



Designing AirPort Networks

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AirPort offers the easiest way to provide wireless Internet access and networking anywhere in the home, classroom, or office.

Instead of using cables to create a network, AirPort uses wireless local area network (WLAN) technology to provide wireless communication between computers. Through a wireless network you can access the Internet, share files, play multiplayer games, and more. If you have an AirPort Express and use AirPort 4.0 or later, you can play iTunes music through remote speakers using AirTunes.

Note: This document contains information about AirPort and detailed information about designing AirPort networks using AirPort Extreme. If you are using AirPort Express, you can find general information in Chapter 5, “Using AirPort Express,” on page 65. See the documentation that came with your AirPort Express for more detailed information about the different ways to set up your AirPort Express network.

Using AirPort technology, you can:

- Create a wireless network in your home or school using an AirPort Extreme Base Station or AirPort Express, then connect to the Internet and share the connection among several computers simultaneously. An entire family or classroom can be on the Internet at the same time.
- Set up a wireless connection to your standard computer network. AirPort-equipped computers can access the entire network without being connected with a cable.
- Connect multiple computers in a wireless “Computer-to-Computer” network so that you can share files or play network games.

You can set up an AirPort Extreme Base Station or AirPort Express and connect to the Internet without wires in minutes. But since they are flexible and powerful networking devices, you can also create an AirPort network that does much more. If you want to design an AirPort network that provides Internet access to non-AirPort computers via Ethernet, or take advantage of some of the base station’s more advanced features, use this document to design and implement your network.

Note: Some of the AirPort features described in this book are available only in Mac OS X version 10.3 or later, using AirPort 4.0 or later. If you are using an earlier version of Mac OS X or AirPort, images shown in this book may be slightly different from what you see on your screen.

How AirPort Works

In a wired network, sharing files and information between computers requires the computers to be connected by cables. With AirPort, the data is transferred between computers using radio waves through a wireless network.

There are two ways to create a wireless network:

- You can use an AirPort-equipped computer to create a temporary “Computer-to-Computer” network, which other AirPort-equipped computers within range can join.
- You can create a more permanent wireless network using a base station. In this kind of network, all wireless communication goes through the base station to the Internet or to other computers on the network.

You can also incorporate AirPort technology into an existing Ethernet network by connecting an AirPort Extreme Base Station or AirPort Express to the network. This allows non-AirPort computers to communicate with AirPort computers.

The typical indoor range for an AirPort connection is up to 150 feet (45 meters). Range in a wireless network may vary with site conditions.

How Wireless Internet Access Is Provided

Wireless Internet access requires an AirPort Card or an AirPort Extreme Card, an AirPort Extreme Base Station or AirPort Express, and an account with an Internet service provider (fees may apply). Some Internet service providers (ISPs) are not currently compatible with AirPort. Some cable modem and DSL providers may not be compatible with AirPort. Contact your service provider for more information.

AirPort technology is similar to cordless telephone technology. The handset of the cordless phone makes a wireless connection to the base, which is connected to the telephone system. Likewise, with AirPort, your computer does not establish a wireless connection with your ISP directly. You set up a wireless connection from the computer to a base station that is connected to the Internet by a wire, such as a DSL or telephone line.

Use AirPort to provide wireless Internet access and share a single Internet connection among multiple computers in the following ways:

- Connect the AirPort Extreme Base Station or AirPort Express to a DSL or cable modem. If you are using an AirPort Extreme Base Station that has an internal modem, you can connect it to a telephone line. Once connected to the Internet, the AirPort Extreme Base Station or AirPort Express receives webpages and email content from the Internet via its Internet connection and then sends it to AirPort-equipped computers, using the wireless network.
- Connect the AirPort Extreme Base Station or AirPort Express to an existing network that already has Internet access, such as in a school or small office. AirPort-equipped computers connect wirelessly to the base station and receive network and Internet content.

Configuring the AirPort Extreme Base Station and AirPort Express for Internet Access

Like your computer, the AirPort Extreme Base Station or AirPort Express must be set up with the appropriate hardware and Internet Protocol (IP) networking information to connect to the Internet. To provide the Internet configuration information to your AirPort Extreme Base Station or AirPort Express, you can use the AirPort Setup Assistant. The AirPort Setup Assistant asks a series of questions to determine how the base station's Internet connection and other interfaces should be set up.

To set up more complex configurations, you use AirPort Admin Utility. For more information about the AirPort Setup Assistant and AirPort Admin Utility, see the following sections.

AirPort Setup Assistant

Use the AirPort Setup Assistant to enter the settings your AirPort Extreme Base Station or AirPort Express needs to connect to the Internet. Enter the settings you received from your ISP for Ethernet, PPP over Ethernet (PPPoE), or the internal modem if your base station has one. You can also give your AirPort network a name and password. You can use the AirPort Setup Assistant to set up a base station as a wireless bridge and extend the range of your existing AirPort Extreme or AirPort Express network.

If you are using an AirPort Express, you can create a new wireless network or join an existing wireless network. If you connect AirPort Express to your stereo or powered speakers, you can set up your AirPort Express to play iTunes music using AirTunes. See Chapter 5, "Using AirPort Express," on page 65 for more information.

When you have finished entering the settings, the AirPort Setup Assistant transfers the settings to your base station and your base station shares its Internet connection with computers that join its AirPort network.

For instructions on using the AirPort Setup Assistant, see “Using the AirPort Setup Assistant” on page 22.

AirPort Admin Utility

AirPort Admin Utility is a convenient way to make quick adjustments to your base station configuration. Some of the AirPort Extreme Base Station and AirPort Express advanced networking features can be configured only with AirPort Admin Utility.

Use AirPort Admin Utility when:

- You want to provide Internet access to computers that connect to the base station using Ethernet
- You have already set up your base station, but you need to change one setting, such as your account credentials, or the phone number for your ISP
- You need to configure advanced base station settings such as channel frequency, security options, closed networks, DHCP lease time, access control, WAN privacy, power controls, or port mapping

For instructions on using AirPort Admin Utility, see “Using AirPort Admin Utility” on page 22.

Extending the Range of Your AirPort Network

You can extend the range of your network by using AirPort Admin Utility to set up wireless connections between multiple base stations in your network, known as a Wireless Distribution System (WDS), or to connect AirPort Extreme Base Stations via Ethernet to create a roaming network. For more information on setting up a Wireless Distribution System or a roaming network, see “Connecting Additional Base Stations to Your AirPort Network” on page 49. You can also extend the range of your wireless network by connecting an Apple-certified external antenna to the antenna port on an AirPort Extreme Base Station.

If you are using AirPort Express to extend the range of your AirPort Extreme network, see Chapter 5, “Using AirPort Express,” on page 65.

Some models of the AirPort Extreme Base Station can receive power through the Ethernet WAN port when it is connected to 802.3af-compliant Power Sourcing Equipment (PSE) with a CAT 5 Ethernet cable. A PSE is a line-powered Ethernet device, like a switch or a hub, that supplies power to Powered Devices (PDs) over the Ethernet cable. Powering the base station using a PSE is known as *Power over Ethernet* (PoE).

If your base station can receive power over Ethernet, the base station and the mounting bracket conform to UL Standard 2043, “Fire Test for Heat and Visible Smoke Release for Discrete Products and Their Accessories Installed in Air-Handling Spaces,” for placement in the air-handling space above suspended ceilings. Using Power over Ethernet allows you to install a base station in places away from a standard electrical outlet. For more information about using PoE, see the documentation that came with your base station.

To use the base station in an air-handling space above suspended ceilings, you must connect the Ethernet WAN port to an 802.3af-compliant PSE with a plenum-rated Ethernet cable. You cannot use the AC power adapter to power a base station installed in an air-handling space. When the base station receives power over Ethernet, the USB port is disabled. Do not connect an external antenna to a base station mounted in an air-handling space.

AirTunes

If you are using AirPort Express, and you have connected it to your stereo or powered speakers, you can play iTunes music on the stereo using AirTunes. AirTunes is an encoding technology that allows for CD-quality transmission of iTunes music over the air. You can stream music from your iTunes library to AirPort Express wirelessly, and AirPort Express plays the music on your stereo through cables connected to the analog and optical digital audio stereo mini-jack. The music is buffered to ensure smooth playback without skips or jumps.

Anything you play in iTunes—MP3 files, AAC files, audio books, even Dolby surround-sound—you can play using AirTunes.

To use AirTunes, you need an AirPort Express connected to your stereo or powered speakers, AirPort 4.0 or later, and iTunes 4.6 or later.

Printing via an AirPort Extreme Base Station or AirPort Express

If you have a USB printer connected to your AirPort Extreme Base Station or AirPort Express, computers on the AirPort network can print to the printer by selecting it via Rendezvous in Printer Setup Utility, located in Applications/Utilities. You must use Mac OS X version 10.2.3 or later to print to a USB printer via an AirPort Extreme Base Station.

If your AirPort Extreme Base Station supports PoE, and is receiving power from an 802.3af-compliant PSE, you cannot connect a printer to it.

Sharing Your Computer's Internet Connection

If you have an AirPort Card installed in your computer and you are connected to the Internet, you can share your Internet connection with other computers using Mac OS X version 10.2 or later. This is sometimes called using your computer as a *software base station*.

You can share your Internet connection as long as your computer is connected to the Internet. If your computer goes to sleep or is restarted, or if you lose your Internet connection, you need to restart Internet sharing.

To start Internet sharing:

- 1 Open System Preferences, click Sharing, and then click Internet.
- 2 Select how you would like to share your Internet connection, then click Start. You can choose to share your Internet connection with AirPort-equipped computers, computers with built-in Ethernet, or both.



Note: If your Internet connection and your local network use the same port (built-in Ethernet, for example), contact your ISP before you turn on Internet sharing. In some cases (if you use a cable modem, for example) you might unintentionally affect the network settings of other ISP customers, and your ISP might terminate your service to prevent you from disrupting its network.

- 3 If you select “Share your Internet connection with AirPort-equipped computers,” click AirPort Options to give your network a name and password.

Network Name: James Morengo's Network

Channel: Automatic

Enable encryption (using WEP)

Password:

Confirm Password:

WEP Key Length: 40-bit (more compatible)

If you plan to share your Internet connection with non-Apple computers, use a 5 character password for a 40-bit WEP key, and a 13 character password for a 128-bit WEP key.

Cancel OK

This chapter contains information about your computer's network settings, what they do, and how to adjust them in Mac OS X. It also describes the software used for IP and AirPort networking.

To take advantage of all the power and flexibility of AirPort, you may need to change the network settings on your computer or your base station.

If you make frequent changes to your network settings, it helps to be aware of what the settings do and what they mean. Understanding these network basics makes configuring and adjusting your computer and AirPort network settings simple and easy.

Configuring your computer involves two steps:

- Selecting a network (Ethernet or AirPort)
- Configuring Internet Protocol (IP)

Step 1: Select Your Network

To join an Ethernet network, connect an Ethernet cable to the Ethernet port on your computer and to an open port on your Ethernet network.

