Reference Manual for the Model RP614 Web Safe Router

NETGEAR

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Federal Communications Commission (FCC) Compliance Notice: Radio Frequency Notice

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 generates, 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 measures:

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

EN 55 022 Declaration of Conformance

This is to certify that the Model RP614 Web Safe Router is shielded against the generation of radio interference in accordance with the application of Council Directive 89/336/EEC, Article 4a. Conformity is declared by the application of EN 55 022 Class B (CISPR 22).

Bestätigung des Herstellers/Importeurs

Es wird hiermit bestätigt, daß das Model RP614 Web Safe Router gemäß der im BMPT-AmtsblVfg 243/1991 und Vfg 46/1992 aufgeführten Bestimmungen entstört ist. Das vorschriftsmäßige Betreiben einiger Geräte (z.B. Testsender) kann jedoch gewissen Beschränkungen unterliegen. Lesen Sie dazu bitte die Anmerkungen in der Betriebsanleitung.

Das Bundesamt für Zulassungen in der Telekommunikation wurde davon unterrichtet, daß dieses Gerät auf den Markt gebracht wurde und es ist berechtigt, die Serie auf die Erfüllung der Vorschriften hin zu überprüfen.

Certificate of the Manufacturer/Importer

It is hereby certified that the Model RP614 Web Safe Router has been suppressed in accordance with the conditions set out in the BMPT-AmtsblVfg 243/1991 and Vfg 46/1992. The operation of some equipment (for example, test transmitters) in accordance with the regulations may, however, be subject to certain restrictions. Please refer to the notes in the operating instructions.

Federal Office for Telecommunications Approvals has been notified of the placing of this equipment on the market and has been granted the right to test the series for compliance with the regulations.

Voluntary Control Council for Interference (VCCI) Statement

This equipment is in the second category (information equipment to be used in a residential area or an adjacent area thereto) and conforms to the standards set by the Voluntary Control Council for Interference by Data Processing Equipment and Electronic Office Machines aimed at preventing radio interference in such residential areas.

When used near a radio or TV receiver, it may become the cause of radio interference.

Read instructions for correct handling.

Customer Support

Refer to the Support Information Card that shipped with your Model RP614 Web Safe Router.

World Wide Web

NETGEAR maintains a World Wide Web home page that you can access at the universal resource locator (URL) *http://www.netgear.com*. A direct connection to the Internet and a Web browser such as Internet Explorer or Netscape are required.

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About This Guide

Congratulations on your purchase of the NETGEAR™ Model RP614 Web Safe Router.

The Model RP614 router provides connection for multiple personal computers (PCs) to the Internet through an external broadband access device (such as a cable modem or DSL modem) that is normally intended for use by a single PC.



Note: If you are unfamiliar with networking and routing, refer to Appendix B, "Network and Routing Basics," to become more familiar with the terms and procedures used in this manual.

Technical Support

For help with any technical issues, contact Customer Support at 1-888-NETGEAR, or visit us on the Web at www.NETGEAR.com. The NETGEAR Web site includes an extensive knowledge base, answers to frequently asked questions, and a means for submitting technical questions online.

Related Publications

As you read this document, you may be directed to various RFC documents for further information. An RFC is a Request For Comment (RFC) published by the Internet Engineering Task Force (IETF), an open organization that defines the architecture and operation of the Internet. The RFC documents outline and define the standard protocols and procedures for the Internet. The documents are listed on the World Wide Web at *www.ietf.org* and are mirrored and indexed at many other sites worldwide.

For more information about address assignment, refer to the IETF documents RFC 1597, *Address Allocation for Private Internets*, and RFC 1466, *Guidelines for Management of IP Address Space*.

For more information about IP address translation, refer to RFC 1631, *The IP Network Address Translator (NAT)*.

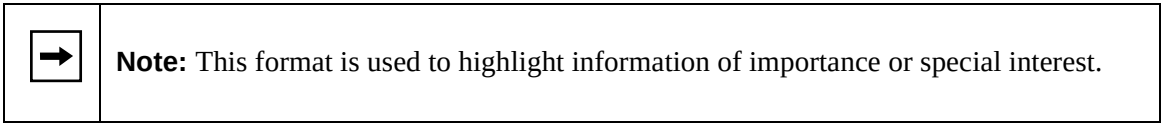
Typographical Conventions

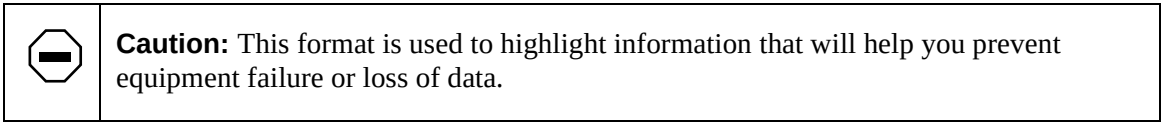
This guide uses the following typographical conventions:

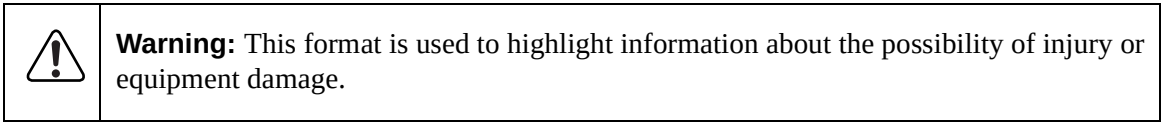
italics	Book titles and UNIX file, command, and directory names.
`courier font`	Screen text, user-typed command-line entries.
Initial Caps	Menu titles and window and button names.
[Enter]	Named keys in text are shown enclosed in square brackets. The notation [Enter] is used for the Enter key and the Return key.
[Ctrl]+C	Two or more keys that must be pressed simultaneously are shown in text linked with a plus (+) sign.
ALL CAPS	DOS file and directory names.

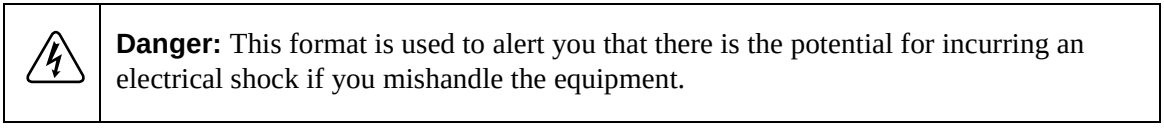
Special Message Formats

This guide uses the following formats to highlight special messages:









Chapter 1
Introduction

This chapter describes the features of the NETGEAR Model RP614 Web Safe Router.

About the Router

The Model RP614 Web Safe Router with 4-port switch connects your local area network (LAN) to the Internet through an external access device such as a cable modem or DSL modem.

The Model RP614 router provides you with multiple Web content filtering options, plus browsing activity reporting and instant alerts -- both via e-mail. Parents and network administrators can establish restricted access policies based on time-of-day, Website addresses and address keywords, and share high-speed cable/DSL Internet access for up to 253 personal computers. Network Address Translation (NAT) protects you from hackers.

With minimum setup, you can install and use the router within minutes.

Key Features

The Model RP614 router provides the following features:

- Easy, web-based setup for installation and management
  - Smart Wizard automatically senses Internet connection type
- Security
  - Parental control of web browsing and newsgroup access using Web Address (URL) keyword blocking
  - Auditing and e-mail reporting of web browsing activities

  - Blocking can be scheduled by day and time
  - Network Address Translation (NAT) hides local PCs from the Internet
  - Incoming port forwarding and DMZ for specific services
- Built in 4-port 10/100 Mbps Switch
  - Allows LAN connections at 10 megabits per second (Mbps) or 100 Mbps
  - Autosensing for Ethernet (10BASE-T) or Fast Ethernet (100BASE-Tx) transmissions
  - Half-duplex or full-duplex operation
- Ethernet connection to a wide area network (WAN) device, such as a cable modem or DSL modem
  - Allows Ethernet connection at 10 megabits per second (Mbps)
- Protocol Support
  - IP routing
  - Network Address Translation (NAT) for operation with a single static or dynamic IP address
  - Dynamic Host Configuration Protocol (DHCP) server for dynamically assigning network configuration information to PCs on the LAN
  - DHCP client for dynamically obtaining configuration information from the Internet Service Provider (ISP)
  - DNS Proxy for simplified configuration
  - PPP over Ethernet (PPPoE) support
- Login capability

  Automatically executes user login for:
  - PPP over Ethernet (PPPoE) accounts
  - PPTP service (for European service providers)
  - BigPond service (for Telstra Australia)
- Front panel LEDs for easy monitoring of status and activity
- Flash memory for firmware upgrade
- Free technical support seven days a week, twenty-four hours a day

Content Filtering

With its content filtering features, the Model RP614 router prevents objectionable content from reaching your PCs. Its content filtering features include:

- Content filtering by domain or keyword
  The Model RP614 router uses content filtering to enforce your network's Internet access policies. The router allows you to control access to Internet content by screening for keywords within Website names or newsgroup names.
- Logging of inappropriate use
  You can configure the Model RP614 router to log access to Web sites and to e-mail the log to you. You can also configure the router to send an immediate alert e-mail message to you whenever a local user attempts to access a blocked Web site.

Security

The Model RP614 router is equipped with several features designed to maintain security, as described in this section.

- PCs Hidden by NAT
  Network address translation (NAT) opens a temporary path to the Internet for requests originating from the local network. Requests originating from outside the LAN are discarded, preventing users outside the LAN from finding and directly accessing the PCs on the LAN.
- Port Forwarding with NAT
  Although NAT prevents Internet locations from directly accessing the PCs on the LAN, the router allows you to direct incoming traffic to specific PCs based on the service port number of the incoming request, or to one designated "DMZ" host computer. You can specify forwarding of single ports or ranges of ports.

Autosensing 10/100 Ethernet

With its internal, 4-port 10/100 switch, the Model RP614 router can connect to either a 10 Mbps standard Ethernet network or a 100 Mbps Fast Ethernet network. The local LAN interface is autosensing and is capable of full-duplex or half-duplex operation.

TCP/IP

The Model RP614 router supports the Transmission Control Protocol/Internet Protocol (TCP/IP) and Routing Information Protocol (RIP).

For further information about TCP/IP, refer to Appendix B, "Network and Routing Basics."

- IP Address Sharing by NAT
  The Model RP614 router allows several networked PCs to share an Internet account using only a single IP address, which may be statically or dynamically assigned by your Internet service provider (ISP). This technique, known as Network Address Translation (NAT), allows the use of an inexpensive single-user ISP account.
- Automatic Configuration of Attached PCs by DHCP
  The Model RP614 router dynamically assigns network configuration information, including IP, gateway, and domain name server (DNS) addresses, to attached PCs on the LAN using the Dynamic Host Configuration Protocol (DHCP). This feature greatly simplifies configuration of PCs on your local network.
- DNS Proxy
  When DHCP is enabled and no DNS addresses are specified, the router provides its own address as a DNS server to the attached PCs. The router obtains actual DNS addresses from the ISP during connection setup and forwards DNS requests from the LAN.
- PPP over Ethernet (PPPoE)
  PPP over Ethernet is a protocol for connecting remote hosts to the Internet over a DSL connection by simulating a dial-up connection. This feature eliminates the need to run a login program such as Entersys or WinPOET on your PC.

Easy Installation and Management

You can install, configure, and operate the Model RP614 Web Safe Router within minutes after connecting it to the network. The following features simplify installation and management tasks:

- Browser-based management
  Browser-based configuration allows you to easily configure your router from almost any type of personal computer, such as Windows, Macintosh, or Linux. A user-friendly Setup Wizard is provided and online help documentation is built into the browser-based Web Management Interface.
- Smart Wizard
  The Model RP614 router automatically senses the type of Internet connection, asking you only for the information required for your type of ISP account.

- Visual monitoring
  The Model RP614 router's front panel LEDs provide an easy way to monitor its status and activity.

Maintenance and Support

NETGEAR offers the following features to help you maximize your use of the Model RP614 router:

- Flash memory for firmware upgrade
- Free technical support seven days a week, twenty-four hours a day

Chapter 2
Setting Up the Hardware

This chapter describes the Model RP614 Web Safe Router hardware and provides instructions for installing it.

Package Contents

The product package should contain the following items:

- Model RP614 Web Safe Router
- AC power adapter
- Category 5 (CAT5) Ethernet cable
- *Model RP614 Resource* CD, including:
  - This guide
  - Application Notes and other helpful information
- *RP614 Cable/DSL Web Safe Router Installation Guide*
- Registration and Warranty Card
- Support Information Card

If any of the parts are incorrect, missing, or damaged, contact your NETGEAR dealer. Keep the carton, including the original packing materials, in case you need to return the router for repair.

Local Network Hardware Requirements

The Model RP614 Web Safe Router is intended for use in a network of personal computers (PCs) that are interconnected by twisted-pair Ethernet cables.

PC Requirements

To install and run the Model RP614 router over your network of PCs, each PC must have an installed Ethernet Network Interface Card (NIC) and an Ethernet cable. If the PC will connect to your network at 100 Mbps, you must use a Category 5 (CAT5) cable such as the cable provided with your router.

Access Device Requirement

The shared broadband access device (cable modem or DSL modem) must provide a standard 10 Mbps (10BASE-T) Ethernet interface.

The Router's Front Panel

The front panel of the Model RP614 Web Safe Router (Figure 2-1) contains status LEDs.

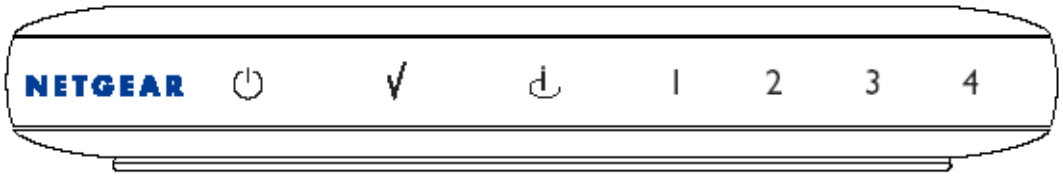


Figure 2-1. RP614 Front Panel

You can use some of the LEDs to verify connections. Table 2-1 lists and describes each LED on the front panel of the router. These LEDs are green when lit.

