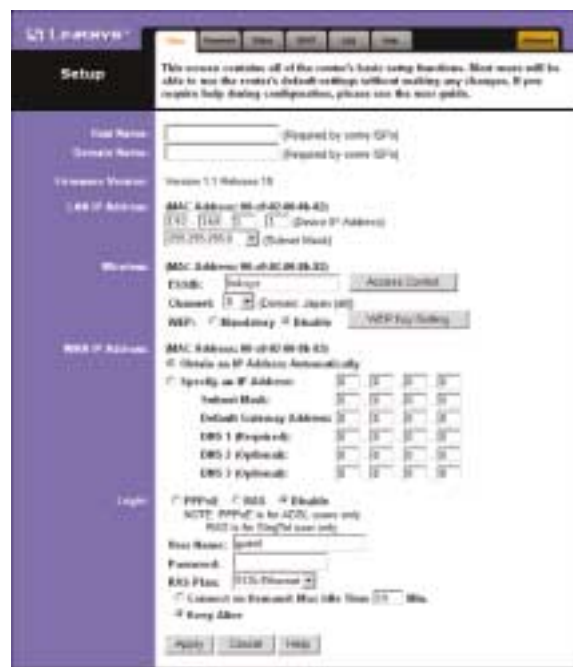
- If you are running Netscape Navigator: Click **Edit >> Preference >> Advanced >> Proxies** and click **Direct Connection to the Internet**.
- If you are running Internet Explorer v5 or better, click **Start >> Settings >> Control Panel >> Internet Options >> Connections >> LAN Settings**. Remove the checks from all three boxes. Click **OK** to continue.

2. A username and password prompt will appear. Leave the User Name box empty and type **admin** (the default password) in the **Password** box. Click **OK**. (See Figure 5-2.)



Figure 5-2

3. The Cable/DSL Wireless-Ready Router's Setup page will appear. (See Figure 5-3.)



Note: The Setup page shown in this graphic may differ from yours.

Figure 5-3

4. Configure the following values.

Note: All of this information should be readily available from your ISP.

Host Name & 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.

LAN IP Address These values refer to your internal network settings. Unless you have specific internal needs, there should be no reason to change these values. For the internal LAN, the default values are as follows.

- Private IP Address: 192.168.1.1
- Subnet Mask: 255.255.255.0

Wireless In this section, enter the ESSID and Channel for your wireless network. You can provide access to your network for other PCs with **Access Control**. You'll need to enter the MAC Address, then click on **Add** for any PC that you want to add. Click on **Apply** when finished. You can decide whether or not to use WEP Encryption and configure the level of WEP Encryption. WEP Encryption is not necessary for the operation of your Router. For more information, see the section of this guide called **Setting WEP Encryption**. You must use a wireless PC card (sold separately) to use this and any other wireless feature.

WAN IP Address These values refer to the outside network you connect to every time you access your Broadband Internet connection. Most Broadband ISPs assign their clients a different IP address each time they log on. If this is the case with your ISP, click **Obtain an IP Address Automatically** and continue to step 5. If your ISP assigns you a fixed IP address, click **Specify an IP Address** and enter the address into the **Subnet Mask, Default Gateway Address, and DNS** fields provided by the ISP.

Login This section is used if you are using a dial-up style connection like PPPoE or RAS.

PPPoE (Point-to-Point Protocol over Ethernet) is used by DSL-based ISPs to establish communications with an end-user. If you are using a DSL line, check with your ISP to see if they use PPPoE. If they do use PPPoE, you must enable it by selecting PPPoE in the login section. If you do enable PPPoE, remember to remove any existing PPPoE applications already on any of your PCs. To enable PPPoE:

1. Click on the button next to **PPPoE**.
2. Enter the **User Name** you use to log on to your Internet connection.
3. Enter your corresponding **Password**.

RAS (Remote Access Service) is a service used in Singapore only. If you are using a RAS connection, check with your ISP for the necessary setup information. To enable RAS:

1. Click on the button next to **RAS**.
2. Enter the **User Name** you use to log on to your Internet connection.
3. Enter your corresponding **Password**.

RAS Plan Select the type of plan you have.

Connect on Demand (*Only available if PPPoE is enabled*) If you aren't actively using the Internet, you can configure your Router to cut your connection with your ISP after a certain period of time. If you have been disconnected due to inactivity, *Connect on Demand* enables your Router to automatically re-establish your connection as soon as you attempt to access the Internet again. Click on the button next to **Connect on Demand** to Enable the option.

Keep Alive Option This option keeps your PPPoE-enabled Internet access connected indefinitely, even when it sits idle. It keeps the connection alive by sending out a few data packets periodically, so your Internet service thinks that the connection is still active. To use this option, click on the button next to **Keep Alive** to select it.

5. **When you have properly configured** the *Setup* page, click **Apply**, and then click **Continue**.

6. **Reset the power on the cable or DSL modem**, and then restart the computer so the computer can obtain the new Router information.

Your Cable/DSL Wireless-Ready Router is now configured to your network. If you would like, you may continue on to learn more about the Router's Web-based Utility.

Note: Make sure that a Network Card or adapter has been successfully installed into each PC you plan on configuring before you continue.

Chapter 6: The Cable/DSL Wireless-Ready Router's Web-based Utility

Quick & Easy Administration

For your convenience, an administrative utility has been programmed into the chipset of your router. All router-based administrative tasks are performed through this web utility. The web utility can be accessed by any PC on the network by typing **http://192.168.1.1** into the PC's web browser address window. (See Figure 6-1.)

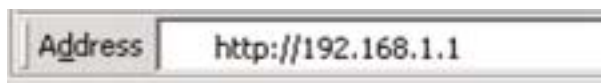


Figure 6-1

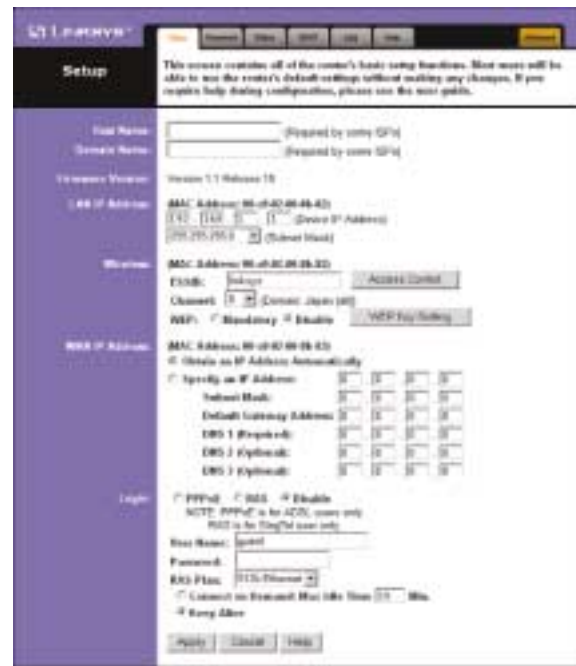
After entering the address into the web browser, a password request page will pop up. (See Figure 6-2.) Leave the User Name field empty, but type **admin** into the Password field.