To create or join an AirPort network, use the AirPort status menu in the menu bar to turn on AirPort and choose an available AirPort network.

Once you are connected, both types of networks work the same way.

Step 2: Configure IP on Your Computer

Configuring IP consists of two steps:

- Selecting a networking interface
- Selecting a configuration method

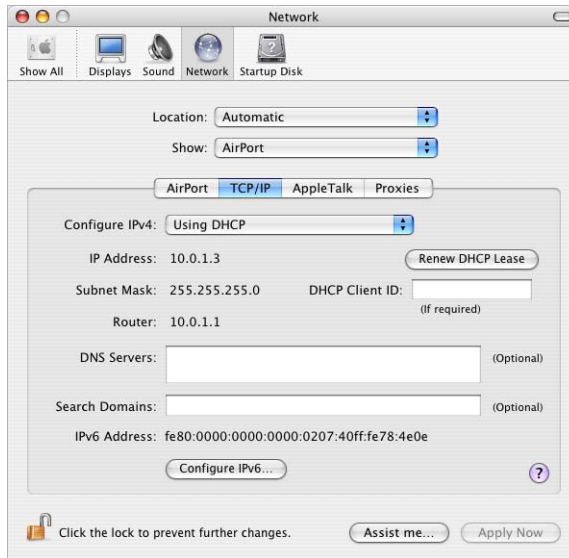
To configure IP:

- 1 Open the Network pane of System Preferences, and then choose Built-in Ethernet from the Show pop-up menu if you are connecting to an Ethernet network, or AirPort if you are connecting to an AirPort network.
- 2 Click TCP/IP, and then choose the configuration method from the Configure IPv4 pop-up menu.

The three most frequently used methods are PPP, DHCP, and Manually.

- PPP is used for dial-up modem connections to your ISP and the Internet.
- DHCP is used frequently on Ethernet networks and by DSL or cable modem providers.
- Manual configurations are used on Ethernet networks and sometimes by DSL and cable modem providers. Your network administrator or ISP should provide you with the appropriate configuration information if you configure IPv4 manually.

For example, below is the Network pane of System Preferences, configured to use AirPort for the network interface and DHCP for the TCP/IP configuration.



If you have trouble connecting to the Internet, check these network and IP configurations on your computer first.

Software Used for IP Networking in Mac OS X

You'll frequently use several preferences and applications on your computer for networking. Here's what each is used for:

Network Preferences

Use the Show pop-up menu to configure how you connect to the network or the Internet, for example via AirPort or Ethernet.

Use the TCP/IP pane of Network preferences to configure your computer for IP networking. The information in this pane must be correct to connect to the Internet.

To configure how you receive an IP address, for example manually or via DHCP, use the Configure IPv4 pop-up menu.

Use the remaining fields to fill in the other information you need in order to connect to the Internet. Contact your ISP or network administrator for the information to type in these fields.

Internet Connect Application

Use the Internet Connect application to specify the phone number, user name, and password for making a dial-up connection to the Internet. If you use a dial-up connection to the Internet, the AirPort Setup Assistant transfers the settings in the Internal Modem portion of the Internet Connect application to the base station.

If you use AirPort to connect to the Internet, choose AirPort from the Configuration pop-up menu.

You also use Internet Connect to authenticate with or set up a network protected by 802.1X.

AppleTalk

AppleTalk is a protocol used in local networks. Use the AppleTalk pane of Network preferences to set up AppleTalk networking.

Location Management

Use the Location pop-up menu in Network preferences to manage sets of TCP/IP, AppleTalk, and Internet Connect configurations. After you create your locations, you can switch all of your network settings by choosing a location from the Location pop-up menu in Network preferences. For more information about network locations, see Mac OS Help, available in the Help menu.

Software Used for AirPort Networking in Mac OS X

You'll use different Mac OS X and AirPort applications to create and manage your wireless network. Here's what each is used for:

Internet Connect Application

Use the Internet Connect application to:

- Turn AirPort on or off
- Monitor the signal quality of the AirPort wireless connection
- Find the Base Station ID (the hardware address of your AirPort Extreme Base Station or AirPort Express)
- See the connection status of an AirPort Extreme Base Station that is configured to connect to a dial-up ISP
- Select an AirPort network
- Create or join a Computer-to-Computer network
- Join a closed network
- Join or set up an 802.1X protected network

AirPort Status Menu

Use the AirPort status icon in the menu bar to:

- Turn AirPort on or off
- Monitor the signal quality of the AirPort wireless connection
- Select an AirPort network
- Open the Internet Connect application
- Create or join a Computer-to-Computer network

AirPort Setup Assistant

Use the AirPort Setup Assistant to:

- Set up an AirPort Extreme Base Station or AirPort Express
- Extend the range of your AirPort Extreme or AirPort Express network
- Set up an AirPort Express to join an existing AirPort network
- Set up AirPort Express to play iTunes music on your stereo using AirTunes

AirPort Admin Utility

Use AirPort Admin Utility to set optional advanced settings and to:

- Download the base station configuration to your computer
- Modify the configuration on your base station
- Set advanced security options for the AirPort network
- Upload a modified configuration to the base station
- Upgrade the base station software

This chapter provides an overview of the security features available in AirPort for Mac OS X.

Apple has designed the AirPort Extreme Base Station and AirPort Express to provide multiple levels of security, so you can enjoy peace of mind when you access the Internet, manage online financial transactions, or send and receive email. The AirPort Extreme Base Station also includes a slot for inserting a Kensington lock to deter theft.

For information and instructions for setting up these security features, see “Setting Up the AirPort Network” on page 23.

Security for AirPort Networks at Home

Apple gives you ways to protect your wireless AirPort network as well as the data that travels over it.

Firewall

You can separate your wireless network from the outside world with firewall protection. The AirPort Extreme Base Station and AirPort Express have a built-in firewall that creates a barrier between your network and the Internet, protecting data from Internet-based IP attacks. The firewall is automatically turned on when you set up the base station to share a single Internet connection. For computers with a cable or DSL modem, AirPort can actually be safer than a wired connection.

Closed Network

Creating a closed network keeps the network name and the very existence of your network private. The network will not show up in a scan of available networks, so prospective users of your network must know the network name and password to access it. Use AirPort Admin Utility, located in Applications/Utilities, to create a closed network.

Password Protection and Encryption

AirPort uses password protection and encryption to deliver a level of security comparable to traditional wired networks. Users can be required to enter a password to log in to the AirPort network. When transmitting data and passwords, the base station uses up to 128-bit encryption, through either Wi-Fi Protected Access™ (WPA) or Wireless Equivalent Privacy (WEP), to scramble data and help keep it safe.

Note: WPA security features are available only to AirPort Extreme Base Stations; AirPort Express; AirPort and AirPort Extreme clients using Mac OS X 10.3 or later and AirPort 3.3 or later, and to non-Apple clients using other 802.11 wireless adapters that support WPA.

If you're using AirPort in conjunction with an America Online account, you can use AOL parental controls to further restrict access. The settings you configure are used for all clients connected to that base station.

iTunes Speaker Password

If you are using AirPort Express to play iTunes music on your stereo or powered speakers using AirTunes, you can password-protect the speaker name that is displayed in the speakers pop-up menu in iTunes. Anyone trying to play music from iTunes to the stereo or speaker will need to enter the password.

Security for AirPort Networks in Business and Education

Businesses, schools, colleges, and universities want to restrict network communications to authorized users and keep data safe from prying eyes, so AirPort Extreme hardware and software provide a robust suite of security mechanisms. Use AirPort Admin Utility to set up these advanced security features.

Transmitter Power Control

Because radio waves travel in all directions, they can extend outside the confines of a specific building. The Transmitter Power setting in AirPort Admin Utility lets you adjust the transmission range of your base station's network. Only users within the network vicinity have access to the network.

MAC Filtering

Every AirPort and wireless card has a unique MAC address. For AirPort and AirPort Extreme Cards, the MAC address is sometimes referred to as the AirPort ID. Support for MAC (Media Access Control) filtering lets administrators set up a list of MAC addresses and restrict access to the network to only those users whose MAC addresses are in the access control list.

RADIUS Support

The Remote Authentication Dial-In User Service (RADIUS) makes securing a large network easy. RADIUS is an access control protocol that allows a system administrator to create a central list of the computers that can access the network. Placing this list on a centralized server allows many base stations to access the list and makes it easy to update. If the MAC address of a user's computer (which is unique to each 802.11 wireless card) is not on your approved MAC address list, the user cannot join your network.

LEAP Support

The Lightweight Extensible Authentication Protocol (LEAP) is a security protocol used by Cisco access points to dynamically assign a different WEP key to each user. AirPort Extreme is compatible with Cisco's LEAP security protocol, enabling AirPort users to join Cisco-hosted wireless networks using LEAP.

Wi-Fi Protected Access (WPA)

There has been increasing concern about the vulnerabilities of WEP. In response, the Wi-Fi Alliance, in conjunction with the IEEE, has developed a strongly enhanced, interoperable security standard called Wi-Fi Protected Access (WPA).

WPA is a specification that brings together standards-based, interoperable security mechanisms that strongly increase the level of data protection and access control for wireless LANs. WPA provides wireless LAN users with a high level of assurance that their data remains protected and that only authorized network users can access the network. A wireless network that uses WPA requires that all computers that access the wireless network have WPA support. It provides a high level of data protection and (when used in Enterprise mode) requires user authentication.

The main standards-based technologies that comprise WPA include Temporal Key Integrity Protocol (TKIP), 802.1X, Message Integrity Check (MIC), and Extensible Authentication Protocol (EAP).

TKIP provides enhanced data encryption by addressing the WEP encryption vulnerabilities, including the frequency with which keys are used to encrypt the wireless connection. 802.1X and EAP provide the ability to authenticate a user on the wireless network.

802.1X is a port-based network access control method for wired as well as wireless networks. The IEEE adopted 802.1X as a standard in August 2001.

The Message Integrity Check (MIC) is designed to prevent an attacker from capturing data packets, altering them, and resending them. The MIC provides a strong mathematical function in which the receiver and the transmitter each compute and then compare the MIC. If they do not match, the data is assumed to have been tampered with and the packet is dropped. If multiple MIC failures occur, the network may initiate counter-measures.

The EAP protocol known as TLS (Transport Layer Security) presents a user's credentials in the form of digital certificates. A user's digital certificates can comprise user names and passwords, smart cards, secure IDs, or any other identity credentials that the IT administrator is comfortable using. WPA uses a wide variety of standards-based EAP implementations, including EAP-Transport Layer Security (EAP-TLS), EAP-Tunnel Transport Layer Security (EAP-TTLS), and Protected Extensible Authentication Protocol (PEAP).

WPA has two modes: Enterprise mode, which uses a RADIUS server for user authentication, and Personal mode, which relies on the capabilities of TKIP without requiring a RADIUS server.

Note: WPA security features are available only to AirPort Extreme Base Stations; AirPort Express; AirPort and AirPort Extreme clients using Mac OS X 10.3 or later and AirPort 3.3 or later, and clients using other 802.11 wireless adapters that support WPA.