Table 2-1. LED Descriptions

Label	Activity	Description
Power	On Off	Power is supplied to the router. Power is not supplied to the router.
Test	On Off	The system is initializing. The system is ready and running.
Internet (Wide Area Network)	On Blink	The Internet port has detected a link with an attached device. Data is being transmitted or received by the Internet port.
Local (Local Area Network) 4	On (Green) Blink (Green) On (Amber) Blink (Amber) Off	The Local port has detected link with a 100 Mbps device. Data is being transmitted or received at 100 Mbps. The Local port has detected link with a 10 Mbps device. Data is being transmitted or received at 10 Mbps. No link is detected on this port.

The Router's Rear Panel

The rear panel of the Model RP614 router (Figure 2-2) contains port connections.

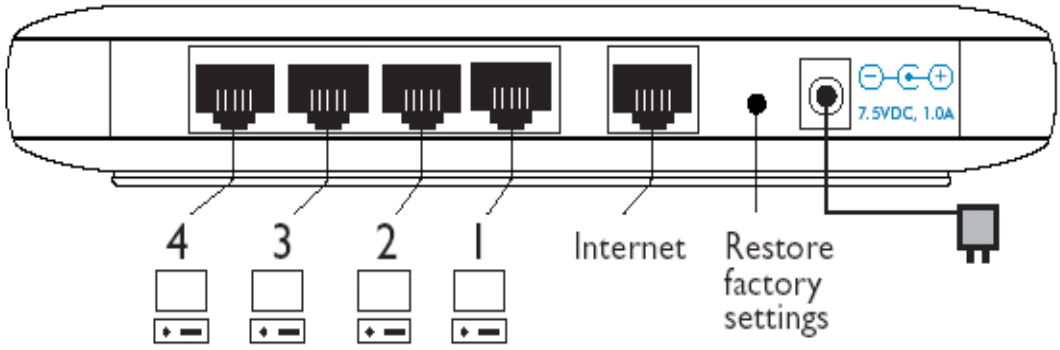


Figure 2-2. RP614 Rear Panel

The rear panel contains the following features:

- AC power adapter outlet
- Factory Default Reset pushbutton
- Internet (WAN) Ethernet port for connecting the router to a cable or DSL modem
- Four Local (LAN) Ethernet ports for connecting the router to the local PCs

Connecting the Router

Before using your router, you need to do the following:

- Connect your local Ethernet network to the Local port(s) of the router (described next).
- Connect your cable or DSL modem to the Internet port of the router (see page 2-5).
- Connect the power adapter (see page 2-5)

Note: The Resource CD included with your router contains an animated Connection Guide to help you through this procedure.

Connecting to your Local Ethernet Network

Your local area network (LAN) will attach to the four Local router ports shown in Figure 2-2. The Local ports are capable of operation at either 10 Mbps (10BASE-T) or 100 Mbps (100BASE-Tx), depending on the Ethernet interface of the attached PC, hub, or switch. For any connection which will operate at 100 Mbps, you must use a Category 5 (CAT5) rated Ethernet cable, such as the cable included with the router.

The Model RP614 router incorporates a four-port switch for connection to your local network. To connect the Model RP614 router to your LAN:

- Connect up to four PCs directly to any of the four Local ports of the router using standard Ethernet cables.

If your local network consists of more than four hosts, you will need to connect your router to another hub or switch:

- Connect any Local port of your router to the Uplink port of an Ethernet hub or switch using a standard Ethernet cable.

  OR

- Connect any Local port of your router to any normal port of an Ethernet hub or switch using a crossover Ethernet cable.

Connecting to Your Internet Access Device

Connect the router's Internet (WAN) port to the Ethernet port on your existing Internet access device (your cable modem or DSL modem). Turn the device off for ten seconds, then on again.

Note: Your cable or DSL modem must provide a standard 10BASE-T Ethernet connection for connection to your PC or network. The Model RP614 router does not include a cable for this connection. Instead, use the Ethernet cable provided with your access device or any other standard 10BASE-T Ethernet cable.

Note: The Ethernet cable supplied by your ISP for connecting to your cable or DSL modem may be an Ethernet crossover cable rather than a straight-through cable. It is important to use the existing cable to connect the modem to your router, not to connect your PCs to your router.

Connecting the Power Adapter

To connect the router to the power adapter:

1. Plug the connector of the power adapter into the power adapter outlet on the rear panel of the router.
2. Plug the other end of the adapter into a standard wall outlet.
3. Verify that the Power LED on the router is lit.

Verifying Power

After connecting the power adapter to the router and a power source, the router powers on automatically. Complete the following steps to verify that power is correctly applied to the router:

1. When power is first applied, verify that the Power LED comes on.
2. During the first 10 seconds, all LEDs will be tested.
3. After approximately 10 seconds, verify that:
   a. The Test LED is not lit.
   b. The Local port LEDs are lit for any local ports that are connected.
   c. The Internet port LED is lit.

   If a port's LED is lit, a link has been established to the connected device. If a Local port is connected to a 100 Mbps device, verify that the port's LED is green. If the port is 10 Mbps, the LED will be amber.

You are now ready to begin configuration of your network, as described in the following chapter.

Chapter 3
Preparing Your Network

This chapter describes how to prepare your PC network to connect to the Internet through the Model RP614 Web Safe Router and how to order broadband Internet service from an Internet service provider (ISP). .



Note: If an ISP technician configured your PC during the installation of a broadband modem, or if you configured it using instructions provided by your ISP, you may need to copy the current configuration information for use in the configuration of your router. Write down this information before reconfiguring your PCs. Refer to "Obtaining ISP Configuration Information (Windows)" on page 3-10 or "Obtaining ISP Configuration Information (Macintosh)" on page 3-11 for further information.

Preparing Your Personal Computers for IP Networking

Personal Computers access the Internet using a protocol called TCP/IP (Transmission Control Protocol/Internet Protocol). Each PC on your network must have TCP/IP installed and selected as its networking protocol. If a Network Interface Card (NIC) is already installed in your PC, then TCP/IP is probably already installed as well.

Note: In this chapter, we use the term "PC" to refer to personal computers in general, and not necessarily Windows computers.

Most PC operating systems include the software components you need for networking with TCP/IP:

- Windows® 95 or later includes the software components for establishing a TCP/IP network.
- Windows 3.1 does not include a TCP/IP component. You need to purchase a third-party TCP/IP application package such as NetManage Chameleon.

- Macintosh Operating System 7 or later includes the software components for establishing a TCP/IP network.
- All versions of UNIX or Linux include TCP/IP components. Follow the instructions provided with your operating system or networking software to install TCP/IP on your computer..

In your IP network, each PC and the router must be assigned a unique IP addresses. Each PC must also have certain other IP configuration information such as a subnet mask (netmask), a domain name server (DNS) address, and a default gateway address. In most cases, you should install TCP/IP so that the PC obtains its specific network configuration information automatically from a DHCP server during bootup. For a detailed explanation of the meaning and purpose of these configuration items, refer to “Appendix B, “Networks, Routing, and Firewall Basics.”

The Model RP614 router is shipped preconfigured as a DHCP server. The router assigns the following TCP/IP configuration information automatically when the PCs are rebooted:

- PC or workstation IP addresses—192.168.0.2 through 192.168.0.254
- Subnet mask—255.255.255.0
- Gateway address (the router)—192.168.0.1

These addresses are part of the IETF-designated private address range for use in private networks.

Configuring Windows 95, 98, and ME for IP Networking

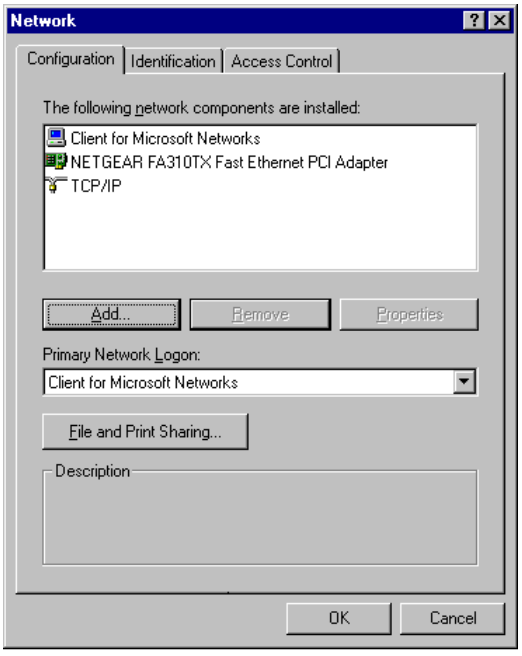
As part of the PC preparation process, you need to manually install and configure TCP/IP on each networked PC. Before starting, locate your Windows CD; you may need to insert it during the TCP/IP installation process.

Install or Verify Windows Networking Components

To install or verify the necessary components for IP networking:

1. On the Windows taskbar, click the Start button, point to Settings, and then click Control Panel.
2. Double-click the Network icon.

   The Network window opens, which displays a list of installed components:



You must have an Ethernet adapter, the TCP/IP protocol, and Client for Microsoft Networks.

Note: It is not necessary to remove any other network components shown in the Network window in order to install the adapter, TCP/IP, or Client for Microsoft Networks.

If you need the adapter:

a. Click the Add button.

b. Select Adapter, and then click Add.

c. Select the manufacturer and model of your Ethernet adapter, and then click OK.

If you need TCP/IP:

a. Click the Add button.

b. Select Protocol, and then click Add.

c. Select Microsoft.

d. Select TCP/IP, and then click OK.

If you need Client for Microsoft Networks:

a. Click the Add button.

b. Select Client, and then click Add.

c. Select Microsoft.

d. Select Client for Microsoft Networks, and then click OK.

3. Restart your PC for the changes to take effect.

Assign TCP/IP configuration by DHCP

After the TCP/IP protocol components are installed, each PC must be assigned specific information about itself and resources that are available on its network. The simplest way to configure this information is to allow the PC to obtain the information from the internal DHCP server of the Model RP614 router. To use DHCP with the recommended default addresses, follow these steps:

1. Connect all PCs to the router, then restart the router and allow it to boot.
2. On each attached PC, open the Network control panel (refer to the previous section) and select the Configuration tab.
3. From the components list, select TCP/IP->(your Ethernet adapter) and click Properties.
4. In the IP Address tab, select “Obtain an IP address automatically”.
5. Select the Gateway tab.
6. If any gateways are shown, remove them.
7. Click OK.
8. Restart the PC.

Repeat steps 2 through 8 for each PC on your network.

Selecting Internet Access Method

1. On the Windows taskbar, click the Start button, point to Settings, and then click Control Panel.
2. Double-click the Internet Options icon.

3. Select “I want to set up my Internet connection manually” or “I want to connect through a Local Area Network” and click Next.
4. Select “I want to connect through a Local Area Network” and click Next.
5. Uncheck all boxes in the LAN Internet Configuration screen and click Next.
6. Proceed to the end of the Wizard.

Verifying TCP/IP Properties

After your PC is configured and has rebooted, you can check the TCP/IP configuration using the utility *winipcfg.exe*:

1. On the Windows taskbar, click the Start button, and then click Run.
2. Type **`winipcfg`**, and then click OK.

   The IP Configuration window opens, which lists (among other things), your IP address, subnet mask, and default gateway.
3. From the drop-down box, select your Ethernet adapter.

   The window is updated to show your settings, which should match the values below if you are using the default TCP/IP settings that NETGEAR recommends:

   - The IP address is between 192.168.0.2 and 192.168.0.254
   - The subnet mask is 255.255.255.0
   - The default gateway is 192.168.0.1

Configuring Windows NT or 2000 for IP Networking

As part of the PC preparation process, you need to manually install and configure TCP/IP on each networked PC. Before starting, locate your Windows CD; you may need to insert it during the TCP/IP installation process.

Install or Verify Windows Networking Components

To install or verify the necessary components for IP networking:

1. On the Windows taskbar, click the Start button, point to Settings, and then click Control Panel.
2. Double-click the Network and Dialup Connections icon.

3. If an Ethernet adapter is present in your PC, you should see an entry for Local Area Connection. Double-click that entry.
4. Select Properties.
5. Verify that 'Client for Microsoft Networks' and 'Internet Protocol (TCP/IP)' are present. If not, select Install and add them.
6. Select 'Internet Protocol (TCP/IP)', click Properties, and verify that "Obtain an IP address automatically is selected.
7. Click OK and close all Network and Dialup Connections windows.
8. Make sure your PC is connected to the router, then reboot your PC.

Verifying TCP/IP Properties

To check your PC's TCP/IP configuration:

1. On the Windows taskbar, click the Start button, and then click Run.

   The Run window opens.
2. Type **cmd** and then click OK.

   A command window opens
3. Type **ipconfig /all**

   Your IP Configuration information will be listed, and should match the values below if you are using the default TCP/IP settings that NETGEAR recommends:

   - The IP address is between 192.168.0.2 and 192.168.0.254
   - The subnet mask is 255.255.255.0
   - The default gateway is 192.168.0.1
4. Type **exit**

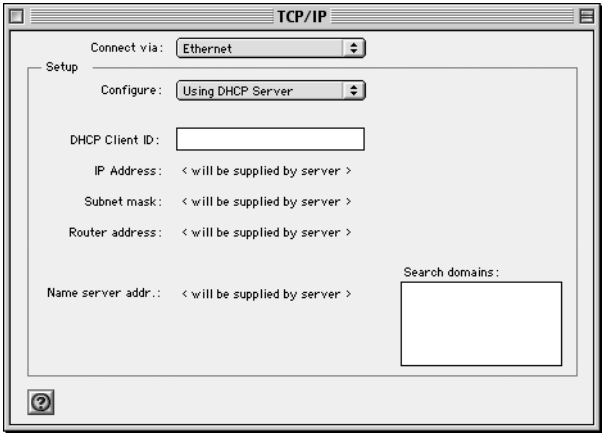
Configuring the Macintosh for IP Networking

Beginning with Macintosh Operating System 7, TCP/IP is already installed on the Macintosh. On each networked Macintosh, you will need to configure TCP/IP to use DHCP.

