Reference Manual for the ME103 802.11b ProSafe Wireless Access Point

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Trademarks

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

NETGEAR ProSafe Wireless Access Point ME103

Tested to Comply
with FCC Standards
FOR HOME OR OFFICE USE

FCC ID: PY3ME103

Warning!

To comply with the FCC's of exposure requirements you must maintain a distance of at least 1 cm from the antenna of this device while it is in use.

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.
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 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.

RF Exposure Requirements

WARNING! To ensure compliance with FCC RF exposure requirements, the antenna used for this device must be installed to provide a separation distance of at least 20 cm (8 in) from all persons and must not be co-located or operating in conjunction with any other antenna or radio transmitter. Installers and end-users must follow the installation instructions provided in this user guide.

Radio Frequency Interference Requirements

This device is restricted to indoor use due to its operation in the 2.4 GHz frequency range. FCC requires this product to be used indoors in 2.4 GHz the frequency range to reduce the potential for harmful interference to co-channel Mobile Satellite systems.

Regulatory Compliance Information

This device is restricted to indoor use due to reduce the potential for harmful interference to co-channel Mobile Satellite and Radar Systems.

Canadian Department of Communications Compliance Statement

This Class B Digital apparatus (ME103 802.11b ProSafe Wireless Access Point) meets all the requirements of the Canadian Interference Causing Equipment Regulations.

Cet appareil numerique del la classe B respect les exigences du Regalement sur le material broilleur du Canada.

This device comples with Class B limits of Industry of Canada. Operation is subject to the following two conditions:

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

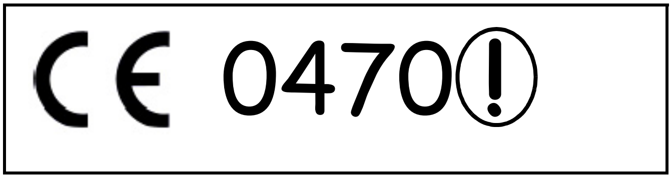
The device is certified to the requirements of RSS-139-1 and RSS-210 for 2.4 GHz spread spectrum devices. The use of this device in a system operating either partially or completely outdoors may require the user to obtain a license for the system according to the Canadian regulations. For further information, contact your local Industry Canada office.

EN 55 022 Declaration of Conformance

This is to certify that the ME103 802.11b ProSafe Wireless Access Point is shielded against the generation of radio interference in accordance with the application of Council Directive 89/336/EEC, Article 4a. Conformity is declared by the application of EN 55 022 Class B (CISPR 22).

CE Declaration of Conformity

For the following equipment: ME103 802.11b ProSafe Wireless Access Point



is herewith confirmed to comply with the requirements set out in the Council Directive on the Approximation of the Laws of the Member States relating to Electromagnetic Compatibility (89/336/EEC), Low-voltage Directive (73/23/EEC) and the Amendment Directive (93/68/EEC), the procedures given in European Council Directive 99/5/EC and 89/3360EEC. The equipment was passed. The test was performed according to the following European standards:

- EN 301489-1 V1.2.1 (2000-08)
- EN 301 489-17 V1.1.1 (2000-09)
- EN 55022: 1988 Class B
- EN 61000-3-2: 2000
- EN 6100-3-3: 1995
- EN 55024: 1998 (IEC 61000-4-5:1995, IEC 61000-4-3:1995, IEC 61000-4-4;1995, IEC 61000-4-5:1995, IEC 61000-4-6:1996, IEC 61000-4-8:1993, IEC 61000-4-11:1994)

The test was carried out on February 19, 2003 at Sporton International Inc. Lab.

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Chapter 1
About This Manual

Congratulations on your purchase of the ME103 802.11b ProSafe Wireless Access Point. The ME103 provides connection for multiple personal computers to the Internet through an external broadband access device (such as a cable modem or DSL modem).

Audience

This reference manual assumes that the reader has basic to intermediate computer and Internet skills. However, basic computer network, Internet, firewall, and VPN technologies tutorial information is provided in the Appendices, on the *Resource CD for the ME103 ProSafe Wireless Access Point*, and on the Netgear website.

Scope

This manual is written for the ME103 Access Point according to these specifications:

Table 1-1. Manual Specifications

Product Version	ME103 802.11b ProSafe Wireless Access Point
Product Final Assembly Number	
Firmware Version Number	Version 3.0 Release 16
Manual Part Number	
Manual Publication Date	August 2003

Note: Product updates are available on the NETGEAR web site at *www.netgear.com/support/main.asp*. Documentation updates are available on the NETGEAR, Inc. web site at *www.netgear.com/docs*.

Typographical Conventions

This guide uses the following typographical conventions:

Table 1. Typographical conventions

italics	Emphasis.
bold times roman	User input.
[Enter]	Named keys in text are shown enclosed in square brackets. The notation [Enter] is used for the Enter key and the Return key.
SMALL CAPS	DOS file and directory names.

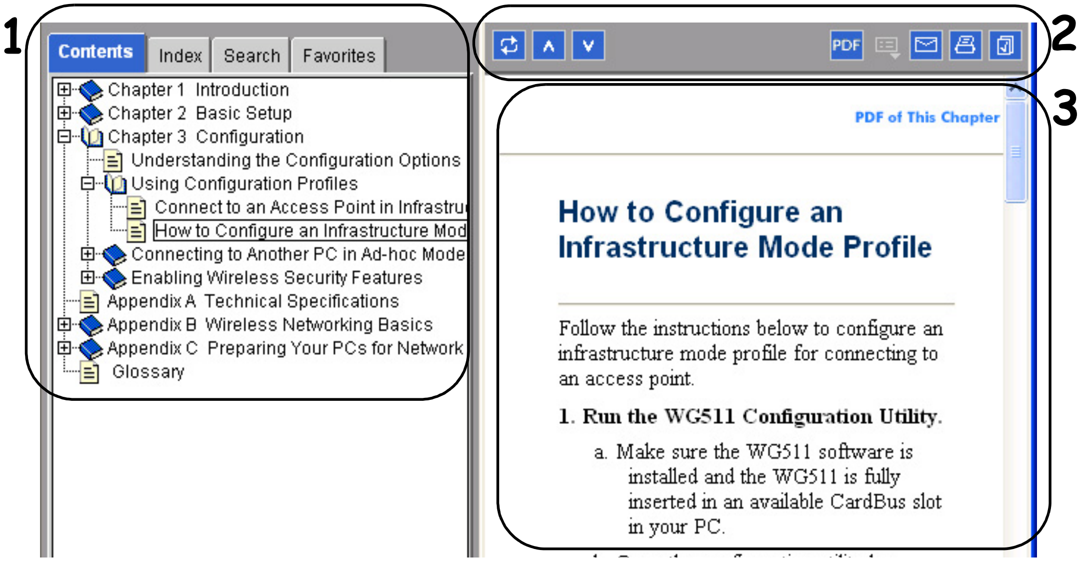
Special Message Formats

This guide uses the following formats to highlight special messages:

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

How to Use the HTML Version of this Manual

The HTML version of this manual includes these features.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How to Configure an Infrastructure Mode Profile

Follow the instructions below to configure an infrastructure mode profile for connecting to an access point.

1. Run the WG511 Configuration Utility.

a. Make sure the WG511 software is installed and the WG511 is fully inserted in an available CardBus slot in your PC.

Figure 1-1: HTML version of this manual

1. **Left pane**. Use the left pane to view the Contents, Index, Search, and Favorites tabs.

   To view the HTML version of the manual, you must have a version 4 or later browser with Java or JavaScript enabled. To use the Favorites feature, your browser must be set to accept cookies. You can record a list of favorite pages in the manual for easy later retrieval.

2. **Toolbar buttons**. Use the toolbar buttons across the top to navigate, print pages, and more.

   – The *Show in Contents* button locates the currently displayed topic in the Contents tab.
   – *Previous/Next* buttons display the topic that precedes or follows the current topic.
   – The *PDF* button links to a PDF version of the full manual.
   – The *E-mail* button enables you to send feedback by e-mail to Netgear support.
   – The *Print* button prints the currently displayed topic. Using this button when a step-by-step procedure is displayed will send the entire procedure to your printer--you do not have to worry about specifying the correct range of pages.
   – The *Bookmark* button bookmarks the currently displayed page in your browser.

3. **Right pane**. Use the right pane to view the contents of the manual. Also, each page of the manual includes a “PDF of This Chapter” link at the top right which links to a PDF file containing just the currently selected chapter of the manual.

How to Print this Manual

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

- **A "How To" Sequence of Steps in the HTML View**. Use the *Print* button on the upper right of the toolbar to print the currently displayed topic. Using this button when a step-by-step procedure is displayed will send the entire procedure to your printer--you do not have to worry about specifying the correct range of pages.
- **A Chapter**. Use the "PDF of This Chapter" link at the top right of any page.
  - Click "PDF of This Chapter" link at the top right of any page in the chapter you want to print. A new browser window opens showing the PDF version of the chapter you were viewing.
  - Click the print icon in the upper left of the window.
  - **Tip**: If your printer supports printing two pages on a single sheet of paper, you can save paper an printer ink by selecting this feature.
- **The Full Manual**. Use the PDF button in the toolbar at the top right of the browser window.
  - Click PDF button. A new browser window opens showing the PDF version of the chapter you were viewing.
  - Click the print icon in the upper left of the window.
  - **Tip**: If your printer supports printing two pages on a single sheet of paper, you can save paper an printer ink by selecting this feature.

Chapter 2
Introduction

This chapter introduces the NETGEAR ME103 802.11b ProSafe Wireless Access Point. Minimal prerequisites for installation are presented in "System Requirements" on page 2-5.

About the ME103 802.11b ProSafe Wireless Access Point

The ME103 802.11b ProSafe Wireless Access Point is the basic building block of a wireless LAN infrastructure. It provides connectivity between Ethernet wired networks and radio-equipped wireless notebook systems, desktop systems, print servers, and other devices.

The ME103 provides wireless connectivity to multiple wireless network devices within a fixed range or area of coverage, interacting with a wireless network interface card (NIC) via an antenna. Typically, an individual in-building access point provides a maximum connectivity area with about a 300 foot radius. The ME103 802.11b ProSafe Wireless Access Point can support a small group of users in a range of several hundred feet. Most access points are rated between 30-70 users simultaneously.

The ME103 802.11b ProSafe Wireless Access Point acts as a bridge between the wired LAN and wireless clients. Connecting multiple ME103 Access Points via a wired Ethernet backbone can further lengthen 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 to another and still maintain seamless connection to the network.

The auto-sensing capability of the ME103 802.11b ProSafe Wireless Access Point allows packet transmission at up to 11Mbps, or at reduced speeds to compensate for distance or electromagnetic noise interference.

Key Features

The ME103 Access Point is easy-to-use and provides solid wireless and networking support.

Supported Standards and Conventions

The following standards and conventions are supported:

- **Standards Compliant.** The Wireless Access Point complies with the IEEE 802.11b (DSSS) and IEEE 802.1x specifications for Wireless LANs.
- **802.1x Support.** Support for 802.1x mode is included, providing for the industrial-strength wireless security of 802.1x authentication and authorization.
- **Radius Client Support.** The Wireless Access Point can log in to your existing Radius server (as a Radius client).
- **WEP support.** Support for WEP is included. Both 64-bit and 128-bit keys are supported.
- **Dynamic WEP key Support.** In 802.1x mode, fixed or Dynamic WEP (Wired Equivalent Privacy) keys can be used. Dynamic key exchange can be used when deploying 802.1x EAP-TLS.
- **DHCP Client Support.** DHCP provides a dynamic IP address to PCs and other devices upon request. The ME103 can act as a client and obtain information from your DHPC server.
- **NAT & WINS Support.** Support for both NetBIOS broadcast and WINS (Windows Internet Naming Service) allows the ME103 to easily fit into your existing Windows network.
- **SNMP Support.** Support for Simple Network Management Protocol (SNMP) Management Information Base (MIB) management.

Key Features

The NETGEAR ME103 provides solid functionality, including these features:

- **Multiple Operating Modes**
  - **Wireless Access Point.** Operates as a standard 802.11b or 802.11x Access Point.
  - **Point-to-Point Bridge.** In this mode, the ME103 only communicates with another bridge-mode wireless station. You must enter the MAC address (physical address) of the other bridge-mode wireless station in the field provided. WEP should be used to protect this communication.
  - **Point-to-Multi-Point Bridge.** Select this only if this ME103 is the “Master” for a group of bridge-mode wireless stations. The other bridge-mode wireless stations must be set to Point-to-Point Bridge mode, using this ME103's MAC address. They then send all traffic to this “Master”, rather than communicate directly with each other. WEP should be used to protect this traffic.

- **Upgradeable Firmware.** Firmware is stored in a flash memory and can be upgraded easily, using only your Web browser, and can be upgraded remotely.
- **Access Control.** The Access Control MAC address filtering feature can ensure that only trusted wireless stations can use the ME103 to gain access to your LAN.
- **Simple Configuration.** If the default settings are unsuitable, they are easy to change.
- **Hidden Mode.** The SSID is not broadcast, assuring only clients configured with the correct SSID can connect.
- **Configuration Backup.** Configuration settings can be backed up to a file and restored.
- **Supports Diversity.** Dual removable external antennas support diversity.
- **Secure and Economical Operation.** Adjustable power output allows more secure or economical operation.
- **Automatic Date and Time Updates.** Date and time can be automatically updated from Internet time servers.
- **Autosensing Ethernet Connection with Auto Uplink Interface.** Connects to 10/100 Mbps IEEE 802.3 Ethernet networks.
- **LED Indicators.** Power and wireless activity are easily identified.

802.11b Standards-based Wireless Networking

The ME103 802.11b ProSafe Wireless Access Point provides a bridge between Ethernet wired LANs and 802.11b compatible wireless LAN networks. It provides connectivity between Ethernet wired networks and radio-equipped wireless notebook systems, desktop systems, print servers, and other devices. Additionally, the ME103 supports the following wireless features:

- Distributed coordinated function (CSMA/CA, Back off procedure, ACK procedure, retransmission of unacknowledged frames)
- RTS/CTS handshake
- Beacon generation
- Packet fragmentation and reassembly
- Authentication Algorithms (Open System, Shared Key, 802.1x)
- Short or long preamble
- Roaming among access points on the same subnet

Autosensing Ethernet Connections with Auto Uplink

The ME103 can connect to a standard Ethernet network. The LAN interface is autosensing and capable of full-duplex or half-duplex operation.

The wireless access point incorporates Auto Uplink™ technology. The 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 any concerns about crossover cables, as Auto Uplink will accommodate either type of cable to make the right connection.

Compatible and Related NETGEAR Products

For a list of compatible products from other manufacturers, see the Wireless Ethernet Compatibility Alliance Web site (WECA, see *http://www.wi-fi.net*).

The following NETGEAR products work with the ME103 Access Point:

- POE101 Power Over Ethernet Adapter
- WAB501 a/b Dual Band Wireless PC Card Adapter
- MA401 802.11b Wireless PC Card
- WG511 802.11g Wireless CardBus Adapter
- MA111 801.11b Wireless Bridge
- MA101 802.11b Wireless USB Adapter
- ME102 802.11b Wireless Access Point
- MA311 802.11b Wireless PCI Adapter
- MA701 802.11b Wireless Compact Flash Card

System Requirements

Before installing the ME103, make sure your system meets these requirements:

- A 10/100 Mbps Local Area Network device such as a hub or switch
- The Category 5 UTP straight through Ethernet cable with RJ-45 connector included in the package, or one like it
- A 100-240 V, 50-60 HZ AC power source
- A Web browser for configuration such as Microsoft Internet Explorer 5.0 or above, or Netscape Navigator 4.78 or above

- At least one computer with the TCP/IP protocol installed
- 802.11b-compliant devices, such as the NETGEAR MA401 Wireless Adapter

What’s In the Box?

The product package should contain the following items:

- ME103 802.11b ProSafe Wireless Access Point
- Power adapter and cord (12Vdc, 800mA)
- Straight through Category 5 Ethernet cable
- ME103 802.11b ProSafe Wireless Access Point Quick Installation Guide
- *Resource CD for the ME103 ProSafe Wireless Access Point*

  Reference Manual for the ME103 802.11b ProSafe Wireless Access Point ( ) -- this manual
- Support Information card
- Warranty and Registration card

Contact your reseller or customer support in your area if there are any wrong, missing, or damaged parts. You can refer to the Support Information Card for the telephone number of customer support in your area. You should keep the Support Information card, along with the original packing materials, and use the packing materials to repack the ME103 if you need to return it for repair. To qualify for product updates and product warranty registrations, we encourage you to register on the NETGEAR Web site at: *http://www.NETGEAR.com*.

Hardware Description

The ME103 802.11b ProSafe Wireless Access Point front and rear hardware functions are described below.

ME103 Wireless Access Point Front Panel

The ME103 Access Point provides three status LEDs.

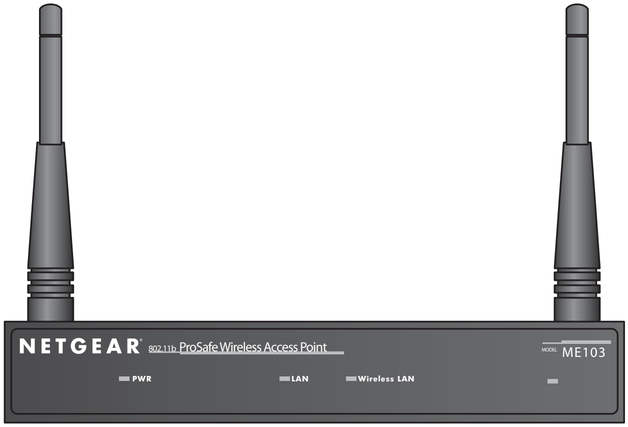


Figure 2-1: ME103 front panel

The following table explains the LED indicators:

LED	DESCRIPTION
Power	Power Indicator
Off	No power. If this LED does not come on with the power adapter and cord correctly installed, see Chapter 4, Troubleshooting.
On	Power is on.
Blink	Indicates self test, loading software, or system fault (if continues). **Note:** This LED may blink for a minute before going on steady.
LAN	Ethernet LAN Link Activity Indicator
Off	Indicates no Ethernet link detected.
Green On	100 Mbps Fast Ethernet link detected, no activity.
Green Blink	Indicates data traffic on the 100Mbps Ethernet LAN.
Amber 0n	10 Mbps Ethernet link detected, no activity.
Amber Blink	Indicates data traffic on the 10Mbps Ethernet LAN.
Wireless LAN	Wireless LAN Link Activity Indicator
Off	Indicates no Ethernet link detected.
Green On	Wireless link enabled, no activity.
Green Blink	Wireless link activity.