WPA Enterprise

WPA is a subset of the draft IEEE 802.11i standard and effectively addresses the Wireless Local Area Network (WLAN) security requirements for the enterprise. It provides a strong encryption and authentication solution prior to the ratification of the 802.11i standard. In an enterprise with IT resources, WPA should be used in conjunction with an authentication server such as RADIUS to provide centralized access control and management. With this implementation in place, the need for add-on solutions such as Virtual Private Networks (VPN) may be eliminated, at least for securing wireless connections in a network.

WPA Personal

For home or Small Office/Home Office (SO/HO) networks, WPA runs in Personal mode, taking into account that the typical household or small office does not have an authentication server. Instead of authenticating with a RADIUS server, users manually enter a password to log in to the wireless network. When the user enters the password correctly, the base station starts the encryption process using TKIP. TKIP takes the original password and derives its encryption keys mathematically from the network password. TKIP then regularly changes and rotates the encryption key so that the same encryption key is never used twice. This all happens behind the scenes. Other than entering the network password, the user isn't required to do anything to make WPA Personal work in the home.

This chapter provides overview information and instructions for the types of AirPort networks you can set up.

Use this chapter to design and set up your AirPort Extreme network. If you are using AirPort Express, use the information in Chapter 5, “Using AirPort Express,” to set up your AirPort Express network.

Configuring your AirPort Extreme Base Station or AirPort Express to implement a network design involves three steps:

Step 1: Setting Up the AirPort Network

Computers communicate with the AirPort Extreme Base Station or AirPort Express over the AirPort wireless network. When you set up the AirPort network created by the base station, you can name the wireless network, assign a password needed to join the wireless network, and other options.

Step 2: Configuring and Sharing Internet Access

When computers access the Internet via the AirPort network, the base station connects to the Internet and transmits information to the computers over the AirPort network. You provide the base station with settings appropriate for your ISP and configure how the base station shares this connection with other computers.

Step 3: Setting Advanced Options

These settings are optional for most users. They include using the base station as a bridge between your AirPort network and an Ethernet network, setting advanced security options, setting up a Wireless Distribution System (WDS) to extend the AirPort network to other base stations, and fine-tuning other AirPort settings.

For specific instructions on all these steps, refer to the sections later in this chapter.

You can do most of your setup and configuration tasks with the AirPort Setup Assistant. To set advanced options, you need to use AirPort Admin Utility.

Using the AirPort Setup Assistant

To set up and configure your computer or base station to use AirPort for wireless networking and Internet access, you can use the AirPort Setup Assistant.

Note: The AirPort Setup Assistant is not compatible with AirPort Express. If you are setting up AirPort Express, see Chapter 5, “Using AirPort Express,” on page 65.

- 1 Open the AirPort Setup Assistant, located in Applications/Utilities.



- 2 Follow the onscreen instructions and enter the settings from your ISP or network administrator. for the type of network you want to set up.

Using AirPort Admin Utility

To modify the base station configuration, open the configuration with AirPort Admin Utility.

To open your base station's configuration:

- 1 Open AirPort Admin Utility, located in Applications/Utilities.
- 2 Select your base station and click Configure.
- 3 Enter the base station password if necessary. The default base station password is *public*.

If you don't see your base station in the Select Base Station window:

- 1 Open the AirPort status menu and make sure that you have joined the AirPort network created by your base station.
- 2 Make sure your network and TCP/IP settings are configured properly.

Choose AirPort from the Show pop-up menu in the Network pane of System Preferences. Then choose Using DHCP from the Configure IPv4 pop-up menu in the TCP/IP pane.

If you can't open the base station's configuration:

- 1 Make sure your network and TCP/IP settings are configured properly.
Choose AirPort from the Show pop-up menu in the Network pane of System Preferences. Choose Using DHCP from the Configure IPv4 pop-up menu in the TCP/IP pane.
- 2 Make sure you entered the AirPort Extreme Base Station or AirPort Express password correctly. The default password is *public*. If you have forgotten the base station password, you can reset it to *public* by resetting the base station.

To temporarily reset the base station password to *public*, press and hold the reset button for one second. To reset the base station back to its default settings, hold the reset button for five full seconds.

If you are on an Ethernet network that has other base stations, or you are using Ethernet to connect to the base station:

AirPort Admin Utility scans the Ethernet network to create the list of base stations in the Select Base Station window. As a result, when you open AirPort Admin Utility, you may see base stations that you cannot configure.

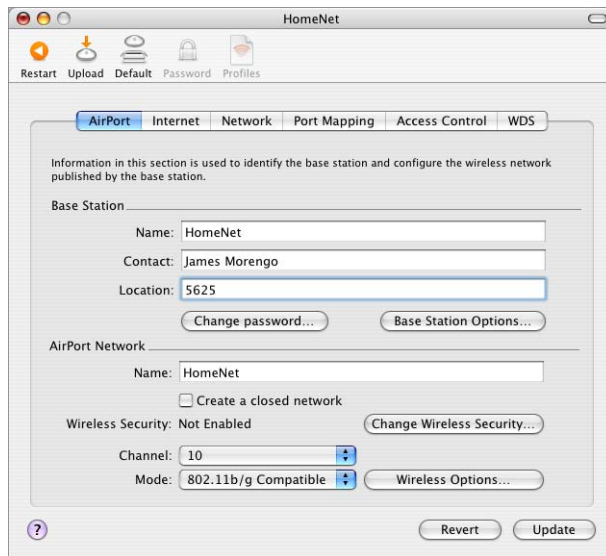
Setting Up the AirPort Network

The first step in configuring your base station is setting up the AirPort network it will create. You can set up most AirPort networks using the AirPort Setup Assistant. Open the setup assistant, located in Applications/Utilities. Follow the onscreen instructions and enter the information from your ISP or network administrator.

To configure a network manually or set advanced options, open your base station's configuration in AirPort Admin Utility, located in Applications/Utilities.

- 1 Choose the network of the base station you want to configure from the AirPort status menu.
- 2 Open AirPort Admin Utility and select the base station from the list. If you don't see the base station you want to configure, click Rescan to scan for available base stations, then select the base station.

- 3 If you are prompted for a password, enter it, then click Configure. Enter information in the AirPort pane.



Naming the Base Station

Give the base station an easily identifiable name. This makes it easy for administrators to locate a specific base station on an Ethernet network with multiple base stations. The optional Contact and Location fields may also be helpful if you have more than one base station on your network.

Changing the Base Station Password

The base station password protects the base station configuration so that only the administrator can modify it. The default password is *public*. It is a good idea to change the base station password to prevent unauthorized changes to the base station.

If the base station password is not changed from *public*, you will not be prompted for a password when you select it from the Select Base Station list and click Configure.

Naming the AirPort Network

Give your AirPort network a name. This name appears in the AirPort status menu on the AirPort-equipped computers that are in range of your AirPort network.

Password-Protecting Your Network

To password-protect your network, you can choose from a number of wireless security options. In the AirPort pane of AirPort Admin Utility, click Change Wireless Security and choose one of the following options:

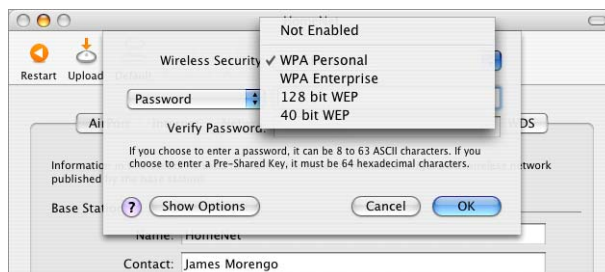
- **Not Enabled** Choosing this option turns off all password protection for the network. Any computer with a wireless adapter or card can join the network, unless the network is set up to use access control. See “Setting Up Access Control” on page 58.
- **128 bit or 40 bit WEP** Choose either of these options to protect your network with a Wireless Equivalent Protection password. Your AirPort Extreme Base Station and AirPort Express support 40-bit and 128-bit encryption. Choose standard 40-bit encryption for maximum compatibility, or choose 128-bit encryption, which provides more WEP security.

If you choose 128-bit encryption, only computers with 128-bit encryption-capable wireless networking cards will be able to join your network. If you choose 40-bit encryption, computers with 40-bit and 128-bit encryption-capable wireless networking cards will be able to join your wireless network, but they will join with only 40-bit encryption.

- **WPA Personal** Choose this option and enter a password for the wireless network. When a wireless client enters the password correctly, the base station starts the encryption process using TKIP.

The password you choose can be between 8 and 63 ASCII characters, or if you choose to enter a Pre-Shared Key, it must be exactly 64 hexadecimal characters.

- **WPA Enterprise** Choose this option if you are setting up a network that includes a RADIUS server with individual user accounts. Enter the IP address and port number for the RADIUS server, and enter a “shared secret,” which is the password for the server.



Note: WPA security features are available only to AirPort Extreme Base Stations; AirPort Express; AirPort and AirPort Extreme clients using Mac OS X 10.3 or later and AirPort 3.3 or later, and clients using other 802.11 wireless adapters that support WPA.

For more information and instructions for setting up WPA on your network, see “Using Wi-Fi Protected Access (WPA)” on page 56.

Joining a 128-Bit Encrypted Wireless Network

If you want to join a wireless network that requires 128-bit encryption, you have two options for entering a password, depending on the password scheme the network administrator has set up.

If you were given a password that is 13 characters, enter it exactly. Thirteen-character passwords are usually case-sensitive.

Example: password12345

If you were given a password that is 26 characters, put a dollar sign (\$) before the password. Twenty-six-character passwords may be case-sensitive.

Example: \$12345678901234567890abcdef

If you need additional information on your 128-bit password, contact your network administrator.

Joining a WPA Personal Network

If you want to join a wireless network that is protected by WPA Personal (also known as Pre-Shared Key), you must enter either an ASCII password of 8 to 63 ASCII characters, or a hexadecimal password of exactly 64 hexadecimal characters. Check with your system administrator to find out which to use.

Joining a WPA Enterprise Network

If you are joining a WPA Enterprise network, you were probably given an Internet Connect configuration file that contains network settings specific to the network you want to join. Double-click the configuration file to open it in Internet Connect. If prompted, enter the user name and password you were given for the network, and if necessary, choose the network from the Wireless Network pop-up menu.

Once the network settings are in Internet Connect, you should be able to choose the WPA Enterprise network from the AirPort status menu. You may be prompted for your user name and password.

Some authentication protocols, such as TLS, require a digital certificate to authenticate the user before joining the network. If your network administrator gave you a digital certificate file, open it in Keychain Access (located in Applications/Utilities), authenticate your network credentials, and join the network.

Check with your network administrator for more information about digital certificates and joining a WPA Enterprise network.

Changing the Channel

The “channel” is the radio frequency over which your base station communicates. If you use only one base station (for example, at home), you probably won’t need to change the channel frequency. If you set up multiple base stations in a school or office, use different channel frequencies for base stations that are within approximately 150 feet of each other.