MacOS 8.6 or 9.x

1. From the Apple menu, select Control Panels, then TCP/IP.

   The TCP/IP Control Panel opens:



2. From the “Connect via” box, select your Macintosh’s Ethernet interface.
3. From the “Configure” box, select Using DHCP Server.

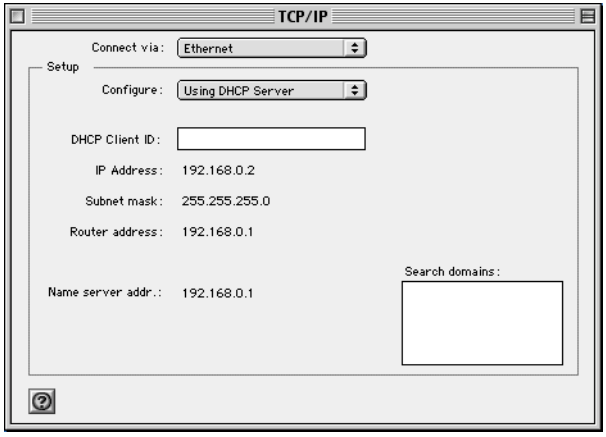
   You can leave the DHCP Client ID box empty.
4. Close the TCP/IP Control Panel.
5. Repeat this for each Macintosh on your network.

MacOS X

1. From the Apple menu, choose System Preferences, then Network.
2. If not already selected, select Built-in Ethernet in the Configure list.
3. If not already selected, Selct Using DHCP in the TCP/IP tab.
4. Click Save.

Verifying TCP/IP Properties (Macintosh)

After your Macintosh is configured and has rebooted, you can check the TCP/IP configuration by returning to the TCP/IP Control Panel. From the Apple menu, select Control Panels, then TCP/IP.



The panel is updated to show your settings, which should match the values below if you are using the default TCP/IP settings that NETGEAR recommends:

- The IP Address is between 192.168.0.2 and 192.168.0.254
- The Subnet mask is 255.255.255.0
- The Router address is 192.168.0.1

If you do not see these values, you may need to restart your Macintosh or you may need to switch the “Configure” setting to a different option, then back again to “Using DHCP Server”.

Your Internet Account

For access to the Internet, you need to contract with an Internet service provider (ISP) for a single-user Internet access account using an external broadband access device such as a cable modem or DSL modem. This modem must be a separate physical box (not a card) and must provide an Ethernet port intended for connection to a Network Interface Card (NIC) in a PC. Your router does not support a USB-connected broadband modem.

For a single-user Internet account, your ISP supplies TCP/IP configuration information for one PC. With a typical account, much of the configuration information is dynamically assigned when your PC is first booted up while connected to the ISP, and you will not need to know that dynamic information.

In order to share the Internet connection among several computers, your router takes the place of the single PC, and you need to configure it with the TCP/IP information that the single PC would normally use. When the router's Internet port is connected to the broadband modem, the router appears to be a single PC to the ISP. The router then allows the PCs on the local network to masquerade as the single PC to access the Internet through the broadband modem. The method used by the router to accomplish this is called Network Address Translation (NAT) or IP masquerading.

Login Protocols

Some ISPs require a special login protocol, in which you must enter a login name and password in order to access the Internet. If you normally log in to your Internet account by running a program such as WinPOET or EnterNet, then your account uses PPP over Ethernet (PPPoE).

When you configure your router, you will need to enter your login name and password in the router's configuration menus. After your network and router are configured, the router will perform the login task when needed, and you will no longer need to run the login program from your PC. It is not necessary to uninstall the login program.

Account Information

Unless these items are dynamically assigned by the ISP, your ISP should give you the following basic information for your account:

- An IP address and subnet mask
- A gateway IP address, which is the address of the ISP's router
- One or more domain name server (DNS) IP addresses
- Host name and domain suffix

  For example, your account's full server names may look like this:

  `mail.xxx.yyy.com`

  In this example, the domain suffix is `xxx.yyy.com`.

If any of these items are dynamically supplied by the ISP, your router automatically acquires them. If an ISP technician configured your PC during the installation of the broadband modem, or if you configured it using instructions provided by your ISP, you need to copy configuration information from your PC's Network TCP/IP Properties window (or Macintosh TCP/IP Control Panel) before reconfiguring your PC for use with the router. These procedures are described next.

Obtaining ISP Configuration Information (Windows)

As mentioned above, you may need to collect configuration information from your PC so that you can use this information when you configure the Model RP614 router. Following this procedure is only necessary when your ISP does not dynamically supply the account information.

To get the information you need to configure the router for Internet access:

1. On the Windows taskbar, click the Start button, point to Settings, and then click Control Panel.
2. Double-click the Network icon.

   The Network window opens, which displays a list of installed components.
3. Select TCP/IP, and then click Properties.

   The TCP/IP Properties dialog box opens.
4. Select the IP Address tab.

   If an IP address and subnet mask are shown, write down the information. If an address is present, your account uses a fixed (static) IP address. If no address is present, your account uses a dynamically-assigned IP address. Click "Obtain an IP address automatically".
5. Select the Gateway tab.

   If an IP address appears under Installed Gateways, write down the address. This is the ISP's gateway address. Select the address and then click Remove to remove the gateway address.
6. Select the DNS Configuration tab.

   If any DNS server addresses are shown, write down the addresses. If any information appears in the Host or Domain information box, write it down. Click Disable DNS.
7. Click OK to save your changes and close the TCP/IP Properties dialog box.

   You are returned to the Network window.
8. Click OK.
9. Reboot your PC at the prompt. You may also be prompted to insert your Windows CD.

Obtaining ISP Configuration Information (Macintosh)

As mentioned above, you may need to collect configuration information from your Macintosh so that you can use this information when you configure the Model RP614 router. Following this procedure is only necessary when your ISP does not dynamically supply the account information.

To get the information you need to configure the router for Internet access:

1. From the Apple menu, select Control Panels, then TCP/IP.

   The TCP/IP Control Panel opens, which displays a list of configuration settings. If the "Configure" setting is "Using DHCP Server", your account uses a dynamically-assigned IP address. In this case, close the Control Panel and skip the rest of this section.
2. If an IP address and subnet mask are shown, write down the information.
3. If an IP address appears under Router address, write down the address. This is the ISP's gateway address.
4. If any Name Server addresses are shown, write down the addresses. These are your ISP's DNS addresses.
5. If any information appears in the Search domains information box, write it down.
6. Change the "Configure" setting to "Using DHCP Server".
7. Close the TCP/IP Control Panel.

Restarting the Network

Once you've set up your computers to work with the router, you must reset the network for the devices to be able to communicate correctly.

1. Turn off the DSL or cable modem, wait 15 seconds, and then turn it on again
2. Turn off the router, and then turn it on again and wait until the Test light turns off.
3. Restart any computer that is connected to the firewall.

Note: If the modem doesn't have an on/off switch, either pull the modem's power adapter out of the wall socket or power down the power strip.

Ready for Configuration

After configuring all of your PCs for TCP/IP networking and connecting them to the local network of your Model RP614 router, you are ready to access and configure the router. Proceed to the next chapter.

Chapter 4
Basic Configuration of the Router

This chapter describes how to perform the basic configuration of your Model RP614 Web Safe Router using the Setup Wizard, which walks you through the configuration process for your Internet connection.

Accessing the Web Configuration Manager

In order to use the browser-based Web Configuration Manager, your PC must have a web browser program installed such as Microsoft Internet Explorer or Netscape Navigator. Because the Configuration Manager uses Java, your Web browser must be Java-enabled and support HTTP uploads. NETGEAR recommends using Microsoft Internet Explorer or Netscape Navigator 4.0 or above. Free browser programs are readily available for Windows, Macintosh, or UNIX/Linux.

To configure for Internet access using your browser:

1. Turn on the router and wait for initialization to complete.

   Allow at least ten seconds and verify that the Test LED is off. 

2. Reboot your PC to obtain DHCP configuration from the router.
3. Launch your web browser.

   Note: If you normally use a login program (such as Enternet or WinPOET) to access the Internet, do not launch that program.

4. Click your browser's Stop button.
5. In the Address (or Location) box of your browser, type **http://192.168.0.1** and press ENTER.

A login window opens as shown in Figure 4-1 below:.

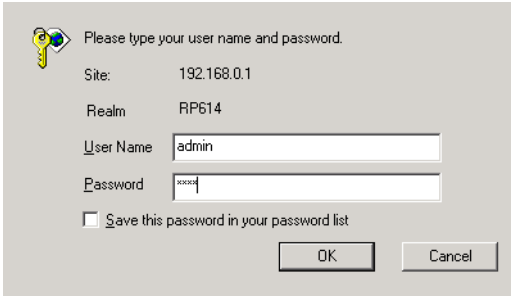


Figure 4-1. Login window

This screen may have a different appearance in other browsers.

6. Type **admin** in the User Name box, **password** in the Password box, and then click OK.

   If your router password was previously changed, enter the current password.

If your router has not yet been configured, the Setup Wizard should launch automatically. Otherwise, the main menu of the Web Configuration Manager will appear as shown in Figure 4-2 below:

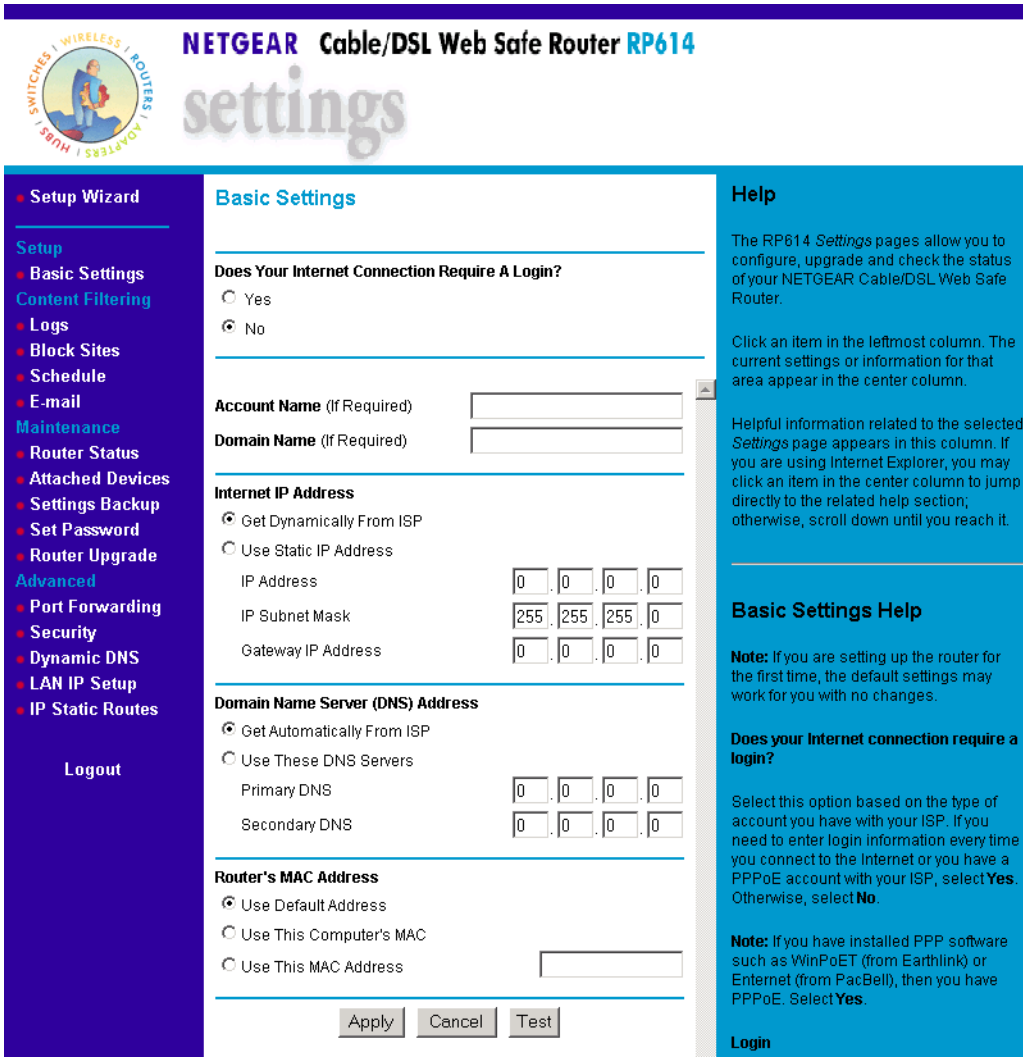


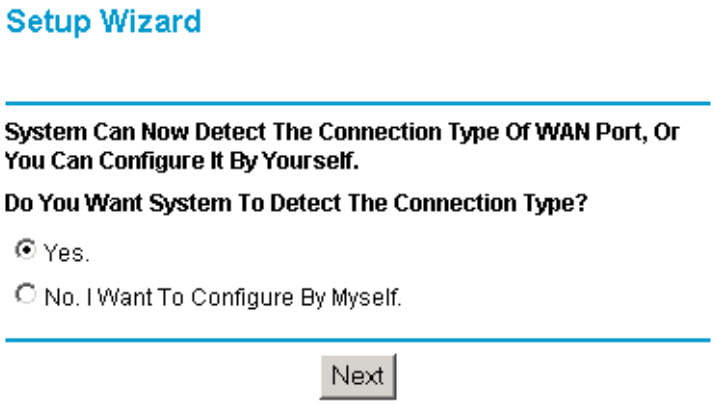
Figure 4-2. Browser-based configuration main menu

You can manually configure your router using this menu as described in “Manual Configuration“ on page 4-8, or you can allow the Setup Wizard to determine your configuration as described in the following chapter.

