Reference Manual for the Wireless Cable Modem Gateway CG814WG

NETGEAR

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Statement of Conditions

In the interest of improving internal design, operational function, and/or reliability, NETGEAR reserves the right to make changes to the products described in this document without notice.

NETGEAR does not assume any liability that may occur due to the use or application of the product(s) or circuit layout(s) described herein.

FCC Warning Statement

This device complies with Part 15 of the FCC Rules. Operation is subject to the following two conditions:

(1) this device may not cause harmful interference, and

(2) this device must accept any interference received, including interference that may cause undesired operation.

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.

CAUTION: Any changes or modifications not expressly approved by the party responsible for compliance could void the user’s authority to operate the equipment.

Prohibition of Co-location

This device and its antenna(s) must not be co-located or operating in conjunction with any other antenna or transmitter.

Safety Information

To maintain compliance with FCC’s RF exposure guidelines, this equipment should be installed and operated with minimum distance of 20 cm between the radiator and your body. Use the supplied antenna.

Declaration of Conformity for R&TTE directive 1999/5/EC

Essential requirements – Article 3. Protection requirements for health and safety – Article 3.1a. Testing for electric safety according to EN 60950-1 has been conducted. These are considered relevant and sufficient. Protection requirements for electromagnetic compatibility – Article 3.1b. Testing for electromagnetic compatibility according to EN 301 489-1 and EN 301 489-17 has been conducted. These are considered relevant and sufficient. Effective use of the radio spectrum – Article 3.2. Testing for radio test suites according to EN 300 328- 2 has been conducted. These are considered relevant and sufficient.

Bestätigung des Herstellers/Importeurs

Es wird hiermit bestätigt, daß das CG814WG Wireless Cable Modem Gateway 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 CG814WG Wireless Cable Modem Gateway 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.

Technical Support

Thank you for choosing Netgear product(s). Please register online and take advantage of the technical support resources such as Netgear online knowledge base. Technical support is available 24 hours a day, seven days a week; please call your Cable Internet Service Provider.

Product and Publication Details

Model Number:	CG814WG
Publication Date:	February 2005
Product Family:	gateway
Product Name:	CG814WG Wireless Cable Modem Gateway
Home or Business Product:	Home
Language:	English
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Contents

Chapter 1
About This Manual

Congratulations on your purchase of the CG814WG Wireless Cable Modem Gateway. The CG814WG provides connection for multiple personal computers to the Internet. It connects directly to your cable line using an embedded DOCSIS 2.0 cable modem.

Audience, Conventions, Publication Date

This reference manual assumes that the reader has basic-to-intermediate computer and Internet skills. However, basic computer network, Internet, firewall, and networking technology tutorial information is provided in the Appendices.

This guide uses the following typographical conventions:

Table 1. Typographical conventions

italics	Emphasis, books, CDs, URL names
bold times roman	User input
`courier font`	Screen text, file and server names, extensions, commands, IP addresses

This guide uses the following formats to highlight special messages:

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

This manual is written f according to these specifications.:

Table 1-1. Firmware Version and Manual Publication Date

Firmware Version	2.95r09
Manual Publication Date	April 2004

Chapter 2
Introduction

This chapter describes the features of the NETGEAR CG814WG Wireless Cable Modem Gateway.

About the CG814WG

The NETGEAR CG814WG Wireless Cable Modem Gateway connects directly to the wide area network (WAN) using its built-in cable modem. It has multiple options to connect to your local area network (LAN), including a 4-port 10/100 Mbps Ethernet switch, a USB port and an 802.11b wireless Access Point.

The CG814WG Gateway is a complete security solution that protects your network from attacks and intrusions. Unlike simple Internet sharing routers that rely on Network Address Translation (NAT) for security, the CG814WG uses Stateful Packet Inspection for Denial of Service (DoS) attack protection and intrusion detection. The CG814WG provides highly reliable Internet access for up to 253 users.

Key Features

The CG814WG offers the following features.

Built-in Cable Modem

The CG814W Gateway connects directly the WAN using an integrated cable modem. The modem is DOCSIS 2.0, guaranteeing that it will work with your local cable service provider.

A Powerful, True Firewall

Unlike simple Internet sharing NAT routers, the CG814WG is a true firewall, using stateful packet inspection to defend against hacker attacks. Its firewall features include:

- Denial of Service (DoS) protection
  Automatically detects and thwarts Denial of Service (DoS) attacks such as Ping of Death, SYN Flood, LAND Attack and IP Spoofing.
- Configurable Port Forwarding, Port Blocking, Port Triggering and DMZ provide enough flexibility for most applications.
- Blocks access from your LAN to Internet locations or services that you specify as off-limits.
- Logs security incidents
  The CG814WG will log security events such as blocked incoming traffic, port scans, attacks, and administrator logins. You can configure the gateway to email the log to you whenever a significant event occurs.

Content Filtering

With its content filtering feature, the CG814WG prevents objectionable content from reaching your PCs. The gateway allows you to control access to Internet content by screening for keywords within Web addresses.

Dual login allows an adult to configure content filtering, while still allowing a child to configure other features of the Gateway.

802.11b and 802.11g Standards-based Wireless Networking

The CG814WG Gateway includes an 802.11g- and 802.11b-compliant wireless access point, providing continuous, high-speed 54 Mbps access between your wireless and Ethernet devices. The access point provides:

- 802.11g Standards-based wireless networking at up to 54Mbps
- 64-bit and 128-bit WEP encryption security
- WEP keys can be generated manually or by passphrase
- Wireless access can be restricted by MAC address.

Configurable Auto Uplink™ Ethernet Connection

With its internal 4-port 10/100 switch, the CG814WG can connect to either a 10 Mbps standard Ethernet network or a 100 Mbps Fast Ethernet network. Both the local LAN and the Internet WAN interfaces are autosensing and capable of full-duplex or half-duplex operation.

The gateway incorporates Auto Uplink™ technology. Each LOCAL Ethernet port will automatically sense whether the Ethernet cable plugged into the port should have a ‘normal’ connection such as to a PC or an ‘uplink’ connection such as to a switch or hub. That port will then configure itself to the correct configuration. This feature also eliminates the need to worry about crossover cables, as Auto Uplink will accommodate either type of cable to make the right connection.

USB Port

A USB connection for your computer eliminates the need for installing an Ethernet card.

Protocol Support

The CG814WG supports the Transmission Control Protocol/Internet Protocol (TCP/IP). Appendix B, "Networks, Routing, and Firewall Basics" provides further information on TCP/IP.

- IP Address Sharing by NAT
  The CG814WG 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 CG814WG 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.

Easy Installation and Management

You can install, configure, and operate the CG814WG 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 gateway 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.
- Diagnostic functions
  The gateway incorporates built-in diagnostic functions such as Ping, DNS lookup, and remote reboot. These functions allow you to test Internet connectivity and reboot the gateway. You can use these diagnostic functions directly from the CG814WG when your are connect on the LAN or when you are connected over the Internet via the remote management function.
- Visual monitoring
  The gateway's front panel LEDs provide an easy way to monitor its status and activity.

What's in the Box?

The product package should contain the following items:

- CG814WG Wireless Cable Modem Gateway
- AC power adapter
- Category 5 (CAT5) Ethernet cable
- USB cable
- *Resource CD*, including:
  - This manual
  - Application Notes, Tools, and other helpful information

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 product for repair.

The Gateway's Front Panel

The front panel of the CG814WG (Figure 2-1) contains status LEDs.

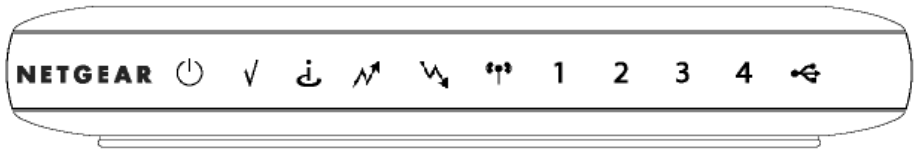


Figure 2-1: CG814WG Front Panel

You can use some of the LEDs to verify connections. Table 2-1 lists and describes each LED on the front panel of the CG814WG Gateway. These LEDs are green when lit.

Table 2-1. LED Descriptions

Label	Activity	Description
Power 	On Off	Power is supplied to the gateway. Power is not supplied to the gateway.
Test 	On Off	A system failure has occurred. Reboot the gateway. Normal operation.
Cable Link 	On (Green) Off	Configuration of the cable interface by your cable service provider is complete. Configuration of the cable interface is still in progress.
Upload Traffic 	Off Blink	Data is being transmitted to the cable interface. The cable interface is idle.
Download Traffic 	Off Blink	Data is being received from the cable interface. The cable interface is idle.
Wireless 	On Blink	Indicates that the wireless Access Point is operating normally. Data is being transmitted or received on the wireless interface.
Local (Local Area Network) 	On (Green) Blink (Green) On (Yellow) Blink (Yellow) 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.
USB 	On (Green) Blink (Green) Off	The Local port has detected link with a USB device. Data is being transmitted or received through USB. No link is detected on the USB port.

The Gateway's Rear Panel

The rear panel of the CG814WG (Figure 2-2) contains the connections identified below.

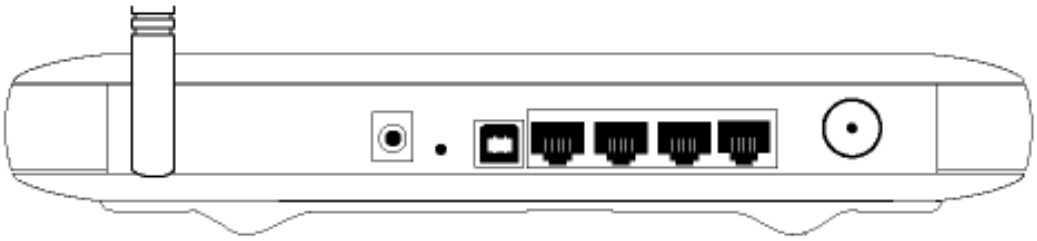


Figure 2-2: CG814WG Rear Panel

Viewed from left to right, the rear panel contains the following elements:

- 802.11 Wireless antenna
- AC power adapter input
- Factory Default Reset push button
- USB port for connecting the gateway to a local computer
- Four Ethernet RJ-45 ports for connecting the gateway to local computers
- Coaxial F-type connector for connecting the gateway to your cable service provider

Chapter 3
Connecting the Gateway to the Internet

This chapter describes how to set up the CG814WG Gateway on your Local Area Network (LAN), connect to the Internet and perform basic configuration.

What You Will Need Before You Begin

You need to prepare these three things before you can connect your gateway to the Internet:

1. A computer properly connected to the gateway as explained below.
2. Active Data Over Cable Internet service provided by cable modem account.
3. The Internet Service Provider (ISP) configuration information for your cable modem account.

Hardware Requirements

The CG814WG Gateway connects to your LAN using either its twisted-pair Ethernet, USB or 802.11b or 802.11g wireless port.

To use the CG814WG Gateway on your network, each computer must have either an installed Ethernet Network Interface Card (NIC), USB Host port or 802.11b or 802.11g wireless adapter. If the computer will connect to your network at 100 Mbps, you must use a Category 5 (CAT5) cable such as the one provided with your gateway.

LAN Configuration Requirements

For the initial connection to the Internet and configuration of your gateway, you will need to connect a computer to the gateway which is set to automatically get its TCP/IP configuration from the gateway via DHCP.

Note: Please refer to Appendix C, "Preparing Your Network" for assistance with DHCP configuration.

Internet Configuration Requirements

Depending on how your ISP set up your Internet account, you will need one or more of these configuration parameters to connect your gateway to the Internet:

- Host and Domain Names
- ISP Domain Name Server (DNS) Addresses
- Fixed or Static IP Address

Connecting the CG814WG Gateway

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

- Connect to your computer, using either Ethernet, USB or wireless.
- Connect the line from your cable service provider to the cable connector of the gateway.
- Connect the power adapter.

Your computer will attach to either the Ethernet, USB or wireless ports on the CG814WG Gateway.

1. Connect the Gateway.

a. Turn off your computer.
b. Using the coaxial cable provided by your cable company, connect the CG814WG cable port (A**)** to your cable line splitter or outlet.

Figure 3-1: Connect the gateway to the cable network.

c. Connect the gateway to you computer.

— If you will connect with the Ethernet cable, follow the instructions below.

— If you will connect with the USB cable, skip to step d below.

	Note: Set up the CG814WG Gateway using either an Ethernet or USB connection to your computer first, then configure the wireless settings. Detailed instructions on configuring your wireless devices for TCP/IP networking are provided in the next chapter.

Connect the gateway to you computer using the Ethernet cable included in the box from your CG814WG's LAN port (B**)** to the Ethernet adapter in your computer.

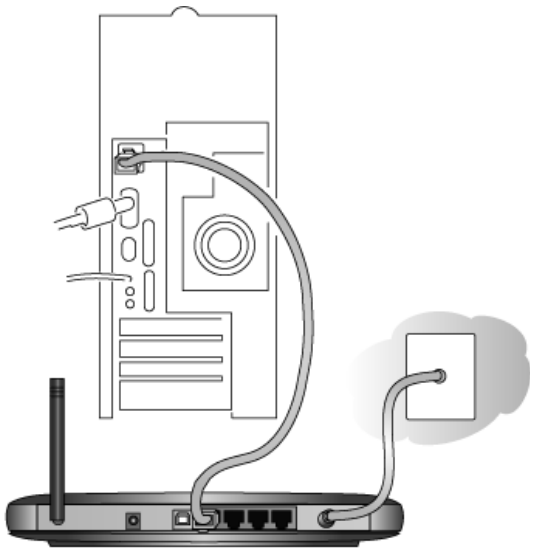


Figure 3-2: Connect a PC to the gateway

The CG814WG Gateway incorporates Auto Uplink™ technology. Each LOCAL Ethernet port will automatically sense whether the cable plugged into the port should have a 'normal' connection (e.g. connecting to a PC) or an 'uplink' connection (e.g. connecting to a switch or hub). That port will then configure itself to the correct configuration. This feature also eliminates the need to worry about crossover cables, as Auto Uplink will accommodate either type of cable to make the right connection.

d. To connect your computer to the modem via USB involves installing the USB driver.Insert the CD which came with your gateway into the CD drive of your computer.

	Note: The USB connection option is only available for Windows PCs. Also, Windows 95 does not support USB without special operating system upgrades and patches.

Install the USB driver.

– Connect the USB cable to your modem and plug in the AC power for the gateway.

– Use the USB cable to connect your computer to the gateway.

– The found new hardware Windows installation wizard will prompt you for the drivers.

