

Instant Broadband™ Series

# EtherFast® Wireless Access Point + Cable/DSL Router with 4-Port Switch



Use this Guide to install: **BEFW11S4**

User Guide

 **LINKSYS**®

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#### FCC STATEMENT

The Instant Broadband EtherFast® Wireless Access Point + Cable/DSL 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 device
- 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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# Introduction

## The Linksys Wireless AP + Cable/DSL Router

Congratulations on your purchase of an EtherFast® Wireless AP + Cable/DSL Router with 4-Port Switch. The EtherFast® Wireless AP + Cable/DSL Router provides the ideal solution for connecting your wireless network to a high-speed broadband Internet connection and a 10/100 Fast Ethernet backbone. Configurable as a DHCP server for your existing network, the EtherFast® Wireless AP + Cable/DSL Router acts as the only externally recognized Internet gateway on your local area network (LAN) and serve as an Internet NAT firewall against unwanted outside intruders. The Router can also be configured to filter internal users' access to the Internet.

A typical router relies on a hub or a switch to share its Internet connection, but the Linksys EtherFast® Wireless AP + Cable/DSL Router 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 router and switch technology eliminates the need to buy an additional hub or switch and extends the range of 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® Wireless AP + Cable/DSL Router, your network will take off at speeds faster than you ever imagined possible.

## Features

- Share Internet Access With Others on the 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 64-Bit WEP Encryption
- MAC Address and Internal Internet Access Filtering
- Connects to a Broadband Modem, a 10/100 Ethernet Backbone and a Wireless Network
- Configurable Through Your Networked PC's Web Browser
- Supports IPSec Pass-Thru and PPTP
- Able to Act as a DHCP Server for Your Existing Network
- Free Technical Support—24 Hours a Day, 7 Days a Week for North America Only
- 1-Year Limited Warranty



## Package Contents

- One Linksys EtherFast® Wireless Access Point + Cable/DSL Router with 4-Port Switch
- One power adapter
- One Tech Helper CD-ROM
- Two Antennas
- One user guide and registration card

## System Requirements

- One Broadband Internet connection using an External Cable or DSL Modem (if sharing an Internet connection)
- One PC with an installed 10Mbps, 100Mbps, or 10/100 Mbps Ethernet card (for initial setup)
- TCP/IP network protocol for each PC
- UTP network cable with RJ-45 connector
- Internet Explorer 4.0 (Minimum) or higher (5.0 Recommended), or Netscape Navigator 4.0 (Minimum) or higher (4.7 Recommended)

# Getting to Know the Wireless Access Point + Cable/DSL Router

## The Wireless AP + Cable/DSL Router's Rear Panel

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



**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. If Port 4 is being used, the Uplink Port will not work.

**Uplink** The Uplink Port is where you can expand your network by connecting to another switch or hub. The Uplink Port is shared with Port 4. Uplinking to another switch or a hub is done by simply running a cable from the Uplink Port to the other device. If the Uplink port is being used, Port 4 will not work.

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

**Antenna Jacks** The Antenna Jacks are where you will connect the included antennas.

### The Reset Button\*



Briefly pressing the Reset Button will refresh the Router's connections, potentially clearing any jammed links.

Pressing the Reset Button and holding it in for a few seconds will clear all of the Router's data and restore the factory defaults. This should be done only if you are experiencing heavy routing problems, and only after you have exhausted all of the other troubleshooting options. By resetting the Router, you run the risk of creating conflicts between your PCs' actual IP Addresses and what the Router thinks their IP Addresses should be. You may be forced to reboot the entire system(s).

If your router locks up, simply power it down for 3 to 5 seconds by removing the power cable from the Router's Power Port. Leaving the power off for too long could result in the loss of network connections.

## The Wireless AP + Cable/DSL Router's Front Panel LEDs



## The LAN Indicators

- WLAN Act** *Green.* The Link LED illuminates when there is wireless activity.
- WLAN Link** *Green.* The Link LED illuminates when the wireless option is enabled. When the wireless option is disabled (through the Web-based utility), the LED is off.
- Power** *Green.* The Power LED illuminates when the Router is powered on.
- 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.
- 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.
- 100** *Orange.* The 100 LED illuminates when a successful 100Mbps connection is made through the corresponding port.

## The WAN Indicators

- Link** *Green.* The Link LED illuminates when a successful connection is made between the Router and your Broadband device or network.
- Act** *Green.* The Act LED flickers when the Router is sending or receiving data over the broadband port.
- 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.

# Connecting the Wireless Access Point + Cable/DSL Router to Your Network

## Overview

Unlike a simple hub or switch, the setup of the Wireless Access Point + Cable/DSL 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 Wireless Access Point + Cable/DSL Router:

- Your broadband-configured PC's fixed 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*
- } *Only if applicable*

Whoever installed your broadband access should have left this information with you. If not, 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 computer in a TCP/IP network. Static IP addresses are usually assigned to networked devices, which are consistently accessed by multiple users, such as Server PCs, or 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 may 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 onto 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 Wireless Access Point + Cable/DSL 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. (LAN Port 4 will become inactive if you use the Uplink port.)
3. **Connect the network cable** from your Cable or DSL modem to the **WAN** port on the rear of the Router.
4. **Connect the power-supply cable** to the Power port on the rear of the Router, then plug the supplied AC power cable 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 **Link** LED in the WAN column on the front of the Router. The Link LED will be illuminated if the power is on and the modem is ready.



6. Press the **Reset button** on the back of the router. Hold the button in for three seconds, or until the **Diag LED** illuminates red. This restores the router's default settings.
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 Ping Your ISP's E-mail & Web Addresses**.

## Configuring Your PCs to Connect to the Wireless Access Point + Cable/DSL 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.



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

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.

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





4. Click the **Properties** button, then choose the **IP Address** tab. Select **Obtain an IP address automatically**. Click on the **Gateway** tab and make sure that all fields there are empty.



5. Click **OK**. 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 the PC. Click **Yes**.

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

## Configuring Your Network with the Wireless Access Point + Cable/DSL Router

### Configuring the Wireless AP + Cable/DSL Router

Now that your Wireless Access Point + Cable/DSL Router is wired into your network, you can begin configuring your system.