Figure 6-2

On the following pages you will find brief descriptions and important functions of each utility web page. More detailed explanations and instructions can be found by clicking each page's **Help** button. To clear any values you've entered on any page, click **Cancel** and re-enter the information. To apply any settings that you have changed on any page, click the **Apply** button. Once all settings are correct, click **Continue**.

Setup



Note: The Setup page shown in this graphic may differ from yours.

Figure 6-3

The basic Setup screen is the first screen you will see when you access the Utility. If you have already installed and set up your router, you have already seen this screen and have already properly configured all of the screen's values.

- **Host Name** This entry is necessary for some ISPs. Ask your ISP.
- **Domain Name** This entry is necessary for some ISPs. Ask your ISP.
- **Firmware Version** This entry shows the version of the firmware you are using. Future versions of the Router's Firmware may become available on the Linksys website.
- **LAN IP Address and Subnet Mask** The IP Address and Subnet Mask of the router as they are seen on the internal LAN. The default value is 192.168.1.1 for IP and 255.255.255.0 for Subnet Mask. Unless you already know your settings, we recommend that you keep the defaults.

- **ESSID** The ESSID is the unique name that is shared among all points in a wireless network. The ESSID must be identical for all points in the network. It is case sensitive and must not exceed 32 characters. Make sure that all points in the network are the same. Verify that you are using the correct ESSID.
- **Access Control** Provides access to your network for other PCs. You'll need to enter the MAC Address, then click on **Add** for any PC that you want to add. Click on **Apply** when finished.
- **Channel** Select the appropriate channel from the list provided to correspond with your network settings, between 1 and 11. All points in your wireless network must use the same channel in order to function correctly. Verify that the correct channel is selected.
- **WEP (Mandatory/Disable)**. In order to utilize WEP encryption, select **Mandatory**. If you do not wish to utilize WEP encryption, make sure **Disable** is selected.
- **WEP Key Setting** When WEP Encryption is Enabled, press this button to modify the WEP Key Settings. See the Section on **Setting WEP Encryption** for more information.
- **WAN IP Address and Subnet Mask** The IP Address and Subnet Mask of the router as seen by external users on the Internet (including your ISP). If set to Obtain an IP Address Automatically, these values are assigned by your ISP.
- **Default Gateway Address** Your ISP will provide you with the Gateway IP Address. If set to Obtain an IP Address Automatically, these values are automatically assigned by your ISP.
- **DNS (Domain Name Server) IP Address** Your ISP will provide you with at least one DNS IP Address. If set to Obtain an IP Address Automatically, these values are automatically assigned by your ISP.

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

Login This section is used if you are using a dial-up style connection like PPPoE or RAS.

PPPoE (Point-to-Point Protocol over Ethernet) is used by DSL-based ISPs to establish communications with an end-user. If you are using a DSL line, check with your ISP to see if they use PPPoE. If they do use PPPoE, you must enable it by selecting PPPoE in the login section. If you do enable PPPoE, remember to remove any existing PPPoE applications already on any of your PCs. To enable PPPoE:

1. Click on the button next to **PPPoE**.
2. Enter the **User Name** you use to log on to your Internet connection.
3. Enter your corresponding **Password**.

RAS (Remote Access Service) is a service used in Singapore only. If you are using a RAS connection, check with your ISP for the necessary setup information. To enable RAS:

1. Click on the button next to **RAS**.
2. Enter the **User Name** you use to log on to your Internet connection.
3. Enter your corresponding **Password**.

RAS Plan Select the type of plan you have.

Connect on Demand (*Only available if PPPoE is enabled*) If you aren't actively using the Internet, you can configure your Router to cut your connection with your ISP after a certain period of time. If you have been disconnected due to inactivity, *Connect on Demand* enables your Router to automatically re-establish your connection as soon as you attempt to access the Internet again. Click on the button next to **Connect on Demand** to enable the option.

Keep Alive Option This option keeps your PPPoE-enabled Internet access connected indefinitely, even when it sits idle. It keeps the connection alive by sending out a few data packets periodically, so your Internet service thinks that the connection is still active. To use this option, click on the button next to **Keep Alive** to select it.

In order for your changes to take effect, click the **Apply** button.

Setting WEP Encryption

Note: WEP Encryption is an additional data security measure that is not essential for Router operation, but is strongly recommended.

WEP (Wired Equivalent Privacy) Encryption is a method of encrypting data that is transmitted over your wireless network to ensure data security. In a wired network, data security is maintained through the physical wire. WEP Encryption provides the same level of security for your wireless data as if it were being transmitted over standard network cabling (which is how the name is derived). In order to duplicate wired network security levels, wireless data is encrypted at its point of transmission. It is decoded by the receiving device. This allows users to have the same amount of security over their wireless network as they would over a wired network. This level of security is above that already provided by the use of password protection by your network operating system.

The present standard for this encryption, set by the IEEE (the Institute of Electrical and Electronics Engineers), is defined as 40-bit (sometimes also called 64-bit) encryption. Some vendors, including Linksys, offer the higher 128-bit encryption. These numbers refer to the complexity of the algorithms generated in order to code and decode the data transmitted. The higher the bit number, the greater the complexity of the algorithm, which is designed to provide increasingly secure encryption. Be aware, however, that higher levels of encryption often negatively affect network data transmission rates. **This encryption is not necessary for the operation of your wireless network device, but is strongly recommended.** Your need for security can only be determined by you. If your security needs are such that ordinary password protection is sufficient, you may decide not to use the additional WEP Encryption. However, should your security needs dictate it, the Cable/DSL Wireless-Ready Router can provide as secure a connection as is available in wireless networking.

1. At the Setup Screen, if you choose to enable WEP Encryption, select **Mandatory** under the WEP section.
2. Press the **WEP Key Setting** button to set the WEP Encryption type and level.

3. The following screen will appear, verifying that you are enabling WEP Encryption. Press the **OK** button to continue. (See Figure 6-4.)

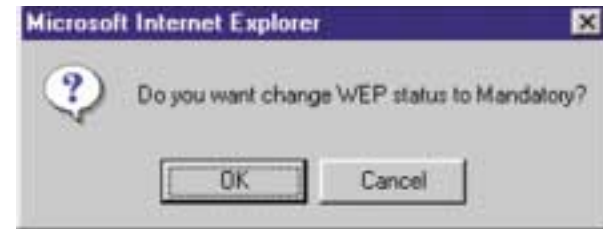


Figure 6-4

4. The following screen will appear, where you will choose your WEP Encryption settings. For the Authentication Type, select **Open System** (default setting). (See Figure 6-5.)



Figure 6-5

Note: The screen shown in this graphic may differ from yours.

