MOTOROLA

Motorola Cellular Gateway NC800
User Guide

Version 2.0

WARNING: TO PREVENT FIRE OR SHOCK HAZARD, DO NOT EXPOSE THIS PRODUCT TO RAIN OR MOISTURE. THE UNIT MUST NOT BE EXPOSED TO DRIPPING OR SPLASHING. DO NOT PLACE OBJECTS FILLED WITH LIQUIDS, SUCH AS VASES, ON THE UNIT.

CAUTION: DO NOT CONNECT THE PLUG INTO AN EXTENSION CORD, RECEPTACLE, OR OTHER OUTLET UNLESS THE PLUG CAN BE FULLY INSERTED WITH NO PART OF THE BLADES EXPOSED.

CAUTION: TO ENSURE REGULATORY AND SAFETY COMPLIANCE, USE ONLY THE PROVIDED POWER AND INTERFACE CABLES.

CAUTION: TO ENSURE REGULATORY AND SAFETY COMPLIANCE, USE ONLY THE PROVIDED EXTERNAL ANTENNA.

CAUTION: DO NOT OPEN THE UNIT. DO NOT PERFORM ANY SERVICING OTHER THAN THAT CONTAINED IN THE INSTALLATION AND TROUBLESHOOTING INSTRUCTIONS. REFER ALL SERVICING TO QUALIFIED SERVICE PERSONNEL.

CAUTION: CHANGES AND MODIFICATIONS NOT EXPRESSLY APPROVED BY MOTOROLA FOR COMPLIANCE COULD VOID THE USER'S AUTHORITY TO OPERATE THE EQUIPMENT.

CAUTION: EXPOSURE TO RADIO FREQUENCY RADIATION. TO COMPLY WITH THE FCC RF EXPOSURE COMPLIANCE REQUIREMENTS, THE SEPARATION DISTANCE BETWEEN THE ANTENNA AND ANY PERSON'S BODY (INCLUDING HANDS, WRISTS, FEET AND ANKLES) MUST BE AT LEASE 20 CM (8 INCHES).

This device complies with Part 15 sub b 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.

Note: This equipment has been tested and found to comply with the limits for a Class B digital device, pursuant to Part 15 sub b 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 of the radio or television.
- 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.

This device must be installed and used in strict accordance with the manufacturer's instructions as described in the user documentation that comes with the product.

Postpone Motorola Cellular Gateway NC800 installation until there is no risk of thunderstorm or lightning activity in the area.

Do not overload outlets or extension cords, as this can result in a risk of fire or electric shock. Overloaded AC outlets, extension cords, frayed power cords, damaged or cracked wire insulation, and broken plugs are dangerous. They may result in a shock or fire hazard.

Route power supply cords so that they are not likely to be walked on or pinched by items placed upon or against them. Pay particular attention to cords where they are attached to plugs and convenience receptacles, and examine the point where they exit from the product.

Place this equipment in a location that is close enough to an electrical outlet to accommodate the length of the power cord.

Place this equipment on a stable surface.

When using this device, basic safety precautions should always be followed to reduce the risk of fire, electric shock and injury to persons, including the following:

- Read all of the instructions (listed here and/or in the user manual) before you operate this equipment. Give particular attention to all safety precautions. Retain the instructions for future reference.
- Comply with all warning and caution statements in the instructions. Observe all warning and caution symbols that are affixed to this equipment.
- Comply with all instructions that accompany this equipment.

- *Avoid using this product during an electrical storm.* There may be a risk of electric shock from lightning. For added protection for this product during a lightning storm, or when it is left unattended and unused for long periods of time, unplug it from the wall outlet. This will prevent damage to the product due to lightning and power surges.
- Operate this product only from the type of power source indicated on the product's marking label. If you are not sure of the type of power supplied to your home, consult your dealer or local power company.
- Upon completion of any service or repairs to this products, ask the service technician to perform safety checks to determine that the product is in safe operating condition.

It is recommended that the customer install an AC surge protector in the AC outlet to which this device is connected. This is to avoid damaging the equipment by local lightning strikes and other electrical surges.

Different types of cord sets may be used for connections to the main supply circuit. Use only a main line cord that complies with all applicable product safety requirements of the country of use.

Installation of this product must be in accordance with national wiring codes.

Place unit to allow for easy access when disconnecting the power cord/adapter of the device from the AC wall outlet.

Wipe the unit with a clean, dry cloth. Never use cleaning fluid or similar chemicals. Do not spray cleaners directly on the unit or use forced air to remove dust.

This product was qualified under test conditions that included the use of the supplied cables between system components. To be in compliance with regulations, the user must use these cables and install them properly. Connect the unit to a grounding type AC wall outlet (100-240 V AC) using the standard power cord/adapter as supplied with the unit.

Do not cover the device, or block the airflow to the device with any other objects. Keep the device away from excessive heat and humidity and keep the device free from vibration and dust.

Installation must at all times conform to local regulations.

This product is provided with a separate *Regulatory, Safety, Software License, and Warranty Information* card. If one is not provided with this product, please ask your service provider or point-of-purchase representative, as the case may be.

- THIS PRODUCT IS IN COMPLIANCE WITH ONE OR MORE OF THE STANDARDS LISTED ON THE *REGULATORY, SAFETY, SOFTWARE LICENSE, AND WARRANTY INFORMATION* CARD. NOT ALL STANDARDS APPLY TO ALL MODELS.
- NO WARRANTIES OF ANY KIND ARE PROVIDED BY MOTOROLA WITH RESPECT TO THIS PRODUCT, EXCEPT AS STATED ON THE *REGULATORY, SAFETY, SOFTWARE LICENSE, AND WARRANTY INFORMATION* CARD. MOTOROLA'S WARRANTIES DO NOT APPLY TO A PRODUCT THAT HAS BEEN REFURBISHED OR REISSUED BY YOUR SERVICE PROVIDER.

Table of Contents

1. Overview

Thank you for purchasing the Motorola® Cellular Gateway NC800. The Motorola Cellular Gateway NC800 is particularly well suited for the Small Office Home Office (SOHO) environment since it provides wireless access to the Internet. Applications where the Motorola Cellular Gateway NC800 is especially useful include:

- Households having multiple computers requiring connection to the Internet and each other.
- Small businesses or home offices requiring secure wireless Internet access.
- Internet gamers wanting easier setup for
  - Programs such as DirectX®
  - Sites such as MSN Games
  - Video conferencing with programs such as NetMeeting®

The features and physical appearance of your Motorola Cellular Gateway NC800 may differ slightly from the picture

A home or internal network enables you to share information between two or more computers. You can connect your home network to the Internet through the Motorola Cellular Gateway NC800. The Motorola Cellular Gateway NC800 is the central connection point between your computers and the Internet. It directs (routes) information between the computers connected to your home network. A built-in CDMA wireless modem transmits information between your home network and the Internet. The Motorola Cellular Gateway NC800:

- Combines four separate products — a CDMA wireless modem, IEEE 802.11b/g wireless access point, Ethernet 10/100 Base-T connections, and firewall — in one compact unit.
- Enables you to create a custom network sharing a single broadband connection, files, and peripherals, with or without wires
- Has an advanced firewall for enhanced network security for wired and wireless users
- Provides easy setup

This product is subject to change. Not all features described in this guide are available on all Motorola Cellular Gateway NC800 models. For the most recent documentation, visit the Cable Modems and Gateways page on the Motorola website http://motorola.com/

Intended audience

This document provides detailed information regarding the Motorola Cellular Gateway NC800. It describes its features, provides some background information on the technology used in the product and it gives detailed instructions on how to set up the Motorola Cellular Gateway NC800should you have advanced requirements.
The typical deployment of the Motorola Cellular Gateway NC800 will not have any additional setup requirements. Most users will therefore be able to set up and use the Motorola Cellular Gateway NC800 by using only the Quick Installation Guide provided with the product.
The remainder of this User Guide is therefore intended for users that have advanced requirements and for the interested reader.

Easy setup

It is much easier to configure a local area network (LAN) using a Motorola Cellular Gateway NC800 than using traditional networking equipment:
- The Web-based Setup Wizard provides a graphical user interface (GUI) for quick and easy configuration of **required** wireless, Ethernet, gateway, Dynamic Host Configuration Protocol (DHCP), and security settings. In most cases you can set up the Motorola Cellular Gateway NC800 via the Setup Wizard using the information in the Quick Installation Guide.
- For basic operation, most default settings require no modification.
- For the user with more advanced requirements, this user guide provides detailed information on how to configure the Motorola Cellular Gateway NC800 using the Web-based configuration utility.

Network connection types

The Motorola Cellular Gateway NC800 provides different network connection types for your computers to exchange data. The connection between your computers and the Motorola Cellular Gateway NC800 may be with a wireless or a wired connection or a combination of the two. Your network can use one or any combination of the following network connections:
- Ethernet local area network (LAN). Two connections are provided.
- Wireless LAN (IEEE 802.11g that also supports IEEE 802.11b wireless clients)

Powerful features in a single unit

A Motorola Cellular Gateway NC800 combines high-speed Internet access, networking, and computer security for a home or small-office LAN. The Motorola Cellular Gateway NC800 provides:

- An integrated high-speed wireless modem, which provides **continuous access** to the Internet and other online services.
- A single broadband connection to multiple computers to surf the Web; all computers on the LAN communicate as if they were connected to the same physical network.
- It is an IEEE 802.11b/g WLAN certified **wireless access point,** which allows wireless enabled laptop users to remain connected while moving around the home or small office or to connect desktop computers without installing network wiring. Depending on distance, wireless connection speeds can match that of the Ethernet at up to 22 Mbps.
- A **single interface** for multiple computers to surf the web; all computers on the Ethernet and wireless LANs communicate as if they were connected to the same physical network and access the Internet through the Motorola Cellular Gateway NC800 using only **a single external IP address**. Cellular technology is used to access the Internet via the WAN interface.
- A built-in **DHCP server** to assign IP addresses on a combined **wired and/or wireless Class C private LAN** automatically.
- A two-port 10/100Base-T Ethernet hub supporting:
  - Half- or full-duplex connection
  - Auto-MDIX
- A built-in **firewall** with IP and MAC Address filtering, UDP and TCP Port filtering and forwarding.

- The firewall supports:
  - Stateful inspection
  - DMZ
  - Network Address Translation (NAT)
- Enhanced wireless **security** with WLAN Protected Access Pre-Shared Key (WPA-PSK) support. Weaker encryption is also supported via 64 and 128-bit Wired Equivalent Privacy (WEP) encryption.
- A built-in gateway using **Routing Information Protocol (RIP v1 and v2)** - up to 10 static routes.
- Support for **Virtual Private Network (VPN)** using Internet Protocol Security (IPSec) packets and Point-to-Point Tunneling Protocol (PPTP).
- *Wireless range of 100 meters[1] indoors, 300 meters outdoors*
- Easy to use **Web-based configuration**.

Typical application

Figure 1 shows a typical use of the Motorola Cellular Gateway NC800 in a home or home office environment. Access to the Motorola Cellular Gateway NC800 from local PCs and notebooks is either by the 802.11b/g WLAN interface, or the Ethernet LAN interface. In this example, the PC is connected to the Ethernet LAN and the notebook is connected via the WLAN interface.

The 802.11g WLAN interface supports an effective data transmission rate of up to 22Mbps. Note that if devices are present on the WLAN that support 802.11b, the effective data transmission rate drops to 11 Mbps. The Ethernet LAN interface supports data transmission rates of 10/100 Mbps.