1. **Open your web browser** and type `http://192.168.1.1` in the browser's Address box. This number is the default IP address of your router. Press **Enter**.



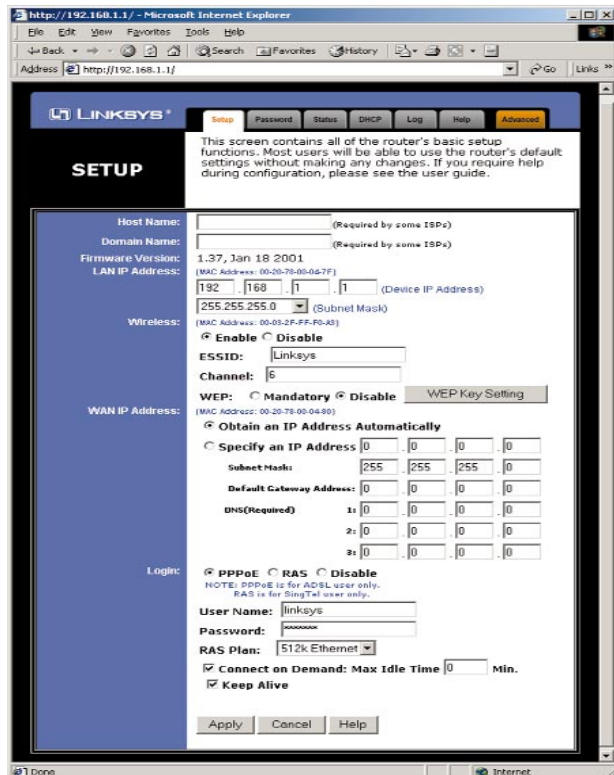
**Note:** If you have previously enabled an Internet Sharing Proxy Service on any of your PCs, you must disable it now.

- 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**.



3. The **Wireless AP + Cable/DSL Router's Setup** page will appear.



*Note: Due to differences in web browsers, some of the screens shown may differ from those seen on your router.*

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, 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**.

**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 with 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.

**PPPoE (Point-to-Point Protocol over Ethernet)** Some DSL-based ISPs use PPPoE 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. 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 **Enable** option in the PPPoE section of the *Setup* screen.
2. Enter the **User Name** you use to log on to your Internet connection.
3. Enter your corresponding **Password**.

**Note:** RAS Settings are for Singapore customers only. If you are a Singapore customer, contact your ISP for RAS Settings before trying to complete this screen.

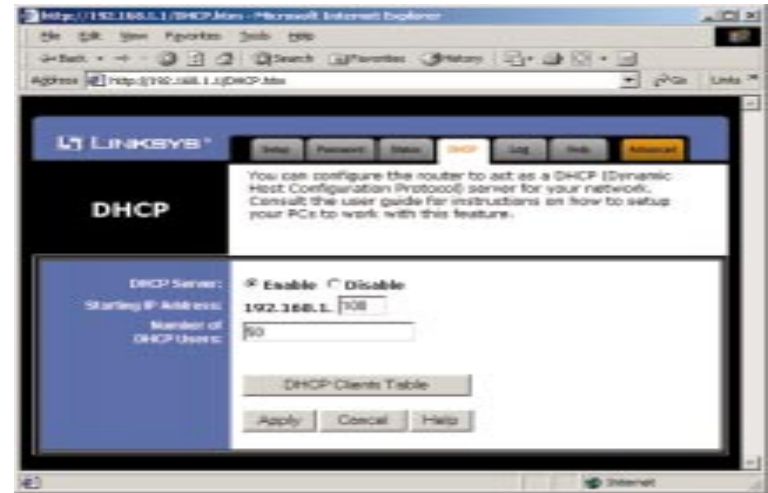
**Connect on Demand** (*Only available if PPPoE is enabled*) If you aren't actively using the Internet, you can configure your Router to cut your connection with your ISP after a certain period of time. If you have been disconnected due to inactivity, *Connect on Demand* enables your Router to automatically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

**Max Idle Time** (*Only available if PPPoE is enabled*) *Max Idle Time* is the number of minutes that passes before the Router drops your Internet connection, due to inactivity. For best connection reliability, the recommended settings are 0 or 9999. Otherwise, enter in the number of minutes you want to elapse before your Internet access disconnects.

**Keep Alive Option** (*Only available if PPPoE is enabled*) 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 box next to Keep Alive to select it.

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

6. Choose the **DHCP** tab.



**Note:** You cannot have two DHCP servers running on one LAN at the same time. If you have an existing DHCP server on your LAN, you must decide which device will act as server. If you choose this Router, you must disable the DHCP capabilities of the other device, and vice versa. The device which is not the DHCP server must have a static IP address, which must be compatible with your existing network in order to be recognized.

7. Unless you already have a **DHCP** server on your internal network, choose **Enable** from the *DHCP Server* field. By choosing **Enable**, you will configure the Router to automatically assign IP addresses to each of your PCs. In the *Number of DHCP Users* box, enter the number of PCs you plan on networking to the Router. Don't forget to change this number if, in the future, you add more PCs to your network. In most cases, these values will not have to be changed unless you have more than 50 computers on the network.

8. Click **Apply**, then click **Continue**.
9. **Reset the power on the cable or DSL modem**, then restart the computer so the computer can obtain the new Router information.

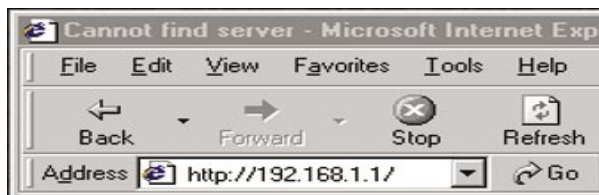
**Note:** Make sure that a Network Card or adapter has been successfully installed into each PC you plan on configuring prior to continuing.

**Your Wireless Access Point + Cable/DSL 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.**

# The Wireless Access Point + Cable/DSL 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.



Upon entering the address into the web browser, a password request page will pop up.

Leave the User Name field empty, but type “admin” into the Password field.



On the following pages you will find brief descriptions of each utility web-page and each page's more important functions. 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 information. To apply any settings you've altered 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 the one seen on your router.