Adjacent base stations should have at least three channels between their channel frequencies. So if base station A is set to channel 1, base station B should be set to channel 4 or higher.

AirPort-equipped computers automatically tune to the channel frequency your base station is using when they join the AirPort network. If you change the channel frequency, AirPort client computers do not need to make any changes.

Creating a Closed Network

The closed network option hides the name of the network created by the AirPort Extreme Base Station or AirPort Express. Users must enter the exact network name and password to join the AirPort network.

To create a closed network, select the “Create a closed network” checkbox in the AirPort pane of the AirPort Admin Utility.

Note: Creating a closed network can prevent AirPort base stations from automatically selecting a channel.

To join a closed network, users of client computers must follow these steps:

- 1 Click the AirPort status icon in the menu bar and choose Other from the list of available networks.
- 2 Enter the name and password of the AirPort network.

Note: The AirPort Setup Assistant can’t create a connection to a base station with a closed network. Use AirPort Admin Utility to modify the configuration of a base station with a closed network. To use AirPort Admin Utility to set other advanced options, see “Setting Advanced Options” on page 48.

Choosing the Network Mode

Choose 802.11b/g Compatible from the Mode pop-up menu if computers with 802.11g or 802.11b wireless cards or will join the network. Each client computer will transmit at its highest speed.

Choose 802.11g Only if only computers with 802.11g wireless cards will join the network. The transmission rate of the network will be at 802.11g speed, up to 54 megabits per second. Computers with 802.11b wireless cards will not be able to join this network.

Choose 802.11b Only if computers with 802.11b wireless cards will join the network. The transmission rate of the network will be at 802.11b speed, up to 11 megabits per second. Computers with 802.11g cards will be able to join this network, but will join at 802.11b speed.

Setting Wireless Options

Click the Wireless Options button to set the multicast rate of the network, enable interference robustness, and adjust the transmitter power of the base station. Settings in this pane can reduce the range of the base station and should not be modified without good reason.

Setting the Multicast Rate

Use the “Multicast rate” pop-up menu to set the multicast rate. Increase the rate to improve the performance of certain types of network activity, like video or audio streaming. The increase in performance will reduce the range of the wireless network.

Enabling Interference Robustness

Select “Enable interference robustness” when the base station is in an environment with other 2.4 Ghz devices that can interfere with your network. Devices that can cause interference include cordless telephones, some television repeaters, and microwave ovens. For more examples of devices that can cause interference, see “Items That Can Cause Interference With AirPort” on page 80.

Note: Client computers using AirPort Extreme wireless cards must choose Interference Robustness from the AirPort status menu in the menu bar to take advantage of this feature.

Adjusting Transmitter Power

Use the Transmitter Power pop-up menu to reduce the power the base station uses and limit the range of the base station. This may be useful in areas where many base stations are in close proximity to each other. Client computers will need to be closer to the base station in order to join the network it creates. Choose a milliwatt setting from 1 to 32. The larger the number, the greater the network range.

To set more advanced security options, see “Keeping Your Network Secure” on page 56.

Setting Base Station Options

Click Base Station Options to adjust WAN Ethernet port settings. You can select to enable SNMP access, remote configuration, or remote printer access. You can also turn off the Ethernet WAN port on an AirPort Extreme Base Station or the Ethernet port on an AirPort Express.

Click Logging/NTP to set up base station logging and the IP address of a syslog host computer. You can also choose the Network Time Protocol (NTP) server. The NTP server is necessary to ensure the base station date and time are set automatically, and the base station log messages are correct.

If you have a printer connected to an AirPort Extreme Base Station or an AirPort Express, you can change the name of the printer. Click USB Printer, and then double-click the name of the printer and enter a new name.

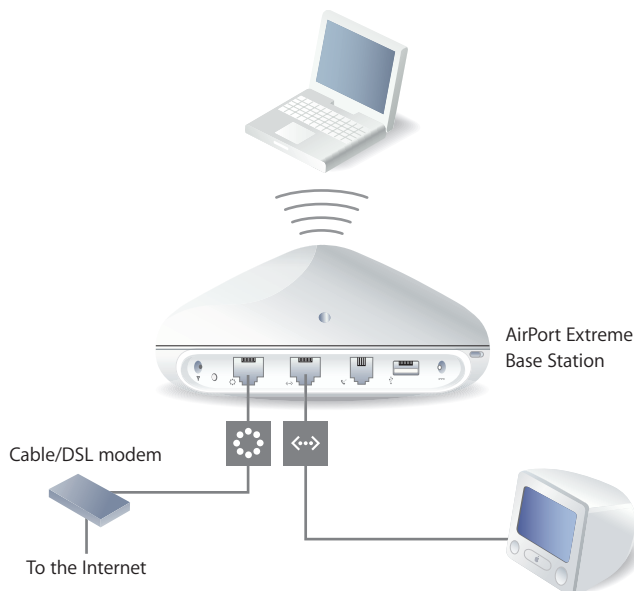
Configuring and Sharing Internet Access

The next step is setting up your base station's Internet connection and sharing its Internet access with client computers. The following three sections tell you what to do, depending on how your base station connects to the Internet.

You're Using a DSL or Cable Modem

In most cases, you can implement this network design with the AirPort Setup Assistant. You only need to use AirPort Admin Utility to adjust optional advanced base station settings.

What It Looks Like



How It Works

- The AirPort Extreme Base Station connects to the Internet through its Ethernet WAN (⚡) connection to your DSL or cable modem. AirPort Express connects to the modem through its Ethernet port.
- Computers using AirPort or computers connected to the AirPort Extreme Base Station's Ethernet LAN (↔) port connect to the Internet through the base station.
- AirPort computers and Ethernet computers communicate with one another through the base station.

Important: Connect Ethernet computers that are not connected to the Internet to the AirPort Extreme Base Station's LAN (↔) port only. Since the base station can provide network services, you must set it up carefully to avoid interfering with other services on your Ethernet network.

What You Need for a DSL or Cable Modem Connection

Components	Check ✓	Comments
Internet account with cable modem or DSL service provider	Does your service provider use a static IP or DHCP configuration?	You can get this information from your service provider or the Network preferences pane on the computer you use to access the Internet through this service provider.
AirPort Extreme Base Station or AirPort Express		Place the base station near your DSL or cable modem.
Optional Ethernet hub		If you want to add more than one computer to your network using Ethernet, you need an Ethernet hub.

What to Do

If you are using the AirPort Setup Assistant to configure the AirPort Extreme Base Station or AirPort Express for Internet access:

- 1 Open the setup assistant, located in Applications/Utilities.
- 2 Follow the onscreen instructions and enter the settings for your service provider.

If you are using AirPort Admin Utility:

- 1 Make sure that your DSL or cable modem is connected to the Ethernet WAN (⚡) port on your base station.
- 2 Open AirPort Admin Utility, located in Applications/Utilities. Select your base station and click Configure.

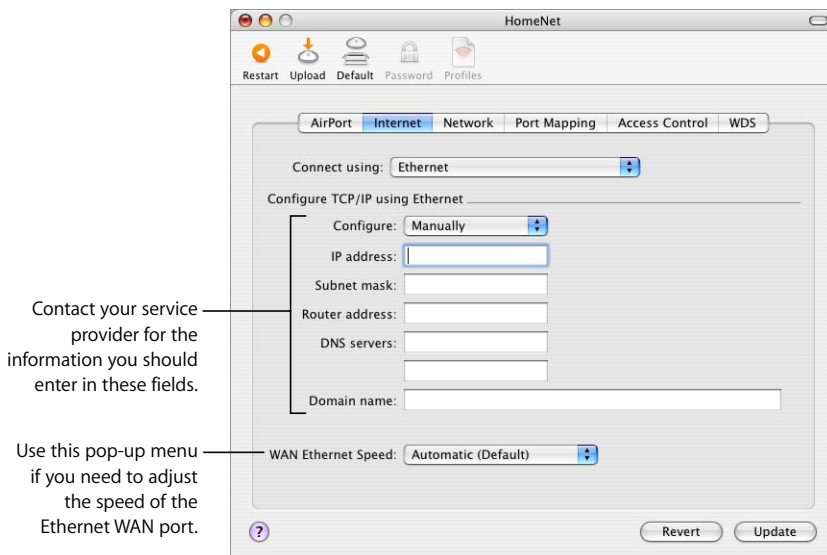
- 3 Click Internet. Choose Ethernet or “PPP over Ethernet (PPPoE)” from the “Connect using” pop-up menu, depending on which one your service provider requires. If your service provider gave you PPPoE connection software, such as EnterNet or MacPoET, choose PPPoE.

Note: If you are connecting to the Internet through a router using PPPoE and your base station is connected to the router via Ethernet, you do not need to use PPPoE on your base station. Choose Ethernet from the “Connect using” pop-up menu in the Internet pane, and deselect the “Distribute IP addresses” checkbox in the Network pane. Contact your service provider if you aren’t sure which one to select.

- 4 If you chose Ethernet from the “Connect using” pop-up menu, choose Manually or Using DHCP from the Configure pop-up menu, depending on how your service provider provides IP addresses. If your provider gave you an IP address and other numbers with your subscription, use that information to configure the base station IP address manually. If you aren’t sure, ask your service provider.

If your service provider asks you for the MAC address of your base station, use the address of the Ethernet WAN (:;) port, printed on the label on the bottom of the base station.

If you configure TCP/IP manually, choose Manually from the Configure pop-up menu and enter your own IP address information in the fields below the Configure pop-up menu.

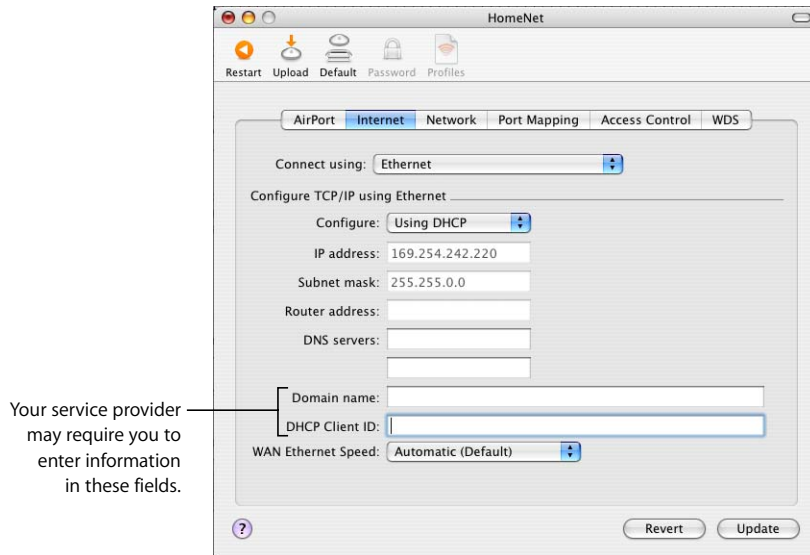


If you have already used the AirPort Setup Assistant to set up your AirPort Extreme Base Station or AirPort Express, the fields below the Configure pop-up menu may already contain the information appropriate for your service provider.