ME103 Wireless Access Point Rear Panel

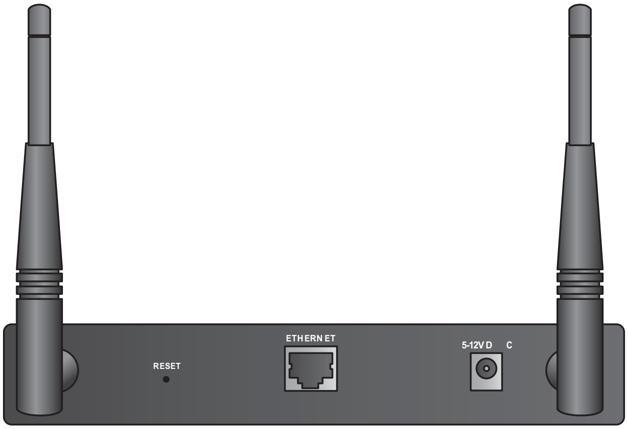


Figure 2-2: ME103 rear panel

Left Side Primary and Right Side Secondary Detachable Antenna

The ME103 provides two detachable antenna. The one on the left is the primary, and the one on the right is the secondary. See "Understanding Advanced Wireless Settings" on page 5-8 and "Antenna Installation" on page 5-13 for important information about configuring and positioning the antenna to best take advantage of diversity and range capabilities of the ME103.

Restore to Factory Defaults Button

The restore to default button located between the Ethernet RJ-45 connector and the power socket restores the ME103 to the factory default settings.

RJ-45 Ethernet Port

Use the ME103 Ethernet RJ-45 port to connect to an Ethernet LAN through a device such as a hub, switch, or router.

Power Socket

This socket connects to the ME103 power adapter.

Chapter 3
Basic Installation and Configuration

This chapter describes how to set up your ME103 802.11b ProSafe Wireless Access Point for wireless connectivity to your LAN. This basic configuration will enable computers with 802.11b or 802.11g wireless adapters to do such things as connect to the Internet, or access printers and files on your LAN.

> ➡ **Note:** Indoors, computers can connect over 802.11b wireless networks at ranges of several hundred feet or more. This distance can allow for others outside your area to access your network. It is important to take appropriate steps to secure your network from unauthorized access. The ME103 Access Point provides highly effective security features which are covered in detail in Chapter 3, "Configuring Your Wireless Network. Deploy the security features appropriate to your needs.

You need to prepare these three things before you can establish a connection through your wireless access point:

- A location for the ME103 that conforms to the Observing Placement and Range Guidelines below.
- The wireless access point connected to your LAN through a device such as a hub, switch, router, or Cable/DSL gateway.
- One or more computers with properly configured 802.11b or 802.11g wireless adapters.

Observing Placement and Range Guidelines

The operating distance or range of your wireless connection can vary significantly based on the physical placement of the wireless access point. The latency, data throughput performance, and notebook power consumption of wireless adapters also vary depending on your configuration choices.

> **Note:** Failure to follow these guidelines can result in significant performance degradation or inability to wirelessly connect to the ME103. For complete performance specifications, see Appendix A, “Specifications”.

For best results, place your wireless access point:

- Near the center of the area in which your PCs will operate.
- In an elevated location such as a high shelf where the wirelessly connected PCs have line-of-sight access (even if through walls).
- Away from sources of interference, such as PCs, microwaves, and 2.4 GHz cordless phones.
- Away from large metal surfaces.
- If using multiple access points, it is better if adjacent access points use different radio frequency Channels to reduce interference. The recommended Channel spacing between adjacent access points is 5 Channels (for example, use Channels 1 and 6, or 6 and 11).

The time it takes to establish a wireless connection can vary depending on both your security settings and placement. WEP connections can take slightly longer to establish. Also, WEP encryption can consume more battery power on a notebook PC.

Cabling Requirements

The ME103 Access Point connects to your LAN via twisted-pair Category 5 Ethernet cable with RJ-45 connectors.

> **Note:** The power adapter and cord shipped with the ME103 limits the distance from an AC outlet. To overcome this, consider using NETGEAR’s POE101 Power Over Ethernet Adapter with a Cat 5 Ethernet cable like the one included with your ME103. This adapter sends DC power through an Ethernet cable to enable you to power an access point in a remote location up to 328 feet away.

Default Factory Settings

When you first receive your ME103, the default factory settings will be set as shown below. You can restore these defaults with the Factory Default Restore switch on the rear panel — see "ME103 Wireless Access Point Rear Panel" on page 2-7.

FEATURE	FACTORY DEFAULT SETTINGS
User Name (case sensitive)	**admin**
Password (case sensitive)	**password**
Operating Mode	**Access Point**
Access Point Name	**NETGEARxxxxxx where xxxxxx are the last six digits of the wireless access point's MAC address**
DHCP	**DHCP client**
IP Configuration (if DHCP server is unavailable)	**IP Address: 192.168.0.224** **Subnet Mask: 255.255.255.0** **Gateway: 0.0.0.0** **Primary DNS Server: *blank*** **Secondary DNS Server: *blank***
Network Name (SSID)	**NETGEAR**
Broadcast Network Name (SSID	**Enabled**
802.11b Radio Frequency Channel	**11**
WEP	**Disabled**
Restricting connectivity based on MAC Access Control List	**Disabled**
WEP	**Disabled**
802.1x	**Disabled**
SNMP	**Disabled**

Understanding ME103 Wireless Security Options

Unlike wired network data, your wireless data transmissions can be received well beyond your walls by anyone with a compatible adapter. For this reason, use the security features of your wireless equipment. The ME103 Access Point provides highly effective security features which are covered in detail in this chapter. Deploy the security features appropriate to your needs.

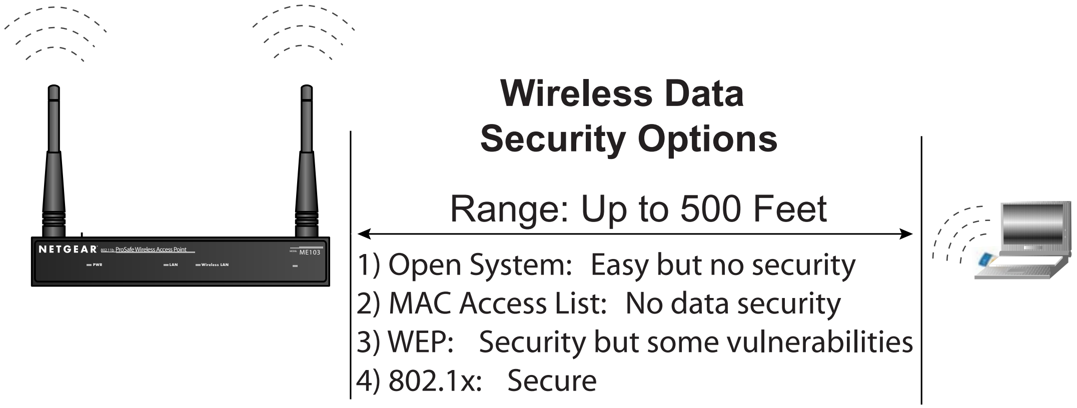

NETGEAR
ProSafe Wireless Access Point
ME103
PWR
LAN
Wireless LAN
Wireless Data
Security Options
Range: Up to 500 Feet
1) Open System: Easy but no security
2) MAC Access List: No data security
3) WEP: Security but some vulnerabilities
4) 802.1x: Secure

Figure 3-1: ME103 wireless data security options

There are several ways you can enhance the security of your wireless network:

- **Restrict Access Based on MAC address.** You can restrict access to only trusted PCs so that unknown PCs cannot wirelessly connect to the ME103. MAC address filtering adds an obstacle against unwanted access to your network, but the data broadcast over the wireless link is fully exposed.
- **Turn Off the Broadcast of the Wireless Network Name (SSID).** If you disable broadcast of the SSID, only devices that have the correct SSID can connect. This nullifies the wireless network 'discovery' feature of some products such as Windows XP, but the data is still fully exposed to a determined snoop using specialized test equipment like wireless sniffers.
- **Use WEP.** Wired Equivalent Privacy (WEP) data encryption provides data security. WEP Shared Key authentication and WEP data encryption will block all but the most determined eavesdropper.
- **Implement 802.1x.** IEEE 802.1x provides very strong security. Although it can use the same data encryption scheme as WEP, it enables stronger authentication as well as the ability to dynamically vary the encryption keys.

Installing the ME103 802.11b ProSafe Wireless Access Point

Before installing the ME103 802.11b ProSafe Wireless Access Point, you should make sure that your Ethernet network is up and working. You will be connecting the access point to the Ethernet network so that computers with 802.11b or 802.11g wireless adapters will be able to communicate with computers on the Ethernet network. In order for this to work correctly, verify that you have met all of the system requirements, shown on page 2-5.

1 SET UP THE ME103 ACCESS POINT

1 SET UP THE ME103 ACCESS POINT

Tip: Before mounting the ME103 in a high location, first set up and test the ME103 to verify wireless network connectivity.

a. Prepare a PC with an Ethernet adapter. If this PC is already part of your network, record its TCP/IP configuration settings.

b. Configure the PC with a static IP address of 192.168.0.210 and 255.255.255.0 for the Subnet Mask.

c. Connect an Ethernet cable from the ME103 to the PC (**A**).

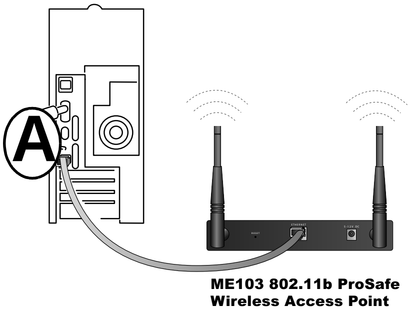


Figure 3-2: Connecting the ME103 to a PC

d. Turn on your computer, connect the power adapter to the ME103 and verify the following:
   - The PWR power light goes on.
   - The LAN light of the wireless access point is lit when connected to a powered on PC.

2 Configure LAN and Wireless Access

a. Configure the ME103 Ethernet port for LAN access.

- Connect to the ME103 by opening your browser and entering *http://192.168.0.224* in the address field.
- When prompted, enter **admin** for the user name and **password** for the password, both in lower case letters.
- Click the IP Settings link and configure the IP Settings for your network.

b. Configure the wireless interface for wireless access. See the online help or the Understanding Basic Wireless Settings topic of the Reference Manual for full instructions.

Note: You must set the Regulatory Domain. It may not be legal to operate the wireless access point in a region other than one of those identified in this field.

Now that you have finished the setup steps, you are ready to deploy the ME103 in your network. If needed, you can now reconfigure the PC you used in step 1 back to its original TCP/IP settings.

3 Deploy the ME103 Access Point

a. Disconnect the ME103 and position it where you will deploy it. The best location is elevated, such as wall mounted or on the top of a cubicle, at the center of your wireless coverage area, and within line of sight of all the mobile devices.

Tip: If you plan to locate the ME103 in a location where it is difficult to connect the electrical power supply, consider using the NETGEAR, Inc. POE101 Power Over Ethernet Adapter which provides power to the ME103 through the Ethernet cable.

b. Lift the antenna on either side so that they are vertical.

Note: Consult the antenna positioning and wireless mode configuration information in the Advanced Configuration chapter of the Reference Manual.

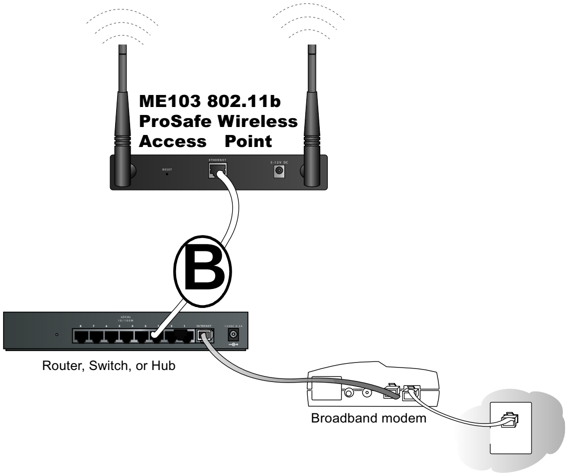


Figure 3-3: Connecting the Ethernet cable to a router, hub, or switch

c. Connect an Ethernet cable from your ME103 Access Point to a LAN port (**B**) on your router, switch, or hub.

   Note: By default, ME103 is set to be a DHCP client. If your network uses static IP addresses, you will need to change this setting.

d. Connect the power adapter to the wireless access point and plug the power adapter in to a power outlet. The PWR, LAN, and Wireless LAN lights and should light up.

e. Connect the power adapter to the wireless access point and plug the power adapter in to a power outlet. The PWR, LAN, and Wireless LAN lights and should light up.

4 Verify Wireless Connectivity

Using a computer with an 802.11b or 802.11g wireless adapter with the correct wireless settings needed to connect to the ME103 (SSID, WEP, MAC ACL, 802.1x, etc.), verify connectivity by using a browser such as Netscape or Internet Explorer to browse the Internet, or check for file and printer access on your network.

Note: If you are unable to connect, see Chapter 6, “Troubleshooting.”

How to Log In to the ME103 Using Its Default NetBIOS Name

The ME103 802.11b ProSafe Wireless Access Point can be configured remotely from Microsoft Internet Explorer browser version 5.0 or above, or Netscape Navigator web browser version 4.78 or above. You can connect to the ME103 by using its default NetBIOS name or its default IP address. The instructions for connecting using the default NetBIOS name are below. The instructions for connecting using the default IP address follow this section.

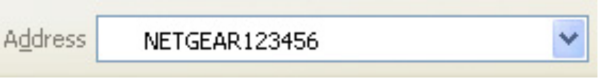
1. Determine the NetBIOS name of your access point.

   To find the NetBIOS name, refer to the labels on the bottom of your access point. The access point NetBIOS name is on the label on the bottom of the unit and looks like "NETGEAR123456", where 123456 is the last 6 digits of the access point's MAC address.

   Note: If the computer you are using to connect to the ME103 is on a different subnet, you will not be able to connect via its NetBIOS name unless there is a WINS server on you LAN.

2. Open a Web browser such as Internet Explorer or Netscape Navigator.
3. Log in to the ME103 using the NetBIOS name you found on the bottom of the unit.

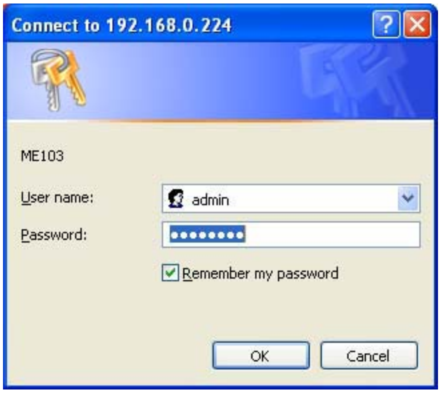
   In this example, you see NETGEAR123456 in the browser address or location box. There is no space between "NETGEAR" and the 6 digits of the access point name.You do not need to include "www" or "http://."



Address NETGEAR123456

Figure 3-4: Example ME103 NetBIOS name in browser address bar

4. A login window like the one shown below opens:



Connect to 192.168.0.224

ME103

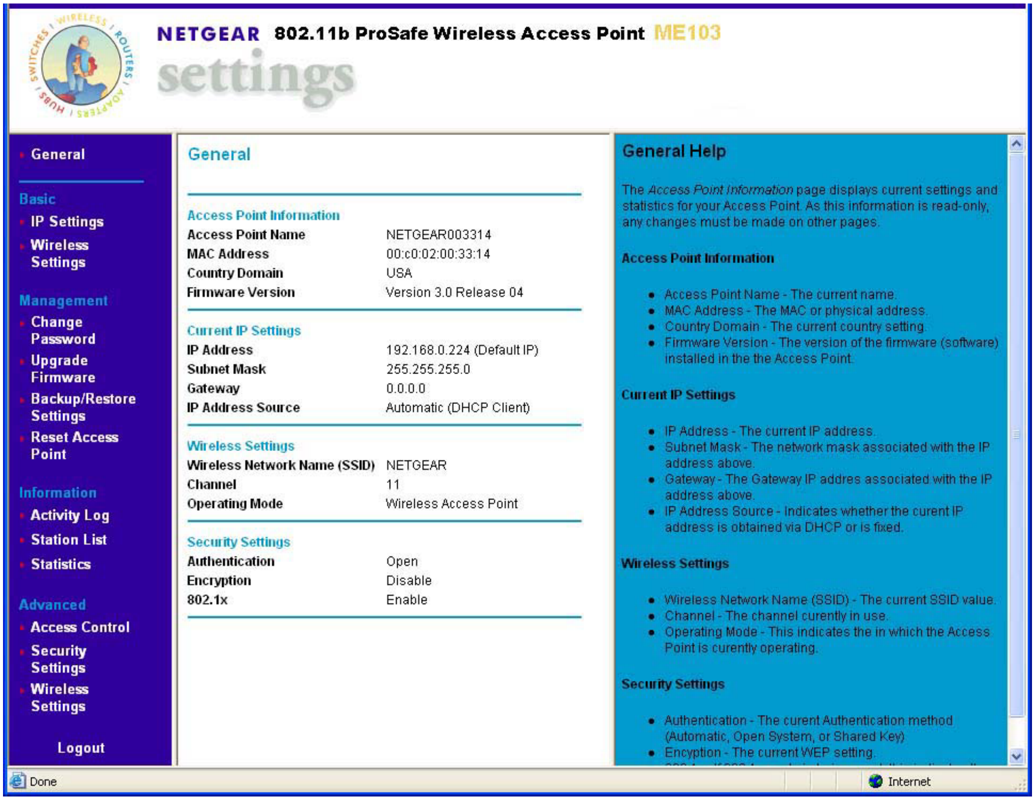
User name: admin

Password: ••••••••

☑ Remember my password

Figure 3-5: Login window

Enter the default user name of **admin** and the default password of **password**.