5. For the Encryption, choose **64 Bit Encryption** or **128 Bit Encryption**. The one you choose must also be used on all your other network devices. Enter Hexadecimal characters, which are the letters "A" through "F" and the numbers "0" through "9" into the fields provided. If you have set a WEP Encryption on a wireless device on your network, then you must use the same key set. All devices on a network must use the same key set.
6. Click the **Save** button, then the Close button and the encryption portion of the setup is now complete.

Password



Figure 6-6

It is strongly recommended that you set a password for the router. When you first power up the router, you will notice that the Password setting default is **admin**. For security, we recommend that you change your password often.

To change your password, enter your new password in the Router Password box. Enter it again in the box just below the Router Password box, exactly as you typed it in the first box. When you are sure you have entered the password as you want it, press the **Apply** button.



If you set the Restore Factory Default option and click Apply, you will clear all of the Router's settings. Do not restore to the factory defaults unless you want to completely set up the Router again. Once the Router is reset, you will have to re-enter your configuration.

Status

This tab displays the current status of the Router; it reflects data and selections that you have entered under the setup tab.



Figure 6-7

All of the information provided on this screen is read-only. To make changes, select the Setup tab.

- **Host Name** This field shows the name of your Router. This entry is necessary for some ISPs.
- **Firmware Version** This field shows the installed version of the firmware.
- **Login** This field shows whether you have enabled the use of the Router's PPPoE support and the status.
- **LAN** These fields display the current IP Address and Subnet Mask of the Router, as seen by users on your internal network.
- **WAN** These fields display the WAN IP Address, WAN Subnet Mask, and WAN Default Gateway IP address of the Router, as seen by external users on the Internet.
- **DNS (Domain Name System) IP Address** These fields show the IP Address(es) of the DNS currently used by the Router. Multiple DNS IP settings are common. In most cases, the first available DNS entry is used.

- **DHCP Release** Click the **DHCP Release** button to release the WAN IP address from the Router.
- **DHCP Renew** Click the **DHCP Renew** button to get the new WAN IP address from your ISP.
- **DHCP Clients Table** Click on the **Clients Table** button to show the current DHCP Client information. (This information is stored in temporary memory, so the list of clients could disappear.)

DHCP

A DHCP (Dynamic Host Configuration Protocol) Server automatically assigns IP addresses to each computer on your network. Unless you already have one, it is highly recommended that your router be set up as a DHCP server.



Figure 6-8

- **DHCP Server** Check the **Enable** option to enable the DHCP server option of the router. If you already have a DHCP server on your network, set the router's DHCP option to **Disable**.
- **Starting IP Address** Enter a numerical value for the DHCP server to start with when issuing IP addresses.
- **Number of DHCP Users** Enter the maximum number of PCs that you want the DHCP server to assign IP addresses to, with the absolute maximum being 253.
- **DHCP Clients Table** Click on the **Clients Table** button to show the current DHCP Client information. (This information is stored in temporary memory, so the list of clients could disappear.)

Log

This tab shows the status of Logging on the Router. If you enable logging, the Router will keep a record of all sites on the Internet (i.e., e-mail, ftp sites, etc.) that have been accessed through the Router.



Figure 6-9

- **Incoming/Outgoing Access Logs:** Here you will specify whether you want to make a record of Internet sites that have been accessed through the Router. Both outgoing or incoming addresses can be recorded. (For instance, if you have a web server, you can keep a record of the sites from which your web server has been accessed.)
- **E-Mail Logs:** Select **Send Incoming Log** or **Send Outgoing Log**. Enter the **Email address** and **Subject** for the log. Add the IP Address of the **SMTP E-Mail Server** and the **Port Number**.
- **E-Mail Schedule:** Choose to send the log **When log is full** or enter a specific time. Select the **Timezone** in the drop-down menu.
- Click the **Apply** button to save any changes.

Help

Under the Help tab, you'll find links to all of the Router's internal support documentation, including the application that upgrades the Router's firmware.

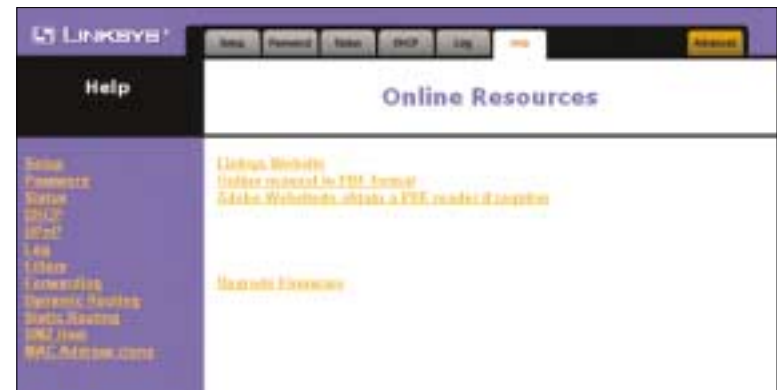


Figure 6-10

New firmware versions are posted at www.linksys.com and can be downloaded for free. If the Router can access the Internet already, there's no need to download a newer firmware version, unless that version has a new feature that you want to use. Loading new firmware onto the Router might not enhance the speed or the quality of your connection speed.

UPnP

This screen shows the Universal Plug and Play services that are available.

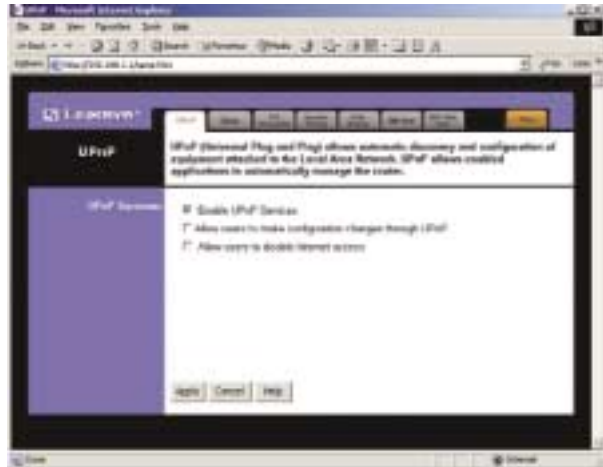


Figure 6-11

Microsoft ME and XP feature Universal Plug and Play (UPnP), which allows automatic discovery and configuration of equipment attached to the LAN. UPnP allows enabled applications to automatically manage the router.

There are two ways to begin the UPnP configuration. Choose one:

- Double-click **My Network Place**. Then double-click the **Linksys BEFSR41W icon**.
- Or, start your Web interface. Type in the address **http://192.168.1.1**.

Using either method, you will see the Setup tab. Click the **Advanced** tab. Then click the **UPnP** tab.

On the UPnP tab, you have three features to choose from:

- **Enable UPnP Services** This allows Windows XP to activate the UPnP feature for automatic configuration.
- **Allow users to make configuration changes through UPnP** This allows you to make manual changes while still using the UPnP feature.
- **Allow users to disable Internet access** This allows you to prohibit any and all Internet connections.