The Basic Setup screen is the first screen you will see when you access the Utility. If you have already installed and setup 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 it is 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.
- **Wireless (Enable/Disable).** In order to utilize the wireless functions of the Router, select **Enable**. If you do not wish to utilize any wireless functions, make sure **Disable** is selected. (*Note: No other wireless functions will be available unless you enable this setting.*)

- **ESSID** The ESSID is the unique name 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're using the correct ESSID and click the **Enable** button to set it.
- **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 and click the **Enable** button to set it.
- **WEP (Mandatory/Disable)**. In order to utilize WEP encryption, select **Enable**. 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.

- **PPPoE (Point-to-Point Protocol over Ethernet)** Some DSL-based ISPs use PPPoE 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. 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 **Enable** option in the PPPoE section of the *Setup* screen.
2. Enter the **User Name** you use to log on to your Internet connection.
3. Enter your corresponding **Password**.

**Note:** RAS Settings are for Singapore customers only. If you are a Singapore customer, contact your ISP for RAS Settings before trying to complete this screen.

- **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. If you wish to activate *Connect on Demand*, choose the **Enable** option.
- **Max Idle Time** (*Only available if PPPoE is enabled*) The Max Idle Time is the amount of time you would like to pass before the Router drops your Internet connection due to inactivity. For best connection reliability, the recommended settings are 0 or 9999.
- **Keep Alive Option** (*Only available if PPPoE is enabled*) 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 box next to Keep Alive to select it.

In order to have the changes that you have made take affect, click the **Apply** button.



## Setting WEP Encryption

**Note: WEP Encryption is an additional data security measure and not essential for Router operation.**

WEP (Wired Equivalent Privacy) Encryption is a method of encrypting data that is transmitted over your wireless network to insure 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 64-bit (sometimes also called 40-bit) encryption. The Router allows you to choose between 64-bit and 128-bit. 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 a more secure the 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.** 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 Wireless Access Point + Cable/DSL 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.

**Note:** In order for WEP Encryption to be enabled, wireless functions must first be enabled. Select **Enable** under the Wireless section before proceeding.

3. The following screen will appear, where you will choose your WEP Encryption settings. If you select **64 Bit**, choose your WEP Encryption settings in the screen below.

The screenshot shows a web interface for generating a WEP key. At the top, it says: "To create a new WEP key, either enter a passphrase and press the generate button, or enter the key elements into the table below." Below this, there is a dropdown menu for encryption type with "64Bit" selected. Underneath is a "Passphrase:" text input field and a "Generate" button. Below the passphrase field are four rows for key elements, labeled "Key 1" through "Key 4", each with a "Clear" button. The "Key 1" field contains "00000000". At the bottom, there is a "Default TX Key:" dropdown menu with "1" selected, and "Apply" and "Undo" buttons.

4. If you select **128 Bit** as shown in the screen above, the following screen will appear, allowing you to create a new WEP key.

The screenshot shows the same WEP key generation interface as above, but with "128Bit" selected in the encryption type dropdown menu. The "Key:" field now contains a longer string of zeros: "00000000000000000000000000000000". The "Passphrase:" field and "Generate" button are still present.

WEP Encryption key can be generated in one of two ways:

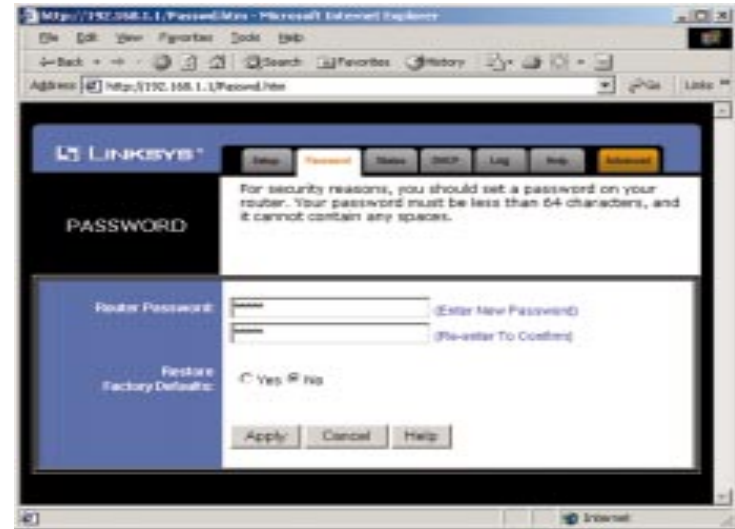
1. You can create an encryption key by using a **Passphrase**. To generate the encryption key using a passphrase, enter a text string in the **Passphrase** box and press the **Generate** button. The **Passphrase** can be any text string with a maximum of 31 alphanumeric characters.
2. You may enter the encryption key manually.

*(The **Passphrase** method is recommended; however, you may need to enter a manual key in order to meet the requirements of existing wireless equipment on your network. If you are unsure, check with your System Administrator.)*

In either case, you should commit this Passphrase or Manual Key to memory. You will probably need it for other wireless devices on the network.

Once you have chosen your key encryption method and entered either the Passphrase or manual key, click the **Apply** button and the encryption portion of the setup is complete.

## Password



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 you've entered under the setup tab.



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

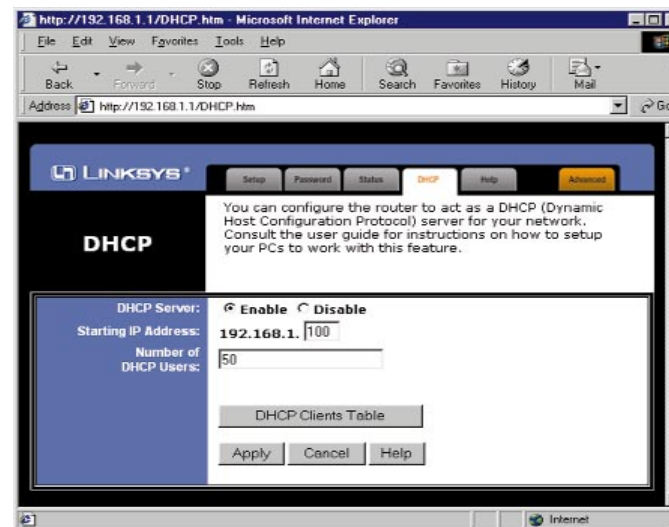
- **Host Name** This field shows the name of your Router. This entry is necessary for some ISPs.
- **Firmware Version** This field shows the installed version and date of the firmware. Version dates are slightly more accurate than version numbers.
- **Login** This field shows whether you have enabled 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.
- **Wireless (Enable/Disable).** In order to utilize the wireless functions of the Router, select **Enable**. If you do not wish to utilize any wireless functions, make sure **Disable** is selected. (*Note: No other wireless functions will be available unless you enable this setting.*)
- **ESSID** The ESSID is the unique name 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're using the correct ESSID and click the **Enable** button to set it.

