

NETGEAR RangeMax™ Wireless-N Gigabit Router WNR3500 User Manual



NETGEAR®

NETGEAR, Inc.
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Product Registration, Support, and Documentation

Register your product at <http://www.netgear.com/register>. Registration is required before you can use our telephone support service. Product updates and Web support are always available at <http://www.netgear.com/support>.

Setup documentation is available on the CD, on the support website, and on the documentation website. When the wireless router is connected to the Internet, click the Knowledge Base or the Documentation link under Web Support on the main menu to view support information.

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Marking by the above symbol indicates compliance with the Essential Requirements of the R&TTE Directive of the European Union (1999/5/EC). This equipment meets the following conformance standards:

EN300 328, EN301 489-17, EN60950

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FCC Requirements for Operation in the United States

FCC Information to User

This product does not contain any user serviceable components and is to be used with approved antennas only. Any product changes or modifications will invalidate all applicable regulatory certifications and approvals.

FCC Guidelines for Human Exposure

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

This transmitter must not be co-located or operating in conjunction with any other antenna or transmitter.

FCC Declaration Of Conformity

We NETGEAR, Inc., 4500 Great America Parkway, Santa Clara, CA 95054, declare under our sole responsibility that the model WNR3500 RangeMax Wireless-N Gigabit Router WNR3500 complies with Part 15 of FCC Rules. Operation is subject to the following two conditions:

- This device may not cause harmful interference, and
- This device must accept any interference received, including interference that may cause undesired operation.

FCC Radio Frequency Interference Warnings & Instructions

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

- Reorient or relocate the receiving antenna.
- Increase the separation between the equipment and the receiver.
- Connect the equipment into an electrical outlet on a circuit different from that which the radio receiver is connected.
- Consult the dealer or an experienced radio/TV technician for help.

RangeMax Wireless-N Gigabit Router WNR3500



Tested to Comply
with FCC Standards
FOR HOME OR OFFICE USE

Modifications made to the product, unless expressly approved by NETGEAR, Inc., could void the user's right to operate the equipment.

Maximum Wireless Signal Rate Derived from IEEE Standard 802.11 Specifications

Actual data throughput will vary. Network conditions and environmental factors, including volume of network traffic, building materials and construction, and network overhead, lower actual data throughput rate.

Product and Publication Details

Model Number:	WNR3500
Publication Date:	March 2008
Product Family:	Wireless Router
Product Name:	RangeMax Wireless-N Gigabit Router WNR3500
Home or Business Product:	Home
Language:	English
Publication Part Number:	202-10305-01

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About This Manual

The user manual provides information for configuring the features of the NETGEAR® RangeMax Wireless-N Gigabit Router WNR3500 beyond initial configuration settings. Initial configuration instructions can be found in the *NETGEAR Wireless Router Setup Manual*. You should have basic to intermediate computer and Internet skills.

Conventions, Formats, and Scope

The conventions, formats, and scope of this manual are described in the following paragraphs:

- **Typographical conventions.** This manual uses the following typographical conventions:

<i>Italic</i>	Emphasis, books, CDs
Bold	User input, GUI screen text
Fixed	Command prompt, CLI text, code
<i>Italic</i>	URL links

- **Formats.** This manual uses the following formats to highlight special messages:

	Note: This format is used to highlight information of importance or special interest.
---	--

	Tip: This format is used to highlight a procedure that will save time or resources.
---	--

	Warning: Ignoring this type of note might result in a malfunction or damage to the equipment, a breach of security, or a loss of data.
---	---



Danger: This is a safety warning. Failure to take heed of this notice might result in personal injury or death.

- **Scope.** This manual is written for the WNR3500 router according to these specifications:

Product Version	RangeMax Wireless-N Gigabit Router WNR3500
Manual Publication Date	March 2008

For more information about network, Internet, firewall, and VPN technologies, click the links to the NETGEAR website in [Appendix B, “Related Documents.”](#)



Note: Product updates are available on the NETGEAR, Inc. website at <http://www.netgear.com/support>.

How to Use This Manual

The HTML version of this manual includes the following:

- Buttons,  and , for browsing forward or backward through the manual one page at a time.
- A  button that displays the table of contents and an  button that displays an index. Double-click a link in the table of contents or index to navigate directly to where the topic is described in the manual.
- A  button to access the full NETGEAR, Inc. online knowledge base for the product model.
- Links to PDF versions of the full manual and individual chapters.

How to Print This Manual

To print this manual, you can choose one of the following options, according to your needs.

- **Printing a page from HTML.** Each page in the HTML version of the manual is dedicated to a major topic. Select File > Print from the browser menu to print the page contents.

- **Printing from PDF.** Your computer must have the free Adobe Acrobat Reader installed for you to view and print PDF files. The Acrobat Reader is available on the Adobe website at <http://www.adobe.com>.
 - **Printing a PDF chapter.** Use the **PDF of This Chapter** link at the top left of any page.
 - Click the **PDF of This Chapter** link at the top left of any page in the chapter you want to print. The PDF version of the chapter you were viewing opens in a browser window.
 - Click the print icon in the upper left of your browser window.
 - **Printing a PDF version of the complete manual.** Use the **Complete PDF Manual** link at the top left of any page.
 - Click the **Complete PDF Manual** link at the top left of any page in the manual. The PDF version of the complete manual opens in a browser window.
 - Click the print icon in the upper left of your browser window.



Tip: If your printer supports printing two pages on a single sheet of paper, you can save paper and printer ink by selecting this feature.

Revision History

NETGEAR, Inc. is constantly searching for ways to improve its products and documentation. The following table indicates any changes that might have been made since the WNR3500 router was introduced.

Table 2-1. Publication Revision History

Part Number	Version Number	Date	Description
202-10305-01	v1.0	March 2008	First publication.

Chapter 1

Configuring Basic Connectivity

This chapter describes the settings for your Internet connection and your wireless local area network (LAN) connection. When you perform the initial configuration of your wireless router using the *Resource CD* as described in the *NETGEAR Wireless Router Setup Manual*, these settings are specified automatically for you. This chapter provides further details about these connectivity settings, as well as instructions on how to log in to the router for further configuration.



Note: NETGEAR recommends using the Smart Wizard™ on the *Resource CD* for initial configuration, as described in the *NETGEAR Wireless Router Setup Manual*.

This chapter includes the following sections:

- [“Using the Setup Manual”](#)
- [“Logging In to Your Wireless Router” on page 1-2](#)
- [“Configuring Your Internet Connection Using the Smart Setup Wizard” on page 1-5](#)
- [“Viewing and Configuring Basic ISP Settings” on page 1-5](#)

Using the Setup Manual

For first-time installation of your wireless router, refer to the *NETGEAR Wireless Router Setup Manual*. The *Setup Manual* explains how to launch the NETGEAR Smart Wizard on the *Resource CD* to step you through the procedure to connect your router, modem, and computers. The Smart Wizard will assist you in configuring your wireless settings and enabling wireless security for your network. After initial configuration using the *Setup Manual*, you can use the information in this *User Manual* to configure additional features of your wireless router.

For installation instructions in a language other than English, refer to the language options on the *Resource CD*.

Logging In to Your Wireless Router

When the wireless router is connected to your network, you can access and configure the router using your browser.

To access the Web Configuration Manager:

1. Connect to the wireless router by typing **http://www.routerlogin.net** or the router's LAN IP address (the default is 192.168.1.1) in the address field of your browser, and then press Enter. A login window opens:



Figure 1-1



Tip: You can connect to the wireless router by typing either of these URLs in the address field of your browser, and then pressing Enter:

- <http://www.routerlogin.net>
- <http://www.routerlogin.com>

If these URLs do not work, you must type the IP address of the router, for example, <http://www.192.168.1.1>.

2. Enter **admin** for the router user name and your password (or the default, **password**). For information about how to change the password, see [“Changing the Administrator Password”](#) on page 2-22.



Note: The router user name and password are not the same as any other user name or password you might use to log in to your Internet connection.

The Checking for Firmware Updates screen appears unless you previously cleared the **Check for Updated Firmware Upon Log-in** check box.

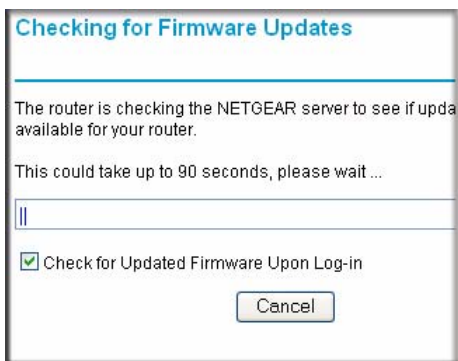


Figure 1-2

If the router discovers a newer version of software, you are asked if you want to upgrade to the new software (see [“Upgrading the Router Software”](#) on page 6-8 for details). If no new firmware is available, the following message displays.

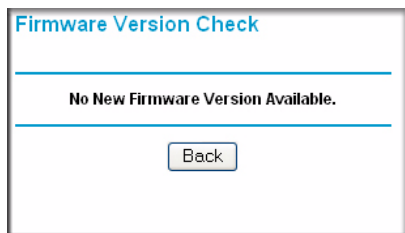


Figure 1-3

3. In the main menu on the left, select **Basic Settings** under Setup. The Basic Settings screen displays showing the wireless router's home page and suggested default settings.

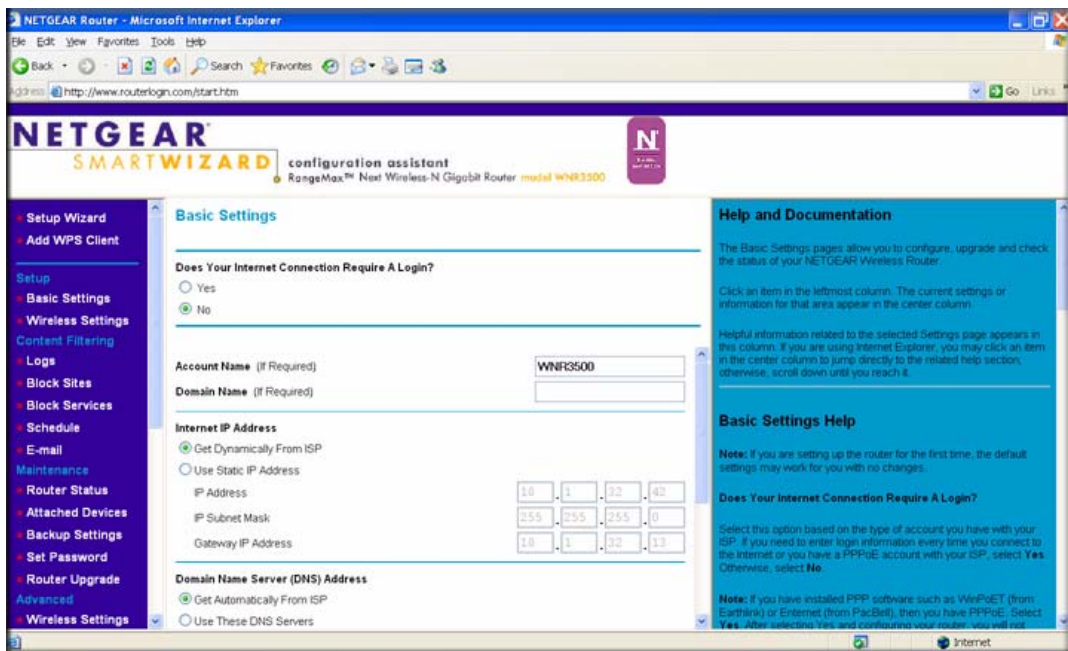


Figure 1-4



Note: If the **Check for New Version Upon Log-in** check box is selected, the home page is the Router Upgrade screen. Otherwise, it is the Basic Settings screen.

If the wireless router is connected to the Internet, you can select **Knowledge Base** or **Documentation** under Web Support in the main menu to view support information or the documentation for the wireless router.

If you do not click **Logout**, the wireless router will wait for 5 minutes after no activity before it automatically logs you out.

Configuring Your Internet Connection Using the Smart Setup Wizard

You can manually configure your Internet connection using the Basic Settings screen, or you can allow the Smart Setup Wizard to determine your Internet Service Provider (ISP) configuration.

The Smart Setup Wizard searches your Internet connection for servers and protocols to determine your ISP configuration. This feature is not the same as the Smart Wizard configuration assistant that appears only when the router is in its factory default state. To use the Smart Setup Wizard to assist with configuration or to verify the Internet connection settings:

1. From the top of the main menu of the browser interface, click **Setup Wizard**.
2. Click **Next** to proceed. Enter your ISP settings, as needed.
3. At the end of the Setup Wizard, click **Test** to verify your Internet connection. If you have trouble connecting to the Internet, see [Chapter 7, “Troubleshooting.”](#)

Viewing and Configuring Basic ISP Settings

Settings related to your Internet service are specified in the Basic Settings screen. To access the Basic Settings screen, from the main menu of the router’s Web Configuration Interface, under Setup, select **Basic Settings**.

The content you see in the Basic Settings screen depends on whether your ISP requires that you log in with a user name and password for Internet access.

- **No login required by ISP.** If no login is required by your ISP, the following settings appear in the Basic Settings screen.

ISP does not require login

Basic Settings

Does Your Internet Connection Require A Login?

☐ Yes

☒ No

Account Name (If Required)

Domain Name (If Required)

Internet IP Address

☒ Get Dynamically From ISP

☐ Use Static IP Address

IP Address

IP Subnet Mask

Gateway IP Address

Domain Name Server (DNS) Address

☒ Get Automatically From ISP

☐ Use These DNS Servers

Primary DNS

Secondary DNS

Router MAC Address

☒ Use Default MAC Address

☐ Use Computer MAC Address

☐ Use This MAC Address

Figure 1-5

- **Account Name** (might also be called Host Name). The account name is provided to the ISP during a DHCP request from your router. In most cases, this setting is not required, but some ISPs require it for access to ISP services such as mail or news servers.
- **Domain Name**. The domain name is provided by your router to computers on your LAN when the computers request DHCP settings from your router. In most cases, this settings is not required.

- **Internet IP Address.** Determines how your router obtains an IP address for Internet access.
 - If your ISP assigns an IP address dynamically (by DHCP), select **Get Dynamically From ISP**.
 - If your ISP has assigned you a permanent, fixed (static) IP address for your computer, select **Use Static IP Address**. Enter the IP address that your ISP assigned. Also, enter the subnet mask and the gateway IP address. The gateway is the ISP's router to which your router will connect.
- **Domain Name Server (DNS) Address.** If you know that your ISP does not automatically transmit DNS addresses to the router during login, select **Use These DNS Servers**, and enter the IP address of your ISP's primary DNS server. If a secondary DNS server address is available, enter it also.



Note: If you enter or change a DNS address, restart the computers on your network so that these settings take effect.

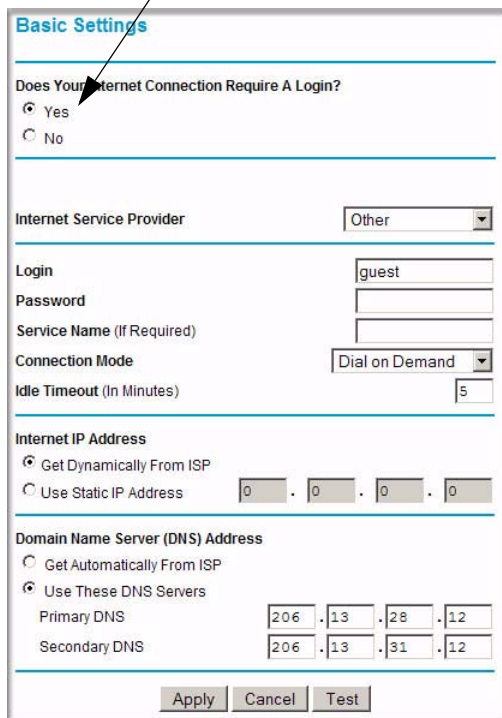
- **Router MAC Address.** This section determines the Ethernet MAC address that the router will use on the Internet port. Typically, you would leave **Use Default Address** selected. However, some ISPs (especially cable modem providers) register the Ethernet MAC address of the network interface card in your computer when your account is first opened. They then accept only traffic from the MAC address of that computer. This feature allows your router to masquerade as that computer by “cloning” or “spoofing” its MAC address. To change the MAC address, select one of the following methods:
 - Select **Use Computer MAC Address**. The router will then capture and use the MAC address of the computer that you are now using. You must be using the one computer that is allowed by the ISP.
 - Select **Use This MAC Address**, and type it in here.
- **Does Your Internet Connection Require A Login?** If you usually must use a login program such as WinPOET to access the Internet, your Internet connection requires a login. After you select **Yes**, the Basic Settings screen displays, as shown in the [Figure 1-6 on page 1-8](#).



Note: After you finish setting up your router, you will no longer need to launch the ISP's login program on your computer to access the Internet. When you start an Internet application, your router will automatically log you in.

If a login is required by your ISP, the following settings appear in the Basic Settings screen:

ISP does require login



Basic Settings

Does Your Internet Connection Require A Login?

☒ Yes

☐ No

Internet Service Provider: Other

Login: guest

Password:

Service Name (If Required):

Connection Mode: Dial on Demand

Idle Timeout (In Minutes): 5

Internet IP Address

☒ Get Dynamically From ISP

☐ Use Static IP Address: 0 . 0 . 0 . 0

Domain Name Server (DNS) Address

☐ Get Automatically From ISP

☒ Use These DNS Servers

Primary DNS: 206 . 13 . 28 . 12

Secondary DNS: 206 . 13 . 31 . 12

Apply Cancel Test

Figure 1-6

- **Internet Service Provider.** This drop-down list contains a few ISPs that need special protocols for connection. The list includes:
 - **PPTP** (Point to Point Tunneling Protocol), used primarily in Austrian DSL services
 - **Telstra Bigpond**, an Australian residential cable modem service



Note: The Telstra Bigpond setting is only for older cable modem service accounts still requiring a Bigpond login utility. Telstra has discontinued this type of account. Those with Telstra DSL accounts and newer cable modem accounts should select **No** for Does Your Internet Connection Require a Login.

- **Other**, which selects PPPoE (Point to Point Protocol over Ethernet), the protocol used by most DSL services worldwide.

Basic Settings

Does Your Internet Connection Require A Login?

☒ Yes
☐ No

Internet Service Provider

Other (selected)
PPTP
Telstra Bigpond
Other

Login
guest

Password

Service Name (If Required)

Idle Timeout (In Minutes)
5

Internet IP Address

☒ Get Dynamically From ISP
☐ Use Static IP Address

Domain Name Server (DNS) Address

☒ Get Automatically From ISP
☐ Use These DNS Servers

Primary DNS

Secondary DNS

Apply Cancel Test

Figure 1-7



Note: Not all ISPs are listed here. The ones on this list have special requirements.

- **Login and Password.** This is the user name and password provided by your ISP. This name and password are used to log in to the ISP server.
- **Service Name.** If your connection is capable of connecting to multiple Internet services, this setting specifies which service to use.

- **Connection Mode.** This drop-down list (shown in [Figure 1-6 on page 1-8](#)) selects when the router will connect to and disconnect from the Internet. The list includes:
 - **Always On.** The router logs in to the Internet immediately after booting and never disconnects.
 - **Dial on Demand.** The router logs in only when outgoing traffic is present and logs out after the idle time-out.
 - **Manually Connect.** The router logs in or logs out only when the user clicks **Connect** or **Disconnect** in the Router Status screen.
- **Idle Timeout.** Your Internet connection is logged out if there is no data transfer during the specified time interval.
- **Domain Name Server (DNS) Address.** If you know that your ISP does not automatically transmit DNS addresses to the router during login, select **Use These DNS Servers**, and enter the IP address of your ISP's primary DNS server. If a secondary DNS server address is available, enter it also.



Note: If you enter or change a DNS address, restart the computers on your network so that these settings take effect.

Chapter 2

Safeguarding Your Network

The RangeMax Wireless-N Gigabit Router WNR3500 provides highly effective security features, which are covered in detail in this chapter.

This chapter includes the following sections:

- [“Choosing Appropriate Wireless Security”](#)
- [“Recording Basic Wireless Settings Setup Information” on page 2-5](#)
- [“Changing Wireless Security Settings” on page 2-6](#)
- [“Viewing Advanced Wireless Settings” on page 2-12](#)
- [“Using Push 'N' Connect \(Wi-Fi Protected Setup\)” on page 2-14](#)
- [“Restricting Wireless Access by MAC Address” on page 2-19](#)
- [“Changing the Administrator Password” on page 2-22](#)
- [“Backing Up Your Configuration” on page 2-23](#)
- [“Understanding Your Firewall” on page 2-23](#)

Choosing Appropriate Wireless Security

Unlike wired networks, wireless networks allow anyone with a compatible adapter to receive your wireless data transmissions well beyond your walls. Operating an unsecured wireless network creates an opportunity for outsiders to eavesdrop on your network traffic or to enter your network to access your computers and files. Indoors, computers can connect over 802.11g/n wireless networks at ranges of up to 300 feet. Such distances can allow for others outside your immediate area to access your network. Use the security features of your wireless equipment that are appropriate to your needs.