Access from the Motorola Cellular Gateway NC800 to the Internet is achieved by using CDMA2000 EV-DO / 1xRTT technology. The Code Division Multiple Access (CDMA) antenna is placed up to six feet from the Motorola Cellular Gateway NC800, and connects to the CDMA infrastructure via a local CDMA base station. The CDMA2000 EV-DO supports downlink data rates of up to 2.4576 Mbps and uplink data rates of 154 kbps.
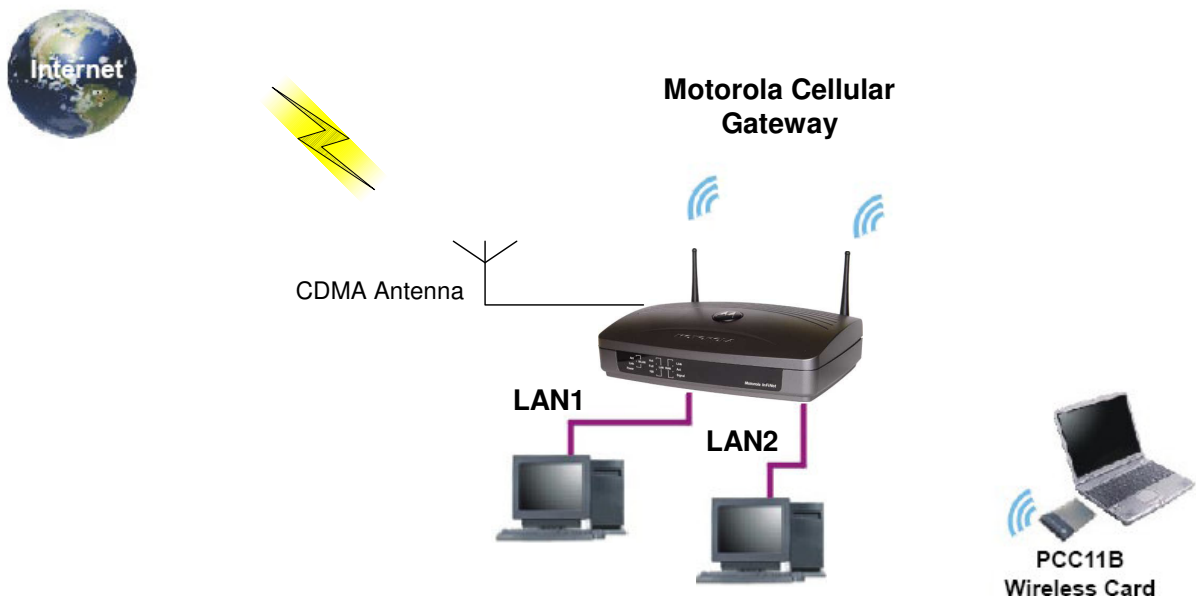
Figure 1. Typical home office configuration.

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[1] Architectural and environmental factors may adversely affect range.

The sample application shown in Figure 2 is slightly more complex and is more typical of a small office environment. It contains the following devices, all protected by the Motorola Cellular Gateway NC800 firewall:

- A PDA connected through the wireless IEEE 802.11b connection.
- One desktop PC on a wireless connection. A Motorola USB 802.11b Wireless Adapter (an optional PC accessory available from Motorola) or any other 802.11b/g wireless adapter can be used to connect your PC USB port to the Motorola Cellular Gateway NC800 via a wireless connection.
- A laptop PC on a wireless connection. The wireless connection can be made using a Motorola PCC11b Wireless Card or any other 802.11b/g wireless card in the PCMCIA slot of the laptop (the PCC11b Wireless Card is an optional laptop accessory available from Motorola).
- Three computers connected to the LAN 1 Ethernet port via a hub or switch.
- A fourth computer connected to the LAN 2 Ethernet port. This could be a De-Militarized Zone (DMZ) computer.
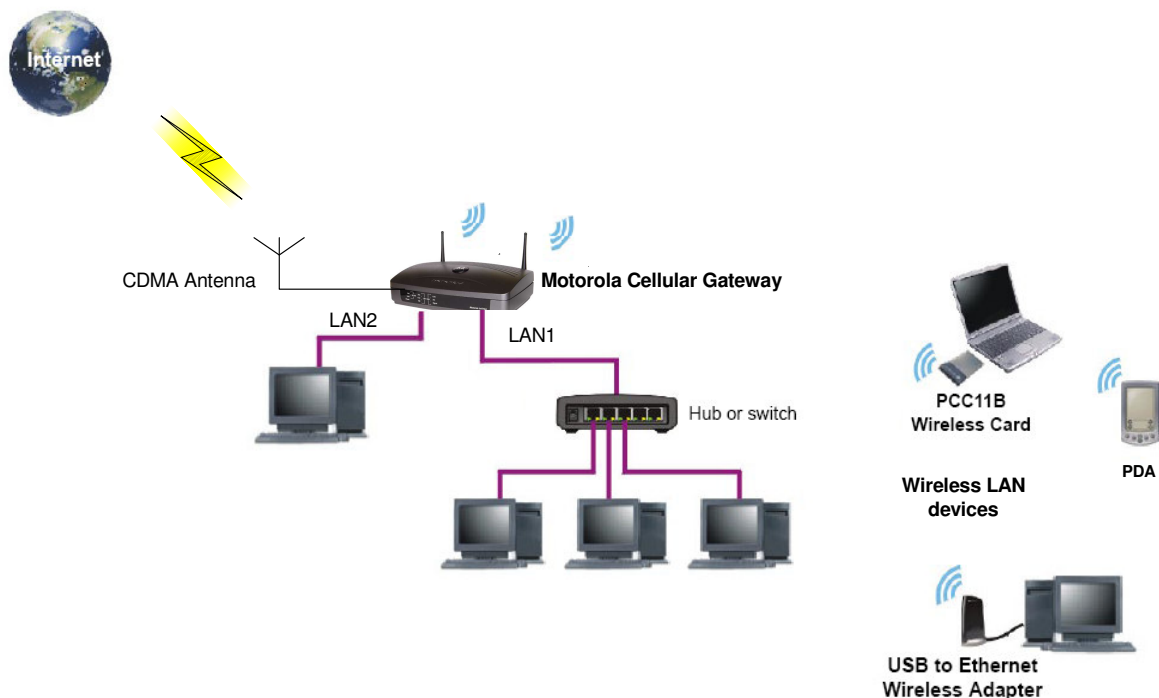
Figure 2. Typical application of a Motorola Cellular Gateway NC800 in a small office environment.

Security

The Motorola Cellular Gateway NC800 provides the following security mechanisms:

- A firewall to protect the Motorola Cellular Gateway NC800 LAN from undesired attacks over the Internet
- The capability to set up a DMZ
- Security measures to prevent eavesdropping of wireless data (including WEP / WPA-PSK encryption and authentication)
- Multiple tunnel Virtual Private Network (VPN) pass-through operation
- Access control to configure the Motorola Cellular Gateway NC800.

The subsections below provide some introductory information regarding the security technology listed above. More details are provided in the relevant subsections of the Detailed Motorola Cellular Gateway NC800 Configuration section as well as in the relevant Glossary entries. *A full discussion of network security is beyond the scope of this document.*

Note that the Setup Wizard guides you to set the Motorola Cellular Gateway NC800 up with a reasonable level of security. If you have more stringent security requirements, the instructions in this user guide provide detailed information on how to set up the relevant security fields.

Figure 3 illustrates the security measures provided by the Motorola Cellular Gateway NC800. *This is a logical network diagram and therefore does not necessarily correspond to the network cabling. The Ethernet LAN and the WLAN are shown as a single logical network. No hubs or switches are shown.* Logically, only the Motorola Cellular Gateway NC800 and the computer in the DMZ are exposed to the Internet (are on the Internet side of the firewall). Physically, the firewall is implemented on the Motorola Cellular Gateway NC800.
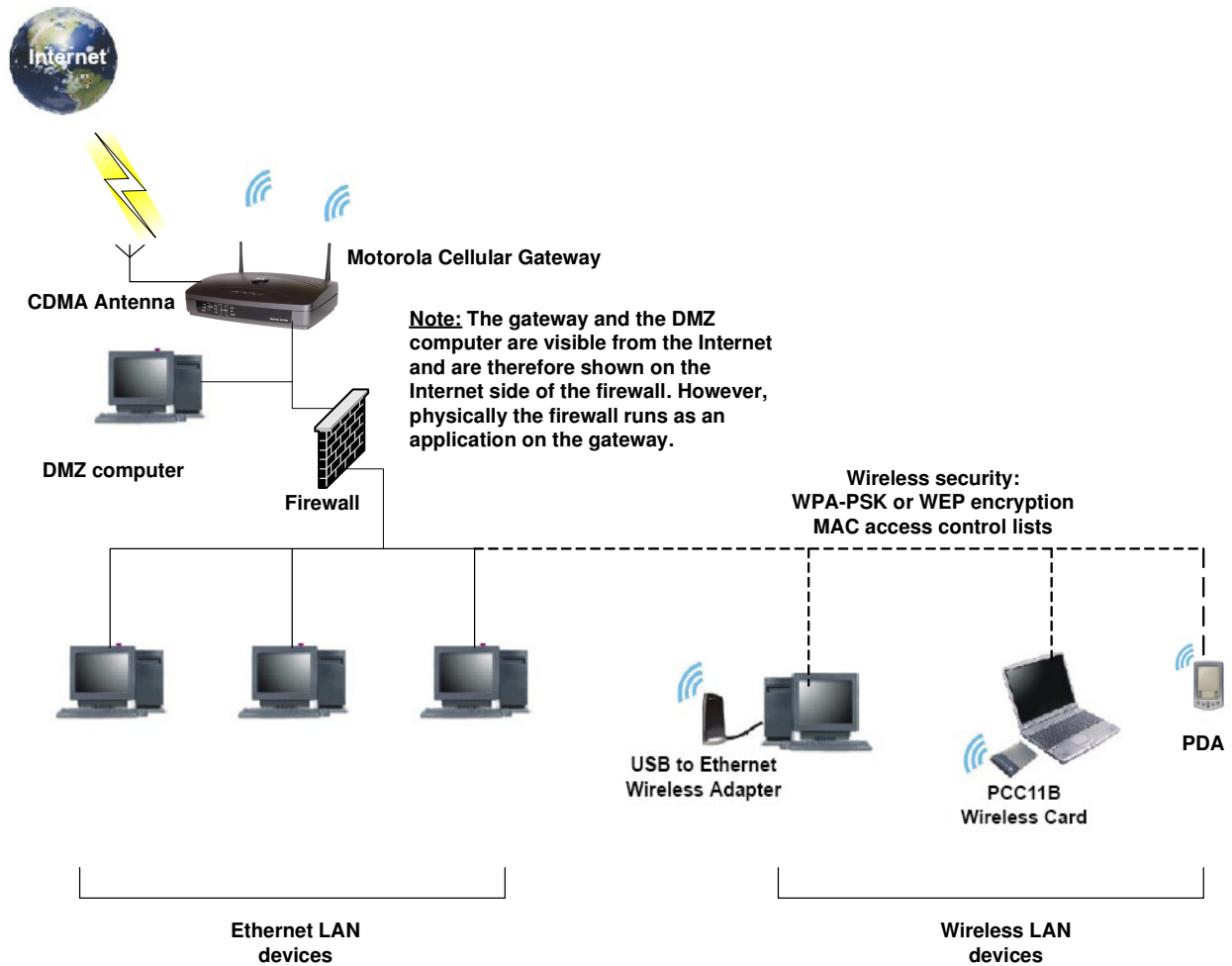
Figure 3. Motorola Cellular Gateway NC800 security measures shown in a logical network diagram

Firewall

The Motorola Cellular Gateway NC800 firewall protects the Motorola Cellular Gateway NC800 LAN from undesired attacks and other intrusions from the Internet. It provides an advanced integrated stateful-inspection firewall. The firewall:
- Maintains state data for every TCP/IP session on the OSI network and transport layers
- Monitors all incoming and outgoing packets and applies the firewall policy to each one
- Provides comprehensive logging for all rejected internal and external connection requests
- You can configure the firewall filters to set rules for port usage and to block specific IP domains and networks.