Figure 3-3: Found New Hardware Wizard window

Browse to the CD and install the USB driver by clicking through the Windows wizard prompts.

e. Plug in your CG814WG and wait about 30 seconds for the lights to stop blinking.

f. Now, turn on your computer. If software usually logs you in to your Internet connection, do not run that software or cancel it if it starts automatically.

g. Verify the following:

The power light is lit after turning on the gateway.

The cable link light is solid green, indicating a link has been established to the cable network.

The local lights are lit for any connected computers.

2. Log in to the Gateway.

Note: To connect to the gateway, your computer needs to be configured to obtain an IP address automatically via DHCP. For instructions on how to do this, please see Appendix C, "Preparing Your Network".

a. Using the computer you first used to access your cable modem Internet service, connect to the gateway by typing *http://192.168.0.1* in the address field of Internet Explorer or Netscape® Navigator.

A login window opens as shown in Figure 3-4 below:

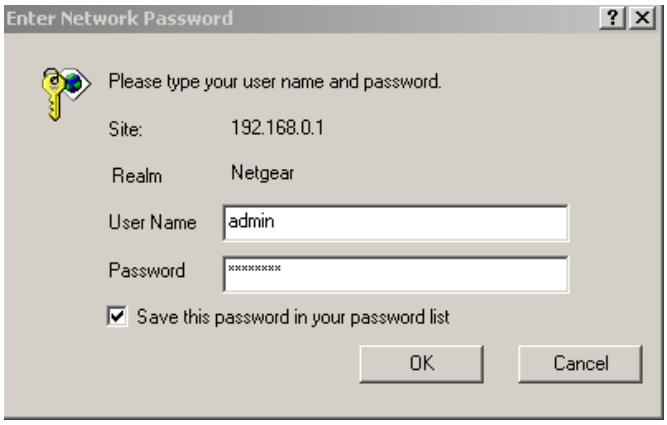


Figure 3-4: Login window

b. For security reasons, the gateway has two sets of user names and passwords: one for a parent and one for children. Only the parent's login can be used to set up Parental Control and MAC Filtering. The child's login can configure all other features of the Gateway.

When prompted, to log in as the parent, enter **superuser** for the user name and **password** for the password, both in lower case letters.

When prompted, to log in as the child, enter **admin** for the user name and **password** for the password, both in lower case letters.

c. After logging in, you will see the Basic Settings shown in Figure 3-5 below.

	**Note:** If you were unable to connect to the gateway, please refer to "Basic Functions" on page 7-1.

3. Connect to the Internet.

a. You are now connected to the gateway. Click the Basic Settings link on the upper left of the main menu. You are now connected to the gateway's *Basic Settings* page, shown below.

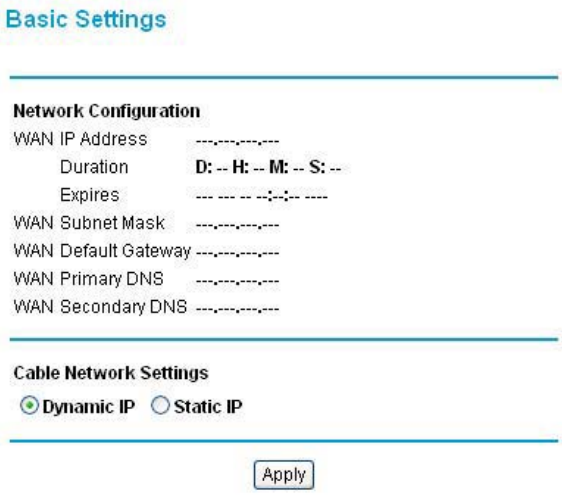


Figure 3-5: Basic Settings page

You are ready to configure your gateway to connect to the Internet.

b. Select Dynamic or Static IP Address:

If your service provider assigns your IP address automatically through DHCP, select "Dynamic IP". If your service provider has assigned you a permanent, fixed (static) IP address for your PC, select "Static IP".

If you select Static IP, enter the IP address that your ISP assigned. Also enter the Static IP Mask (also known as netmask), Gateway IP address and Domain Name Server (DNS) Address.

- The Gateway is the ISP's router to which your gateway will connect.
- A DNS server is a host on the Internet that translates Internet names (such as www.netgear.com) to numeric IP addresses. Typically your ISP transfers the IP address of one or two DNS servers to your gateway 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 gateway.

c. Click Apply to accept these settings.

Chapter 4
Wireless Configuration

This chapter describes how to configure the wireless features of your CG814WG Wireless Cable Modem Gateway.

	**Note:** If you are configuring the gateway from a wireless PC and you change the gateway's SSID, channel, or WEP settings, you will lose your wireless connection when you click on Apply. You must then change the wireless settings of your PC to match the gateway's new settings.

Considerations For A Wireless Network

In planning your wireless network, you should consider the level of security required. You should also select the physical placement of your gateway in order to maximize the network speed. For further information on wireless networking, refer to "Wireless Networking Overview" in Appendix B, "Networks, Routing, and Firewall Basics"."

Implement Appropriate Security

Unlike wired network data, your wireless data transmissions can extend beyond your walls and can be received by anyone with a compatible adapter. For this reason, use the security features of your wireless equipment. Restricting access by MAC address filtering adds an obstacle to unwanted users joining your network. To hinder a determined eavesdropper, you should use one of Wired Equivalent Privacy (WEP) data encryption options.

Observe Placement and Range Guidelines

The operating distance or range of your wireless connection can vary significantly based on the physical placement of the wireless gateway.

Note: Failure to follow these guidelines can result in significant performance degradation or inability to wirelessly connect to the router.

For best results, place your gateway:

- Near the center of the area in which your PCs will operate.
- In an elevated location such as a high shelf.
- Away from potential sources of interference, such as PCs, microwaves, and 2.4 GHz cordless phones.
- Away from large metal surfaces.

Configuring Wireless Settings

To configure the Wireless interface of your gateway, click on the Wireless Settings heading in the Setup section of the browser interface. The Wireless Settings menu will appear, as shown below:

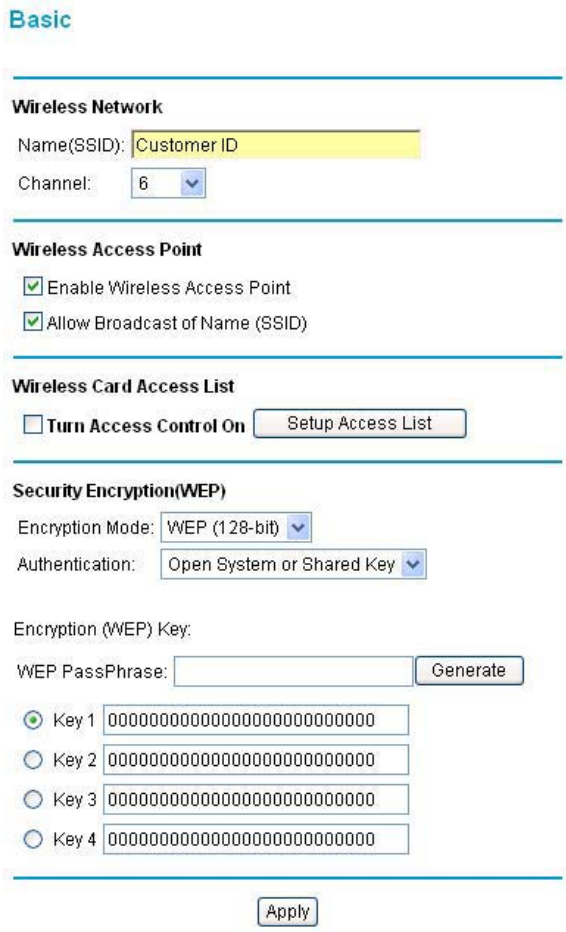


Figure 4-1: Wireless Settings menu

Wireless Network Settings

In the Wireless Settings section are the following parameters:

- Name (SSID)
  Enter a Service Set ID (SSID) value of up to 32 alphanumeric characters. The same SSID must be assigned to all wireless devices in your network. The default SSID is **Wireless**, but NETGEAR strongly recommends that you change your network's SSID to a different value.
- Channel
  This field determines which operating frequency will be used. It should not be necessary to change the wireless channel unless you notice interference problems with another nearby access point.

Wireless Access Point

In the Wireless Access Point Settings section are the following parameters:

- Enable Wireless Access Point
  Use this checkbox to turn on or turn off the wireless network. The default is to enable the wireless network.
- Allow Broadcast of Name (SSID)
  Use this checkbox to turn on or turn off broadcast of the wireless network Name (SSID). The default is to broadcast the wireless network Name (SSID). If you uncheck this item, only wireless devices with the correct SSID will be connect. Turning off the SSID broadcast prevents some wireless devices from discovering and reporting the SSID of your wireless network.

Restricting Wireless Access by MAC Address

By default, any wireless PC that is configured with the correct SSID will be allowed access to your wireless network. For increased security, you can restrict access to the wireless network to only allow specific PCs based on their MAC addresses.

Check the Turn Access Control On box to restrict access to you network to computers in the Access Control List.

To access the Access List, click the Setup Access List button.

Note: If the **Turn Access Control On** is enabled and the Access Control List is blank; then all wireless PCs will be unable to connect to your wireless network.

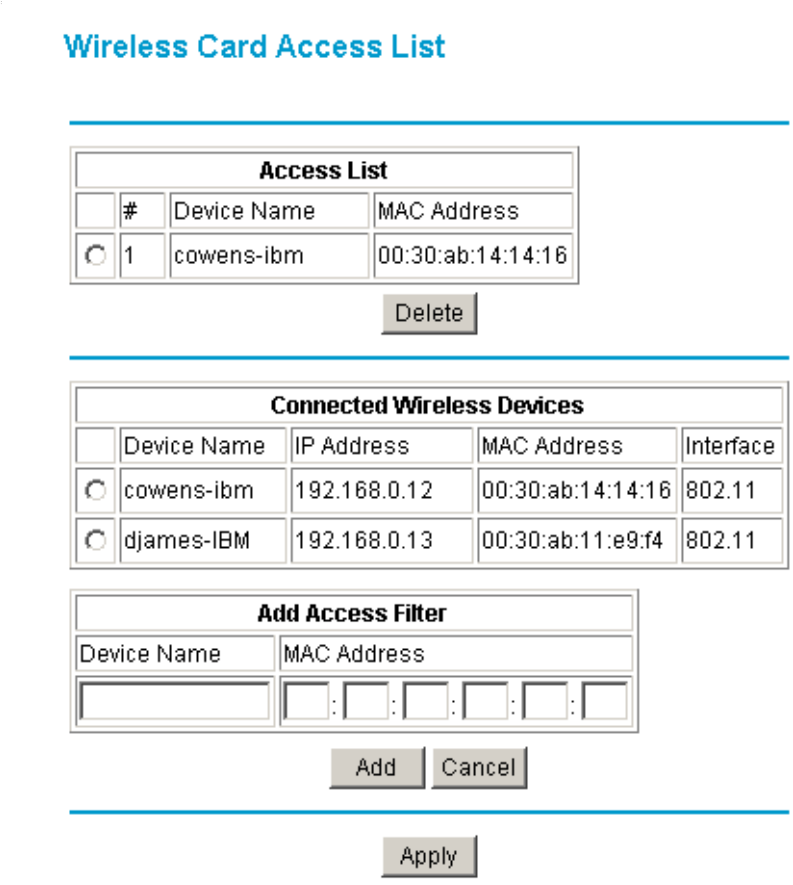


Figure 4-2: Wireless Access List menu

The Access List displays a list of MAC addresses that will be allowed to connect to the gateway. These PCs must also have the correct SSID and WEP settings. You can add MAC addresses to the Access List by either selecting form the list of Connected Wireless Devices, or by manual entering MAC addresses

To restrict access based on MAC addresses:

1. For your convenience, this menu displays a list of currently Connected Wireless Devices and their MAC addresses. Select a device from the list that you want to allow to access your network.
2. If the desired PC does not appear in the list, you can manually enter the MAC address of the authorized PC.
   The MAC address is usually printed on the wireless card.

3. If no Device Name appears, you can type a descriptive name for the PC that you are adding.
4. Click Add.
5. When you have finished entering MAC addresses, click Apply to save the Access List and return to the Wireless Settings menu.

To delete a MAC address from the table, click on it to select it, then click the Delete button.

Configuring Wired Equivalent Privacy (WEP)

In the Wireless Settings menu you can configure WEP data encryption using the following parameters:

- Encryption Mode
  Select the WEP Encryption level:
  - Off - no data encryption (Open System)
  - 64-bit (sometimes called 40-bit) encryption
  - 128-bit encryption
- Authentication Type
  Select the appropriate value - "Open System" or "Shared Key." Check your wireless card's documentation to see what method to use.
- Encryption (WEP) Key
  If WEP is enabled, you can manually or automatically program the four data encryption keys. These values must be identical on all PCs and Access Points in your network.
  - Automatic - Enter a word or group of printable characters in the WEP PassPhrase box and click the Generate button. The four key boxes will be automatically populated with key values.
  - Manual - Enter ten hexadecimal digits (any combination of 0-9, a-f, or A-F)
    Select which of the four keys will be active.

Be sure to click Apply to save your settings in this menu.

Chapter 5
Protecting Your Network

This chapter describes how to use the firewall features of the CG814WG Wireless Cable Modem Gateway to protect your network.

Protecting Access to Your CG814WG Gateway

For security reasons, the gateway has its own user name and password. Also, after a period of inactivity for a set length of time, the administrator login will automatically disconnect. When prompted, enter **admin** for the gateway User Name and **password** for the gateway Password. You can use procedures below to change the gateway's password and the amount of time for the administrator's login timeout.

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

NETGEAR recommends that you change this password to a more secure password. The ideal password should contain no dictionary words from any language, and should be a mixture of both upper and lower case letters, numbers, and symbols. Your password can be up to 30 characters.

Procedure 5-1: Changing the Built-In Password

1. Log in to the gateway at its default LAN address of *http://192.168.0.1* with its default User Name of **admin**, default password of **password**, or using whatever Password and LAN address you have chosen for the gateway.

Figure 5-1: Log in to the gateway

2. From the Main Menu of the browser interface, under the Maintenance heading, select Set Password to bring up the menu shown in Figure 5-2.