General

Access Point Information	
Access Point Name	NETGEAR003314
MAC Address	00:c0:02:00:33:14
Country Domain	USA
Firmware Version	Version 3.0 Release 04
Current IP Settings	
IP Address	192.168.0.224 (Default IP)
Subnet Mask	255.255.255.0
Gateway	0.0.0.0
IP Address Source	Automatic (DHCP Client)
Wireless Settings	
Wireless Network Name (SSID)	NETGEAR
Channel	11
Operating Mode	Wireless Access Point
Security Settings	
Authentication	Open
Encryption	Disable
802.1x	Enable

General Help

The *Access Point Information* page displays current settings and statistics for your Access Point. As this information is read-only, any changes must be made on other pages.

Access Point Information

- Access Point Name - The current name.
- MAC Address - The MAC or physical address.
- Country Domain - The current country setting.
- Firmware Version - The version of the firmware (software) installed in the the Access Point.

Current IP Settings

- IP Address - The current IP address.
- Subnet Mask - The network mask associated with the IP address above.
- Gateway - The Gateway IP addres associated with the IP address above.
- IP Address Source - Indicates whether the curent IP address is obtained via DHCP or is fixed.

Wireless Settings

- Wireless Network Name (SSID) - The current SSID value.
- Channel - The channel curently in use.
- Operating Mode - This indicates the in which the Access Point is curently operating.

Security Settings

- Authentication - The curent Authentication method (Automatic, Open System, or Shared Key)
- Encyption - The current WEP setting.

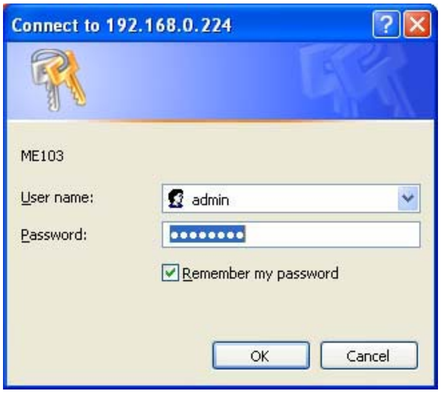
Figure 3-6: Login result: ME103 home page

The Web browser will then display the ME103 home page.

How to Log In to the ME103 Using Its Default IP Address

1. 192.168.0.224 is the default IP address of your access point. However, the ME103 is also set, by default, to be a DHCP client. So, if the ME103 has not yet been installed, and there is no DHCP server on the network, you can log in to the ME103 using its default IP address. Otherwise, you should use either the NetBIOS login described in "How to Log In to the ME103 Using Its Default NetBIOS Name" on page 3-8 or the procedure described in "Set up the ME103 Access Point" on page 3-5" which uses a static IP configuration.

   Note: The computer you are using to connect to the ME103 should be configured with an IP address that starts with 192.168.0.x and a Subnet Mask of 255.255.255.0.
2. Open a Web browser such as Internet Explorer or Netscape Navigator.
3. Connect to the ME103 by entering its default address of *http://192.168.0.224* into your browser.
4. A login window like the one shown below opens:



Connect to 192.168.0.224

ME103

User name: admin

Password: ••••••••

☑ Remember my password

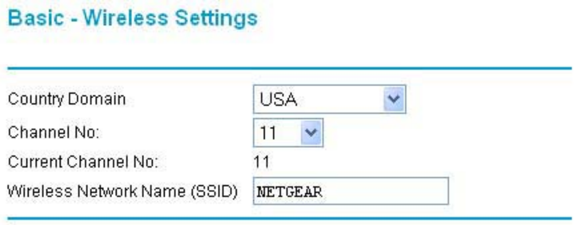
Figure 3-7: Login window

Log in use the default user name of **admin** and default password of **password**.

Once you have entered your access point name, your Web browser should automatically find the ME103 Access Point and display the home page, as shown in "Login result: ME103 home page" on page 3-9.

Understanding Basic Wireless Settings

To configure the wireless settings of your wireless access point, click the Wireless Settings link in the Basic section of the main menu of the browser interface. The Basic Wireless Settings menu will appear, as shown below.



Basic - Wireless Settings

Country Domain	USA
Channel No:	11
Current Channel No:	11
Wireless Network Name (SSID)	NETGEAR

Figure 3-8: Basic Wireless Settings menu

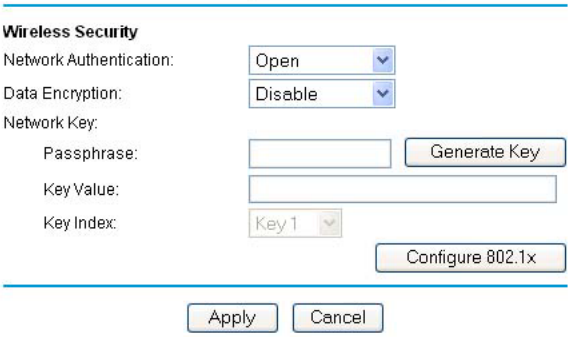
The Basic Wireless Settings menu options are discussed below:

- **Country Domain.** This field identifies the region where the ME103 can be used. It may not be legal to operate the wireless features of the wireless access point in a region other than one of those identified in this field. There is no default country domain, and the channel is set to 11. Unless a country domain is selected, the channel cannot be changed.
- **Channel.** This field identifies which operating frequency will be used. It should not be necessary to change the wireless channel unless you notice interference problems or setting up the ME103 near another access point. See “Wireless Channels” on page B-7 for more information on wireless channels.
  - Access points use a fixed channel. You can select the channel used. This allows you to choose a channel which provides the least interference and best performance. In the USA and Canada, 11 channels are available.
  - If using multiple access points, it is better if adjacent access points use different channels to reduce interference. The recommended channel spacing between adjacent access points is 5 channels (for example, use channels 1 and 6, or 6 and 11).
  - In "Infrastructure" mode, wireless stations normally scan all channels, looking for an access point. If more than one access point can be used, the one with the strongest signal is used. This can only happen when the various access points are using the same SSID.

- **Wireless Network Name (SSID).** The SSID is also known as the wireless network name. Enter a value of up to 32 alphanumeric characters. In a setting where there is more than one wireless network, different wireless network names provide a means for separating the traffic. Any device you want to participate in a particular wireless network will need to use the SSID. The ME103 default SSID is: **NETGEAR**.
  - A group of Wireless Stations and a single access point, all using the same ID (SSID), form a Basic Service Set (BSS).
  - Using the same SSID is essential. Devices with different SSIDs are unable to communicate with each other. However, some access points allow connections from wireless stations which have their SSID set to “any” or whose SSID is blank (null).
  - A group of wireless stations and multiple access points, all using the same ID (ESSID), form an Extended Service Set (ESS).
  - Different access points within an ESS can use different channels. To reduce interference, it is recommended that adjacent access points *should* use different channels.
  - As wireless stations physically move through the area covered by an ESS, they will automatically change to the access point which has the least interference or best performance. This capability is called roaming.

Understanding Basic Wireless Security Options

The table below identifies the various basic wireless security options. A full explanation of these standards is available in Appendix B, “Wireless Networking Basics”.



Wireless Security

Network Authentication: Open

Data Encryption: Disable

Network Key:

Passphrase:

Key Value:

Key Index: Key 1

Figure 3-9: Basic Wireless Security options

Table 3-1. Basic Wireless Security Options

Field	Description
Network Authentication	You can select the following network authentication options: • Open: the ME103 does not perform any authentication. However, if the 802.1x option is configured, authentication of connections can be performed by a RADIUS server. • Shared: this is for shared key authentication. The SSID and data are encrypted.
Data Encryption	You can select the following data encryption options: • Disabled • 64- or 128-bit WEP With Open Network Authentication and 64- or 128-bit WEP Data Encryption, the ME103 *does* perform 64- or 128-bit data encryption but *does not* perform any authentication. However, if the 802.1x option is configured, authentication of connections will be performed by a RADIUS server.
Network 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 (key 1 must be the same for all, key 2 must be the same for all, etc.) There are two methods for creating WEP encryption keys: • Passphrase. These characters *are* case sensitive. Enter a word or group of printable characters in the Passphrase box and click the Generate button. **Note**: Not all wireless adapters support passphrase key generation. • Manual. These values *are not* case sensitive. 64-bit WEP: enter 10 hexadecimal digits (any combination of 0-9, a-f, or A-F). 128-bit WEP: enter 26 hexadecimal digits (any combination of 0-9, a-f, or A-F).
Configure 802.1x	WEP security can be compromised by a determined snoop. If you require the kind of strong security that is extremely difficult to compromise, use 802.1x RADIUS authentication as explained in "Configuring Advanced Security 802.1x Options" on page 5-1. For an explanation of 802.1x security, please see "Understanding 802.1x Port Based Network Access Control" on page B-9.

Information to Gather Before Changing Basic Wireless Settings

Before customizing your wireless settings, print this form and record the following information. If you are working with an existing wireless network, the person who set up or is responsible for the network will be able to provide this information. Otherwise, you will choose the settings for your wireless network. Either way, record the settings for your wireless network in the spaces below.

- **Wireless Network Name (SSID)*:*** ______________________________ The SSID, identifies the wireless network. You can use up to 32 alphanumeric characters. The SSID is case sensitive.

  Note: The SSID in the wireless adapter card must match the SSID of the wireless access point. In some configuration utilities (such as in Windows XP), the term “wireless network name” is used instead of SSID.
- **Authentication.** Circle one: **Open System** or **Shared Key**.
  Authentication is unrelated to encryption of data transmissions. Shared Key provides more network access security.

  Note: If you select Shared Key, the other devices in the network will not connect unless they are set to Shared Key as well and are configured with the correct key.
- **WEP Encryption key size**. Choose one: **64-bit** or **128-bit**. 128-bit provides stronger data security. Again, the encryption key size must be the same for the wireless adapters and the wireless access point.
- **Data Encryption (WEP) Keys**.

  There are two methods for creating WEP data encryption keys. Whichever method you use, record the key values in the spaces below.

  - **Passphrase method**. ______________________________ These characters *are* case sensitive. Enter a word or group of printable characters. When you enter the Passphrase and click the Generate Key button on the ME103, the keys will be generated.
  - **Manual method**. These values *are not* case sensitive. For 64-bit WEP, enter 10 hex digits (any combination of 0-9 or a-f). For 128-bit WEP, enter 26 hex digits.

  Key 1: ____________________________________

  Key 2: ____________________________________

  Key 3: ____________________________________

  Key 4: ____________________________________

Use the procedures described in the following sections to configure the ME103. Store this information in a safe place.

How to Set Up and Test Basic Wireless Connectivity

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

1. Log in to the ME103 using the MDI/MDIX name printed on the bottom of the unit or at its default address of *http://192.168.0.224* or at whatever IP address the unit is currently configured. Use the default user name of **admin** and default password of **password**, or whatever password you set up.
2. Click the Wireless Settings link in the main menu of the ME103.
3. Choose a suitable descriptive name for the wireless network name (SSID). In the SSID box, enter a value of up to 32 alphanumeric characters. The default SSID is NETGEAR.

   Note: The SSID of any wireless access adapters must match the SSID you configure in the ME103 802.11b ProSafe Wireless Access Point. If they do not match, you will not get a wireless connection to the ME103.
4. Select the Country Domain in which the wireless interface will operate.
5. Set the Channel. It should not be necessary to change the wireless channel unless you notice interference problems or are near another wireless access point. Select a channel that is not being used by any other wireless networks within several hundred feet of your wireless access point. For more information on the wireless channel frequencies see "Wireless Channels" on page B-7.
6. For initial configuration and testing, leave the Wireless Card Access List set to "Everyone" and the Encryption Strength set to "Disabled."
7. Click Apply to save your changes.

➡	**Note:** If you are configuring the ME103 from a wireless PC and you change the SSID, channel, or security settings, you will lose your wireless connection when you click Apply. You must then change the wireless settings of your PC to match the new settings.

8. Configure and test your PCs for wireless connectivity.

   Program the wireless adapter of your PCs to have the same SSID and channel that you configured in the ME103. Check that they have a wireless link and are able to obtain an IP address by DHCP from the ME103.

Once your PCs have basic wireless connectivity to the ME103, you can configure the advanced wireless security functions.

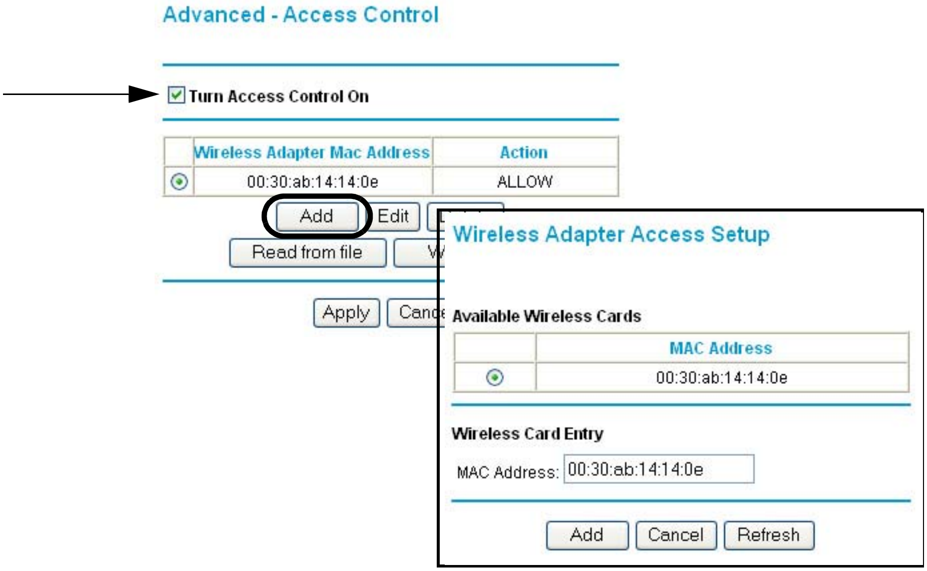
How to Restrict Wireless Access by MAC Address

To restrict access based on MAC addresses, follow these steps:

1. Log in to the ME103 using the MDI/MDIX name printed on the bottom of the unit or at its default address of *http://192.168.0.224* or at whatever IP address the unit is currently configured. Use the default user name of **admin** and default password of **password**, or whatever LAN address and password you have set up.

> **Note:** When configuring the ME103 from a wireless PC whose MAC address is not in the access control list, if you select Turn Access Control On, you will lose your wireless connection when you click Apply. You must then access the wireless access point from a wired PC or from a wireless PC which is on the access control list to make any further changes.

2. From the Wireless Settings menu, click the Setup Access List button to display the Wireless Access menu shown below.



Advanced - Access Control

☑ Turn Access Control On

	Wireless Adapter Mac Address	Action
●	00:30:ab:14:14:0e	ALLOW

Wireless Adapter Access Setup

Available Wireless Cards

	MAC Address
●	00:30:ab:14:14:0e

Wireless Card Entry

MAC Address: 00:30:ab:14:14:0e

Figure 3-10: Wireless Card Access List Setup

3. Click Add to add a wireless device to the wireless access control list. The Wireless Adapter Access Setup menu displays.

4. Select the Turn Access Control On check box.
5. Then, either select from the list of available wireless cards the ME103 has found in your area, or enter the MAC address and device name for a device you plan to use. You can usually find the MAC address printed on the wireless adapter.

   Tip: You can copy and paste the MAC addresses from the ME103's Station List menu into the MAC Address box. To do this, configure each wireless PC to obtain a wireless link to the ME103. The PC should then appear in the Station List menu.

   Tip: You can import a list of MAC addresses from saved a NETGEAR ME102 access point access control list. Alternatively, you can produce a list in a text file where each line is a single MAC address. For example, the MAC address is 00 12 34 aa bb cc can be typed in the following formats:

   - 001234aabbcc
   - 00 12 34 aa bb cc
   - 00-12-34-aa-bb-cc
   - 00:12:34:aa:bb:cc

   Only one MAC address per line is allowed. The valid characters are 0 to 9 and a, b, c, d, e, and f. The valid separators are those shown above. An invalid character will cause the line to be ignored.
6. Click Add to add the wireless device to the access list. Repeat these steps for each additional device you want to add to the list.
7. Be sure to click Apply to save your wireless access control list settings.

Now, only devices on this list will be allowed to wirelessly connect to the ME103.

How to Configure WEP

To configure WEP data encryption, follow these steps:

1. Log in to the ME103 using the NetBIOS name printed on the bottom of the unit or at its default address of *http://192.168.0.224* or at whatever IP address the unit is currently configured Use the default user name of **admin** and default password of **password**, or whatever LAN address and password you have set up.
2. Click the Wireless Settings link in the Basic section of the main menu of the ME103.
3. From the Wireless Settings menu drop-down list, select 64- or 128-bit encryption.
4. 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 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.