DMZ

A de-militarized zone (DMZ) has one or more computers logically located outside the firewall between a Motorola Cellular Gateway NC800 LAN and the Internet. A DMZ prevents direct access by outside users to private data. You can use a DMZ to set up a web server without exposing confidential data on your network. A DMZ is also useful for people playing games that have a problem running a computer game's protocol through a firewall. DMZ provides the person playing games a way to expose a single host directly to the Internet and thus overcome any problems where the firewall rules might cause packets to this computer to be blocked.

Wireless Security

To prevent unauthorized eavesdropping of data transmitted over the wireless LAN, you must enable wireless security.

802.11b/g supports two subtypes of network authentication services: **Open System and Shared key**. Under open system authentication, any wireless station can connect to the Motorola Cellular Gateway NC800 provided that it knows the Service Set Identifier (SSID) of the Motorola Cellular Gateway NC800. If the Motorola Cellular Gateway NC800 is broadcasting this information, then any wireless client can access the Motorola Cellular Gateway NC800. Under **Shared Key** authentication the Motorola Cellular Gateway NC800 generates a random 128-bit challenge. The station returns the challenge, encrypted with a shared key—a "secret" key configured into both the station and the Motorola Cellular Gateway NC800. The Motorola Cellular Gateway NC800 decrypts the challenge, using a CRC to verify its integrity. If the decrypted frame matches the original challenge, the station is considered authentic. The challenge/response handshake is repeated in the opposite direction for mutual authentication.

By default the Motorola Cellular Gateway NC800 is set to open system authentication, which provides no security for transmitted data. You can use either the Setup Wizard or the instructions in this guide to enable a reasonable level of security by configuring a WEP key on the Motorola Cellular Gateway NC800. The same key must also be configured on the wireless LAN clients (stations).

For even better security, the relatively new WLAN Protected Access Pre-Shared Key (WPA-PSK) option is also supported by the Motorola Cellular Gateway NC800. However, in order to use WPA-PSK, you must ensure that it is also supported on the wireless LAN clients.

A RADIUS server may also be used to do centralized authentication for WPA if PSK is not used.

You can also define a MAC access control list to restrict wireless LAN access to specified clients based on the Client MAC address.

Virtual Private Networks

The Motorola Cellular Gateway NC800 allows multiple tunnel VPN pass-through operation to securely connect remote computers over the Internet through the Motorola Cellular Gateway NC800. The Motorola Cellular Gateway NC800:
- Identifies and forwards Point to Point Tunneling Protocol (PPTP) packets
- Identifies and forwards **certain** IPSec packets.

PPTP enables the implementation of secure, multi-protocol VPNs through private "tunnels" over the public Internet. Through PPTP, it is possible for remote users to access their corporate networks and applications from anywhere on the Internet. The Motorola Cellular Gateway NC800 identifies and forwards PPTP packets.

IPSec is a suite of protocols used to implement secure exchange of packets at the IP layer. VPNs using Encapsulating Security Payload (ESP) in tunnel mode are supported. VPNs using Authentication Header (AH) are not supported.

2. The Motorola Cellular Gateway NC800 and its accessories

This section describes the physical features of the Motorola Cellular Gateway NC800, as well as the other items received with the Motorola Cellular Gateway NC800.

Package Contents

The following items should be present in the Motorola Cellular Gateway NC800 package:

- ✓ Motorola Cellular Gateway NC800.
- ✓ Power Adapter – 220 / 110 VAC, 50/60 Hz input, 12VDC, 1.8A output.
- ✓ Ethernet Cable.
- ✓ External CDMA Antenna.
- ✓ A CD containing this manual as well as the logging scripts (the logging scripts are described in section 7).
- ✓ Quick Installation Guide.

Figure 4. Motorola Cellular Gateway NC800 packout

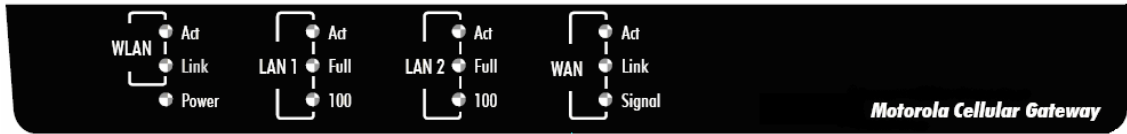## The Motorola Cellular Gateway NC800's Front Panel

Figure 5. Motorola Cellular Gateway NC800 front panel

The status of the Motorola Cellular Gateway NC800 is displayed via the LEDs on the front panel (from left to right):

- **Power**   *Green*   The Power LED is permanently on (green) when there is power to the Motorola Cellular Gateway NC800.

WLAN Indicators

- **Act**   *Green*   When the Act LED flickers there is activity on the wireless network.
- **Link**   *Green*   This is the link operational indicator, and it is off when the Wireless LAN is not active, and is permanently on when the Wireless LAN is active.

LAN 1 Indicators

- **Act**   *Green*   This LED serves as the link operational indicator and as the activity indicator. It is permanently on (green) when there is a valid LAN connection with no activity, and flickers when there is LAN activity.
- **Full**   *Green*   This LED is permanently on (green) for a full duplex mode connection, and is off for a half duplex mode connection.
- **100**   *Green*   This LED lights up when a successful 100Mbps connection is made through the corresponding port. If the LED is not on, then the connection made through this port is 10Mbps.

LAN 2 Indicators

- **Act**   *Green*   This LED serves as the link operational indicator and as the activity indicator. It is permanently on (green) when there is a valid LAN connection with no activity, and flickers when there is LAN activity.
- **Full**   *Green*   This LED is permanently on (green) for a full duplex mode connection, and is off for a half duplex mode connection.
- **100**   *Green*   This LED lights up when a successful 100Mbps connection is made through the corresponding port. If the LED is not on, then the connection made through this port is 10Mbps.

WAN Indicators

- **Act**   *Green*   When the Act LED flickers there is activity on the WAN interface.
- **Link**   *Green*   This is the link operational indicator, and it is off when the WAN link is not in data mode, and is permanently on (green) when the WAN is in data mode.
- **Signal**   *Green*   This LED conveys the signal strength. It is permanently on (green) if the signal strength is good to excellent, it flickers if the signal strength is poor and it is off if there is no signal present.

The Motorola Cellular Gateway NC800's Back Panel

Figure 6. Motorola Cellular Gateway NC800 back panel

The Motorola Cellular Gateway NC800's back panel contains the following connectors (*from left to right*):

WLAN antenna	A WLAN antenna is connected to either side of the Motorola Cellular Gateway NC800. These antennas provide wireless access to the Motorola Cellular Gateway NC800 for devices equipped with 802.11b/g modules.
Reset Button	The **Reset** button can be used in one of two ways: • Reboot the Motorola Cellular Gateway NC800 while keeping all of its settings. This is similar to pressing the **Reset** button on your PC to reboot it. • Restore the Motorola Cellular Gateway NC800's factory default settings. If you are experiencing problems with the Motorola Cellular Gateway NC800 and have tried all other troubleshooting measures, press the **Reset Button** and hold it down for **10 seconds**. This will restore all settings, including your new password and IP address, to the factory default settings. Refer to **Factory Default Settings for the Motorola Cellular Gateway NC800** for more detail.
DIAG 1 Port	A diagnostics port for maintenance support use only.
DIAG 2 Port	A diagnostics port for maintenance support use only.
WAN Antenna	This is a connector for the external CDMA antenna. It provides access to the Internet through a CDMA base station. CAUTION: Only the provided external antenna should be mounted.
LAN 1 Port	This is an 802.3 10/100Mbps Full/Half Duplex LAN interface. It provides wired access to the Motorola Cellular Gateway NC800 for devices equipped with 802.3 LAN modules. Use this port to connect to network devices such as a computer, printer, hub, switch or gateway. You can connect either a straight-through or crossover cable to the port – the Motorola Cellular Gateway NC800 will detect the cable configuration and reconfigure itself accordingly.
LAN 2 Port	This is an 802.3 10/100Mbps Full/Half Duplex LAN interface. It provides wired access to the Motorola Cellular Gateway NC800 for devices equipped with 802.3 LAN modules. Use this port to connect to network devices such as a computer, printer, hub, switch or gateway. You can connect either a straight-through or crossover cable to the port – the Motorola Cellular Gateway NC800 will detect the cable configuration and reconfigure itself accordingly.
Power	This is where you connect the power adapter. Please make sure that you use only the power adapter that is shipped with the Motorola Cellular Gateway NC800.
WLAN antenna	A WLAN antenna is connected to either side of the Motorola Cellular Gateway NC800. These antennas provide wireless access to the Motorola Cellular Gateway NC800 for devices equipped with 802.11b/g modules.

The Power Adapter

Warning: Using a power supply with a different voltage rating to the adapter included with the Motorola Cellular Gateway NC800 may cause damage to the Motorola Cellular Gateway NC800 and void the warranty for this product. **Please use the adapter with Limited Power Source or Class II output only!**

Ethernet Cable

Ethernet cable specifications:
Cable: CAT5E 24AWG UTP 4T/P stranded round cable; Outside Diameter 5.3mm
Connector: RJ-45 8P8C plug; contact: plated gold 50U
PVC: Color: gray

External CDMA Antenna

The external CDMA antenna can either be wall-mounted using the bracket supplied with the antenna, or it can be attached to a glass or metal surface using the suction cups. The bracket and the suction cups slide into the receptacles at the back of the casing of the antenna.
Note: The direction in which the antenna should be mounted is indicated on the casing of the antenna.

3. Installation

Before you begin

Check the package contents as described in the previous section.

Precautions

Postpone the Motorola Cellular Gateway NC800 installation until there is no risk of thunderstorm or lightning activity in the area.

To avoid potential shock, always unplug the power cord from the wall outlet or other power source before disconnecting it from the Motorola Cellular Gateway NC800 rear panel.

When removing the power to the Motorola Cellular Gateway, leave the device powered down for at least 10 seconds before re-applying the power.

To prevent overheating the Motorola Cellular Gateway NC800, do not block the ventilation holes on the top and bottom of the unit.

Do not open the unit. Refer all service to your Motorola service agent.

Wipe the unit with a clean, dry cloth. Never use cleaning fluid or similar chemicals. Do not spray cleaners directly on the unit or use forced air to remove dust.

> **Warning:** Electrostatic discharges (ESD) to the Motorola Cellular Gateway could cause the device to require a manual reset.

Signing up for Service

In order to access the Internet and other online services, you must be activated with a CDMA service provider.
To activate your service, call your local CDMA service provider.
You should ask your CDMA service provider the following questions:

- Do you have any special system requirements?
- When can I begin to use my Motorola Cellular Gateway NC800?
- Are there any files I need to download after I am connected?
- Do I need a user name or password to access the Internet or use e-mail?
- Do I need to configure a WAN IP address?
- What is my Data Access Number (the number that must be dialed to set up the cellular connection)?

System Requirements for Computers Connected to the WLAN or Ethernet LAN

The Motorola Cellular Gateway NC800 supports the following:

Operating Systems:
- Microsoft Windows (WIN2000 or higher)
- MAC OS (version X or above)
- Linux Red Hat (version 9.0 or above).