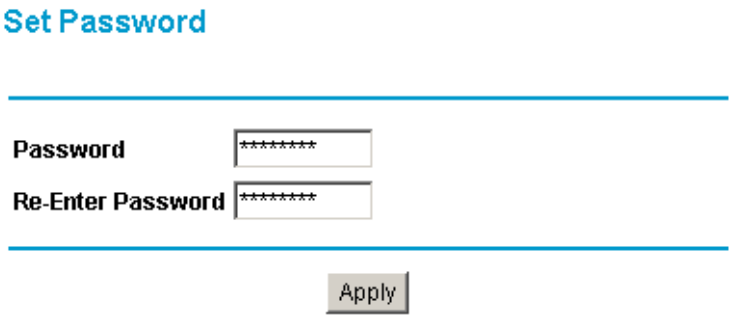


Figure 5-2: Set Password menu

3. To change the password, first enter the old password, and then enter the new password twice.
4. Click Apply to save your changes.

Note: After changing the password, you will be required to log in again to continue the configuration. If you have backed up the gateway settings previously, you should do a new backup so that the saved settings file includes the new password.

Blocking Keywords, Sites, and Services

The gateway provides a variety of options for blocking Internet based content and communications services. With its content filtering feature, the CG814WG Gateway prevents objectionable content from reaching your PCs. The CG814WG allows you to control access to Internet content by screening for keywords within Web addresses. It also has the capability to block access to all sites except those that are explicitly allowed. Key content filtering options include:

- Blocking access from your LAN to Internet locations that contain keywords that your specify.
- Blocking access to web sites that you specify as off-limits.
- Allowing access to only web sites that you specify as allowed.

The section below explains how to configure your gateway to perform these functions.

Blocking Keywords and Domains

Note: The Block Sites feature must be configured while logged in as a parent.

The CG814WG Gateway allows you to restrict access to Internet content based on functions such as web address keywords and web domains.

A domain name is the name of a particular web site. For example, for the address www.NETGEAR.com, the domain name is NETGEAR.com.

1. Log in to the gateway at its default LAN address of *http://192.168.0.1* with its parent default User Name of **superuser**, default password of **password**, or using whatever Password and LAN address you have chosen for the gateway in parent mode.
2. Click on the Block Sites link of the Content Filtering menu.

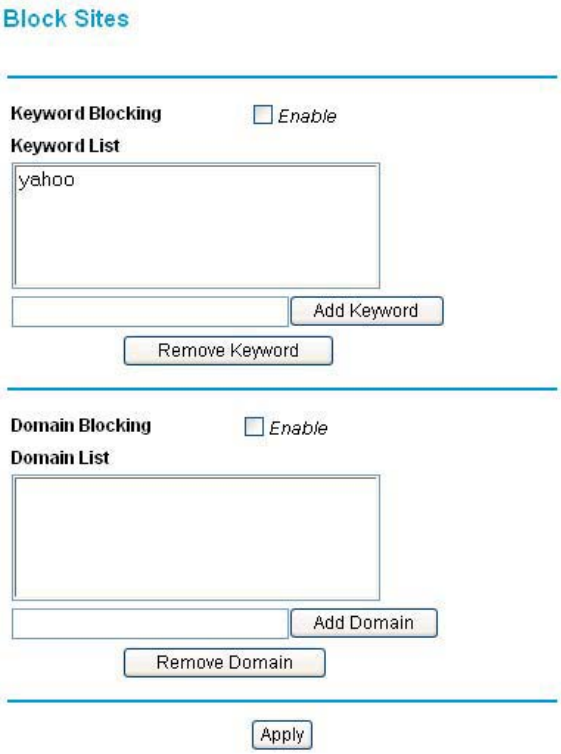


Figure 5-3: Block Sites menu

3. To enable keyword blocking or Domain Blocking, check the appropriate Enable box.
4. Enter Keywords into the Keyword List by typing then in the Add Keyword box, then, click Add Keyword.

   Some examples of Keyword applications follow:

   - If the keyword "XXX" is specified, the URL <http://www.badstuff.com/xxx.html> is blocked.
   - If the keyword ".com" is specified, only websites with other domain suffixes (such as .edu or .gov) can be viewed.
   - Enter the keyword "." to block all Internet browsing access.

   Up to 8 entries are supported in the Keyword list.
5. Enter Domains into the Domain List by typing then in the Add Domain box, then, click Add Domain.

   If the domain "badstuff.com" is specified, the URL <http://www.badstuff.com/xxx.html> is blocked, along with all other urls in the badstuff.com site.

   Up to 8 entries are supported in the Keyword list.
6. To block access to the domains in the Domain List, select Deny Domains.

   To allow access to only the domains in the Domain List, select Allow Domains. If the domain "goodstuff.com" is specified, you will be able to access only sites on the goodstuff site.
7. To delete a keyword or domain, select it from the list, click Remove Keyword or Remove Domain.
8. Click Apply to save your settings.

Using MAC Filtering

Note: The MAC Filtering feature must be configured while logged in as a parent.

By default, any PC will be allowed access to the Internet through your Gateway. MAC Filtering allows you to block access to the Internet to any PC on your LAN based on the hardware address of its ethernet or wireless adapter: the MAC address.

1. Log in to the gateway at its default LAN address of *http://192.168.0.1* with its parent default User Name of **superuser**, default password of **password**, or using whatever Password and LAN address you have chosen for the gateway in parent mode.
2. Click on the MAC Filtering link of the Advanced menu. At the top of the page is a list of *Trusted Devices* that are currently connected to the Gateway.

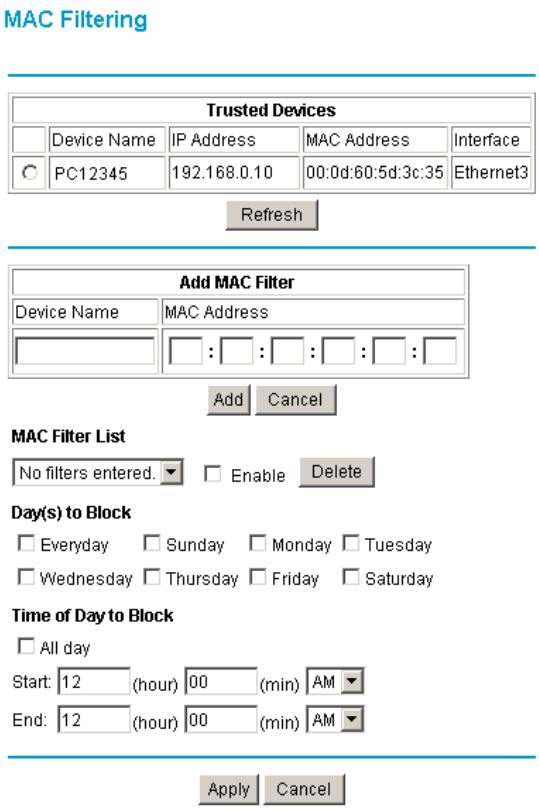


Figure 5-4: MAC Filtering menu.

3. To add a device to the MAC Filter list:
   a. If the desired device appears in the *Trusted Devices* table, you can click the radio button of that PC to capture is MAC address.
   b. If the desired device does not appear in the *Trusted Devices* table, you can manually enter the MAC address of the PC you wish to block.
   c. If no Device Name automatically appears, you can type a descriptive name for the PC that you are adding.

   d. When you have finished entering the MAC address, click **Add**.

4. To delete a device from the MAC Filtering List:

   a. Select the MAC address of the PC you want to delete from the list.

   b. Click **Delete** to delete the entry.

5. Click **Apply** to activate the settings.

The default blocking schedule is to block access all day. However, you can also block access according to a daily schedule for each PC individually.

1. In the *MAC Filter List*, select the PC for which the schedule will be modified.
2. In the *Day(s) to Block* section, click the boxes next to the days when you want access blocked.
3. In the *Time of Day to Block* section, select either **All Day**, or set the hours for internet blocking.
4. Click **Apply** to activate the settings.

Using Port Blocking

Firewall rules are used to block or allow specific traffic passing through from one side to the other. Inbound rules (WAN to LAN) restrict access by outsiders to private resources, selectively allowing only specific outside users to access specific resources. Instructions for setting up inbound rules can be found in “Port Forwarding“ on page -7. Outbound rules (LAN to WAN) determine what outside resources local users can have access to. This section describes how to set up outbound rules.

A firewall has two default rules, one for inbound traffic and one for outbound. The default rules of the CG814WG are:

- Inbound: Block all access from outside except responses to requests from the LAN side.
- Outbound: Allow all access from the LAN side to the outside.

You may define additional rules that will specify exceptions to the default rules. By adding custom rules, you can block or allow access based on the service or application, source or destination IP addresses, and time of day.

To configure outbound rules on the CG814WG, click the Port Blocking link on the Advanced

section of the main menu.

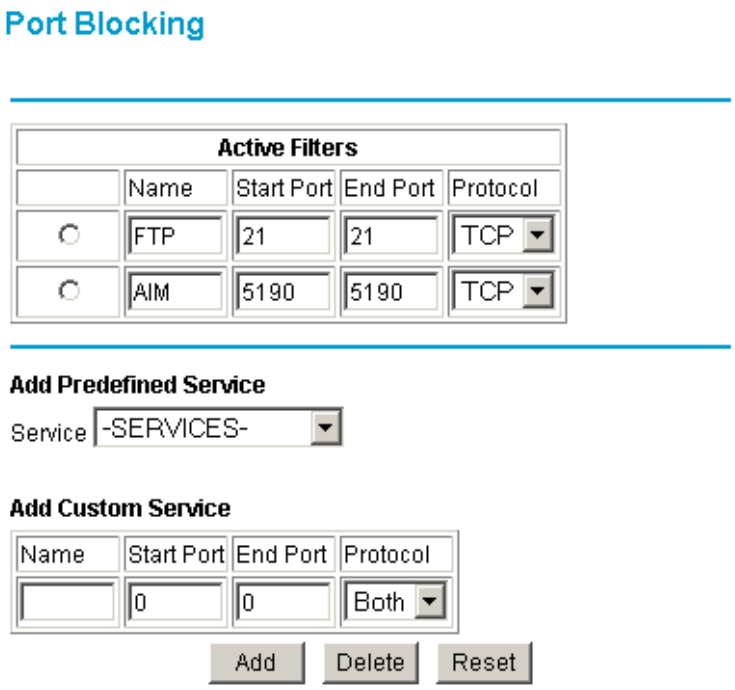


Figure 5-5: Port Blocking menu

- To block outbound traffic, select the service you would like to block from the drop-down list of predefined services. Click Add.
- If the service you would like to block is not in the predefined list, you can add a custom service. Enter the range of ports you would like to block and select whether the ports are TCP, UDP or Both. Click Add.
- To delete an existing rule, select its button on the left side of the table and click Delete.

Port Forwarding

Because the CG814WG uses Network Address Translation (NAT), your network presents only one IP address to the Internet, and outside users cannot directly address any of your local computers. However, by defining an inbound rule you can make a local server (for example, a web server or game server) visible and available to the Internet. The rule tells the gateway to direct inbound

traffic for a particular service to one local server based on the destination port number. This is also known as Port Forwarding.

	**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.

Considerations for Port Forwarding

- If the IP address of the local server PC is assigned by DHCP, it may change when the PC is rebooted. To avoid this, you can assign a static IP address to your server outside the range that is assigned by DHCP, but in the same subnet as the rest of your LAN. By default, the IP addresses in the range of 192.168.0.2 through 192.168.0.9 are reserved for this.
- Local PCs must access the local server using the PCs' local LAN address (192.168.0.XXX, by default). Attempts by local PCs to access the server using the external WAN IP address will fail.

Remember that allowing inbound services opens holes in your firewall. Only enable those ports that are necessary for your network.

The following are two application examples of inbound rules.

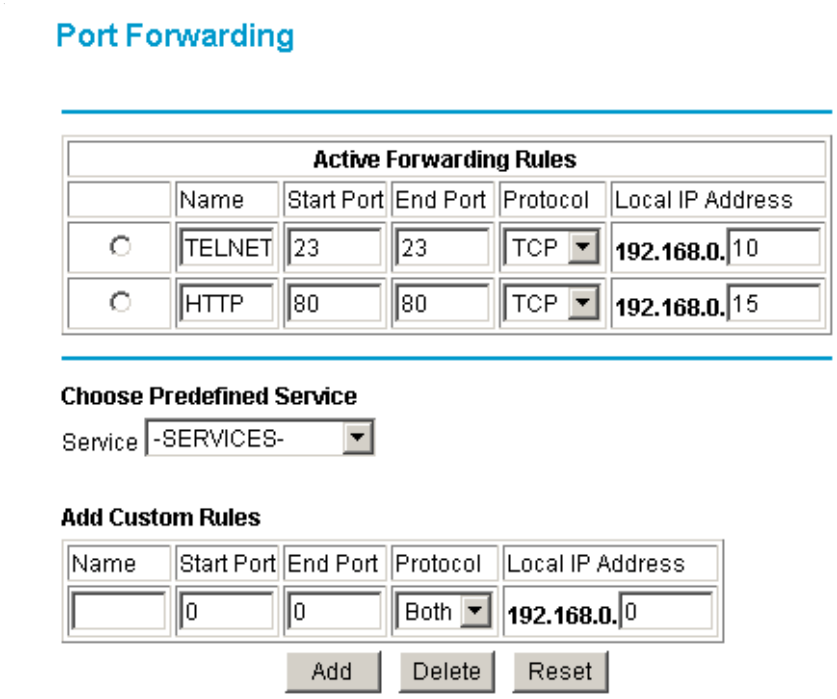


Figure 5-6: Port Forwarding menu

- To forward inbound traffic:
  1. Select the service you would like to forward from the drop-down list of predefined services.

     If the service you would like to forward is not in the predefined list, you can add a custom service. Enter the range of ports you would like to forward and select whether the ports are TCP, UDP or Both.
  2. Enter the IP address of the computer on your network to which you would like to direct the inbound traffic
  3. Click Add.
  4. To access the local computer from the Internet, you must use the WAN address of your gateway, which can be found on the Basic Settings page.
- To delete an existing rule, select its button on the left side of the table and click Delete.

Using Port Triggering

Port Triggering is an advanced feature that allows you to dynamically open inbound ports based on outbound traffic on different ports. This is an advanced feature that can be used for gaming and other internet applications.

Port Forwarding can typically be used to enable similar functionality, but it is static and has some limitations. Ports will be open to traffic from the internet until the port forwarding rule is removed. Additionally, port forwarding does not work well for some applications when your WAN IP address is assigned by DHCP, and is changed frequently. Port Triggering opens in incoming port temporarily and can does not require the server on the internet to track your IP address if it is changed.

Port Triggering monitors outbound traffic. When the gateway detects traffic on the specified outbound port, it remembers the IP address of the computer that sent the data and “triggers” the incoming port. Incoming traffic on the triggered port is then forwarded to the triggering computer.