## DHCP

- **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 and click the **Enable** button to set it.
- **DHCP Server** This field shows the status of the Router's DHCP server function, which is either enabled or disabled.
- **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.

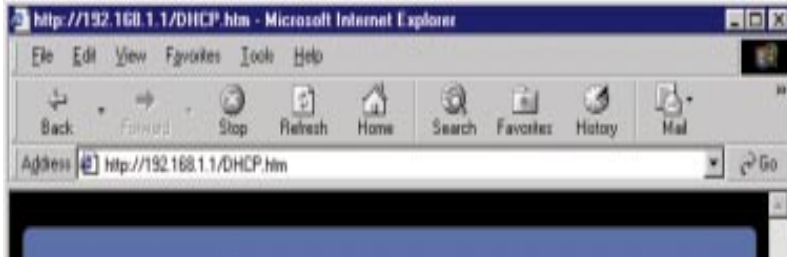
## DHCP

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.



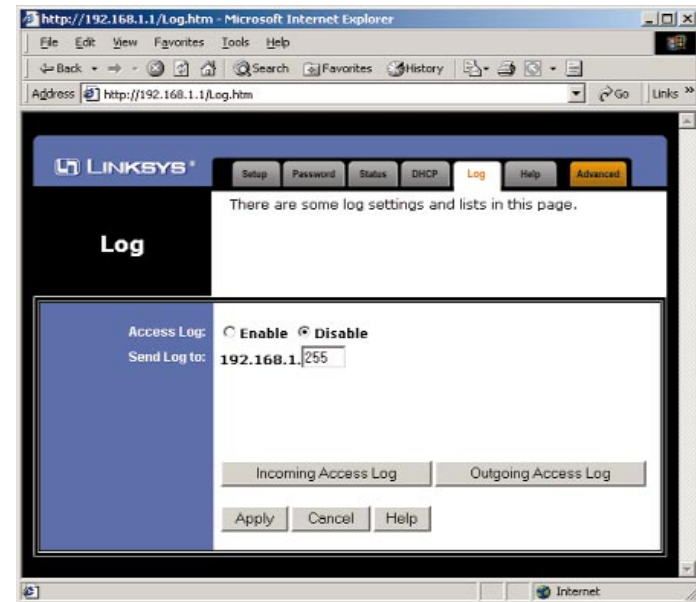
- **DHCP Server** Check the **Enable** option to enable the DHCP server option of the router. If you already have a DHCP server on your network, set the router's DHCP option to **Disable**.

- **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, as in the following screen.)



## 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.

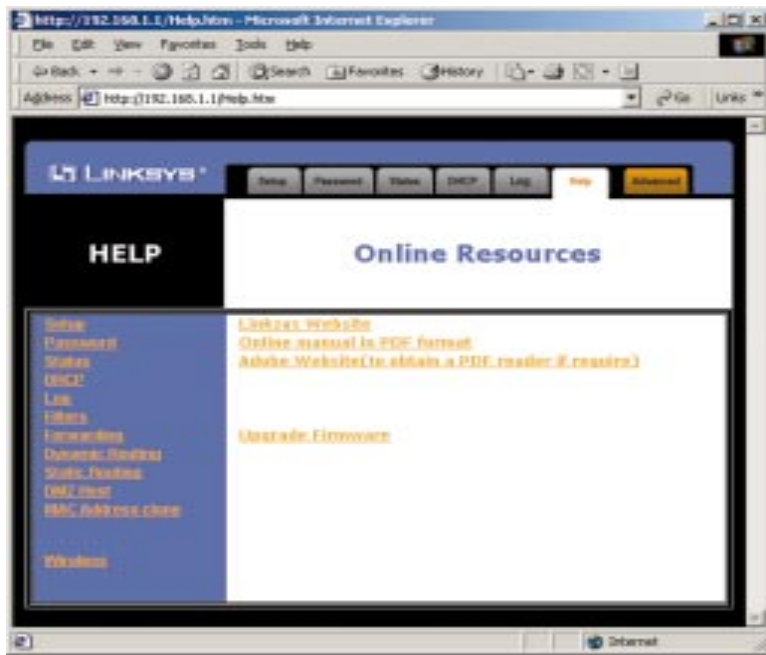


- **Access Log:** Here you will either Enable or Disable the logging feature.
  - **Send Log To:** Here you will specify the address that you would like the log to be sent to.
  - **Incoming/Outgoing Access Log:** Here you will specify whether you want to make a record of Internet sites that have been accessed through the Router. Both outgoing or incoming addresses can be recorded. (For instance, if you have web-server, you can keep a record of the sites from which your web-server has been accessed.)

To view these logs, you need the **Log Viewer** software. You can download the software from <ftp://ftp.linksys.com/pub/befsr41/logviewer.exe>.

Help

Here you will find links to all of the Utility’s internal support documentation, a link to Linksys’s website, the application that upgrades the Router’s firmware.