Web Browsers:
- Microsoft® Internet Explorer browser (version 6.0 or above)
- Netscape Navigator® browser (version 7.0 or above)
- Opera (version 7.4 or above)
- Mozilla (version 1.7.3 or above)
- Mozilla Firefox (version 1.0 or above)

The LAN will operate with computers that:
- Are Web-enabled
- Have *at least one* of the following adapters:

Ethernet	10Base-T or 10/100Base-T Ethernet adapter with proper NIC driver software installed
IEEE 802.11b/g	Any IEEE 802.11b/g adapter

Installation Considerations

The Motorola Cellular Gateway NC800 is designed to let you access your network using a wireless connection from virtually anywhere. Please keep in mind that the number, thickness and location of walls, ceilings or other objects that the wireless signals must pass through may limit the range.

To maximize the Motorola Cellular Gateway NC800's wireless range:

1. Keep the number of walls and ceilings between the Motorola Cellular Gateway NC800 and your receiving device to a minimum – each wall or ceiling can reduce your Motorola Cellular Gateway NC800's range from 1-30 meters.
2. Building materials make a difference – metal or aluminum objects may have a negative effect on range. Try to position the Motorola Cellular Gateway NC800 and computers with wireless adapters (clients) so that the signal passes through thin walls or open doorways and not other materials.
3. Use the signal strength indicator present in most wireless adapters' software to experiment with the signal strength in various positions in the building where you are going to use the Motorola Cellular Gateway NC800.
4. Keep the Motorola Cellular Gateway NC800 away (at least 1-2 meters) from electrical devices that generate Radio Frequency (RF) noise.

For the average home or office, signal range should not be an issue. If you experience low or no signal strength in areas of your home or office that you wish to access, consider positioning the wireless Motorola Cellular Gateway NC800 in a location directly between the computers with wireless adapters. Additional wireless gateways can be connected to provide better coverage in rooms or offices where the signal does not appear as strong as desired.

LAN capacity:

The **theoretical** upper limit of the number of devices connected to a class C Ethernet and/or wireless LAN is 253. This upper limit is due to the IP address structure of a class C network. (Please refer to the Glossary for more details on the IP address structure.) However, several factors should be kept in mind when designing your network:

1. The devices on the network share the available bandwidth on the WAN link if simultaneous WAN access is required.
2. As many as 32 wireless devices can be attached to the WLAN. However, it must be kept in mind that each wireless client of the Motorola Cellular Gateway NC800 shares the available bandwidth on the WLAN with all the other wireless clients on the WLAN.
3. The bandwidth on the Ethernet LAN would be shared if a device such as a hub is connected to the Motorola Cellular Gateway NC800 to create a wired LAN with multiple devices.

Connecting the Motorola Cellular Gateway NC800 to your network

The Motorola Cellular Gateway NC800 has **three network interfaces,** namely the **WAN**, **LAN** and **WLAN** interfaces. This section describes how to connect your network devices to the Motorola Cellular Gateway NC800 using these interfaces.

Connecting the Motorola Cellular Gateway NC800 to the CDMA Network

The following procedure is for assembling and powering up the Motorola Cellular Gateway NC800:

1. Be sure the Motorola Cellular Gateway NC800 is unplugged (not powered on).
2. Place the Motorola Cellular Gateway NC800 in a position that is close enough to the surface where the external antenna for CDMA access will be mounted. The distance between the antenna and the Motorola Cellular Gateway NC800 is determined by the length of the cable attached to the antenna.
3. Screw in the loose end of the cable into the antenna connector on the rear panel of the Motorola Cellular Gateway NC800.
4. Mount the external antennas as described in the next section.
5. Plug the power cord into the power connector on the rear panel of the Motorola Cellular Gateway NC800.
6. Plug the power adapter into the electrical outlet. This turns on the Motorola Cellular Gateway NC800.
7. Verify that the lights on the front panel cycle through the following sequence:
    *   The **Power** light turns on when AC power is connected to the Motorola Cellular Gateway NC800 and indicates that the power supply is working properly.
    *   The **Signal** light indicates the presence of a CDMA signal. Good signal strength will make the light appear solid green.
    *   The **Link** light turns on indicating a connection on the WAN interface.
    *   The **Act** light flashes when there is activity on the WAN link.

Mounting the external antenna

The external antenna can be mounted on a wall using suitable screws and anchors or directly on the glass of a window using the supplied suction caps.

Window mounting the antenna directly on glass
*   Clip the supplied rubber suction caps into the mounting holes of the antenna mounting bracket.
*   Affix the antenna mounting bracket to the glass by gently pressing the suction cups against the glass pane of the window until the suction cups grip the glass.
*   Align the antenna alongside the mounting bracket and gently slide it down until it locks in position on the mounting bracket.

Mounting the antenna on a wall
*   Locate a suitable mounting position on a wall made of wood, concrete, masonry, or a wooden stud.
*   Using the antenna mounting bracket as a template, drill 2 suitable holes for a pair of anchors and screws to fasten the antenna mounting bracket securely onto the wall.
*   Align the antenna alongside the mounting bracket and gently slide it down until it locks in position on the mounting bracket.

Warning: Before drilling holes, check the structure for potential damage to water, gas, or electric lines.
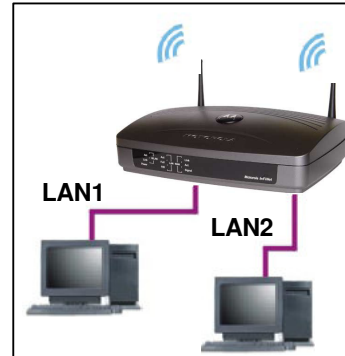
Wired Connections to the Motorola Cellular Gateway NC800 – Direct connection

The Motorola Cellular Gateway NC800 has two RJ-45 LAN connectors available for direct connection to a computer on your network. You can use either a straight through or a crossover cable between the computer and the Motorola Cellular Gateway NC800 – the Motorola Cellular Gateway NC800 will automatically detect the cable configuration. Use category 5 cabling for all Ethernet connections.

Each computer on the Ethernet LAN requires an Ethernet network interface card (NIC) and driver software installed.

The physical wiring arrangement has no connection to the logical network allocation of IP addresses.

Wired Connections to the Motorola Cellular Gateway NC800 – Connections via other network devices

If you need to connect to another network via another gateway or need to expand the number of Ethernet ports by using a hub or a switch you can connect one of these devices directly to the Motorola Cellular Gateway NC800 using the LAN port. The port is designed to automatically detect and handle both straight through and crossover cables.
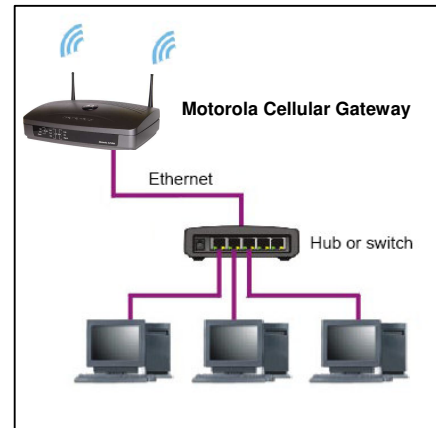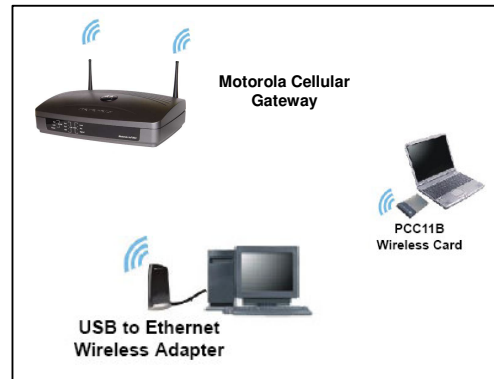

Wireless Connections to the Motorola Cellular Gateway NC800

Wireless communication occurs over radio waves rather than a wire. Like a cordless telephone, a wireless LAN uses radio signals instead of wires to exchange data. A wireless network eliminates the need for expensive and intrusive wiring to connect computers throughout the home or office. Mobile users can remain connected to the network even when carrying their laptops to different locations in the home or office.
Each computer on a wireless LAN requires an adapter for access to the WLAN:

- For wireless laptop connections, a Motorola PCC11b Wireless Card can be used in the PCMCIA slot.
- For wireless desktop connections, a Motorola USB11b Wireless Adapter can be used to connect your PC USB port.

You can connect any combination of 802.11g or 802.11b wireless clients to the Motorola Cellular Gateway NC800.

Please note that if WLAN security is enabled on the Motorola Cellular Gateway NC800 then each wireless client must be configured using the Motorola Cellular Gateway NC800's Service Set Identifier (SSID) and Wired Equivalent Privacy (WEP) or WLAN Protected Access Pre-Shared Key (WPA-PSK) security settings before it can connect to the Motorola Cellular Gateway NC800 – see the **Detailed Configuration** section.

As many as **32** wireless clients can be connected to a Motorola Cellular Gateway NC800. However, remember that each client is sharing the available bandwidth with all the other clients on the wireless network. Too many clients will degrade the overall performance of the *wireless* network.

4. Setting up the PCs

This section describes the steps to set up your PCs to connect to the Motorola Cellular Gateway NC800. The setup procedure should be the same for both **LAN** and **WLAN** connections. Refer to your Wireless adapter's installation manual for detailed information about Wireless connections.
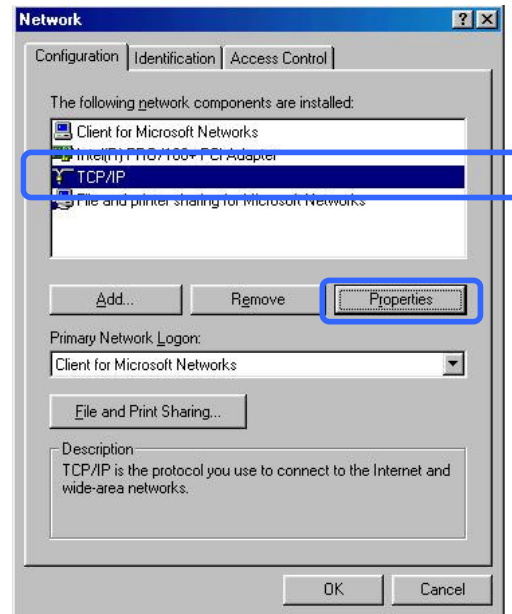
Configuring Windows 98 and Millennium (ME) PCs

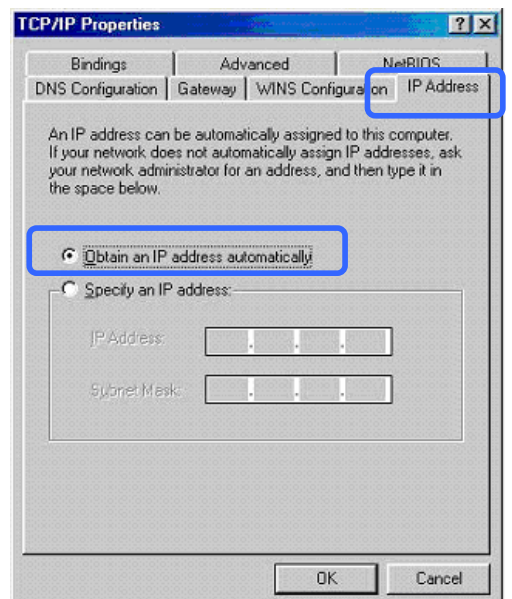1. Click on the **Start** button. Select **Settings**->**Control Panel**.