An example of Port Triggering for Internet Relay Chat (IRC) is shown in Figure 5-7. When you connect to an IRC server, the server tries to connect back on port 113 to do an Ident lookup. Unless you have configured Port Forwarding to open port 113, the traffic will be blocked. In this example, the initial login to the server in the range of ports 6660 to 6670 will be detected. This will trigger

the gateway to temporarily forward port 113 to the PC that initiated the login.l

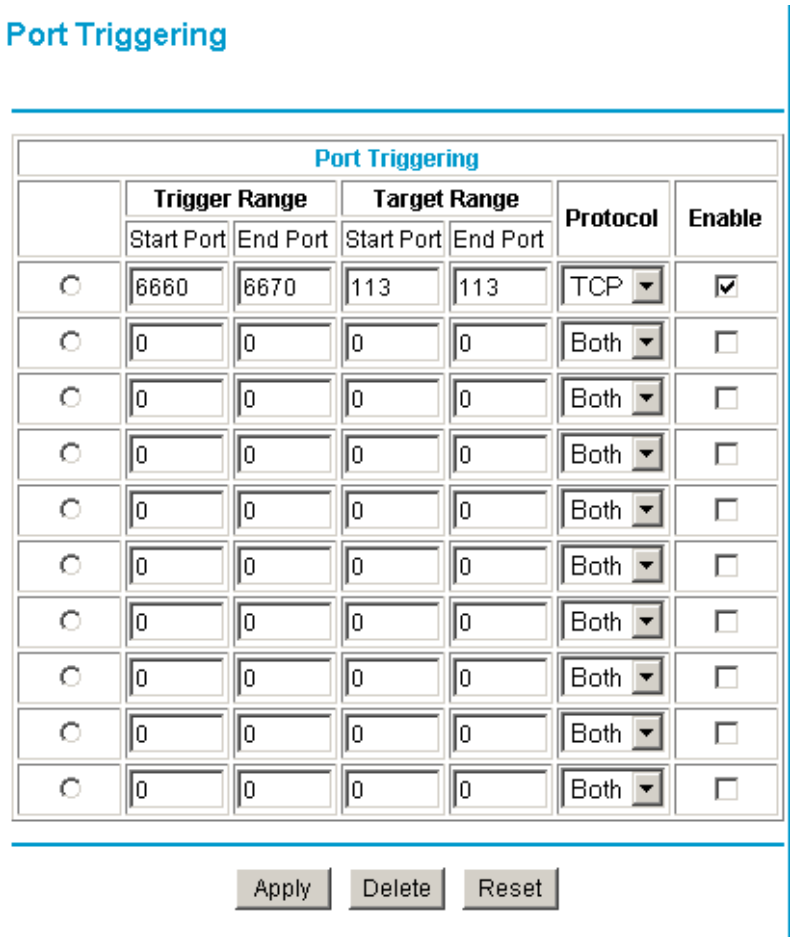


Figure 5-7: Port Triggering menu, with IRC example.

To configure Port Triggering:

1. In the Trigger Range, enter the outbound ports that will be monitored for activity. This will be the “trigger”.
2. In the Target Range, enter the inbound ports that should be forwarded when the trigger occurs.
3. Select the appropriate protocol: TCP, UDP or Both.
4. Check the Enable box
5. Click Apply

To clear a Port Triggering rule, you can either remove the check from the Enable box, to

temporarily disable the rule, or you can select the rule and click Delete.

Setting Up A Default DMZ Host

The Default DMZ Server feature is helpful when using some online games and videoconferencing applications that are incompatible with NAT. The gateway 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 Host.

	**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 firewall, and is exposed to many exploits from the Internet. If compromised, the computer can be used to attack your network.

Incoming traffic from the Internet is normally discarded by the gateway unless the traffic is a response to one of your local computers or a service that you have configured in the Port Forwarding or Port Triggering menu. Instead of discarding this traffic, you can have it forwarded to one computer on your network. This computer is called the Default DMZ Host.

To assign a computer or server to be a DMZ Host, from the Main Menu, under Advanced, select DMZ Host. Enter the IP address of the computer you would like to assign as a DMZ Host and click Apply. To disable the DMZ Host, enter "0" and click Apply.

Respond to Ping on Internet WAN Port

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

Enabling or Disabling Content Filtering Services

	**Note:** The Services page is only accessible while logged in as a parent.

You can use the Services page to disable certain gateway features. To disable a feature, remove the check box from its Enable check box.

When Firewall Features are enabled, the gateway will perform Stateful Packet Inspection (SPI) and protect against Denial of Service (DoS) attacks.

When VPN Pass-Through is enabled, IPSec, PPTP and LT2P traffic will be forwarded. When it is disabled, this traffic will be blocked.

Chapter 6
Managing Your Network

This chapter describes how to perform network management tasks with your CG814WG Wireless Cable Modem Gateway.

Network Status Information

The CG814W provides a variety of status and usage information which is discussed below.

Viewing Gateway Status

From the Main Menu, under Maintenance, select Gateway Status to view the screen in Figure 6-1.

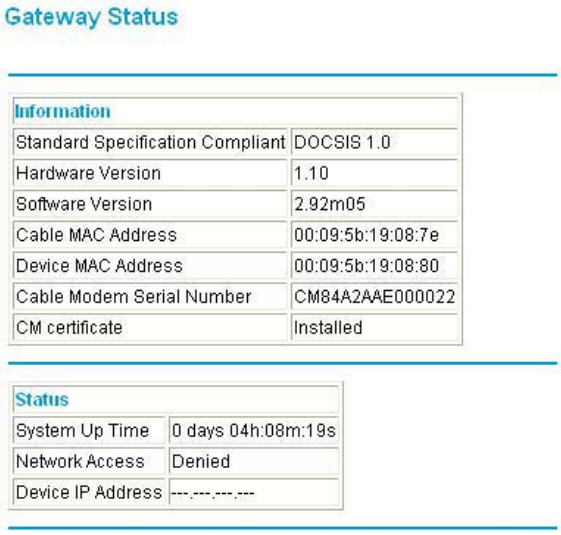


Figure 6-1: Gateway Status screen

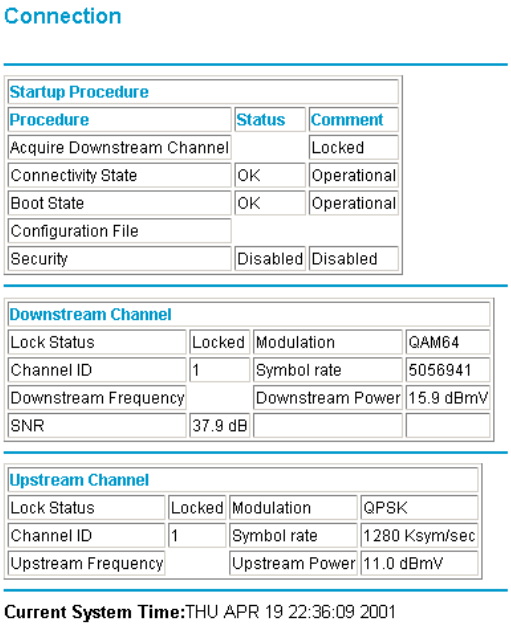
This screen shows the following parameters:

Table 6-1. Menu 3.2 - Router Status Fields

Field	Description
Information	
Standard Specification Compliant	The specification to which the gateway's cable interface is compatible.
Hardware Version	The hardware version of the gateway.
Software Version	The software version of the gateway.
Cable Modem MAC Address	The MAC address being used by the Cable Modem port of the gateway. This MAC address may need to be registered with your Cable Service Provider.
Device MAC Address	The MAC address of the router side of the gateway. This is the equivalent of your PC when connected to a cable modem. You can use the MAC Cloning feature to replace this MAC address with another address when sending packets to the WAN.
Cable Modem Serial Number	The serial number of the gateway hardware.
CM Certificate	If the Cable Modem certificate is Installed, it is possible for the service provider to upgrade your Data Over Cable service securely.
Status	
System Up Time	This is the time since the gateway has registered with your cable service provider.
Network Access	This field will change to Allowed when the registration with your cable service provider is complete.
Cable Modem IP Address	The IP address of you gateway, as seen from the Internet.

Connection Status

From the Main Menu, under Maintenance, select Connection to view the screen in Figure 6-2.



Connection

Startup Procedure		
Procedure	**Status**	**Comment**
Acquire Downstream Channel		Locked
Connectivity State	OK	Operational
Boot State	OK	Operational
Configuration File		
Security	Disabled	Disabled

Downstream Channel			
Lock Status	Locked	Modulation	QAM64
Channel ID	1	Symbol rate	5056941
Downstream Frequency		Downstream Power	15.9 dBmV
SNR	37.9 dB		

Upstream Channel			
Lock Status	Locked	Modulation	QPSK
Channel ID	1	Symbol rate	1280 Ksym/sec
Upstream Frequency		Upstream Power	11.0 dBmV

Current System Time:THU APR 19 22:36:09 2001

Figure 6-2: Connection screen

This screen shows detailed information about the status of the connection to your cable service provider that can be used for troubleshooting. The gateway goes through the following steps to be provisioned

1. Acquire and lock Downstream Channel
2. Acquire upstream parameters and range.
3. Lock Upstream Channel
4. Acquire IP Address through DHCP

Current System Time

The date and time is acquired from your cable service provider as part of the registration procedure.

Configuring LAN IP Settings

The LAN IP Setup menu allows configuration of LAN IP services such as the IP address of the gateway and DHCP. These features can be found under the Advanced heading in the Main Menu in the LAN IP menu.

LAN IP Setup

The LAN IP Setup menu is shown in Figure 6-3.0

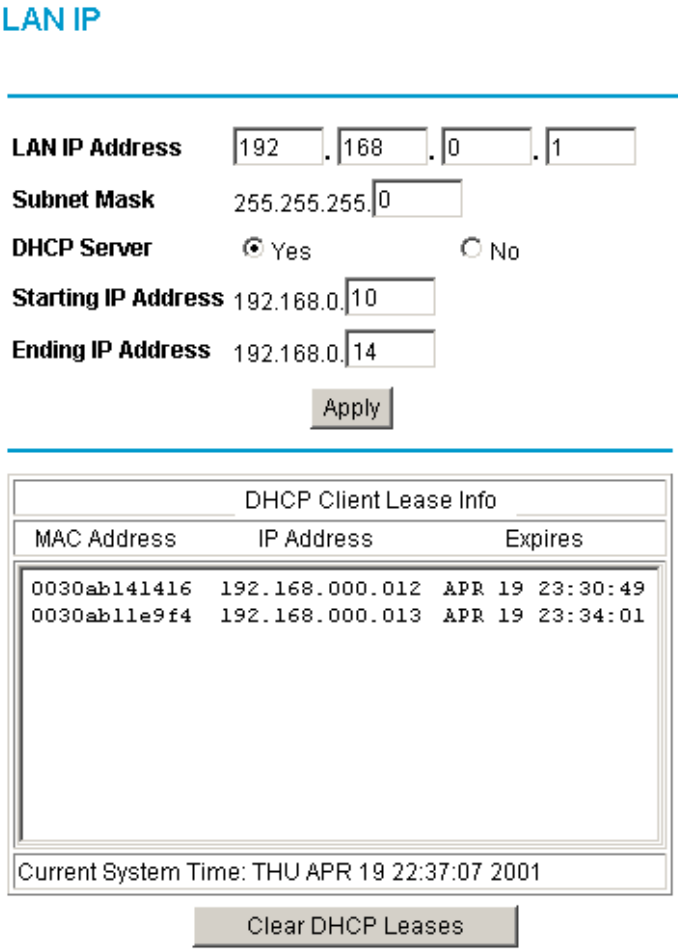


Figure 6-3: LAN IP setup screen.

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

- LAN IP addresses—192.168.0.1
- Subnet mask—255.255.255.

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.

The LAN TCP/IP Setup parameters are:

- LAN IP Address
  This is the IP address of the gateway.
- Subnet Mask
  This is the LAN Subnet Mask of the gateway. Combined with the IP address, the Subnet Mask allows a device to know which other addresses are local to it, and which must be reached through a gateway or router

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

Using the Gateway as a DHCP Server

By default, the gateway 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 gateway. 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 gateway are satisfactory. See "IP Configuration by DHCP" on page A-10" for an explanation of DHCP and information about how to assign IP addresses for your network.

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, select NO for the DHCP Server, otherwise leave Yes selected.

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 gateway's LAN IP address. Using the default addressing scheme, you should define a range between 192.168.0.10 and 192.168.0.253. The range of IP addresses between 192.168.0.2 and 192.168.0.9 can be used for devices with fixed addresses.

The gateway 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 is the gateway's LAN IP address
- Primary DNS Server, if you entered a Primary DNS address in the Basic Settings menu; otherwise, the gateway's LAN IP address
- Secondary DNS Server, if you entered a Secondary DNS address in the Basic Settings menu.

Note: The gateway implements a DNS Relay function. When it receives a DNS request on the LAN, it passes it to the DNS server specified on the WAN. It then relays the response back to the original requesting PC.

DHCP Client Lease Info

The DHCP Client Lease Info table lists information about each PC that has been assigned a DHCP lease by the gateway. The MAC address of the PC, IP address assigned and the expiration time of the DHCP lease are listed.

You can manually revoke the DHCP leases by clicking Clear DHCP Leases.

Viewing and Emailing Logged Information

The gateway will log security-related events such as denied incoming service requests and hacker probes. You can enable e-mail notification to receive these logs in an e-mail message. Log entries are described in Table 6-4

Table 6-4: Security Log entry descriptions

Field	Description
Description	The type of event and what action was taken if any.
Count	This is a reference number for each event.
Last Occurrence	The date and time the log entry was recorded.
Target	The name or IP address of the destination device or website.
Source	The IP address of the initiating device for this log entry.

Enabling Logs Event E-mail Notification

In order to receive logs and alerts by e-mail, you must provide your e-mail information in the E-Mail section of the Logs menu:

- In the Contact Email Address, type the e-mail address to which the logs will be sent. Use a full e-mail address (for example, ChrisXY@myISP.com).
- In the SMTP Server Name box, type the outgoing SMTP mail server of your ISP (for example, 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, no alerts or logs will be sent.
- Check the E-mail Alerts Enable box.
- Click E-mail Log to send the log immediately.
- Click Apply

Erasing Configuration

The configuration settings of the CG814WG Gateway are stored in a configuration file in the gateway. This file can be reverted to factory default settings. The procedures below explain how to do these tasks.