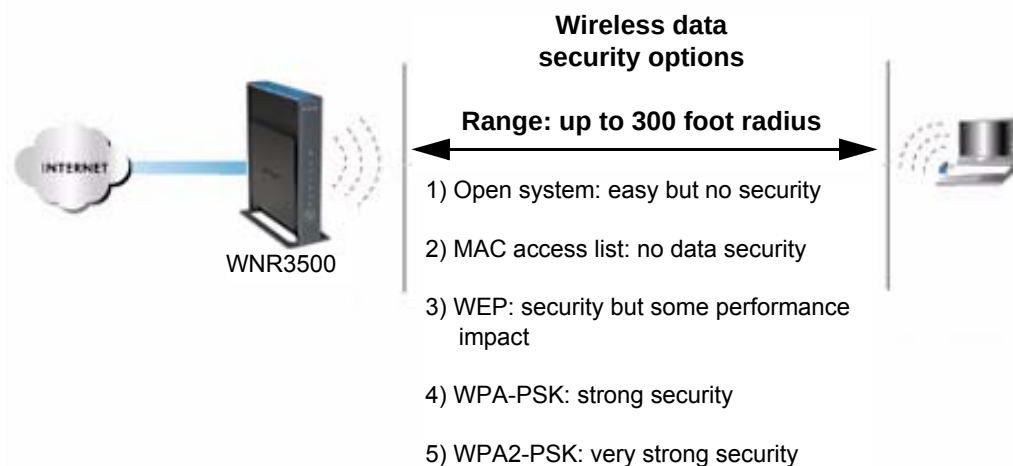
The time it takes to establish a wireless connection can vary depending on both your security settings and router placement.

Stronger security methods can entail a cost in terms of throughput, latency, battery consumption, and equipment compatibility. In choosing an appropriate security level, you can also consider the effort compared to the reward for a hacker to break into your network. As a minimum, however, NETGEAR recommends using WEP with Shared Key authentication. Do not run an unsecured wireless network unless it is your intention to provide free Internet access for the public.

WEP connections can take slightly longer to establish. Also, WEP, WPA-PSK, and WPA2-PSK encryption can consume more battery power on a notebook computer, and can cause significant performance degradation with a slow computer.



Note: NETGEAR recommends that you change the administration password of your router. Default passwords are well known, and an intruder can use your administrator access to read or disable your security settings. For information about how to change the administrator password, see [“Changing the Administrator Password” on page 2-22](#).



Note: Use these with other features that enhance security ([Table 2-2 on page 2-4](#)).

Figure 2-1

To configure the wireless network, you can:

- **Manually specify your SSID and your wireless security settings.** The WNR3500 router provides two screens for configuring the wireless settings: the basic Wireless Settings screen, which you access under Setup in the main menu (see [“Changing Wireless Security Settings” on page 2-6](#)), and the Advanced Wireless Settings screen, which you access under Advanced (see [“Changing Wireless Security Settings” on page 2-6](#)).

- **Use Wi-Fi Protected Setup (WPS) to automatically set the SSID and implement WPA/WPA2 security on both the router and the client device.** If the clients in your network are WPS capable, you can use Wi-Fi Protected Setup (WPS) to automatically set the SSID and implement WPA/WPA2 security on both the router and the client device (see [“Using Push 'N' Connect \(Wi-Fi Protected Setup\)” on page 2-14](#)).

Basic security options are listed in order of increasing effectiveness in [Table 2-1](#). Other features that affect security are listed in [Table 2-2 on page 2-4](#). For more details on wireless security methods, click the link to the online document [“Wireless Networking Basics” in Appendix B](#).

Table 2-1. Wireless Security Options

Security Type	Description
None.	No wireless security. Recommended only for troubleshooting wireless connectivity. Do not run an unsecured wireless network unless it is your intention to provide free Internet access for the public.
WEP. Wired Equivalent Privacy.	Wired Equivalent Privacy (WEP) data encryption provides moderate data security. WEP Shared Key authentication and WEP data encryption can be defeated by a determined eavesdropper using publicly available tools. For more information, see “Configuring WEP Wireless Security” on page 2-9 .
WPA-PSK (TKIP). WPA-PSK standard encryption with TKIP encryption type. WPA2-PSK (AES). Wi-Fi Protected Access version 2 with Pre-Shared Key; WPA2-PSK standard encryption with the AES encryption type. WPA-PSK (TKIP) + WPA2-PSK (AES). Mixed mode.	Wi-Fi Protected Access with Pre-Shared Key (WPA-PSK and WPA2-PSK) data encryption provides extremely strong data security, very effectively blocking eavesdropping. Because WPA and WPA2 are relatively new standards, older wireless adapters and devices might not support them. For more information, see “Configuring WPA-PSK and WPA2-PSK Wireless Security” on page 2-10 .

Table 2-2. Other Features That Enhance Security

Security Type	Description
Disable the wireless router radio.	If you disable the wireless router radio, wireless devices cannot communicate with the router at all. You might disable this when you are away or when other users of your network all use wired connections. For more information, see “Viewing Advanced Wireless Settings” on page 2-12.
Turn off the broadcast of the wireless network name SSID.	If you disable the broadcast of the SSID, only devices that know the correct SSID can connect. This nullifies the wireless network discovery feature of some products such as Windows XP, but your data is still fully exposed to an intruder using available wireless eavesdropping tools. For more information, see “Viewing Advanced Wireless Settings” on page 2-12.
Restrict access based on MAC address.	You can restrict access to only trusted computers so that unknown computers cannot wirelessly connect to the WNR3500 router. MAC address filtering adds an obstacle against unwanted access to your network by the general public, but the data broadcast over the wireless link is fully exposed. This data includes your trusted MAC addresses, which can be read and impersonated by a hacker. For more information, see “Restricting Wireless Access by MAC Address” on page 2-19.
Modify your firewall's rules.	By default, the firewall allows any outbound traffic and prohibits any inbound traffic except for responses to your outbound traffic. However, you can modify the firewall's rules. For more information, see “Understanding Your Firewall” on page 2-23.
Use the Push 'N' Connect feature (Wi-Fi Protected Setup).	Wi-Fi Protected Setup provides easy setup by means of a push button. Older wireless adapters and devices might not support this. Check whether devices are WPS enabled. For more information, see “Using Push 'N' Connect (Wi-Fi Protected Setup)” on page 2-14.

Recording Basic Wireless Settings Setup Information

Before customizing your wireless settings, print this section, and record the following information. If you are working with an existing wireless network, the person who set up or is responsible for the network can provide this information. Otherwise, you must choose the settings for your wireless network. Either way, record the settings for your wireless network in the spaces provided.

- **Wireless Network Name (SSID).** _____ The SSID identifies the wireless network. You can use up to 32 alphanumeric characters. The SSID is case-sensitive. The SSID in the wireless adapter card must match the SSID of the wireless router. In some configuration utilities (such as in Windows XP), the term “wireless network name” is used instead of SSID.
- If **WEP Authentication** is used, circle one: **Open System**, **Shared Key**, or **Auto**.



Note: If you select Shared Key, the other devices in the network will not connect unless they are also set to Shared Key and are configured with the correct key.

- **WEP Encryption Key Size.** Choose one: **64-bit** or **128-bit**. Again, the encryption key size must be the same for the wireless adapters and the wireless router.
- **Data Encryption (WEP) Keys.** There are two methods for creating WEP data encryption keys. Whichever method you use, record the key values in the spaces provided.
 - **Passphrase Method.** _____ These characters *are* case-sensitive. Enter a word or group of printable characters and click Generate. Not all wireless devices support the passphrase method.
 - **Manual Method.** These values *are not* case-sensitive. For 64-bit WEP, enter 10 hexadecimal digits (any combination of 0–9, a–f, or A–F). For 128-bit WEP, enter 26 hexadecimal digits.
 - Key 1: _____
 - Key 2: _____
 - Key 3: _____
 - Key 4: _____
- If WPA-PSK or WPA2-PSK authentication is used:

- **Passphrase.** _____ These characters *are* case-sensitive. Enter a word or group of printable characters. When you use WPA-PSK, the other devices in the network will not connect unless they are also set to WPA-PSK and are configured with the correct passphrase. Similarly, when you use WPA2-PSK, the other devices in the network will not connect unless they are also set to WPA2-PSK and are configured with the correct passphrase.

Use the procedures described in the following sections to specify the WNR3500 router. Store this information in a safe place.

Changing Wireless Security Settings

This section describes the wireless settings that you can view and configure in the Wireless Settings screen, which you access under Setup in the main menu.

Viewing Basic Wireless Settings

To specify the wireless security settings of your router:

1. Log in to the router as described in [“Logging In to Your Wireless Router” on page 1-2](#).
2. Select **Wireless Settings** under Setup in the main menu.

The image shows a web-based configuration interface titled "Wireless Settings". It is divided into two main sections: "Wireless Network" and "Security Options".

Wireless Network

- Name (SSID):** A text input field containing "NETGEAR".
- Region:** A dropdown menu showing "United States".
- Channel:** A dropdown menu showing "6, 10".
- Mode:** A dropdown menu showing "Up to 300Mbps".

Security Options

- ☒ None
- ☐ WEP
- ☐ WPA-PSK [TKIP]
- ☐ WPA2-PSK [AES]
- ☐ WPA-PSK [TKIP] + WPA2-PSK [AES]

At the bottom of the form are two buttons: "Apply" and "Cancel".

Figure 2-2

The available settings in this screen are:

- **Name (SSID).** The SSID is also known as the wireless network name. Enter a value of up to 32 alphanumeric characters. When more than one wireless network is active, different wireless network names provide a way to separate the traffic. For a wireless device to participate in a particular wireless network, it must be configured with the SSID for that network. The WNR3500 default SSID is **NETGEAR**. You can disable this broadcast as described in [“Viewing Advanced Wireless Settings” on page 2-12](#).
- **Region.** This field identifies the region where the WNR3500 router can be used. It might not be legal to operate the wireless features of the wireless router in a region other than one of those identified in this field.



Note: The region selection feature might not be available in all countries.

- **Channel.** This field determines which operating frequency is used. It should not be necessary to change the wireless channel unless you notice interference problems with another nearby wireless network. The wireless router uses channel bonding technology to extend the bandwidth for data transmission. For more information about the wireless channel frequencies, see the online document that you can access from [“Wireless Networking Basics” in Appendix B](#).
- **Mode.** This field determines which data communications protocol is used. You can choose from:
 - **Up To 54 Mbps.** Legacy mode, for compatibility with the slower 802.11b and 802.11g wireless devices.
 - **Up To 145 Mbps.** Neighbor Friendly mode, for reduced interference with neighboring wireless networks. Provides two transmission streams with different data on the same channel at the same time, but also allows 802.11b and 802.11g wireless devices. This is the default mode.
 - **Up To 300 Mbps.** Performance mode, using channel expansion to achieve the 300 Mbps data rate. The WNR3500 router will use the channel you selected as the primary channel and expand to the secondary channel (primary channel +4 or –4) to achieve a 40 MHz frame-by-frame bandwidth. The WNR3500 router will detect channel usage and will disable frame-by-frame expansion if the expansion would result in interference with the data transmission of other access points or clients.



Note: The maximum wireless signal rate is derived from the IEEE Standard 802.11 specifications. Actual data throughput will vary. Network conditions and environmental factors, including volume of network traffic, building materials and construction, and network overhead, lower actual data throughput rate.

- **Security Options.** The selection of wireless security options can significantly affect your network performance. The time it takes to establish a wireless connection can vary depending on both your security settings and router placement.

WEP connections can take slightly longer to establish. Also, WEP, WPA-PSK, and WPA2-PSK encryption can consume more battery power on a notebook computer, and can cause significant performance degradation with a slow computer. Instructions for configuring the security options can be found in [“Choosing Appropriate Wireless Security” on page 2-1](#). A full explanation of wireless security standards is available in the online document that you can access from [“Wireless Networking Basics” in Appendix B](#).

3. Click **Apply** to save your settings.

Configuring WEP Wireless Security

WEP Shared Key authentication and WEP data encryption can be defeated by a determined eavesdropper using publicly available tools.

WEP offers the following options:

- **Open System.** With Open System authentication and 64 or 128 bit WEP data encryption, the WNR3500 router *does* perform data encryption but *does not* perform any authentication. Anyone can join the network. This setting provides very little practical wireless security.
- **Shared Key.** With Shared Key authentication, a wireless device must know the WEP key to join the network. Select the encryption strength (64 or 128 bit data encryption). Manually enter the key values, or enter a word or group of printable characters in the **Passphrase** field. Manually entered keys *are not* case-sensitive, but passphrase characters *are* case-sensitive.

To configure WEP data encryption:



Note: If you use a wireless computer to configure WEP settings, you will be disconnected when you click **Apply**. You must then either configure your wireless adapter to match the wireless router WEP settings or access the wireless router from a wired computer to make any further changes. Not all wireless adapter configuration utilities support passphrase key generation.

1. Select **Wireless Settings** under Setup in the main menu.
2. In the Security Options section, select **WEP**. The WEP options display.

Security Options

☐ None

☒ WEP

☐ WPA-PSK [TKIP]

☐ WPA2-PSK [AES]

☐ WPA-PSK [TKIP] + WPA2-PSK [AES]

Security Encryption (WEP)

Authentication Type:

Encryption Strength:

Security Encryption (WEP) Key

Passphrase:

Key 1: ☒

Key 2: ☐

Key 3: ☐

Key 4: ☐

Figure 2-3

3. Select the authentication type and encryption strength.
4. You can manually or automatically program the four data encryption keys. These values must be identical on all computers and access points in your network.
 - **Automatic.** In the **Passphrase** field, enter a word or group of printable characters, and click **Generate**. The passphrase is case-sensitive. For example, NETGEAR is not the same as nETgear. The four key fields are automatically populated with key values.
 - **Manual.** Enter 10 hexadecimal digits (any combination of 0–9, a–f, or A–F). These entries are not case-sensitive. For example, AA is the same as aa. Select which of the four keys to activate.
5. Click **Apply** to save your settings.

Configuring WPA-PSK and WPA2-PSK Wireless Security

Wi-Fi Protected Access with Pre-Shared Key (WPA-PSK and WPA2-PSK) data encryption provides extremely strong data security, very effectively blocking eavesdropping. Because WPA and WPA2 are relatively new standards, older wireless adapters and devices might not support

them. Check whether newer drivers are available from the manufacturer. Also, you might be able to use the Push 'N' Connect feature to configure this type of security if it is supported by your wireless clients. See [“Using Push 'N' Connect \(Wi-Fi Protected Setup\)” on page 2-14](#).

WPA-Pre-Shared Key *does* perform authentication. WPA-PSK uses TKIP (Temporal Key Integrity Protocol) data encryption, and WPA2-PSK uses AES (Advanced Encryption Standard) data encryption. Both methods dynamically change the encryption keys making them nearly impossible to circumvent.

Mixed mode allows clients using either WPA-PSK (TKIP) or WPA2-PSK (AES). This provides the most reliable security, and is easiest to implement, but it might not be compatible with older adapters.



Note: Not all wireless adapters support WPA. Furthermore, client software is also required. Windows XP with Service Pack 2 does include WPA support. Nevertheless, the wireless adapter hardware and driver must also support WPA. For instructions on configuring wireless computers or PDAs (personal digital assistants) for WPA-PSK security, consult the documentation for the product you are using.

To configure WPA-PSK, WPA2-PSK, or WPA-PSK+WPA2-PSK:

1. Select **Wireless Settings** under Setup in the main menu.
2. Select one of the WPA-PSK or WPA2-PSK options for the security type. The third option (WPA-PSK [TKIP] + WPA2-PSK [AES]) is the most flexible, since it allows clients using either WPA-PSK or WPA2-PSK.
3. In the **Passphrase** field, enter a word or group of 8–63 printable characters. The passphrase is case-sensitive.

Wireless Settings

Wireless Network

Name (SSID):

Region:

Channel:

Mode:

Security Options

☐ None

☐ WEP

☐ WPA-PSK [TKIP]

☐ WPA2-PSK [AES]

☒ WPA-PSK [TKIP] + WPA2-PSK [AES]

Security Options (WPA-PSK + WPA2-PSK)

Passphrase:

(8-63 characters or 64 hexdigits)

Figure 2-4

4. Click **Apply** to save your settings.

Viewing Advanced Wireless Settings

This section describes the wireless settings that you can view and specify in the Advanced Wireless Settings screen, which you access under Advanced in the main menu.

To configure the advanced wireless security settings of your router:

1. Log in to the router as described in [“Logging In to Your Wireless Router”](#) on page 1-2.
2. Select **Wireless Settings** under Advanced in the main menu.

Advanced Wireless Settings

Wireless Router Settings

☒ Enable Wireless Router Radio

☒ Enable SSID Broadcast

Fragmentation Threshold (256 - 2346):

CTS/RTS Threshold (1 - 2347):

Preamble Mode: ▼

WPS Settings

Router's PIN: **70779691**

☐ Disable Router's PIN

☐ Keep Existing Wireless Settings

Wireless Card Access List

Figure 2-5

The available settings in this screen are:

- **Enable Wireless Router Radio.** If you disable the wireless router radio, wireless devices cannot connect to the WNR3500 router. If you will not be using your wireless network for a period of time, you can clear this check box and disable all wireless connectivity.
- **Enable SSID Broadcast.** Clear this check box to disable broadcast of the SSID, so that only devices that know the correct SSID can connect. Disabling SSID broadcast nullifies the wireless network discovery feature of some products such as Windows XP.
- **WPS Settings.** For information about these settings, see the following section, [“Using Push 'N' Connect \(Wi-Fi Protected Setup\)” on page 2-14.](#)
- **Wireless Card Access List.** For information about this list, see [“Restricting Wireless Access by MAC Address” on page 2-19.](#)



Note: The Fragmentation Threshold, CTS/RTS Threshold, and Preamble Mode options are reserved for wireless testing and advanced configuration only. Do not change these settings.

Using Push 'N' Connect (Wi-Fi Protected Setup)

If your wireless clients support Wi-Fi Protected Setup (WPS), you can use this feature to configure the router's network name (SSID) and security settings and, at the same time, connect a wireless client securely and easily to the router. Look for the  symbol on your client device. WPS automatically configures the network name (SSID) and wireless security settings for the router (if the router is in its default state) and broadcasts these settings to the wireless client.



Note: NETGEAR's Push 'N' Connect feature is based on the Wi-Fi Protected Setup (WPS) standard (for more information, see <http://www.wi-fi.org>). All other Wi-Fi-certified and WPS-capable products should be compatible with NETGEAR products that implement Push 'N' Connect.

When you add wireless clients, whether or not they are WPS enabled, the added devices must share the same network name (SSID) and security passphrase. For more information, see [“Connecting Additional Wireless Client Devices after WPS Setup” on page 2-18](#).



Note: If you choose to use WPS, the only security methods supported are WPA-PSK and WPA2-PSK. WEP security is not supported by WPS.

The WNR3500 router provides two methods for connecting to a wireless client that supports WPS, described in the following sections:

- [“Push Button Configuration”](#)
- [“Security PIN Entry” on page 2-16](#)

Push Button Configuration

There are two methods to enable a wireless client to join a network using a push button on the router: using the physical push button or using the software button in the Add WPS Client screen.

Using the Physical Push Button

1. Press the button on the WNR3500 router for over 5 seconds. For information about the WPS button light, see the *NETGEAR Wireless Router Setup Manual*.

The green  button light begins to blink in a regular pattern. While the light is blinking, you have 2 minutes to enable WPS on the client that you are trying to connect to the router.

2. On the wireless client, follow its specific networking instructions to enable WPS, to allow it to connect to the router.

The WNR3500 router's green  button light ceases blinking and remains on when one of these conditions occurs:

- The router and the client establish a wireless connection.
- The 2-minute window period expires for establishing a WPS connection. If the connection is not established, no WPS security settings will be specified in the WNR3500 router.

Using the Software Button in the Add WPS Client Screen

1. Log in to the router as described in [“Logging In to Your Wireless Router”](#) on page 1-2.
2. Select **Add WPS Client** in the main menu, and click **Next**.
3. Select the **Push Button** setup method.

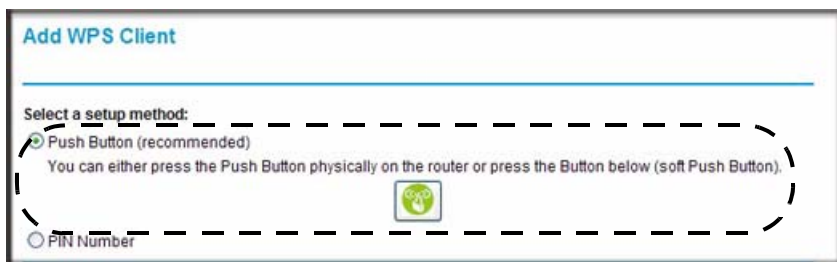


Figure 2-6

4. Click the  button in the Add WPS Client screen. The following screen displays:



Figure 2-7

The green  button light on the WNR3500 router begins to blink in a regular pattern. While the button light is blinking, you have 2 minutes to enable WPS on the device you are trying to connect to the router.