Configuration using the Setup Wizard

The Web Configuration Manager contains a Setup Wizard that can automatically determine your network connection type. If the Setup Wizard does not launch automatically, click on the Setup Wizard heading in the upper left of the opening screen, shown in Figure 4-2.

When the Wizard launches, allow the router to automatically determine your connection type by selecting Yes in the menu below and clicking Next:



The Setup Wizard will now check for a connection on the Internet port. If the Setup Wizard determines that there is no connection to the Internet port, you will be prompted to check the physical connection between your router and cable or DSL modem. When the connection is properly made, the router's Internet LED should be on.

Next, the Setup Wizard will attempt to determine which of the following connection types your Internet service account uses:

- Dynamic IP assignment
- Fixed IP address assignment
- A login protocol such as PPPoE

The Setup Wizard will report which connection type it has discovered, and it will then use the appropriate configuration menu for that connection type.

Configuring for Dynamic IP Account

If the Setup Wizard determines that your Internet service account uses Dynamic IP assignment, you will be directed to the menu shown in Figure 4-3 below:

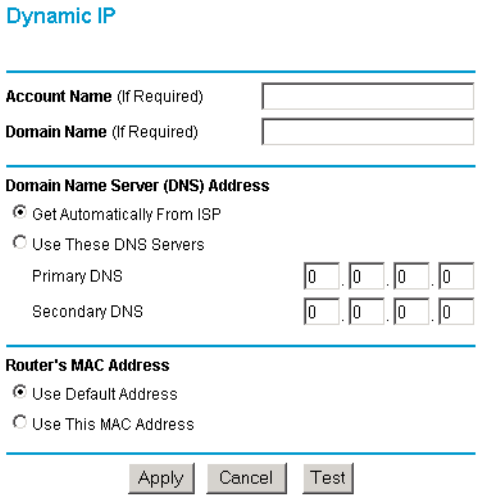


Figure 4-3. Setup Wizard menu for Dynamic IP address

1. Enter your Account Name (may also be called Host Name) and Domain Name. These parameters may be necessary to access your ISP's services such as mail or news servers. If you leave the Domain Name field blank, the router will attempt to learn the domain automatically from the ISP. If this is not successful, you may need to enter it manually.
2. 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.

   A DNS server is a host on the Internet that translates Internet names (such as www addresses) to numeric IP addresses. Typically your ISP transfers the IP addresses of one or two DNS servers to your router during login. If the ISP does not transfer an address, you must obtain it from the ISP and enter it manually here. If you enter an address here, you should reboot your PCs after configuring the router.

3. Router's MAC Address: This section determines the Ethernet MAC address that will be used by the router on the Internet port. If your ISP allows access by only one specific PC's Ethernet MAC address, select "Use this MAC address". The router will then capture and use the MAC address of the PC that you are now using. You must be using the one PC that is allowed by the ISP.

   Some ISPs will register the Ethernet MAC address of the network interface card in your PC when your account is first opened. They will then only accept traffic from the MAC address of that PC. This feature allows your router to masquerade as that PC by using its MAC address.

4. Click on Apply, then proceed to "Completing the Configuration" on page 4-9.

Configuring for Fixed IP Account

If the Setup Wizard determines that your Internet service account uses Fixed IP assignment, you will be directed to the menu shown in Figure 4-4 below:

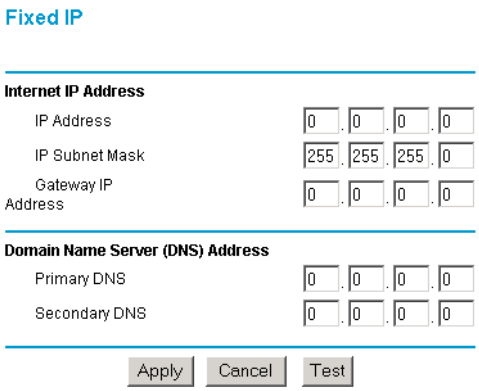


Figure 4-4. Setup Wizard menu for Fixed IP address

1. Enter your assigned IP Address, Subnet Mask, and the IP Address of your ISP's gateway router. This information should have been provided to you by your ISP.
2. 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.

A DNS server is a host on the Internet that translates Internet names (such as www addresses) to numeric IP addresses. Typically your ISP transfers the IP addresses of one or two DNS servers to your router during login. If the ISP does not transfer an address, you must obtain it from the ISP and enter it manually here. If you enter an address here, you should reboot your PCs after configuring the router.

3. Click on Apply, then proceed to "Completing the Configuration" on page 4-9.

Configuring for an Account with Login

If the Setup Wizard determines that your Internet service account uses a login protocol such as PPP over Ethernet (PPPoE), you will be directed to a menu like the PPPoE menu shown in Figure 4-5 below:

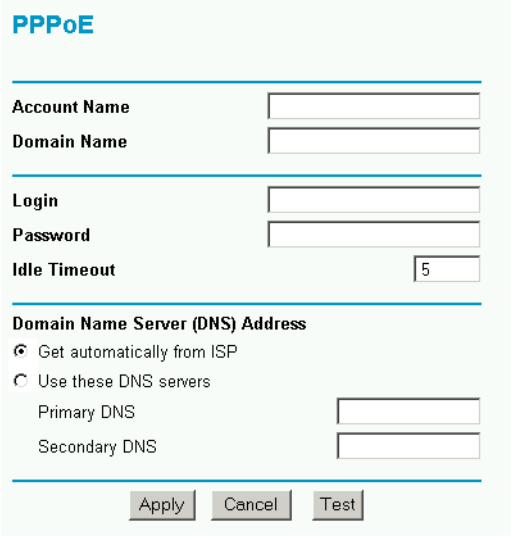


Figure 4-5. Setup Wizard menu for PPPoE login accounts

1. Enter your Account Name (may also be called Host Name) and Domain Name. These parameters may be necessary to access your ISP's services such as mail or news servers. If you leave the Domain Name field blank, the router will attempt to learn the domain automatically from the ISP. If this is not successful, you will need to enter it manually.
2. Enter the PPPoE login user name and password provided by your ISP. These fields are case sensitive. If you wish to change the login timeout, enter a new value in minutes.

Note: You will no longer need to launch the ISP's login program on your PC in order to access the Internet. When you start an Internet application, your router will automatically log you in.

3. 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.

   A DNS server is a host on the Internet that translates Internet names (such as www addresses) to numeric IP addresses. Typically your ISP transfers the IP addresses of one or two DNS servers to your router during login. If the ISP does not transfer an address, you must obtain it from the ISP and enter it manually here. If you enter an address here, you should reboot your PCs after configuring the router.

4. Click on Apply, then proceed to "Completing the Configuration" on page 4-9.

Manual Configuration

You can manually configure the router in the Basic Settings menu shown in Figure 4-2 using these steps:

1. Select whether your Internet connection requires a login.

   Select 'Yes' if you normally must launch a login program such as Enternet or WinPOET in order to access the Internet.

2. Enter your Account Name (may also be called Host Name) and Domain Name. These parameters may be necessary to access your ISP's services such as mail or news servers.

3. (If displayed) Enter the PPPoE login user name and password provided by your ISP. These fields are case sensitive. If you wish to change the login timeout, enter a new value in minutes.

   Note: You will no longer need to launch the ISP's login program on your PC in order to access the Internet. When you start an Internet application, your router will automatically log you in.

4. Internet IP Address: If your ISP has assigned you a permanent, fixed (static) IP address for your PC our router, select "Use static IP address". Enter the IP address that your router has been assigned. Also enter the netmask and the Gateway IP address. The Gateway is the ISP's router to which your router will connect.

5. 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.

A DNS server is a host on the Internet that translates Internet names (such as www addresses) to numeric IP addresses. Typically your ISP transfers the IP addresses of one or two DNS servers to your router during login. If the ISP does not transfer an address, you must obtain it from the ISP and enter it manually here. If you enter an address here, you should reboot your PCs after configuring the router.

6. Router's MAC Address: This section determines the Ethernet MAC address that will be used by the router on the Internet port. Some ISPs will register the Ethernet MAC address of the network interface card in your PC when your account is first opened. They will then only accept traffic from the MAC address of that PC. This feature allows your router to masquerade as that PC by "cloning" its MAC address. You can specify the MAC address in one of two ways:

   a. Select "Use this Computer's MAC address". The router will then capture and use the MAC address of the PC that you are now using. You must be using the one PC that is allowed by the ISP.

   b. Select "Use this MAC address" and manually enter the MAC address you wish to use.

7. Click on Apply, then proceed to "Completing the Configuration" on page 4-9.

Completing the Configuration

Click on the Test button to test your Internet connection. If the NETGEAR website does not appear within one minute, refer to Chapter 8, "Troubleshooting".

Your router is now configured to provide Internet access for your network. When your router and PCs are configured correctly, your router automatically accesses the Internet when one of your LAN devices requires access. It is not necessary to run a dialer or login application such as Dial-Up Networking or Enternet to connect, log in, or disconnect. These functions are performed by the router as needed.

To access the Internet from any PC connected to your router, launch a browser such as Microsoft Internet Explorer or Netscape Navigator. You should see the router's Internet LED blink, indicating communication to the ISP. The browser should begin to display a Web page.

The following chapters describe how to configure the Advanced features of your router, and how to troubleshoot problems that may occur.

Chapter 5
Content Filtering

This chapter describes how to use the Content Filtering features of your Model RP614 Web Safe Router. These features can be found by clicking on the Content Filtering heading in the Main Menu of the browser interface.

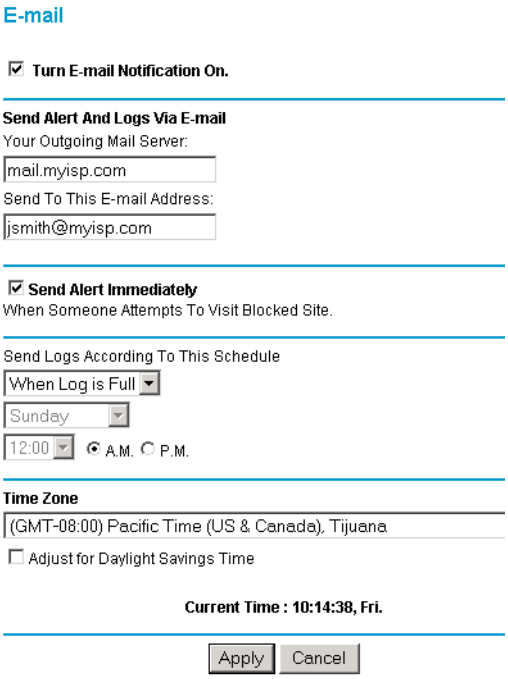
Configuring for Content Filtering

The Model RP614 Web Safe Router provides you with Web content filtering options, plus browsing activity reporting and instant alerts via e-mail. Parents and network administrators can establish restricted access policies based on time-of-day, web and newsgroup addresses and web and newsgroup address keywords.

To configure these features of your router, click on the subheadings under the Content Filtering heading in the Main Menu of the browser interface. The subheadings are described below:

E-Mail

In order to receive logs and alerts by email, you must provide your email information in the E-Mail subheading:



- Turn e-mail notification on
  Check this box if you wish to receive e-mail logs and alerts from the router.
- Your outgoing mail server
  Enter the name of your ISP's outgoing (SMTP) mail server (such as mail.myISP.com). You may be able to find this information in the configuration menu of your e-mail program. If you leave this box blank, log and alert messages will not be sent via e-mail.
- Send to this e-mail address
  Enter the e-mail address to which logs and alerts are sent. This e-mail address will also be used as the From address. If you leave this box blank, log and alert messages will not be sent via e-mail.

You can specify that logs are automatically sent to the specified e-mail address with these options:

- Send alert immediately
  Check this box if you would like immediate notification of attempted access to a blocked site.
- Send logs according to this schedule
  Specifies how often to send the logs: Hourly, Daily, Weekly, or When Full.
  - Day for sending log
    Specifies which day of the week to send the log. Relevant when the log is sent weekly or daily.
  - Time for sending log
    Specifies the time of day to send the log. Relevant when the log is sent daily or weekly.

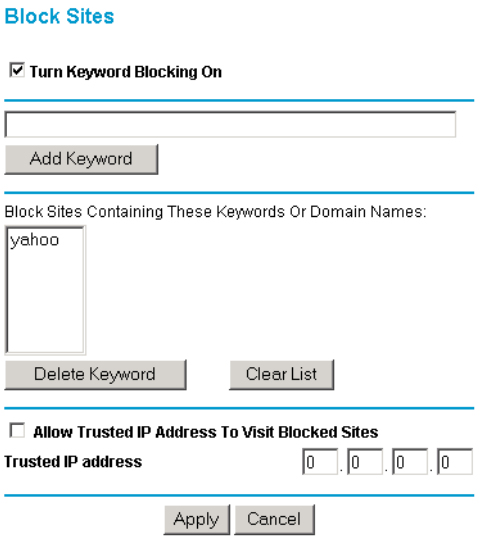
  If the Weekly, Daily or Hourly option is selected and the log fills up before the specified period, the log is automatically e-mailed to the specified e-mail address. After the log is sent, the log is cleared from the router's memory. If the router cannot e-mail the log file, the log buffer may fill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

The Model RP614 router uses the Network Time Protocol (NTP) to obtain the current time and date from one of several Network Time Servers on the Internet. In order to localize the time for your log entries, you must specify your Time Zone:

- Time Zone
  Select your local time zone. This setting will be used for the blocking schedule and for time-stamping log entries.
- Daylight Savings Time
  Check this box if your time zone is currently under daylight savings time.

Block Sites

The Model RP614 router allows you to restrict access based on web and newsgroup addresses and web and newsgroup address keywords. Up to 255 entries are supported in the Keyword list. The Keyword Blocking menu is shown below:



To enable keyword blocking, check “Turn keyword blocking on”, then click Apply. Be sure that a time period for blocking is specified on the Schedule menu.

To add a keyword or domain, type it in the Keyword box, click Add Keyword, then click Apply.

To delete a keyword or domain, select it from the list, click Delete Keyword, then click Apply.