Click **Apply** to accept changes, or click **Cancel** to cancel changes.

Filters

Filters block specific internal users from accessing the Internet. You can set up a filter through an IP address or a network port number.

Filtered Private IP Range

- To set up a filter using IP addresses, enter the range of IP addresses you wish to filter in the IP address fields. Users who have filtered IP addresses will not be able to access the Internet at all. If you only want to filter one IP address instead of a range of IP addresses, enter the same value into both fields.



Figure 6-12

Filtered Private Port Range

- To filter users by network port number, enter a network port number or a range of network ports. Select the protocol for each port number you want to filter, TCP or UDP. Enter the port numbers you want to filter in the port numbers fields. Users connected to the Router will no longer be able to access any port number listed there.

Editing MAC Filter Setting

- This feature filters the network adapter's specific MAC address from going out to the Internet.
- To check your network adapter's MAC address, run "winipcfg" or "ipconfig" in the command prompt. To set the MAC filter, click the **Edit MAC Filter Setting** button. When a second window appears, select the range in the drop-down box, and at the MAC number prompt, enter the 12-digit MAC address you want to filter. Click the **Apply** button and then the **Continue** button before closing the window.

Block WAN Request

- By enabling the *Block WAN Request* feature, you can prevent your network from being pinged or detected by other Internet users. The *Block WAN Request* feature also adds another measure of security to your network by hiding your network ports. Both functions of the *Block WAN Request* feature make it more difficult for outside users to work their way into your network.

- Click on **Apply** to save any changes.

Using IPsec Pass Through

- This feature lets you use IPsec Pass Through. To use this feature, click on **Enable** next to “IPsec Pass Through,” then click on **Apply**.
- To disable IPsec Pass Through, click on **Disable**, and then click on **Apply**.

Using PPTP Pass Through

- Point-to-Point Tunneling Protocol is the method used to enable VPN (Virtual Private Network) sessions. To enable this feature, click on **Enable** next to PPTP Pass Through, then click **Apply**.
- To disable this feature, click on **Disable** next to PPTP Pass Through, then click on **Apply**.

Using L2TP Pass Through

- This feature lets you use L2TP Pass Through. To use this feature, click on **Enable** next to “L2TP Pass Through,” and then click on **Apply**.
- To disable L2TP Pass Through, click on **Disable**, and then click on **Apply**.

Using Remote Management

- This feature allows you to manage your Router from a remote location, via the Internet. To enable this feature, click on **Enable**, and enter the desired port number from 1025 to 65535 (By default it is set to 8080). Then click on **Apply**.

Using remote management is easy. Once you have enabled remote management, enter **http://<WAN IP Address>:8080** or the **Port Number** you have defined, into the browser of any PC on the network. Press the **Enter** key. You will then be able to alter the Router configuration settings.

- To disable Remote Management, click on **Disable**, then click on **Apply**.

Using Default MTU (Maximum Transmission Unit)

- This feature allows you to specify the largest packet size permitted for network transmission. Select **Enable** and enter the value desired. It is recommended that you leave this value within the 1200 to 1500 range. Most DSL users should use **1492**. When this function is disabled, the MTU is set at a default value of **1500**.

Port Forwarding

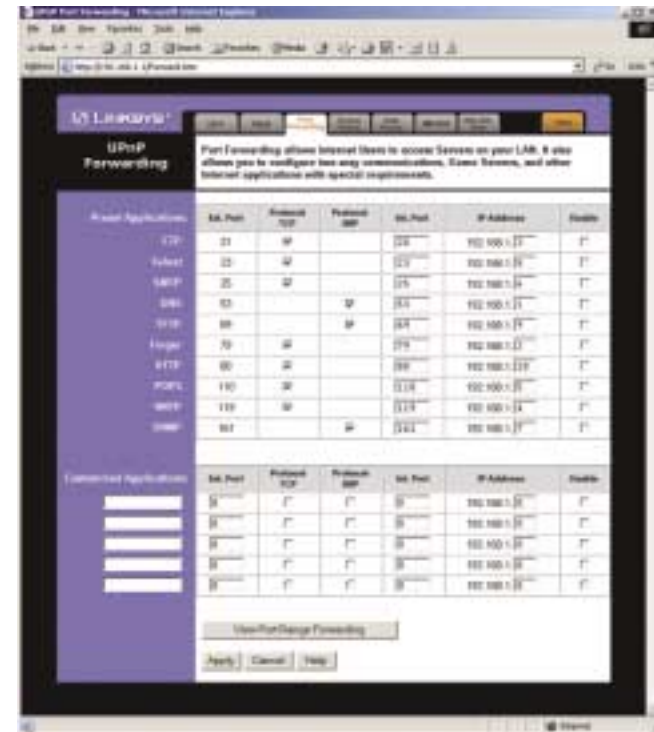


Figure 6-13

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

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 Web site on a local machine, they are typically uploaded to the Web server using FTP. FTP includes functions to log on to the network, list directories, and copy files. 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://.

- **Telnet** A terminal emulation protocol commonly used on the Internet and TCP/IP-based networks. It allows a user at a terminal or computer to log on to 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 telephone number, whether currently logged on or the last time logged on. The person being “fingered” must have placed his or her profile on the system. 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 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.).

You must check the **Enable** box to enable the applications you have defined.

To add a customized application in the UPnP Forwarding screen:

1. Enter the name of the application in the appropriate **Customized Applications** field. Continue with the fields on the same line.
2. In the **Ext. Port** field, enter the number of the external port used by the server.
3. Check **Protocol TCP** or **Protocol UDP**, depending on which protocol you use.
4. Enter the number of the internal port.
5. Enter the IP address of the server that you want the Internet users to access. Refer to your software documentation for more information about changing service port settings, if necessary.
6. Now, check the Enable box or the changes that you made to UPnP Forwarding will not function.

Port Range Forwarding

Forwarding is generally used to set up a web server, ftp server, or e-mail server on your network. The router's DHCP function must be disabled to use Forwarding.

Click the **View Port Range Forwarding** button to open the Port Range Forwarding screen. (See Figure 6-14.) Port forwarding sets up public services on your network. When users from the Internet make certain requests of your network, the router will forward those requests to the appropriate computer.