2. Double click on the **Network** icon.

3. In the Network dialog box, select TCP/IP for the applicable Ethernet adapter. Click on the **Properties** button.

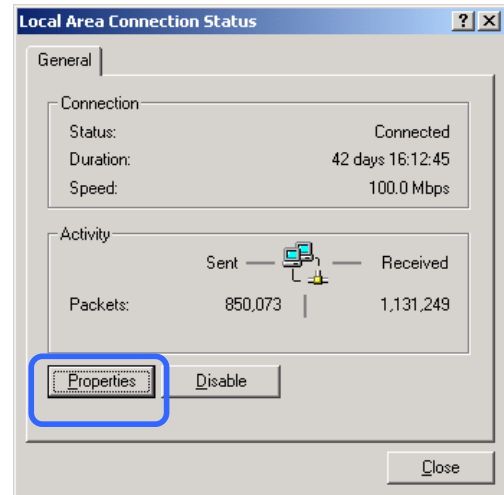4. Select the **IP Address** tab. Select **Obtain IP address automatically.**

5. Next, click on the **Gateway** tab and ensure that the Installed Gateway field is blank. The Motorola Cellular Gateway NC800 IP address will be automatically obtained when the DHCP protocol is executed.
6. Click on **OK** to apply the changes.
7. When the **Network** dialog box re-appears, click on **OK** to close it.
8. Windows may ask for the original Windows disk. Insert your Windows CD into your CD-ROM drive and let Windows finish installing / updating the necessary files.
9. Windows may also ask you to restart the PC – please do so. If Windows does not ask you to restart, do so anyway.
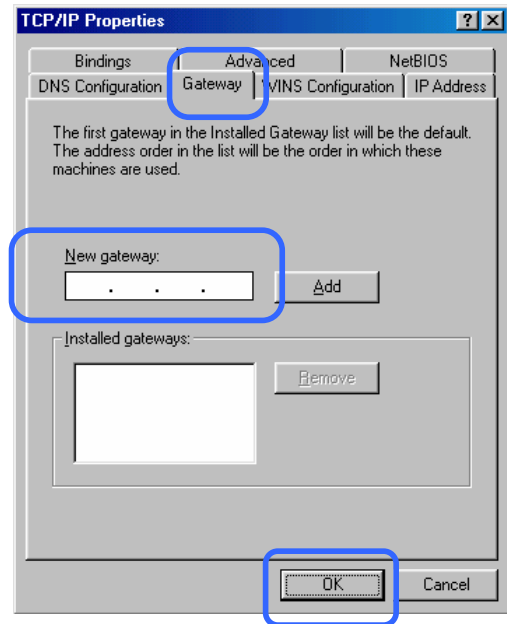
Configuring Windows 2000 PCs

Use the following procedure to configure Windows 2000 PCs to connect to the Motorola Cellular Gateway NC800:

1. Click on the **Start** button. Select **Settings**->**Control Panel**. Double click on **Network and Dial-up Connections**.
2. Double click on the **Local Area Connection** for the applicable Ethernet adapter.
3. The **Local Area Connection Status** dialog box is displayed:

4. Click on the **Properties** button.

Ensure that the check box next to **Internet Protocol (TCP/IP)** is selected. Select **Internet Protocol (TCP/IP)** and click on the **Properties** button:
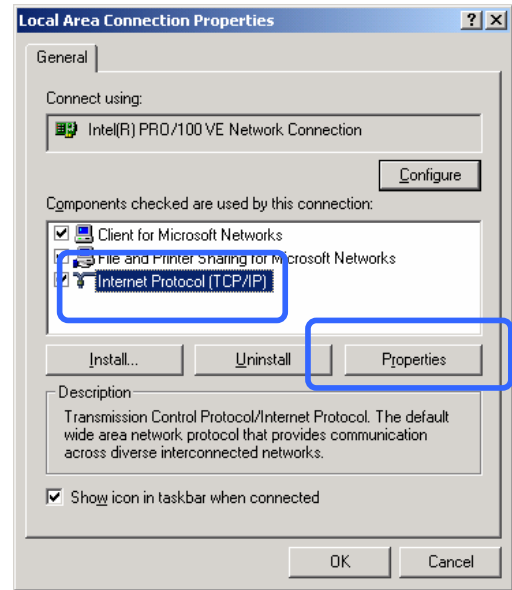
5. Select **Obtain an IP address automatically** and **Obtain DNS server address automatically**.
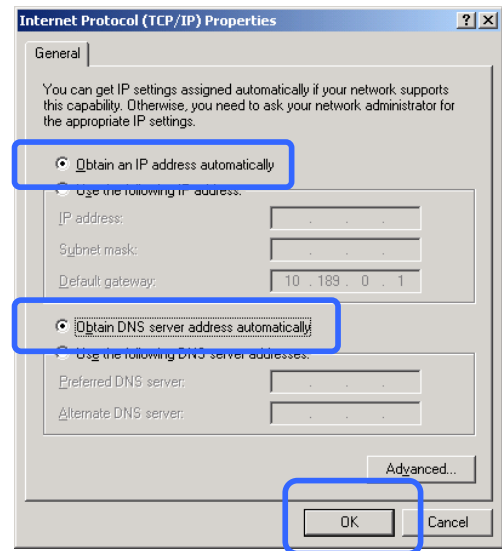
6. Click on **OK** to close the Internet Protocol (TCP/IP) Properties page.
7. On the Local Area Connection Properties dialog box, click on **OK** to close it.

Configuring Windows XP PCs

Windows XP introduced a new interface look and feel called the Category View. If you are using the Windows XP Classic View interface settings, use the following instructions. There is not much difference between the views except that the dialog boxes, menus and dialog items are drawn slightly different. The *content* of the dialog boxes and menus are almost the same. The computer is configured to respond to the Motorola Cellular Gateway NC800 as a DHCP server as follows.
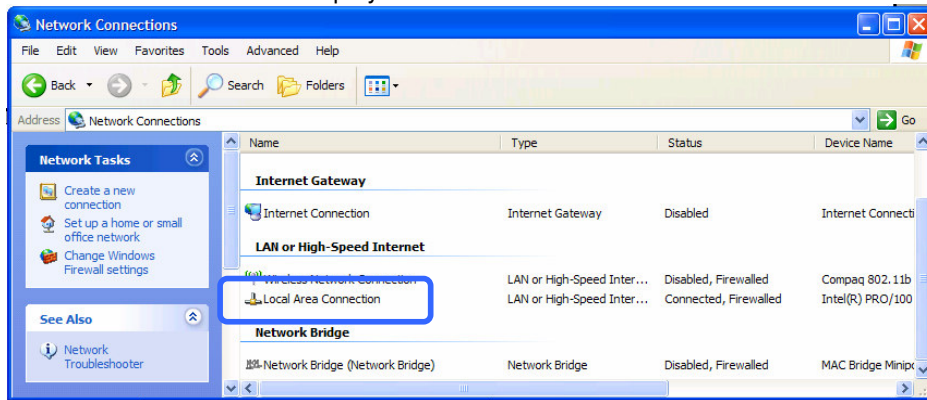
1. Click on the ![start] button. Select ![Control Panel]. Double click on ![Network Connections].

2. The Network Connections Screen is displayed.

3. Check that the applicable ![Local Area Connection] adapter is enabled. If not, right click and **Enable** the applicable Local Area Connection by selecting **Enable** from the pop-up list.

4. Right click on ![Local Area Connection] for the applicable Ethernet adapter. Choose the **Properties** entry at the bottom of the pop-up list. This will lead to the Local Area Connection Properties sheet.

5. The Local Area Connection Properties screen is displayed. Ensure that the **Internet Protocol (TCP/IP)** is enabled (the box to the left of it should be checked). Highlight **Internet Protocol (TCP/IP)** and click on the **Properties** button.

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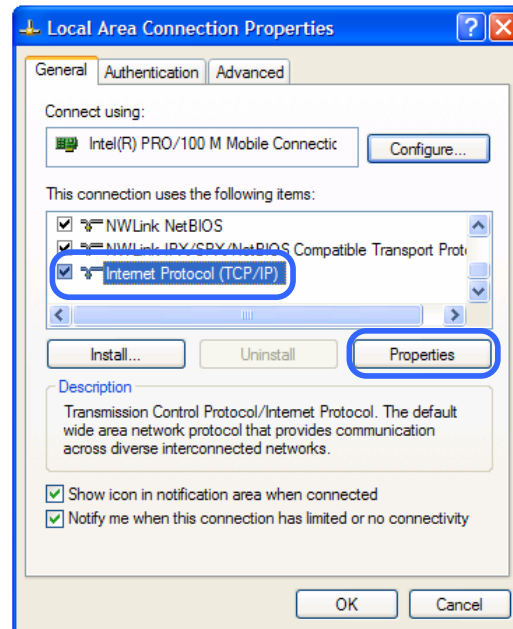
6. The Internet Protocol (TCP/IP) Properties screen is displayed.

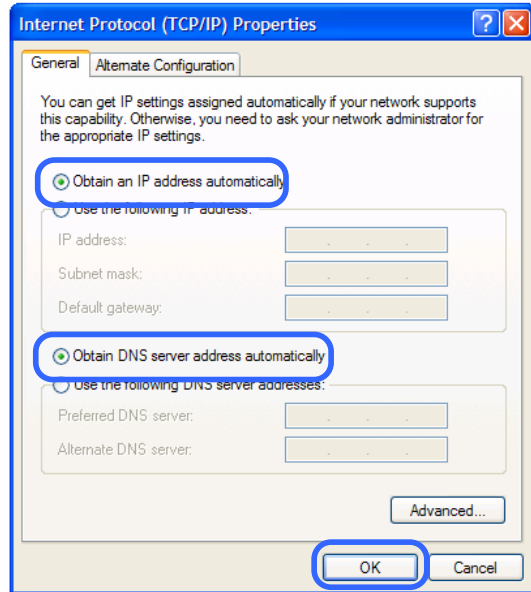   The computer must be configured to **Obtain an IP address automatically** and also **Obtain DNS server address automatically**.

7. Click **OK** to complete.

   Click OK on the Local Area Connection Properties screen, and **Close** on any other screens still left open.

5. Motorola Cellular Gateway NC800 Configuration

Motorola Cellular Gateway NC800 configuration is done via a Web-based configuration utility. This means that you can change the Motorola Cellular Gateway NC800's settings from any PC with a web browser that supports HTML version 4.0. The Motorola Cellular Gateway NC800 has been optimized for Internet Explorer (version 6.0 or above) or Netscape Navigator (version 7.0 or above). You only need to configure the Motorola Cellular Gateway NC800 once.

Computer System Requirements for Motorola Cellular Gateway NC800 Configuration

In order to configure the Motorola Cellular Gateway NC800, you need:
- A Web-enabled PC.
- Any of the previously mentioned Web Browsers, with JavaScript enabled.
- Either:
  - A wireless adapter compatible with the 802.11b or 802.11g standard and enabled as described previously.
  - A LAN connection via the Ethernet adapter from the Gateway to the PC. It is preferable to use a wired connection to LAN 1.

Logging In

- Open a browser to the default address of the Motorola Cellular Gateway NC800: **http://192.168.1.1**. If you have already changed the IP address of the Motorola Cellular Gateway NC800 then use the new IP address instead of the default address.

- When prompted for a user name and password type **admin** in both the **User Name** and **Password** fields. If you have already changed the **HTTP Username** and **Password**, then use the new values. [2]

- The initial page of the Motorola Cellular Gateway NC800 Configuration will open showing the **Basic Gateway Settings** page.