Keyword application examples:

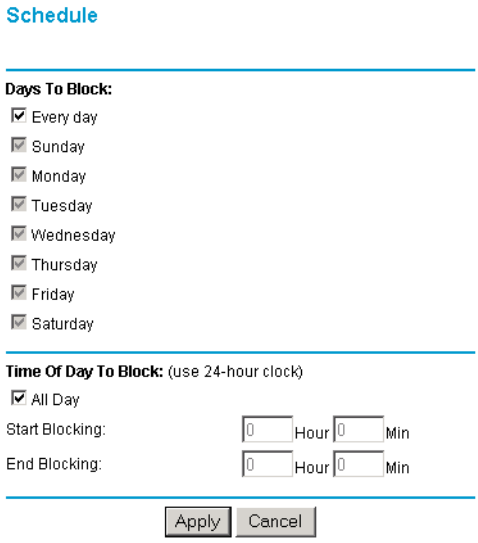
- If the keyword "XXX" is specified, the URL <http://www.badstuff.com/xxx.html> is blocked, as is the NNTP newsgroup alt.XXX.
- If the keyword “.com” is specified, only websites with other domain suffixes (such as .edu or .gov) can be viewed.
- If you wish to block all Internet browsing access during a scheduled period, enter the keyword “.” and set the schedule in the Schedule menu.

To specify a Trusted User, enter that PC’s IP address in the Trusted User box and click Apply.

You may specify one Trusted User, which is a PC that will be exempt from blocking and logging. Since the Trusted User will be identified by an IP address, you should configure that PC with a fixed IP address.

Schedule

The Model RP614 router allows you to specify when blocking will be enforced. The Schedule tab is shown below:

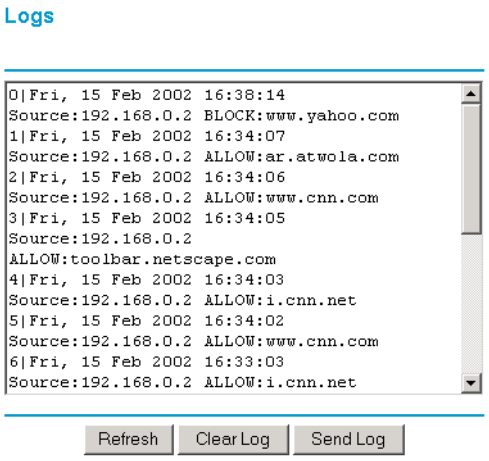


- Use this schedule for blocking content
  Check this box if you wish to enable a schedule for Content Filtering. Click Apply.
- Days to Block
  Select days to block by checking the appropraite boxes. Select Everyday to check the boxes for all days. Click Apply.
- Time of Day to Block
  Select a start and end time in 23:59 format. Select All day for 24 hour blocking. Click Apply.

Be sure to select your Time Zone in the E-Mail menu.

Logs

The log is a detailed record of what websites you have accessed or attempted to access. Up to 128 entries are stored in the log. Log entries will only appear when keyword blocking is enabled, and no log entries will be made for the Trusted User. An example is shown below:



Log entries are described in Table 5-1

Table 5-1. Log entry descriptions

Field	Description
Number	The index number of the content filter log entries. 128 entries are available numbered from 0 to 127. The log will keep the record of the latest 128 entries.
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.
Action	This field displays whether the access was blocked or allowed.
	The name or IP address of the website or newsgroup visited or attempted to access.

Log action buttons are described in Table 5-2

Table 5-2. Log action buttons

Field	Description
Refresh	Click this button to refresh the log screen.
Clear Log	Click this button to clear the log entries.
Send Log	Click this button to email the log immediately.

Chapter 6
Maintenance

This chapter describes how to use the maintenance features of your Model RP614 Web Safe Router. These features can be found by clicking on the Maintenance heading in the Main Menu of the browser interface.

System Status

The System Status menu provides a limited amount of status and usage information. From the Main Menu of the browser interface, click on Maintenance, then select System Status to view the System Status screen, shown in Figure 6-1.

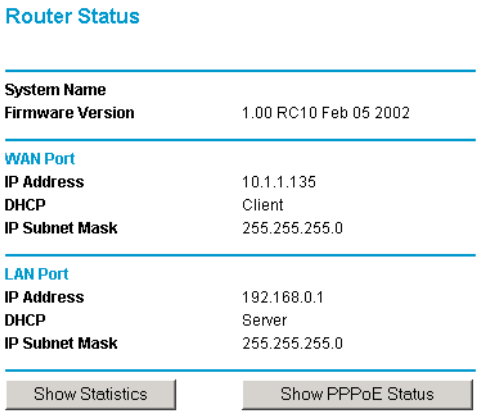


Figure 6-1. System Status screen

This screen shows the following parameters:

Table 6-1. Menu 3.2 - System Status Fields

Field	Description
System Name	This field displays the Host Name assigned to the router.
Firmware Version	This field displays the router firmware version.
WAN Port	These parameters apply to the Internet (WAN) port of the router.
IP Address	This field displays the IP address being used by the Internet (WAN) port of the router. If no address is shown, the router cannot connect to the Internet.
IP Subnet Mask	This field displays the IP Subnet Mask being used by the Internet (WAN) port of the router.
DHCP	If set to None, the router is configured to use a fixed IP address on the WAN. If set to Client, the router is configured to obtain an IP address dynamically from the ISP.
LAN Port	These parameters apply to the Local (WAN) port of the router.
IP Address	This field displays the IP address being used by the Local (LAN) port of the router. The default is 192.168.0.1
IP Subnet Mask	This field displays the IP Subnet Mask being used by the Local (LAN) port of the router. The default is 255.255.255.0
DHCP	If set to None, the router will not assign IP addresses to local PCs on the LAN. If set to Server, the router is configured to assign IP addresses to local PCs on the LAN.

Click on the “Show Statistics” button to display router usage statistics, as shown in Figure 6-2 below:

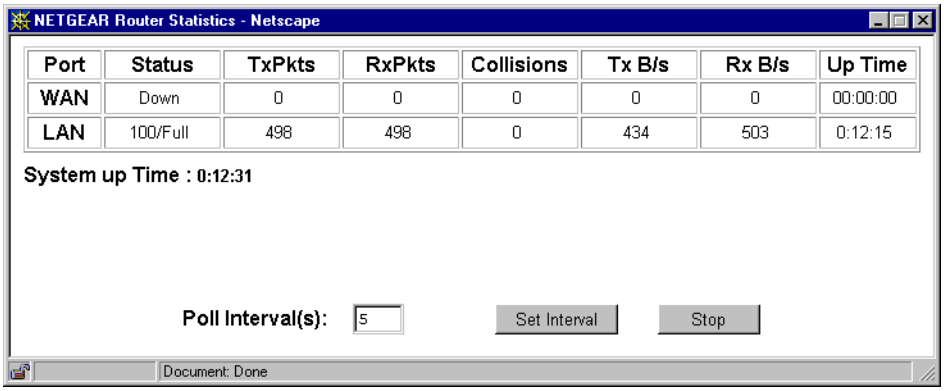


Figure 6-2. Router Statistics screen

This screen shows the following statistics:.

Table 6-2. Router Statistics Fields

Field	Description
Port	The statistics for the WAN (Internet) and LAN (local) ports. For each port, the screen displays:
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 line utilization—percentage of current bandwidth used on this port.
Tx B/s	The average line utilization —average CLU for this port.
Up Time	The time elapsed since this port acquired link.
System up Time	The time elapsed since the last power cycle or reset.
Poll Interval	Specifies the intervals at which the statistics are updated in this window. Click on Stop to freeze the display.

Click on the “Show PPPoE Status” button to display the progress of the PPPoE connection, as shown in Figure 6-2

Attached Devices

The Attached Devices menu 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 the Maintenance heading, select Attached Devices to view the table, shown in Figure 6-3

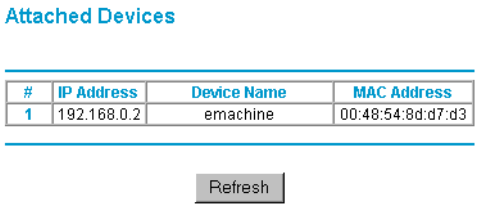


Figure 6-3. Attached Devices menu

For each device, the table shows the IP address, NetBIOS Host Name (if available), and Ethernet MAC address. Note that if the router is rebooted, the table data is lost until the router rediscovers the devices. To force the router to look for attached devices, click the Refresh button.

Router Software Upgrade

The routing software of the Model RP614 router is stored in FLASH memory, and can be upgraded as new software is released by NETGEAR. Upgrade files can be downloaded from Netgear's website. If the upgrade file is compressed (.ZIP file), you must first extract the binary (.BIN) file before sending it to the router. The upgrade file can be sent to the router using your browser.

Note: The Web browser used to upload new firmware into the Model RP614 router must support HTTP uploads. NETGEAR recommends using Microsoft Internet Explorer or Netscape Navigator 3.0 or above.

From the Main Menu of the browser interface, under the Maintenance heading, select the Router Upgrade heading to display the menu shown in Figure 6-4.

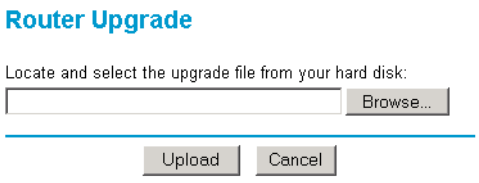


Figure 6-4. Router Upgrade menu

To upload new firmware:

1. Download and unzip the new software file from NETGEAR.
2. In the Router Upgrade menu, click the Browse button and browse to the location of the binary (.BIN) upgrade file
3. Click Upload.

   Note: When uploading software to the Model RP614 router, it is important not to interrupt the Web browser by closing the window, clicking a link, or loading a new page. If the browser is interrupted, it may corrupt the software. When the upload is complete, your router will automatically restart. The upgrade process will typically take about one minute.

In some cases, you may need to reconfigure the router after upgrading.

Configuration File Settings Management

The configuration settings of the Model RP614 router are stored within the router in a configuration file. This file can be saved (backed up) to a user's PC, retrieved (restored) from the user's PC, or cleared to factory default settings.

From the Main Menu of the browser interface, under the Maintenance heading, select the Settings Backup heading to bring up the menu shown in Figure 6-5.

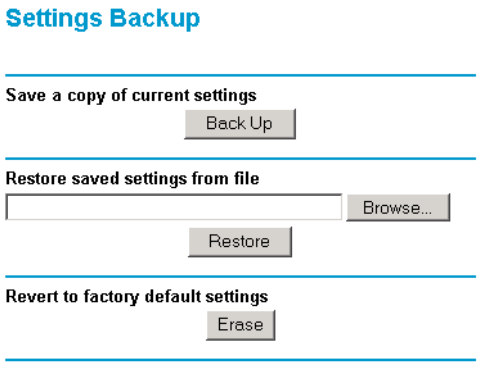


Figure 6-5. Settings Backup menu

Three options are available, and are described in the following sections.

Restore and Backup the Configuration

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

To save your settings, select the Backup tab. Click the Backup button. Your browser will extract the configuration file from the router and will prompt you for a location on your PC to store the file. You can give the file a meaningful name at this time, such as pacbell.cfg.

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

Erase the Configuration

It is sometimes desirable to restore the router to a known blank condition. This can be done by using the Erase function, which will restore all factory settings. After an erase, the router's password will be **password**, the LAN IP address will be 192.168.0.1, and the router's DHCP client will be enabled.

To erase the configuration, click the Erase button.

To restore the factory default configuration settings without knowing the login password or IP address, you must use the Default Reset button on the rear panel of the router. See “Using the Default Reset button“ on page 8-7.

Changing the Configuration 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.

From the Main Menu of the browser interface, under the Maintenance heading, select Set Password to bring up the menu shown in Figure 6-6.

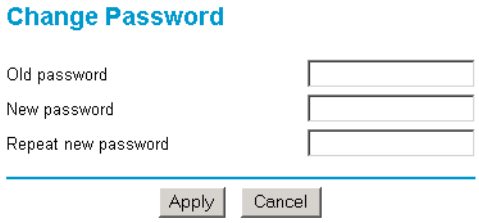


Figure 6-6. Set Password menu

To change the password, first enter the old password, and then enter the new password twice. Click Apply.

Chapter 7
Advanced Configuration of the Router

This chapter describes how to configure the advanced features of your Model RP614 Web Safe Router. These features can be found under the Advanced heading in the Main Menu of the browser interface.

Configuring for Port Forwarding to Local Servers

Although the router causes your entire local network to appear as a single machine to the Internet, you can make a local server (for example, a web server or game server) visible and available to the Internet. This is done using the Port Forwarding menu. From the Main Menu of the browser interface, under Advanced, click on Port Forwarding to view the port forwarding menu, shown in Figure 7-1

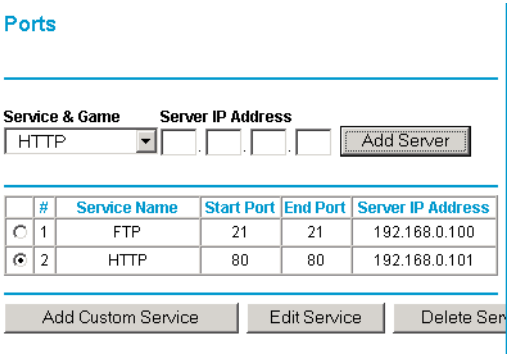


Figure 7-1. Port Forwarding Menu.

Note: Some residential broadband ISP accounts do not allow you to run any server processes (such as a Web or FTP server) from your location. Your ISP may periodically check for servers and may suspend your account if it discovers any active services at your location. If you are unsure, refer to the Acceptable Use Policy of your ISP.

Use the Port Forwarding menu to configure the router to forward 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 Security Menu.

Before starting, you'll need to determine which type of service, application or game you'll provide and the IP address of the computer that will provide each service. Be sure the computer's IP address never changes. To configure port forwarding to a local server:

1. From the Service & Game box, select the service or game that you will host on your network. If the service does not appear in the list, refer to the following section, "Add a Custom Service".