5. In the wireless client, follow its specific networking instructions to enable WPS, to allow it to connect to the router.

The WNR3500 router's green  button light ceases blinking and remains on when one of these conditions occurs:

- The router and the client establish a wireless connection.
- The 2-minute window period expires for establishing a WPS connection. If the connection is not established, no WPS security settings will be specified in the WNR3500 router.

Security PIN Entry

There are two ways to enable a wireless client to join a network using a PIN: using the router's security PIN or using the wireless client's security PIN.

Using the Router's Security PIN

1. Obtain your router's security PIN from the rear panel of the router or from the Advanced Wireless Settings screen.
2. On the wireless client, follow its specific networking instructions to enter the router's security PIN and to establish a wireless connection with the router.

Using the Wireless Client's Security PIN

1. Log in to the router as described in [“Logging In to Your Wireless Router”](#) on page 1-2.
2. Select **Add WPS Client** in the main menu, and click **Next**.
3. Select the **PIN Number** setup method.



Figure 2-8

4. On the wireless client, obtain its security PIN, or follow its specific networking instructions to generate a client security PIN.

5. In the Add WPS Client screen of the WNR3500 router, enter the client security PIN in the **Enter Client's PIN** field.
6. Click **Next**. The following screen displays, and the Smart Wizard initiates the wireless connection:

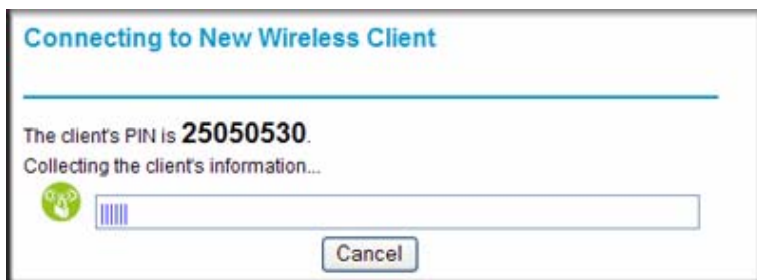


Figure 2-9

Configuring the WPS Settings

1. Log in to the router as described in [“Logging In to Your Wireless Router”](#) on page 1-2.
2. Select **Wireless Settings** under Advanced in the main menu.



Figure 2-10

These options are available under WPS Settings:

- **Router's PIN.** The PIN is displayed so that you can use it to configure the router through WPS (Wi-Fi Protected Setup). It is also displayed on the router's label.
- **Disable Router's PIN.** If the router's PIN is disabled, you cannot configure the router's wireless settings with WPS. However, if your settings are already configured, you can still add WPS-enabled wireless clients. The router might disable the PIN if it detects suspicious attempts to break into your wireless settings; this can happen if the check box is selected. You can enable the PIN by clearing the check box and clicking **Apply**.
- **Keep Existing Wireless Settings.** This check box is automatically selected after WPS is enabled to prevent unwanted settings changes, and is also selected if you have already specified wireless security settings or your SSID without using WPS. When this check box is *not* selected, adding a new wireless client using the push button or the Add WPS Client screen (see [“Push Button Configuration” on page 2-14](#)) changes the router's SSID and security passphrase. You might need to clear it if you are using certain registrars, such as for a Windows Vista PC, to configure the router through WPS.

Connecting Additional Wireless Client Devices after WPS Setup

You can add WPS-enabled and non-WPS-enabled client devices.

Adding Additional WPS-Enabled Clients

To add an additional wireless client device that is WPS enabled:



Note: Your wireless settings do not change when you add an additional WPS-enabled client unless you have cleared the **Keep Existing Wireless Settings** check box (in the Wireless Settings screen). If you do clear the check box, a new SSID and a passphrase are generated, and all existing connected wireless clients are disassociated and disconnected from the router.

1. Follow the procedures in [“Push Button Configuration” on page 2-14](#) or [“Security PIN Entry” on page 2-16](#).
2. For information about how to view a list of all devices connected to your router (including wireless and Ethernet-connected), see [“Viewing a List of Attached Devices” on page 6-6](#).

Adding Additional Non-WPS-Enabled Clients

If you are connecting a combination of WPS-enabled clients and clients that are not WPS enabled, you cannot use the WPS setup procedures to add clients that are not WPS enabled. You need to record and then manually enter your security settings (see [“Recording Basic Wireless Settings Setup Information” on page 2-5](#)).

To connect non-WPS-enabled and WPS-enabled clients to the WNR3500 router:

1. Restore the router to factory default settings (see [“Restoring the Default User Name and Password” on page A-4](#)).
After you restore factory settings, all existing connected wireless clients are disassociated and disconnected from the router.
2. Configure the network name (SSID) and security passphrase of the WNR3500 router (shown in the Wireless Settings screen) as appropriate, and record that information. See [“Viewing Basic Wireless Settings” on page 2-6](#).
3. For the non-WPS-enabled devices that you wish to connect, open the networking utility, and follow the utility’s instructions to enter security settings.
4. For the WPS-enabled devices that you wish to connect, follow the procedures in [“Push Button Configuration” on page 2-14](#) or [“Security PIN Entry” on page 2-16](#).
5. For information about how to view a list of all devices connected to your router (including wireless and Ethernet connected), see [“Viewing a List of Attached Devices” on page 6-6](#).

Restricting Wireless Access by MAC Address

When a Wireless Card Access List is configured and enabled, the router checks the MAC address of any wireless device attempting a connection and allows only connections to computers identified on the trusted computers list.

The Wireless Card Access List displays a list of wireless computers that you allow to connect to the router based on their MAC addresses. These wireless computers must also have the correct SSID and wireless security settings to access the wireless router.

The MAC address is a network device’s unique 12-character physical address, containing the hexadecimal characters 0–9, a–f, or A–F only, and separated by colons (for example, 00:09:AB:CD:EF:01). It can usually be found on the bottom of the wireless card or network interface device. If you do not have access to the physical label, you can display the MAC address

using the network configuration utilities of the computer. In WindowsXP, for example, typing the **ipconfig/all** command in an MSDOS command prompt window displays the MAC address as Physical Address. You might also find the MAC addresses in the router's Attached Devices screen.

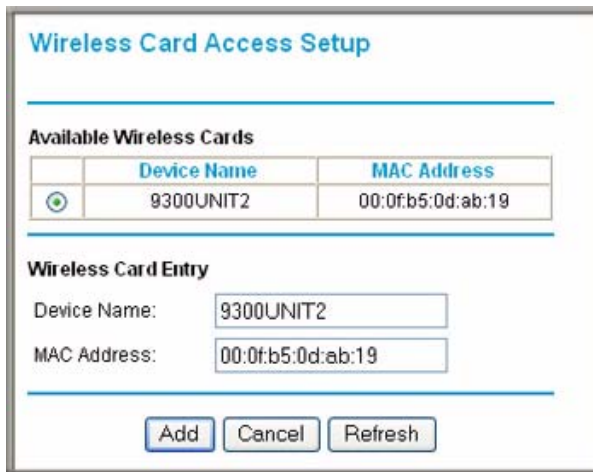
To restrict access based on MAC addresses:

1. Select **Wireless Settings** under Advanced in the main menu.
2. In the Advanced Wireless Settings screen, click **Setup Access List** to display the Wireless Card Access List.



Figure 2-11

3. Click **Add** to add a wireless device to the wireless access control list. The Wireless Card Access Setup screen opens and displays a list of currently active wireless cards and their Ethernet MAC addresses.



The screenshot shows the 'Wireless Card Access Setup' web interface. It has a title bar 'Wireless Card Access Setup'. Below it is a section 'Available Wireless Cards' containing a table with two columns: 'Device Name' and 'MAC Address'. The table has one row with a radio button, '9300UNIT2', and '00:0f:b5:0d:ab:19'. Below this is a 'Wireless Card Entry' section with two input fields: 'Device Name' (containing '9300UNIT2') and 'MAC Address' (containing '00:0f:b5:0d:ab:19'). At the bottom are three buttons: 'Add', 'Cancel', and 'Refresh'.

	Device Name	MAC Address
☐	9300UNIT2	00:0f:b5:0d:ab:19

Wireless Card Entry

Device Name:

MAC Address:

Figure 2-12

- If the computer you want appears in the Available Wireless Cards list, you can select the radio button of that computer to capture its MAC address; otherwise, you can manually enter a name and the MAC address of the authorized computer. You can usually find the MAC address on the bottom of the wireless device.



Tip: You can copy and paste the MAC addresses from the router's Attached Devices screen into the MAC Address field of this screen. To do this, configure each wireless computer to obtain a wireless link to the router. The computer should then appear in the Attached Devices screen.

- Click **Add** to add this wireless device to the Wireless Card Access List. The screen changes back to the list screen.
- Repeat [step 3](#) through [step 5](#) for each additional device you want to add to the list.
- Select the **Turn Access Control On** check box.



Note: When configuring the router from a wireless computer whose MAC address is not in the Trusted PC list, if you select **Turn Access Control On**, you lose your wireless connection when you click **Apply**. You must then access the wireless router from a wired computer or from a wireless computer that is on the access control list to make any further changes.

- Click **Apply** to save your Wireless Card Access List settings.

Now, only devices on this list can wirelessly connect to the WNR3500 router.



Warning: MAC address filtering adds an obstacle against unwanted access to your network by the general public. However, because your trusted MAC addresses appear in your wireless transmissions, an intruder can read them and impersonate them. Do not rely on MAC address filtering alone to secure your network.

Changing the Administrator Password

The default password for the router's Web Configuration Manager is **password**. NETGEAR recommends that you change this password to a more secure password.



Tip: Before changing the router password, back up your configuration settings with the default password of **password**. If you save the settings with a new password, and then you later forget the new password, you will have to reset the router back to the factory defaults, and log in using the default password of **password**. This means you will have to re-enter all the router configuration settings. For information about how to back up your settings, see [“Backing Up and Restoring the Configuration” on page 6-7](#).

To change the administrator password:

1. On the main menu, under Maintenance, select **Set Password** to display the Set Password screen.

Set Password

Old Password

New Password

Repeat New Password

Figure 2-13

2. To change the password, first enter the old password, then enter the new password twice.
3. Click **Apply**.

Backing Up Your Configuration

The configuration settings of the WNR3500 router are stored within the router in a configuration file. You can back up (save) this file and retrieve it later. NETGEAR recommends that you save your configuration file after you complete the configuration. If the router fails or becomes corrupted, or an administrator password is lost, you can easily re-create your configuration by restoring the configuration file.

For instructions on saving and restoring your configuration file, see [“Managing the Configuration File” on page 6-6](#).



Tip: Before saving your configuration file, change the administrator password to the default, **password**. Then change it again after you have saved the configuration file. If you save the file with a new password, and then you later forget the new password, you will have to reset the router back to the factory defaults and log in using the default password of **password**. This means you will have to re-enter all the router configuration settings.

Understanding Your Firewall

Your RangeMax Wireless-N Gigabit Router WNR3500 contains a true firewall to protect your network from attacks and intrusions. A firewall is a device that protects one network from another while allowing communication between the two. Using a process called Stateful Packet Inspection, the firewall analyzes all inbound and outbound traffic to determine whether or not it will be allowed to pass through.

By default, the firewall allows any outbound traffic and prohibits any inbound traffic except for responses to your outbound traffic. However, you can modify the firewall's rules to achieve the following behavior:

- **Blocking sites.** Block access from your network to certain Web locations based on Web addresses and Web address keywords. This feature is described in [“Blocking Access to Internet Sites” on page 3-1](#).

- **Blocking services.** Block the use of certain Internet services by specific computers on your network. This feature is described in [“Blocking Access to Internet Services” on page 3-3](#).
- **Scheduled blocking.** Block sites and services according to a daily schedule. This feature is described in [“Scheduling Blocking” on page 3-5](#).
- **Allow inbound access to your server.** To allow inbound access to resources on your local network (for example, a Web server or remote desktop program), you can open the needed services by configuring port forwarding as described in [“Allowing Inbound Connections to Your Network” on page 5-1](#).
- **Allow certain games and applications to function correctly.** Some games and applications need to allow additional inbound traffic in order to function. Port triggering can dynamically allow additional service connections, as described in [“Allowing Inbound Connections to Your Network” on page 5-1](#). Another feature to solve application conflicts with the firewall is Universal Plug and Play (UPnP), described in [“Using Universal Plug and Play” on page 5-12](#).

Chapter 3

Restricting Access From Your Network

This chapter describes how to use the content filtering and reporting features of the RangeMax Wireless-N Gigabit Router WNR3500 to protect your network. You can find these features by selecting the items under Content Filtering in the main menu of the browser interface.

This chapter includes the following sections:

- [“Content Filtering Overview”](#)
- [“Blocking Access to Internet Sites”](#)
- [“Blocking Access to Internet Services” on page 3-3](#)
- [“Scheduling Blocking” on page 3-5](#)
- [“Viewing Logs of Web Access or Attempted Web Access” on page 3-6](#)
- [“Configuring E-mail Alert and Web Access Log Notifications” on page 3-7](#)
- [“Setting the Time” on page 3-9](#)

Content Filtering Overview

The RangeMax Wireless-N Gigabit Router WNR3500 provides you with Web content filtering options, plus browser activity reporting and instant alerts through e-mail. Parents and network administrators can establish restricted access policies based on time of day, Web addresses, and Web address keywords. You can also block Internet access by applications and services, such as chat rooms or games.

To configure these features of your router, select the items under Content Filtering in the main menu of the browser interface. This chapter describes the screens that display.

Blocking Access to Internet Sites

The WNR3500 router allows you to restrict access based on Web addresses and Web address keywords. Up to 255 entries are supported in the Keyword list.

Keyword application examples:

- If the keyword **XXX** is specified, the URL `www.zzzyyqq.com/xxx.html` is blocked.
- If the keyword **.com** is specified, only websites with other domain suffixes (such as .edu, .org, or .gov) can be viewed.

To block access to Internet sites:

1. Select **Block Sites** under Content Filtering in the main menu. The Block Sites screen displays.

Block Sites

Keyword Blocking

☒ Never
☐ Per Schedule
☐ Always

Type keyword or domain name here.

Add Keyword

Block sites containing these keywords or domain names:

discodanny

Delete Keyword Clear List

☐ Allow Trusted IP Address To Visit Blocked Sites

Trusted IP Address 0 0 0 0

Apply Cancel

Figure 3-1

2. Enable keyword blocking by selecting either **Per Schedule** or **Always**.

To block by schedule, be sure to specify a time period in the Schedule screen. For information about scheduling, see [“Scheduling Blocking” on page 3-5](#).

Block all access to Internet browsing during a scheduled period by entering a dot (.) as the keyword, and then set a schedule in the Schedule screen.

3. Add a keyword or domain by entering it in the keyword field and clicking **Add Keyword**. The keyword or domain name then appears the **Block sites containing these keywords or domain names** list.

Delete a keyword or domain name by selecting it from the list and clicking **Delete Keyword**.

4. You can specify one trusted user, which is a computer that is exempt from blocking and logging. Specify a trusted user by entering that computer's IP address in the **Trusted IP Address** fields.

Since the trusted user is identified by IP address, you should configure that computer with a fixed IP address.

5. Click **Apply** to save all your settings in the Block Sites screen.

Blocking Access to Internet Services

The WNR3500 router allows you to block the use of certain Internet services by computers on your network. This is called service blocking or port filtering. Services are functions performed by server computers at the request of client computers. For example, Web servers serve Web pages, time servers serve time and date information, and game hosts serve data about other players' moves. When a computer on your network sends a request for service to a server computer on the Internet, the requested service is identified by a service or port number. This number appears as the destination port number in the transmitted IP packets. For example, a packet that is sent with destination port number 80 is an HTTP (Web server) request.

To block access to Internet services:

1. Select **Block Services** under Content Filtering in the main menu. The Block Services screen displays.



#	Service Type	Port	IP
---	--------------	------	----

Figure 3-2

2. Enable service blocking by selecting either **Per Schedule** or **Always**, and then click **Apply**.

To block by schedule, be sure to specify a time period in the Schedule screen. For information about scheduling, see [“Scheduling Blocking” on page 3-5](#).

3. Specify a service for blocking by clicking **Add**. The Block Services Setup screen displays.

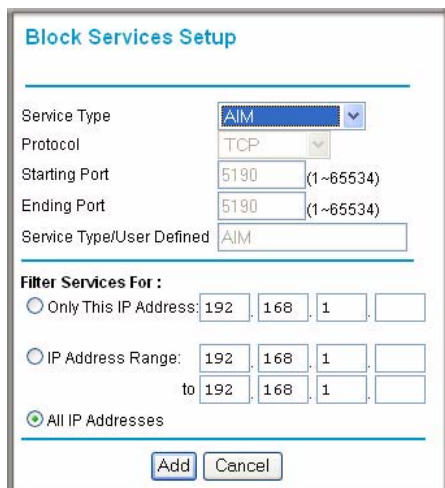


Figure 3-3

4. From the **Service Type** list, select the application or service to be allowed or blocked. The list already displays several common services, but you are not limited to these choices. To add any additional services or applications that do not already appear, select **User Defined**.
5. Select the radio button for the IP address configuration you want to block, and then enter the IP addresses in the appropriate fields.
6. Click **Add** to enable your Block Services Setup selections.

Configuring a User-Defined Service

To define a service, first you must determine which port number or range of numbers is used by the application. The service port numbers for many common protocols are defined by the Internet Engineering Task Force (IETF) and published in RFC1700, “Assigned Numbers.” Service numbers for other applications are typically chosen from the range 1024 to 65535 by the authors of the application. You can often determine port number information by contacting the publisher of the application, by asking user groups or newsgroups, or by searching.

- Enter the starting port and ending port numbers. If the application uses a single port number, enter that number in both fields.
- If you know that the application uses either TCP or UDP, select the appropriate protocol. If you are not sure, select **Both**.

Blocking Services by IP Address Range

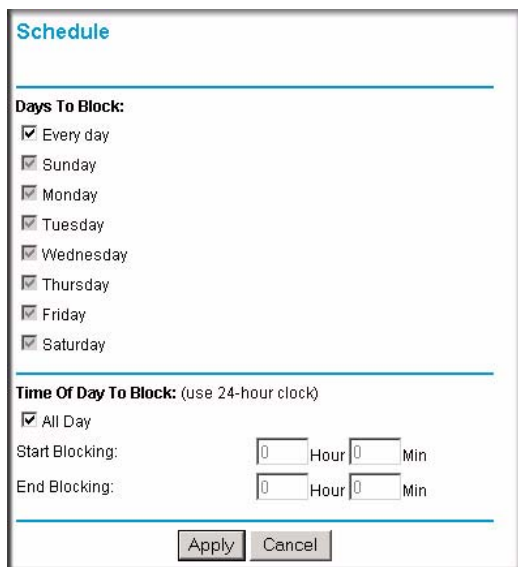
In the Filter Services For area, you can block the specified service for a single computer, a range of computers (having consecutive IP addresses), or all computers on your network.

Scheduling Blocking

The WNR3500 router allows you to specify when blocking is enforced.

To schedule blocking:

1. Select **Schedule** under Content Filtering in the main menu. The Schedule screen displays.



The screenshot shows the 'Schedule' configuration page. It has a title 'Schedule' in blue. Below it is a section 'Days To Block:' with a list of days from Sunday to Saturday, each with a checked checkbox. Another section 'Time Of Day To Block: (use 24-hour clock)' has a checked checkbox for 'All Day'. Below this are two rows for 'Start Blocking:' and 'End Blocking:', each with input fields for 'Hour' and 'Min'. At the bottom are 'Apply' and 'Cancel' buttons.

Figure 3-4

2. Configure the schedule for blocking keywords and services.
 - a. **Days to Block.** Select days on which you want to apply blocking by selecting the appropriate check boxes. Select **Every Day** to select the check boxes for all days. Click **Apply**.
 - b. **Time of Day to Block.** Select a start and end time in 24-hour format. Select **All Day** for 24-hour blocking. Click **Apply**.

Be sure to select your time zone in the E-mail screen as described in [“Setting the Time” on page 3-9](#).

3. Click **Apply** to save your settings.

Viewing Logs of Web Access or Attempted Web Access

The log is a detailed record of the websites you have accessed or attempted to access. Up to 128 entries are stored in the log. Log entries appear only when keyword blocking is enabled and no log entries are made for the trusted user.

Select **Logs** under Content Filtering in the main menu. The Logs screen displays.

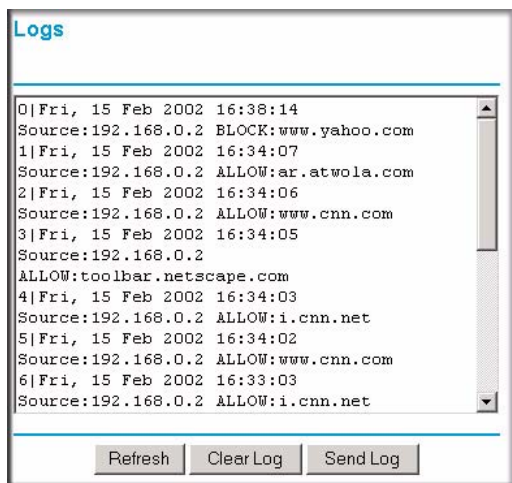


Figure 3-5

Table 3-1 describes the log entries.