It is sometimes desirable to restore the gateway to the factory default settings. This can be done by using the Erase function.

1. To erase the configuration, from the Main Menu, under Maintenance select Set Password. Select Yes for Restore Factory Defaults and click Apply.
2. The gateway will then reboot automatically.

   After an erase, the gateway's password will be **password**, the LAN IP address will be 192.168.0.1, and the router's DHCP client will be enabled.

Note: 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 gateway.

1. Using a paper clip, depress and hold the Default Reset Button. All the numbered Ethernet LEDs will illuminate green.
2. Continue to depress the button for at least 5 seconds.
3. The gateway will reboot and clear its configuration information.

Running Diagnostic Utilities

The CG814WG Gateway has a diagnostics feature. You can use the diagnostics menu to test connectivity to PC using the Ping command:

From the Main Menu of the browser interface, under the Maintenance heading, select the Diagnostics menu, shown in Figure 6-5.

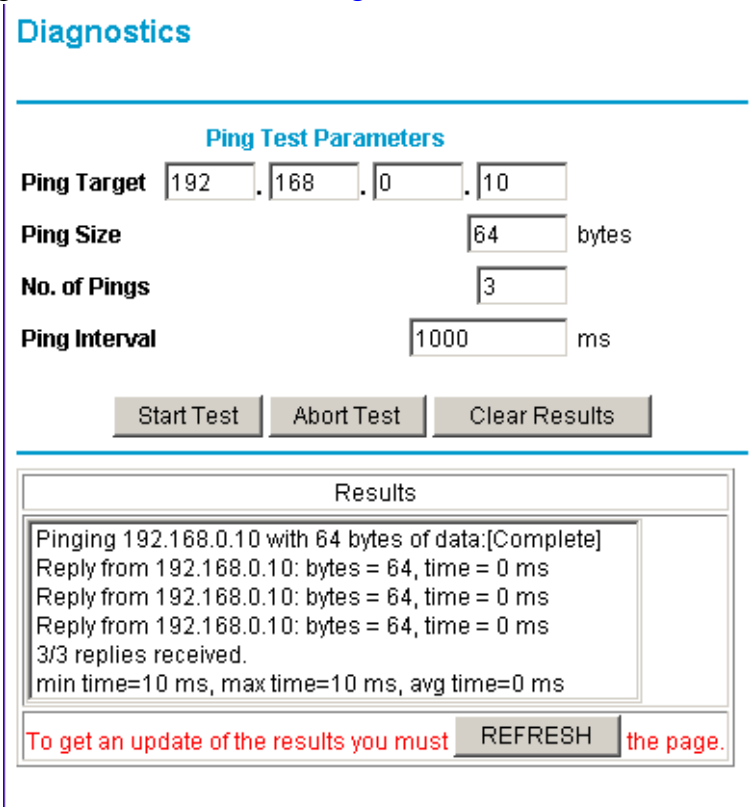


Figure 6-5: Diagnostics menu

To perform a Ping test

1. In the Ping Target section, enter the IP address of the PC you would like to ping.
2. If you would like to specify additional details, you can set the Ping Size, No. of Ping and Ping Interval.
3. Click Start Test.
4. Click REFRESH to see the results of the Ping test.

Enabling Remote Management Access

Using the Remote Management page, you can allow a user or users on the Internet to configure, upgrade and check the status of your CG814WG Gateway.

To configure your gateway for Remote Management:

1. Select the Allow Remote Management check box.
2. Specify what the Remote User Name and Remote Password that will be required to remotely access your CG814WG.
3. Specify the Port Number that will be used for accessing the management interface.

   Web browser access normally uses the standard HTTP service port 80. For greater security, you can change the remote management web interface to a custom port by entering that number in the box provided. Choose a number between 1024 and 65535, but do not use the number of any common service port. The default is 8080, which is a common alternate for HTTP.
4. Click Apply to have your changes take effect.
5. When accessing your router from the Internet, type your router's WAN IP address into your browser, followed by a colon (:) and the port number. For example, if your WAN IP address is 134.177.0.123 and you use port number 8080, type the following in your browser:

   `http://134.177.0.123:8080`

Enabling Remote Management Access After a Reset

Using the Remote Management page, you can allow the Remote Management feature to be active after a Factory Default Reset. If you do not select this checkbox and use the Erase button to revert to the Factory Default settings, you will not be able to remotely access your CG814WG.

Chapter 7
Troubleshooting

This chapter gives information about troubleshooting your CG814WG Wireless Cable Modem Gateway. For the common problems listed, go to the section indicated.

- Is the gateway on?
- Have I connected the gateway correctly?

  Go to "Basic Functions" on page 7-1.
- I can't access the gateway's configuration with my browser.

  Go to "Troubleshooting the Web Configuration Interface" on page 7-3.
- I've configured the gateway but I can't access the Internet.

  Go to "Troubleshooting the ISP Connection" on page 7-4.
- I can't remember the gateway's configuration password.
- I want to clear the configuration and start over again.

  Go to "Erasing Configuration" on page 6-8.

Basic Functions

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

1. When power is first applied, verify that the Power LED is on.
2. Verify that the numbered ethernet LEDs come on momentarily.
3. After approximately 30 seconds, verify that:
   c. The Local port Link LEDs are lit for any local ports that are connected.
   d. The Test LED is not lit.

e. The Internet Link port LED is lit.

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 gateway is turned on:

- Make sure that the power cord is properly connected to your gateway and that the power supply adapter is properly connected to a functioning power outlet.
- Check that you are using the 12VDC power adapter supplied by NETGEAR for this product.

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

Test LED Stays On

If the Test LED stays on continuously, there is a fault within the gateway.

If you experience problems with the Test LED:

- Cycle the power to see if the gateway recovers and the LED goes off
- If all LEDs including the Test LED are still on one minute after power up, clear the gateway's configuration to factory defaults. This will set the gateway's IP address to 192.168.0.1. This procedure is explained in "Erasing Configuration" on page 6-8.

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

Local Link LEDs Not On

If the Local Port Link LEDs do not light when the Ethernet connection is made, check the following:

- Make sure that the Ethernet cable connections are secure at the gateway and at the hub or PC.
- Make sure that power is turned on to the connected hub or PC.
- Be sure you are using the correct cable:
  - When connecting the gateway's Internet port to a cable or DSL modem, use the cable that was supplied with the cable or DSL modem. This cable could be a standard straight-through Ethernet cable or an Ethernet crossover cable.

Cable Link LED Not On

If the Cable Link LED does not light when connected to your cable television cable, check the following:

- Make sure that the coaxial cable connections are secure at the gateway and at the wall jack.
- Make sure that your cable internet service has been provisioned by your cable service provider. Your provider should verify that the signal quality is good enough for cable modem service.
- Remove any excessive splitters you may have on your cable line. It may be necessary to run a "home run" back to the point where the cable enters your home.

Troubleshooting the Web Configuration Interface

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

- Check the Ethernet connection between the PC and the gateway as described in the previous section.
- Make sure your PC's IP address is on the same subnet as the gateway. If you are using the recommended addressing scheme, your PC's address should be in the range of 192.168.0.10 to 192.168.0.254. Refer to "Verifying TCP/IP Properties" on page C-6 or "Configuring the Macintosh for TCP/IP Networking" on page C-17 to find your PC's IP address. Follow the instructions in Appendix C 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 gateway and reboot your PC.
- If your gateway's IP address has been changed and you don't know the current IP address, clear the gateway's configuration to factory defaults. This will set the gateway's IP address to 192.168.0.1. This procedure is explained in "Erasing Configuration" on page 6-8.
- 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 gateway 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 gateway is unable to access the Internet and your Cable Link LED is on, you may need to register the Cable MAC Address and/or Device MAC Address of you gateway with your cable service provider. This is described in "Connecting the CG814WG Gateway" on page 3-2.

Additionally, your PC may not have the gateway configured as its TCP/IP gateway. If your PC obtains its information from the gateway by DHCP, reboot the PC and verify the gateway address as described in "DHCP Configuration of TCP/IP in Windows 2000 " on page C-11.

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 easier by using the ping utility in your PC or workstation.

Testing the LAN Path to Your Gateway

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

To ping the gateway 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 gateway, 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 "Local Link LEDs Not On" on page 7-2.
     - — 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 gateway.
   - 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 gateway 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 gateway 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 gateway is listed as the default gateway as described in "DHCP Configuration of TCP/IP in Windows 2000 " on page C-11.

— 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 Link LED is on.

— 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 Device MAC Address of your gateway because it does not match the MAC Address of the PC you previously used to connect to a cable modem. In this case you will need to clone your PCs MAC Address. Refer to "Connecting the CG814WG Gateway" on page 3-2.

Appendix A
Technical Specifications

This appendix provides technical specifications for the CG814WG Wireless Cable Modem Gateway.

Network Protocol and Standards Compatibility

Data and Routing Protocols:	TCP/IP DHCP server and client DNS relay NAT (many-to-one) TFTP client VPN pass through (IPSec, L2TP)

Power Adapter

North America (input):	120V, 60 Hz, input
All regions (output):	12 V DC @ 1.25A output, 15W maximum

Physical Specifications

Dimensions:	255 by 169 by 34 mm 10.0 by 6.7 by 1.3 in.
Weight:	0.54 kg 1.2 lb.

Environmental Specifications

Operating temperature:	32°-140° F (0° to 40° C)
Operating humidity:	90% maximum relative humidity, noncondensing

Electromagnetic Emissions

Meets requirements of:	FCC Part 15 Class B

Interface Specifications

Local:	10BASE-T or 100BASE-Tx, RJ-45 USB 1.1 Function 802.11b Wireless Access Point
Internet:	DOCSIS 2.0. Downward compatible with DOCSIS 1.0 and DOCSIS 1.1.

Appendix B
Networks, Routing, and Firewall Basics

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

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.

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 CG814WG Wireless Cable Modem Gateway 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 CG814WG Gateway 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.

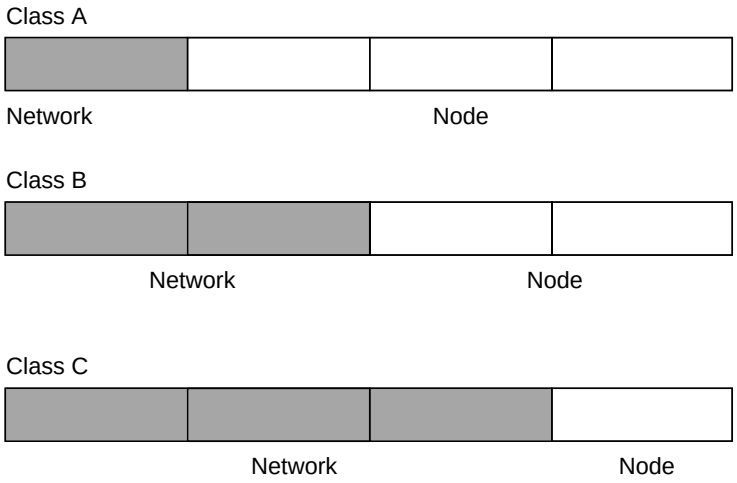


Figure B-1: Three Main Address Classes

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.

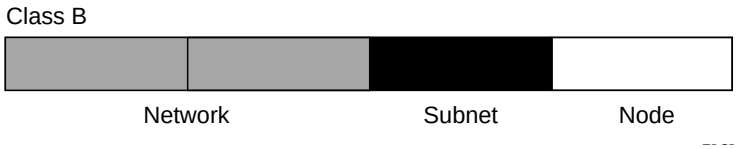


Figure B-2: Example of Subnetting a Class B Address

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 7-1. 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 mask length formats.

Table 7-2. Netmask Formats

Dotted-Decimal	Masklength
255.0.0.0	/8
255.255.0.0	/16

Table 7-2. Netmask Formats

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
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 CG814WG Gateway 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 CG814WG Gateway 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.

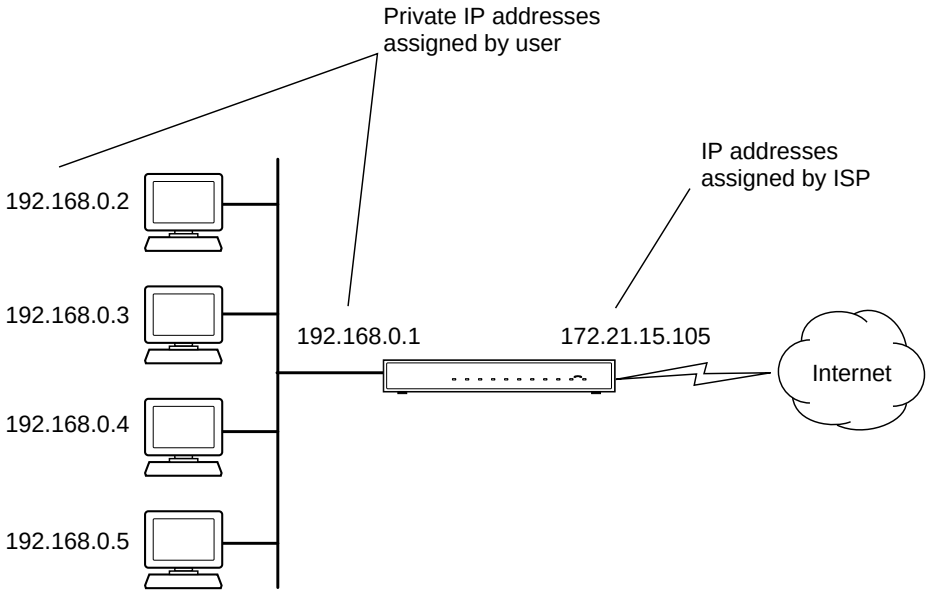


Figure B-3: Single IP Address Operation Using NAT

This scheme offers the additional benefit of 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.

Related Documents

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.

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)*.

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 CG814WG Gateway has the capacity to act as a DHCP server.

The CG814WG Gateway also functions as a DHCP client when connecting to the ISP. The gateway can automatically obtain an IP address, subnet mask, DNS server addresses, and a gateway address if the ISP provides this information by DHCP.

Internet Security and Firewalls

When your LAN connects to the Internet through a router, an opportunity is created for outsiders to access or disrupt your network. A NAT router provides some protection because by the very nature of the Network Address Translation (NAT) process, the network behind the NAT router is shielded from access by outsiders on the Internet. However, there are methods by which a determined hacker can possibly obtain information about your network or at the least can disrupt your Internet access. A greater degree of protection is provided by a firewall router.

What is a Firewall?