2. Enter the IP address of the local server in the corresponding Server IP Address box.
3. Click the Add button.

Add a Custom Service

To define a service, game or application that does not appear in the Services & Games list, you must detemine what port numbers are used by the service. For this information, you may need to contact the manufacturer of the program that you wish to use. When you have the port number information, follow these steps:

1. Click the Add Custom Service button.
2. Enter the first port number in an unused Start Port box.
3. To forward only one port, enter it again in the End Port box. To specify a range of ports, enter the last port to be forwarded in the End Port box.
4. Enter the IP address of the local server in the corresponding Server IP Address box.
5. Type a name for the service.
6. Click Apply at the bottom of the menu.

Edit or Delete a Port Forwarding Entry

To edit or delete a Port Forwarding entry, follow these steps.

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

Local Web and FTP Server Example

If a local PC with a private IP address of 192.168.0.33 acts as a Web and FTP server, configure the Ports menu to forward HTTP (port 80) and FTP (port 21) to local address 192.168.0.33

In order for a remote user to access this server from the Internet, the remote user must know the IP address that has been assigned by your ISP. If this address is 172.16.1.23, for example, an Internet user can access your Web server by directing the browser to http://172.16.1.23. The assigned IP address can be found in the Maintenance Status Menu, where it is shown as the WAN IP Address.

Some considerations for this application are:

- If your account’s IP address is assigned dynamically by your ISP, the IP address may change periodically as the DHCP lease expires.

- If the IP address of the local PC is assigned by DHCP, it may change when the PC is rebooted. To avoid this, you can manually configure the PC to use a fixed address.
- Local PCs must access the local server using the PCs' local LAN address (192.168.0.33 in this example). Attempts by local PCs to access the server using the external IP address (172.16.1.23 in this example) will fail.

Tip: Multiple Computers for Half Life, KALI or Quake III

To set up an additional computer to play Half Life, KALI or Quake III:

1. Click the button of an unused port in the table.
2. Select the game again from the Services/Games list.
3. Change the beginning port number in the Start Port box.
   For these games, use the supplied number in the default listing and add +1 for each additional computer. For example, if you've alrealy configured one computer to play Hexen II (using port 26900), the second computer's port number would be 26901, and the third computer would be 26902.
4. Type the same port number in the End Port box that you typed in the Start Port box.
5. Type the IP address of the additional computer in the Server IP Address box.
6. Click Apply.

Some online games and videoconferencing applications are incompatible with NAT. The Model RP614 router is programmed to recognize some of these applications and to work properly with them, but there are other applications that may not function well. In some cases, one local PC can run the application properly if that PC's IP address is entered as the default in the PORTS Menu. If one local PC acts as a game or videoconference host, enter its IP address as the default.

Security

DMZ Server

Incoming traffic from the Internet is normally 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 menu. 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 Default DMZ Server feature is helpful when using some online games and videoconferencing applications that are incompatible with NAT. The router is programmed to recognize some of these applications and to work properly with them, but there are other applications that may not function well. In some cases, one local PC can run the application properly if that PC's IP address is entered as the Default DMZ Server.

The Security menu, shown in Figure 7-2, allows the configuration of a Default DMZ Server.

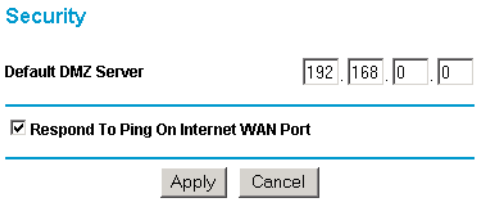


Figure 7-2. Security menu.

Note: For security, you should avoid using the Default DMZ Server feature. When a computer is designated as the Default DMZ Server, it loses much of the protection of the router, and is exposed to many exploits from the Internet. If compromised, the computer can be used to attack your network.

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

1. Click Default DMZ Server.
2. Type the IP address for that server.
3. Click Apply.

Respond to Ping on Internet WAN Port

If you want the router to respond to a 'ping' from the Internet, click the 'Respond to Ping on Internet WAN Port' check box. This should only be used as a diagnostic tool, since it allows your router to be discovered. Don't check this box unless you have a specific reason to do so.

Dynamic DNS

If your network has 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 will 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, who will allow you to register your domain to their IP address, and will forward traffic directed at your domain to your frequently-changing IP address.

The router contains a client that can connect to many popular dynamic DNS services. You can select one of these services and obtain an account with them. Then, whenever your ISP-assigned IP address changes, your router will automatically contact your dynamic DNS service provider, log in to your account, and register your new IP address.

From the Main Menu of the browser interface, under Advanced, click on Dynamic DNS. To configure Dynamic DNS:

1. Access the website of one of the dynamic DNS service providers whose names appear in the 'Select Service Provider' box, and register for an account.
   For example, for dyndns.org, go to 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 that your dynamic DNS service provider gave you.
   The dynamic DNS service provider may call this the domain name.
5. Type the User Name for your dynamic DNS account.
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 may select the Use wildcards check box to activate this feature.
   For example, the wildcard feature will cause *.yourhost.dyndns.org to be aliased to the same IP address as yourhost.dyndns.org
8. Click Apply to save your configuration.



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 will not be routed on the Internet.

LAN IP Setup

The second feature category under the Advanced heading is LAN IP Setup. This menu allows configuration of LAN IP services such as DHCP and RIP. From the Main Menu of the browser interface, under Advanced, click on LAN IP Setup to view the LAN IP Setup menu, shown in Figure 7-3

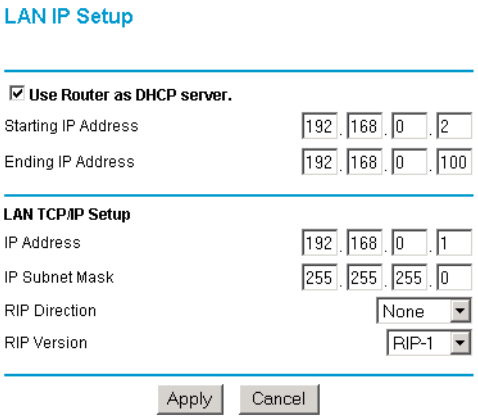


Figure 7-3. LAN IP Setup Menu

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 addresses—192.168.0.1
- Subnet mask—255.255.255.0

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

DHCP

By default, the router will function as a DHCP (Dynamic Host Configuration Protocol) 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. IP addresses will be assigned to the attached PCs from a pool of addresses specified in this menu. 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. See “IP Configuration by DHCP” on page B-10 for an explanation of DHCP and information about how to assign IP addresses for your network.

Use router as DHCP server

If another device on your network will be the DHCP server, or if you will manually configure the network settings of all of your computers, clear the ‘Use router as DHCP server’ check box. Otherwise, leave it checked.

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 192.168.0.2 and 192.168.0.253, although you may wish to save part of the range for devices with fixed addresses.

The router will deliver 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 menu; otherwise, the router’s LAN IP address)
- Secondary DNS Server (if you entered a Secondary DNS address in the Basic Settings menu

LAN TCP/IP Setup

The LAN IP parameters are:

- IP Address
  This is the LAN IP address of the router.
- IP Subnet Mask
  This is 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 (Router Information Protocol) 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 will broadcast its routing table periodically.

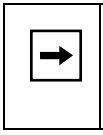
— When set to Both or In Only, it will incorporate the RIP information that it receives.

— When set to None, it will not send any RIP packets and will ignore any RIP packets received.

- RIP Version
  This controls the format and the broadcasting method of the RIP packets that the router sends. (It recognizes both formats when receiving.) By default, this is set for RIP-1.

  — RIP-1 is universally supported. RIP-1 is probably adequate for most networks, unless you have an unusual network setup.

  — RIP-2 carries more information. RIP-2B uses subnet broadcasting..



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.

Static Routes

Static Routes provide additional routing information to your router. Under normal 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.

From the Main Menu of the browser interface, under Advanced, click on Static Route to view the Static Route menu, shown in Figure 7-4.

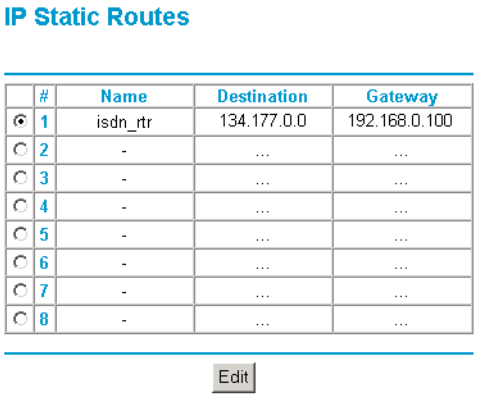


Figure 7-4. Static Route Summary Table

To add or edit a Static Route:

1. Select a number and click the Edit button to open the Edit Menu, shown in Figure 7-5.

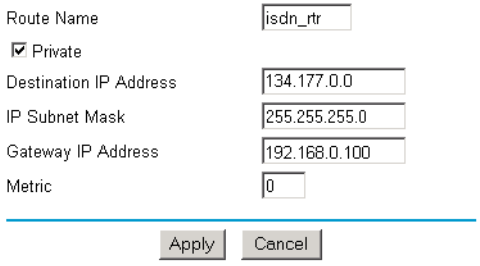


Figure 7-5. Static Route Entry and Edit Menu

2. Type a route name for this static route in the Route Name box under the table. (This is for identification purpose only.)
3. Select Private if you want to limit access to the LAN only. The static route will not be reported in RIP.
4. Select Active to make this route effective.
5. Type the Destination 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 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.

Static Route Example

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 192.168.0.100.
- Your company's network 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 192.168.0.x addresses. With this configuration, if you attempt to access a device on the 134.177.0.0 network, your router will forward your request to the ISP. The ISP forwards your request to the company where you are employed, and the request will likely 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 192.168.0.100. The static route would look like Figure 7-5.

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 fields specifies that all traffic for these addresses should be forwarded to the ISDN router at 192.168.0.100.
- 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.

Chapter 8
Troubleshooting

This chapter gives information about troubleshooting your Model RP614 Web Safe Router. After each problem description, instructions are provided to help you diagnose and solve the problem.

Basic Functioning

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 LED is on.
2. Verify that the Test LED lights within a few seconds, indicating that the self-test procedure is running.
3. After approximately 10 seconds, verify that:
   a. The Test LED is not lit.
   b. The LAN port LEDs are lit for any local ports that are connected.
   c. The WAN port LED is lit.

   If a port's LED is lit, a link has been established to the connected device. If a LAN port is connected to a 100 Mbps device, verify that the port's LED is green. If the port is 10 Mbps, the LED will be amber.

If any of these conditions does not occur, refer to the appropriate following section.

Power LED Not On

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

- Make sure that the power cord is properly connected to your router and that the power supply adapter is properly connected to a functioning power outlet.

- Check that you are using the 7.5 V DC power adapter supplied by NETGEAR for this product.

If the error persists, you have a hardware problem and should contact technical support.

Test LED Never Turns On or Test LED Stays On

When the router is turned on, the Test LED turns on for about 10 seconds and then turns off. If the Test LED does not turn on, or if it stays on, there is a fault within the router.

If you experience problems with the Test LED:

- Cycle the power to see if the router recovers and the LED blinks for the correct amount of time.

If all LEDs including the Test LED are still on one minute after power up:

- Cycle the power to see if the router recovers.
- Clear the router's configuration to factory defaults. This will set the router's IP address to 192.168.0.1. This procedure is explained in "Using the Default Reset button" on page 8-7.

If the error persists, you might have a hardware problem and should contact technical support.

LAN or WAN Port LEDs Not On

If either the LAN LEDs or WAN LED do not light when the Ethernet connection is made, check the following:

- Make sure that the Ethernet cable connections are secure at the router and at the hub or workstation.
- Make sure that power is turned on to the connected hub or workstation.
- Be sure you are using the correct cable:
  - When connecting the router's WAN 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.

Troubleshooting the Web Configuration Interface

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

- Check the Ethernet connection between the PC and the router as described in the previous section.
- Make sure your PC's IP address is on the same subnet as the router. If you are using the recommended addressing scheme, your PC's address should be in the range of 192.168.0.2 to 192.168.0.254. Refer to "Verifying TCP/IP Properties" on page 3-5 or "Verifying TCP/IP Properties (Macintosh)" on page 3-8 to find your PC's IP address. Follow the instructions in Chapter 3 to configure your PC.

  Note: If your PC's IP address is shown as 169.254.x.x:
  Recent versions of Windows and MacOS will generate and assign an IP address if the computer cannot reach a DHCP server. These auto-generated addresses are in the range of 169.254.x.x. If your IP address is in this range, check the connection from the PC to the router and reboot your PC.
- If your router's IP address has been changed and you don't know the current IP address, clear the router's configuration to factory defaults. This will set the router's IP address to 192.168.0.1. This procedure is explained in "Using the Default Reset button" on page 8-7.
- Make sure your browser has Java, JavaScript, or ActiveX enabled. If you are using Internet Explorer, click Refresh to be sure the Java applet is loaded.
- Try quitting the browser and launching it again.
- Make sure 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 the APPLY button before moving to another menu or tab, or your changes are lost.
- Click the Refresh or Reload button in the Web browser. The changes may have occurred, but the Web browser may be caching the old configuration.

Troubleshooting the ISP Connection

If your router is unable to access the Internet, you should first determine whether the router is able to obtain a WAN IP address from the ISP. Unless you have been assigned 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. Launch your browser and select an external site such as www.netgear.com
2. Access the Main Menu of the router's configuration at http://192.168.0.1
3. Under the Maintenance heading, select Router Status
4. Check that an IP address is shown for the WAN 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 may need to force your cable or DSL modem to recognize your new router by performing the following procedure:

1. Turn off power to the cable or DSL modem.
2. Turn off power to your router.
3. Wait five minutes and reapply power to the cable or DSL modem.
4. When the modem's LEDs indicate that it has reacquired sync with the ISP, reapply power to your router.