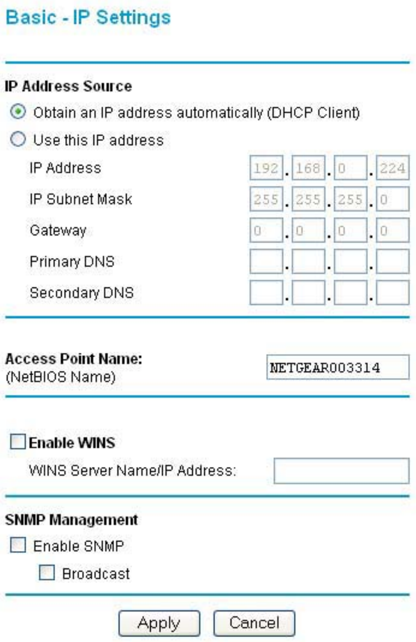
See “Overview of WEP Parameters” on page B-5 for a full explanation of each of these options, as defined by the IEEE 802.11 wireless communication standard.

5. Click Apply to save your settings.

Note: If you use a wireless PC to configure WEP settings, you will be disconnected when you click Apply. Reconfigure your wireless adapter to match the new settings or access the wireless access point from a wired PC to make any further changes.

Using the Basic IP Settings Options

The Basic IP Settings menu is under the Basic heading of the main menu. Use this menu to configure DHCP, static IP, access point NetBIOS name, WINS, and SNMP settings.



Basic - IP Settings

IP Address Source

● Obtain an IP address automatically (DHCP Client)

○ Use this IP address

IP Address	192 . 168 . 0 . 224
IP Subnet Mask	255 . 255 . 255 . 0
Gateway	0 . 0 . 0 . 0
Primary DNS	. . .
Secondary DNS	. . .

Access Point Name: (NetBIOS Name) NETGEAR003314

□ **Enable WINS**

WINS Server Name/IP Address:

SNMP Management

□ Enable SNMP

□ Broadcast

Figure 3-11: Basic IP Settings Menu

- **The IP Address Source**

  The wireless access point is shipped preconfigured to use a private IP address on the LAN side, and to act as a DHCP client. If the wireless access point does not find a DHCP server on the Ethernet LAN, it defaults to this IP configuration:

  – IP Address— 192.168.0.224

  – IP Subnet Mask— 255.255.255.0

  – Gateway — 0.0.0.0

  – Primary DNS — *blank*

  – Secondary DNS — *blank*

  If your network has a requirement to use a different IP addressing scheme, you can make those changes in this menu. These settings are only required if the “Use this IP address” radio button is chosen. Remember to click Apply to save your changes.

- **Access Point Name (NetBIOS)**

  Enter a new name for the wireless access point and click Apply to save your changes.

- **Enable EWINS**

  This allows your wirelessly connected PCs to browse the remote network using the Windows Network Neighborhood feature. Select this check box, enter the WINS Server name or IP address, and click Apply to save your changes.

- **SNMP Management**

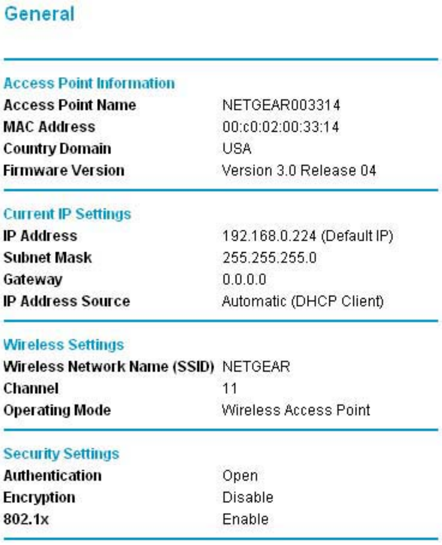
  This allows your take advantage of the management features supported in the ME103 MIBs.

Chapter 4
Maintenance

This chapter describes how to use the management features of your ME103 802.11b ProSafe Wireless Access Point. These features can be found by clicking on the Maintenance heading in the Main Menu of the browser interface.

Viewing General, Log, Station, and Statistical Information

The General information screen provides a summary of the current ME103 configuration settings. From the main Menu of the browser interface, click General to view the System Status screen, shown below.



General

Access Point Information	
Access Point Name	NETGEAR003314
MAC Address	00:c0:02:00:33:14
Country Domain	USA
Firmware Version	Version 3.0 Release 04
Current IP Settings	
IP Address	192.168.0.224 (Default IP)
Subnet Mask	255.255.255.0
Gateway	0.0.0.0
IP Address Source	Automatic (DHCP Client)
Wireless Settings	
Wireless Network Name (SSID)	NETGEAR
Channel	11
Operating Mode	Wireless Access Point
Security Settings	
Authentication	Open
Encryption	Disable
802.1x	Enable

Figure 4-1: Wireless Access Point Status screen

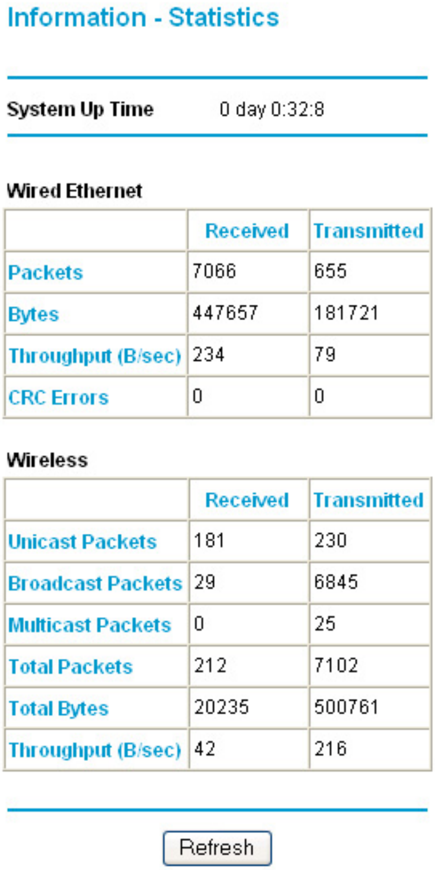
This screen shows the following parameters:

Table 4-1. General Information Fields

Field	Description
Access Point Information	
Access Point Name	The default name may be changed if desired. **Note**: In 802.1x mode, this name is used as the client Login name for the RADIUS server.
MAC Address	Displays the Media Access Control address (MAC address) of the wireless access point's Ethernet port.
Country Domain	Displays the domain or region for which the wireless access point is licensed for use. It may not be legal to operate this wireless access point in a region other than one of those identified in this field.
Firmware Version	The version of the firmware currently installed.
Current IP Settings	These parameters apply to the Local ME103 firewall.
IP Address	The IP address of the wireless access point.
Subnet Mask	The subnet mask for the wireless access point.
Gateway	The default gateway for the wireless access point communication.
IP Address Source	Automatic (DHCP client) indicates that the current IP address was obtained from a DHCP server on your network.
Wireless Settings	These parameters apply to the target remote ME103 firewall, VPN gateway, or VPN client.
Wireless Network Name (SSID)	Displays the wireless network name (SSID) being used by the wireless port of the wireless access point. The default is NETGEAR.
Channel	Identifies the channel the wireless port is using. 11 is the default channel setting. See "Wireless Channels" on page B-7 for the frequencies used on each channel.
Operating Mode	Identifies the operating mode of the ME103.
Security Settings	
Authentication	WEP or 802.1x authentication setting.
Encryption	The current WEP or 802.1x encryption setting.
802.1x	The current 802.1x setting.

Statistics

The Information - Statistics screen provides various LAN and WLAN statistics.



Information - Statistics

System Up Time	0 day 0:32:8

Wired Ethernet

	Received	Transmitted
Packets	7066	655
Bytes	447657	181721
Throughput (B/sec)	234	79
CRC Errors	0	0

Wireless

	Received	Transmitted
Unicast Packets	181	230
Broadcast Packets	29	6845
Multicast Packets	0	25
Total Packets	212	7102
Total Bytes	20235	500761
Throughput (B/sec)	42	216

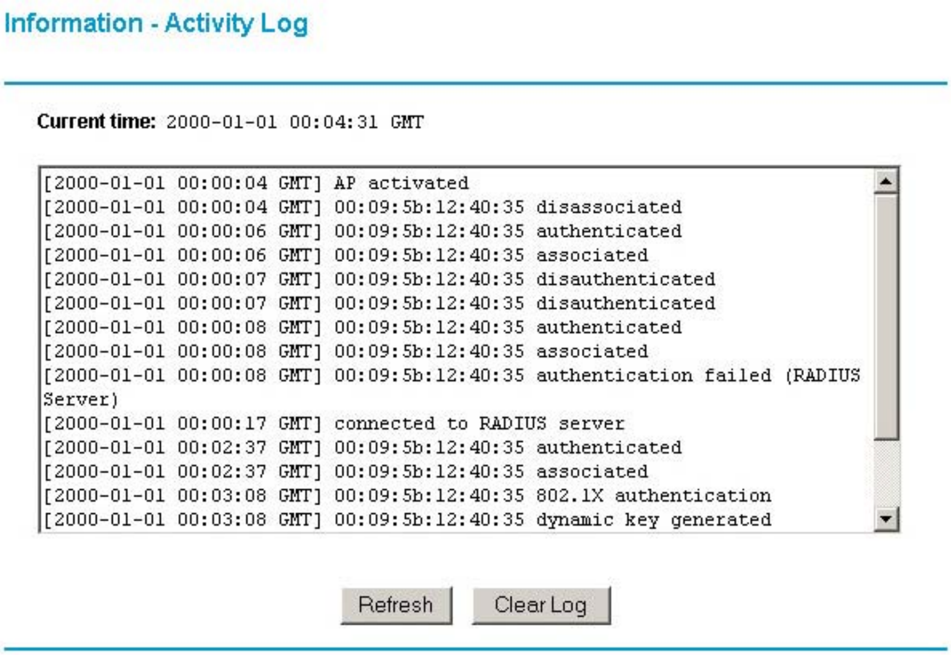
Figure 4-2: Wireless Access Point Status screen

Table 4-1. Statistics Fields

Field	**Description**
System Up Time	The length of time the ME103 802.11b ProSafe Wireless Access Point has been connected to your network since it was last restarted.
Wired Ethernet Received/Transmitted	
Packets	The number of packets sent since the ME103 was last restarted.
Bytes	The number of bytes sent since the ME103 was last restarted.
Throughput (B/sec)	The current bandwidth used on the LAN port.
CRC Errors	The number of CRC errors since the ME103 was last restarted.
Wireless Received/Transmitted	
Unicast Packets	The Unicast packets sent since the ME103 was last restarted.
Broadcast Packets	The Broadcast packets sent since the ME103 was last restarted.
Multicast Packets	The Multicast packets sent since the ME103 was last restarted.
Total Packets	The Wireless packets sent since the ME103 was last restarted.
Total Bytes	The Wireless bytes sent since the ME103 was last restarted.
Throughput (B/sec)	The current bandwidth used on the wireless port.
Refresh button	Click the Refresh button to update the statistics on this screen.

Activity Log

Use the Activity Log to view step-by-step login exchanges or other information about the wireless communications sessions on the ME103 802.11b ProSafe Wireless Access Point.



Information - Activity Log

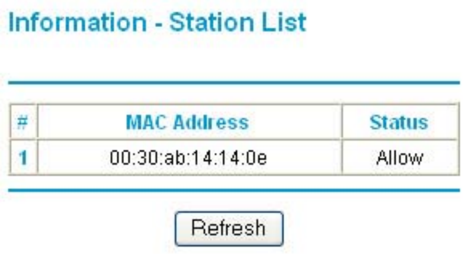
Current time: 2000-01-01 00:04:31 GMT

```
[2000-01-01 00:00:04 GMT] AP activated
[2000-01-01 00:00:04 GMT] 00:09:5b:12:40:35 disassociated
[2000-01-01 00:00:06 GMT] 00:09:5b:12:40:35 authenticated
[2000-01-01 00:00:06 GMT] 00:09:5b:12:40:35 associated
[2000-01-01 00:00:07 GMT] 00:09:5b:12:40:35 disauthenticated
[2000-01-01 00:00:07 GMT] 00:09:5b:12:40:35 disauthenticated
[2000-01-01 00:00:08 GMT] 00:09:5b:12:40:35 authenticated
[2000-01-01 00:00:08 GMT] 00:09:5b:12:40:35 associated
[2000-01-01 00:00:08 GMT] 00:09:5b:12:40:35 authentication failed (RADIUS
Server)
[2000-01-01 00:00:17 GMT] connected to RADIUS server
[2000-01-01 00:02:37 GMT] 00:09:5b:12:40:35 authenticated
[2000-01-01 00:02:37 GMT] 00:09:5b:12:40:35 associated
[2000-01-01 00:03:08 GMT] 00:09:5b:12:40:35 802.1X authentication
[2000-01-01 00:03:08 GMT] 00:09:5b:12:40:35 dynamic key generated
```

Figure 4-3: Activity Log screen

Viewing a List of Attached Devices

The Station List menu contains a table of all IP devices associated with the wireless access point in the wireless network defined by the Wireless Network Name (SSID). From the main menu of the browser interface, under the Information heading, click the Station List link to view the list, shown below.



Information - Station List

#	MAC Address	Status
1	00:30:ab:14:14:0e	Allow

Figure 4-4: Information Station List of associated devices

For each device, the table shows the MAC address and whether the device is allowed to communicate with the wireless access point or not. Note that if the wireless access point is rebooted, the table data is lost until the wireless access point rediscovers the devices. To force the wireless access point to look for associated devices, click the Refresh button.

Note: A wireless network can include multiple wireless access points, all using the same network name (SSID). This enables extending the reach of the wireless network and allows users to roam from one access point to another, providing seamless network connectivity. Under these circumstances, be aware that only the stations associated with this access point will be presented in the Station List.

Upgrading the Wireless Access Point Software

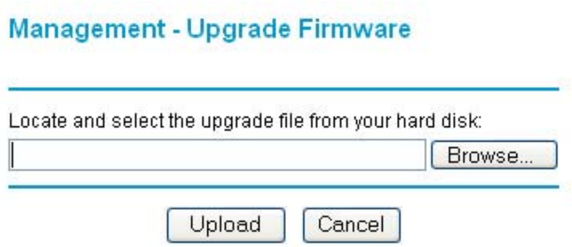
> **Note:** When uploading software to the ME103 Access Point, it is important not to interrupt the Web browser by closing the window, clicking a link, or loading a new page. If the browser is interrupted, the upload may fail, corrupt the software, and render the ME103 completely inoperable.

You cannot perform the firmware upgrade from a workstation connected to the ME103 via a wireless link. The firmware upgrade must be performed via a workstation connected to the ME103 via the Ethernet LAN interface.

The software of the ME103 Access Point is stored in FLASH memory, and can be upgraded as new software is released by NETGEAR. Upgrade files can be downloaded from Netgear's Web site. If the upgrade file is compressed (.ZIP file), you must first extract the image (.IMG) file before sending it to the wireless access point. The upgrade file can be sent using your browser.

Note: The Web browser used to upload new firmware into the ME103 must support HTTP uploads, such as Microsoft Internet Explorer 5.0 or above, or Netscape Navigator 4.78 or above.

1. Download the new software file from NETGEAR, save it to your hard disk, and unzip it.



Management - Upgrade Firmware

Locate and select the upgrade file from your hard disk:

Figure 4-5: ME103 Upgrade menu

2. From the main menu Management section, click the Upgrade Firmware link to display the screen above.
3. In the Upgrade Firmware menu, click the Browse button and browse to the location of the image (.IMG) upgrade file.

4. Click Upload.

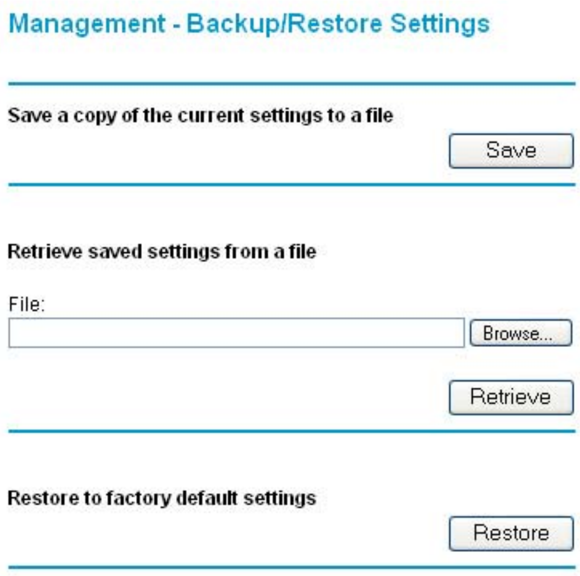
   When the upload completes, your wireless access point will automatically restart. The upgrade process typically takes about one minute.

In some cases, you may need to reconfigure the wireless access point after upgrading.

Configuration File Management

The ME103 Access Point settings are stored in the wireless access point in a configuration file. This file can be saved (backed up) to a user’s PC, retrieved (restored) from the user’s PC, or cleared to factory default settings.

From the main menu Management heading, click the Backup/Restore Settings link to bring up the menu shown below.



Management - Backup/Restore Settings

Save a copy of the current settings to a file

Retrieve saved settings from a file

File:

Restore to factory default settings

Figure 4-6: Settings Backup menu

The three options displayed are described in the following sections:

Saving and Retrieving the Configuration

The Backup/Restore Settings menu allows you to save or retrieve a file containing your wireless access point's configuration settings.

To save your settings, click the Save button. Your browser will extract the configuration file from the wireless access point and prompts you for a location on your PC to store the file. You can give the file a meaningful name at this time, such as `operations.cfg`.

To restore your settings from a saved configuration file, enter the full path to the file on your PC or click the Browse button to locate the file. When you have located it, click the Retrieve button to upload the file. After completing the upload, the ME103 will reboot automatically.

Restoring the ME103 to the Factory Default Settings

It is sometimes desirable to restore the wireless access point to the factory default settings. This can be done by using the Restore function, which restores all factory settings. After a restore, the wireless access point's password will be **password**, the ME103's DHCP client is enabled, the default LAN IP address is 192.168.0.224, and the NetBIOS name is reset to the name printed on the label on the bottom of the unit.

Using the Reset Button to Restore Factory Default Settings

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 wireless access point (see "ME103 Wireless Access Point Rear Panel" on page 2-7). The reset button has two functions:

- **Reboot.** When pressed and released, the Wireless Access Point will reboot (restart).
- **Reset to Factory Defaults.** This button can also be used to clear all data and restore all settings to the factory default values.