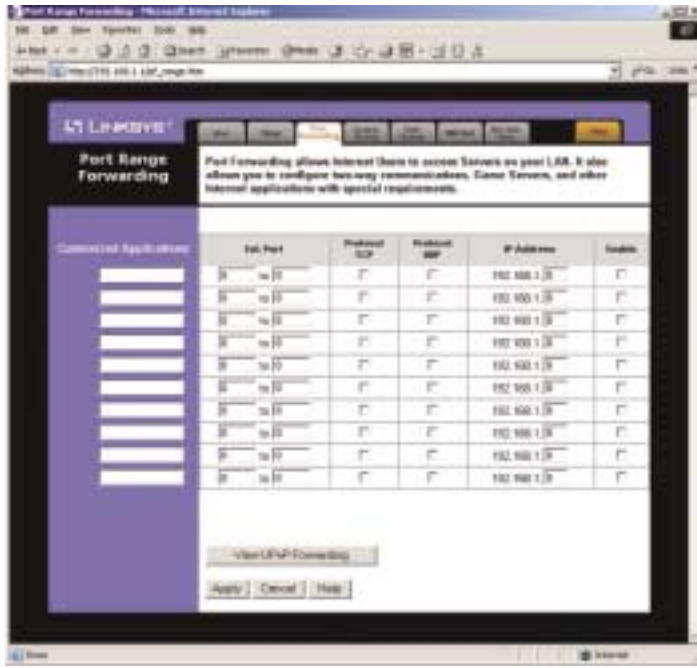


Figure 6-14

To add a server using Port Range Forwarding:

1. Enter the name of the application in the appropriate **Customized Applications** field. Continue with the fields on the same line.
2. In the **Ext. Port** field, enter the number of the external port used by the server.
3. Check **Protocol TCP** or **Protocol UDP**, depending on which protocol you use.
4. Enter the IP address of the server that you want the Internet users to access. Refer to your software documentation for more information about changing service port settings, if necessary.
5. Now, check the Enable box or the changes that you made to Port Range Forwarding will not function.

Dynamic Routing

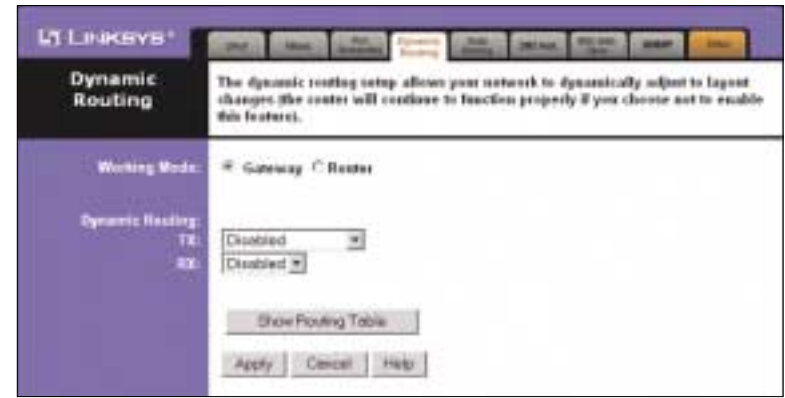


Figure 6-15

With Dynamic Routing you can automatically adjust to physical changes in the network's layout. Using RIP protocol, the router determines the route of the network packets 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. To set up Dynamic Routing:

1. Choose the correct working mode. Use **Gateway Mode** if your Router is hosting your network's connection to the Internet. Use **Router Mode** if the router exists on a network with other routers.
2. In the **TX** field, choose the protocol by which you transmit data on the network.
3. In the **RX** field, choose the protocol by which you receive data on the network.
4. Click the **Apply** button to save your changes.

Static Routing



Figure 6-16

If your 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. Click the **Show Routing Table** button to view the current static routing configuration.

To create a static route entry:

1. Select **Static Route Entry** from the drop down list. The Cable/DSL Router supports up to 20 static route entries.
2. Enter the following data to create a new static route:

Destination LAN IP The Destination LAN IP 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 here. If you are building a route to an entire network, be sure that the network portion of the IP address is set to zero (0). For example, the Router's standard IP address is 192.168.1.1. Based on this address, the address of the network to which the Router is connected is 192.168.1, with the last digit (1, in this case) determining the Router's place on the network. Therefore you would enter the IP address 192.168.1.0 if you want 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. In the example above, the Network 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) would identify the specific host.

Default Gateway IP 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 value gives the number of **nodes** that a data packet passes through before reaching its destination. A node is any device on the network, such as switches, PCs, etc.

Interface This interface tells you whether your network is on the internal LAN or the WAN, or the external Internet. If you are connecting to a sub-network, select LAN. If you're connecting to another network through the Internet, select WAN.

3. Click the **Apply** button to save your changes.

DMZ Host



Figure 6-17

The DMZ Host setting allows one local computer to be exposed to the Internet for the use of special-purpose services such as Internet gaming or video-conferencing.

To expose one computer, enter the computer's IP address and click the **Apply** button. Inactivate DMZ by entering a zero (0).

MAC Address Cloning



Figure 6-18

MAC Address Cloning allows you to assign the Router a MAC address, which is a 12-digit code assigned to a unique piece of hardware for identification, like a Social Security number. Some ISPs require that you register the MAC address of your network card/adaptor, which was connected to your cable or DSL modem during installation.

Click on the **Clone** button to find your adapter's MAC address and click **OK**.

This clones your network adapter's MAC address onto your Router, and prevents you from having to call your ISP to change the registered MAC address to the adapter's MAC address.

Appendix A: Troubleshooting

Common Problems and Solutions

This section provides possible solutions to problems regarding the installation and operation of the Cable/DSL Wireless-Ready 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 can't connect to the Cable/DSL Wireless-Ready Router.

- Ensure that the Cable/DSL Wireless-Ready Router is properly installed, LAN connections are OK, and it is powered ON.
- Ensure that your PC and the Cable/DSL Wireless-Ready Router are on the same network segment. If you are not sure, initiate the DHCP function, and let the PC get the IP address automatically.
- Ensure that your PC is using an IP address within the default range of 192.168.1.2 to 192.168.1.254 and thus compatible with the Cable/DSL Wireless-Ready Router default IP Address of 192.168.1.1
- Also, the Subnet Mask should be set to 255.255.255.0 to match the Cable/DSL Wireless-Ready Router. For the Cable/DSL Wireless-Ready Router, you can check these settings by going to the Start Menu. Click on **Settings**, then **Control Panel**, then double-click on **Network**, to check the Properties for the TCP/IP protocol.

2. The Diag LED stays lit when it shouldn't.

- The Diag LED lights up when the device is first powered up. Meantime, the system will boot up itself and check for proper operation. After finishing the checking procedure, the LED turns off to show the system is working fine. If the LED remains lit after this time, the device is not working properly. Try to re-flash the firmware by assigning a static IP address to the computer, and then upgrade the firmware again. If that doesn't help, contact your dealer for further inspection.

3. I can't browse through the Cable/DSL Wireless-Ready Router.

- Check if both ends of the network cable and power adapter are properly connected. Check if the status LEDs on the front panel are functioning properly.
- If using Windows 95 or Windows 98, check the TCP/IP setup on the client side. Run **windows** by clicking on the **Start** button, selecting **Run**, and typing **windows** in the Run box. Then press **Enter**. The PC should have an IP address of 192.168.1.xxx ("xxx" is from 2 to 254.) The Subnet Mask is 255.255.255.0; the default gateway IP should be the Router's IP Address, and check that the DNS is correct.
- Same as above, check the same setup values on the Status Monitor page of the Cable/DSL Wireless-Ready Router.