Table 3-1. Log Entry Descriptions

Field	Description
Date and time	The date and time the log entry was recorded.
Source IP	The IP address of the initiating device for this log entry.
Target address	The name or IP address of the website or newsgroup visited or to which access was attempted.
Action	Whether the access was blocked or allowed.

To refresh the log screen, click the **Refresh** button.

To clear the log entries, click the **Clear Log** button.

To e-mail the log immediately, click the **Send Log** button.

Configuring E-mail Alert and Web Access Log Notifications

To receive logs and alerts by e-mail, you must provide your e-mail account information.

To configure e-mail alert and web access log notifications:

1. Select **E-mail** under Content Filtering in the main menu. The E-mail screen displays.

The screenshot shows the 'E-mail' configuration page. At the top, there is a checkbox labeled 'Turn E-mail Notification On'. Below this is a section titled 'Send Alerts and Logs Via E-mail'. It contains two text input fields: 'Your Outgoing Mail Server:' and 'Send To This E-mail Address:'. Below these is another checkbox labeled 'My Mail Server requires authentication'. If checked, it would reveal 'User Name' and 'Password' input fields. There is also a checkbox labeled 'Send Alert Immediately' with the text 'When Someone Attempts To Visit A Blocked Site.' below it. A section titled 'Send Logs According to this Schedule' includes a dropdown menu currently set to 'None', and fields for 'Day' and 'Time' (with 'a.m.' and 'p.m.' radio buttons). Below this is a 'Time Zone' section with a dropdown menu set to '(GMT-08:00) Pacific Time (US Canada)' and a checkbox for 'Automatically Adjust for Daylight Savings Time'. At the bottom, it displays 'Current Time: Monday, 24 Dec 2007 15:17:07' and two buttons: 'Apply' and 'Cancel'.

Figure 3-6

2. To receive e-mail logs and alerts from the router, select the **Turn E-mail Notification On** check box.
 - a. Enter the name of your ISP's outgoing (SMTP) mail server (such as **mail.myISP.com**) in the **Your Outgoing Mail Server** field. You might be able to find this information in the configuration screen of your e-mail program. If you leave this field blank, log and alert messages will not be sent by e-mail.
 - b. Enter the e-mail address to which logs and alerts are sent in the **Send To This E-mail Address** field. This e-mail address will also be used as the From address. If you leave this field blank, log and alert messages will not be sent by e-mail.
3. If your e-mail server requires authentication, select the **My Mail Server requires authentication** check box.
 - a. Enter your user name for the e-mail server in the **User Name** field.
 - b. Enter your password for the e-mail server in the **Password** field.

4. You can specify that logs are automatically sent by e-mail with these options:

- **Send alert immediately.** Select this check box for immediate notification of attempted access to a blocked site or service.
- **Send Logs According to this Schedule.** Specifies how often to send the logs: Hourly, Daily, Weekly, or When Full.
 - **Day.** Specifies which day of the week to send the log. Relevant when the log is sent weekly or daily.
 - **Time.** Specifies the time of day to send the log. Relevant when the log is sent daily or weekly.

If you select the Weekly, Daily, or Hourly option and the log fills up before the specified period, the log is automatically e-mailed to the specified e-mail address. After the log is sent, the log is cleared from the router's memory. If the router cannot e-mail the log file, the log buffer might fill up. In this case, the router overwrites the log and discards its contents.

5. Click **Apply** to save your settings.

So that the log entries are correctly time-stamped and sent at the correct time, be sure to set the time as described in the next section.

Setting the Time

The WNR3500 router uses the Network Time Protocol (NTP) to obtain the current time and date from one of several network time servers on the Internet. To localize the time for your log entries, you must specify your time zone:

- **Time Zone.** Select your local time zone. This setting is used for the blocking schedule and for time-stamping log entries.
- **Automatically Adjust for Daylight Savings Time.** Select this check box if your region supports daylight savings time. The router will automatically adjust the time at the start and end of the daylight savings time period.

Chapter 4

Customizing Your Network Settings

This chapter describes how to configure advanced networking features of the RangeMax Wireless-N Gigabit Router WNR3500, including LAN, WAN, and routing settings.

It contains the following sections:

- [“Using the LAN IP Setup Options”](#)
- [“Using a Dynamic DNS Service” on page 4-5](#)
- [“Configuring the WAN Setup Options” on page 4-7](#)
- [“Configuring Static Routes” on page 4-9](#)
- [“Wireless Repeating \(Also Called WDS\)” on page 4-11](#)

Using the LAN IP Setup Options

The LAN Setup screen allows configuration of LAN IP services such as Dynamic Host Configuration Protocol (DHCP) and Routing Information Protocol (RIP).

To configure LAN IP settings, from the main menu of the browser interface, under Advanced, click **LAN Setup**. The following screen displays:

LAN Setup

Device Name: WNR3500

LAN TCP/IP Setup

IP Address: 192 . 168 . 1 . 1

IP Subnet Mask: 255 . 255 . 255 . 0

RIP Direction: None

RIP Version: Disabled

☒ Use Router as DHCP Server

Starting IP Address: 192 . 168 . 1 . 2

Ending IP Address: 192 . 168 . 1 . 254

Address Reservation

#	IP Address	Device Name	Mac Address
---	------------	-------------	-------------

Add Edit Delete

Apply Cancel

Figure 4-1

Configuring a Device Name

The device name is a user-friendly name for the router. This name is shown in the Network on Windows Vista and the Network Explorer on all Windows systems. The **Device Name** field cannot be blank. The default name is WNR3500.

Configuring LAN TCP/IP Setup Parameters

The router is shipped preconfigured to use private IP addresses on the LAN side and to act as a DHCP server. The router's default LAN IP configuration is:

- LAN IP address. **192.168.1.1**
- Subnet mask. **255.255.255.0**

These addresses are part of the designated private address range for use in private networks and should be suitable for most applications. If your network has a requirement to use a different IP addressing scheme, you can make those changes in this screen.

The LAN IP settings are:

- **IP Address.** The LAN IP address of the router.
- **IP Subnet Mask.** The LAN subnet mask of the router. Combined with the IP address, the IP subnet mask allows a device to know which other addresses are local to it, and which must be reached through a gateway or router.
- **RIP Direction.** RIP allows a router to exchange routing information with other routers. The RIP Direction selection controls how the router sends and receives RIP packets. **Both** is the default.
 - When set to **Both** or **Out Only**, the router broadcasts its routing table periodically.
 - When set to **Both** or **In Only**, the router incorporates the RIP information that it receives.
 - When set to **None**, the router does not send any RIP packets and ignores any RIP packets received.
- **RIP Version.** This controls the format and the broadcasting method of the RIP packets sent by the router. (It recognizes both formats when receiving.) The default setting is **RIP-1**.
 - **RIP-1** is universally supported. RIP-1 is usually adequate unless you have an unusual network setup.
 - **RIP-2B** carries more information than RIP-1 and uses subnet broadcasting.
 - **RIP-2M** carries more information than RIP-1 and uses multicasting.



Note: If you change the LAN IP address of the router while connected through the browser, you will be disconnected. You must then open a new connection to the new IP address and log in again.

Using the Router as a DHCP Server

By default, the router functions as a DHCP server, allowing it to assign IP, DNS server, and default gateway addresses to all computers connected to the router's LAN. The assigned default gateway address is the LAN address of the router. The router assigns IP addresses to the attached computers from a pool of addresses specified in this screen. Each pool address is tested before it is assigned to avoid duplicate addresses on the LAN.

For most applications, the default DHCP and TCP/IP settings of the router are satisfactory. Click the link to the online document [“TCP/IP Networking Basics” in Appendix B](#) for an explanation of DHCP and information about how to assign IP addresses for your network.

Specify the pool of IP addresses to be assigned by setting the starting IP address and ending IP address. These addresses should be part of the same IP address subnet as the router's LAN IP address. Using the default addressing scheme, you should define a range between 192.168.1.2 and 192.168.1.254, although you might wish to save part of the range for devices with fixed addresses.

The router delivers the following parameters to any LAN device that requests DHCP:

- An IP address from the range you have defined
- Subnet mask
- Gateway IP address (the router's LAN IP address)
- Primary DNS server (if you entered a primary DNS address in the Basic Settings screen; otherwise, the router's LAN IP address)
- Secondary DNS server (if you entered a secondary DNS address in the Basic Settings screen)

To use another device on your network as the DHCP server, or to manually specify the network settings of all of your computers, clear the **Use Router as DHCP Server** check box. Otherwise, leave it selected. If this service is not selected and no other DHCP server is available on your network, you need to set your computers' IP addresses manually or they will not be able to access the router.

Using Address Reservation

When you specify a reserved IP address for a computer on the LAN, that computer always receives the same IP address each time it accesses the router's DHCP server. Reserved IP addresses should be assigned to computers or servers that require permanent IP settings.

To reserve an IP address:

1. Click **Add**.
2. In the **IP Address** field, type the IP address to assign to the computer or server. (Choose an IP address from the router's LAN subnet, such as **192.168.1.x**.)
3. Type the MAC address of the computer or server.



Tip: If the computer is already present on your network, you can copy its MAC address from the Attached Devices screen and paste it here.

4. Click **Apply** to enter the reserved address into the table.

	Note: The reserved address is not assigned until the next time the computer contacts the router's DHCP server. Reboot the computer or access its IP configuration and force a DHCP release and renew.
---	--

To edit or delete a reserved address entry:

1. Click the button next to the reserved address you want to edit or delete.
2. Click **Edit** or **Delete**.

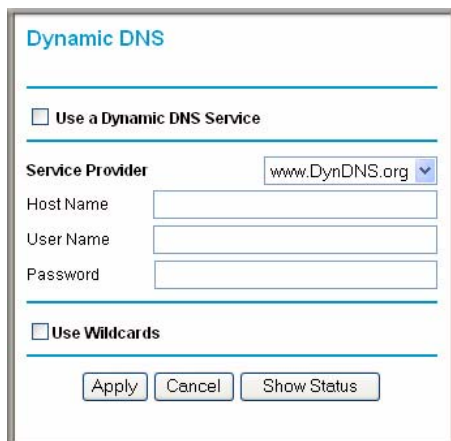
Using a Dynamic DNS Service

If your Internet Service Provider (ISP) gave you a permanently assigned IP address, you can register a domain name and have that name linked with your IP address by public Domain Name Servers (DNS). However, if your Internet account uses a dynamically assigned IP address, you do not know in advance what your IP address will be, and the address can change frequently. In this case, you can use a commercial Dynamic DNS service, which allows you to register your domain to their IP address, and forwards traffic directed at your domain to your frequently changing IP address.

	Note: If your ISP assigns a private WAN IP address (such as 192.168.x.x or 10.x.x.x), the Dynamic DNS service will not work because private addresses are not routed on the Internet.
--	--

Your router contains a client that can connect to the Dynamic DNS service provided by DynDNS.org. You must first visit their website at www.dyndns.org and obtain an account and host name, which you specify in the router. Then, whenever your ISP-assigned IP address changes, your router automatically contacts the Dynamic DNS service provider, logs in to your account, and registers your new IP address. If your host name is hostname, for example, you can reach your router at hostname.dyndns.org.

From the main menu of the browser interface, under Advanced, select **Dynamic DNS** to display the Dynamic DNS screen.



The screenshot shows the 'Dynamic DNS' configuration page. At the top, the title 'Dynamic DNS' is in blue. Below it is a checkbox labeled 'Use a Dynamic DNS Service'. Under this checkbox is a 'Service Provider' dropdown menu currently set to 'www.DynDNS.org'. Below the dropdown are three text input fields labeled 'Host Name', 'User Name', and 'Password'. Further down is another checkbox labeled 'Use Wildcards'. At the bottom of the form are three buttons: 'Apply', 'Cancel', and 'Show Status'.

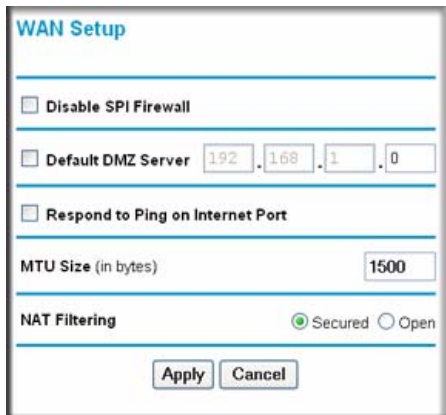
Figure 4-2

To configure Dynamic DNS:

1. Register for an account with one of the Dynamic DNS service providers whose names appear in the **Service Provider** list. For example, for DynDNS.org, select **www.dyndns.org**.
2. Select the **Use a Dynamic DNS Service** check box.
3. Select the name of your Dynamic DNS service provider.
4. Type the host name (or domain name) that your Dynamic DNS service provider gave you.
5. Type the user name for your Dynamic DNS account. This is the name that you use to log in to your account, not your host name.
6. Type the password (or key) for your Dynamic DNS account.
7. If your Dynamic DNS provider allows the use of wildcards in resolving your URL, you can select the **Use Wildcards** check box to activate this feature.
For example, the wildcard feature causes *.yourhost.dyndns.org to be aliased to the same IP address as yourhost.dyndns.org.
8. Click **Apply** to save your configuration.

Configuring the WAN Setup Options

The WAN Setup options let you configure a DMZ (demilitarized zone) server, change the Maximum Transmit Unit (MTU) size, and enable the wireless router to respond to a ping on the WAN (Internet) port. From the main menu of the browser interface, under Advanced, click **WAN Setup** to view the WAN Setup screen.

The screenshot shows the 'WAN Setup' configuration page. It features several settings: a checkbox for 'Disable SPI Firewall' which is unchecked; a 'Default DMZ Server' section with four input fields containing the IP address 192.168.1.0; a checkbox for 'Respond to Ping on Internet Port' which is unchecked; an 'MTU Size (in bytes)' field set to 1500; and a 'NAT Filtering' section with radio buttons for 'Secured' (selected) and 'Open'. At the bottom are 'Apply' and 'Cancel' buttons.

WAN Setup	
☐ Disable SPI Firewall	
☐ Default DMZ Server	192 . 168 . 1 . 0
☐ Respond to Ping on Internet Port	
MTU Size (in bytes)	1500
NAT Filtering	☒ Secured ☐ Open
Apply Cancel	

Figure 4-3

Disabling the SPI Firewall

The Stateful Packet Inspection (SPI) firewall protects your network and computers against attacks and intrusions. A stateful packet firewall carefully inspects incoming traffic packets, looking for known exploits such as malformed, oversized, or out-of-sequence packets. The firewall should be disabled only in special circumstances, such as when you are troubleshooting application issues.

Setting Up a Default DMZ Server

The default DMZ server feature is helpful when you are using some online games and videoconferencing applications that are incompatible with Network Address Translation (NAT). The router is programmed to recognize some of these applications and to work correctly with

them, but there are other applications that might not function well. In some cases, one local computer can run the application correctly if that computer's IP address is entered as the default DMZ server.



Warning: DMZ servers pose a security risk. A computer designated as the default DMZ server loses much of the protection of the firewall, and is exposed to exploits from the Internet. If compromised, the DMZ server computer can be used to attack other computers on your network.

Incoming traffic from the Internet is usually discarded by the router unless the traffic is a response to one of your local computers or a service that you have configured in the Port Forwarding/Port Triggering screen. Instead of discarding this traffic, you can have it forwarded to one computer on your network. This computer is called the default DMZ server.

The WAN Setup screen lets you configure a default DMZ server.

To assign a computer or server to be a default DMZ server:

1. In the last **Default DMZ Server** field, type the last digit of the IP address for that computer. To remove the default DMZ server, enter 0 (zero).
2. Select the **Default DMZ Server** check box, and click **Apply**.

Responding to a Ping on the Internet (WAN) Port

If you want the router to respond to a ping from the Internet, select the **Respond to Ping on Internet Port** check box. This should be used only as a diagnostic tool, since it allows your router to be discovered by Internet scanners. Do not select this check box unless you have a specific reason to do so, such as when troubleshooting your connection.

Setting the MTU Size

The normal MTU value for most Ethernet networks is 1500 bytes, 1492 bytes for PPPoE connections, or 1450 for PPTP connections. For some ISPs, you might need to reduce the MTU size, but this is rarely required and should not be done unless you are sure it is necessary for your ISP connection. For more information, see [“Changing the MTU Size” on page 5-20](#).

To change the MTU size:

1. In the **MTU Size** field, enter a new size between 64 and 1500.
2. Click **Apply** to save the new configuration.

Configuring NAT Filtering

Network Address Translation (NAT) determines how the router processes inbound traffic. Secured NAT provides a secured firewall to protect the computers on the LAN from attacks from the Internet, but might prevent some Internet games, point-to-point applications, or multimedia applications from functioning. Open NAT provides a much less secured firewall, but allows almost all Internet applications to function. For more information about NAT, see [“How Your Computer Accesses a Remote Computer through Your Router” on page 5-2](#).

To change the NAT option:

1. In the NAT Filtering area, select either the **Secured** or the **Open** radio button.
2. Click **Apply** to save the new configuration.

Configuring Static Routes

Static routes provide additional routing information to your router. Under usual circumstances, the router has adequate routing information after it has been configured for Internet access, and you do not need to configure additional static routes. You must configure static routes only for unusual cases such as multiple routers or multiple IP subnets located on your network.

As an example of when a static route is needed, consider the following case:

- Your primary Internet access is through a cable modem to an ISP.
- You have an ISDN router on your home network for connecting to the company where you are employed. This router's address on your LAN is 192.168.1.100.
- Your company's network address is 134.177.0.0.

When you first configured your router, two implicit static routes were created. A default route was created with your ISP as the gateway, and a second static route was created to your local network for all 192.168.1.x addresses. With this configuration, if you attempt to access a device on the 134.177.0.0 network, your router forwards your request to the ISP. The ISP forwards your request to the company where you are employed, and the request is likely to be denied by the company's firewall.

In this case you must define a static route, telling your router that 134.177.0.0 should be accessed through the ISDN router at 192.168.1.100.

In this example:

- The **Destination IP Address** and **IP Subnet Mask** fields specify that this static route applies to all 134.177.x.x addresses.

- The **Gateway IP Address** field specifies that all traffic for these addresses should be forwarded to the ISDN router at 192.168.1.100.
- A **Metric** value of 1 will work since the ISDN router is on the LAN.
- **Private** is selected only as a precautionary security measure in case RIP is activated.

Select **Static Routes** under Advanced in the main menu. The Static Routes screen displays.



Figure 4-4

To add or edit a static route:

1. Click **Add** to expand the Static Routes screen.

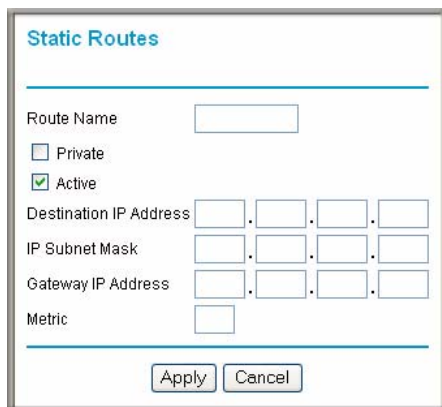


Figure 4-5

2. In the **Route Name** field, type a name for this static route. (This is for identification purposes only.)
3. Select the **Private** check box if you want to limit access to the LAN only. If Private is selected, the static route is not reported in RIP.
4. Select the **Active** check box to make this route effective.

5. Type the IP address of the final destination.
6. Type the IP subnet mask for this destination.
If the destination is a single host, type **255.255.255.255**.
7. Type the gateway IP address, which must be a router on the same LAN segment as the WNR3500 router.
8. Type a number between 1 and 15 as the metric value.
This represents the number of routers between your network and the destination. Usually, a setting of 2 or 3 works, but if this is a direct connection, set it to 1.
9. Click **Apply** to have the static route entered into the table.

Wireless Repeating (Also Called WDS)

The WNR3500 router can be used with a wireless access point (AP) to build large bridged wireless networks. Wireless repeating is a type of Wireless Distribution System (WDS).