To clear all data and restore the factory default values:

1. Power Off the ME103
2. Hold the Reset Button down while you Power On the ME103.
3. Continue holding the Reset Button until the LEDs blink twice.
4. Release the Reset Button.

The factory default configuration has now been restored, and the ME103 is ready for use.

Changing the Administrator Password

The default password is **password**. Change this password to a more secure password. You cannot change the administrator login name.

From the main menu of the browser interface, under the Management heading, click Change Password to bring up the menu shown below.

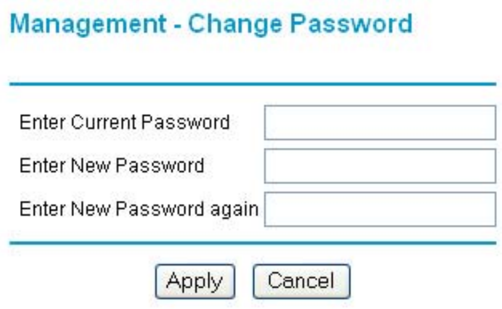


Figure 4-7: Set Password menu

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

Chapter 5
Advanced Configuration

This chapter describes how to configure the advanced features of your ME103 802.11b ProSafe Wireless Access Point. These features can be found under the Advanced heading in the main menu.

Configuring Advanced Security 802.1x Options

For an overview of 802.1x, see "Understanding 802.1x Port Based Network Access Control" on page B-9. The ME103 802.11b ProSafe Wireless Access Point supports these 802.1x options:

- **Key Exchange**. Key exchange (PEAP, EAP-TLS, EAP-TTLS) provides strong security through mutual authentication and automatic key exchange between the two endpoints. Periodic updates are performed using public-key cryptography through a certificate server and a Remote Authentication Dial-In User Service (RADIUS) server.

The ME103 configuration procedures for these options are presented below.

Basic Requirements for 802.1x

802.1x requires these parts:

1. Authenticator: ME103
2. Authentication Server - a RADIUS server.

   Microsoft Internet Authentication Server (IAS) provides RADIUS functionality. Other vendors also support RADIUS for 802.1x.
3. Supplicant - Windows 2000 with the 802.1x client patch applied (SP4 802.1x client) or Windows XP.
4. Optionally, the Key Exchange options (PEAP, EAP-TLS, and EAP-TTLS) can take advantage of a Certificate Authority (CA) such as Windows 2000 server provides. To use certificate-based authentication, both the RADIUS server and the client need to have a certificate from a certificate server such as Windows 2000 or a public service such as Verisign.

With the above basic requirements, 802.1x security can be implemented with the ME103. Refer to "Understanding 802.1x Port Based Network Access Control" on page B-9 for a description of basic 802.1x functionality.

How to Configure the 802.1x Key Exchange Option

Follow this procedure to configure the ME103 for 802.1x Key Exchange security. The sample configuration worksheet below is filled in with the parameters used in this procedure. To configure your ME103, print and fill out the blank worksheet found at the end of this section and record your network configuration. A blank worksheet is provided below.

Key Exchange Configuration Worksheet

802.1x Key Exchange Security Settings	
WEP Encryption Key Length:	**128/64-bit**
Note: Be sure your wireless adapter has the WEP 128/64-bit encryption feature enabled.	
RADIUS Port:	**1812**
RADIUS Shared Key:	**r>T(h4&3@#kB**

Network	**LAN IP Network Address**	**Subnet Mask**	**Gateway IP (LAN IP Address)**
ME103	**192.168.0.2**	**255.255.255.0**	**192.168.0.1**

1. **Configure the RADIUS server to use the 802.1x settings in the worksheet above.**
   a. Add the ME103 to the RADIUS server using either its IP address or the NetBIOS name.
   b. Set the shared key. Both the ME103 and the RADIUS entries should use the same shared key so that the RADIUS server allows the ME103 to log in to the RADIUS server.
2. **Configure the ME103 802.1x Key Exchange parameters.**
   a. Log in to the ME103 using the NetBIOS name printed on the bottom of the unit, or at its default address of *http://192.168.0.224,* or at whatever IP address the unit is currently configured with. Use the default user name of **admin** and password of **password**. Click the Security Settings link in the main menu Advanced section to display the Advanced Security Settings menu.

Note: Perform this procedure from a LAN connected computer rather than over a wireless link. This procedure will change the ME103's data encryption settings, so all wireless connections will be disconnected when you apply the settings.

b. Fill in the settings from the worksheet as illustrated above.

Data Encryption (WEP) features are not functional in this mode. Key Exchange mode automatically supplies the encryption keys and changes the keys regularly at short intervals.

c. Click Apply.

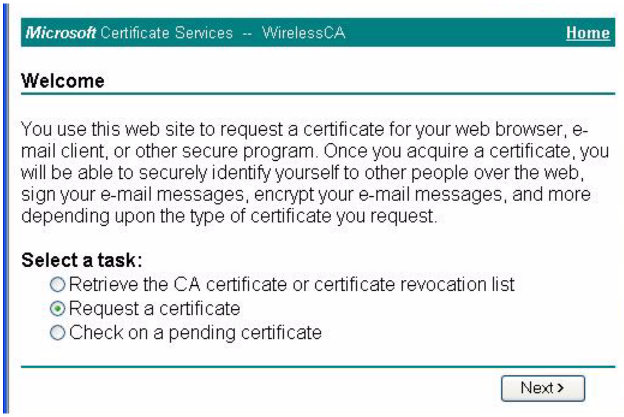
➡	**Note:** The idle timeout on the ME103 is 10 minutes. If there is no traffic for 10 minutes, the 802.1x supplicant (wireless client) will be automatically disconnected.

3. Configure the PCs on network to use the 802.1x and WEP settings you just applied to the ME103.

Note: At this time, only Windows XP includes built-in support for 802.1x. Windows 2000 can support 802.1x with the appropriate SP4 patch. There are also third party client software packages which will provide 802.1x support for a variety of Windows, Macintosh, Unix, and Linux clients. The information below is an example of one of many possible scenarios you may encounter when deploying 802.1x. NETGEAR does not provide support for Windows or third party software.

a. Using a computer connected via the Ethernet LAN, obtain and install a certificate.

Note: In this example, you must perform this operation from a wired connection to the Windows 2000 certificate server. A wireless connection through the ME103 will not be available until after the certificate is already recorded by the client Windows operating system.



Microsoft Certificate Services -- WirelessCA

Home

Welcome

You use this web site to request a certificate for your web browser, e-mail client, or other secure program. Once you acquire a certificate, you will be able to securely identify yourself to other people over the web, sign your e-mail messages, encrypt your e-mail messages, and more depending upon the type of certificate you request.

Select a task:

○ Retrieve the CA certificate or certificate revocation list
● Request a certificate
○ Check on a pending certificate

Figure 5-1: Request a certificate

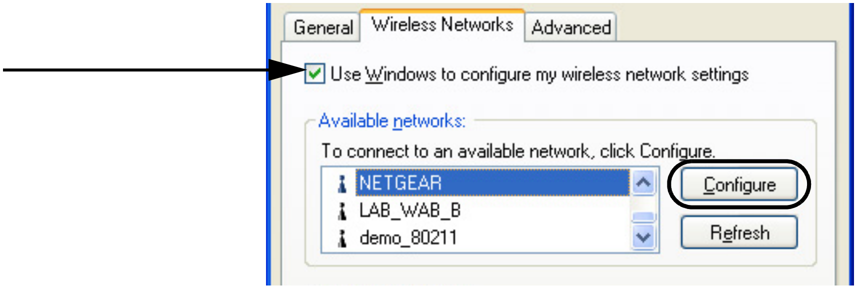
Note: The procedure for obtaining certificates differs between a CA like Verisign and a CA such as a Windows 2000 certificate server. Organizations operate Windows 2000 certificate servers to provide certificates for its members. For example, an administrator of a Windows 2000 certificate server might provide a certificate to you via e-mail rather than connecting directly as shown in this example.

– Obtain the certificate which includes the public key from a Certificate Authority (CA).

– Install this certificate in the Windows Root Certificate Store.

– After installing the certificate on the Windows client, switch from the wired Ethernet connection to the wireless adapter.

b. Verify that the “Use Windows to configure my wireless network settings” check box is selected in the Windows XP Network Connections wireless adapter properties dialog box Wireless Networks tab page.



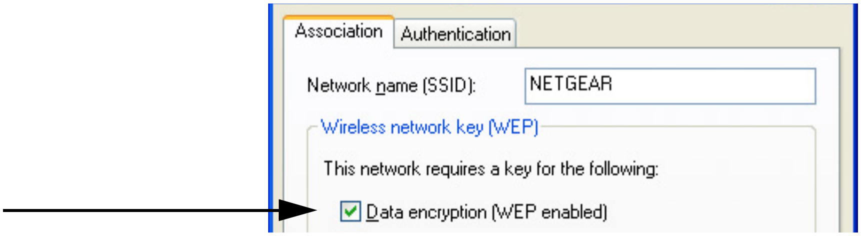
☑ Use Windows to configure my wireless network settings

Available networks:

To connect to an available network, click Configure.

Figure 5-2: Windows XP wireless adapter configuration utility

c. Select the wireless network to which you will connect (NETGEAR in the screen above), and click the Configure button to display the Wireless network properties dialog box shown below.



Network name (SSID): NETGEAR

Wireless network key (WEP)

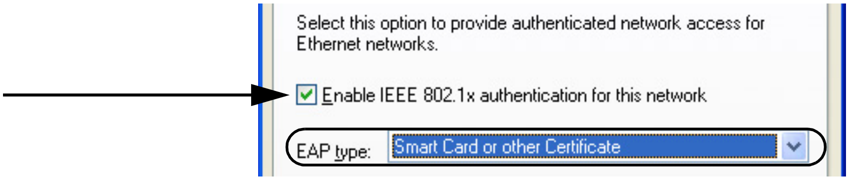
This network requires a key for the following:

☑ Data encryption (WEP enabled)

Figure 5-3: Configure a Windows XP wireless adapter association

d. Select only the “Data encryption (WEP enabled)” check box.

e. Click the Authentication tab to display the screen below.



Select this option to provide authenticated network access for Ethernet networks.

☑ Enable IEEE 802.1x authentication for this network

EAP type: Smart Card or other Certificate

Figure 5-4: Configure a Windows XP wireless adapter for EAP-TLS

f. Configure the wireless adapter to enable 802.1x authentication by selecting the “Enable IEEE 802.1x authentication for this network” check box.

g. Click OK to apply the settings to your wireless adapter.

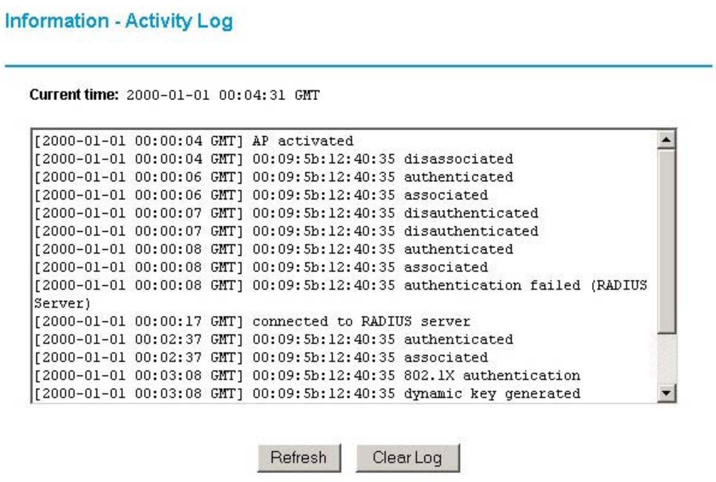
h. The first time you establish the EAP-TLS wireless session from a client workstation, Windows will prompt you to verify that the certificate it found is the correct one.

➡	**Note:** During the authentication processes, there is a session timeout. If either the authenticator or the client does not respond with the proper data to the other side in 30 seconds, the authentication fails. If this happens, you should physically remove the wireless adapter from your computer, and re-insert it to start the authentication again. In addition, if the ME103 is rebooted, you should physically remove the wireless adapter from your computer and re-insert it to start the authentication again.

4. View the ME103 log and check the connection

To check the connection, you can initiate a request from a wireless device to the network.

Use the ME103 Activity Log to monitor the initiation of the 802.1x wireless session.



Information - Activity Log

Current time: 2000-01-01 00:04:31 GMT

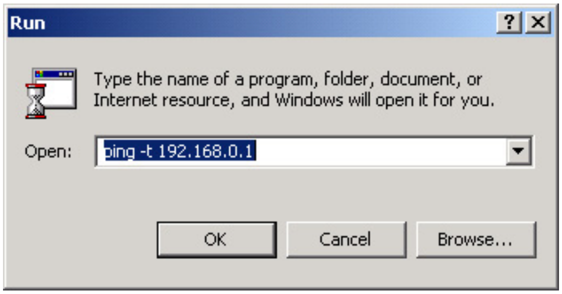
```
[2000-01-01 00:00:04 GMT] AP activated
[2000-01-01 00:00:04 GMT] 00:09:5b:12:40:35 disassociated
[2000-01-01 00:00:06 GMT] 00:09:5b:12:40:35 authenticated
[2000-01-01 00:00:06 GMT] 00:09:5b:12:40:35 associated
[2000-01-01 00:00:07 GMT] 00:09:5b:12:40:35 disauthenticated
[2000-01-01 00:00:07 GMT] 00:09:5b:12:40:35 disauthenticated
[2000-01-01 00:00:08 GMT] 00:09:5b:12:40:35 authenticated
[2000-01-01 00:00:08 GMT] 00:09:5b:12:40:35 associated
[2000-01-01 00:00:08 GMT] 00:09:5b:12:40:35 authentication failed (RADIUS
Server)
[2000-01-01 00:00:17 GMT] connected to RADIUS server
[2000-01-01 00:02:37 GMT] 00:09:5b:12:40:35 authenticated
[2000-01-01 00:02:37 GMT] 00:09:5b:12:40:35 associated
[2000-01-01 00:03:08 GMT] 00:09:5b:12:40:35 802.1X authentication
[2000-01-01 00:03:08 GMT] 00:09:5b:12:40:35 dynamic key generated
```

Figure 5-5: Information Activity Log for starting a 802.1x wireless connection

The simplest method is to ping the LAN IP address of another computer on the Ethernet LAN.

a. From a wireless PC, on the Windows taskbar click the Start button, then click Run.

b. Type **`ping -t 192.168.0.1`** , and click OK.

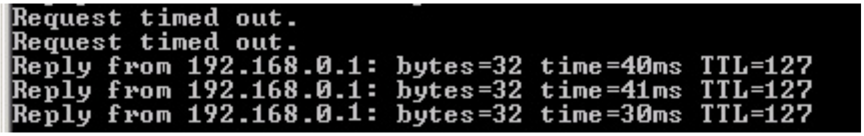


Type the name of a program, folder, document, or Internet resource, and Windows will open it for you.

Open: ping -t 192.168.0.1

Figure 5-6: Running a Ping test from Windows

c. This command causes a continuous ping to be sent. Between several seconds to two minutes, the ping response should change from “timed out” to “reply.”



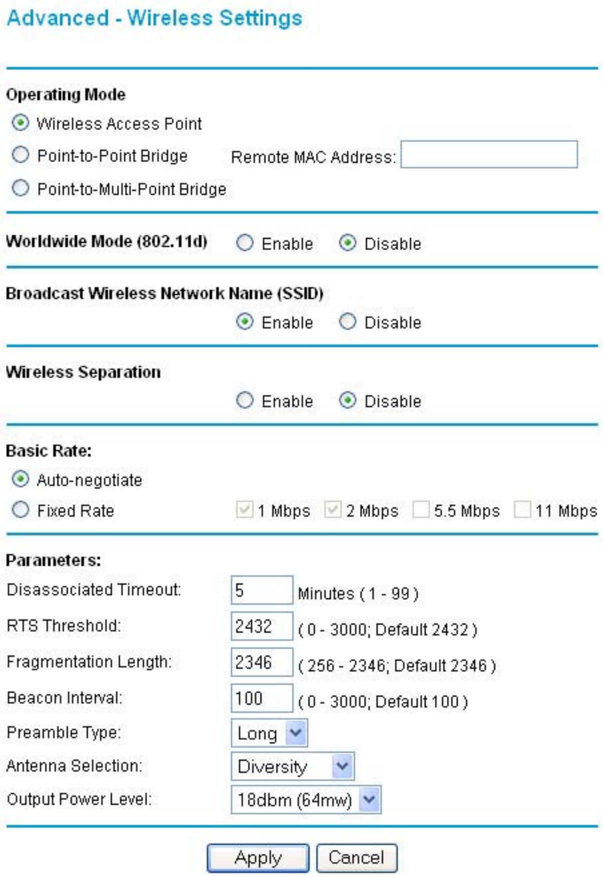
```
Request timed out.
Request timed out.
Reply from 192.168.0.1: bytes=32 time=40ms TTL=127
Reply from 192.168.0.1: bytes=32 time=41ms TTL=127
Reply from 192.168.0.1: bytes=32 time=30ms TTL=127
```

Figure 5-7: Ping test results

At this point the connection is established and your wireless connection is working.

Understanding Advanced Wireless Settings

The default advanced wireless settings usually work well. These settings should not be changed unless you are sure it is necessary.