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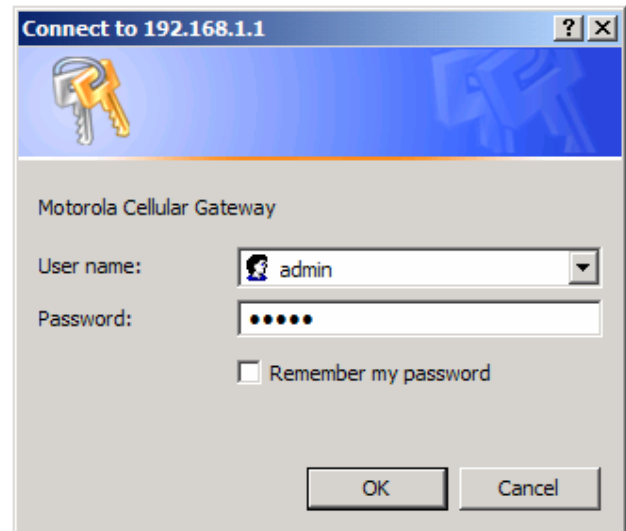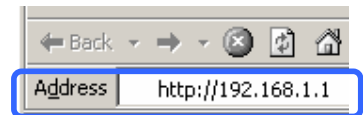
[2] By asking for a **Username** and **Password** the gateway is preventing unauthorized persons from changing the gateway settings. It is important that you remember the gateway's username and password. If you forget either the Username or Password you will have to restore the gateway's default settings by pressing the Reset button for about 10 seconds, login using the default username and password and re-setup all the gateway's settings.

Using the Motorola Cellular Gateway NC800's Configuration Utility

Once you have logged in to the Motorola Cellular Gateway NC800's configuration utility you can easily configure the Motorola Cellular Gateway NC800 using this web-based tool. The initial Motorola Cellular Gateway NC800 configuration screen is shown below.
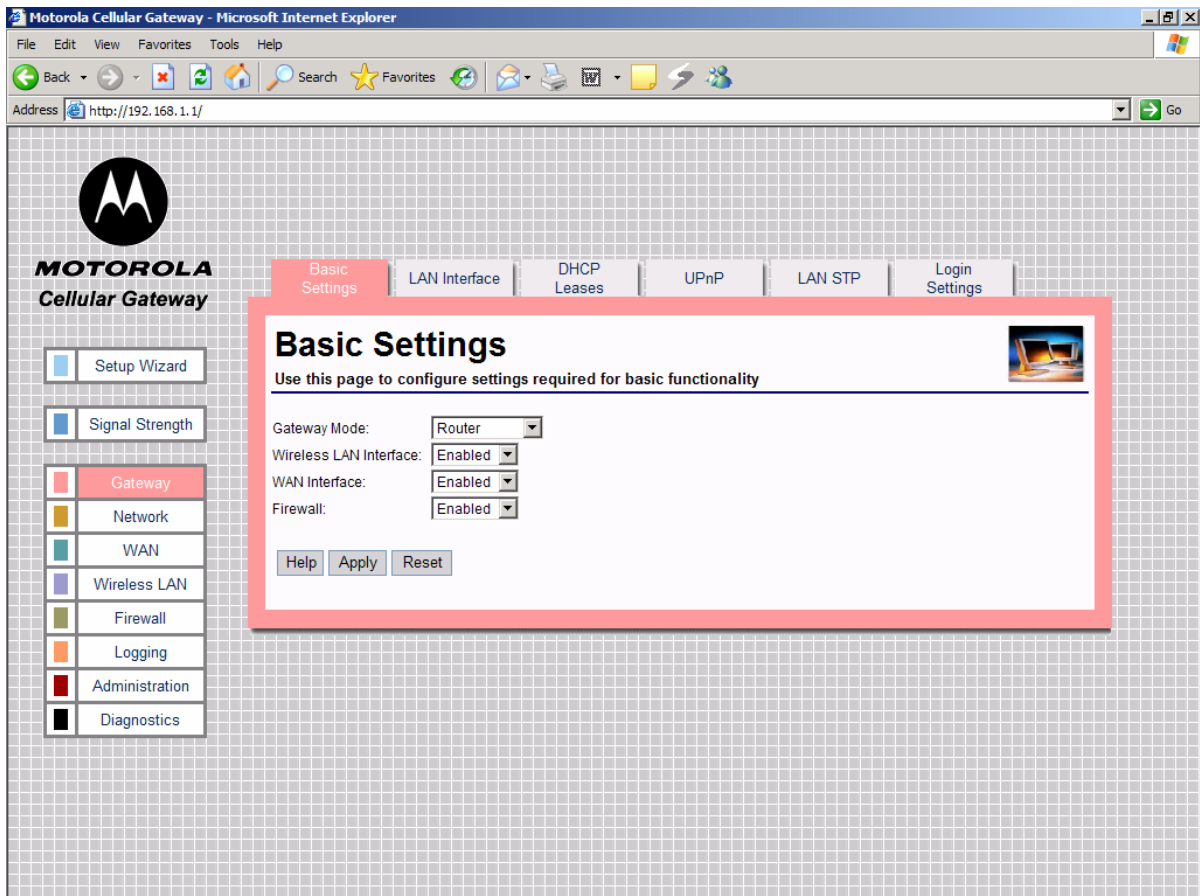
The Motorola Cellular Gateway NC800's settings are organized according to the following main categories (stack of buttons on the left of the page):

Setup Wizard   This wizard helps you to perform the necessary changes to the default settings of the Motorola Cellular Gateway NC800 to prepare it for your personal use. If you have more specialized requirements, the detailed configuration screens accessible via the remaining buttons are available for more advanced configuration.

Signal Strength   This option enables you to monitor the CDMA signal strength.

Gateway   Contains settings required for basic gateway operation. You can also view the Current status of the Motorola Cellular Gateway NC800 and see the current DHCP leases.

Network   Contains the Network setup and configuration parameters such as routing, VLAN and network time settings.

WAN   Use this heading to change settings to allow you to connect to the Internet via your ISP.

Wireless LAN   This heading allows you to configure the wireless interface. It includes settings related to

encryption, performance and compatibility.

Firewall   The Motorola Cellular Gateway NC800 contains extensive mechanisms to protect your network against intruders and abuse. Use the settings under this heading to prevent certain types of packets from entering / leaving your network and also to restrict access to specific users.

Logging   Access to all logging screens.

Administration   Restore factory defaults and upgrade the Motorola Cellular Gateway NC800's firmware.

Diagnostics   Access to Diagnostics pages. Usually triggered when prompted by service personnel

You can move into more detailed configuration settings by selecting a specific category.

Important buttons:

Help   Every page has a **Help** button. Press this button to have the Motorola Cellular Gateway NC800 open a new window containing detailed help on the current configuration page.

Apply   Most pages have an **Apply** button. Once you have made all the changes that you require click on this button to apply the new settings. The Motorola Cellular Gateway NC800 verifies the settings and lets you know if there are any problems. Applying settings typically takes about **5 seconds** to complete as the Motorola Cellular Gateway NC800 needs to re-initialize parts of its software according to the changes that you have made. Closing or moving on to other menus will not apply the modified settings.

Reset   Most pages have a **Reset** button. If you have made any changes that you do not want to save, click on the **Reset** button to reset the settings on the current page to those that were there when you entered the page.

Factory Default Settings for the Motorola Cellular Gateway NC800

Please take note of the following factory default settings. Out of the box, the Motorola Cellular Gateway NC800 is configured with these commonly used settings. If you ever need to use the Motorola Cellular Gateway NC800's **Administration->Restore** function, these are the settings that will be restored (this can also be achieved by pressing the reset button on the rear panel and holding it down for 10 seconds):

Gateway Mode	Router
LAN Spanning Tree	Enabled
Firewall	Enabled
Wireless Interface	Enabled
WAN Interface	Enabled
LAN DHCP Server	Enabled
IP Address	192.168.1.1
SSID	Motorola
Channel	11
Country	Worldwide
Network Authentication	Disabled
Data Encryption	Off
Station Filtering	Disabled
User Name	admin *(lower case)*
Password	admin *(lower case)*

Table 1: Default settings for the Motorola Cellular Gateway NC800.

⚠️ **Warning:** The settings above are the commonly used defaults. These may differ from one service provider to another. Please refer to any additional material provided by your service provider.

6. Detailed Motorola Cellular Gateway NC800 Configuration

This section provides a detailed description of each of the Motorola Cellular Gateway NC800 configuration pages accessible via the options on the left hand side of the main configuration screen.

> In the typical application only a few fields are user-specific and need to be set. The Setup Wizard can be used to ensure that you fill in all the required fields. If you have any further user-specific requirements, you may use the other configuration screens at any time to set the specific fields.

The first time the user accesses the configuration pages, the **Setup Wizard** is automatically started.

> If the **Setup Wizard** does not automatically start the first time you access the configuration pages, it can be manually invoked by clicking on the **Setup Wizard** button on the upper-left portion of the configuration screen. The **Setup Wizard** can be activated at any time by clicking this button.

Setup Wizard

The Setup Wizard has the following screens:

|	
Wizard-> Welcome page	This page describes the purpose of the wizard and how to use it.
Wizard-> Location Specific Information	The Motorola Cellular Gateway NC800 location determines aspects such as the time zone and channels that may be used.
Wizard-> Gateway Administration	The username and password are used to access the Gateway's configuration screens. For security reasons, the default username and password should be changed.
Wizard-> Internet Account Information	The username and password to access the Internet are entered here if required by your ISP.
Wizard-> Internet Network Information	The IP address used to access the Motorola Cellular Gateway NC800 from the Internet is entered here, unless the Motorola Cellular Gateway NC800 obtains it automatically from the ISP.
Wizard-> Internet Security	Restrictions on external access from the Internet may be specified here.
Wizard-> Wireless LAN security	This page is used to specify whether the wireless LAN connections should be encrypted.
Wizard-> Summary	This page displays the values set by you for confirmation before the changes are applied.

Wizard-> Welcome page

Click **Next** on Setup Wizard's introduction page to proceed to the **Location Specific Information** page.
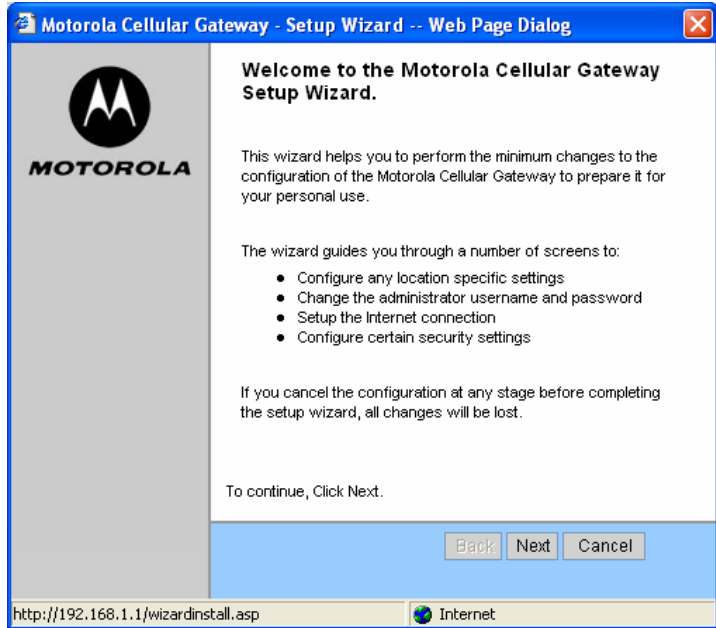
Wizard-> Location Specific Information

On this page select the country that you are operating the Motorola Cellular Gateway NC800 in and the time zone.