A firewall is a device that protects one network from another, while allowing communication between the two. A firewall incorporates the functions of the NAT router, while adding features for dealing with a hacker intrusion or attack. Several known types of intrusion or attack can be recognized when they occur. When an incident is detected, the firewall can log details of the attempt, and can optionally send email to an administrator notifying them of the incident. Using information from the log, the administrator can take action with the ISP of the hacker. In some types of intrusions, the firewall can fend off the hacker by discarding all further packets from the hacker's IP address for a period of time.

Stateful Packet Inspection

Unlike simple Internet sharing routers, a firewall uses a process called stateful packet inspection to ensure secure firewall filtering to protect your network from attacks and intrusions. Since user-level applications such as FTP and Web browsers can create complex patterns of network traffic, it is necessary for the firewall to analyze groups of network connection "states." Using Stateful Packet Inspection, an incoming packet is intercepted at the network layer and then analyzed for state-related information associated with all network connections. A central cache within the firewall keeps track of the state information associated with all network connections. All traffic passing through the firewall is analyzed against the state of these connections in order to determine whether or not it will be allowed to pass through or rejected.

Denial of Service Attack

A hacker may be able to prevent your network from operating or communicating by launching a Denial of Service (DoS) attack. The method used for such an attack can be as simple as merely flooding your site with more requests than it can handle. A more sophisticated attack may attempt to exploit some weakness in the operating system used by your router or gateway. Some operating systems can be disrupted by simply sending a packet with incorrect length information.

Wireless Networking Overview

The CG814WG Gateway conforms to the Institute of Electrical and Electronics Engineers (IEEE) 802.11b standard for wireless LANs (WLANs). On an 802.11b wireless link, data is encoded using direct-sequence spread-spectrum (DSSS) technology and is transmitted in the unlicensed radio spectrum at 2.5GHz. The maximum data rate for the wireless link is 11 Mbps, but it will automatically back down from 11 Mbps to 5.5, 2, and 1 Mbps when the radio signal is weak or when interference is detected.

The 802.11b standard is also called Wireless Ethernet or Wi-Fi by the Wireless Ethernet Compatibility Alliance (WECA, see *http://www.wi-fi.net*), an industry standard group promoting interoperability among 802.11b devices. The 802.11b standard offers two methods for configuring a wireless network - ad hoc and infrastructure.

Infrastructure Mode

With a wireless Access Point, you can operate the wireless LAN in the infrastructure mode. This mode provides wireless connectivity to multiple wireless network devices within a fixed range or area of coverage, interacting with wireless nodes via an antenna.

In the infrastructure mode, the wireless access point converts airwave data into wired Ethernet data, acting as a bridge between the wired LAN and wireless clients. Connecting multiple Access Points via a wired Ethernet backbone can further extend the wireless network coverage. As a mobile computing device moves out of the range of one access point, it moves into the range of another. As a result, wireless clients can freely roam from one Access Point domain to another and still maintain seamless network connection.

Ad Hoc Mode (Peer-to-Peer Workgroup)

In an ad hoc network, computers are brought together as needed; thus, there is no structure or fixed points to the network - each node can generally communicate with any other node. There is no Access Point involved in this configuration. This mode enables you to quickly set up a small wireless workgroup and allows workgroup members to exchange data or share printers as supported by Microsoft networking in the various Windows operating systems. Some vendors also refer to ad hoc networking as peer-to-peer group networking.

In this configuration, network packets are directly sent and received by the intended transmitting and receiving stations. As long as the stations are within range of one another, this is the easiest and least expensive way to set up a wireless network.

Network Name: Extended Service Set Identification (ESSID)

The Extended Service Set Identification (ESSID) is one of two types of Service Set Identification (SSID). In an ad hoc wireless network with no access points, the Basic Service Set Identification (BSSID) is used. In an infrastructure wireless network that includes an access point, the ESSID is used, but may still be referred to as SSID.

An SSID is a thirty-two character (maximum) alphanumeric key identifying the name of the wireless local area network. Some vendors refer to the SSID as network name. For the wireless devices in a network to communicate with each other, all devices must be configured with the same SSID.

Authentication and WEP

The absence of a physical connection between nodes makes the wireless links vulnerable to eavesdropping and information theft. To provide a certain level of security, the IEEE 802.11 standard has defined two types of authentication methods, Open System and Shared Key. With Open System authentication, a wireless PC can join any network and receive any messages that are not encrypted. With Shared Key authentication, only those PCs that possess the correct authentication key can join the network. By default, IEEE 802.11 wireless devices operate in an Open System network.

Wired Equivalent Privacy (WEP) data encryption is used when the wireless devices are configured to operate in Shared Key authentication mode. There are two shared key methods implemented in most commercially available products, 64-bit and 128-bit WEP data encryption.

802.11b Authentication

The 802.11b standard defines several services that govern how two 802.11b devices communicate. The following events must occur before an 802.11b Station can communicate with an Ethernet network through an access point such as the one built in to the CG814WG:

1. Turn on the wireless station.
2. The station listens for messages from any access points that are in range.
3. The station finds a message from an access point that has a matching SSID.
4. The station sends an authentication request to the access point.
5. The access point authenticates the station.

6. The station sends an association request to the access point.
7. The access point associates with the station.
8. The station can now communicate with the Ethernet network through the access point.

An access point must authenticate a station before the station can associate with the access point or communicate with the network. The IEEE 802.11b standard defines two types of authentication: Open System and Shared Key.

- Open System Authentication allows any device to join the network, assuming that the device SSID matches the access point SSID. Alternatively, the device can use the "ANY" SSID option to associate with any available Access Point within range, regardless of its SSID.
- Shared Key Authentication requires that the station and the access point have the same WEP Key to authenticate. These two authentication procedures are described below.

Open System Authentication

The following steps occur when two devices use Open System Authentication:

1. The station sends an authentication request to the access point.
2. The access point authenticates the station.
3. The station associates with the access point and joins the network.

This process is illustrated in below.

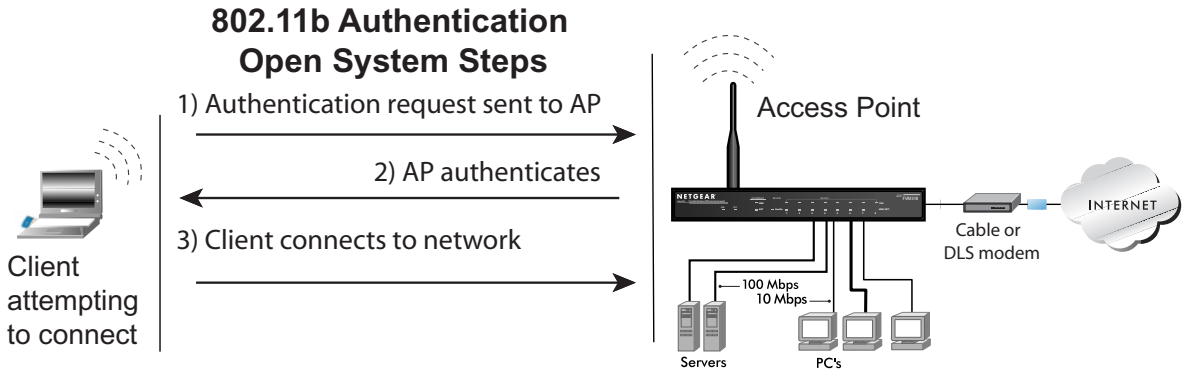


Figure B-4: 802.11b open system authentication

Shared Key Authentication

The following steps occur when two devices use Shared Key Authentication:

1. The station sends an authentication request to the access point.
2. The access point sends challenge text to the station.
3. The station uses its configured 64-bit or 128-bit default key to encrypt the challenge text, and sends the encrypted text to the access point.
4. The access point decrypts the encrypted text using its configured WEP Key that corresponds to the station's default key. The access point compares the decrypted text with the original challenge text. If the decrypted text matches the original challenge text, then the access point and the station share the same WEP Key and the access point authenticates the station.
5. The station connects to the network.

If the decrypted text does not match the original challenge text (i.e., the access point and station do not share the same WEP Key), then the access point will refuse to authenticate the station and the station will be unable to communicate with either the 802.11b network or Ethernet network.

This process is illustrated in below.

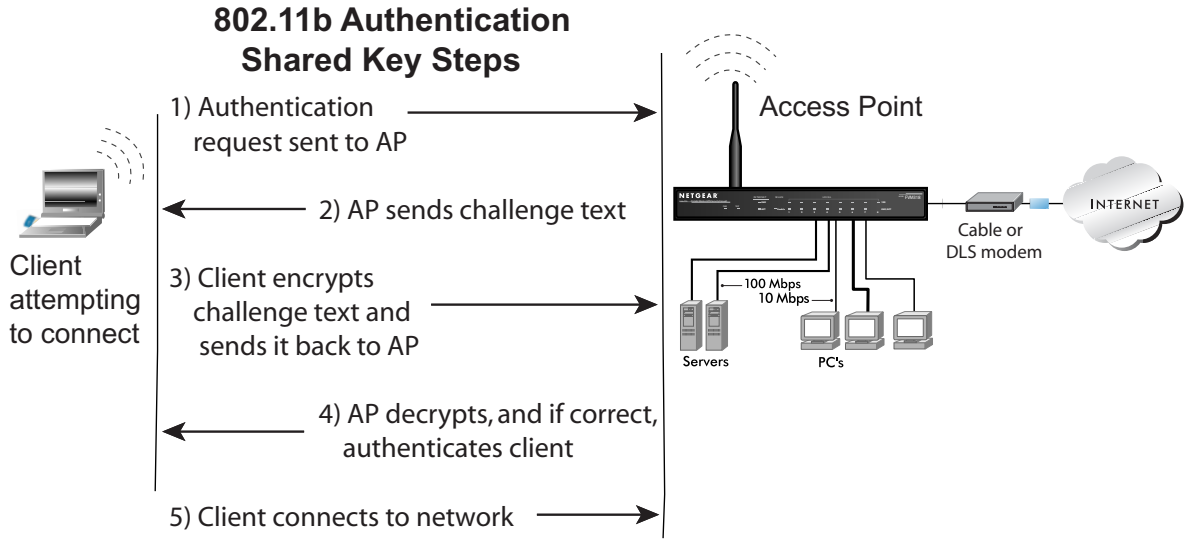


Figure B-5: 802.11b shared key authentication

Overview of WEP Parameters

Before enabling WEP on an 802.11b network, you must first consider what type of encryption you require and the key size you want to use. Typically, there are three WEP Encryption options available for 802.11b products:

1. **Do Not Use WEP:** The 802.11b network does not encrypt data. For authentication purposes, the network uses Open System Authentication.

2. **Use WEP for Encryption:** A transmitting 802.11b device encrypts the data portion of every packet it sends using a configured WEP Key. The receiving 802.11b device decrypts the data using the same WEP Key. For authentication purposes, the 802.11b network uses Open System Authentication.

3. **Use WEP for Authentication and Encryption:** A transmitting 802.11b device encrypts the data portion of every packet it sends using a configured WEP Key. The receiving 802.11b device decrypts the data using the same WEP Key. For authentication purposes, the 802.11b network uses Shared Key Authentication.

Note: Some 802.11b access points also support **Use WEP for Authentication Only** (Shared Key Authentication without data encryption).

Key Size

The IEEE 802.11b standard supports two types of WEP encryption: 40-bit and 128-bit.

The 64-bit WEP data encryption method, allows for a five-character (40-bit) input. Additionally, 24 factory-set bits are added to the forty-bit input to generate a 64-bit encryption key. (The 24 factory-set bits are not user-configurable). This encryption key will be used to encrypt/decrypt all data transmitted via the wireless interface. Some vendors refer to the 64-bit WEP data encryption as 40-bit WEP data encryption since the user-configurable portion of the encryption key is 40 bits wide.

The 128-bit WEP data encryption method consists of 104 user-configurable bits. Similar to the forty-bit WEP data encryption method, the remaining 24 bits are factory set and not user configurable. Some vendors allow passphrases to be entered instead of the cryptic hexadecimal characters to ease encryption key entry.

128-bit encryption is stronger than 40-bit encryption, but 128-bit encryption may not be available outside of the United States due to U.S. export regulations.

When configured for 40-bit encryption, 802.11b products typically support up to four WEP Keys. Each 40-bit WEP Key is expressed as 5 sets of two hexadecimal digits (0-9 and A-F). For example, “12 34 56 78 90” is a 40-bit WEP Key.

When configured for 128-bit encryption, 802.11b products typically support four WEP Keys but some manufacturers support only one 128-bit key. The 128-bit WEP Key is expressed as 13 sets of two hexadecimal digits (0-9 and A-F). For example, “12 34 56 78 90 AB CD EF 12 34 56 78 90” is a 128-bit WEP Key.

Note: Typically, 802.11b access points can store up to four 128-bit WEP Keys but some 802.11b client adapters can only store one. Therefore, make sure that your 802.11b access and client adapters configurations match.

WEP Configuration Options

The WEP settings must match on all 802.11b devices that are within the same wireless network as identified by the SSID. In general, if your mobile clients will roam between access points, then all of the 802.11b access points and all of the 802.11b client adapters on the network must have the same WEP settings.

Note: Whatever keys you enter for an AP, you must also enter the same keys for the client adapter in the same order. In other words, WEP key 1 on the AP must match WEP key 1 on the client adapter, WEP key 2 on the AP must match WEP key 2 on the client adapter, etc.

Note: The AP and the client adapters can have different default WEP Keys as long as the keys are in the same order. In other words, the AP can use WEP key 2 as its default key to transmit while a client adapter can use WEP key 3 as its default key to transmit. The two devices will communicate as long as the AP’s WEP key 2 is the same as the client’s WEP key 2 and the AP’s WEP key 3 is the same as the client’s WEP key 3.

Wireless Channels

IEEE 802.11 wireless nodes communicate with each other using radio frequency signals in the ISM (Industrial, Scientific, and Medical) band between 2.4 GHz and 2.5 GHz. Neighboring channels are 5 MHz apart. However, due to spread spectrum effect of the signals, a node sending signals using a particular channel will utilize frequency spectrum 12.5 MHz above and below the center channel frequency. As a result, two separate wireless networks using neighboring channels (for example, channel 1 and channel 2) in the same general vicinity will interfere with each other. Applying two channels that allow the maximum channel separation will decrease the amount of channel cross-talk, and provide a noticeable performance increase over networks with minimal channel separation.