4. When I enter a URL or IP address, I get a time out error.

- Check if other PCs work. If they do, ensure that your workstations IP settings are correct (IP address, Subnet Mask, Default gateway and DNS)
- If the PCs are configured correctly, but still not working, check the Cable/DSL Wireless-Ready 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 Cable/DSL Wireless-Ready Router is configured correctly, check your Internet connection (DSL/Cable modem, etc.) to see that it is working correctly.
- Manually configure the TCP/IP with a DNS address provided by your ISP.

5. I can't obtain an IP address from my cable or DSL modem.

- Ensure that all of your cabling is properly connected and that all of the router's WAN and LAN LEDs are correctly illuminated.
- Power down your cable or DSL modem for a few seconds. Turn it back on. After the modem goes through its self-test, check to see if you now have an IP address.
- Ensure that your cable or DSL modem is DHCP-capable.
- You may have to enter the router or host name in the Setup page of the Router's web-based utility. Go to the **Setup** section of the Web-based Utility for more information.
- Your ISP may require Mac addresses. Check with your ISP. This address can be obtained in the Status screen of the Router's Web-based Utility.

Frequently Asked Questions

What is the maximum number of IP addresses that the Cable/DSL Wireless-Ready Router will support? The Router will support up to 253 IP addresses.

Is IPsec Pass-Thru supported by the Router? Yes, it is a built-in feature that the router automatically enables.

Where is the Cable/DSL Wireless-Ready Router installed on the network? In a typical environment, the Router is installed between the Cable/DSL Modem and the LAN. Plug the Cable/DSL Wireless-Ready Router into the Cable/DSL Modem's Ethernet port.

Does the Cable/DSL Wireless-Ready 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 from LAN to LAN connections, but those protocols cannot connect from WAN to LAN.

Does the WAN connection of the Cable/DSL Wireless-Ready Router support 100Mb Ethernet? Because of the speed limitations of broadband Internet connections, the Cable/DSL Router's current hardware design supports 10Mb Ethernet on its WAN port. It does, of course, support 100Mbps over the auto-sensing Fast Ethernet 10/100 switch on the LAN side of the router.

What is Network Address Translation and what is it used for? Network Address Translation (NAT) translates multiple IP addresses on the private LAN to one public address that is sent out to the Internet. This adds a level of security since the address of a PC connected to the private LAN is never transmitted on the Internet. Furthermore, NAT allows the Cable/DSL Wireless-Ready 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 Cable/DSL Wireless-Ready Router support any operating system other than Windows 95, Windows 98, Windows 2000, Windows NT, 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 Cable/DSL router support ICQ send file? Yes, with the following fix: ICQ menu-> preference -> connections tab-> check "I am behind a firewall or proxy," and set the firewall time-out to 80 seconds in firewall setting. The Internet user can then send a file to a user behind the router.

How do I get Napster to work with the Router? Napster is fully compatible with the Router, but you must make sure that, during installation, you select "no idea" when asked about your firewall selection. Set your proxy settings to "No Proxy Server" in your *File>Preferences*.

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. If you want to use the UT Server Admin, forward another port (8080 usually works well), 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 of the server computer. There remains, however, a problem with people being booted after a few minutes with an "illegible server message."

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 NIC to 10Mbps or half duplex mode, and turn off the “Auto-negotiate” feature of your NIC 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 at least three seconds and 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.

Does the Cable/DSL Wireless-Ready Router support IPSec? Yes, but only pass through IPSec is supported.

Will the router function in a Macintosh environment? Yes, but the router’s setup pages are accessible only through Internet Explorer v4.0 or Netscape Navigator v4.0 or higher for Macintosh.

With which type of firewall is the router equipped? The Cable/DSL Wireless-Ready Router uses NAT and TCP/IP port inspections.

Does the Router do Stateful packet inspection? No

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.

What is DMZ? 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.

If DMZ 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.

Will the Router allow me to use my own public IPs and Domain, or do I have to use the IPs provided by the Router? The router mode allows for customization of your public IPs and Domain.

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 are the advanced features of the Router? The router’s advanced features include Filters, Forwarding, Dynamic Routing, Static Routing, and DMZ host.

Does Linksys provide syslog support? No, Linksys does not currently provide syslog support.

How can I check whether I have static DHCP IP Addresses? Consult your ISP to confirm the information.

How do I get mIRC to work with the Router? Set port forwarding to 113 for the computer on which you are using mIRC. If you are experiencing difficulty after setting the port forwarding, try changing the Direct Client-to-Client (DCC) settings to a range from 1024 to 1030 on the DCC option and Forwarding page of the Web-based Setup Utility.

If your questions are not addressed here, refer to the contact information on the last page of this manual.

Appendix B: How to Obtain Your ISP's E-mail & Web Addresses

Virtually all Internet addresses are configured with words or characters (i.e., www.linksys.com, www.yahoo.com, etc.) In actuality, however, these Internet addresses are assigned to IP addresses, which are the true addresses on the Internet. For example, www.linksys.com is actually 216.23.162.142. Type it into your web browser and you will wind up at the Linksys home page every time.

IP and web addresses, however, can sometimes be long and hard to remember. Because of this, certain ISPs will shorten their server addresses to single words or codes on their users' web browser or e-mail configurations. If your ISP's e-mail and web server addresses are configured with single words ("www," "e-mail," "home," "pop3," etc.) rather than whole Internet addresses or IP addresses, your Router may have problems sending or receiving mail and accessing the Internet. This happens because your Router has not been configured by your ISP to accept their abbreviated server addresses.

The solution is to determine the true web addresses behind your ISP's code words. You can determine the IP and web addresses of your ISP's servers by "pinging" them.



If you don't have your ISP's web and e-mail IP addresses, you must either get them from your ISP or follow these steps prior to connecting your Router to your network.

Step One: Pinging an IP Address

The first step to determining your ISP's web and e-mail server address is to ping its IP address.

1. **Power on the computer and the cable or DSL modem**, and restore the network configuration set by your ISP if you have since changed it.
2. **Click Start**, then **Run**, and type **command**. This will bring up the DOS window.

3. **At the DOS command prompt**, type **ping mail**. (assuming that the location for which you're trying to find an IP address is configured as "mail"). Press **Enter**. Information such as the following data, taken from a ping of Microsoft Network's e-mail server, will be displayed.

```
C:\>ping mail

Pinging mail [24.53.32.4] with 32 bytes of data:

Reply from 24.53.32.4: bytes=32 time<10ms TTL=128
Reply from 24.53.32.4: bytes=32 time<10ms TTL=128
Reply from 24.53.32.4: bytes=32 time<10ms TTL=128
Reply from 24.53.32.4: bytes=32 time<10ms TTL=128

Ping statistics for 24.53.32.4:
    Packets: Sent = 4, Received = 4, Lost = 0 (0%
    loss),
    Approximate round trip times in milli-seconds:
        Minimum = 0ms, Maximum = 0ms, Average = 0ms
```

4. **Write down the IP address returned by the ping command**. (In the example above: 24.53.32.4.) This IP address is the actual IP address of the server "mail," or any other word or value you have pinged.