Warning: If you use the wireless repeating function, your options for wireless security are limited to None or WEP. For more information about wireless security, see [Chapter 2, “Safeguarding Your Network.”](#)

The following figure shows a wireless repeating scenario:

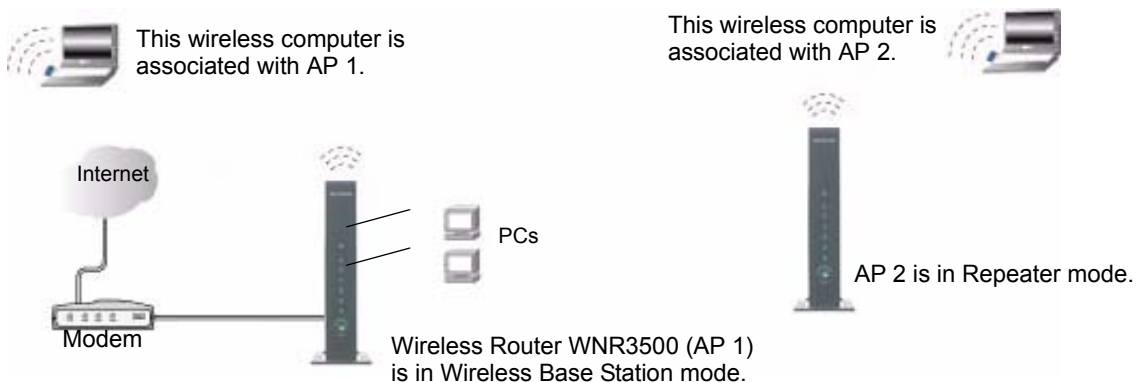


Figure 4-6

In the scenario shown, the following conditions must be met for both APs:

- Both APs must use the same SSID, wireless channel, authentication mode (if any), and encryption mode (see information about WEP in [“Configuring WEP Wireless Security” on page 2-9](#)”).
- Both APs must be on the same LAN IP subnet. That is, all the AP LAN IP addresses are in the same network.
- All LAN devices (wired and wireless computers) must be configured to operate in the same LAN network address range as the APs.
- If you are using DHCP, the **Get Dynamically From ISP Gateway** radio button in the Internet IP Address section of the Basic Settings screen should be selected for all AP devices in the IP Address Source section.

Wireless Repeating Function

You can view or change wireless repeater settings for the wireless router. From the main menu of the browser interface, under Advanced, click **Wireless Repeating Function** to display the Wireless Repeating Function screen.

Wireless Repeating Function

☐ **Enable Wireless Repeating Function**
Wireless MAC of this router: 00:30:AB:66:77:88

☒ **Wireless Repeater**
Repeater IP Address: 192 . 168 . 1 .
☐ Disable Wireless Client Association
Base Station MAC Address:

☐ **Wireless Base Station**
☐ Disable Wireless Client Association
Repeater MAC Address 1:
Repeater MAC Address 2:
Repeater MAC Address 3:
Repeater MAC Address 4:

Figure 4-7

The wireless router supports two modes of the wireless repeating function, and allows you to control wireless client association:

- **Wireless Base Station mode.** The wireless router acts as the parent AP, bridging traffic to and from the child repeater AP, as well as handling wireless and wired local computers. To configure this mode, you must know the MAC addresses of the child repeater AP.
- **Wireless Repeater mode.** The wireless router sends all traffic from its local wireless or wired computers to a remote AP. To configure this mode, you must know the MAC address of the remote parent AP.
- **Disable Wireless Client Association.** Usually this check box is cleared so that the router is an access point for wireless computers.

If this check box is selected, the router communicates wirelessly only with other APs whose MAC addresses are listed in this screen. The router still communicates with wire-connected LAN devices.

Setting Up the Base Station

The wireless repeating function works only in hub and spoke mode. The units cannot be daisy chained. You must know the wireless settings for both units. You must know the MAC address of the remote unit. First, set up the base station, and then set up the repeater.

To set up the base station:

1. Set up both units with exactly the same wireless settings (SSID, mode, channel, and security). Note that the wireless security option must be set to **None** or **WEP**.

- From the main menu of the browser interface on the wireless router base unit, under Advanced, click **Wireless Repeating Function** to display the Wireless Repeating Function screen.

Wireless Repeating Function

☐ **Enable Wireless Repeating Function**
Wireless MAC of this router : 00:30:AB:66:77:88

☒ **Wireless Repeater**
Repeater IP Address: 192 . 168 . 1 .
☐ **Disable Wireless Client Association**
Base Station MAC Address:

☐ **Wireless Base Station**
☐ **Disable Wireless Client Association**
Repeater MAC Address 1:
Repeater MAC Address 2:
Repeater MAC Address 3:
Repeater MAC Address 4:

Apply Cancel

Figure 4-8

- Select the **Enable Wireless Repeating Function** check box and the **Wireless Base Station** radio button.
- Enter the MAC address for the repeater units.
- Click **Apply** to save your changes.

Setting Up a Repeater Unit

Use a wired Ethernet connection to set up the repeater unit to avoid conflicts with the wireless connection to the base station.



Note: If you are using the WNR3500 router base station with a different model wireless router as the repeater, you might need to change additional configuration settings. In particular, you should disable the DHCP server function on the wireless repeater AP.

To configure a WNR3500 router as a repeater unit:

1. If you are using the same model of wireless router for both the base station and repeaters, you must change the LAN IP address for each repeater to a different IP address in the same subnet (see [“Using the LAN IP Setup Options” on page 4-1](#)).



Note: Failing to change the LAN IP address will cause an IP address conflict in the network because the factory default LAN IP is the same for both units.

2. Check the Wireless Settings screen, and verify that the wireless settings match the base unit exactly. The wireless security option must be set to **WEP** or **None**.
3. In the Wireless Repeating Function screen, select the **Enable Wireless Repeater Mode** radio button.

In the **Repeater IP Address field**, the router's IP address is automatically filled in. This IP address must be in the same subnet as the base station but different from the LAN IP of the base station.

4. Fill in the **Base Station MAC Address** field.
5. Click **Apply** to save your changes.
6. Verify connectivity across the LANs.

A computer on any wireless or wired LAN segment of the wireless router should be able to connect to the Internet or share files and printers with any other wireless or wired computer or server connected to the other AP.

Chapter 5

Fine-Tuning Your Network

This chapter describes how to modify the configuration of the RangeMax Wireless-N Gigabit Router WNR3500 to allow specific applications to access the Internet or to be accessed from the Internet, and how to make adjustments to enhance your network's performance.

This chapter includes the following sections:

- [“Allowing Inbound Connections to Your Network”](#)
- [“Configuring Port Forwarding to Local Servers” on page 5-6](#)
- [“Configuring Port Triggering” on page 5-9](#)
- [“Using Universal Plug and Play” on page 5-12](#)
- [“Optimizing Wireless Performance” on page 5-13](#)
- [“Configuring Quality of Service” on page 5-14](#)
- [“Changing the MTU Size” on page 5-20](#)
- [“Optimizing Your Network Bandwidth” on page 5-21](#)
- [“Overview of Home and Small Office Networking Technologies” on page 5-23](#)

Allowing Inbound Connections to Your Network

By default, the WNR3500 router blocks any inbound traffic from the Internet to your computers except for replies to your outbound traffic. However, you might need to create exceptions to this rule for the following purposes:

- To allow remote computers on the Internet to access a server on your local network.
- To allow certain applications and games to work correctly when their replies are not recognized by your router.

Your router provides two features for creating these exceptions: port forwarding and port triggering. This section explains how a normal outbound connection works, followed by two examples explaining how port forwarding and port triggering operate and how they differ.

How Your Computer Accesses a Remote Computer through Your Router

When a computer on your network needs to access a computer on the Internet, your computer sends your router a message containing source and destination address and process information. Before forwarding your message to the remote computer, your router must modify the source information and must create and track the communication session so that replies can be routed back to your computer.

Here is an example of normal outbound traffic and the resulting inbound responses:

1. You open Internet Explorer, beginning a browser session on your computer. Invisible to you, your operating system assigns a service number (port number) to every communication process running on your computer. In this example, let's say Windows assigns port number 5678 to this browser session.
2. You ask your browser to get a Web page from the Web server at www.example.com. Your computer composes a Web page request message with the following address and port information:
 - The source address is your computer's IP address.
 - The source port number is 5678, the browser session.
 - The destination address is the IP address of www.example.com, which your computer finds by asking a DNS server.
 - The destination port number is 80, the standard port number for a Web server process.

Your computer then sends this request message to your router.

3. Your router creates an entry in its internal session table describing this communication session between your computer and the Web server at www.example.com. Before sending the Web page request message to www.example.com, your router stores the original information and then modifies the source information in the request message, performing Network Address Translation (NAT):
 - The source address is replaced with your router's public IP address. This is necessary because your computer uses a private IP address that is not globally unique and cannot be used on the Internet.
 - The source port number is changed to a number chosen by the router, such as 33333. This is necessary because two computers could independently be using the same session number.

Your router then sends this request message through the Internet to the Web server at www.example.com.

4. The Web server at www.example.com composes a return message with the requested Web page data. The return message contains the following address and port information:
 - The source address is the IP address of www.example.com.
 - The source port number is 80, the standard port number for a Web server process.
 - The destination address is the public IP address of your router.
 - The destination port number is 33333.

The Web server then sends this reply message to your router.

5. Upon receiving the incoming message, your router checks its session table to determine whether there is an active session for port number 33333. Finding an active session, the router then modifies the message, restoring the original address information replaced by NAT. The message now contains the following address and port information:
 - The source address is the IP address of www.example.com.
 - The source port number is 80, the standard port number for a Web server process.
 - The destination address is your computer's IP address.
 - The destination port number is 5678, the browser session that made the initial request.

Your router then sends this reply message to your computer, which displays the Web page from www.example.com.

6. When you finish your browser session, your router eventually senses a period of inactivity in the communications. Your router then removes the session information from its session table, and incoming traffic is no longer accepted on port number 33333.

How Port Triggering Changes the Communication Process

In the preceding example, requests are sent to a remote computer by your router from a particular service port number, and replies from the remote computer to your router are directed to that port number. If the remote server sends a reply back to a different port number, your router will not recognize it and will discard it. However, some application servers (such as FTP and IRC servers) send replies back to multiple port numbers. Using the port triggering function of your router, you can tell the router to open additional incoming ports when a particular outgoing port originates a session.

An example is Internet Relay Chat (IRC). Your computer connects to an IRC server at destination port 6667. The IRC server not only responds to your originating source port, but also sends an “identify” message to your computer on port 113. Using port triggering, you can tell the router,

“When you initiate a session with destination port 6667, you must also allow incoming traffic on port 113 to reach the originating computer.” Using steps similar to the preceding example, the following sequence shows the effects of the port triggering rule you have defined:

1. You open an IRC client program, beginning a chat session on your computer.
2. Your IRC client composes a request message to an IRC server using a destination port number of 6667, the standard port number for an IRC server process. Your computer then sends this request message to your router.
3. Your router creates an entry in its internal session table describing this communication session between your computer and the IRC server. Your router stores the original information, performs Network Address Translation (NAT) on the source address and port, and sends this request message through the Internet to the IRC server.
4. Noting your port triggering rule, and having observed the destination port number of 6667, your router creates an additional session entry to send any incoming port 113 traffic to your computer.
5. The IRC server sends a return message to your router using the NAT-assigned source port (as in the previous example, let's say port 33333) as the destination port. The IRC server also sends an “identify” message to your router with destination port 113.
6. Upon receiving the incoming message to destination port 33333, your router checks its session table to determine whether there is an active session for port number 33333. Finding an active session, the router restores the original address information replaced by NAT and sends this reply message to your computer.
7. Upon receiving the incoming message to destination port 113, your router checks its session table and learns that there is an active session for port 113, associated with your computer. The router replaces the message's destination IP address with your computer's IP address and forwards the message to your computer.
8. When you finish your chat session, your router eventually senses a period of inactivity in the communications. The router then removes the session information from its session table, and incoming traffic is no longer accepted on port numbers 33333 or 113.

To configure port triggering, you need to know which inbound ports the application needs. Also, you need to know the number of the outbound port that will trigger the opening of the inbound ports. You can usually determine this information by contacting the publisher of the application, or user groups or newsgroups.



Note: Only one computer at a time can use the triggered application.

How Port Forwarding Changes the Communication Process

In both of the preceding examples, your computer initiates an application session with a server computer on the Internet. However, you might need to allow a client computer on the Internet to initiate a connection to a server computer on your network. Normally, your router ignores any inbound traffic that is not a response to your own outbound traffic. You can configure exceptions to this default rule by using the port forwarding feature.

A typical application of port forwarding can be shown by reversing the client-server relationship from our previous Web server example. In this case, a remote computer's browser needs to access a Web server running on a computer in your local network. Using port forwarding, you can tell the router, "When you receive incoming traffic on port 80 (the standard port number for a Web server process), forward it to the local computer at 192.168.1.123." The following sequence shows the effects of the port forwarding rule you have defined:

1. The user of a remote computer opens Internet Explorer and requests a Web page from www.example.com, which resolves to the public IP address of your router. The remote computer composes a Web page request message with the following destination information:
 - The destination address is the IP address of www.example.com, which is the address of your router.
 - The destination port number is 80, the standard port number for a Web server process.

The remote computer then sends this request message through the Internet to your router.

2. Your router receives the request message and looks in its rules table for any rules covering the disposition of incoming port 80 traffic. Your port forwarding rule specifies that incoming port 80 traffic should be forwarded to local IP address 192.168.1.123. Therefore, your router modifies the destination information in the request message:

The destination address is replaced with 192.168.1.123.

Your router then sends this request message to your local network.

3. Your Web server at 192.168.1.123 receives the request and composes a return message with the requested Web page data. Your Web server then sends this reply message to your router.
4. Your router performs Network Address Translation (NAT) on the source IP address, and sends this request message through the Internet to the remote computer, which displays the Web page from www.example.com.

To configure port forwarding, you need to know which inbound ports the application needs. You usually can determine this information by contacting the publisher of the application or user groups or newsgroups.

How Port Forwarding Differs from Port Triggering

The following points summarize the differences between port forwarding and port triggering:

- Port triggering can be used by any computer on your network, although only one computer can use it at a time.
- Port forwarding is configured for a single computer on your network.
- Port triggering does not need to know the computer's IP address in advance. The IP address is captured automatically.
- Port forwarding requires that you specify the computer's IP address during configuration, and the IP address must never change.
- Port triggering requires specific outbound traffic to open the inbound ports, and the triggered ports are closed after a period of no activity.
- Port forwarding is always active and does not need to be triggered.

Configuring Port Forwarding to Local Servers

Using the port forwarding feature, you can allow certain types of incoming traffic to reach servers on your local network. For example, you might make a local Web server, FTP server, or game server visible and available to the Internet.

Use the Port Forwarding screen to configure the router to forward specific incoming protocols to computers on your local network. In addition to servers for specific applications, you can also specify a default DMZ server to which all other incoming protocols are forwarded. The DMZ server is configured in the WAN Setup screen, as discussed in [“Setting Up a Default DMZ Server” on page 4-7](#).

Before starting, you need to determine which type of service, application, or game you will provide, and the local IP address of the computer that will provide the service. Be sure the computer's IP address never changes.



Tip: To ensure that your server computer always has the same IP address, use the reserved IP address feature of your WNR3500 router. See [“Using Address Reservation” on page 4-4](#) for instructions on how to use reserved IP addresses.

To configure port forwarding to a local server:

1. Select **Port Forwarding/Port Triggering** under Advanced in the main menu.

Port Forwarding / Port Triggering

Please select the service type

☒ Port Forwarding
☐ Port Triggering

Service Name: Age-of-Empire (dropdown)
Server IP Address: 192, 168, 1, [] (Add button)

#	Service Name	Start Port	End Port	Server IP Address
---	--------------	------------	----------	-------------------

Edit Service Delete Service Add Custom Service

Figure 5-1

2. From the **Service Name** list, select the service or game that you will host on your network. If the service does not appear in the list, see the following section, [“Adding a Custom Service.”](#)
3. In the corresponding **Server IP Address** box, enter the last digit of the IP address of your local computer that will provide this service.
4. Click **Add**. The service appears in the list in the screen.

Adding a Custom Service

To define a service, game, or application that does not appear in the Service Name list, you must first determine which port number or range of numbers is used by the application. You can usually determine this information by contacting the publisher of the application or user groups or newsgroups. When you have the port number information, follow these steps:

1. Select **Port Forwarding/Port Triggering** under Advanced in the main menu.

2. Click **Add Custom Service**.

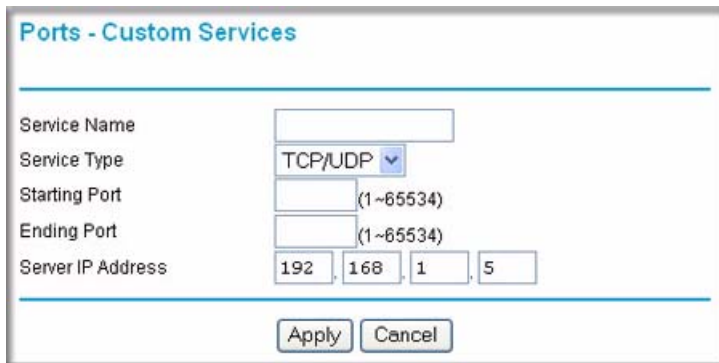


Figure 5-2

3. In the **Service Name** field, enter a descriptive name.
4. In the **Service Type** field, select the protocol. If you are unsure, select **TCP/UDP**.
5. In the **Starting Port** field, enter the beginning port number.
 - If the application uses only a single port, enter the same port number in the **Ending Port** field.
 - If the application uses a range of ports, enter the ending port number of the range in the **Ending Port** field.
6. In the **Server IP Address** field, enter the IP address of your local computer that will provide this service.
7. Click **Apply**. The service appears in the list in the Port Forwarding/Port Triggering screen.

Editing or Deleting a Port Forwarding Entry

To edit or delete a port forwarding entry:

1. In the table, select the button next to the service name.
2. Click **Edit Service** or **Delete Service**.

Application Example: Making a Local Web Server Public

If you host a Web server on your local network, you can use port forwarding to allow Web requests from anyone on the Internet to reach your Web server.

To make a local Web server public:

1. Assign your Web server either a fixed IP address or a dynamic IP address using DHCP address reservation, as explained in [“Using Address Reservation” on page 4-4](#). In this example, your router will always give your Web server an IP address of 192.168.1.33.
2. In the Port Forwarding screen, configure the router to forward the HTTP service to the local address of your Web server at **192.168.1.33**.
HTTP (port 80) is the standard protocol for Web servers.
3. (Optional) Register a host name with a Dynamic DNS service, and configure your router to use the name as described in [“Using a Dynamic DNS Service” on page 4-5](#).
To access your Web server from the Internet, a remote user must know the IP address that has been assigned by your ISP. However, if you use a Dynamic DNS service, the remote user can reach your server by a user-friendly Internet name, such as mynetgear.dyndns.org.

Configuring Port Triggering

Port triggering is a dynamic extension of port forwarding that is useful in these cases:

- More than one local computer needs port forwarding for the same application (but not simultaneously).
- An application needs to open incoming ports that are different from the outgoing port.

When port triggering is enabled, the router monitors outbound traffic looking for a specified outbound “trigger” port. When the router detects outbound traffic on that port, it remembers the IP address of the local computer that sent the data. The router then temporarily opens the specified incoming port or ports, and forwards incoming traffic on the triggered ports to the triggering computer.

While port forwarding creates a static mapping of a port number or range to a single local computer, port triggering can dynamically open ports to any computer that needs them and can close the ports when they are no longer needed.



Note: If you use applications such as multiplayer gaming, peer-to-peer connections, real-time communications such as instant messaging, or remote assistance (a feature in Windows XP), you should also enable Universal Plug and Play (UPnP) according to the instructions in [“Using Universal Plug and Play” on page 5-12](#).

To configure port triggering, you need to know which inbound ports the application needs. Also, you need to know the number of the outbound port that will trigger the opening of the inbound ports. You can usually determine this information by contacting the publisher of the application or user groups or newsgroups.

To set up port triggering:

1. Select **Port Forwarding/Port Triggering** under Advanced in the main menu. The Forwarding/Port Triggering screen displays.
2. Select the **Port Triggering** radio button. The port triggering information displays.

Port Forwarding / Port Triggering

Please select the service type

☐ Port Forwarding

☒ Port Triggering

☐ Disable Port Triggering

Port Triggering Timeout (in minutes)

Port Triggering Portmap Table

	#	Enable	Service Name	Service Type	Inbound Connection	Service User
☐	1	☒	dialpad_1	TCP:51200	TCP/UDP:51200	ANY
☐	2	☒	dialpad_2	TCP:51201	TCP/UDP:51201	ANY
☐	3	☒	paltalk_1	TCP:2090	TCP/UDP:2090	ANY
☐	4	☒	paltalk_2	TCP:2091	TCP/UDP:2091	ANY
☐	5	☒	quicktime	TCP:554	TCP/UDP:6970..6990	ANY
☐	6	☒	starcraft	TCP:6112	TCP/UDP:6112	ANY

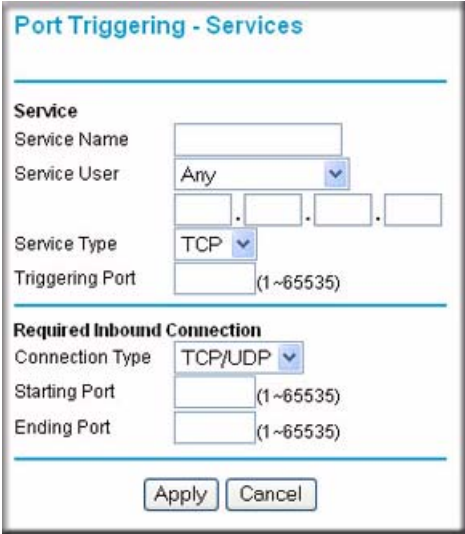
Figure 5-3

3. Clear the **Disable Port Triggering** check box.



Note: If the Disable Port Triggering check box is selected after you configure port triggering, port triggering is disabled. However, any port triggering configuration information you added to the router is retained even though it is not used.