The radio frequency channels used are listed in Table 7-3:

Table 7-3. 802.11 Radio Frequency Channels

Channel	Center Frequency	Frequency Spread
1	2412 MHz	2399.5 MHz - 2424.5 MHz
2	2417 MHz	2404.5 MHz - 2429.5 MHz
3	2422 MHz	2409.5 MHz - 2434.5 MHz
4	2427 MHz	2414.5 MHz - 2439.5 MHz
5	2432 MHz	2419.5 MHz - 2444.5 MHz
6	2437 MHz	2424.5 MHz - 2449.5 MHz
7	2442 MHz	2429.5 MHz - 2454.5 MHz
8	2447 MHz	2434.5 MHz - 2459.5 MHz
9	2452 MHz	2439.5 MHz - 2464.5 MHz
10	2457 MHz	2444.5 MHz - 2469.5 MHz
11	2462 MHz	2449.5 MHz - 2474.5 MHz
12	2467 MHz	2454.5 MHz - 2479.5 MHz
13	2472 MHz	2459.5 MHz - 2484.5 MHz

Note: The available channels supported by the wireless products in various countries are different.

The preferred channel separation between the channels in neighboring wireless networks is 25 MHz (5 channels). This means that you can apply up to three different channels within your wireless network. There are only 11 usable wireless channels in the United States. It is recommended that you start using channel 1 and grow to use channel 6, and 11 when necessary, as these three channels do not overlap.

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 as described in Table 7-4.

Table 7-4. 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 and Crossover Cables

In the wiring table, the concept of transmit and receive are from the perspective of the PC. For example, the PC transmits on pins 1 and 2. At the hub, the perspective is reversed, and the hub receives on pins 1 and 2. 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. 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. The second method is to use a crossover cable, which 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", 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.

Appendix C
Preparing Your Network

This appendix describes how to prepare your network to connect to the Internet through the CG814WG Wireless Cable Modem Gateway and how to verify the readiness of broadband Internet service from an Internet service provider (ISP).

Note: If an ISP technician configured your computer 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 gateway. Write down this information before reconfiguring your computers. Refer to "Obtaining ISP Configuration Information for Windows Computers" on page C-20 or "Obtaining ISP Configuration Information for Macintosh Computers" on page C-21 for further information.

Preparing Your Computers for TCP/IP Networking

Computers access the Internet using a protocol called TCP/IP (Transmission Control Protocol/ Internet Protocol). Each computer 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.

Most 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 gateway 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 CG814WG Gateway is shipped preconfigured as a DHCP server. The gateway 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 gateway)—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 TCP/IP Networking

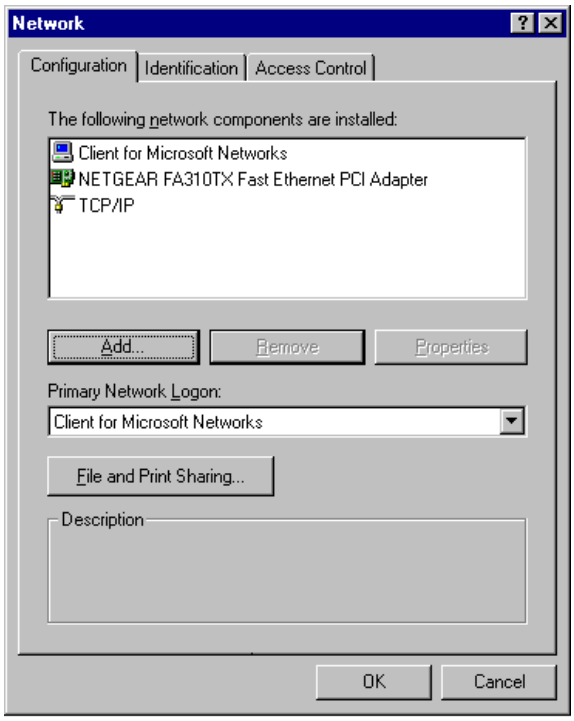
As part of the PC preparation process, you need to manually install and configure TCP/IP on each networked PC. Before starting, locate your Windows CD; you may need to insert it during the TCP/IP installation process.

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 to install a new adapter, follow these steps:

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.

Enabling DHCP in Windows 95B, 98, and Me

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 a DHCP server in the network.

You will find there are many similarities in the procedures for different Windows systems when using DHCP to configure TCP/IP.

The following steps will walk you through the configuration process for each of these versions of Windows.

1

Locate your **Network Neighborhood** icon.

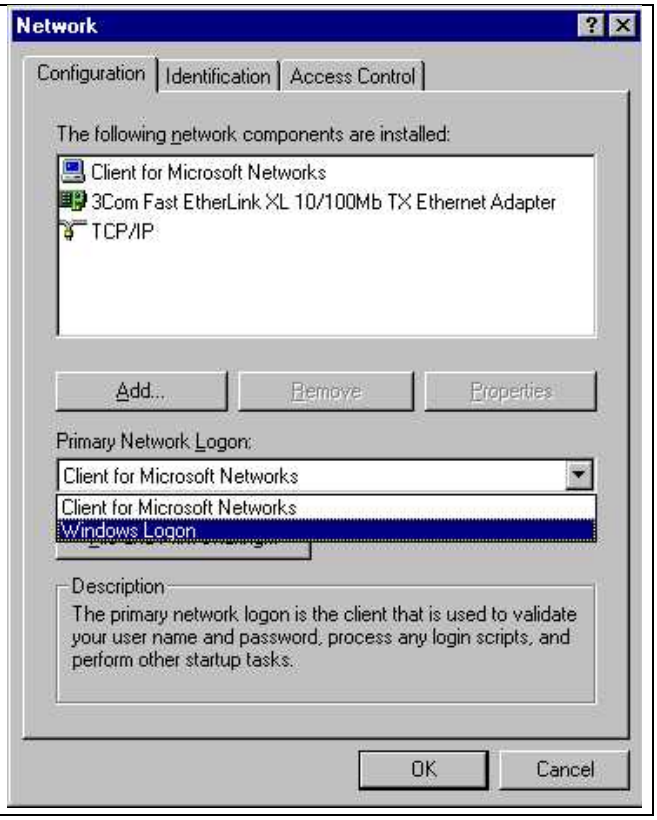
- If the Network Neighborhood icon is on the Windows desktop, position your mouse pointer over it and right-click your mouse button.
- If the icon is not on the desktop,
  - — Click **Start** on the task bar located at the bottom left of the window.
  - — Choose **Settings**, and then **Control Panel**.
  - — Locate the **Network Neighborhood** icon and click on it. This will open the Network panel as shown below.

2

Verify the following settings as shown:

- Client for Microsoft Network exists
- Ethernet adapter is present
- TCP/IP is present
- **Primary Network Logon** is set to Windows logon

Click on the **Properties** button. The following TCP/IP Properties window will display.

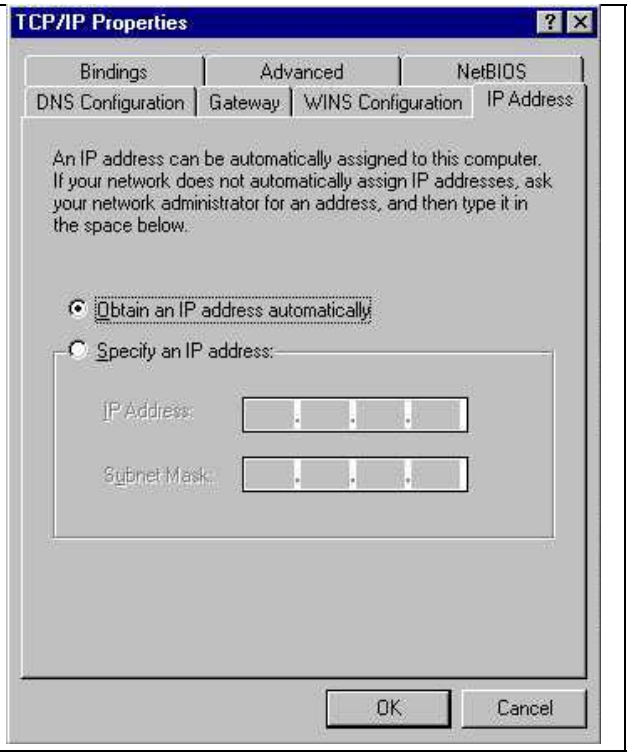


3

By default, the **IP Address** tab is open on this window. Verify the following:

- **Obtain an IP address automatically** is selected. If not selected, click in the radio button to the left of it to select it. This setting is required to enable the DHCP server to automatically assign an IP address.
- Click **OK** to continue.
- Restart the PC.

Repeat these steps for each PC with this version of Windows on your network.



Selecting Windows' 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 for connecting through a router or gateway:

   - 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 NT4, 2000 or XP for IP Networking

As part of the PC preparation process, you may need to 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. Then, restart your PC.

DHCP Configuration of TCP/IP in Windows XP, 2000, or NT4

You will find there are many similarities in the procedures for different Windows systems when using DHCP to configure TCP/IP.

The following steps will walk you through the configuration process for each of these versions of Windows.

DHCP Configuration of TCP/IP in Windows XP

1

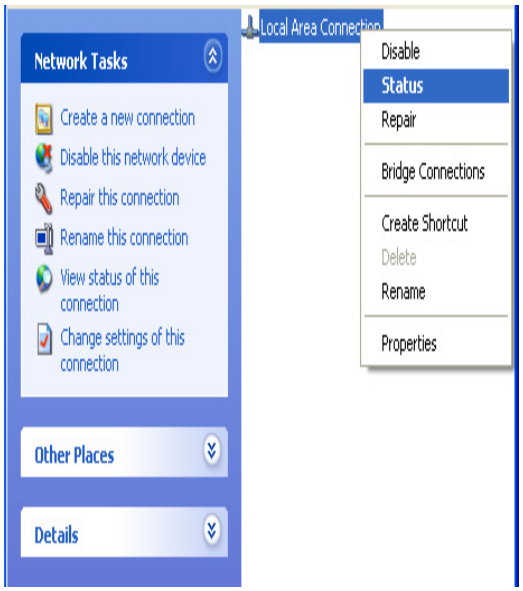
Locate your **Network Neighborhood** icon.

- Select **Control Panel** from the Windows XP new Start Menu.
- Select the **Network Connections** icon on the Control Panel. This will take you to the next step.

2

Now the Network Connection window displays. The Connections List that shows all the network connections set up on the PC, located to the right of the window.

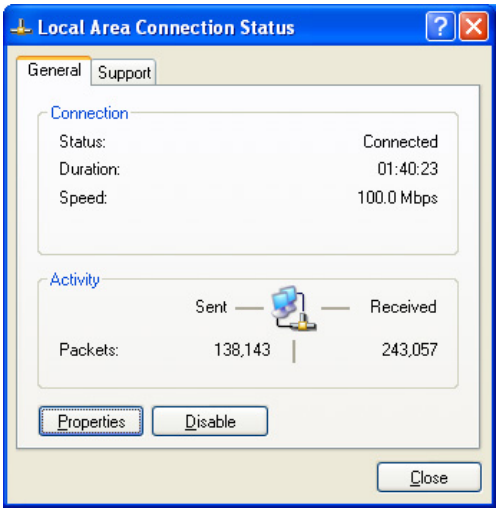
- Right-click on the **Connection with the wireless icon** and choose **Status**.



3

Now you should be at the Local Area Network Connection Status window. This box displays the connection status, duration, speed, and activity statistics.

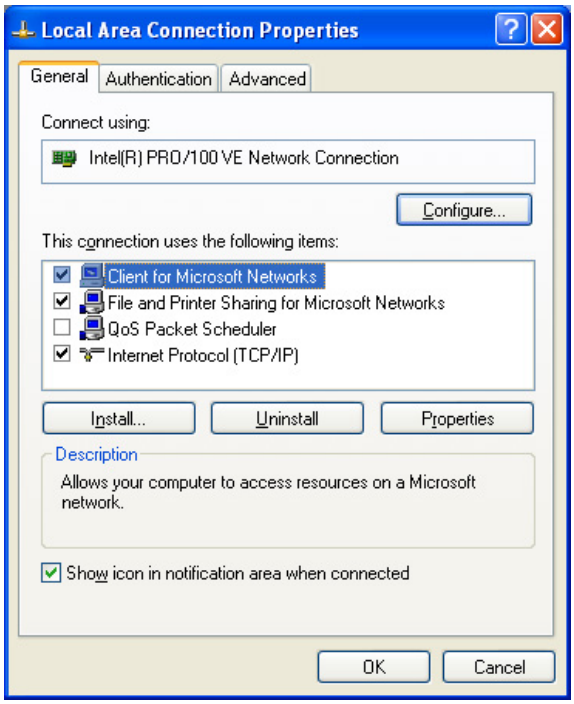
- Administrator logon access rights are needed to use this window.
- Click the **Properties button** to view details about the connection.



4

The TCP/IP details are presented on the Support tab page.

- Select **Internet Protocol,** and click **Properties** to view the configuration information**.**



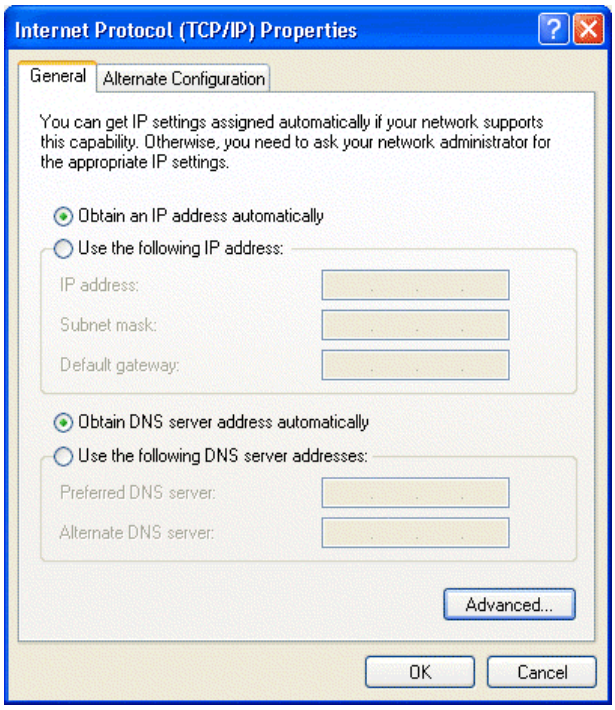
5

Verify that the **Obtain an IP address automatically** radio button is selected.

- Verify that **Obtain DNS server address automatically** radio button is selected.
- Click the **OK** button.

This completes the DHCP configuration of TCP/IP in Windows XP.

Repeat these steps for each PC with this version of Windows on your network.