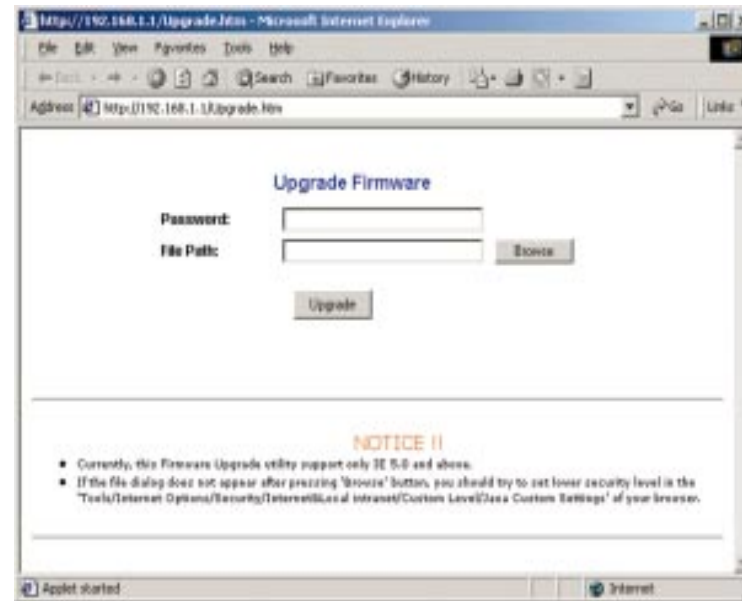


In order to upgrade the Router’s firmware, you **must** use Internet Explorer 5.0 or higher, or Netscape Navigator 4.7 or higher. Upgrading the firmware may cause the Router to be reset to the factory defaults. Make a record of all settings before attempting the upgrade.

To upgrade the Router’s firmware:

1. Download the latest firmware version from the Linksys website (www.linksys.com).
2. Go to the **Help** screen (above).

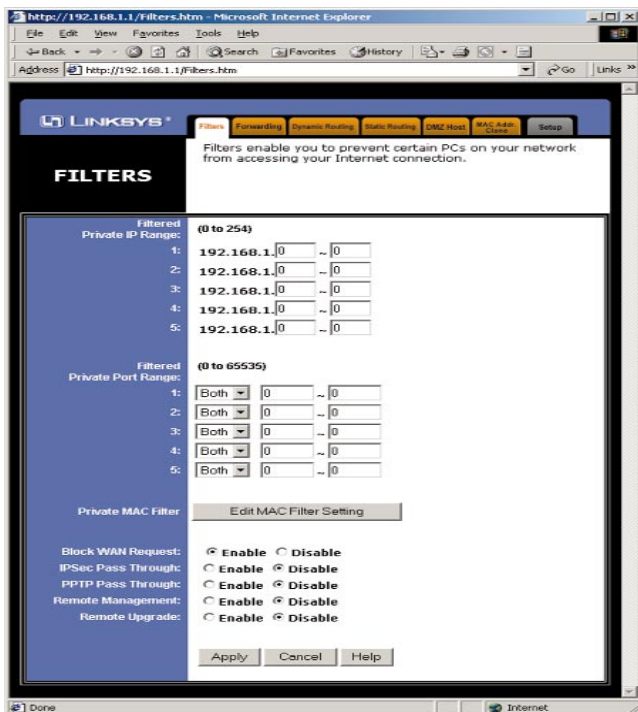
3. Click **Upgrade Firmware**. A new page will appear.



4. Enter your Router’s administration password into the *Password* box.
5. Click the **Browse** button and find the firmware upgrade file that you downloaded from the Linksys website. Double-click the **upgrade file**. This will place the file into the “File Path:” box.
6. When the correct file is in the “File Path:” box, click the **Upgrade** button and follow the instructions there. This will complete your firmware upgrade.

## 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.



### To Modify Filter Settings

- Enter the IP addresses you wish to filter into the IP address fields. The users who have these IP addresses will not be able to access the Internet.
- You can also filter users by entering their network port number and protocol (UDP, TCP or both). Enter the port numbers and protocol you want to filter into the port numbers fields. Users who are connected to the Router will no longer be able to access any port number listed there.

### 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 the **Apply** button 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 Networking) sessions. To enable this feature, click on **Enable** next to PPTP Pass Through, and then click **Apply**.
- To disable this feature, click on **Disable** next to PPTP Pass Through, and then click **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**, then click on **Apply**.

Using remote management is easy. Once you have enabled remote management, enter **http://<WAN IP Address>:8080** into the browser of any PC on the network and 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**.

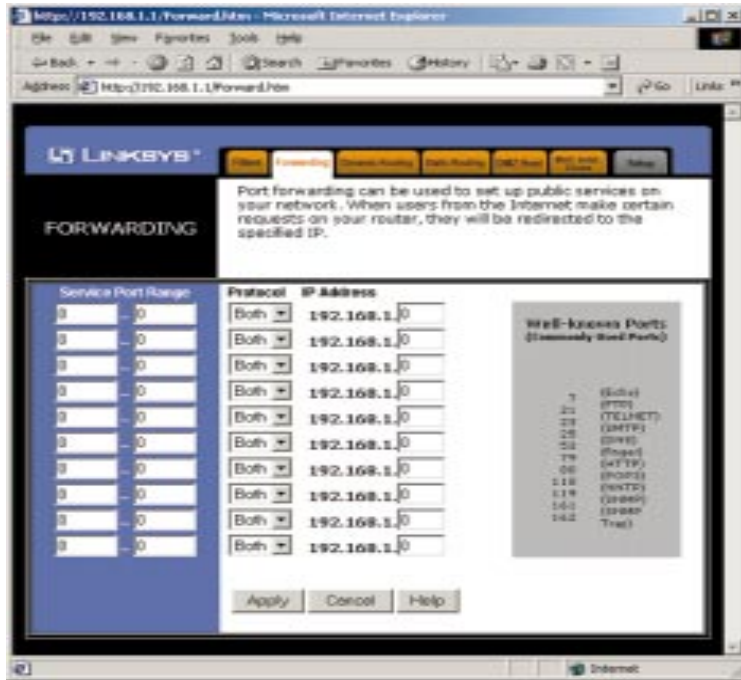
### Using Remote Upgrade

- This feature allows you to “flash,” or upgrade, your Router’s firmware from a remote location. To enable Remote Upgrade, click on **Enable**, then click on **Apply**.

**Note:** Upgrading may cause the Router to be reset to the factory defaults. Make a record of all settings before attempting the upgrade.

- To disable this feature, click on **Disable**, then click on **Apply**.