You can change the WAN Ethernet speed if you have specific requirements for the network you are connected to. In most cases, the settings that are configured automatically are correct. Your service provider should be able to tell you if you need to adjust these settings.

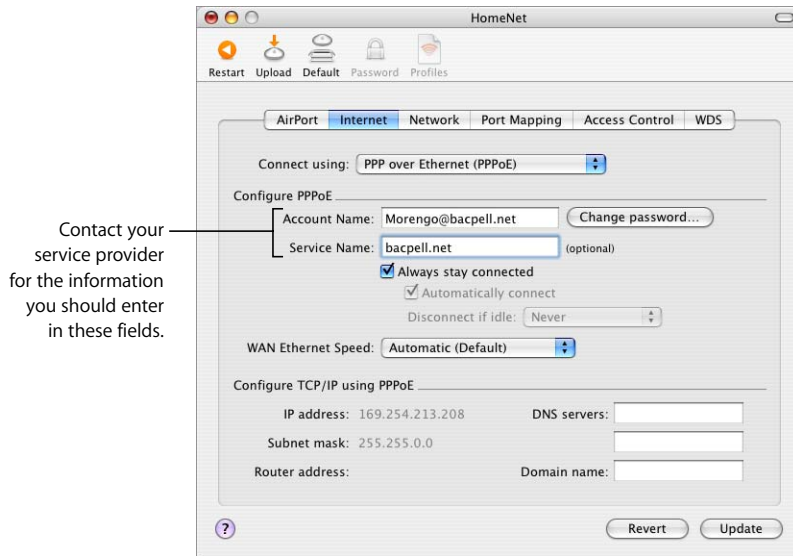
Changing the WAN Ethernet speed can affect the way the base station interacts with the Internet. Unless your service provider has given you specific settings, use the automatic settings. Entering the wrong settings can affect network performance.

If you configure TCP/IP using DHCP, choose Using DHCP from the Configure pop-up menu. Your IP addresses are delivered by the DHCP server.



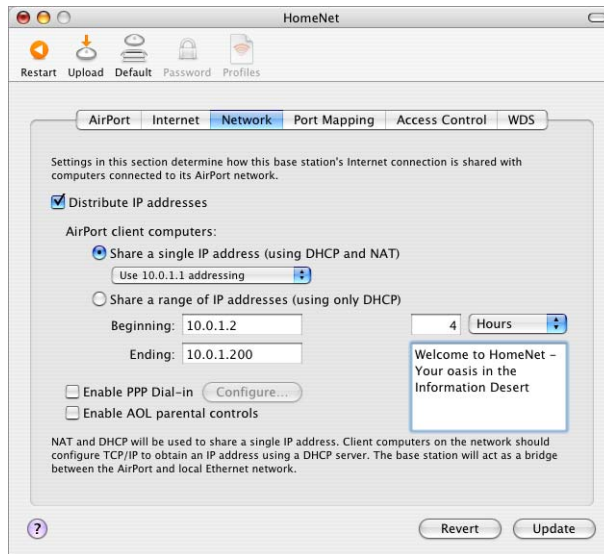
- 5 If you chose “PPP over Ethernet (PPPoE)” from the “Connect using” pop-up menu, enter the PPPoE settings your service provider gave you. Leave the Service Name field blank unless your service provider requires a service name. Contact your ISP for the information to enter in the “DNS servers” and “Domain name” fields.

Note: With AirPort, you don’t need to use a third-party PPPoE connection application. You can connect to the Internet using AirPort.



If you are connecting to the Internet through a router using PPPoE and your base station is connected to the router via Ethernet, you do not need to use PPPoE on your base station. Choose Ethernet from the “Connect using” pop-up menu in the Internet pane, and deselect the “Distribute IP addresses” checkbox in the Network pane.

- 6 Click the Network button and configure how the base station will share its Internet access with AirPort and Ethernet computers.



- To share a single Internet connection with AirPort computers, make sure “Distribute IP addresses” and “Share a single IP address (using DHCP and NAT)” are selected. If you have been given a range of public IP addresses by your ISP, you can select the “Share a range of IP addresses (using only DHCP)” option.
- If you want to connect an AppleTalk Ethernet printer to the base station or use AppleTalk between wired and wireless computers, make sure the devices are connected to the Ethernet LAN (↔) port on the base station.
- Ethernet computers connected to the Ethernet LAN (↔) port share Internet access and a single IP address (using NAT).
- Enabling NAT lets you share a single Internet connection among several computers. Enabling DHCP lets the base station dynamically and automatically assign IP addresses to client computers, which simplifies each computer’s TCP/IP configuration. By default, the base station allows devices and computers using Ethernet and computers using AirPort to communicate with one another using non-IP protocols like AppleTalk.
- If you want to use the parental controls you have set up with your America Online (AOL) account, select the “Enable AOL parental controls” checkbox. This will copy the parental controls to your base station.
- If you want people joining your AirPort network to be greeted with a personal message, type it in the Message field.

- If your AirPort Extreme Base Station has an internal modem, select “Enable PPP Dial-in” to allow you to dial in to the AirPort Extreme Base Station from a computer modem over a standard, analog phone line. Dialing in to your base station gives you access to your home network and the Internet through your home network Internet service provider (ISP).

To set up your base station for PPP dial-in:

- Connect a phone line to the modem (☎) port on your base station.
- In the Network pane of AirPort Admin Utility, select “Enable PPP Dial-in” and click Configure.
- Enter the user name and password, and set other options.

Because you set the base station to answer incoming calls, consider using a dedicated phone line for your base station. Other calls coming in on the same line could cause the base station modem to disconnect.

You cannot enable PPP dial-in if the base station is set up to use a PPP connection to your Internet service provider.

With PPP dial-in enabled, the base station is set to share a single IP address (using DHCP and NAT) only; it cannot share a range of IP addresses (using only DHCP).

Note: If you dial in to your base station from a V.90 modem, the best speed you can expect is the V.34 speed of 33600 bits per second (bps). This is a limitation of the V.90 standard and is not caused by a problem with your modem or base station.

- If you want to adjust optional advanced settings, go to “Setting Advanced Options” on page 48. If you are finished changing settings, click the Update button. Your computer transfers the new settings to the base station. When the transfer is complete, the base station restarts and its new settings are active.

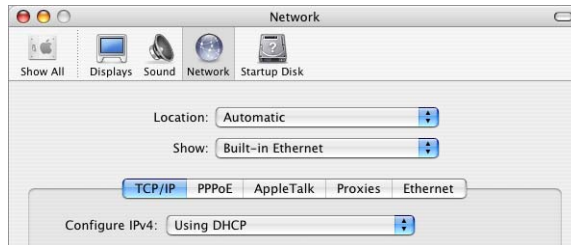
Setting Up Client Computers

To configure TCP/IP on client computers:

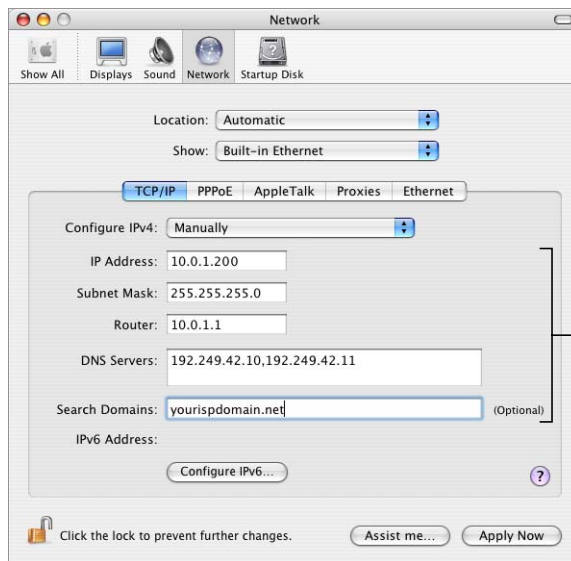
- Open System Preferences on the client computer and click Network.
- Do one of the following:
 - If the client computer is using AirPort, choose AirPort from the Show pop-up menu and Using DHCP from the Configure IPv4 pop-up menu in the TCP/IP pane.



- b If you enabled a DHCP server when you set up the base station's network, and the client computer is using Ethernet, choose Built-in Ethernet from the Show pop-up menu and Using DHCP from the Configure IPv4 pop-up menu in the TCP/IP pane.



- c If you selected "Share a range of IP addresses (using only DHCP)" when you set up the base station's network, you can provide Internet access to Ethernet client computers by setting the client IP addresses manually. Choose Built-in Ethernet from the Show pop-up menu, and choose Manually from the Configure IPv4 pop-up menu.

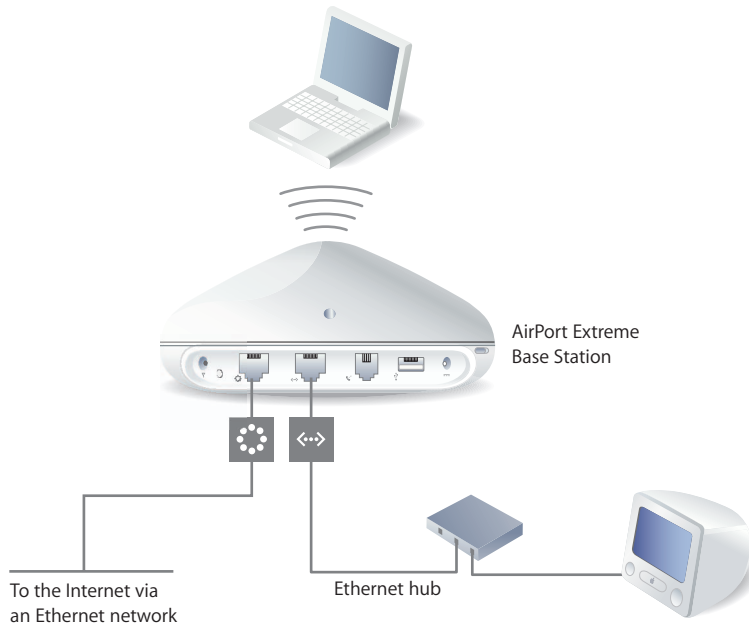


When you configure Ethernet clients manually for a base station that provides NAT over Ethernet, you can use IP addresses in the range 10.0.1.2 to 10.0.1.200. In the Subnet Mask field, enter 255.255.255.0. In the Router field, enter 10.0.1.1. Enter the same name server address and search domain information that you entered in the base station configuration.

You're Using an Existing Ethernet Network

You can use the AirPort Setup Assistant to set up the base station for Internet access through an existing Ethernet network. Use AirPort Admin Utility if you need to adjust optional advanced base station settings.

What It Looks Like



How It Works

- The AirPort Extreme Base Station uses your Ethernet network to communicate with the Internet through the Ethernet WAN (🌐) port. AirPort Express uses the Ethernet port.
- AirPort and Ethernet clients access the Internet and the Ethernet network through the AirPort Extreme Base Station. AirPort clients can access the Internet through AirPort Express.