DHCP Configuration of TCP/IP in Windows 2000

Once again, after you have installed the network card, TCP/IP for Windows 2000 is configured. TCP/IP should be added by default and set to DHCP without your having to configure it. However, if there are problems, you may need to know how to do it manually. Remember, Cox only sets up TCP/IP dynamically, (i.e., it uses DHCP to obtain TCP/IP settings). Following are the steps to configure TCP/IP with DHCP for Windows 2000.

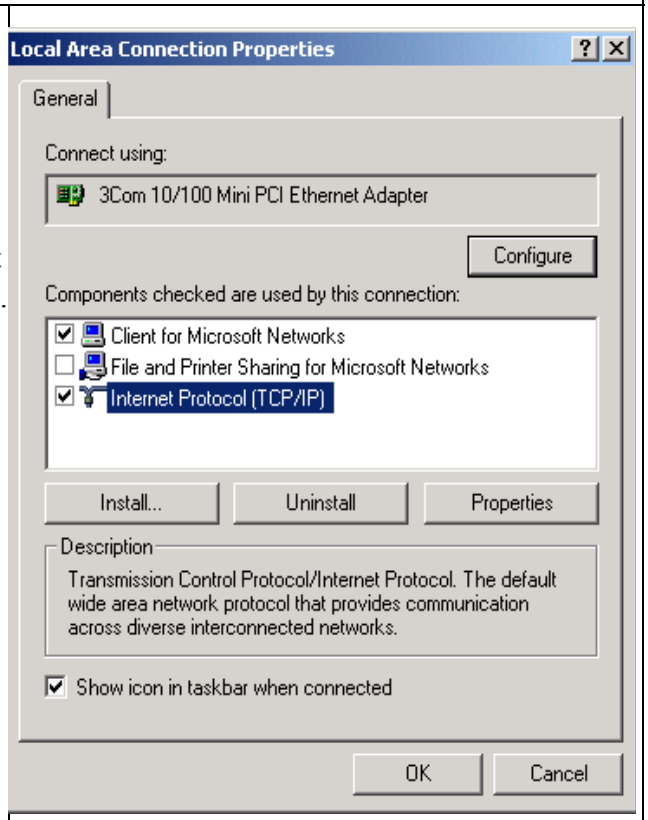
1

- Click on the **My Network Places** icon on the Windows desktop. This will bring up a window called Network and Dial-up Connections.
- Right click on **Local Area Connection** and select **Properties**.

2

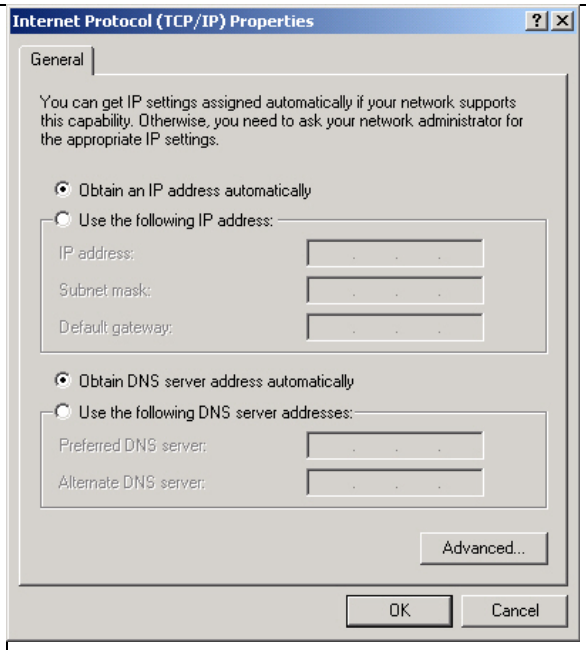
The **Local Area Connection Properties** dialog box appears.

- Verify that you have the correct Ethernet card selected in the **Connect using:** box.
- Verify that at least the following two items are displayed and selected in the box of "Components checked are used by this connection:"
  - — Client for Microsoft Networks and
  - — Internet Protocol (TCP/IP)
- Click **OK**.



3

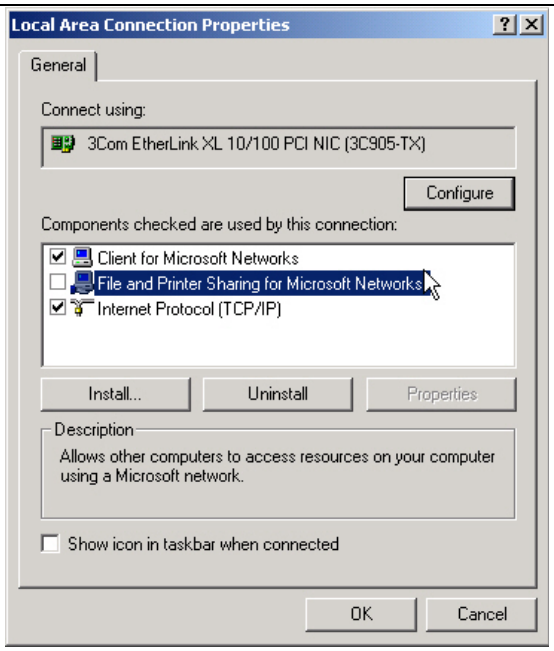
- With Internet Protocol (TCP/IP) selected, click on **Properties** to open the Internet Protocol (TCP/IP) Properties dialogue box. Verify that
  - **Obtain an IP address automatically** is selected.
  - **Obtain DNS server address automatically** is selected.
- Click **OK** to return to Local Area Connection Properties.



4

- Click **OK** again to complete the configuration process for Windows 2000.
- Restart the PC.

Repeat these steps for each PC with this version of Windows on your network.



DHCP Configuration of TCP/IP in Windows NT4

Once you have installed the network card, you need to configure the TCP/IP environment for Windows NT 4.0. Again, remember Cox only sets up TCP/IP dynamically (i.e., it uses DHCP to obtain TCP/IP settings).

Following are the procedures you use to configure TCP/IP with DHCP in Windows NT 4.0.

1

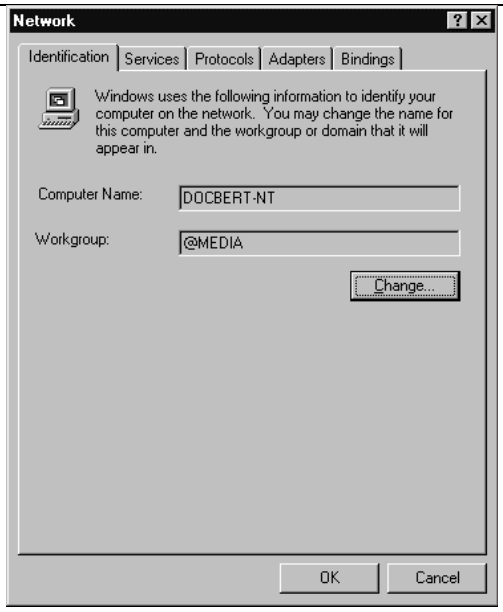
- Choose **Settings** from the Start Menu, and then select **Control Panel**. This will display Control Panel window.

2

- Double-click the **Network** icon in the Control Panel window.

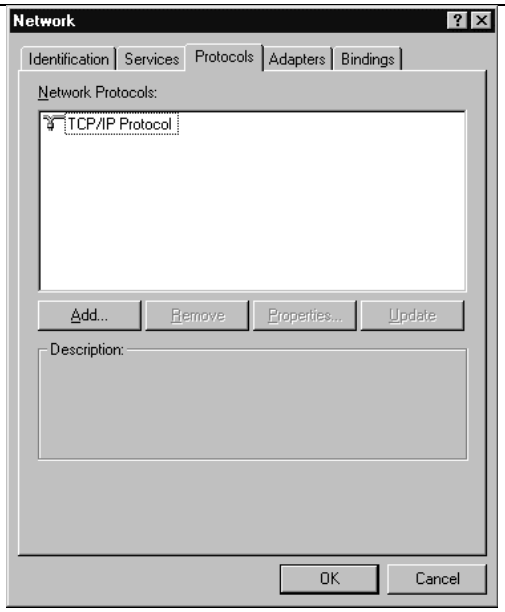
  The Network panel will display.

- Select the **Protocols** tab to continue.



3

- Highlight the **TCP/IP Protocol** in the **Network Protocols** box, and click on the **Properties** button.



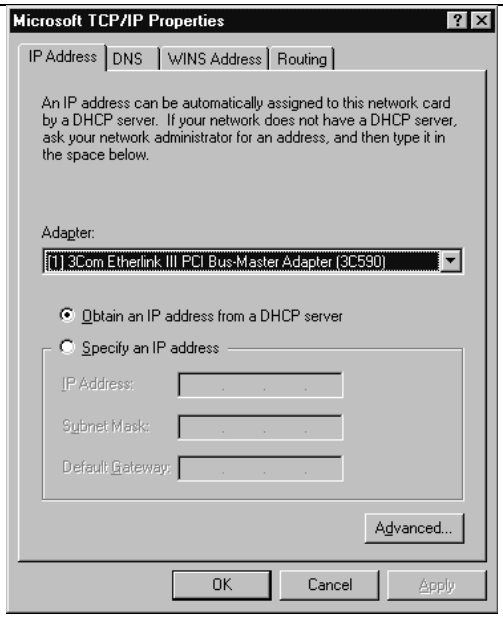
4

The **TCP/IP Properties** dialog box now displays.

- Click the **IP Address** tab**.**
- Select the radio button marked **Obtain an IP address from a DHCP server.**
- Click **OK**. This completes the configuration of TCP/IP in Windows NT.

Restart the PC.

Repeat these steps for each PC with this version of Windows on your network.



Verifying TCP/IP Properties for Windows XP, 2000, and NT4

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 for connecting through a router or gateway:

   - 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`**

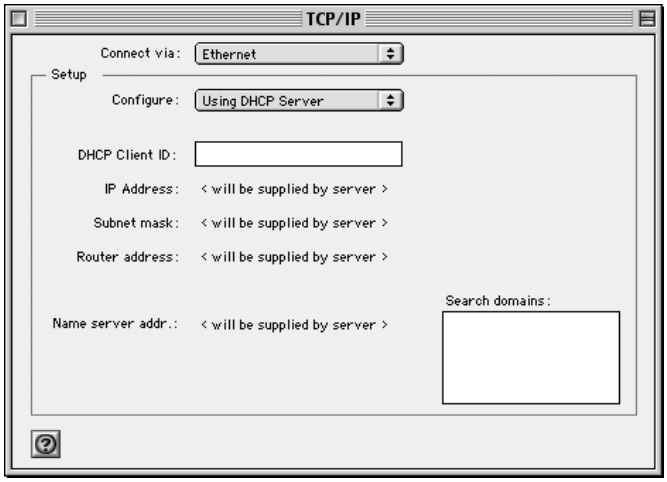
Configuring the Macintosh for TCP/IP Networking

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.

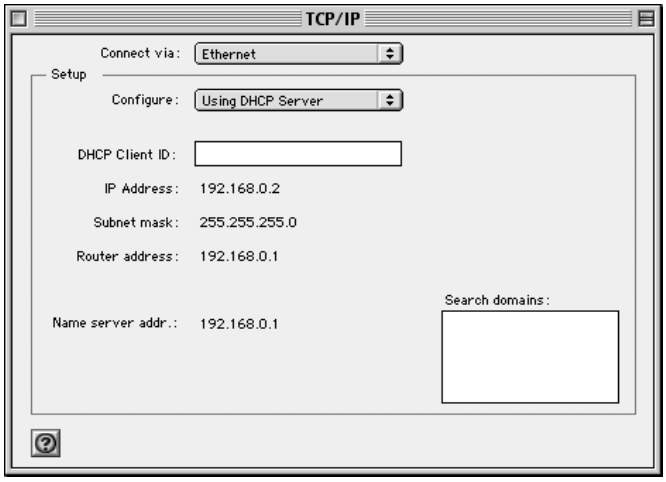
   You can leave the DHCP Client ID box empty.
4. Close the TCP/IP Control Panel.
5. Repeat this for each Macintosh on your network.

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, Select Using DHCP in the TCP/IP tab.
4. Click Save.

Verifying TCP/IP Properties for Macintosh Computers

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”.

Verifying the Readiness of Your Internet Account

For broadband access to the Internet, you need to contract with an Internet service provider (ISP) for a single-user Internet access account using 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 computer. Your gateway does not support a USB-connected broadband modem.

For a single-user Internet account, your ISP supplies TCP/IP configuration information for one computer. 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 gateway 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 gateway's Internet port is connected to the broadband modem, the gateway appears to be a single PC to the ISP. The gateway 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 gateway to accomplish this is called Network Address Translation (NAT) or IP masquerading.

Are Login Protocols Used?

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 gateway are configured, the gateway 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.

What Is Your Configuration Information?

More and more, ISPs are dynamically assigning configuration information. However, if your ISP does not dynamically assign configuration information but instead used fixed configurations, your ISP should have given 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 gateway 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 the 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 gateway. These procedures are described next.

Obtaining ISP Configuration Information for Windows Computers

As mentioned above, you may need to collect configuration information from your PC so that you can use this information when you configure the CG814WG Gateway. 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 gateway 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 for Macintosh Computers

As mentioned above, you may need to collect configuration information from your Macintosh so that you can use this information when you configure the CG814WG Gateway. 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 gateway 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 gateway, you must reset the network for the devices to be able to communicate correctly. Restart any computer that is connected to the firewall.

After configuring all of your computers for TCP/IP networking and restarting them, and connecting them to the local network of your CG814WG Gateway, you are ready to access and configure the gateway.

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.
802.11g	IEEE specification for wireless networking at 54Mbps 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.
DSLAM	DSL Access Multiplexor. The piece of equipment at the telephone company central office that provides the ADSL signal.
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.
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.
MTU	*See* Maximum Transmission Unit.
Maximum Transmit 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.
PPPoA	*See* PPP over ATM
PPPoE	*See* PPP over Ethernet
PPP over ATM	PPPoA. PPP over ATM is a protocol for connecting remote hosts to the Internet over an always-on connection by simulating a dial-up connection.
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.

VCI	Virtual Channel Identifier. Together with the VPI, defines a Virtual Channel through an ATM network. Used by ATM switching equipment to route data through the network.
VPI	Virtual Path Identifier. Together with the VCI, defines a Virtual Channel through an ATM network. Used by ATM switching equipment to route data through the network.
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.
Wi-Fi	*See* 802.11b. A trade name for the 802.11b wireless networking standard, given by the Wireless Ethernet Compatibility Alliance (WECA, see http://www.wi-fi.net), an industry standard group promoting interoperability among 802.11b devices.
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.