## Forwarding

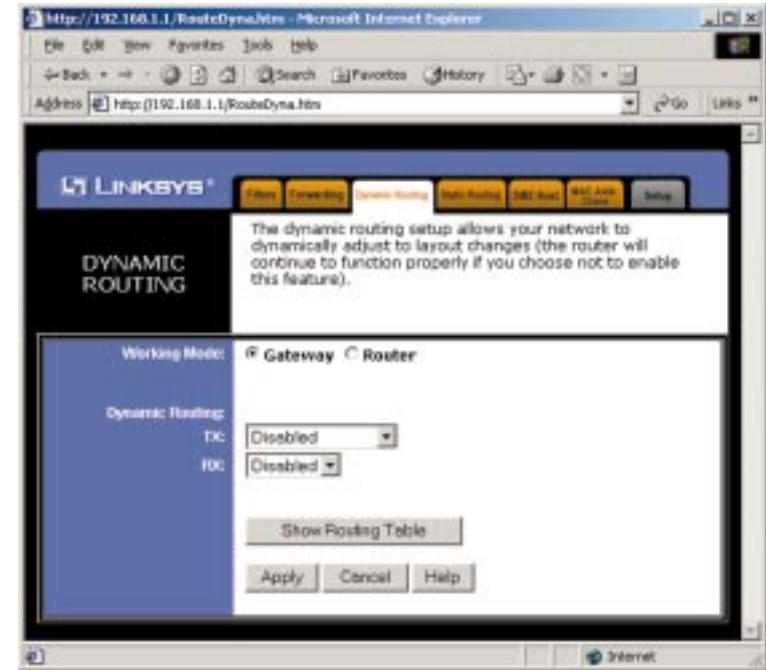


Port forwarding sets up public services on your network. When users from the Internet make certain requests of your network, the router will forward those requests to the appropriate computer. The router's DHCP function must be disabled to use Forwarding.

Forwarding is generally used to set up a web server, ftp server, or e-mail server on your network. To add a server using Forwarding:

1. Enter the port number or range used by the server. On the same line, select TCP, UDP or Both. Enter the IP Address of the server that you want the Internet users to be able to access. Refer to your software documentation for more information concerning which service port settings may need to be changed, if any.
2. Configure as many entries as you would like until all of the link entries are filled.
3. Click **Apply** to save the settings.

## Dynamic Routing

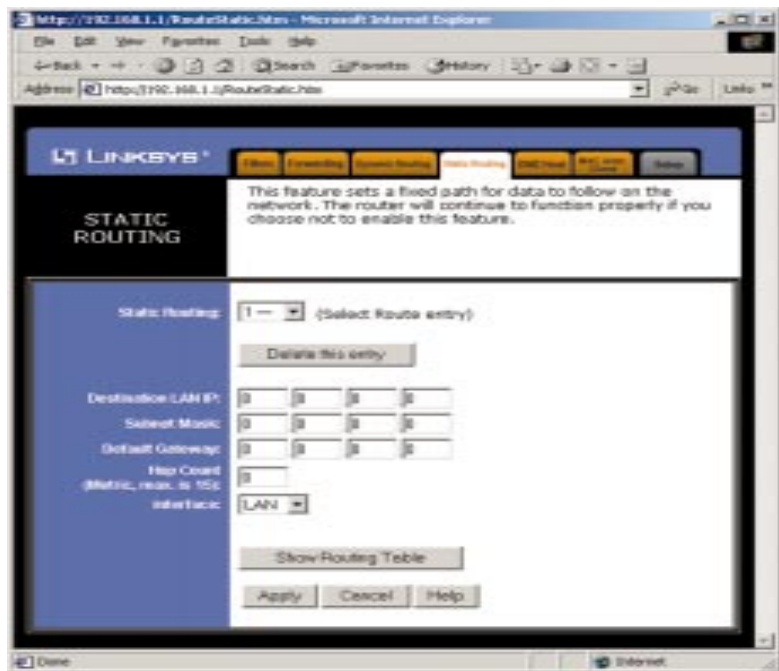


With Dynamic Routing you can automatically adjust to physical changes in the network's layout. The router, using the RIP protocol, determines the network packets' route based on the fewest number of hops between the source and the destination. The RIP protocol regularly broadcasts routing information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

1. Choose the correct working mode. **Gateway Mode** should be used if your Linksys router is hosting your network's connection to the Internet. **Router Mode** should be selected 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 the Router receives network data.
4. Click the **Apply** button to save your changes.



## Static Routing



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 wanted to route to the Router's entire network, rather than just to the Router.

**Network Mask** The Network Mask (also known as the Subnet 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.

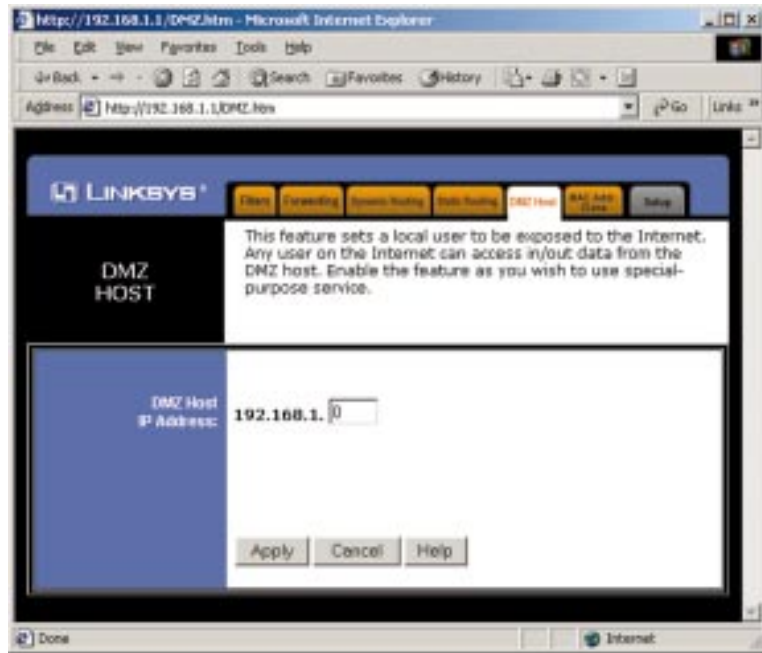
**Gateway IP** This IP address should be the IP address of the gateway device that allows for contact between the Router and the remote network or host.