Advanced - Wireless Settings

Operating Mode

● Wireless Access Point

○ Point-to-Point Bridge   Remote MAC Address:

○ Point-to-Multi-Point Bridge

Worldwide Mode (802.11d)   ○ Enable   ● Disable

Broadcast Wireless Network Name (SSID)

● Enable   ○ Disable

Wireless Separation

○ Enable   ● Disable

Basic Rate:

● Auto-negotiate

○ Fixed Rate   ☑ 1 Mbps   ☑ 2 Mbps   □ 5.5 Mbps   □ 11 Mbps

Parameters:

Disassociated Timeout:	5	Minutes (1 - 99)
RTS Threshold:	2432	(0 - 3000; Default 2432)
Fragmentation Length:	2346	(256 - 2346; Default 2346)
Beacon Interval:	100	(0 - 3000; Default 100)
Preamble Type:	Long	
Antenna Selection:	Diversity	
Output Power Level:	18dbm (64mw)	

Figure 5-8: Advanced Wireless Settings screen

Table 5-1. Advanced Wireless Settings Fields

Field	Description
Operating Mode	You can select the following options: • Wireless Access Point • Point-to-Point Bridge • Point-to-Multi-Point Bridge
Worldwide Mode	If you enable 802.11d, you will have access to additional regulatory domains.
Broadcast Wireless Network Name (SSID)	If you disable broadcast of the SSID, only devices that have the correct SSID can connect. Disabling SSID broadcast nullifies the wireless network 'discovery' feature of some products such as Windows XP.
Wireless Separation	Enable wireless separation avoid channel assignment interference.
Basic Rate	This field determines which data communications rate will be used. It should not be necessary to change from the default of *Auto-negotiate* unless you notice interference problems. There are times when lowering the data rate will help assure a more reliable wireless connection.
Parameters	Use these parameters to set the radio frequency communications settings.
RTS Threshold	The packet size used to determine whether it should use the CSMA/CD (Carrier Sense Multiple Access with Collision Detection) or the CSMA/CA (Carrier Sense Multiple Access with Collision Avoidance) mechanism for packet transmission.
Fragmentation Length	This is the maximum packet size used for fragmentation. Packets larger than the size programmed in this field will be fragmented. The Fragment Threshold value must be larger than the RTS Threshold value.
Beacon Interval	Specifies the data beacon rate between 20 and 3000.
Preamble Type	A long transmit preamble may provide a more reliable connection or slightly longer range. A short transmit preamble gives better performance. Long is the default.
Antenna Selection	You can select the following options: • Primary (R) • Secondary (L) • Diversity - note that ME103 diversity is provided in receive mode only, not in transmit mode. The PRIMARY RF port provides transmit and receive. The SECONDARY provides receive mode only.
Output Power Level	Lowering the output power level lets you reduce the chance of interference with other nearby access points and reduces the coverage range. You can set the power output level of the transmitter to these options: 18dbm (64mw), 17dbm (50mw), 15dbm (30mw), 13dbm (20mw), 7dbm (5mw), 0dbm (1mw).

Configuring Wireless Operating Modes

The ME103 802.11b ProSafe Wireless Access Point lets you build large bridged wireless networks. Examples of wireless bridged configurations are:

- Client Access Point to Access Point.
- Point-to-Point Bridge.
- Multi-point bridging.

These features are discussed below.

How to Configure a ME103 as a Point-to-Point Bridge

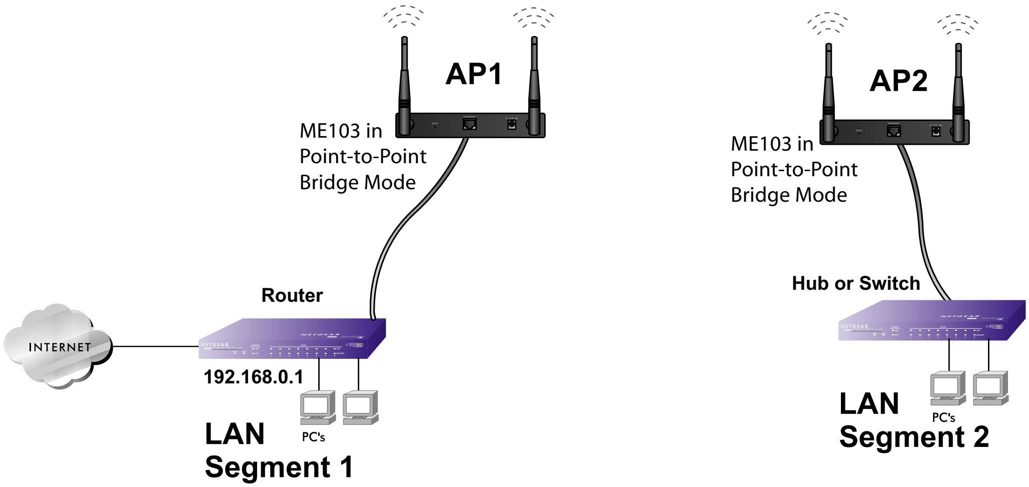


Figure 5-9: Point-to-Point Bridge

1. Configure the ME103 (AP1) on LAN Segment 1 in Point-to-Point Bridge mode.
2. Configure the ME103 (AP2) on LAN Segment 2 in Point-to-Point Bridge mode.
   AP1 must have AP2's MAC address in its Remote MAC Address field and AP2 must have AP1's MAC address in its Remote MAC Address field.
3. Configure and verify the following parameters for both access points:
   - Verify that the LAN network configuration of the ME103 Access Points both are configured to operate in the same LAN network address range as the LAN devices
   - Both use the same ESSID, Channel, authentication mode, if any, and security settings if security is in use.

4. Verify connectivity across the LAN 1 and LAN 2.
   - A PC on either LAN segment should be able to connect to the Internet or share files and printers of any other PCs or servers connected to LAN Segment 1 or LAN Segment 2.

How to Configure Multi-Point Wireless Bridging

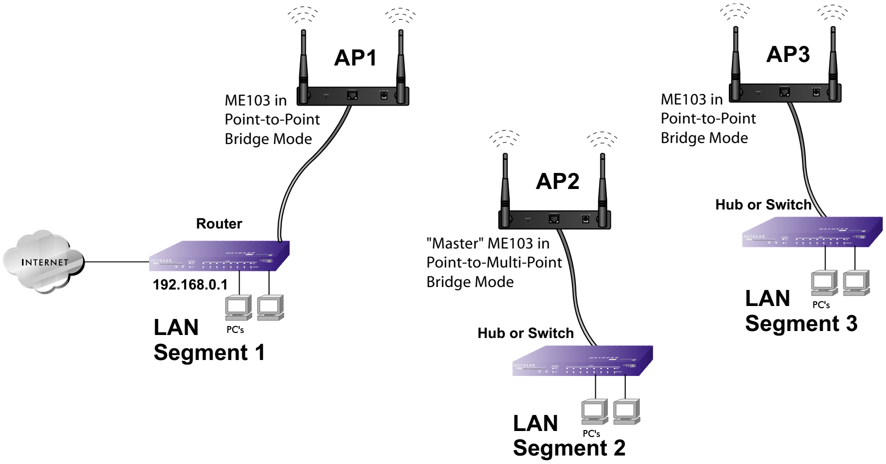


Figure 5-10: Multi-Point bridging

1. Configure the Operating Mode of the ME103 Access Points.
   – ME103 (AP1) on LAN Segment 1 in Point-to-Point Bridge mode with the Remote MAC Address of AP2.

   – Because it is in the central location, configure ME103 (AP2) on LAN Segment 2 in Point-to-Multi-Point Bridge mode. No MAC address is required because it will respond to Point-to-Point APs which are configured communicating to it.

   – Configure the ME103 (AP3) on LAN 3 in Point-to-Point Bridge mode with the Remote MAC Address of AP2.

2. Verify the following parameters for all access points:
   - Verify that the LAN network configuration the ME103 Access Points are configured to operate in the same LAN network address range as the LAN devices
   - Only one AP is configured in Point-to-Multi-Point Bridge mode, and all the others are in Point-to-Point Bridge mode.

- All APs must be on the same LAN. That is, all the APs LAN IP address must be in the same network.
- If using DHCP, all ME103 Access Points should be set to “Obtain an IP address automatically (DHCP Client)” in the IP Address Source portion of the Basic IP Settings menu.
- All ME103 Access Points use the same SSID, Channel, authentication mode, if any, and encryption in use.
- All Point-to-Point APs must have AP2’s MAC address in its Remote AP MAC address field.

3. Verify connectivity across the LANs.
   - A PC on any LAN segment should be able to connect to the Internet or share files and printers with any other PCs or servers connected to any of the three LAN segments.
   - Wireless stations will not be able to connect to the ME103 Access Points in the illustration above. If you require warless stations to access any lan segment, you can additional ME103 Access Points configured in Wireless Access Point mode to any LAN segment.

Note: You can extend this multi-point bridging by adding additional ME103s configured in Point-to-Point mode for each additional LAN segment. Furthermore, you can extend the range of the wireless network with NETGEAR wireless antenna accessories.

Antenna Installation

The ME103 comes with two removable 2-dBi antenna. Two antennae provide what is called “space diversity”, which helps to combat the addition of electromagnetic waves in the space where the unit is installed. This effect is called “multipath fading.” Multipath fading is generated by the multiple reflections of electromagnetic waves in an office due to walls, ceiling, floors, partitions, doors, metallic polls, cubicles, etc. and the motion of people and objects. The benefits of two antennae are evident when there is distance or obstructions in the line of sight between the ME103 and the clients. When only one antenna is used, a degradation of up to 50% of data throughput can be noticed in several spots of the coverage and also at the fringes of the range.

The two 2dBi antenna are dipole and use vertical polarization. They provide an optimal radiation pattern in the plane perpendicular to their direction. When oriented vertically, they provide a optimal range in the horizontal plane (horizontal donut shaped signals). If the office is small and on multiple floors, it is advised to put the antenna flat so that the maximum coverage is vertical rather than horizontal. When the office is an odd shape, NETGEAR advises you to do some orientation trials.

For applications requiring more range, wireless accessories can be used such as external antennae and bi-directional booster(s). The first optional update is replacing the two 2dBi antennae by two 5-7dBi dipole antennae. Simply turn the ME103 off, unscrew the two antenna, and screw on the new ones. Be sure to use antenna with a reversed SMA connector.

Another solution is to relocate the antenna(e) with an RF cable to an optimal spot such as a ceiling, high on a wall, etc. One typical application is to locate the ME103 is in a secure location like a data center. Two external antenna are placed outside the room, for example on the ceiling, and connected with RF cables to the ME103. Another application is two external directional antennae, one pointing to one side of the building, and the other to the other side. Be aware of the loss in the cable. If the cable is too long and used with a medium gain antenna, the gain from placing the antenna in good spot may be reduced or eliminated. Only high gain antenna (more than 10dBi) should be used with a long cable such as 5 or 10m.

To cope with this inherent limitation, NETGEAR also provides bi-directional booster. This component amplifies the RF signal in transmit mode and in receive mode. It automatically switches itself to the receive or transmit mode. The booster is placed very close to the antenna and provides an outstanding output RF power of 500mW or 27dBm. It also includes a low noise amplifier for the receive path of 10dB gain minimum. The antenna and booster can be connected with a cable as long as 10 to 15m from the ME103 without any performance reduction.

Note that ME103 diversity is provided only in receive mode, not in transmit mode. The Primary RF port provides transmit and receive. The Secondary RF port provides receive mode only. Therefore passive components such as external antennae can be connected to either Primary or Secondary ME103 RF ports. However, an active device such as bi-directional booster has to be used on the Primary RF port only. If using one booster on each Primary and Secondary RF port, the one connected to the Secondary will boost only the receive signals.

Blank Configuration Worksheet

EAP-TLS Configuration Worksheet

EAP-TLS 802.1x Security Settings

WEP Encryption Key Length:

RADIUS Port:

RADIUS Shared Key:

Network	LAN IP Network Address	Subnet Mask	Gateway IP (LAN IP Address)

Chapter 6
Troubleshooting

This chapter provides information about troubleshooting your ME103 802.11b ProSafe Wireless Access Point. After each problem description, instructions are given to help you diagnose and solve the problem. For the common problems listed, go to the section indicated.

- Is the ME103 on?
- Have I connected the wireless access point correctly?

  Go to "Installing the ME103 802.11b ProSafe Wireless Access Point" on page 3-5.
- I cannot remember the wireless access point's configuration password.

  Go to "Changing the Administrator Password" on page 4-10.

➡	**Note:** For up-to-date ME103 installation details and troubleshooting guidance visit *www.NETGEAR.com*.

If you have trouble setting up your ME103, check the tips below.

No lights are lit on the access point.

It takes a few seconds for the power indicator to light up. Wait a minute and check the power light status on the access point.

If the access point has no power.

- Make sure the power cord is connected to the access point.
- Make sure the power adapter is connected to a functioning power outlet. If it is in a power strip, make sure the power strip is turned on. If it is plugged directly into the wall, verify that it is not a switched outlet.
- Make sure you are using the correct NETGEAR power adapter supplied with your access point.

The Wireless LAN activity light does not light up.

The access point’s antennae are not working.

- If the Wireless LAN activity light stays off, disconnect the adapter from its power source and then plug it in again.
- Make sure the antennas are tightly connected to the ME103.
- Contact NETGEAR if the Wireless LAN activity light remains off.

The LAN light is not lit.

There is a hardware connection problem.Check these items:

- Make sure the cable connectors are securely plugged in at the access point and the network device (hub, switch, or router). A switch, hub, or router must be installed between the access point and the Ethernet LAN or broadband modem.
- Make sure the connected device is turned on.
- Be sure the correct cable is used. Use a standard Category 5 Ethernet patch cable. If the network device has Auto Uplink™ (MDI/MDIX) ports, you can use either a cross-over cable or a normal patch cable.

I cannot access the Internet or the LAN with a wireless capable computer.

There is a configuration problem.Check these items:

- You may not have restarted the computer with the wireless adapter to have TCP/IP changes take effect. Restart the computer.
- The computer with the wireless adapter may not have the correct TCP/IP settings to communicate with the network. Restart the computer and check that TCP/IP is set up properly for that network. The usual setting for Windows the Network Properties is set to “Obtain an IP address automatically.”
- The access point’s default values may not work with your network. Check the access point default configuration against the configuration of other devices in your network.

I am using EAP-TLS security but get disconnected.

With 802.1x, occasionally, sporadic wireless communications interference might cause the encryption key to get dropped. This is not a breach of security. However, if so, your wireless client can be disconnected from the ME103. Perform these steps:

1. Simply disable and then enable the wireless NIC from the Windows Control Panel in the Network connections section, or from the windows system tray on the lower right of the Windows task bar at the bottom of your screen.
2. Upon restarting your wireless adapter, the ME103 will re-authenticate you and establish a new wireless connection.

I cannot connect to the ME103 to configure it.

Check these items:

- The ME103 is properly installed, LAN connections are OK, and it is powered on. Check that the LAN port LED is green to verify that the Ethernet connection is OK.
- If you are using the NetBIOS name of the ME103 to connect, ensure that your PC and the ME103 are on the same network segment or that there is a WINS server on your network.
- If your PC is set to “Obtain an IP Address automatically” (DHCP client), restart it.
- If your PC uses a Fixed (Static) IP address, ensure that it is using an IP Address in the range of the ME103. The ME103 default IP Address is 192.168.0.224 and the default Subnet Mask is 255.255.255.0. If you are not sure about these settings, follow the instructions for “Installing the ME103 802.11b ProSafe Wireless Access Point” on page 3-5.

When I enter a URL or IP address I get a timeout error.

A number of things could be causing this. Try the following troubleshooting steps.

- Check whether other PCs work. If they do, ensure that your PCs TCP/IP settings are correct. If using a Fixed (Static) IP Address, check the Subnet Mask, Default Gateway, DNS, and IP Addresses.

- If the PCs are configured correctly, but still not working, ensure that the ME103 is connected and turned on. Connect to it and check its settings. If you cannot connect to it, check the LAN and power connections.
- If the ME103 is configured correctly, check your Internet connection (DSL/Cable modem etc.) to make sure that it is working correctly.

Using the Reset Button to Restore Factory Default Settings

The Reset button (see "ME103 Wireless Access Point Rear Panel" on page 2-7) has two functions:

- **Reboot.** When pressed and released quickly, the ME103 will reboot (restart).
- **Reset to Factory Defaults.** This button can also be used to clear ALL data and restore ALL settings to the factory default values.

To clear all data and restore the factory default values:

1. Power off the ME103 and power it back on.
2. Use something with a small point, such as a pen, to press the Reset button in and hold it in for at least 5 seconds.
3. Release the Reset button.

   The factory default configuration has now been restored, and the ME103 is ready for use.

Appendix A
Specifications

This appendix provides technical specifications for the ME103 802.11b ProSafe Wireless Access Point.

Specifications for the ME103

Parameter	ME103 802.11b ProSafe Wireless Access Point
802.11b Data Rates	1, 2, 5.5, & 11 Mbps (Auto-rate capable)
802.11b Operating Frequencies	2.412 ~ 2.462 GHz (US) 2.457 ~ 2.462 GHz (Spain) 2.412 ~ 2.484 GHz (Japan) 2.457 ~ 2.472 GHz (France) 2.412 ~ 2.472 GHz (Europe ETSI)
802.11b Operating Range	Outdoor environment Indoor environment @ 11 Mbps 500 ft (152 m) 100 ft (30 m) @ 5.5 Mbps 885 ft (270 m) 165 ft (50 m) @ 2 Mbps 1300 ft (396 m) 230 ft (70 m) @ 1 Mbps 1500 ft (457 m) 300 ft (91 m)
802.11b Encryption	40-bits (also called 64-bits), 128-bits WEP data encryption
Network Management	Web-based configuration and status monitoring
Maximum Clients	Limited by the amount of wireless network traffic generated by each node; typically 15 to 20 nodes.
Status LEDs	Power/Ethernet LAN/Wireless LAN
Dimensions	W: 7.38 in. (187.3 mm) D: 5.26 in. (131 mm) H: 1 in. (25.4 mm)
Power Adapter	12Vdc, 800mA
Weight	845 g (29.7 oz)
Electromagnetic Compliance	FCC Part 15 Class B and Class E, C-Tick, CE
Environmental Specifications	Operating temperature: 0 to 50° C Operating humidity: 5-95%, non-condensing
Warranty	Limited 3-year warranty

Appendix B
Wireless Networking Basics

This chapter provides an overview of wireless networking and security.