Step Two: Pinging for a Web Address

While the IP address returned above would work as your e-mail server address, it may not be permanent. IP addresses change all the time. Web addresses, however, usually don't. Because of this, you're likely to have fewer problems by configuring your system with web addresses rather than IP addresses. Follow the instructions below to find the web address assigned to the IP address that you just pinged.

1. **At the DOS command prompt**, type "ping -a 24.53.32.4," where 24.53.32.4 is the IP address that you just pinged. Information such as the following data will be displayed.

```
C:\>ping -a 24.53.32.4

Pinging mail.msnv3.occa.home.com [24.53.32.4] with
 32 bytes of data:

Reply from 24.53.32.4: bytes=32 time<10ms TTL=127
Reply from 24.53.32.4: bytes=32 time<10ms TTL=127
Reply from 24.53.32.4: bytes=32 time<10ms TTL=127
Reply from 24.53.32.4: bytes=32 time<10ms TTL=127

Ping statistics for 24.53.32.4:
    Packets: Sent = 4, Received = 4, Lost = 0 (0%
    loss),
    Approximate round trip times in milli-seconds:
        Minimum = 0ms, Maximum = 0ms, Average = 0ms
```

2. **Write down the web address returned by the ping command** (In the example above: mail.msnv3.occa.home.com.). This web address is the web address assigned to the IP address you just pinged. While the IP address of “mail” could conceivably change, it is likely that this web address will not.
3. **Replace your ISP’s abbreviated server address** with this extended web address in the corresponding Internet application (web browser, e-mail application, etc.).

Once you have replaced the brief server address with the true server address, your Router should have no problem accessing the Internet through that Internet application.

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 95, 98 or Millennium. For TCP/IP setup under Microsoft Windows NT, 2000, or XP, please refer to your Microsoft Windows NT, 2000, or XP manual.

1. Click the **Start** button. Choose **Settings**, then **Control Panel**.
2. Double-click the **Network** icon. Your Network window should pop up. Select the **Configuration** tab.



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 on the right side.

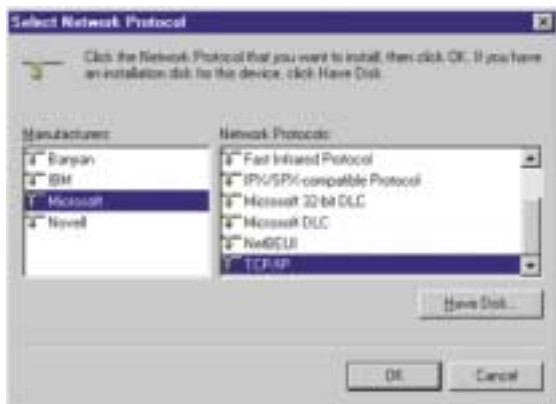


Figure C-2

7. After a few seconds you will be brought back to the main Network window. The TCP/IP Protocol should now be listed.

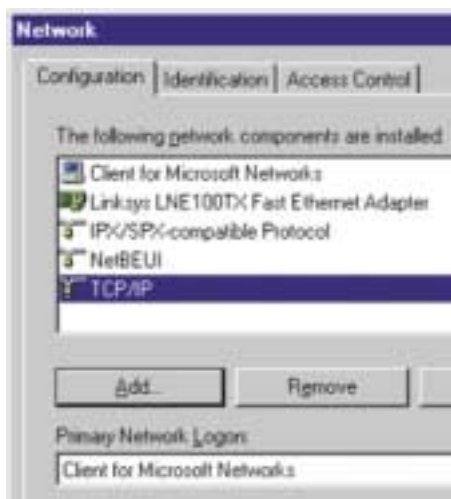


Figure C-3

8. Click **OK**. Windows may ask for original Windows installation files. Supply them as needed (i.e.: D:\win98, D:\win95, c:\windows\options\cabs.)

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

The TCP/IP Installation is complete.

Appendix D: Twisted-Pair Cabling

There are different grades, or categories, of twisted-pair cabling. Category 5 is the most reliable and is highly recommended. Category 3 is a good second choice. Straight-through cables are used for connecting computers to a hub. Crossover cables are used for connecting a hub to another hub (there is an exception: some hubs have a built-in uplink port that is crossed internally; this allows you to link or connect hubs together with a straight-through cable instead).

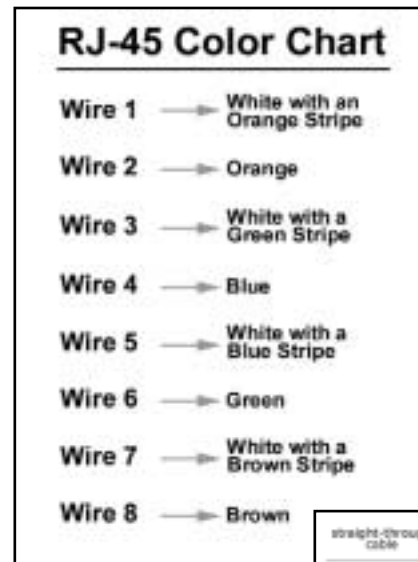


Figure D-1

straight-through cable		crossover cable	
Wire	Becomes	Wire	Becomes
1	1	1	3
2	2	2	6
3	3	3	1
5	6	6	2

You can buy pre-made Category 5 cabling, or cut and crimp your own. Category 5 cables can be purchased or crimped as either straight-through or crossover. Inside a Category 5 cable are eight thin, color-coded wires that run from one end of the cable to the other. All eight wires are used. In a straight-through cable, wires 1, 2, 3, and 6 at one end of the cable are also wires 1, 2, 3, and 6 at the other end. In a crossover cable, the order of the wires change from one end to the other: wire 1 becomes 3, and 2 becomes 6. See the diagrams on the next page for more detailed information on straight-through and crossover cabling.

To determine which wire is wire number 1, hold the cable so that the end of the plastic RJ-45 tip (the part that goes into a wall jack first) is facing away from you. Face the clip down so that the copper side faces up (the springy clip will now be parallel to the floor). When looking down on the copper side, wire 1 will be on the far left.



Figure D-2

Crimping Your Own Network

For Straight-Through Cabling, see Figure D-3 and for Cross-Over Cabling, see Figure D-4.