**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're 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.

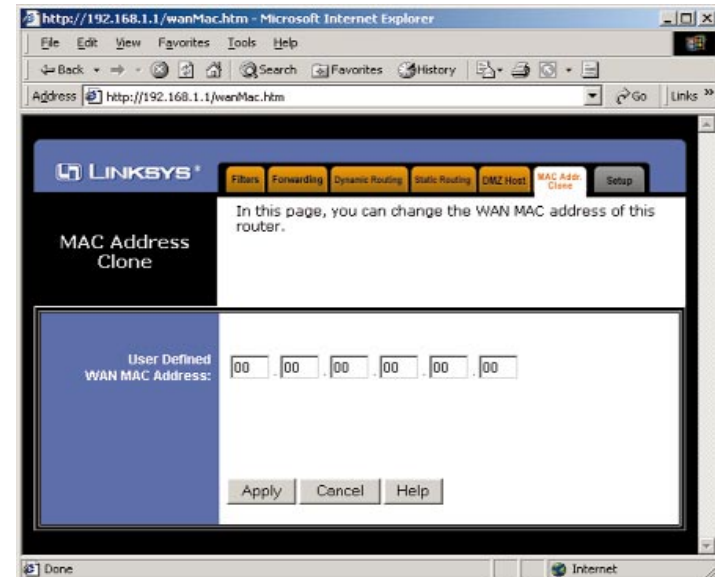
## DMZ Host



The DMZ Host setting allows one local computer to be exposed to the Internet to use a special-purpose service 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



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. You can find your adaptor's MAC address by doing the following:

- If you are running Windows 95, 98 or Millennium:

Go to **Start, Run**, type in **command**, and press **Enter**. At the DOS prompt, type **winipcfg**.

- If you are running Windows NT 4.0 or 2000:

Go to **Start, Run**, type in **command**, and press **Enter**. At the DOS prompt, type **ipconfig /all**. The Physical Address with 12 digits is your adaptor's MAC address.

Enter those 12 digits into the fields on this screen, and click **Apply**. 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.



# Troubleshooting

## Common Problems and Solutions

This section provides possible solutions to problems regarding the installation and operation of the Wireless Access Point + Cable/DSL 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](http://www.linksys.com).

### 1. I Can't connect to the Wireless Access Point + Cable/DSL Router.

- The Wireless AP + Cable/DSL Router is properly installed, LAN connections are OK, and it is powered ON.
- Ensure that your PC and the Wireless AP + Cable/DSL Voice Router are on the same network segment. If you are not sure, initiate the DHCP function, 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 Wireless AP + Cable/DSL Router default IP Address of 192.168.1.1
- Also, the Subnet Mask should be set to 255.255.255.0 to match the Wireless AP + Cable/DSL Router. In the Wireless AP + Cable/DSL Router, you can check these settings by using Control Panel-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, then upgrade the firmware again. If that doesn't help, contact your dealer for further inspection.

### 3. I can't browse through the Wireless Access Point + Cable/DSL 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 **winiipcfg** by clicking on the **Start** button, then selecting **Run**, and typing **winiipcfg** in the Run box and press **Enter**. The PC should have an IP address of 192.168.1.xxx ("xxx" is from 2 to 254.) Subnet Mask is 255.255.255.0, the default gateway IP should be the Router's IP Address, and DNS (in "More".)
- Same as above, check the same setup values in the Status Monitor page of the Wireless AP + Cable/DSL 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 Wireless Access Point + Cable/DSL 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 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 Wireless Access Point + Cable/DSL 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 Wireless Access Point +Cable/DSL Router installed on the network?** In a typical environment, the Router is installed between the Cable/DSL Modem and the LAN. Plug the Wireless AP +Cable/DSL Router into the Cable/DSL Modem's Ethernet port.

**Does the Wireless Access Point + Cable/DSL 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 Wireless Access Point + Cable/DSL 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 in 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 Router to be used with low cost Internet accounts, such as DSL or cable modems, where 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.

**What is the maximum number of users for wireless clients?** 32

**Does the Wireless Access Point + Cable/DSL Router support any operating system other than Windows 95, Windows 98, Windows 2000, or Windows NT?** 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 setup 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), 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 the 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" 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."

Web page hangs, corrupt downloads, 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](http://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 Linksys website, [www.linksys.com](http://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](http://www.linksys.com), where they can be downloaded for free. The router's firmware can be upgraded with TFTP programs.

Does the Wireless Access Point + Cable/DSL 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 Wireless AP + Cable/DSL 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

## How to Ping 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 ISPs 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 Cable/DSL 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 less 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 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 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.

## 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 or 2000, please refer to your Microsoft Windows NT or 2000 manual.

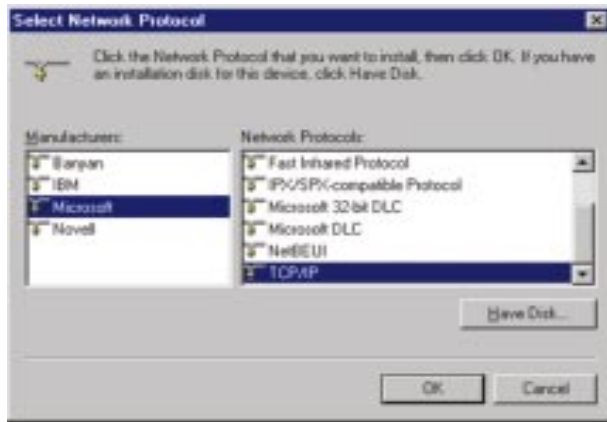
1. Click the **Start** button. Choose **Settings**, then **Control Panel**.
2. Double-click the **Network** icon. Your Network window should pop up. Select the **Configuration** tab.



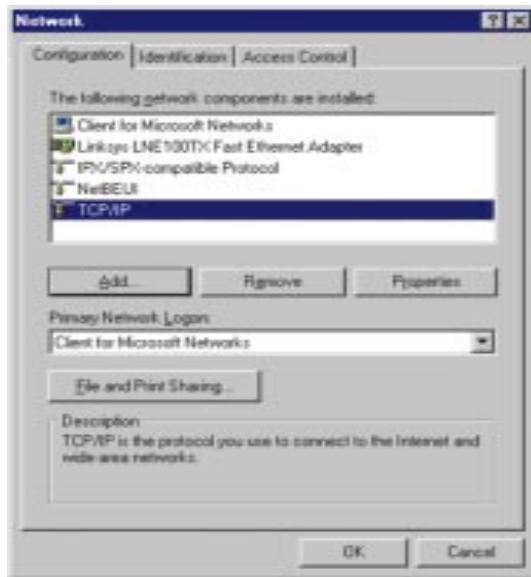
3. Click the **Add** button.
4. Double-click **Protocol**.
5. Highlight **Microsoft** under the list of manufactures.