What You Need for an Ethernet Connection

Components	Check ✓	Comments
AirPort Extreme Base Station or AirPort Express		
Ethernet hub		<p>If you want to add more than one computer to your AirPort network using Ethernet, you need an Ethernet hub.</p> <p>If you use an Ethernet hub, make sure you connect the cable from your Ethernet network to the hub's uplink port. Do not connect the AirPort Extreme Base Station to the uplink port.</p>
Ethernet cables		

What to Do

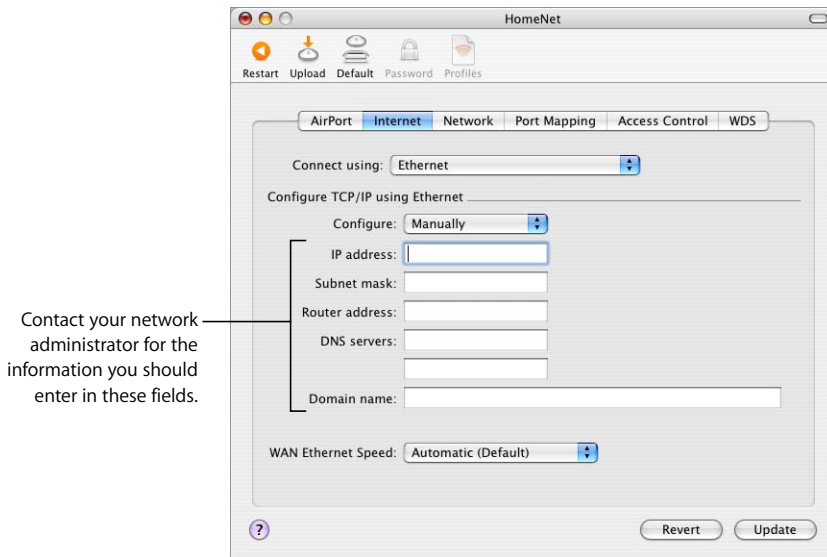
If you are using the AirPort Setup Assistant to set up a base station on an existing Ethernet network:

- 1 Open the setup assistant, located in Applications/Utilities.
- 2 Follow the onscreen instructions and enter the account information you were given by your service provider or network administrator.

If you are using AirPort Admin Utility:

- 1 Open AirPort Admin Utility, located in Applications/Utilities.
- 2 Select your base station and click Configure.
- 3 Click Internet and choose Ethernet from the "Connect using" pop-up menu.
- 4 Choose Manually or Using DHCP from the Configure pop-up menu, depending on how IP addresses are provided on your Ethernet network. If you aren't sure, ask your service provider or network administrator.

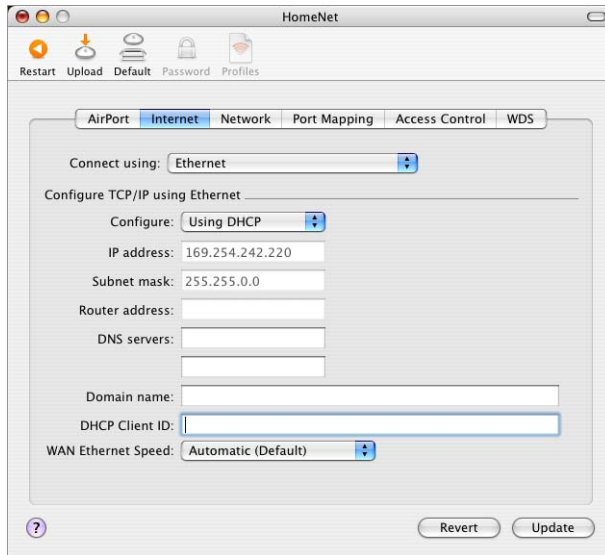
If your addresses are provided manually, choose Manually from the Configure pop-up menu. Enter your IP address information in the fields below the Configure pop-up menu.



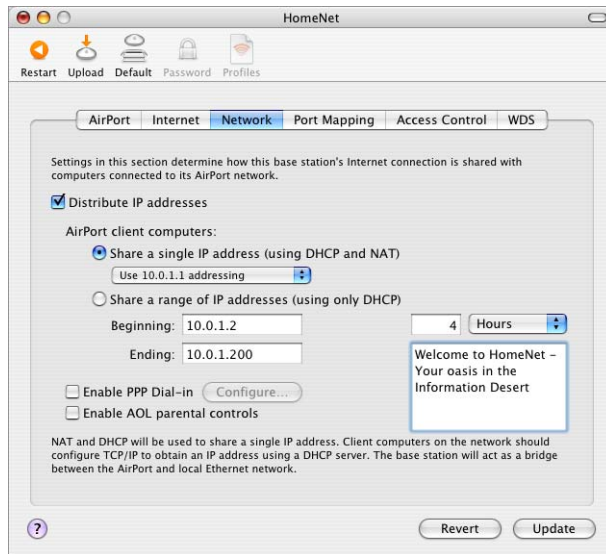
Contact your network administrator for the information you should enter in these fields.

If you have already used the AirPort Setup Assistant to set up your AirPort Extreme Base Station or AirPort Express, the fields below the Configure pop-up menu may already contain the appropriate information.

If your IP address is provided by DHCP, choose Using DHCP from the Configure pop-up menu.



- 5 Click the Network button and select how the base station will share its Internet access with AirPort and Ethernet computers.



- If you want to use the base station to share a single IP address, click the “Distribute IP addresses” checkbox and the “Share a single IP address (using DHCP and NAT)” button.
 - If you want to share a range of public IP addresses, click the “Share a range of IP addresses (using only DHCP)” button.
 - If you don’t want the base station to provide IP addresses (using DHCP or NAT) to AirPort computers, see “Using the AirPort Extreme Base Station or AirPort Express as a Bridge” on page 48.
- Important:** Since the base station can provide network services, you must set it up carefully to avoid interfering with other services on your Ethernet network.
- If you want to use the parental controls you have set up with your America Online (AOL) account, select the “Enable AOL parental controls” checkbox. This will copy the parental controls to your base station. For more information, contact AOL.

- If your base station has an internal modem, select “Enable PPP Dial-in” to allow you to dial in to the AirPort Extreme Base Station from a computer modem over a standard, analog phone line. Dialing in to your base station gives you access to your network and the Internet through your network’s Internet service provider (ISP).

To set up your base station for PPP dial-in:

- Connect a phone line to the modem (☎) port on your base station.
- In the Network pane of AirPort Admin Utility, select “Enable PPP Dial-in” and click Configure.
- Enter the user name and password, and set other options.

Because you set the base station to answer incoming calls, consider using a dedicated phone line for your base station. Other calls coming in on the same line could cause the AirPort Extreme Base Station modem to disconnect.

With PPP dial-in enabled, the base station is set to share a single IP address (using DHCP and NAT) only; it cannot share a range of IP addresses (using only DHCP).

Note: If you dial in to your base station from a V.90 modem, the best speed you can expect is the V.34 speed of 33600 bits per second (bps). This is a limitation of the V.90 standard and is not caused by a problem with your modem or base station.

- If you want to adjust optional advanced settings, go to “Setting Advanced Options” on page 48. If you are finished changing settings, click the Update button. Your computer transfers the new settings to the base station. When the transfer is complete, the base station restarts and its new settings are active.

Setting Up Client Computers

To configure TCP/IP on client computers:

- Open System Preferences on the client computer and click Network.
- For AirPort clients, choose AirPort from the Show pop-up menu and Using DHCP from the Configure IPv4 pop-up menu in the TCP/IP pane. For Ethernet clients, choose Built-in Ethernet from the Show pop-up menu and Using DHCP from the Configure IPv4 pop-up menu in the TCP/IP pane.



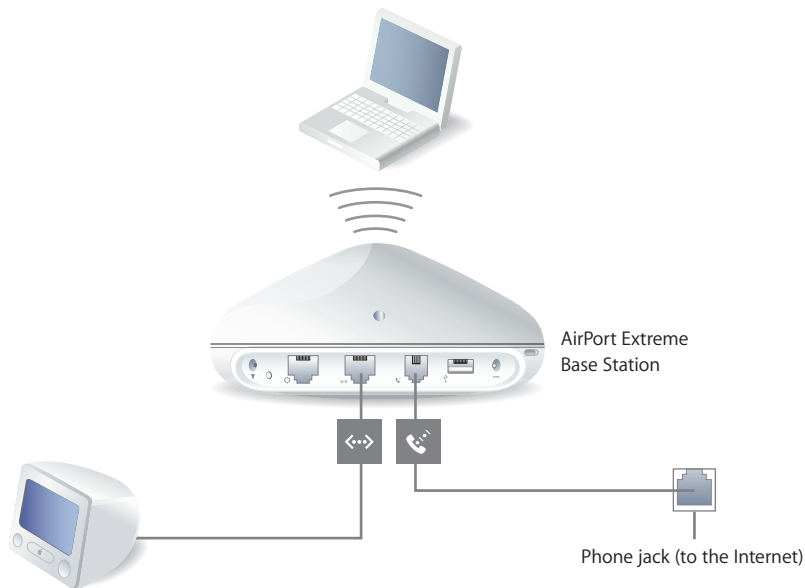
Joining an AirPort Network

To join your AirPort network, clients can choose the network from the AirPort status menu in the menu bar.

You're Using a Dial-Up Internet Service Provider (ISP)

If your AirPort Extreme Base Station came with an internal modem, you can set up its connection to the Internet with the AirPort Setup Assistant. You only need to use AirPort Admin Utility to adjust optional advanced base station settings, such as port mapping, advanced security options, or controlling access to your AirPort network.

What It Looks Like



How It Works

- The base station connects to your ISP and the Internet using its internal modem.
- Computers using AirPort or computers connected to the base station's Ethernet LAN (<->) port can connect to the Internet through the AirPort Extreme Base Station.
- AirPort computers and Ethernet computers communicate with one another through the base station using AppleTalk and other networking protocols.

What You Need for a Dial-Up Connection

Components	Check ✓	Comments
Working dial-up ISP account using standard PPP	Make sure you have the following: <ul style="list-style-type: none">• ISP phone number• account name and password• DNS address• other information your ISP may provide	You can get this information (except the account password) from the Internet Connect application and Network preferences on the computer you use to access the Internet. If Network preferences on your computer doesn't have DNS information, you may not need to provide DNS information in the AirPort Setup Assistant.
AirPort Extreme Base Station with an internal modem		Place the base station near a phone jack and power outlet.
Optional Ethernet hub		If you want to add more than one computer to your network using Ethernet, you need an Ethernet hub.