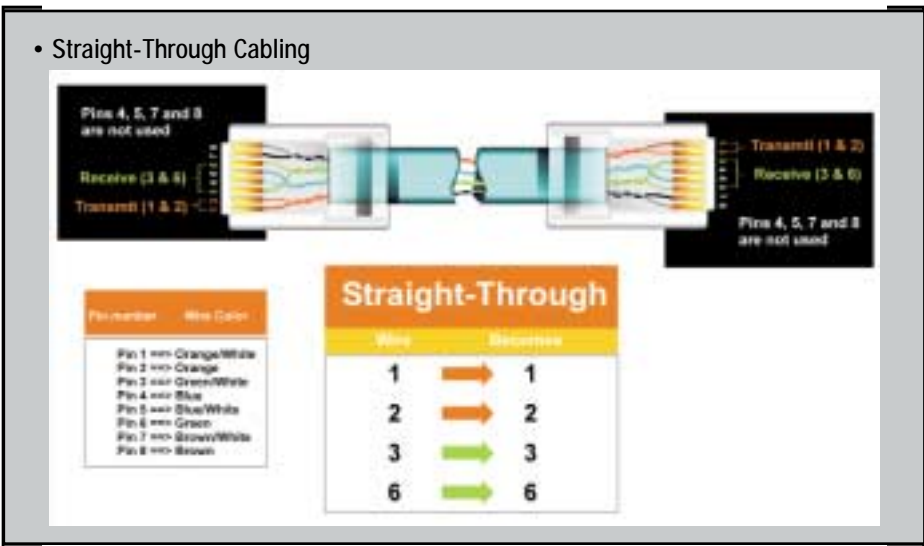


Figure D-3

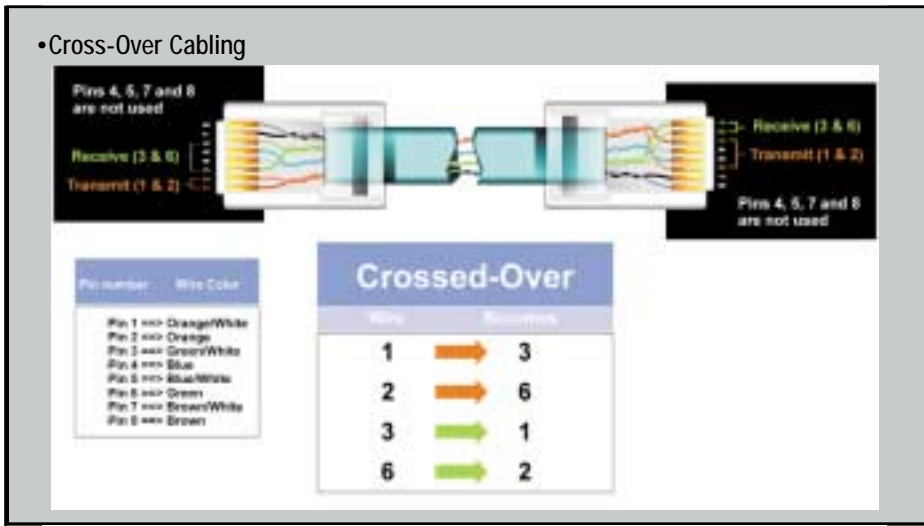


Figure D-4

Appendix E: Glossary

Ad-hoc Network - An ad-hoc network is a wireless network or other small network in which some of the network devices are part of the network only for the duration of a communications session, while others stay in close proximity to the rest of the network.

BSS (Basic Service Set) - A group of Instant Wireless™ Network PC Card users and a Wireless AP + Cable/DSL Router.

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

DHCP (Dynamic Host Configuration Protocol) - 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 - A DMZ (demilitarized zone) is a computer host or small network inserted as a “neutral zone” between a company's private network and the outside public network. It prevents outside users from getting direct access to a server that has company data.

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.

DSSS - Also known as “Direct Sequence Spread Spectrum,” this is a variety of radio transmission methods that continuously change frequencies or signal patterns. Direct Sequence Spread Spectrum (DSSS), which is used in CDMA, multiplies the data bits by a very fast, pseudo-random bit pattern (PN sequence) that “spreads” the data into a large coded stream that takes the full bandwidth of the channel

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.

ESS - More than one BSS in a network.

FHSS - Also known as “Frequency Hopping Spread Spectrum.” Frequency Hopping Spread Spectrum (FHSS) continuously changes the center frequency of a conventional carrier several times per second according to a pseudo-random set of channels, while chirp spread spectrum changes the carrier frequency. Because a fixed frequency is not used, illegal monitoring of spread spectrum signals is extremely difficult, if not downright impossible depending on the particular 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 of 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 to control which outside resources to which its own users have access.

Basically, a firewall, working closely with a router program, 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.

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.

Infrastructure - An infrastructure network is a wireless network or other small network in which the wireless network devices are made a part of the network through an Access Point that connects them to the rest of the network.

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 requester 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 (Internet Protocol Security) 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.

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).

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.

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

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.

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

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

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 (Packet INternet Groper) - 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.

PPPoE (Point to Point Protocol over Ethernet) - 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 (Point-to-Point Tunneling Protocol) - 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.

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

Roaming - The ability to use a wireless device and be able to move from one access point's range to another without losing the connection.

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.).

SSID (Service Set Identifier) - A unique name shared among all points in a wireless network. The SSID must be identical for each point in the wireless network and is case-sensitive. Also known as "ESSID."

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

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.

TCP (Transmission Control Protocol) - 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.

UDP (User Datagram Protocol) - 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.

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.

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

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

WEP (Wired Equivalent Privacy) - 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, under Windows 95, 98, and Millennium, for configuring networks with static IP addresses.

Appendix F: Specifications

Model Number	BEFSR41W
Standards	PC Card 16-bit standard, IEEE 802.3 (10BaseT), IEEE 802.3u (100BaseTX), IEEE 802.11b (Wireless)*
Protocol	CSMA/CD
Ports	
WAN:	One 10Base-T RJ-45 Port for Cable/DSL Modem
LAN:	Four 10/100 RJ-45 Switched Ports, One Shared Uplink Port
Speed	
WAN	10Mbps
LAN	10/100Mbps (Half Duplex) 20/200Mbps (Full Duplex)
Wireless*	Up to 11 Mbps
Cabling Type	UTP Category 5 or better
Operating Range* (Wireless)	Indoors: <i>Up to</i> 300 ft. (91m) Outdoors: <i>Up to</i> 1500 ft. (457m)
LEDs	Power, Diag
WAN	WAN
LAN	100, Full/Col, Link/Act, WLAN

Environmental

Dimensions	7.31" x 1.88" x 6.16" (186 mm x 48 mm x 157 mm)
Unit Weight	14.4 oz. (0.40 kg).
Power Input	External, 12V DC, 800mA
Certifications	FCC Class B, CE Mark
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 G: 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' 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 H: Contact Information

For help with the installation or operation of this product, contact Linksys Customer Support at one of the phone numbers or Internet addresses below.

Sales Information	800-546-5797 (LINKSYS)
Tech Support	800-326-7114
RMA Issues	949-261-1288
Fax	949-261-8868
Email	support@linksys.com
Web	http://www.linksys.com
FTP Site	ftp.linksys.com



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