6. Find and double-click **TCP/IP** in the list to the right (below).



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



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.**

## 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, which allows you to link or connect hubs together with a straight-through cable instead).

### RJ-45 Color Chart

- Wire 1 → White with an Orange Stripe
- Wire 2 → Orange
- Wire 3 → White with a Green Stripe
- Wire 4 → Blue
- Wire 5 → White with a Blue Stripe
- Wire 6 → Green
- Wire 7 → White with a Brown Stripe
- Wire 8 → Brown

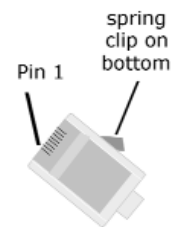
You can buy pre-made Category 5 cabling, or cut and crimp your own. Category 5 cables can be purchased or crimped as either straight-through or crossover. Inside a Category 5 cable are 8 thin, color-coded wires inside that run from one end of the cable to the other. All 8 wires are used. In a straight-through 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.

straight-through cable		crossed cable	
Wire	Becomes	Wire	Becomes
1	1	1	3
2	2	2	6
3	3	3	1
6	6	6	2

detailed information on straight-through and crossover cabling.

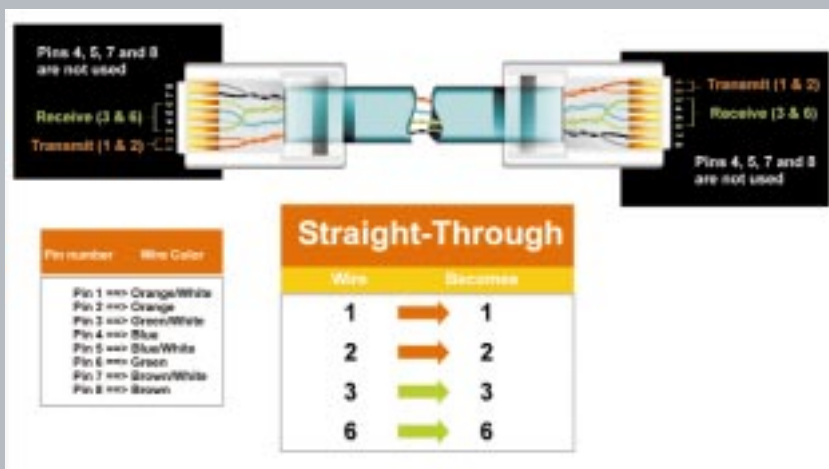
See the diagrams on the next page for more

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.

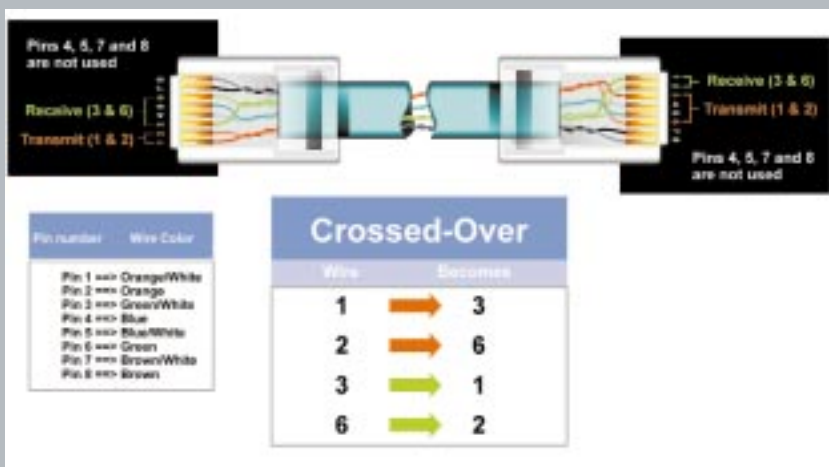


## Crimping Your Own Network Cables

## • Straight-Through Cabling



## • Cross-Over Cabling



## 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 in some 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 manage centrally 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 (demilitarized zone)** - 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 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 program, examines each network packet to determine whether to forward it toward its destination.

**Firmware** - Programming that is inserted into programmable read-only memory (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 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 the Access Point which connects them to the rest of the network.

**IP Address** - In the most widely installed level of the Internet Protocol (Internet Protocol) today, an IP address is a 32-bit binary number that identifies each sender or receiver of information that is sent in packet 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 (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 Web site 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 your computer's unique hardware number.

**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.

**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.

**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 (Internet Protocol) 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 packet) 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 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.

## Specifications

Model Number	BEFW11S4
Standards	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, Switch - 10/100Mbps (Half Duplex) 20/200 (Full Duplex) Wireless (See Below)
Cabling Type	10BaseT: UTP/STP Category 3 or 5 100BaseTX: UTP/STP Category 5
Button	Reset
<b>Operating Range:</b>	(Wireless)
Indoors:	<i>up to</i> 30M (100 ft.) @ 11 Mbps <i>up to</i> 50M (165 ft.) @ 5.5 Mbps <i>up to</i> 70M (230 ft.) @ 2 Mbps <i>up to</i> 91M (300 ft.) @ 1 Mbps
Outdoors:	<i>up to</i> 152M (500 ft.) @ 11 Mbps <i>up to</i> 270M (885 ft.) @ 5.5 Mbps <i>up to</i> 396M (1300 ft.) @ 2 Mbps <i>up to</i> 457M (1500 ft.) @ 1 Mbps
Topology	Star (Ethernet)
LED Indicators	Power, WLAN Activity, WLAN Link
WAN	Link/Activity, Diag for WAN
LAN	Full Duplex/Collision, Link/Activity 100

## Environmental

Dimensions	7.31" x 6.06" X 2.44" (186mm x 154mm x 62mm)
Unit Weight	19.2 oz. (0.56 Kg).
Power Input	External, 5V DC, 3A
Certifications	FCC Class B, FCC Class C, CE Mark Commercial
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

## 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.

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<b>Web</b>	<a href="http://www.linksys.com">http://www.linksys.com</a>
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