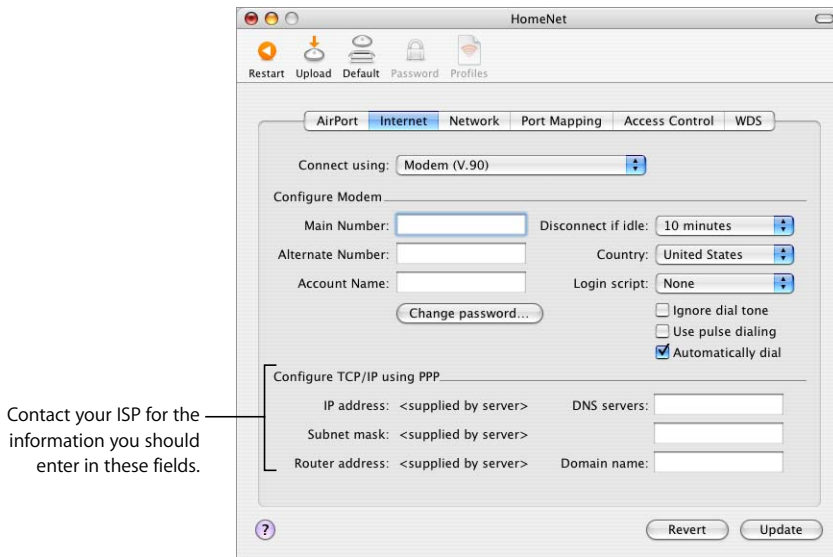
What to Do

If you are using the AirPort Setup Assistant to configure the AirPort Extreme Base Station for Internet access:

- 1 Open the AirPort Setup Assistant, located in Applications/Utilities.
- 2 Follow the onscreen instructions and enter the phone number and other account information for your ISP.

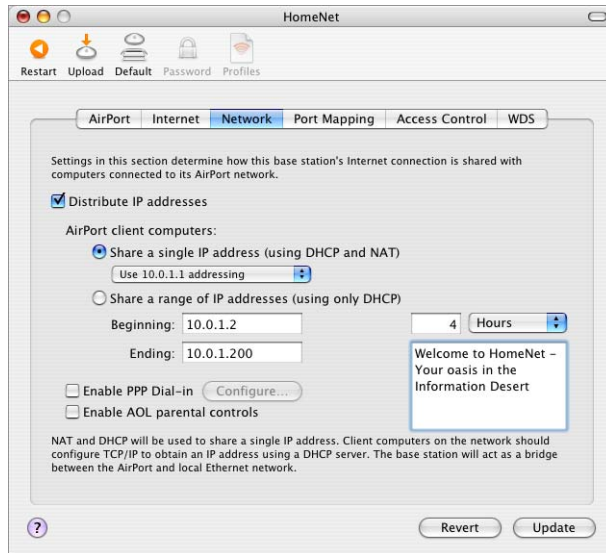
If you are using AirPort Admin Utility to configure the AirPort Extreme Base Station or AirPort Express for Internet access:

- 1 Open AirPort Admin Utility, located in Applications/Utilities. Select your base station and click Configure.
- 2 Click Internet and choose Modem (V.90) from the “Connect using” pop-up menu if you are connecting to an ISP. Enter the phone number and other account information. The “DNS servers” and “Domain name” information may be optional; check with your ISP.



If you have difficulty connecting, you can try to connect at a slower modem speed by choosing Modem (V.34) from the “Connect using” pop-up menu.

- 3 Click Network and configure how the base station will share its Internet access with AirPort and Ethernet computers. Select the “Distribute IP addresses” checkbox and the “Share a single IP address (using DHCP and NAT)” button.



By default, AirPort and Ethernet client computers share a single IP address using Network Address Translation (NAT). The base station acts as a bridge between the AirPort and local Ethernet networks. When Modem is selected in the “Connect using” pop-up menu in the Internet pane, both the Ethernet LAN (↔) port and the Ethernet WAN (⚡) port are bridged, and both can share a single IP address using NAT.

Important: If you are connecting to the Internet by Ethernet or PPPoE, only the Ethernet LAN (↔) port is bridged.

Enabling NAT lets you share a single Internet connection among several computers. Enabling DHCP lets the base station dynamically and automatically assign IP addresses to client computers, which simplifies each computer’s TCP/IP configuration. Bridging allows devices and computers using Ethernet and computers using AirPort to communicate with one another.

Note: If your base station can use Power over Ethernet and receive power and the network connection on the WAN port, by default NAT is not enabled.

- 4 If you want to adjust optional advanced settings, go to “Setting Advanced Options” on page 48. If you are finished changing settings, click the Update button. Your computer transfers the new settings to the base station. When the transfer is complete, the base station restarts and its new settings are active.

Setting Up Client Computers

See “Setting Up Client Computers” on page 35 for information on setting up client computers to access the AirPort network.

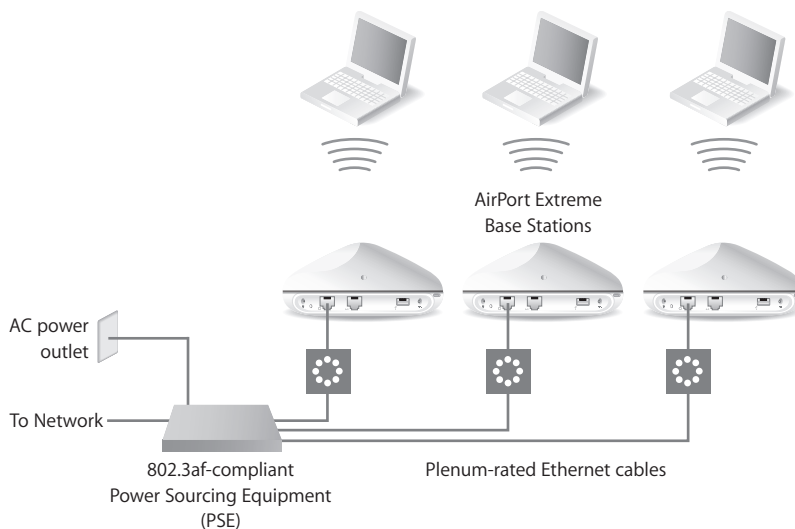
You’re Using AirPort Extreme Base Stations Powered Over Ethernet on an Existing Network

If your AirPort Extreme Base Station supports it, you can connect multiple base stations to 802.3af-compliant Power Sourcing Equipment (PSE), and deliver both power and the network and Internet connection over the same cable. See the documentation that came with your base station to make sure the base station supports Power over Ethernet (PoE).

If your base station supports PoE, the base station and the mounting bracket conform to UL Standard 2043 for placement in the air-handling space above suspended ceilings. Using Power over Ethernet allows you to install a base station in places away from a standard electrical outlet.

To use the base station in an air-handling space above suspended ceilings, you must connect the Ethernet WAN port to an 802.3af-compliant PSE with a plenum-rated Ethernet cable. You cannot use the AC power adapter to power a base station installed in an air-handling space. Do not connect an external antenna to a base station mounted in an air-handling space.

What It Looks Like



How It Works

- The base station uses your Ethernet network to communicate with the Internet and receives power through the Ethernet WAN (⚡) port.
- AirPort clients access the Internet and the Ethernet network through the AirPort Extreme Base Station.

Note: AirPort Extreme Base Stations that support Power over Ethernet (PoE), are set up by default to act as a bridge, and the “Share a single IP address (using DHCP & NAT)” option is not selected. Use the Network pane of AirPort Admin Utility if you want to select the “Share a single IP address (using DHCP & NAT)” option.

What You Need for a Power Over Ethernet Connection

Components	Check ✓	Comments
AirPort Extreme Base Station or multiple base stations that support PoE		
802.3af-compliant Power Sourcing Equipment (PSE)		
Plenum-rated Ethernet cables		If you are mounting the base station in the air-handling space above a suspended ceiling, you need to use plenum-rated Ethernet cables.

What to Do

Follow the instructions in the section, “You’re Using an Existing Ethernet Network” on page 37, to set up the AirPort network.

Setting Advanced Options

Using the AirPort Extreme Base Station or AirPort Express as a Bridge

You can turn off the base station’s Internet sharing features (which provide IP addresses to AirPort computers using DHCP or NAT) to allow bridging between the network’s wireless and wired computers. With bridging turned on, AirPort computers have access to all services on the Ethernet network, and the base station does not provide Internet sharing services.

Using the base station as a bridge can be a way to address incompatibilities between the base station’s Internet sharing features and your ISP’s connection method.

To use the base station as a bridge, all AirPort and Ethernet computers need to have IP addresses set manually and use the same subnet mask.

To set up the base station as a bridge:

- 1 Open AirPort Admin Utility (in Applications/Utilities) and open your base station's configuration.
- 2 Click Network.
- 3 Deselect the "Distribute IP addresses" checkbox.

Connecting Additional Base Stations to Your AirPort Network

You can connect additional AirPort Extreme or AirPort Express base stations to extend the range of your wireless network. You can connect AirPort Extreme Base Stations using Ethernet. A network with base stations connected using Ethernet is known as a *roaming network*. You can also connect both AirPort Extreme and AirPort Express base stations wirelessly. Connecting base stations wirelessly creates what is known as a Wireless Distribution System (WDS).

Setting Up Roaming

Multiple AirPort Extreme Base Stations can be set up to create a single wireless network. Client computers using AirPort can move from base station to base station with no interruption in service (a process known as *roaming*).

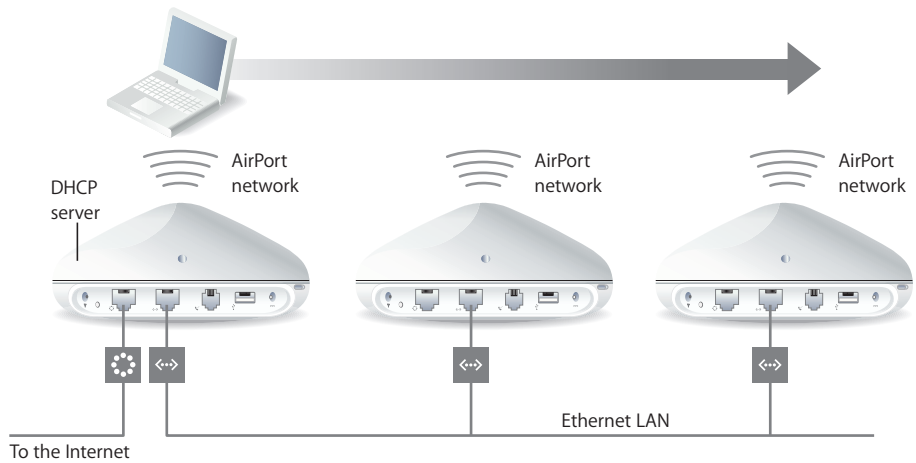
To set up roaming:

- 1 Connect all of the AirPort Extreme Base Stations to the same subnet on your Ethernet network.
- 2 Give each base station a unique name.
- 3 Give each base station the same network name and password.
- 4 Set up the base stations as bridges, following the instructions in the previous section.

If you want one AirPort Extreme Base Station to assign IP addresses using DHCP, also do the following:

- 1 Set up one base station to act as the DHCP server.
- 2 Set up the other base stations as bridges, following the instructions in the previous section.