4. In the **Port Triggering Timeout** field, enter a value up to 9999 minutes. This value controls the inactivity timer for the designated inbound ports. The inbound ports close when the inactivity time expires. This is required because the router cannot be sure when the application has terminated.
5. Click **Add Service**.



The screenshot shows the 'Port Triggering - Services' configuration window. It has a title bar with the text 'Port Triggering - Services'. Below the title bar, there are two main sections. The first section is labeled 'Service' and contains the following fields: 'Service Name' (a text input field), 'Service User' (a dropdown menu with 'Any' selected), 'Service Type' (a dropdown menu with 'TCP' selected), and 'Triggering Port' (a text input field with a range indicator '(1~65535)'). The second section is labeled 'Required Inbound Connection' and contains the following fields: 'Connection Type' (a dropdown menu with 'TCP/UDP' selected), 'Starting Port' (a text input field with a range indicator '(1~65535)'), and 'Ending Port' (a text input field with a range indicator '(1~65535)'). At the bottom of the window, there are two buttons: 'Apply' and 'Cancel'.

Figure 5-4

6. In the **Service Name** field, type a descriptive service name.
7. In the **Service User** field, select **Any** (the default) to allow this service to be used by any computer on the Internet. Otherwise, select **Single address**, and enter the IP address of one computer to restrict the service to a particular computer.
8. Select the service type, either **TCP** or **UDP** or both (**TCP/UDP**). If you are not sure, select TCP/UDP.
9. In the **Triggering Port** field, enter the number of the outbound traffic port that will cause the inbound ports to be opened.
10. Enter the inbound connection port information in the **Connection Type**, **Starting Port**, and **Ending Port** fields.
11. Click **Apply**. The service appears in the Port Triggering Portmap table.

Using Universal Plug and Play

Universal Plug and Play (UPnP) helps devices, such as Internet appliances and computers, to access the network and connect to other devices as needed. UPnP devices can automatically discover the services from other registered UPnP devices on the network.



Note: If you use applications such as multiplayer gaming, peer-to-peer connections, real-time communications such as instant messaging, or remote assistance (a feature in Windows XP), you should enable UPnP.

To turn on Universal Plug and Play:

1. From the main menu of the browser interface, under Advanced, click **UPnP**. The UPnP screen displays.

Active	Protocol	Int. Port	Ext. Port	IP Address
Yes	TCP	9198	11913	192.168.0.2
Yes	UDP	5339	7102	192.168.0.2

Figure 5-5

2. The available settings and displays in this screen are:
 - **Turn UPnP On.** UPnP can be enabled or disabled for automatic device configuration. The default setting for UPnP is disabled. If this check box is not selected, the router does not allow any device to automatically control the resources, such as port forwarding (mapping) of the router.

- **Advertisement Period.** The advertisement period is how often the router broadcasts its UPnP information. This value can range from 1 to 1440 minutes. The default period is 30 minutes. Shorter durations ensure that control points have current device status at the expense of additional network traffic. Longer durations might compromise the freshness of the device status but can significantly reduce network traffic.
- **Advertisement Time To Live.** The time to live for the advertisement is measured in hops (steps) for each UPnP packet sent. The time to live hop count is the number of steps a broadcast packet is allowed to propagate for each UPnP advertisement before it disappears. The number of hops can range from 1 to 255. The default value for the advertisement time to live is 4 hops, which should be fine for most home networks. If you notice that some devices are not being updated or reached correctly, then it might be necessary to increase this value.
- **UPnP Portmap Table.** The UPnP Portmap Table displays the IP address of each UPnP device that is currently accessing the router and which ports (Internal and External) that device has opened. The UPnP Portmap Table also displays what type of port is open and whether that port is still active for each IP address.

3. Click **Apply** to save your settings.

Optimizing Wireless Performance

The speed and operating distance or range of your wireless connection can vary significantly based on the physical placement of the wireless router. You should choose a location for your router that will maximize the network speed.



Note: Failure to follow these guidelines can result in significant performance degradation or inability to wirelessly connect to the router. For complete range and performance specifications, click the link to the online document [“Wireless Networking Basics” in Appendix B.](#)

The following list describes how to optimize wireless router performance.

- **Identify critical wireless links.**
If your network has several wireless devices, decide which wireless devices need the highest data rate, and locate the router near them. Many wireless products have automatic data-rate fallback, which allows increased distances without loss of connectivity. This also means that devices that are farther away might be slower. Therefore, the most critical links in your network are those where the traffic is high and the distances are great. Optimize those first.

- **Choose placement carefully.**

For best results, place your router:

- Near the center of the area in which your computers will operate.
- In an elevated location such as a high shelf where the wirelessly connected computers have line-of-sight access (even if through walls).
- Avoid obstacles to wireless signals.
- Keep wireless devices at least 2 feet from large metal fixtures such as file cabinets, refrigerators, pipes, metal ceilings, reinforced concrete, and metal partitions.
- Keep away from large amounts of water such as fish tanks and water coolers.

- **Reduce interference.**

- Avoid windows unless communicating between buildings.
- Place wireless devices away from various electromagnetic noise sources, especially those in the 2400–2500 MHz frequency band. Common noise-creating sources are:
 - Computers and fax machines (no closer than 1 foot)
 - Copying machines, elevators, and cell phones (no closer than 6 feet)
 - Microwave ovens (no closer than 10 feet)

- **Choose your settings.**

- Use a scanning utility to determine what other wireless networks are operating nearby, and choose an unused channel.
 - Turn off SSID broadcast, and change the default SSID. Other nearby devices might automatically try to connect to your network several times a second, which can cause significant performance reduction.
- Use WMM to improve the performance of voice and video traffic over the wireless link.

Configuring Quality of Service

Quality of Service (QoS) is an advanced feature that can be used to prioritize some types of traffic ahead of others. The WNR3500 router can provide QoS prioritization over the wireless link and on the Internet connection. To configure QoS, use the QoS Setup screen.

From the main menu of the browser interface, under Advanced, select **QoS Setup**. The QoS Setup screen displays:

	#	QoS Policy	Priority	Description
☐	1	MSN Messenger	High	MSN Messenger application
☐	2	Skype	Highest	Skype application
☐	3	Yahoo Messenger	High	Yahoo Messenger application
☐	4	IP Phone	Highest	IP Phone application
☐	5	Vonage IP Phone	Highest	Vonage IP Phone application
☐	6	NetMeeting	High	NetMeeting application
☐	7	AIM	High	AIM application
☐	8	Google Talk	Highest	Google Talk application
☐	9	Counter Strike	High	On-line gaming Counter Strike
☐	10	Ages of Empires	High	On-line gaming Age of Empires
☐	11	Diablo II	High	On-line gaming Diablo II
☐	12	Everquest	High	On-line gaming Everquest
☐	13	Half Life	High	On-line gaming Half Life
☐	14	Quake 2	High	On-line gaming Quake 2
☐	15	Quake 3	High	On-line gaming Quake 3
☐	16	Unreal Tourment	High	On-line gaming Unreal Tourment
☐	17	Warcraft	High	On-line gaming Warcraft
☐	18	Return to Castle Wolfenstein	High	On-line gaming Return to Castle Wolfenstein

Figure 5-6

Using WMM QoS for Wireless Multimedia Applications

The WNR3500 router supports Wi-Fi Multimedia Quality of Service (WMM QoS) to prioritize wireless voice and video traffic over the wireless link. WMM QoS provides prioritization of wireless data packets from different applications based on four access categories: voice, video, best effort, and background. For an application to receive the benefits of WMM QoS, both it and the client running that application must be WMM enabled. Legacy applications that do not support WMM, and applications that do not require QoS, are assigned to the best effort category, which receives a lower priority than voice and video.

WMM QoS is enabled by default. You can disable it in the QoS Setup screen, shown in [Figure 5-6 on page 5-15](#), by clearing the **Enable WMM** check box and clicking **Apply**.

Configuring QoS for Internet Access

You can give prioritized Internet access to the following types of traffic:

- For specific applications
- For specific online games
- On individual Ethernet LAN ports of the router
- From a specific device by MAC address

To specify prioritization of traffic, you must create a policy for the type of traffic and add the policy to the QoS Policy table in the QoS Setup screen. For convenience, the QoS Policy table lists many common applications and online games that can benefit from QoS handling.

QoS for Applications and Online Gaming

To create a QoS policy for applications and online games:

1. From the main menu, under Advanced, select **QoS Setup**. The QoS Setup screen displays, as shown in [Figure 5-6 on page 5-15](#).
2. Click **Add Priority Rule**. The QoS - Priority Rules screen displays.

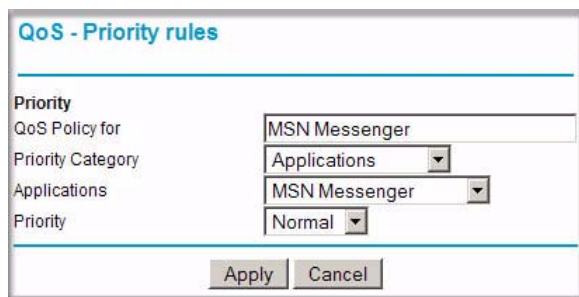


Figure 5-7

3. In the **Priority Category** list, select either **Applications** or **Online Gaming**. In either case, a list of predefined applications or games displays in the **Applications** drop-down list.
4. From the **Applications** list, you can select an existing item, or you can scroll to the bottom of the list and select **Add a New Application** or **Add a New Game**.

- a. If you chose to add a new entry, the screen expands as shown:

QoS - Priority rules

QoS Policy for

Priority Category

Applications

Priority

Specified port range

Connection Type

Starting Port (1~65535)

Ending Port (1~65535)

Figure 5-8

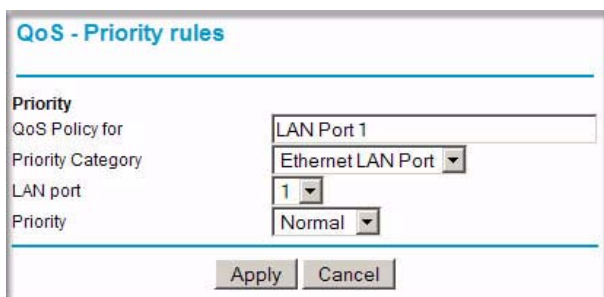
- b. In the **QoS Policy for** field, enter a descriptive name for the new application or game.
- c. Select the packet type, either **TCP**, **UDP**, or both (**TCP/UDP**), and specify the port number or range of port numbers used by the application or game.
5. From the **Priority** drop-down list, select the priority that this traffic should receive relative to other applications and traffic when accessing the Internet. The options are Low, Normal, High, and Highest.
6. Click **Apply** to save this rule to the QoS Policy list and return to the QoS Setup screen.
7. In the QoS Setup screen, select the **Turn Internet Access QoS On** check box.
8. Click **Apply**.

QoS for a Router LAN Port

To create a QoS policy for a device connected to one of the router's LAN ports:

1. From the main menu, under Advanced, select **QoS Setup**. The QoS Setup screen displays, as shown in [Figure 5-6 on page 5-15](#).
2. Click **Add Priority Rule**.

- From the **Priority Category** list, select **Ethernet LAN Port**. The QoS - Priority Rules screen changes:



QoS - Priority rules

Priority

QoS Policy for LAN Port 1

Priority Category Ethernet LAN Port

LAN port 1

Priority Normal

Apply Cancel

Figure 5-9

- From the **LAN port** list, select the LAN port that will have a QoS policy.
- From the **Priority** drop-down list, select the priority that this port's traffic should receive relative to other applications and traffic when accessing the Internet. The options are Low, Normal, High, and Highest.
- Click **Apply** to save this rule to the QoS Policy list and return to the QoS Setup screen.
- In the QoS Setup screen, select the **Turn Internet Access QoS On** check box.
- Click **Apply**.

QoS for a MAC Address

To create a QoS policy for traffic from a specific MAC address:

- From the main menu, under Advanced, select **QoS Setup**. The QoS Setup screen displays, as shown in [Figure 5-6 on page 5-15](#).
- Click **Add Priority Rule**.

- From the **Priority Category** list, select **MAC Address**. The QoS - Priority Rules screen changes:

QoS - Priority rules

Priority

QoS Policy for

Priority Category: MAC Address

MAC Device List

	QoS Policy	Priority	Device Name	MAC Address
☐	Pri_MAC_59F408	Normal	DELL	00:0D:56:59:F4:08

MAC Address

Device Name

Priority: Normal

Add Edit Delete Refresh

Apply Cancel

Figure 5-10

- If the device to be prioritized appears in the MAC Device List, select it. The information from the MAC Device List is used to populate the policy name, MAC Address, and Device Name fields. If the device does not appear in the MAC Device List, click **Refresh**. If it still does not appear, you must complete these fields manually.
- From the **Priority** drop-down list, select the priority that this device's traffic should receive relative to other applications and traffic when accessing the Internet. The options are Low, Normal, High, and Highest.
- Click **Apply** to save this rule to the QoS Policy list and return to the QoS Setup screen.
- In the QoS Setup screen, select the **Turn Internet Access QoS On** check box.
- Click **Apply**.

Editing or Deleting an Existing QoS Policy

To edit or delete an existing QoS policy:

- From the main menu, under Advanced, select **QoS Setup**. The QoS Setup screen displays, as shown in [Figure 5-6 on page 5-15](#).

2. Select the radio button next to the QoS policy to be edited or deleted, and do one of the following:
 - Click **Delete** to remove the QoS policy.
 - Click **Edit** to edit the QoS policy. Follow the instructions in the preceding sections to change the policy settings.
3. Click **Apply** in the QoS Setup screen to save your changes.

Changing the MTU Size

The Maximum Transmission Unit (MTU) is the largest data packet a network device transmits. When one network device communicates across the Internet with another, the data packets travel through many devices along the way. If any device in the data path has a lower MTU setting than the other devices, the data packets must be split or “fragmented” to accommodate the one with the smallest MTU.

The best MTU setting for NETGEAR equipment is often just the default value, and changing the value might fix one problem but cause another. Leave MTU unchanged unless one of these situations occurs:

- You have problems connecting to your ISP, or other Internet service, and either the technical support of the ISP or of NETGEAR recommends changing the MTU size. These might require an MTU change:
 - A secure Web site that will not open, or displays only part of a Web page
 - Yahoo e-mail
 - MSN
 - America Online’s DSL service
- You use VPN and have severe performance problems.
- You used a program to optimize MTU for performance reasons, and now you have connectivity or performance problems.



Note: An incorrect MTU setting can cause Internet communication problems such as the inability to access certain Web sites, frames within Web sites, secure login pages, or FTP or POP servers.

If you suspect an MTU problem, a common solution is to change the MTU size to 1400. If you are willing to experiment, you can gradually reduce the MTU size from the maximum value of 1500 until the problem goes away. [Table 5-1](#) describes common MTU sizes and applications.

Table 5-1. Common MTU Sizes

MTU	Application
1500	The largest Ethernet packet size and the default value. This is the typical setting for non-PPPoE, non-VPN connections, and is the default value for NETGEAR routers, adapters, and switches.
1492	Used in PPPoE environments.
1472	Maximum size to use for ping. (Larger packets are fragmented.)
1468	Used in some DHCP environments.
1460	Usable by AOL if you do not have large e-mail attachments, for example.
1436	Used in PPTP environments or with VPN.
1400	Maximum size for AOL DSL.
576	Typical value to connect to dial-up ISPs.

To change the MTU size:

1. In the main menu, under Advanced, select **WAN Setup**.
2. In the **MTU Size** field, enter a new size between 64 and 1500.
3. Click **Apply** to save the new configuration.

Optimizing Your Network Bandwidth

As your network grows, it might consist of several segments of different networking technologies, each providing different throughput. In planning your network, you should first consider which devices will have the heaviest traffic flow between them. Examples are:

- A media center in one room streaming high-definition video from a server in another room
- A storage device that is used for backing up your computers

Next, consider the throughput of your network devices. Where possible, make the heaviest-traffic connections using higher-speed technologies, with no lower-speed bottlenecks in the path.

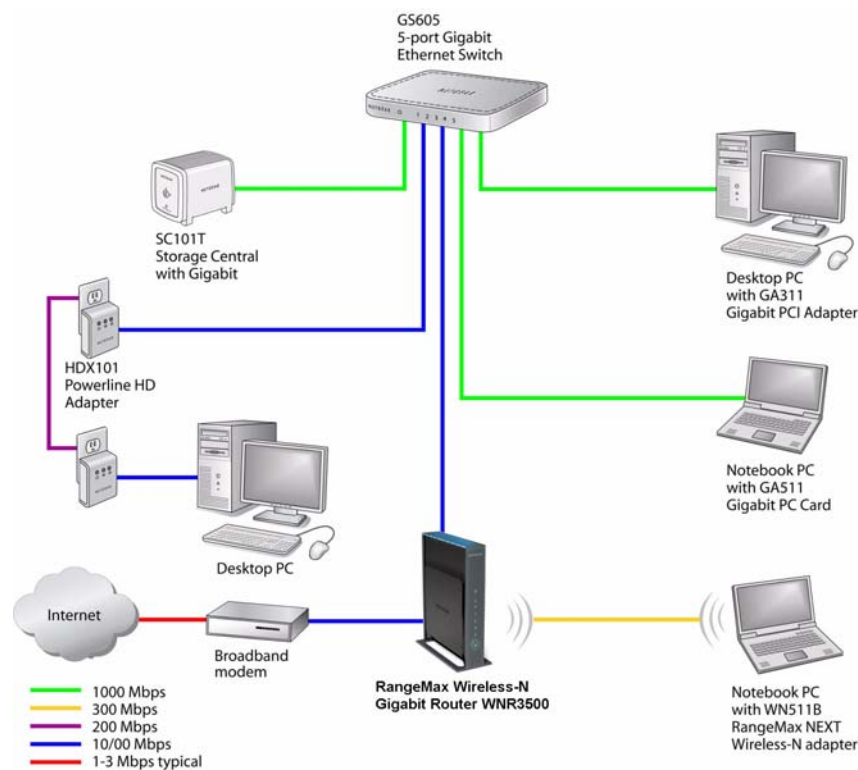


Figure 5-11

Figure 5-11 shows a sample network using multiple networking technologies. In this network, the two PCs with Gigabit (1000 Mbps) Ethernet adapters have a gigabit connection through the GS605 switch to the storage server. This connection should allow for extremely fast backups or quick access to large files on the server. The PC connected through a pair of Powerline HD adapters is limited to the 200 Mbps speed of the Powerline HD connection. Although any of the links in this example would be sufficient for high-traffic applications such as streaming HD video, the use of older devices such as 10 Mbps Ethernet or 802.11b wireless would create a significant bottleneck.

Overview of Home and Small Office Networking Technologies

Common connection types and their speed and security considerations are:

- **Broadband Internet.** Your Internet connection speed is determined by your modem type, such as ADSL or cable modem, as well as the connection speed of the sites to which you connect, and general Internet traffic. ADSL and cable modem connections are asymmetrical, meaning they have a lower data rate *to* the Internet (upstream) than *from* the Internet (downstream). Keep in mind that when you connect to another site that also has an asymmetrical connection, the data rate between your sites is limited by each side's upstream data rate. A typical residential ADSL or cable modem connection provides a downstream throughput of about 1 to 3 megabits per second (Mbps). Newer technologies such as ADSL2+ and Fiber to the Home (FTTH) will increase the connection speed to tens of Mbps.
- **Wireless.** Your RangeMax Wireless-N Gigabit Router WNR3500 provides a wireless data throughput of up to 300 Mbps using technology called multiple input, multiple output (MIMO), in which multiple antennas transmit multiple streams of data. The use of multiple antennas also provides excellent range and coverage. With the introduction of the newer WPA and WPA2 encryption and authentication protocols, wireless security is extremely strong.

To get the best performance, use RangeMax NEXT adapters such as the WN511B for your computers. Although the RangeMax NEXT router is compatible with older 802.11b and 802.11g adapters, the use of these older wireless technologies in your network can result in lower throughput overall (typically less than 10 Mbps for 802.11b and less than 40 Mbps for 802.11g). In addition, many older wireless products do not support the latest security protocols, WPA and WPA2.

- **Powerline.** For connecting rooms or floors that are blocked by obstructions or are distant vertically, consider networking over your building's AC wiring. NETGEAR's Powerline HD family of products delivers up to 200 Mbps to any outlet, while the older-generation XE family of products delivers 14 Mbps or 85 Mbps. Data transmissions are encrypted for security, and you can configure an individual network password to prevent neighbors from connecting.