It is necessary to select the appropriate country due to channel restrictions on wireless networks in certain countries. If the desired country is not in the list, then channel restrictions do not apply and Worldwide may be selected.

The time zone needs to be selected in order to make sure that the logging information provided by the Motorola Cellular Gateway NC800 contains the correct date and time.

If there is daylight saving in the Time Zone specified, it will automatically be enabled. If daylight saving is not applicable to the selected Time Zone no time adjustment will be made throughout the year.

Click **Next** to continue.
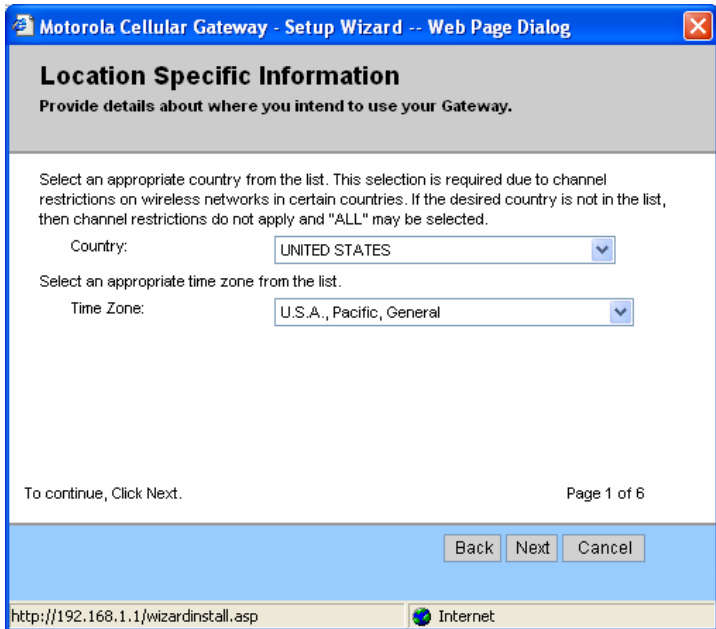
Wizard-> Gateway Administration

The **Gateway Administration** page allows you to set the username and password that is required to access the configuration utility. The default factory settings for username and password are *admin* and *admin* respectively. You should assign a different username and password to prevent unauthorized access to the Motorola Cellular Gateway NC800 configuration tool.

Click **Next** to continue.
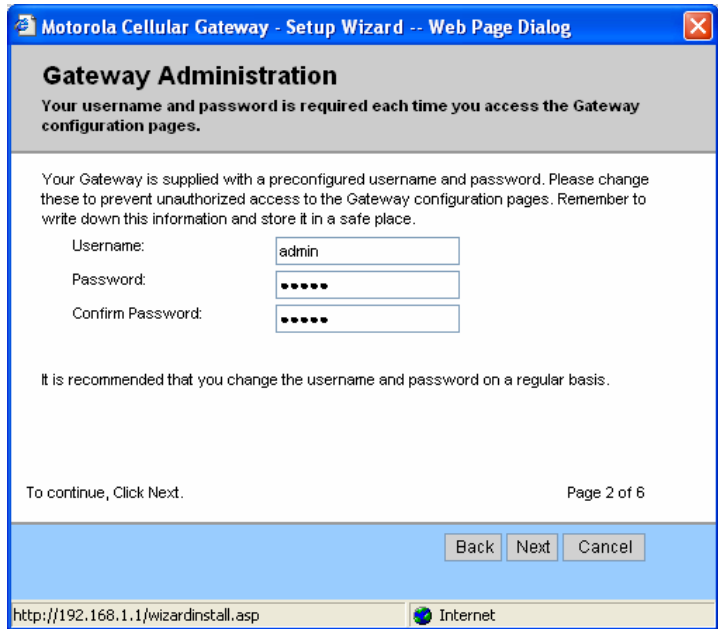
Wizard-> Internet Account Information

The **Internet Account Information** allows you to configure your username and password to access your Internet account. You also need to enter the data access number that must be dialed to setup the cellular connection. Enter your account details as supplied by your ISP (Internet Service Provider), as well as the data access number. A maximum of 10 characters are allowed for the data access number.

Note: Some service providers do not require a username and password. In this case – leave the entries blank.

Click **Next** to continue.
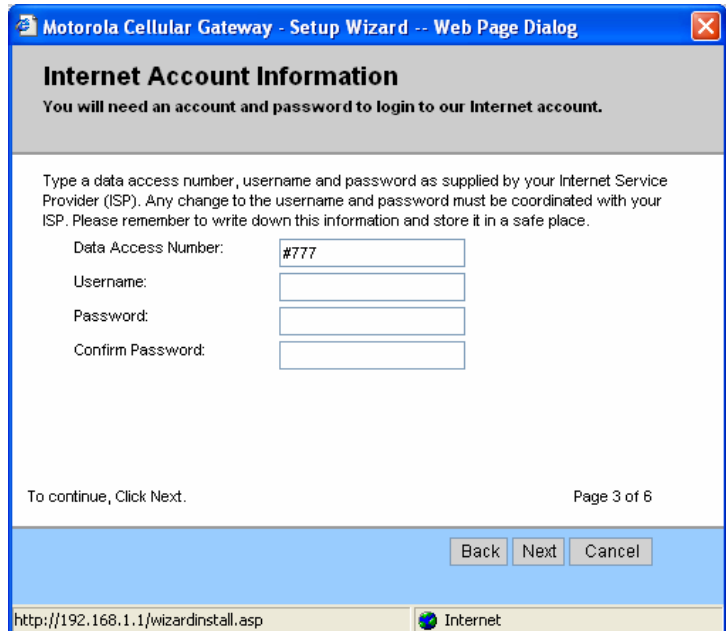
Wizard-> Internet Network Information

The **Internet Network Information** screen appears. This is used to indicate how the Motorola Cellular Gateway NC800 obtains its IP address. The default is automatic, which means the Motorola Cellular Gateway NC800 automatically obtains its IP settings from the ISP (i.e. the check box is ticked).
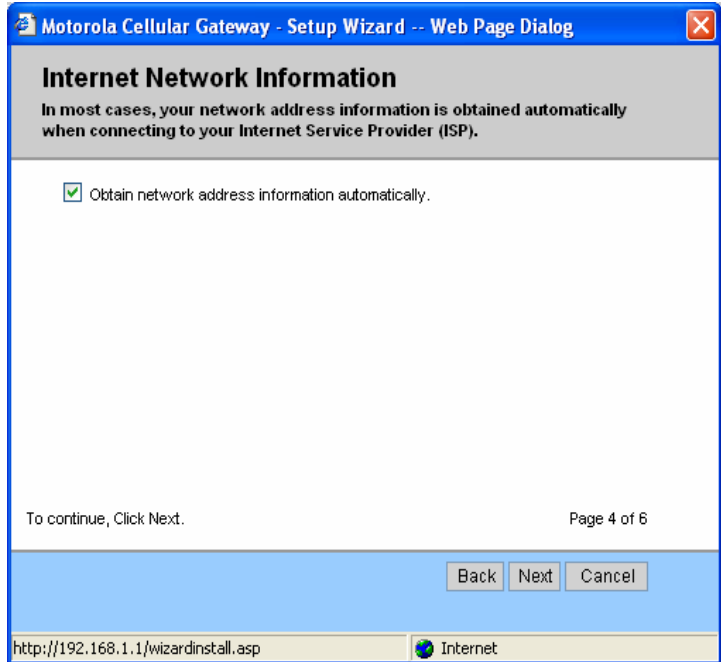
If however, your ISP provides specific IP information that is required to be configured, untick the **automatic** option and enter the details supplied by your ISP.

Click **Next** to continue.
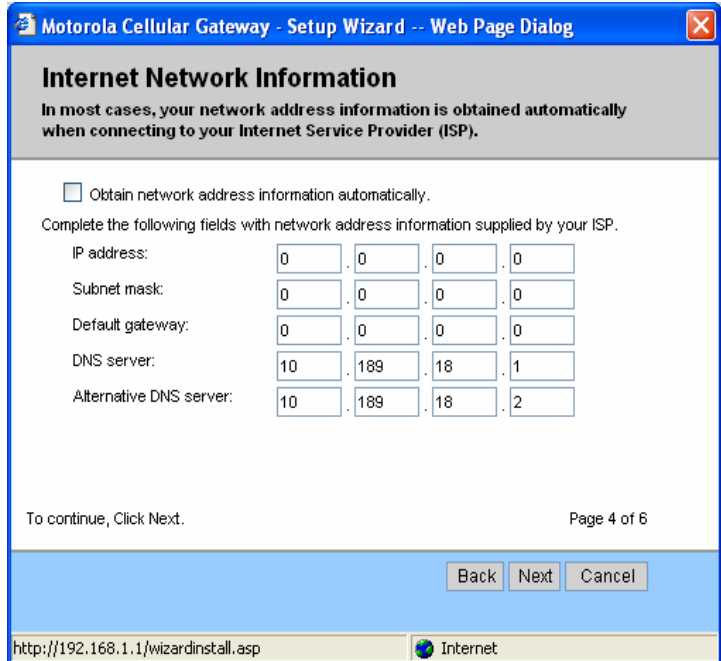
Wizard-> Internet Security

The **Internet Security** provides protection from unauthorized external internet access to your local network. The recommended setting is **High**. Select **High** to completely secure your network.

If you have applications such as games or MS NetMeeting, you will need to allow access to one of your specific computers from the outside the firewall.

Select the **Medium** setting and specify the IP address of the particular computer to which connections will be made. With the **Medium** setting, only FTP, HTTP and SMTP connections will be allowed through the firewall to the selected IP address. The computer at this address is regarded as a DMZ computer.

By selecting **Low**, all traffic is allowed to the selected IP address. Any computer at this point is completely open to the internet and is regarded as a DMZ computer
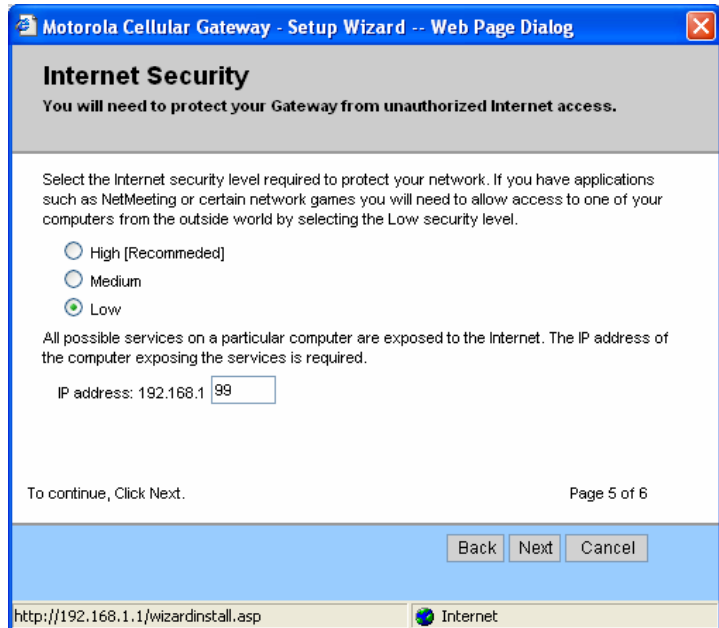
Click **Next** to continue.

Internet Security
You will need to protect your Gateway from unauthorized Internet access.

Select the Internet security level required to protect your network. If you have applications such as NetMeeting or certain network games you will need to allow access to one of your computers from the outside world by selecting the Low security level.