Wireless Networking Overview

The ME103 Access Point 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 802.11 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 802.11 devices. The 802.11 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, WEP, and WPA

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. Recently, Wi-Fi, the Wireless Ethernet Compatibility Alliance (*http://www.wi-fi.net*) developed the Wi-Fi Protected Access (WPA), a new strongly enhanced Wi-Fi security. WPA will soon be incorporated into the IEEE 802.11 standard.

802.11 Authentication

The 802.11 standard defines several services that govern how two 802.11 devices communicate. The following events must occur before an 802.11 Station can communicate with an Ethernet network through an access point such as the one built in to the ME103:

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 802.11 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.

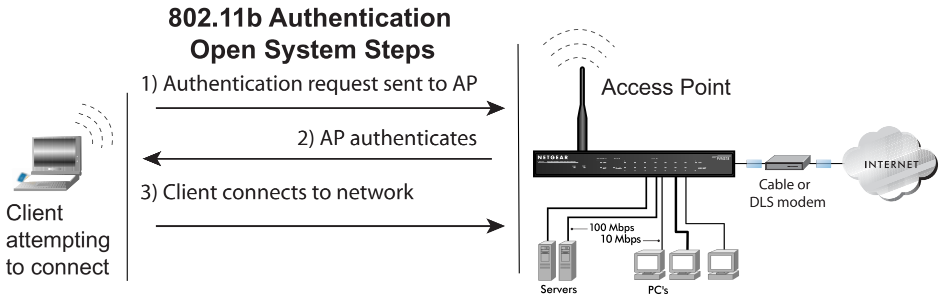


Figure 6-1: 802.11 open system authentication

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 802.11 network or Ethernet network.

This process is illustrated in below.

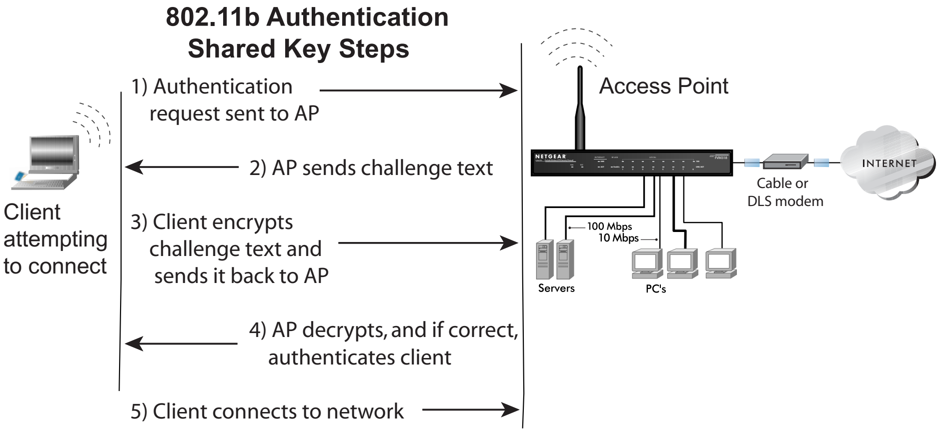

802.11b Authentication
Shared Key Steps
1) Authentication request sent to AP
2) AP sends challenge text
3) Client encrypts challenge text and sends it back to AP
4) AP decrypts, and if correct, authenticates client
5) Client connects to network
Client attempting to connect
Access Point
Cable or DLS modem
INTERNET
100 Mbps
10 Mbps
Servers
PC's

Figure 6-2: 802.11 shared key authentication

Overview of WEP Parameters

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.

Before enabling WEP on an 802.11 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 802.11 products:

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

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

Note: Some 802.11 access points also support **Use WEP for Authentication Only** (Shared Key Authentication without data encryption). However, the ME103 does not offer this option.

Key Size

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

WEP Configuration Options

The WEP settings must match on all 802.11 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 802.11 access points and all of the 802.11 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 802.11b 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 B-1:

Table B-1. 802.11b 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.

Understanding 802.1x Port Based Network Access Control

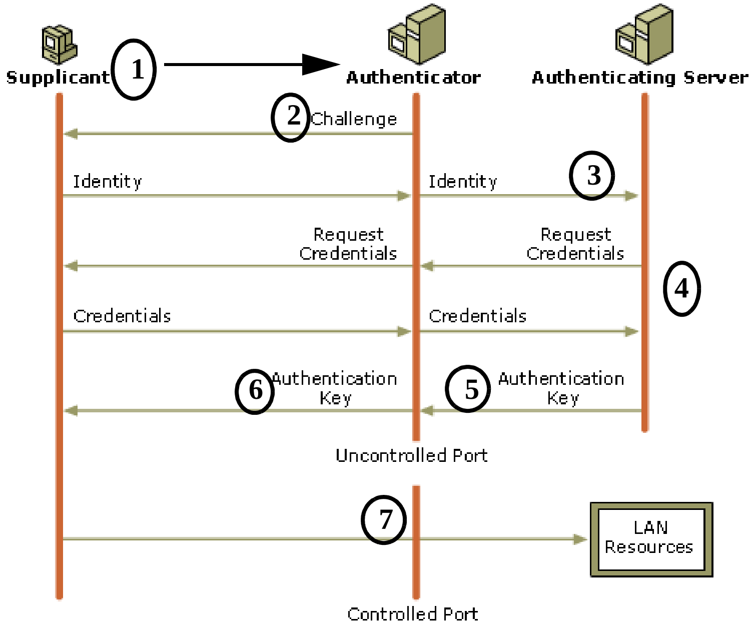
802.1x is well on its way to becoming an industry standard, and provides an effective wireless LAN security solution. Windows XP implements 802.1x natively, and the ME103 802.11b ProSafe Wireless Access Point supports 802.1x. The 802.11i committee is specifying the use of 802.1x to eventually become part of the 802.11 standard.

With 802.11b WEP, all access points and client wireless adapters on a particular wireless LAN must use the same encryption key. Each sending station encrypts data with a WEP key before transmission, and the receiving station decrypts it using an identical key. This process reduces the risk of someone passively monitoring the transmission and gaining access to the data transmitted over the wireless connections.

However, a major problem with the 802.11 standard is that the keys are cumbersome to change. If you don't update the WEP keys often, an unauthorized person with a sniffing tool can monitor your network for less than a day and decode the encrypted messages. In order to use different keys, you must manually configure each access point and wireless adapter with new keys.

Products based on the 802.11 standard alone offer system administrators no effective method to update the keys. This might not be too much of concern with a few users, but the job of renewing keys on larger networks can be a monumental task. As a result, companies either don't use WEP at all or maintain the same keys for weeks, months, and even years. Both cases significantly heighten the wireless LAN's vulnerability to eavesdroppers.

IEEE 802.1x offers an effective framework for authenticating and controlling user traffic to a protected network, as well as dynamically varying encryption keys. 802.1x ties a protocol called EAP (Extensible Authentication Protocol) to both the wired and wireless LAN media and supports multiple authentication methods, such as token cards, Kerberos, one-time passwords, certificates, and public key authentication. For details on EAP specifically, refer to IETF's RFC 2284.



1. The client sends an EAP-start message. This begins a series of message exchanges to authenticate the client.
2. The access point replies with an EAP-request identity message.
3. The client sends an EAP-response packet containing the identity to the authentication server.
4. The authentication server uses a specific authentication algorithm to verify the client's identity. This could be through the use of digital certificates or other EAP authentication type.
5. The authentication server will either send an accept or reject message to the access point.
6. The access point sends an EAP-success packet (or reject packet) to the client.
7. If the authentication server accepts the client, then the access point will transition the client's port to an authorized state and forward additional traffic.

Initial 802.1x communications begin with an unauthenticated supplicant (i.e., client device) attempting to connect with an authenticator (i.e., 802.11 access point). The access point responds by enabling a port for passing only EAP packets from the client to an authentication server located on the wired side of the access point. The access point blocks all other traffic, such as HTTP, DHCP, and POP3 packets, until the access point can verify the client's identity using an authentication server (e.g., RADIUS). Once authenticated, the access point opens the client's port for other types of traffic.

The basic 802.1x protocol provides effective authentication and can offering dynamic key management using 802.1x as a delivery mechanism. If configured to implement dynamic key exchange, the 802.1x authentication server can return session keys to the access point along with the accept message. The access point uses the session keys to build, sign and encrypt an EAP key message that is sent to the client immediately after sending the success message. The client can then use contents of the key message to define applicable encryption keys. In typical 802.1x implementations, the client can automatically change encryption keys as often as necessary to minimize the possibility of eavesdroppers having enough time to crack the key in current use.

It's important to note that 802.1x doesn't provide the actual authentication mechanisms. When using 802.1x, you need to choose an EAP type, such as Transport Layer Security (EAP-TLS) or EAP Tunneled Transport Layer Security (EAP-TTLS), which defines how the authentication takes place.

The important part to know at this point is that the software supporting the specific EAP type resides on the authentication server and within the operating system or application software on the client devices. The access point acts as a “pass through” for 802.1x messages, which means that you can specify any EAP type without needing to upgrade an 802.1x-compliant access point. As a result, you can update the EAP authentication type as newer types become available and your requirements for security change.

Appendix C
Network, Routing, Firewall, and Cabling Basics

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

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 ME103 802.11b ProSafe Wireless Access Point is a small office router that routes the IP protocol over a single-user broadband connection.

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.

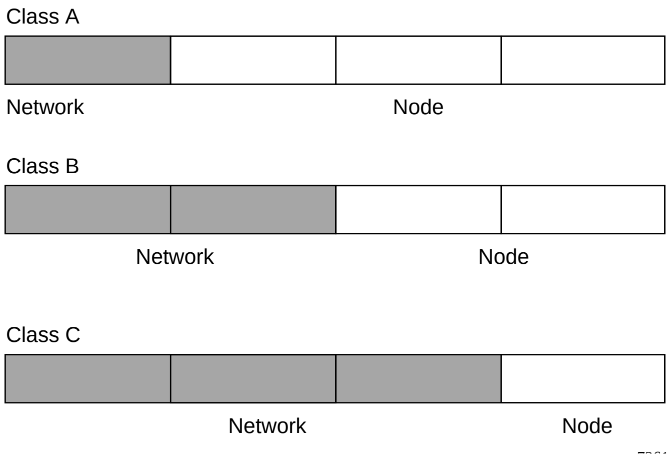


Figure 6-3: Three Main Address Classes

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.

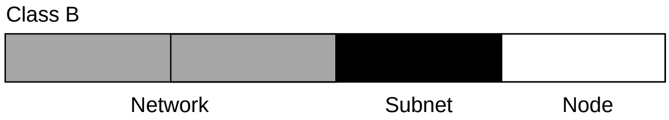


Figure 6-4: Example of Subnetting a Class B Address

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 6-1. Netmask Notation Translation Table for One Octet

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

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

Table 6-2. Netmask Formats

Dotted-Decimal	Masklength
255.0.0.0	/8
255.255.0.0	/16
255.255.255.0	/24
255.255.255.128	/25
255.255.255.192	/26
255.255.255.224	/27
255.255.255.240	/28
255.255.255.248	/29
255.255.255.252	/30
255.255.255.254	/31
255.255.255.255	/32