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

- Your ISP may 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, you may have incorrectly set the login name and password.
- Your ISP may check for your PC's host name.
  Assign the PC Host Name of your ISP account as the Account Name in the Basic Settings menu.
- Your ISP only allows one Ethernet MAC address to connect to Internet, and may check for your PC's MAC address. In this case:

  Inform your ISP that you have bought a new network device, and ask them to use the router's MAC address.

OR

Configure your router to spoof your PC's MAC address. This can be done in the Basic Settings menu. Refer to "Manual Configuration" on page 4-8.

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

- Your PC may 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 will provide the addresses of one or two DNS servers for your use. If you entered a DNS address during the router's configuration, reboot your PC and verify the DNS address as described in "Verifying TCP/IP Properties" on page 3-5. Alternatively, you may configure your PC manually with DNS addresses, as explained in your operating system documentation.

- Your PC may not have the router configured as its TCP/IP gateway.

  If your PC obtains its information from the router by DHCP, reboot the PC and verify the gateway address as described in "Verifying TCP/IP Properties" on page 3-5.

Troubleshooting a TCP/IP Network Using a Ping Utility

Most TCP/IP terminal 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 TCP/IP network is made very easy by using the ping utility in in your PC or workstation.

Testing the LAN Path to Your Router

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

To ping the router from a PC running Windows 95 or later:

1. From the Windows toolbar, click on the Start button and select Run.
2. In the field provided, type Ping followed by the IP address of the router, as in this example:

   ```
   ping 192.168.0.1
   ```

3. Click on 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
  - — Make sure the LAN port LED is on. If the LED is off, follow the instructions in "LAN or WAN Port LEDs Not On" on page 8-2.
  - — Check that the corresponding Link LEDs are on for your network interface card and for the hub ports (if any) that are connected to your workstation and router.
- Wrong network configuration
  - — Verify that the Ethernet card driver software and TCP/IP software are both installed and configured on your PC or workstation.
  - — Verify that the IP address for your router and your workstation are correct and that the addresses are on the same subnet.

Testing the Path from Your PC to a Remote Device

After verifying that the LAN path works correctly, test the path from your PC to a remote device. From the Windows run menu, 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 as in the previous section are displayed. If you do not receive replies:

- — Check that your PC has the IP address of your router listed as the default gateway. If the IP configuration of your PC is assigned by DHCP, this information will not be visible in your PC's Network Control Panel. Verify that the IP address of the router is listed as the default gateway as described in "Verifying TCP/IP Properties" on page 3-5.
- — Check to see that the network address of your PC (the portion of the IP address specified by the netmask) 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 PC, enter that host name as the Account Name in the Basic Settings menu.

— Your ISP could be rejecting the Ethernet MAC addresses of all but one of your PCs. Many broadband ISPs restrict access by only allowing traffic from the MAC address of your broadband modem, but some ISPs additionally restrict access to the MAC address of a single PC connected to that modem. If this is the case, you must configure your router to "clone" or "spoof" the MAC address from the authorized PC. Refer to "Manual Configuration" on page 4-8.

Restoring the Default Configuration and Password

This section explains how to restore the factory default configuration settings, changing the router's administration password to **password** and the IP address to 192.168.0.1. You can erase the current configuration and restore factory defaults in two ways:

- Use the Erase function of the Web Configuration Manager (see "Erase the Configuration" on page 6-5).
- Use the Default Reset button on the rear panel of the router. Use this method for cases when the administration password or IP address is not known.

Using the Default Reset button

To restore the factory default configuration settings without knowing the administration password or IP address, you must use the Default Reset button on the rear panel of the router.

1. Press and hold the Default Reset button until the Test LED turns on (about 10 seconds).
2. Release the Default Reset button and wait for the router to reboot.

Problems with Date and Time

The E-Mail menu in the Content Filtering section displays the current date and time of day. The Model RP614 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:

- 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 configured correctly. If you have just completed configuring the router, wait at least five minutes and check the date and time again.
- Time is off by one hour
  Cause: The router does not automatically sense Daylight Savings Time. In the E-Mail menu, check or uncheck the box marked “Adjust for Daylight Savings Time”.

Appendix A
Technical Specifications

This appendix provides technical specifications for the Model RP614 Web Safe Router.

Network Protocol and Standards Compatibility	
Data and Routing Protocols:	TCP/IP, RIP-1, RIP-2, DHCP PPP over Ethernet (PPPoE)
Power Adapter	
North America:	120V, 60 Hz, input
United Kingdom, Australia:	240V, 50 Hz, input
Europe:	230V, 50 Hz, input
Japan:	100V, 50/60 Hz, input
All regions (output):	7.5 V DC @ 1A output, 20W maximum
Physical Specifications	
Dimensions:	28 x 175 x 118 mm (1.1 x 6.89 x 4.65 in.)
Weight:	0.3 kg (0.66 lb)
Environmental Specifications	
Operating temperature:	0° to 40° C (32º to 104º F)

Operating humidity:	90% maximum relative humidity, noncondensing
Electromagnetic Emissions	
Meets requirements of:	FCC Part 15 Class B
	VCCI Class B
	EN 55 022 (CISPR 22), Class B
Interface Specifications	
LAN:	10BASE-T or 100BASE-Tx, RJ-45
WAN:	10BASE-T, RJ-45

Appendix B
Network and Routing Basics

This chapter provides an overview of IP networks, routing, and firewalls.

Basic Router Concepts

Large amounts of bandwidth can be provided easily and relatively inexpensively in a local area network (LAN). However, providing high bandwidth between a local network and the Internet can be very expensive. Because of this expense, Internet access is usually provided by a slower-speed wide-area network (WAN) link such as a cable or DSL modem. In order to make the best use of the slower WAN link, a mechanism must be in place for selecting and transmitting only the data traffic meant for the Internet. The function of selecting and forwarding this data is performed by a router.

What is a Router?

A router is a device that forwards traffic between networks based on network layer information in the data and on routing tables maintained by the router. In these routing tables, a router builds up a logical picture of the overall network by gathering and exchanging information with other routers in the network. Using this information, the router chooses the best path for forwarding network traffic.

Routers vary in performance and scale, number of routing protocols supported, and types of physical WAN connection they support. The Model RP614 Web Safe Router is a small office router that routes the IP protocol over a single-user broadband connection.

Routing Information Protocol

One of the protocols used by a router to build and maintain a picture of the network is the Routing Information Protocol (RIP). Using RIP, routers periodically update one another and check for changes to add to the routing table.

The Model RP614 router supports both the older RIP-1 and the newer RIP-2 protocols. Among other improvements, RIP-2 supports subnet and multicast protocols. RIP is not required for most home applications.

IP Addresses and the Internet

Because TCP/IP networks are interconnected across the world, every machine on the Internet must have a unique address to make sure that transmitted data reaches the correct destination. Blocks of addresses are assigned to organizations by the Internet Assigned Numbers Authority (IANA). Individual users and small organizations may obtain their addresses either from the IANA or from an Internet service provider (ISP). You can contact IANA at www.iana.org.

The Internet Protocol (IP) uses a 32-bit address structure. The address is usually written in dot notation (also called dotted-decimal notation), in which each group of eight bits is written in decimal form, separated by decimal points.

For example, the following binary address:

```
11000011  00100010  00001100  00000111
```

is normally written as:

```
195.34.12.7
```

The latter version is easier to remember and easier to enter into your computer.

In addition, the 32 bits of the address are subdivided into two parts. The first part of the address identifies the network, and the second part identifies the host node or station on the network. The dividing point may vary depending on the address range and the application.

There are five standard classes of IP addresses. These address classes have different ways of determining the network and host sections of the address, allowing for different numbers of hosts on a network. Each address type begins with a unique bit pattern, which is used by the TCP/IP software to identify the address class. After the address class has been determined, the software can correctly identify the host section of the address. The follow figure shows the three main address classes, including network and host sections of the address for each address type.

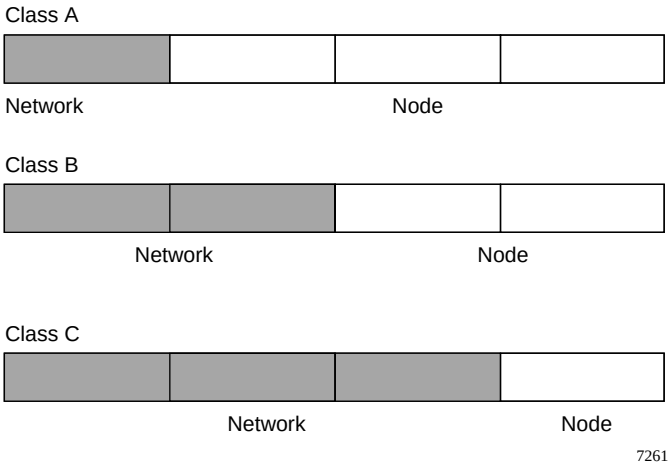


Figure B-1. Three Main Address Classes

The five address classes are:

- Class A
  Class A addresses can have up to 16,777,214 hosts on a single network. They use an eight-bit network number and a 24-bit node number. Class A addresses are in this range:

  `1.x.x.x to 126.x.x.x.`

- Class B
  Class B addresses can have up to 65,354 hosts on a network. A Class B address uses a 16-bit network number and a 16-bit node number. Class B addresses are in this range:

  `128.1.x.x to 191.254.x.x.`

- Class C
  Class C addresses can have 254 hosts on a network. Class C addresses use 24 bits for the network address and eight bits for the node. They are in this range:

  `192.0.1.x to 223.255.254.x.`

- Class D
  Class D addresses are used for multicasts (messages sent to many hosts). Class D addresses are in this range:

  `224.0.0.0 to 239.255.255.255.`

- Class E
  Class E addresses are for experimental use.

This addressing structure allows IP addresses to uniquely identify each physical network and each node on each physical network.

For each unique value of the network portion of the address, the base address of the range (host address of all zeros) is known as the network address and is not usually assigned to a host. Also, the top address of the range (host address of all ones) is not assigned, but is used as the broadcast address for simultaneously sending a packet to all hosts with the same network address.

Netmask

In each of the address classes previously described, the size of the two parts (network address and host address) is implied by the class. This partitioning scheme can also be expressed by a netmask associated with the IP address. A netmask is a 32-bit quantity that, when logically combined (using an AND operator) with an IP address, yields the network address. For instance, the netmasks for Class A, B, and C addresses are 255.0.0.0, 255.255.0.0, and 255.255.255.0, respectively.

For example, the address 192.168.170.237 is a Class C IP address whose network portion is the upper 24 bits. When combined (using an AND operator) with the Class C netmask, as shown here, only the network portion of the address remains:

```
11000000  10101000  10101010  11101101 (192.168.170.237)
```

combined with:

```
11111111  11111111  11111111  00000000 (255.255.255.0)
```

Equals:

```
11000000  10101000  10101010  00000000 (192.168.170.0)
```

As a shorter alternative to dotted-decimal notation, the netmask may also be expressed in terms of the number of ones from the left. This number is appended to the IP address, following a backward slash (/), as “/n.” In the example, the address could be written as 192.168.170.237/24, indicating that the netmask is 24 ones followed by 8 zeros.

Subnet Addressing

By looking at the addressing structures, you can see that even with a Class C address, there are a large number of hosts per network. Such a structure is an inefficient use of addresses if each end of a routed link requires a different network number. It is unlikely that the smaller office LANs would have that many devices. You can resolve this problem by using a technique known as subnet addressing.

Subnet addressing allows us to split one IP network address into smaller multiple physical networks known as subnetworks. Some of the node numbers are used as a subnet number instead. A Class B address gives us 16 bits of node numbers translating to 64,000 nodes. Most organizations do not use 64,000 nodes, so there are free bits that can be reassigned. Subnet addressing makes use of those bits that are free, as shown below.

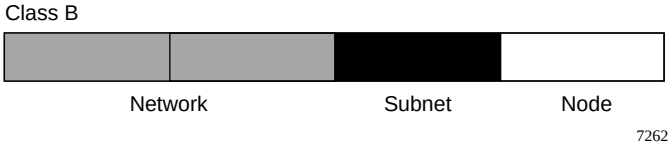


Figure B-2. Example of Subnetting a Class B Address

A Class B address can be effectively translated into multiple Class C addresses. For example, the IP address of 172.16.0.0 is assigned, but node addresses are limited to 255 maximum, allowing eight extra bits to use as a subnet address. The IP address of 172.16.97.235 would be interpreted as IP network address 172.16, subnet number 97, and node number 235. In addition to extending the number of addresses available, subnet addressing provides other benefits. Subnet addressing allows a network manager to construct an address scheme for the network by using different subnets for other geographical locations in the network or for other departments in the organization.

Although the preceding example uses the entire third octet for a subnet address, note that you are not restricted to octet boundaries in subnetting. To create more network numbers, you need only shift some bits from the host address to the network address. For instance, to partition a Class C network number (192.68.135.0) into two, you shift one bit from the host address to the network address. The new netmask (or subnet mask) is 255.255.255.128. The first subnet has network number 192.68.135.0 with hosts 192.68.135.1 to 129.68.135.126, and the second subnet has network number 192.68.135.128 with hosts 192.68.135.129 to 192.68.135.254.

Note: The number 192.68.135.127 is not assigned because it is the broadcast address of the first subnet. The number 192.68.135.128 is not assigned because it is the network address of the second subnet.

The following table lists the additional subnet mask bits in dotted-decimal notation. To use the table, write down the original class netmask and replace the 0 value octets with the dotted-decimal value of the additional subnet bits. For example, to partition your Class C network with subnet mask 255.255.255.0 into 16 subnets (4 bits), the new subnet mask becomes 255.255.255.240.

Table B-1. Netmask Notation Translation Table for One Octet

Number of Bits	Dotted-Decimal Value
1	128
2	192
3	224
4	240
5	248
6	252
7	254
8	255

The following table displays several common netmask values in both the dotted-decimal and the masklength formats.