○ High [Recommeded]
○ Medium
◉ Low

All possible services on a particular computer are exposed to the Internet. The IP address of the computer exposing the services is required.

IP address: 192.168.1 [99]

To continue, Click Next.   Page 5 of 6

[Back] [Next] [Cancel]

http://192.168.1.1/wizardinstall.asp   Internet

Wizard-> Wireless LAN Security

The Wireless LAN security options are presented. The default is no security between your wireless enabled computers and the Motorola Cellular Gateway NC800 (not recommended). This default is selected to reduce the risk of not being able to connect to the Motorola Cellular Gateway NC800 for the first time.

If security is required between your wireless enabled computers and the Motorola Cellular Gateway NC800, tick the option and then specify a 5 character security key. This security key should match that of your previously configured wireless enabled computers (all have to use the same key). Otherwise, generate a random one by clicking on the **Auto-generate** button.

Wireless LAN Security
Unless certain security precautions are applied, any computer in the vicinity of your Gateway can intrude on your wireless LAN.

Wireless LAN security is achieved by encrypting the connections between wireless-enabled computers and the Gateway. The preconfigured setting is no security. It is recommended to enable WEP encryption.

☑ Enable WEP encryption

WEP encryption requires a security key to be configured on the Gateway. This key must match the keys used on each wireless-enabled computer. A random key can be generated by clicking on the Auto-generate button.

Security Key (5 Characters) [MVWBM] [Auto-generate]

To continue, Click Next.   Page 6 of 6

[Back] [Next] [Cancel]

http://192.168.1.1/wizardinstall.asp   Internet

The WEP key entered on this page corresponds to Network Key 1 on the Wireless LAN->WEP Security web page.

If no security is required, then un-tick the encryption option.

Click **Next** to continue.

⚠️ **Warning:** Ensure that all wireless enabled computers accessing the Motorola Cellular Gateway NC800 have the same WEP encryption key configured.


💡 WEP encryption is not the most secure encryption method offered by the Motorola Cellular Gateway NC800, but not all wireless adapters support the more advanced encryption techniques. If you wish to use more secure encryption, please refer to the **Wireless LAN ->Security** section.

Wizard-> Summary

The initial configuration of your **Motorola Cellular Gateway NC800** is now complete. Review the summary of all the settings (possibly Print the settings for future reference) and then click on **Finish** to finalize the settings.

If you don't click **Finish** you will lose all changes. If you **Cancel**, you can restart the wizard by selecting **Setup Wizard** again from the list of options on the left hand side of the main configuration screen.
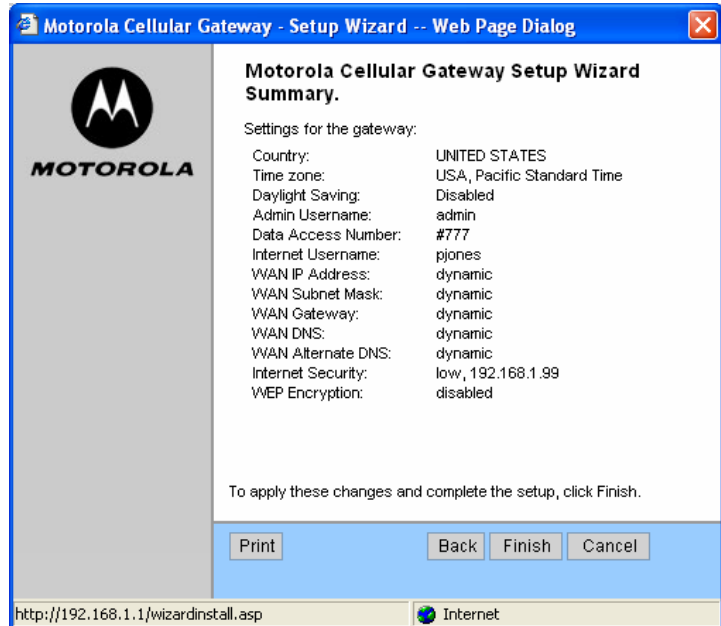
Signal Strength

You can use this screen as an aid to find the optimal position for the CDMA antenna and to check the current CDMA signal strength. The signal strength is shown on a scale from Poor to Excellent.
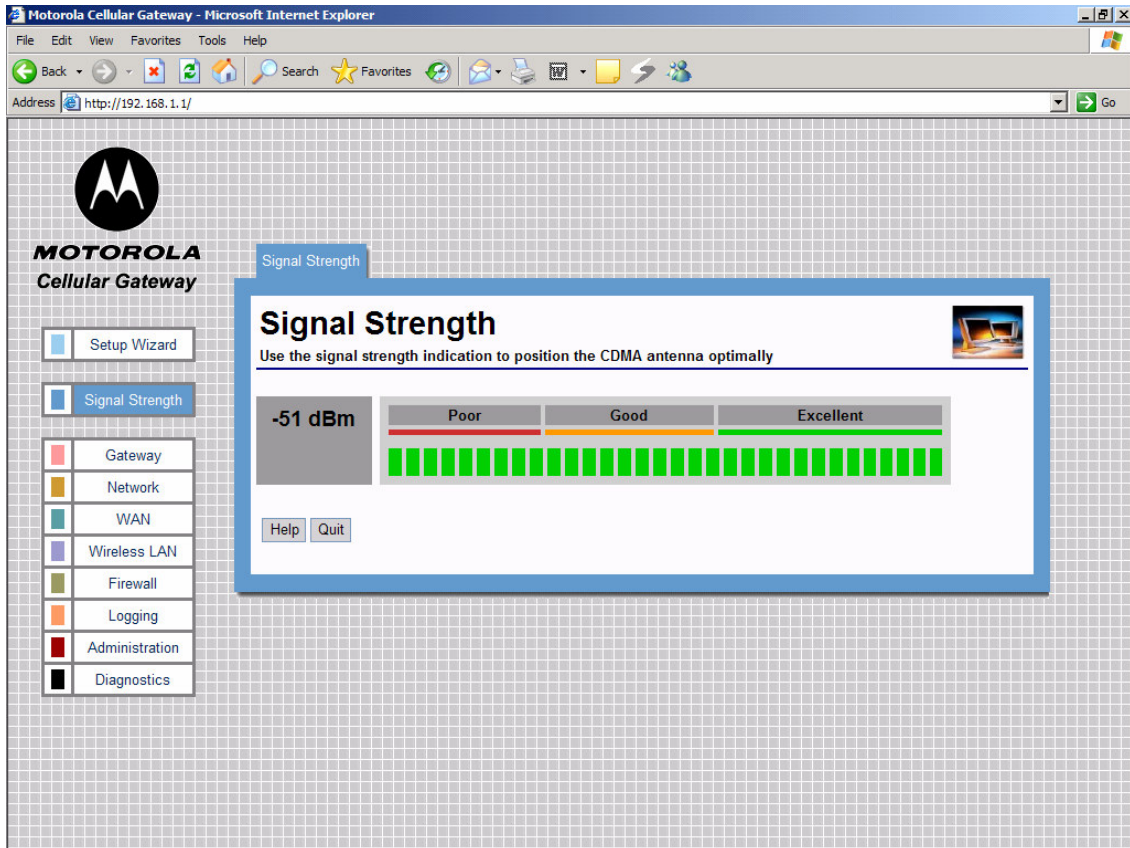To stop monitoring the signal strength, click on the Quit button.

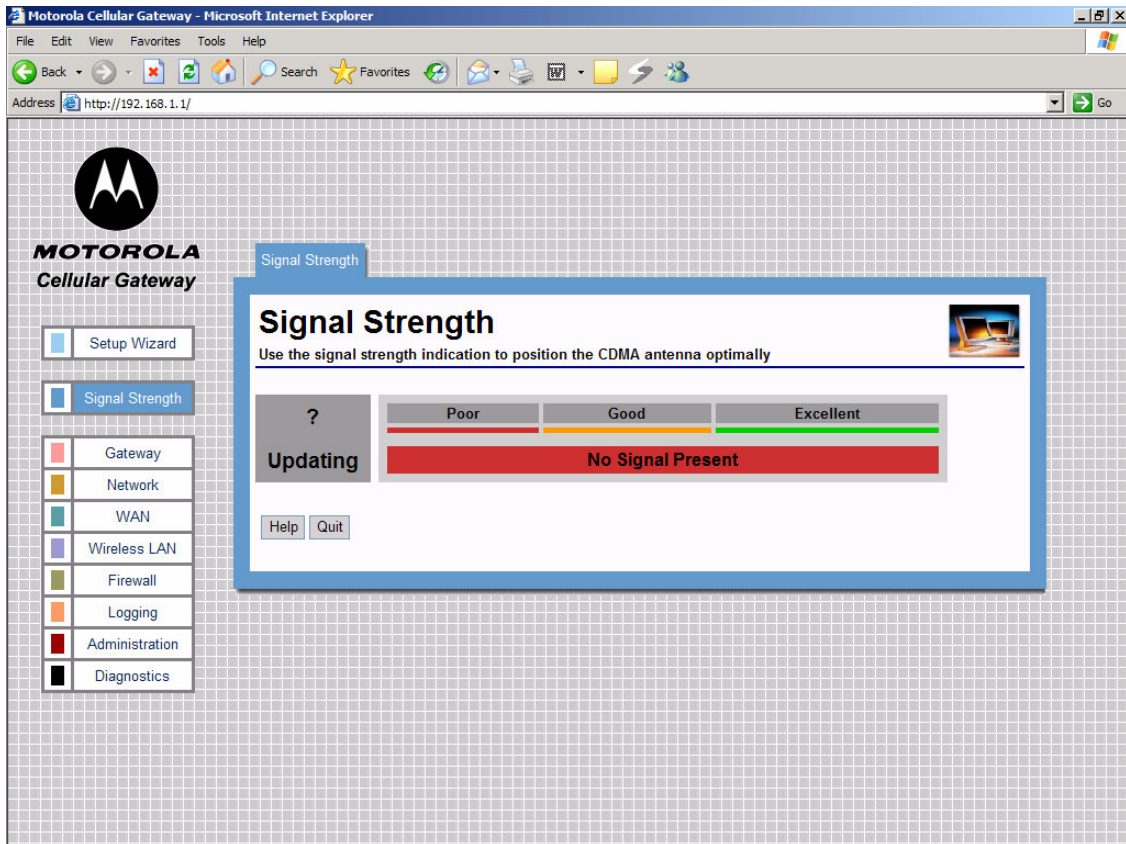**Figure 7. Excellent CDMA signal strength**

Figure 8. No CDMA signal

Gateway

The Gateway category of screens allows you to specify the general settings of the Motorola Cellular Gateway NC800.

Gateway-> Basic Settings   The various interfaces are enabled/disabled on this page. This affects the availability of options on pages in the other main categories.

Gateway-> LAN Interface   The Motorola Cellular Gateway NC800's LAN-specific properties, e.g. its IP address as seen by the other devices on the LAN, are specified here.

Gateway-> DHCP leases   This page displays the status of the current DHCP leases.

Gateway-> UPnP   Universal Plug and Play capabilities are enabled on this page.

Gateway-> LAN STP   The various settings to do with LAN Spanning Tree Protocol.

Gateway-> Login Settings   This page allows the user login and password to be changed

Gateway-> Basic Gateway Settings

This is the very first page that you see when the Motorola Cellular Gateway NC800's configuration utility opens. The settings on this page determine whether certain options on subsequent pages will be available. These dependencies are highlighted on the relevant pages.

The default values displayed on this page will generally be sufficient. The purpose of each field is described below in order to assist you to fill in appropriate values if you have more advanced requirements.