The Powerline HD family of products can coexist on the same network with older-generation XE family products or HomePlug 1.0 products, but they are not interoperable with these older products.

- **Wired Ethernet.** As gigabit-speed Ethernet ports (10/100/1000 Mbps) become common on newer computers, wired Ethernet remains a good choice for speed, economy, and security. Gigabit Ethernet can extend up to 100 meters with twisted-pair wiring of Cat 5e or better. A wired connection is not susceptible to interference, and eavesdropping would require a physical connection to your network.



Note: Actual data throughput will vary. Network conditions and environmental factors, including volume of network traffic, building materials and construction, and network overhead, can lower actual data throughput rate.

Assessing Your Speed Requirements

Because your Internet connection is likely to operate at a much lower speed than your local network, faster local networking technologies might not improve your Internet experience. However, many emerging home applications require high data rates. For example:

- Streaming HD video requires 10 to 30 Mbps per stream. Because latency and packet loss can disrupt your video, plan to provide at least twice the capacity you need.
- Streaming MP3 audio requires less than 1 Mbps per stream and does not strain most modern networks. Like video, however, streaming audio is also sensitive to latency and packet loss, so a congested network or a noisy link can cause problems.
- Backing up computers over the network has become popular due to the availability of inexpensive mass storage. [Table 5-2](#) shows the time to transfer 1 gigabyte (1 GB) of data using various networking technologies.

Table 5-2. Theoretical Transfer Time for 1 Gigabyte

Network Connection	Theoretical Raw Transfer Time
Gigabit wired Ethernet	8 seconds
RangeMax NEXT Wireless-N	26 seconds
Powerline HD	40 seconds
100 Mbps wired Ethernet	80 seconds
802.11n wireless	45 seconds
802.11g wireless	150 seconds
802.11b wireless	700 seconds
10 Mbps wired Ethernet	800 seconds
Cable modem (3 Mbps)	2700 seconds
Analog modem (56 kbps)	144,000 seconds (40 hours)

Chapter 6

Using Network Monitoring Tools

This chapter describes how to use the maintenance features of your RangeMax Wireless-N Gigabit Router WNR3500. You can access these features by selecting the items under Maintenance in the main menu of the browser interface.

This chapter includes the following sections:

- [“Viewing Wireless Router Status Information”](#)
- [“Viewing a List of Attached Devices” on page 6-6](#)
- [“Managing the Configuration File” in Chapter 6](#)
- [“Upgrading the Router Software” on page 6-8](#)
- [“Enabling Remote Management Access” on page 6-11](#)

Viewing Wireless Router Status Information

To view router status and usage information:

1. From the main menu of the browser interface, under Maintenance, select **Router Status**. The Router Status screen displays.

Router Status

Account Name: WNR3500
Hardware Version: V1
Firmware Version: V1.0.10_1.0.10NA

Internet Port

MAC Address: 00:1B:2F:F3:83:AF
IP Address: 192.168.100.102
DHCP: DHCPClient
IP Subnet Mask: 255.255.255.0
Domain Name Server: 192.168.100.1

LAN Port

MAC Address: 00:1B:2F:F3:83:AE
IP Address: 192.168.1.1
DHCP: ON
IP Subnet Mask: 255.255.255.0

Wireless Port

Name (SSID): NETGEAR
Region: United States
Channel: 06
Mode: Up to 300Mbps
Wireless AP: ON
Broadcast Name: ON

Show Statistics Connection Status

Figure 6-1

Table 6-1 describes the router status fields.

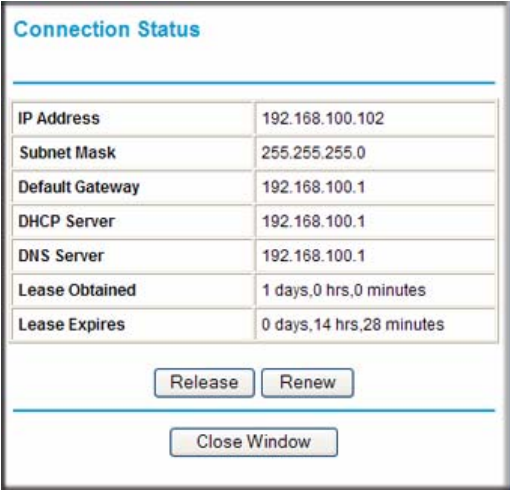
Table 6-1. Wireless Router Status Fields

Field		Description
Account Name		The host name assigned to the router.
Hardware Version		The hardware version of the router.
Firmware Version		The version of the current software installed in the router. This will change if you upgrade your router.
Internet Port		These settings apply to the Internet (WAN) port of the router.
	MAC Address	The Media Access Control address. This is the unique physical address being used by the Internet (WAN) port of the router.
	IP Address	The IP address being used by the Internet (WAN) port of the router. If no address is shown, or is 0.0.0.0, the router cannot connect to the Internet.

Table 6-1. Wireless Router Status Fields (continued)

Field		Description
	DHCP	If set to None, the router is configured to use a fixed IP address on the WAN. If set to DHCP Client, the router is configured to obtain an IP address dynamically from the ISP.
	IP Subnet Mask	The IP subnet mask being used by the Internet (WAN) port of the router. For an explanation of subnet masks and subnet addressing, click the link to the online document “TCP/IP Networking Basics” in Appendix B .
	Domain Name Server	The Domain Name Server addresses being used by the router. A Domain Name Server translates human-language URLs such as www.netgear.com into IP addresses.
LAN Port		These settings apply to the Ethernet (LAN) port of the router.
	MAC Address	The Media Access Control address. This is the unique physical address being used by the LAN port of the router.
	IP Address	The IP address being used by the Ethernet (LAN) port of the router. The default is 192.168.1.1.
	DHCP	Identifies whether the router's built-in DHCP server is active for the LAN-attached devices.
	IP Subnet Mask	The IP subnet mask being used by the Ethernet (LAN) port of the router. The default is 255.255.255.0.
Wireless Port		These settings apply to the wireless port of the router.
	Name (SSID)	The wireless network name (SSID) being used by the wireless port of the router. The default is NETGEAR.
	Region	The geographic region where the router is being used. It might be illegal to use the wireless features of the router in some parts of the world.
	Channel	Identifies the channel of the wireless port being used. Click the link to the online document “Wireless Networking Basics” in Appendix B for the frequencies used on each channel. In Up to 300 Mbps mode, there are two channels: a primary channel (P) and a secondary channel (S).
	Mode	Indicates the wireless communication mode: • Up to 54 Mbps • Up to 145 Mbps • Up to 300 Mbps
	Wireless AP	Indicates whether the radio feature of the router is enabled. If not enabled, the Wireless LED on the front panel is off.
	Broadcast Name	Indicates whether the router is broadcasting its SSID.

2. Click **Connection Status** to display the connection status.



The screenshot shows a web interface titled "Connection Status". It contains a table with the following information:

Item	Description
IP Address	192.168.100.102
Subnet Mask	255.255.255.0
Default Gateway	192.168.100.1
DHCP Server	192.168.100.1
DNS Server	192.168.100.1
Lease Obtained	1 days, 0 hrs, 0 minutes
Lease Expires	0 days, 14 hrs, 28 minutes

Below the table are three buttons: "Release", "Renew", and "Close Window".

Figure 6-2

Table 6-2 describes the connection status settings.

Table 6-2. Connection Status Settings

Item	Description
IP Address	The IP address that is assigned to the router.
Subnet Mask	The subnet mask that is assigned to the router.
Default Gateway	The IP address for the default gateway that the router communicates with.
DHCP Server	The IP address for the Dynamic Host Configuration Protocol server that provides the TCP/IP configuration for all the computers that are connected to the router.
DNS Server	The IP address of the Domain Name Service server that provides translation of network names to IP addresses.
Lease Obtained	The date and time that the lease was obtained.
Lease Expires	The date and time that the lease will expire.

Click the **Release** button to release the connection status items (that is, all items return to 0).

Click the **Renew** button to renew to the connection status items (that is, all items are refreshed).

Click the **Close Window** button to close the Connection Status screen.

3. Click **Show Statistics** to display router usage statistics.

System Up Time 1 day 21:38:00

Port	Status	TxPkts	RxPkts	Collisions	Tx B/s	Rx B/s	Up Time
WAN	100Mbps/Full	201446	237177	0	266	1505	1 day 21:37:49
LAN1	100Mbps/Full	135629	129768	0	1360	179	1 day 05:33:08
LAN2	Link Down						--
LAN3	Link Down						--
LAN4	Link Down						--
WLAN	300M	95234	79713	0	481	159	1 day 21:38:00

Poll Interval : (secs)

Figure 6-3

Table 6-3 describes the router statistics.

Table 6-3. Router Statistics

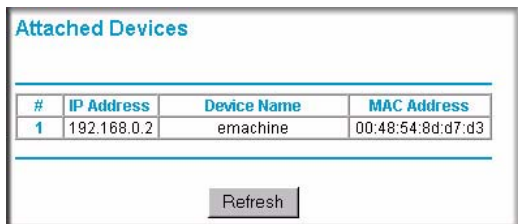
Item		Description
System Up Time		The time elapsed since the router was last restarted.
Port		The statistics for the WAN (Internet) and LAN (Ethernet) ports. For each port, the screen displays the following:
	Status	The link status of the port.
	TxPkts	The number of packets transmitted on this port since reset or manual clear.
	RxPkts	The number of packets received on this port since reset or manual clear.
	Collisions	The number of collisions on this port since reset or manual clear.
	Tx B/s	The current transmission (outbound) bandwidth used on the WAN and LAN ports.
	Rx B/s	The current reception (inbound) bandwidth used on the WAN and LAN ports.
	Up Time	The time elapsed since this port acquired the link.
Poll Interval		The intervals at which the statistics are updated in this screen.

To change the polling frequency, enter a time in seconds in the **Poll Interval** field, and click **Set Interval**.

To stop the polling entirely, click **Stop**.

Viewing a List of Attached Devices

The Attached Devices screen contains a table of all IP devices that the router has discovered on the local network. From the main menu of the browser interface, under Maintenance, select **Attached Devices** to view the table.



#	IP Address	Device Name	MAC Address
1	192.168.0.2	emachine	00:48:54:8d:d7:d3

Refresh

Figure 6-4

For each device, the table shows the IP address, NetBIOS host name or device name (if available), and the Ethernet MAC address. To force the router to look for attached devices, click **Refresh**.



Note: If the router is rebooted, the table data is lost until the router rediscovers the devices.

Managing the Configuration File

The configuration settings of the WNR3500 router are stored within the router in a configuration file. You can back up (save) this file to your computer, restore it, or reset it to the factory default settings.

From the main menu of the browser interface, under Maintenance, select **Backup Settings**.

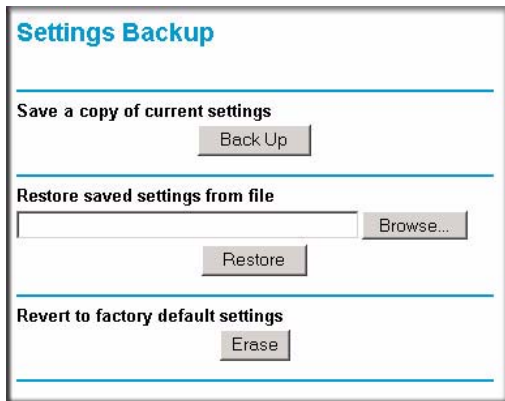


Figure 6-5

The following sections describe the three available options.

Backing Up and Restoring the Configuration

The Restore and Backup options in the Settings Backup screen let you save and retrieve a file containing your router's configuration settings.

To save your settings, click **Back Up**. Your browser extracts the configuration file from the router and prompts you for a location on your computer to store the file. You can give the file a meaningful name at this time, such as comcast.cfg.



Tip: Before saving your configuration file, change the administrator password to the default, **password**. Then change it again after you have saved the configuration file. If you forget the password, you will need to reset the configuration to factory defaults.

To restore your settings from a saved configuration file, enter the full path to the file on your computer, or click **Browse** to browse to the file. When you have located it, click **Restore** to send the file to the router. The router then reboots automatically.



Warning: Do not interrupt the reboot process.

Erasing the Configuration

Under some circumstances (for example, if you move the router to a different network or if you have forgotten the password) you might want to erase the configuration and restore the factory default settings. After an erase, the router's username is **admin**, the password is **password**, the LAN IP address is **192.168.1.1** (or **www.routerlogin.net**), and the router's DHCP server is enabled.

To erase the configuration, click the **Erase** button in the Settings Backup screen.

To restore the factory default configuration settings when you do not know the login password or IP address, you must use the restore factory settings button on the rear panel of the router (see [“Restoring the Default Configuration and Password” on page 7-13](#)).

Upgrading the Router Software

The routing software (also called firmware) of the WNR3500 router is stored in flash memory, and can be upgraded as NETGEAR releases new software. Your router can download and install the new software, or you can download upgrade files from the NETGEAR website and manually send the upgrade file to the router using your browser.



Tip: To ensure that you are always using the latest router firmware, enable the Firmware Upgrade Assistant feature so that the router will automatically detect a new version of the firmware on the Internet and alert you to its availability.

The Checking for Firmware Updates screen appears at login unless you clear the **Check for Updated Firmware Upon Log-in** check box.

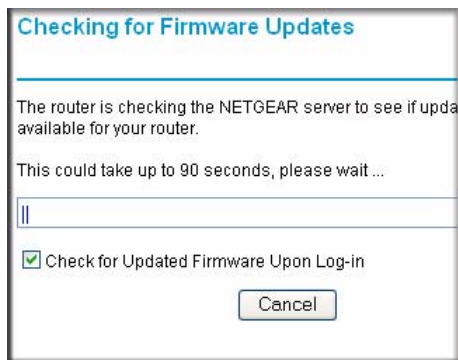


Figure 6-6

A screen is also provided for upgrading the router. From the main menu of the browser interface, under Maintenance, select **Router Upgrade** to display the Router Upgrade screen.

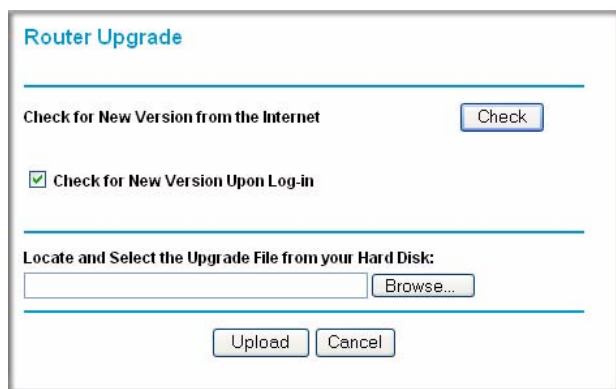
The image shows a web browser window titled "Router Upgrade". It contains a "Check for New Version from the Internet" section with a "Check" button. Below this is a checked checkbox labeled "Check for New Version Upon Log-in". The next section is "Locate and Select the Upgrade File from your Hard Disk:", featuring a text input field and a "Browse..." button. At the bottom are "Upload" and "Cancel" buttons.

Figure 6-7

From this screen, you can check for new software versions by clicking the **Check** button. If a new version is found, you can download and install it in one step. To enable the Smart Wizard to automatically check for a new software version upon login, select the **Check for New Version Upon Log-in** check box.

Alternatively, you can manually install an upgrade file stored on your computer.



Tip: Before upgrading the router software, use the router Settings Backup screen to save your configuration settings. A router upgrade might cause the router settings to revert to the factory defaults. If this happens, after completing the upgrade, you can restore your settings from the backup.

Upgrading Automatically to New Router Software

If you have selected **Check for New Version Upon Log-in**, your router alerts you to the new software when you log in. Otherwise, you can click the **Check** button in the Router Upgrade screen to search for new software.

If the router discovers a newer version of software, the message on the left displays when you log in. If no new software is available, the message on the right displays.

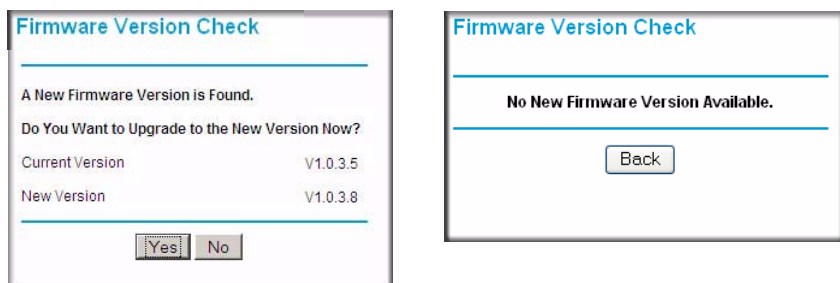


Figure 6-8

To automatically upgrade to the new software, click **Yes** to allow the router to download and install the new software file from NETGEAR.

	Warning: When uploading software to the WNR3500 router, <i>do not</i> interrupt the Web browser by closing the window, clicking a link, or loading a new page. If the browser is interrupted, it could corrupt the software.
--	--

When the upload is complete, your router automatically restarts. The upgrade process typically takes about 1 minute. Read the new software release notes to determine whether you must reconfigure the router after upgrading.

Upgrading Manually to New Router Software

To manually select, download, and install new software to your router:

1. Under Maintenance on the main menu, select **Router Status**. Note the version number of your router firmware.
2. Go to the WNR3500 support page on the NETGEAR website at <http://www.netgear.com/support>.
3. Check the most recent firmware version offered against the firmware version shown on your Router Status screen.
4. If the version on the NETGEAR website is more recent, download the file to your computer.
5. Under Maintenance on the main menu, select **Router Upgrade**.

6. Click **Browse**, and locate the firmware image that you downloaded to your PC (the file ends in .img or .chk).
7. Click **Upload** to send the firmware to the router.



Warning: When uploading software to the WNR3500 router, **do not** interrupt the Web browser by closing the window, clicking a link, or loading a new page. If the browser is interrupted, it could corrupt the software.

When the upload is complete, your router automatically restarts. The upgrade process typically takes about 1 minute. Read the new software release notes to determine whether you must reconfigure the router after upgrading.

Enabling Remote Management Access

Using the Remote Management feature, you can allow a user on the Internet to configure, upgrade, and check the status of your WNR3500 router. From the main menu of the browser interface, under Advanced, select **Remote Management**.

The screenshot shows the 'Remote Management' configuration page. At the top, the title 'Remote Management' is in blue. Below it is a checkbox labeled 'Turn Remote Management On'. Underneath, the 'Remote Management Address' is set to '10.1.32.90:8080'. The 'Allow Remote Access By:' section has three radio button options: 'Only This Computer:' (with four empty IP address boxes), 'IP Address Range:' (with 'From' and 'To' labels and two sets of four empty IP address boxes), and 'Everyone' (which is selected). At the bottom, the 'Port Number:' is set to '8080' in a text box. There are 'Apply' and 'Cancel' buttons at the very bottom.

Figure 6-9



Note: Be sure to change the router's default configuration password to a very secure password. The ideal password should contain no dictionary words from any language, and should be a mixture of letters (both uppercase and lowercase), numbers, and symbols. Your password can be up to 30 characters.

To configure your router for remote management:

1. Select the **Turn Remote Management On** check box.
2. Under Allow Remote Access By, specify what external IP addresses will be allowed to access the router's remote management.



Note: For enhanced security, restrict access to as few external IP addresses as practical.

- To allow access from any IP address on the Internet, select **Everyone**.
 - To allow access from a range of IP addresses on the Internet, select **IP Address Range**. Enter a beginning and ending IP address to define the allowed range.
 - To allow access from a single IP address on the Internet, select **Only This Computer**. Enter the IP address that will be allowed access.
3. Specify the port number for accessing the management interface.

Normal Web browser access uses the standard HTTP service port 80. For greater security, enter a custom port number for the remote management Web interface. Choose a number between 1024 and 65535, but do not use the number of any common service port. The default is 8080, which is a common alternate for HTTP.
 4. Click **Apply** to have your changes take effect.



Note: When accessing your router from the Internet, type your router's WAN IP address into your browser's address or location field, followed by a colon (:) and the custom port number. For example, if your external address is 134.177.0.123 and you use port number 8080, then enter **http://134.177.0.123:8080** in your browser.

Chapter 7

Troubleshooting

This chapter provides information about troubleshooting your RangeMax Wireless-N Gigabit Router WNR3500. After each problem description, instructions are provided to help you diagnose and solve the problem. As a first step, please review the Quick Tips.



Tip: NETGEAR provides helpful articles, documentation, and the latest software updates at <http://www.netgear.com/support>.

This chapter includes the following sections:

- “Troubleshooting Quick Tips”
- “Troubleshooting Basic Functions” on page 7-3
- “Troubleshooting the Web Configuration Interface” on page 7-4
- “Troubleshooting the Internet Connection” on page 7-5
- “Troubleshooting a Network Using the Ping Utility” on page 7-7
- “Problems with Date and Time” on page 7-9
- “Solving Wireless Connection Problems” on page 7-9
- “Restoring the Default Configuration and Password” on page 7-13

Troubleshooting Quick Tips

This section describes tips for troubleshooting some common problems:

Be sure to restart your network in this sequence.