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
```

Choose your private network number from this range. The DHCP server of the ME103 Access Point 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 ME103 Access Point 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.

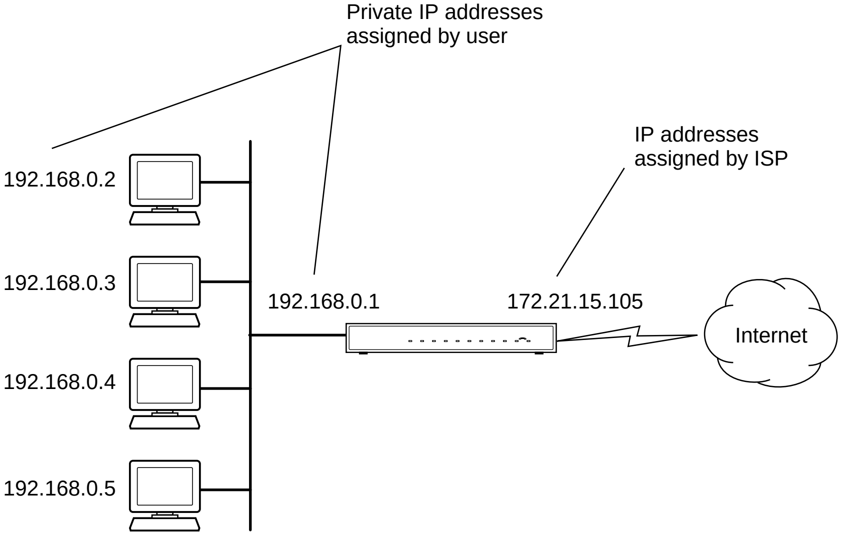


Figure 6-5: Single IP Address Operation Using NAT

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.

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

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 ME103 Access Point has the capacity to act as a DHCP server.

The ME103 Access Point also functions as a DHCP client when connecting to the ISP. The firewall can automatically obtain an IP address, subnet mask, DNS server addresses, and a gateway address if the ISP provides this information by DHCP.

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.

Routing Protocols

Two protocols routers use extensively are:

- Routing Information Protocol (RIP)
- Address Resolution Protocol (ARP)

These two protocols are introduced below.

RIP

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

The ME103 Access Point 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.

MAC Addresses and ARP

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 address (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 ARP to resolve MAC addresses.

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

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

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*.

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 process, the network behind the 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.

Ethernet Cabling

Although Ethernet networks originally used thick or thin coaxial cable, most installations currently use unshielded twisted pair (UTP) cabling. The UTP cable contains eight conductors, arranged in four twisted pairs, and terminated with an RJ45 type connector. A normal straight-through UTP Ethernet cable follows the EIA568B standard wiring and pinout as described in Table 6-1.

Table 6-1. UTP Ethernet cable wiring, straight-through

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

Uplink Switches, Crossover Cables, and MDI/MDIX Switching

In the wiring table above, the concept of transmit and receive are from the perspective of the PC, which is wired as Media Dependant Interface (MDI). In this wiring, the PC transmits on pins 1 and 2. At the hub, the perspective is reversed, and the hub receives on pins 1 and 2. This wiring is referred to as Media Dependant Interface - Crossover (MDI-X).

When connecting a PC to a PC, or a hub port to another hub port, the transmit pair must be exchanged with the receive pair. This exchange is done by one of two mechanisms. 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.

The ME103 Access Point incorporates Auto Uplink™ technology (also called MDI/MDIX). The Ethernet port will automatically sense whether the Ethernet 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 router, 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.

Cable Quality

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

Appendix D
Preparing Your PCs for Network Access

This appendix describes how to prepare your PCs to connect to the Internet through the ME103 802.11b ProSafe Wireless Access Point.

For adding file and print sharing to your network, please consult the Windows help information included with the version of Windows installed on each computer on your network.

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.

In your TCP/IP network, each PC and the wireless access point must be assigned a unique IP addresses. Each PC must also have certain other TCP/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 startup.

Configuring Windows 98 and Me for TCP/IP Networking

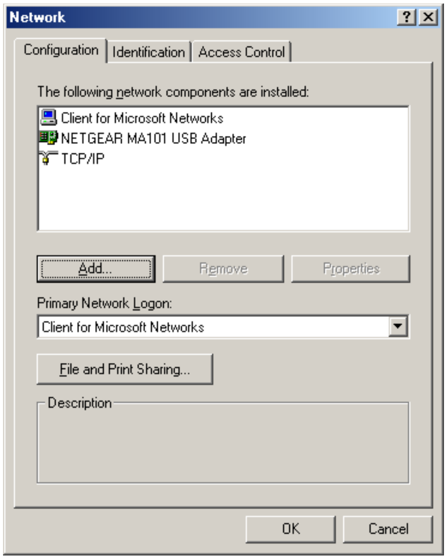
As part of the PC preparation process, you may need to install and configure TCP/IP on your PC. Before starting, locate your Windows CD; you may need to insert it during the TCP/IP installation process.

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:



The following network components are installed:
Client for Microsoft Networks
NETGEAR MA101 USB Adapter
TCP/IP

Primary Network Logon:
Client for Microsoft Networks

You must have an Ethernet adapter or an ME103, the TCP/IP protocol, and the 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 add 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 to add the 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.

If you need to add File and Print Sharing for Microsoft Networks:

a. Click the Add button.
b. Select Client, and then click Add.
c. Select Microsoft.
d. Select File and Print Sharing for Microsoft Networks, and then click OK.

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

Enabling DHCP to Automatically Configure TCP/IP Settings

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

In Windows 98 and Me systems, locate your **Network Neighborhood** icon.

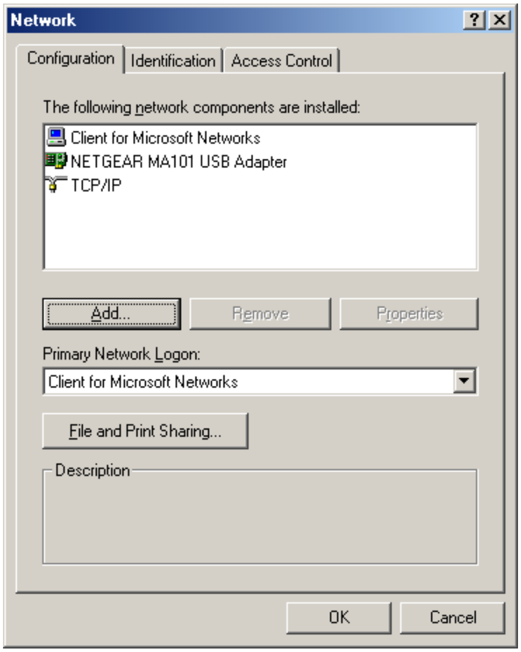
- If the Network Neighborhood icon is on the Windows desktop, position your mouse pointer over it and right-click your mouse button.
- If the icon is not on the desktop,
  - Click **Start** on the task bar located at the bottom left of the window.
  - Choose **Settings**, and then **Control Panel**.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



Network

The following network components are installed:

Client for Microsoft Networks
NETGEAR MA101 USB Adapter
TCP/IP

Primary Network Logon:
Client for Microsoft Networks

3

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

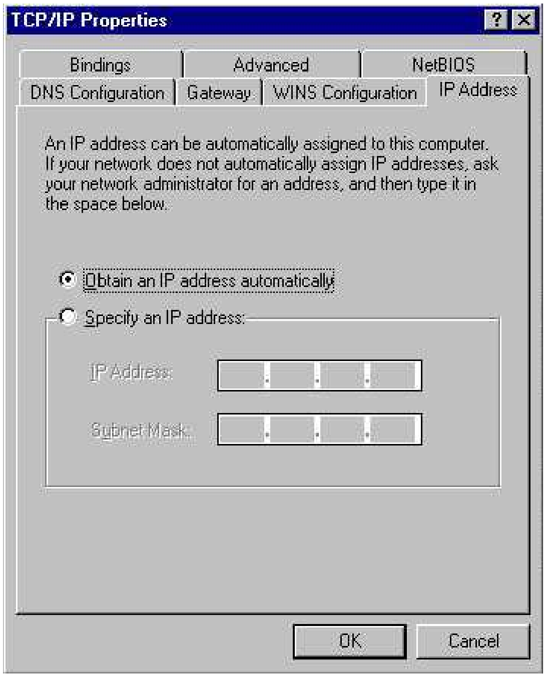
- Verify the following:

  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.



An IP address can be automatically assigned to this computer. If your network does not automatically assign IP addresses, ask your network administrator for an address, and then type it in the space below.

● Obtain an IP address automatically

○ Specify an IP address:

IP Address: . . .

Subnet Mask: . . .

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 2000 or XP for TCP/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

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

In Windows XP and 2000 systems, locate your **Network Neighborhood** icon.

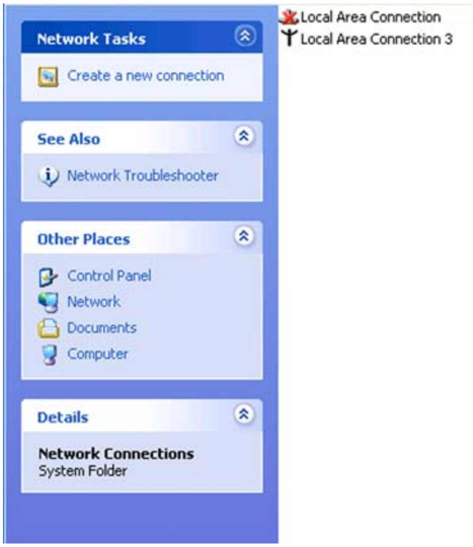
- Select **Control Panel** from the Windows XP Start Menu.
- Select the **Network Connections** icon on the Control Panel. This will take you to the next step.

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**.

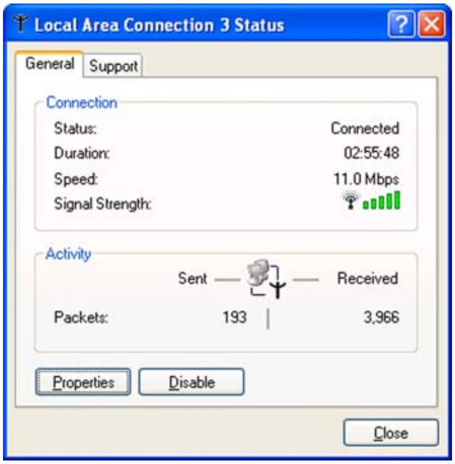


3

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.



Local Area Connection 3 Status

General | Support

Connection

Status: Connected

Duration: 02:55:48

Speed: 11.0 Mbps

Signal Strength:

Activity

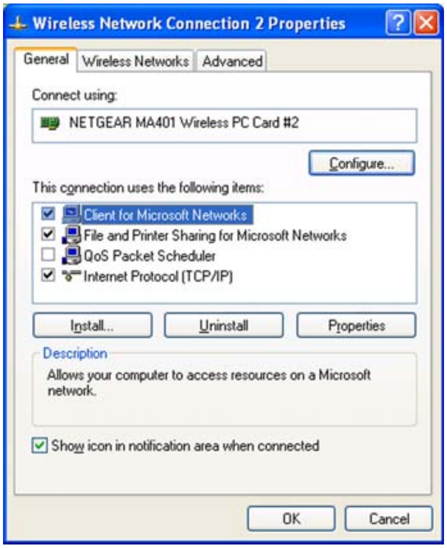
Sent — Received

Packets: 193 | 3,966

4

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

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



Wireless Network Connection 2 Properties

General | Wireless Networks | Advanced

Connect using:

NETGEAR MA401 Wireless PC Card #2

This connection uses the following items:

☑ Client for Microsoft Networks
☑ File and Printer Sharing for Microsoft Networks
☐ QoS Packet Scheduler
☑ Internet Protocol (TCP/IP)

Description

Allows your computer to access resources on a Microsoft network.

☑ Show icon in notification area when connected

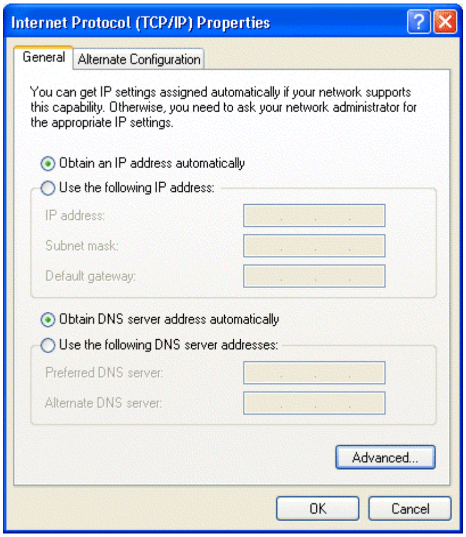
5

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

- Click the **OK** button.

This completes the DHCP configuration in Windows XP.

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



Internet Protocol (TCP/IP) Properties

You can get IP settings assigned automatically if your network supports this capability. Otherwise, you need to ask your network administrator for the appropriate IP settings.

● Obtain an IP address automatically

○ Use the following IP address:

IP address:

Subnet mask:

Default gateway:

● Obtain DNS server address automatically

○ Use the following DNS server addresses:

Preferred DNS server:

Alternate DNS server:

DHCP Configuration of TCP/IP in Windows 2000

After you install a network card, TCP/IP for Windows 2000 is configured and set to DHCP without your having to configure it. However, if there are problems, following the steps below 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.

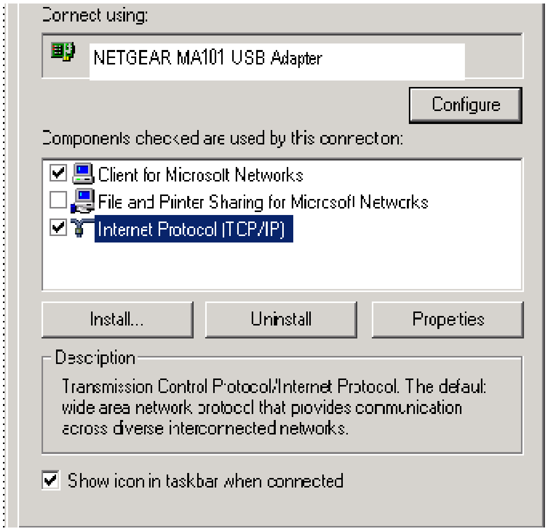
- Right click on **Local Area Connection** and select **Properties**.

2

The **Local Area Connection Properties** dialog box appears. Verify that you have the correct Ethernet card selected in the **Connect using:** box and that 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**.



Connect using:

NETGEAR MA101 USB Adapter

Components checked are used by this connection:

☑ Client for Microsoft Networks
☐ File and Printer Sharing for Microsoft Networks
☑ Internet Protocol (TCP/IP)

Description

Transmission Control Protocol/Internet Protocol. The default wide area network protocol that provides communication across diverse interconnected networks.

☑ Show icon in taskbar when connected

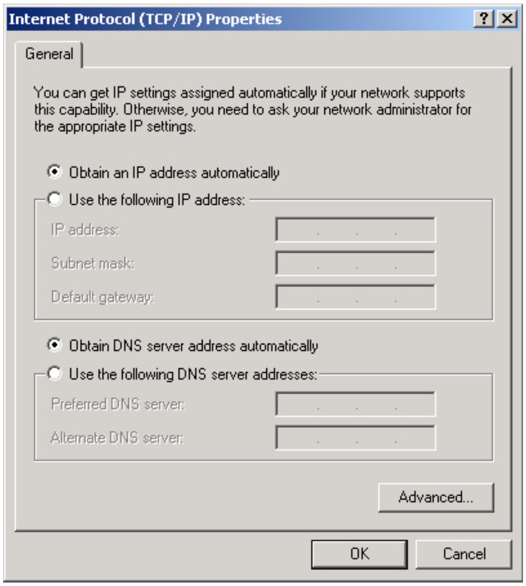
3

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. Click **OK** again to complete the configuration process.

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



Internet Protocol (TCP/IP) Properties

General

You can get IP settings assigned automatically if your network supports this capability. Otherwise, you need to ask your network administrator for the appropriate IP settings.

● Obtain an IP address automatically
○ Use the following IP address:

IP address: . . .
Subnet mask: . . .
Default gateway: . . .

● Obtain DNS server address automatically
○ Use the following DNS server addresses:

Preferred DNS server: . . .
Alternate DNS server: . . .

Verifying TCP/IP Properties for Windows XP or 2000

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`**

Glossary

Use the list below to find definitions for technical terms used in this manual.

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.

802.1x

802.1x defines port-based, network access control used to provide authenticated network access and automated data encryption key management.

The IEEE 802.1x draft standard offers an effective framework for authenticating and controlling user traffic to a protected network, as well as dynamically varying encryption keys. 802.1x uses a protocol called EAP (Extensible Authentication Protocol) and supports multiple authentication methods, such as token cards, Kerberos, one-time passwords, certificates, and public key authentication. For details on EAP specifically, refer to IETF's RFC 2284.

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

A soon to be ratified IEEE specification for wireless networking at 54 Mbps using direct-sequence spread-spectrum (DSSS) technology and operating in the unlicensed radio spectrum at 2.5GHz. 802.11g is backwards compatible with 802.11b.

ADSL

Short for asymmetric digital subscriber line, a technology that allows data to be sent over existing copper telephone lines at data rates of from 1.5 to 9 Mbps when receiving data (known as the downstream rate) and from 16 to 640 Kbps when sending data (known as the upstream rate).

ADSL requires a special ADSL modem. ADSL is growing in popularity as more areas around the world gain access.

ARP

Address Resolution Protocol, a TCP/IP protocol used to convert an IP address into a physical address (called a DLC address), such as an Ethernet address.

A host wishing to obtain a physical address broadcasts an ARP request onto the TCP/IP network. The host on the network that has the IP address in the request then replies with its physical hardware address. There is also Reverse ARP (RARP) which can be used by a host to discover its IP address. In this case, the host broadcasts its physical address and a RARP server replies with the host's IP address.

Auto Uplink

Auto Uplink™ technology (also called MDI/MDIX) eliminates the need to worry about crossover vs. straight-through Ethernet cables. Auto Uplink™ will accommodate either type of cable to make the right connection.

CA

A Certificate Authority is a trusted third-party organization or company that issues digital certificates used to create digital signatures and public-private key pairs.

Cat 5

Category 5 unshielded twisted pair (UTP) cabling. An Ethernet network operating at 10 Mbits/second (10BASE-T) will often tolerate low quality cables, but at 100 Mbits/second (10BASE-Tx) the cable must be rated as Category 5, or Cat 5 or Cat V, by the Electronic Industry Association (EIA).
This rating will be printed on the cable jacket. Cat 5 cable contains eight conductors, arranged in four twisted pairs, and terminated with an RJ45 type connector. In addition, there are restrictions on maximum cable length for both 10 and 100 Mbits/second networks.

Certificate Authority

A Certificate Authority is a trusted third-party organization or company that issues digital certificates used to create digital signatures and public-private key pairs.
The role of the CA in this process is to guarantee that the individual granted the unique certificate is, in fact, who he or she claims to be. Usually, this means that the CA has an arrangement with a financial institution, such as a credit card company, which provides it with information to confirm an individual's claimed identity. CAs are a critical component in data security and electronic_commerce because they guarantee that the two parties exchanging information are really who they claim to be.

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.

DMZ

Specifying a Default DMZ Server allows you to set up a computer or server that is available to anyone on the Internet for services that you haven't defined. There are security issues with doing this, so only do this if you'll willing to risk open access.

DNS

Short for Domain Name System (or Service), an Internet service that translates domain names into IP addresses.

Because domain names are alphabetic, they're easier to remember. The Internet however, is really based on IP addresses. Every time you use a domain name, therefore, a DNS service must translate the name into the corresponding IP address. For example, the domain name www.example.com might translate to 198.105.232.4. The DNS system is, in fact, its own network. If one DNS server doesn't know how to translate a particular domain name, it asks another one, and so on, until the correct IP address is returned.

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.

DSL

Short for digital subscriber line, but is commonly used in reference to the asymmetric version of this technology (ADSL) that allows data to be sent over existing copper telephone lines at data rates of from 1.5 to 9 Mbps when receiving data (known as the downstream rate) and from 16 to 640 Kbps when sending data (known as the upstream rate).

ADSL requires a special ADSL modem. ADSL is growing in popularity as more areas around the world gain access.

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.

EAP

Extensible Authentication Protocol is a general protocol for authentication that supports multiple authentication methods.

EAP, an extension to PPP, supports such authentication methods as token cards, Kerberos, one-time passwords, certificates, public key authentication and smart cards. In wireless communications using EAP, a user requests connection to a WLAN through an AP, which then requests the identity of the user and transmits that identity to an authentication server such as RADIUS. The server asks the AP for proof of identity, which the AP gets from the user and then sends back to the server to complete the authentication. EAP is defined by RFC 2284.

ESSID

The Extended Service Set Identification (ESSID) is a thirty-two character (maximum) alphanumeric key identifying the wireless local area network.

Gateway

A local device, usually a router, that connects hosts on a local network to other networks.

IP

Internet Protocol is the main internetworking protocol used in the Internet. Used in conjunction with the Transfer Control Protocol (TCP) to form TCP/IP.

IP Address

A four-byte number uniquely defining each host on the Internet, usually written in dotted-decimal notation with periods separating the bytes (for example, 134.177.244.57).

Ranges of addresses are assigned by Internic, an organization formed for this purpose.

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

A communications network serving users within a limited area, such as one floor of a building.

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

The Media Access Control address is a unique 48-bit hardware address assigned to every network interface card. Usually written in the form 01:23:45:67:89:ab.

Mbps

Megabits per second.

MD5

MD5 creates digital signatures using a one-way hash function, meaning that it takes a message and converts it into a fixed string of digits, also called a message digest.

When using a one-way hash function, one can compare a calculated message digest against the message digest that is decrypted with a public key to verify that the message hasn't been tampered with. This comparison is called a "hashcheck."

MDI/MDIX

In cable wiring, the concept of transmit and receive are from the perspective of the PC, which is wired as a Media Dependant Interface (MDI). In MDI wiring, a PC transmits on pins 1 and 2. At the hub, switch, router, or access point, the perspective is reversed, and the hub receives on pins 1 and 2. This wiring is referred to as Media Dependant Interface - Crossover (MDI-X). See also Auto Uplink.

NAT

A technique by which several hosts share a single IP address for access to the Internet.

NetBIOS

Network Basic Input Output System. An application programming interface (API) for sharing services and information on local-area networks (LANs). Provides for communication between stations of a network where each station is given a name. These names are alphanumeric names, 16 characters in length.

netmask

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

Point-to-Point Protocol

PPP. A protocol allowing a computer using TCP/IP to connect directly to the Internet.

RADIUS

Short for Remote Authentication Dial-In User Service, RADIUS is an authentication system.
Using RADIUS, you must enter your user name and password before gaining access to a network. This information is passed to a RADIUS server, which checks that the information is correct, and then authorizes access. Though not an official standard, the RADIUS specification is maintained by a working group of the IETF.

RIP

A protocol in which routers periodically exchange information with one another so that they can determine minimum distance paths between sources and destinations.

router

A device that forwards data between networks. An IP router forwards data based on IP source and destination addresses.

SSID

A Service Set Identification is a thirty-two character (maximum) alphanumeric key identifying a wireless local area network. For the wireless devices in a network to communicate with each other, all devices must be configured with the same SSID.

This is typically the configuration parameter for a wireless PC card. It corresponds to the ESSID in the wireless Access Point and to the wireless network name. *See also* Wireless Network Name and ESSID.

Subnet Mask

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

TLS

Short for Transport Layer Security, TLS is a protocol that guarantees privacy and data integrity between client/server applications communicating over the Internet.

The TLS protocol is made up of two layers. The TLS Record Protocol ensures that a connection is private by using symmetric data encryption and ensures that the connection is reliable. The second TLS layer is the TLS Handshake Protocol, which allows authentication between the server and client and the negotiation of an encryption algorithm and cryptographic keys before data is transmitted or received. Based on Netscape’s SSL 3.0, TLS supercedes and is an extension of SSL. TLS and SSL are not interoperable.

UTP

Unshielded twisted pair is the cable used by 10BASE-T and 100BASE-Tx Ethernet networks.

WAN

A long distance link used to extend or connect remotely located local area networks. The Internet is a large WAN.

WEP

Wired Equivalent Privacy 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

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 standards 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 the Windows Network Neighborhood feature.

WINS

WINS. Windows Internet Naming Service is a server process for resolving Windows-based computer names to IP addresses.

Wireless Network Name (SSID)

Wireless Network Name (SSID) is the name assigned to a wireless network. This is the same as the SSID or ESSID configuration parameter.

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