Table B-2. Netmask Formats

Dotted-Decimal	Masklength
255.0.0.0	/8
255.255.0.0	/16
255.255.255.0	/24
255.255.255.128	/25
255.255.255.192	/26
255.255.255.224	/27
255.255.255.240	/28
255.255.255.248	/29

Table B-2. Netmask Formats

255.255.255.252	/30
255.255.255.254	/31
255.255.255.255	/32

NETGEAR strongly recommends that you configure all hosts on a LAN segment to use the same netmask for the following reasons:

- So that hosts recognize local IP broadcast packets

  When a device broadcasts to its segment neighbors, it uses a destination address of the local network address with all ones for the host address. In order for this scheme to work, all devices on the segment must agree on which bits comprise the host address.

- So that a local router or bridge recognizes which addresses are local and which are remote

Private IP Addresses

If your local network is isolated from the Internet (for example, when using NAT), you can assign any IP addresses to the hosts without problems. However, the IANA has reserved the following three blocks of IP addresses specifically for private networks:

```
10.0.0.0 - 10.255.255.255
172.16.0.0 - 172.31.255.255
192.168.0.0 - 192.168.255.255
```

NETGEAR recommends that you choose your private network number from this range. The DHCP server of the Model RP614 router is preconfigured to automatically assign private addresses.

Regardless of your particular situation, do not create an arbitrary IP address; always follow the guidelines explained here. For more information about address assignment, refer to RFC 1597, *Address Allocation for Private Internets*, and RFC 1466, *Guidelines for Management of IP Address Space*. The Internet Engineering Task Force (IETF) publishes RFCs on its Web site at www.ietf.org.

Single IP Address Operation Using NAT

In the past, if multiple PCs on a LAN needed to access the Internet simultaneously, you had to obtain a range of IP addresses from the ISP. This type of Internet account is more costly than a single-address account typically used by a single user with a modem, rather than a router. The Model RP614 router employs an address-sharing method called Network Address Translation (NAT). This method allows several networked PCs to share an Internet account using only a single IP address, which may be statically or dynamically assigned by your ISP.

The router accomplishes this address sharing by translating the internal LAN IP addresses to a single address that is globally unique on the Internet. The internal LAN IP addresses can be either private addresses or registered addresses. For more information about IP address translation, refer to RFC 1631, *The IP Network Address Translator (NAT)*.

The following figure illustrates a single IP address operation.

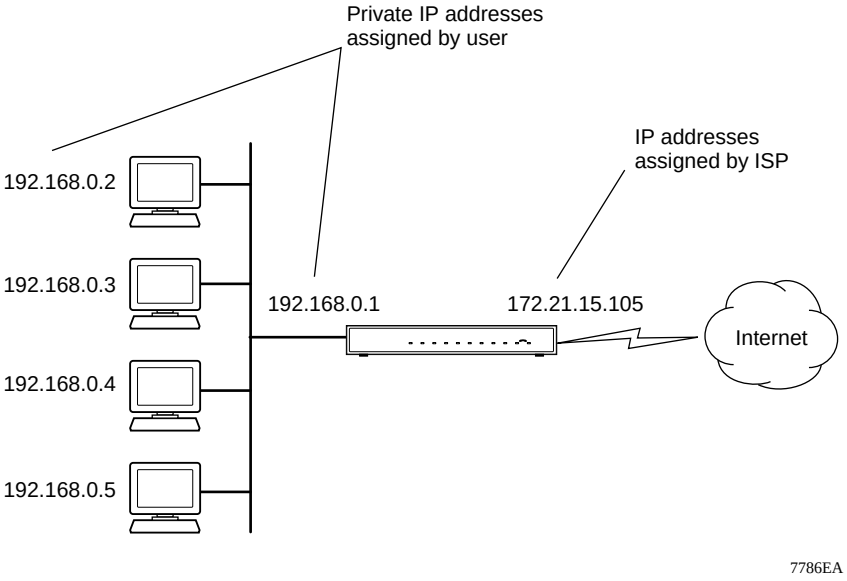


Figure B-3. Single IP Address Operation Using NAT

This scheme offers the additional benefit of simple firewall-like protection because the internal LAN addresses are not available to the Internet through the translated connection. All incoming inquiries are filtered out by the router. This filtering can prevent intruders from probing your system. However, using port forwarding, you can allow one PC (for example, a Web server) on your local network to be accessible to outside users.

MAC Addresses and Address Resolution Protocol

An IP address alone cannot be used to deliver data from one LAN device to another. To send data between LAN devices, you must convert the IP address of the destination device to its media access control (MAC) address. Each device on an Ethernet network has a unique MAC address, which is a 48-bit number assigned to each device by the manufacturer. The technique that associates the IP address with a MAC address is known as address resolution. Internet Protocol uses the Address Resolution Protocol (ARP) to resolve MAC addresses.

If a device sends data to another station on the network and the destination MAC address is not yet recorded, ARP is used. An ARP request is broadcast onto the network. All stations on the network receive and read the request. The destination IP address for the chosen station is included as part of the message so that only the station with this IP address responds to the ARP request. All other stations discard the request.

The station with the correct IP address responds with its own MAC address directly to the sending device. The receiving station provides the transmitting station with the required destination MAC address. The IP address data and MAC address data for each station are held in an ARP table. The next time data is sent, the address can be obtained from the address information in the table.

Domain Name Server

Many of the resources on the Internet can be addressed by simple descriptive names such as *www.NETGEAR.com*. This addressing is very helpful at the application level, but the descriptive name must be translated to an IP address in order for a user to actually contact the resource. Just as a telephone directory maps names to phone numbers, or as an ARP table maps IP addresses to MAC addresses, a domain name system (DNS) server maps descriptive names of network resources to IP addresses.

When a PC accesses a resource by its descriptive name, it first contacts a DNS server to obtain the IP address of the resource. The PC sends the desired message using the IP address. Many large organizations, such as ISPs, maintain their own DNS servers and allow their customers to use the servers to look up addresses.

IP Configuration by DHCP

When an IP-based local area network is installed, each PC must be configured with an IP address. If the PCs need to access the Internet, they should also be configured with a gateway address and one or more DNS server addresses. As an alternative to manual configuration, there is a method by which each PC on the network can automatically obtain this configuration information. A device on the network may act as a Dynamic Host Configuration Protocol (DHCP) server. The DHCP server stores a list or pool of IP addresses, along with other information (such as gateway and DNS addresses) that it may assign to the other devices on the network. The Model RP614 router has the capacity to act as a DHCP server.

The Model RP614 router also functions as a DHCP client when connecting to the ISP. The router can automatically obtain an IP address, subnet mask, DNS server addresses, and a gateway address if the ISP provides this information by DHCP.

Ethernet Cabling

Although Ethernet networks originally used thick or thin coaxial cable, most installations currently use unshielded twisted pair (UTP) cabling. The UTP cable contains eight conductors, arranged in four twisted pairs, and terminated with an RJ45 type connector. A normal "straight-through" UTP Ethernet cable follows the EIA568B standard wiring and pinout as described in Table B-3.

Table B-3. UTP Ethernet cable wiring, straight-through

Pin	Wire color	Signal
1	Orange/White	Transmit (Tx) +
2	Orange	Transmit (Tx) -
3	Green/White	Receive (Rx) +
4	Blue	
5	Blue/White	
6	Green	Receive (Rx) -
7	Brown/White	
8	Brown	

Uplink Switches, Crossover Cables, and MDI/MDIX Switching

In the wiring table above, the concept of transmit and receive are from the perspective of the PC, which is wired as Media Dependant Interface (MDI). In this wiring, the PC transmits on pins 1 and 2. At the hub, the perspective is reversed, and the hub receives on pins 1 and 2. This wiring is referred to as Media Dependant Interface - Crossover (MDI-X). When connecting a PC to a PC, or a hub port to another hub port, the transmit pair must be exchanged with the receive pair. This exchange is done by one of two mechanisms:

- Uplink switch
  Most hubs provide an Uplink switch which will exchange the pairs on one port, allowing that port to be connected to another hub using a normal Ethernet cable.

- Crossover cable
  A crossover cable is a special cable in which the transmit and receive pairs are exchanged at one of the two cable connectors. Crossover cables are often unmarked as such, and must be identified by comparing the two connectors. Since the cable connectors are clear plastic, it is easy to place them side by side and view the order of the wire colors on each. On a straight-through cable, the color order will be the same on both connectors. On a crossover cable, the orange and blue pairs will be exchanged from one connector to the other.

Cable Quality

A twisted pair Ethernet network operating at 10 Mbits/second (10BASE-T) will often tolerate low quality cables, but at 100 Mbits/second (10BASE-Tx) the cable must be rated as Category 5, or "Cat 5" or "Cat V", by the Electronic Industry Association (EIA). This rating will be printed on the cable jacket. A Category 5 cable will meet specified requirements regarding loss and crosstalk. In addition, there are restrictions on maximum cable length for both 10 and 100 Mbits/second networks.

Glossary

10BASE-T	IEEE 802.3 specification for 10 Mbps Ethernet over twisted pair wiring.
100BASE-Tx	IEEE 802.3 specification for 100 Mbps Ethernet over twisted pair wiring.
802.11b	IEEE specification for wireless networking at 11 Mbps using direct-sequence spread-spectrum (DSSS) technology and operating in the unlicensed radio spectrum at 2.5GHz.
Denial of Service attack	DoS. A hacker attack designed to prevent your computer or network from operating or communicating.
DHCP	*See* Dynamic Host Configuration Protocol.
DNS	*See* Domain Name Server.
domain name	A descriptive name for an address or group of addresses on the Internet. Domain names are of the form of a registered entity name plus one of a number of predefined top level suffixes such as .com, .edu, .uk, etc. For example, in the address mail.NETGEAR.com, mail is a server name and NETGEAR.com is the domain.
Domain Name Server	A Domain Name Server (DNS) resolves descriptive names of network resources (such as www.NETGEAR.com) to numeric IP addresses.
Dynamic Host Configuration Protocol	DHCP. An Ethernet protocol specifying how a centralized DHCP server can assign network configuration information to multiple DHCP clients. The assigned information includes IP addresses, DNS addresses, and gateway (router) addresses.
ESSID	The Extended Service Set Identification (ESS ID) is a thirty-two character (maximum) alphanumeric key identifying the wireless local area network.
Gateway	A local device, usually a router, that connects hosts on a local network to other networks.

IP	*See* Internet Protocol.
IP Address	A four-byte number uniquely defining each host on the Internet. Ranges of addresses are assigned by Internic, an organization formed for this purpose. Usually written in dotted-decimal notation with periods separating the bytes (for example, 134.177.244.57).
IPSec	Internet Protocol Security. IPSec is a series of guidelines for securing private information transmitted over public networks. IPSec is a VPN method providing a higher level of security than PPTP.
ISP	Internet service provider.
Internet Protocol	The main internetworking protocol used in the Internet. Used in conjunction with the Transfer Control Protocol (TCP) to form TCP/IP.
LAN	*See* local area network.
local area network	LAN. A communications network serving users within a limited area, such as one floor of a building. A LAN typically connects multiple personal computers and shared network devices such as storage and printers. Although many technologies exist to implement a LAN, Ethernet is the most common for connecting personal computers.
MAC address	Media Access Control address. A unique 48-bit hardware address assigned to every Ethernet node. Usually written in the form 01:23:45:67:89:ab.
Mbps	Megabits per second.
MSB	*See* Most Significant Bit or Most Significant Byte.
MRU	*See* Maximum Receive Unit.
Maximum Receive Unit	The size in bytes of the largest packet that can be sent or received.
Most Significant Bit or Most Significant Byte	The portion of a number, address, or field that is farthest left when written as a single number in conventional hexadecimal ordinary notation. The part of the number having the most value.
NAT	*See* Network Address Translation.
netmask	A number that explains which part of an IP address comprises the network address and which part is the host address on that network. It can be expressed in dotted-decimal notation or as a number appended to the IP address. For example, a 28-bit mask starting from the MSB can be shown as 255.255.255.192 or as /28 appended to the IP address.

Network Address Translation	A technique by which several hosts share a single IP address for access to the Internet.
packet	A block of information sent over a network. A packet typically contains a source and destination network address, some protocol and length information, a block of data, and a checksum.
PPP	*See* Point-to-Point Protocol.
PPP over Ethernet	PPPoE. PPP over Ethernet is a protocol for connecting remote hosts to the Internet over an always-on connection by simulating a dial-up connection.
PPTP	Point-to-Point Tunneling Protocol. A method for establishing a virtual private network (VPN) by embedding Microsoft's network protocol into Internet packets.
PSTN	Public Switched Telephone Network.
Point-to-Point Protocol	PPP. A protocol allowing a computer using TCP/IP to connect directly to the Internet.
RFC	Request For Comment. Refers to documents published by the Internet Engineering Task Force (IETF) proposing standard protocols and procedures for the Internet. RFCs can be found at www.ietf.org.
RIP	*See* Routing Information Protocol.
router	A device that forwards data between networks. An IP router forwards data based on IP source and destination addresses.
Routing Information Protocol	A protocol in which routers periodically exchange information with one another so that they can determine minimum distance paths between sources and destinations.
subnet mask	*See* netmask.
UTP	Unshielded twisted pair. The cable used by 10BASE-T and 100BASE-Tx Ethernet networks.
VPN	Virtual Private Network. A method for securely transporting data between two private networks by using a public network such as the Internet as a connection.
WAN	*See* wide area network.
WEP	Wired Equivalent Privacy. WEP is a data encryption protocol for 802.11b wireless networks. All wireless nodes and access points on the network are configured with a 64-bit or 128-bit Shared Key for data encryption.

wide area network	WAN. A long distance link used to extend or connect remotely located local area networks. The Internet is a large WAN.
Windows Internet Naming Service	WINS. Windows Internet Naming Service is a server process for resolving Windows-based computer names to IP addresses. If a remote network contains a WINS server, your Windows PCs can gather information from that WINS server about its local hosts. This allows your PCs to browse that remote network using Network Neighborhood.
WINS	*See* Windows Internet Naming Service.

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