1. Turn off *and* unplug the modem.
2. Turn off the wireless router and computers.
3. Plug in the modem and turn it on. Wait 2 minutes.

4. Turn on the wireless router and wait 1 minute.
5. Turn on the computers.

Make sure that the Ethernet cables are securely plugged in.

- The Internet status light on the wireless router is on if the Ethernet cable connecting the wireless router and the modem is plugged in securely and the modem and wireless router are turned on.
- For each powered-on computer connected to the wireless router by an Ethernet cable, the corresponding numbered router LAN port light is on.

Make sure that the wireless settings in the computer and router match exactly.

- For a wirelessly connected computer, the wireless network name (SSID) and WEP or WPA security settings of the router and wireless computer must match exactly.
- If you have enabled the wireless router to restrict wireless access by MAC address, you must add the wireless computer's MAC address to the router's wireless card access list.

Make sure that the network settings of the computer are correct.

- Wired and wirelessly connected computers *must* have network (IP) addresses on the same network as the router. The simplest way to do this is to configure each computer to obtain an IP address automatically using DHCP. Click the link to the online document [“Preparing Your Network” in Appendix B](#), or see the documentation that came with your computer.
- Some cable modem service providers require you to use the MAC address of the computer initially registered on the account. Your wireless router can capture and use that MAC address, as described in [“Configuring Your Internet Connection Using the Smart Setup Wizard” on page 1-5](#).

Check the Test light to verify correct router operation.

If the Test light does not turn off within 2 minutes after you turn the router on, reset the router according to the instructions in [“Restoring the Default Configuration and Password” on page 7-13](#).

Troubleshooting Basic Functions

After you turn on power to the router, the following sequence of events should occur:

1. When power is first applied, verify that the Power light  is on.
2. After approximately 10 seconds, verify that:
 - a. The Power light is solidly on.
 - b. The Internet light is on.
 - c. A numbered LAN port light is on for any local port that is connected to a computer. This indicates that a link has been established to the connected device.

If any of the above conditions does not occur, see the appropriate following section.

The Power light is not on or is blinking.

If the Power and other lights are off when your router is turned on:

- Make sure that the power cord is properly connected to your router and that the power adapter is properly connected to a functioning power outlet.
- Check that you are using the 12V DC 1A power adapter that NETGEAR supplied for this product.
- If the Power light blinks alternately green and amber every second, the router software is corrupted. This can happen if a firmware upgrade is interrupted, or if the router detects a problem with the firmware. For recovery instructions, contact Technical Support at www.netgear.com/support.

If the error persists, you have a hardware problem and should contact Technical Support at www.netgear.com/support.

The lights never turn off.

When the router is turned on, the lights turn on for about 10 seconds and then turn off. If all the lights stay on, there is a fault within the router.

If all lights are still on 1 minute after power-up:

- Cycle the power to see if the router recovers.
- Clear the router's configuration to factory defaults as explained in [“Restoring the Default Configuration and Password” on page 7-13](#).

If the error persists, you might have a hardware problem and should contact Technical Support at www.netgear.com/support.

The Internet or Ethernet port lights are not on.

If either the Ethernet port lights or the Internet light does not come on when the Ethernet connection is made, check the following:

- Make sure that the Ethernet cable connections are secure at the router and at the modem or computer.
- Make sure that power is turned on to the connected modem or computer.
- Make sure that you are using the correct cable:

When connecting the router's Internet port to a cable or DSL modem, use the cable that was supplied with the cable or DSL modem. This cable could be a standard straight-through Ethernet cable or an Ethernet crossover cable.

The Wireless light is not on.

If the Wireless light does not come on, verify that the wireless feature is turned on according to the instructions in [“Viewing Advanced Wireless Settings” on page 2-12](#).

Troubleshooting the Web Configuration Interface

If you are unable to access the router's Web Configuration Interface from a computer on your local network, check the following:

- If you are connecting from a wireless computer, try connecting from a wired computer.
- Check the Ethernet connection between the wired computer and the router as described in [“Troubleshooting Basic Functions” on page 7-3](#).
- Make sure that your computer's IP address is on the same subnet as the router. For instructions, click the link to the online document [“Preparing Your Network” in Appendix B](#) to configure your computer.



Note: If your computer's IP address is shown as 169.254.x.x: Windows and Mac OS generate and assign an IP address if the computer cannot reach a DHCP server. These autogenerated addresses are in subnet 169.254.x.x. If your IP address is in this range, check the connection from the computer to the router, and reboot your computer.

- Make sure that your browser has Java, JavaScript, or ActiveX enabled. If you are using Internet Explorer, click **Refresh** to be sure that the Java applet is loaded.
- Try closing the browser and opening it again, or try a different browser.
- Make sure that you are using the correct login information. The factory default login name is **admin**, and the password is **password**. Make sure that Caps Lock is off when entering this information.

If the router does not save changes you have made in the Web Configuration Interface, check the following:

- When entering configuration settings, be sure to click **Apply** before moving to another screen or tab, or your changes could be lost.
- Click **Refresh** or **Reload** in the Web browser. The changes might have occurred, but the Web browser might be caching the old configuration.

Troubleshooting the Internet Connection

If you can access your router but you are unable to access the Internet, you should first determine whether the router can obtain an IP address from your Internet Service Provider (ISP). Unless your ISP provides a static IP address, your router must request an IP address from the ISP. You can determine whether the request was successful using the Web Configuration Manager.

To check the WAN IP address:

1. Start your browser, and select an external site such as <http://www.netgear.com>.
2. Access the main menu of the router's configuration at <http://www.routerlogin.net>.
3. Under Maintenance, select **Router Status**.
4. Check that an IP address is shown for the Internet port. If 0.0.0.0 is shown, your router has not obtained an IP address from your ISP.

If your router is unable to obtain an IP address from the ISP, you might need to force your cable or DSL modem to recognize your new router by restarting your network, as described in “[Be sure to restart your network in this sequence.](#)” on page 7-1.

If your router is still unable to obtain an IP address from the ISP, the problem might be one of the following:

- Your ISP might require a login program.
Ask your ISP whether they require PPP over Ethernet (PPPoE) or some other type of login.

- If your ISP requires a login, the login name or password might be set incorrectly.
- Your ISP might check for your computer's host name.
Assign the computer host name of your ISP account as the account name in the Basic Settings screen.
- Your ISP allows only one Ethernet MAC address to connect to Internet and might check for your computer's MAC address. In this case, do one of the following:
 - Inform your ISP that you have bought a new network device, and ask them to use the router's MAC address.
 - Configure your router to spoof your computer's MAC address. This procedure is explained in [“Configuring Your Internet Connection Using the Smart Setup Wizard” on page 1-5](#).

If your router can obtain an IP address, but your computer is unable to load any Web pages from the Internet:

- Your computer might not recognize any DNS server addresses.
A DNS server is a host on the Internet that translates Internet names (such as www addresses) to numeric IP addresses. Typically, your ISP provides the addresses of one or two DNS servers for your use. If you entered a DNS address during the router's configuration, reboot your computer, and verify the DNS address as described in the online document you can access from [“Preparing Your Network” in Appendix B](#). You can also configure your computer manually with DNS addresses, as explained in your operating system documentation.
- Your computer might not have the router configured as its TCP/IP gateway.
If your computer obtains its information from the router by DHCP, reboot the computer, and verify the gateway address as described in the online document you can access from [“Preparing Your Network” in Appendix B](#).
- You might be running login software that is no longer needed.
If your ISP provided a program to log you in to the Internet (such as WinPoET), you no longer need to run that software after installing your router. You might need to go to Internet Explorer and select **Tools > Internet Options**, click the Connections tab, and select **Never dial a connection**.

Troubleshooting a Network Using the Ping Utility

Most network devices and routers contain a ping utility that sends an echo request packet to the designated device. The device then responds with an echo reply. Troubleshooting a network is made very easy by using the ping utility in your computer or workstation.

Testing the LAN Path to Your Router

You can ping the router from your computer to verify that the LAN path to your router is set up correctly.

To ping the router from a running Windows PC:

1. From the Windows toolbar, click Start, and then select **Run**.
2. In the field provided, type **ping** followed by the IP address of the router, as in this example:
ping www.routerlogin.net
3. Click **OK**.

You should see a message like this one:

Pinging <IP address > with 32 bytes of data

If the path is working, you see this message:

Reply from < IP address >: bytes=32 time=NN ms TTL=xxx

If the path is not working, you see this message:

Request timed out

If the path is not functioning correctly, you could have one of the following problems:

- Wrong physical connections
 - For a wired connection, make sure that the numbered LAN port light is on for the port to which you are connected. If the light is off, follow the instructions in [“The Internet or Ethernet port lights are not on.”](#) on page 7-4.
 - Check that the corresponding Link lights are on for your network interface card. If your router and computer are connected to a separate Ethernet switch, make sure that the Link lights are on for the switch ports that are connected to your computer and router.
- Wrong network configuration
 - Verify that the Ethernet card driver software and TCP/IP software are both installed and configured on your computer.

- Verify that the IP address for your router and your computer are correct and that the addresses are on the same subnet.

Testing the Path from Your Computer to a Remote Device

After verifying that the LAN path works correctly, test the path from your computer to a remote device.

1. From the Windows toolbar, click the Start button, and then select **Run**.
2. In the Windows Run window, type:

ping -n 10 <IP address>

where <IP address> is the IP address of a remote device such as your ISP's DNS server.

If the path is functioning correctly, replies like those shown in the previous section are displayed. If you do not receive replies:

- Check that your computer has the IP address of your router listed as the default gateway. If the IP configuration of your computer is assigned by DHCP, this information is not be visible in your computer's Network Control Panel. Verify that the IP address of the router is listed as the default gateway as described in the online document you can access from [“Preparing Your Network” in Appendix B](#).
- Check to see that the network address of your computer (the portion of the IP address specified by the subnet mask) is different from the network address of the remote device.
- Check that your cable or DSL modem is connected and functioning.
- If your ISP assigned a host name to your computer, enter that host name as the account name in the Basic Settings screen.
- Your ISP could be rejecting the Ethernet MAC addresses of all but one of your computers. Many broadband ISPs restrict access by allowing traffic only from the MAC address of your broadband modem, but some ISPs additionally restrict access to the MAC address of a single computer connected to that modem. If this is the case, you must configure your router to “clone” or “spoof” the MAC address from the authorized computer. For more information, see [“Configuring Your Internet Connection Using the Smart Setup Wizard” on page 1-5](#).

Problems with Date and Time

Under Content Filtering in the main menu, select **E-mail** to display a screen that shows the current date and time of day. The WNR3500 router uses the Network Time Protocol (NTP) to obtain the current time from one of several network time servers on the Internet. Each entry in the log is stamped with the date and time of day. Problems with the date and time function can include the following:

- Date shown is January 1, 2000.
Cause: The router has not yet successfully reached a network time server. Check that your Internet access settings are correct. If you have just completed configuring the router, wait at least 5 minutes, and check the date and time again.
- Time is off by one hour.
Cause: The router does not adjust for daylight savings time. In the E-mail screen, select the **Adjust for Daylight Savings Time** check box.

Solving Wireless Connection Problems

The first steps in solving wireless connection problems are these:

1. Using your wireless card's setup utility program, make sure that your wireless card can find your wireless router.
2. Configure and test with the simplest wireless connection possible, and then add security.

The topics in this section describe these steps.

Using Your Wireless Card Setup Program

When you install a NETGEAR wireless card in your computer, a Smart Wizard utility program is installed that can provide helpful information about your wireless network. You can find this program in your Windows Program menu or as an icon in your system tray. Other wireless card manufacturers might include a similar program.

If you have no specific wireless card setup program installed, you can use the basic setup utility in Windows by following these steps:

1. Open the Windows Control Panel, and double-click **Network Connections**.
2. In the LAN section, double-click **Wireless Network Connection**.

Use the setup program to scan for available wireless networks. Look for a network name (SSID) of NETGEAR or your custom SSID if you have changed it. If your wireless network does not appear, check these conditions:

- Is your router's wireless radio enabled? See [“Viewing Advanced Wireless Settings” on page 2-12](#).
- Is your router's SSID broadcast enabled? See [“Viewing Advanced Wireless Settings” on page 2-12](#).
- Is your router set to a wireless standard that is not supported by your wireless card? Check the Mode setting as described in [“Viewing and Configuring Basic ISP Settings” on page 1-5](#).

If your wireless network appears, but the signal strength is weak, check these conditions:

- Is your router too far from your computer, or too close? Place your computer near the router, but at least 6 feet away, and see whether the signal strength improves.
- Is your wireless signal obstructed by objects between the router and your computer? See [“Optimizing Wireless Performance” on page 5-13](#).

If your wireless network appears and has good signal strength, configure your wireless card and router for the simplest possible connection as described in the next section.

Setting Up and Testing Basic Wireless Connectivity



Note: If you use a wireless computer to change wireless settings, you might be disconnected when you click **Apply**. Reconfigure your wireless adapter to match the new settings, or access the wireless router from a wired computer to make any further changes.

Follow these instructions to set up and test basic wireless connectivity. Once you have established basic wireless connectivity, you can enable security settings appropriate to your needs.

1. Select **Wireless Settings** under Setup in the main menu of the WNR3500 router.



Figure 7-1

2. For the wireless network name (SSID), use the default name, or choose a suitable descriptive name. In the **Name (SSID)** field, you can enter a value of up to 32 alphanumeric characters. The default SSID is NETGEAR.

	Note: The SSID is case-sensitive; NETGEAR is not the same as nETgear. Also, the SSID of any wireless access adapters must match the SSID you specify in the WNR3500 router. If they do not match, you will not get a wireless connection to the WNR3500 router.
---	---

3. Select the region in which the wireless interface will operate.
4. Set the channel. The default channel is **Auto**.

This field determines which operating frequency is used. It should not be necessary to change the wireless channel unless you notice interference problems with another nearby wireless router or access point. Select a channel that is not being used by any other wireless networks within several hundred feet of your router. For more information about the wireless channel frequencies, click the link to the online document “[Wireless Networking Basics](#)” in [Appendix B](#).

5. Set the mode to **Up to 300Mbps**.
6. For Security Options, select **None**.
7. Click **Apply** to save your changes.



Note: If you are configuring the router from a wireless computer and you change the router’s SSID, channel, or security settings, you will lose your wireless connection when you click **Apply**. You must then change the wireless settings of your computer to match the router’s new settings.

8. Select **Wireless Settings** under Advanced in the main menu of the WNR3500 router.

The screenshot shows the 'Advanced Wireless Settings' page. It is divided into three main sections: 'Wireless Router Settings', 'WPS Settings', and 'Wireless Card Access List'. In the 'Wireless Router Settings' section, 'Enable Wireless Router Radio' and 'Enable SSID Broadcast' are checked. 'Fragmentation Threshold (256 - 2346)' is set to 2346, 'CTS/RTS Threshold (1 - 2347)' is set to 2347, and 'Preamble Mode' is set to 'Auto'. In the 'WPS Settings' section, the 'Router's PIN' is 70779691, and both 'Disable Router's PIN' and 'Keep Existing Wireless Settings' are unchecked. In the 'Wireless Card Access List' section, there is a 'Setup Access List' button. At the bottom of the page are 'Apply' and 'Cancel' buttons.

Figure 7-2

9. Make sure that the **Enable Wireless Router Radio** and **Enable SSID Broadcast** check boxes are selected.
10. Click **Setup Access List**.
11. Make sure that the **Turn Access Control On** check box is *not* selected.
12. Configure and test your wireless computer for wireless connectivity.

Program the wireless adapter of your computer to have the same SSID and channel that you specified in the router, and disable encryption. Check that your computer has a wireless link and can obtain an IP address by DHCP from the router.

Once your computer has basic wireless connectivity to the router, you can configure the advanced wireless security functions of the computer and router (for more information about security, see [Chapter 2, “Safeguarding Your Network”](#)).

Restoring the Default Configuration and Password

This section explains how to restore the factory default configuration settings, changing the router's administration password back to **password**. You can erase the current configuration and restore factory defaults in two ways:

- Use the Erase function of the router (see [“Erasing the Configuration” on page 6-8](#)).
- Use the restore factory settings button on the rear panel of the router. Use this method for cases when the administration password or IP address is not known.

To restore the factory default configuration settings when you do not know the administration password or IP address, you must use the restore settings button on the rear panel of the router.

1. Press and hold the restore settings button for 10 seconds.
2. Release the restore settings button, and wait for the router to reboot.

If the wireless router fails to restart, or the Power light continues to blink or turns solid amber, the unit might be defective. If the error persists, you might have a hardware problem and should contact Technical Support at <http://www.netgear.com/support>.

Appendix A

Technical Specifications

Default Configuration Settings

This appendix provides factory default settings and technical specifications for the RangeMax Wireless-N Gigabit Router WNR3500.

Table A-1. WNR3500 Router Default Configuration Settings

Feature		Default Setting
Router Login		
	Router Login URL	http://www.routerlogin.net or http://www.routerlogin.com
	Login Name (case-sensitive) printed on product label	admin
	Login Password (case-sensitive) printed on product label	password
Internet Connection		
	WAN MAC Address	Default hardware address (on label)
	MTU Size	1500
Local Network		
	Router LAN IP address printed on product label (also known as Gateway IP address)	192.168.1.1
	Router Subnet	255.255.255.0
	DHCP Server	Enabled
	DHCP range	192.168.1.2 to 192.168.1.254
	Time Zone	GMT
	Time Zone Adjusted for Daylight Saving Time	Disabled
	Allow a Registrar to configure this router	Enabled

Table A-1. WNR3500 Router Default Configuration Settings (continued)

Wireless		
	Wireless Communication	Enabled
	SSID Name	NETGEAR
	Security	Disabled
	Wireless Access List (MAC Filtering)	All wireless stations allowed
	Broadcast SSID	Enabled
	Transmission Speed	Auto*
	Country/Region	United States (North America only; otherwise varies by country and region)
	RF Channel	6 until region selected
	Operating Mode	145 Mbps
	Data Rate	Best
	Output Power	Full
Firewall		
	Inbound (communications coming in from the Internet)	Disabled (bars all unsolicited requests except for traffic on port 80, the http port)
	Outbound (communications going out to the Internet)	Enabled (all)

*. Maximum Wireless signal rate derived from IEEE Standard 802.11 specifications. Actual throughput will vary. Network conditions and environmental factors, including volume of network traffic, building materials and construction, and network overhead lower actual data throughput rate.

General Specifications

Table A-2. WNR3500 Router General Specifications

Feature		General
Network Protocol and Standards Compatibility		
	Data and Routing Protocols	TCP/IP, RIP-1, RIP-2, DHCP, PPPoE, PPTP, Bigpond, Dynamic DNS, and UPnP
Power Adapter		
	North America	120V, 60 Hz, input
	UK, Australia	240V, 50 Hz, input
	Europe	230V, 50 Hz, input
	Japan	100V, 50/60 Hz, input
	All regions (output)	12V DC @ 1.0A, output
Physical		
	Dimensions	8.9" x 6.8" x 1.5" 225.5 x 172 x 39 mm
	Weight	1.2 lbs. 0.56 kg
Environmental		
	Operating temperature	0° to 40° C (32° to 104° F)
	Operating humidity	90% maximum relative humidity, noncondensing
Electromagnetic Emissions		
	Designed to conform to the following standards	FCC Part 15 Class B EN 55022/24 (CISPR 22/24) Class B EN 60950 (CE LVD) Class B MIC
Interface Specifications		
	LAN	10BASE-T or 100BASE-Tx, RJ-45
	WAN	10BASE-T or 100BASE-Tx, RJ-45

Restoring the Default User Name and Password

You can restore the factory default configuration settings to reset the router's user name to **admin**, the password to **password**, and the IP address to **www.routerlogin.net**. This procedure erases your current configuration, including your wireless security settings, and restores the factory defaults. When you log in after resetting, the Smart Wizard configuration assistant prompts you to configure these settings.

To restore the factory default settings:

1. Use a sharp object such as a pen or a paper clip to press and hold the restore factory settings button, located on the rear panel of the router, for about 20 seconds.
2. Release the restore factory settings button, and wait for the router to reboot.

The factory default settings are restored so that you can access the router from your Web browser using the factory defaults.

Appendix B

Related Documents

This appendix provides links to reference documents you can use to gain a more complete understanding of the technologies used in your NETGEAR product.

Document	Link
TCP/IP Networking Basics	http://documentation.netgear.com/reference/enu/tcpip/index.htm
Wireless Networking Basics	http://documentation.netgear.com/reference/enu/wireless/index.htm
Preparing Your Network	http://documentation.netgear.com/reference/enu/wsdhcp/index.htm
Virtual Private Networking Basics	http://documentation.netgear.com/reference/enu/vpn/index.htm
Glossary	http://documentation.netgear.com/reference/enu/glossary/index.htm

In addition, you can find initial setup instructions for your wireless router in the *NETGEAR Wireless Router Setup Manual*.

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