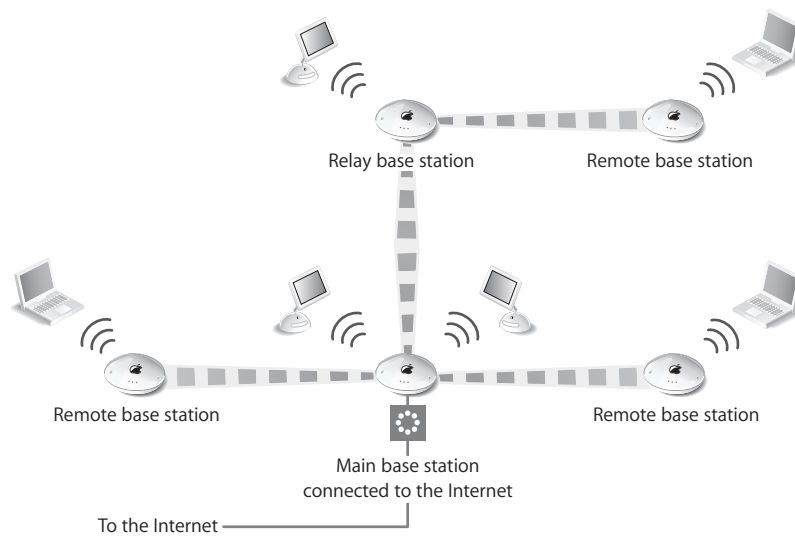
The base station acting as a DHCP server can receive its IP address from the DHCP server on the Ethernet network.



Setting Up a Wireless Distribution System (WDS)

When you connect base stations wirelessly in a WDS, you set up each base station as either a main base station, a remote base station, or, if you are using AirPort 3.1 or later, a relay base station.

Note: If you are setting up AirPort Express to extend the range of your network using WDS, use the AirPort Setup Assistant. See “Extending the Range of an Existing AirPort Extreme or AirPort Express Network” on page 70.



A main base station is connected to the Internet and shares its connection with remote and relay base stations. A remote base station shares the main base station's Internet connection. A relay base station shares the main base station's Internet connection and transfers the connection to other remote or relay base stations.

All three base station configurations (main, remote, and relay) can also share the main base station's Internet connection with client computers wirelessly, or with Ethernet if the client computers are connected to the base station or Ethernet.

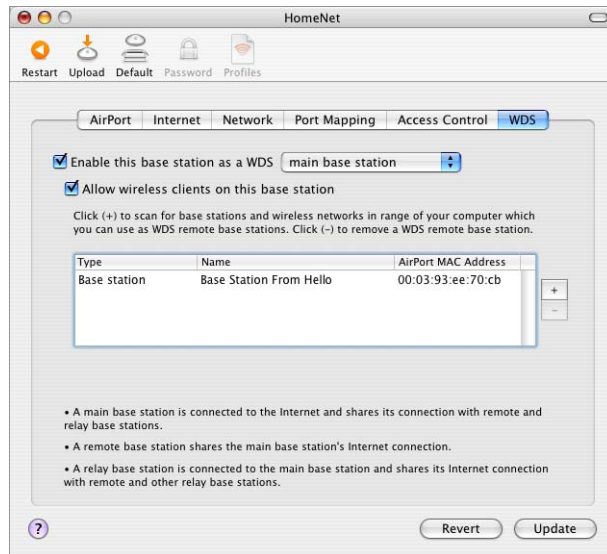
When you set up base stations in a WDS, you need to know the AirPort ID of each base station. The AirPort ID is also known as the *MAC address* and is printed on the label on the bottom of the base station next to the AirPort (📶) symbol. To make it easier to set up a WDS, place all of the base stations on a table and plug them into a power supply.

As part of the WDS setup process, you might consider giving all the base stations unique names, to make them easier to identify in the future.

To set up the main base station to share its Internet connection with other base stations:

- 1 Click the AirPort status menu in the menu bar and choose the wireless network created by the base station you want to set up as the main base station.
- 2 Open AirPort Admin Utility (in Applications/Utilities), select the main base station, and click Configure. Enter the base station password if necessary. If the base station is using the default password of *public*, you will not be prompted for a password.
- 3 Click WDS.
- 4 Select the "Enable this base station as a WDS" checkbox, and choose "main base station" from the pop-up menu.
- 5 Click the Add (+) button to scan for base stations in range of your computer. Click Rescan if a base station you expect to see doesn't appear in the list.
- 6 Select the base stations you want to set up as remote base stations. Deselect the "Auto configure as a WDS remote base station" checkbox if you want to set up the remote base station manually.

Select a base station and click the Delete (–) button to remove the base station from the list.



- 7 Click Update to send the new settings to the base stations in the WDS.

After you click Update, you can give each base station a name and password, and choose how the base station receives IP addresses.



By default, the “Allow wireless clients on this base station” checkbox is selected. If you deselect the “Allow wireless clients on this base station” checkbox, and later want to change the settings on the base station, you must connect to the base station’s LAN port with an Ethernet cable. You will not be able to connect to the base station wirelessly.

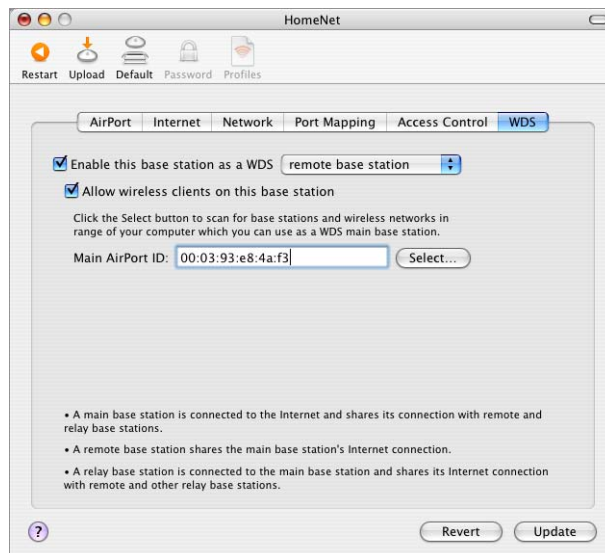
To set up an additional remote base station to connect to the main base station:

If you want to add additional remote or relay base stations to the WDS after setting up the main and remote base stations, use AirPort Admin Utility again.

Remote base stations need to be on the same channel as the main base station. Before setting up additional remote base stations, find the channel of the main base station in the AirPort pane of AirPort Admin Utility.

- 1 Click the AirPort status menu in the menu bar and choose the wireless network created by the base station you want to set up as a remote base station.
- 2 Open AirPort Admin Utility (in Applications/Utilities), select the remote base station, and click Configure. Enter the base station password if necessary. If the base station is using the default password of *public*, you will not be prompted for a password.
- 3 Enter the same network password as the main base station, if necessary.
- 4 Click AirPort and choose the same channel as the main base station from the Channel pop-up menu.
- 5 Click the WDS button and select the “Enable this base station as a WDS” checkbox, and choose “remote base station” from the pop-up menu.
- 6 Enter the MAC address of the main base station in the Main AirPort ID field. The MAC address is also referred to as the AirPort ID and is printed on the label on the bottom of the base station, next to the AirPort (📶) symbol.

If you don't want to enter the MAC address manually, click Select to scan for base stations in range of your computer and select the base station you want to use as the main base station.



- 7 Click Update to transfer the settings to the base station.

By default, the “Allow wireless clients on this base station” checkbox is selected. If you deselect the “Allow wireless clients on this base station” checkbox, and later want to change the settings on the base station, you must connect to the base station’s LAN port with an Ethernet cable. You will not be able to connect to the base station wirelessly.

To set up a relay base station to connect to the main base station and share its connection with additional remote base stations:

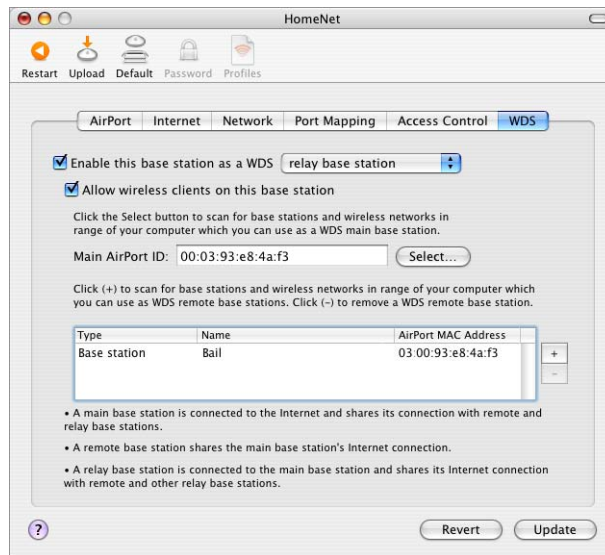
If you want to set up a relay base station in the WDS to share its connection with other remote base stations and wireless clients, use AirPort Admin Utility again.

When you set up a relay base station, you also need to set up at least one additional remote base station to share the relay’s connection. To set up a relay base station, first set up the base station as a remote base station by following the instructions on page 53.

Relay and remote base stations need to be on the same channel as the main base station. Before setting up a relay or remote base station, find the channel of the main base station in the AirPort pane of AirPort Admin Utility.

- 1 Click the AirPort status menu in the menu bar to join the wireless network created by the base station you want to set up as the relay base station.
- 2 Open AirPort Admin Utility (in Applications/Utilities), select the relay base station, and click Configure. If the base station is using the default password of *public*, you will not be prompted for a password.
- 3 Enter the same network password as the main base station, if necessary.
- 4 Click the WDS button and select the “Enable this base station as a WDS” checkbox, and choose “relay base station” from the pop-up menu.
- 5 Enter the MAC address of the main base station in the Main AirPort ID field. The MAC address is also referred to as the AirPort ID and is printed on the label on the bottom of the base station, next to the AirPort (📶) symbol.

If you don't want to enter the MAC address manually, click Select to scan for base stations in range of your computer and select the base station you want to use as a main base station.



- 6 Click the Add (+) button to scan for base stations in range of your computer. Click Rescan if the base station you expect to see doesn't appear in the list. Deselect the "Auto configure as a WDS remote base station" checkbox if you want to set up the remote base station manually.

Select a base station and click the Delete (–) button to remove a base station from the list.

- 7 Select the base stations you want to set up as remote base stations.
- 8 Click Update to transfer the new WDS settings to the relay and remote base stations.

Extending the Range of Your AirPort Network

In addition to adding additional base stations to your network, you can attach an Apple-certified external antenna to an AirPort Extreme Base Station to extend your network's range. You can attach an omnidirectional antenna to broaden the range of the network in all directions, or you can add a unidirectional antenna to extend the network further in one direction. External antennas are available from your Apple-authorized dealer, Apple retail stores, or the Apple Store at www.apple.com/store.

Note: After attaching an external antenna, you must unplug the base station's power adapter and then plug it back in.

Important: If your base station is using Power over Ethernet and is mounted in an air-handling space, do not connect an external antenna unless it complies with UL Standard 2043. Some external antennas do not meet the requirements for placement in air-handling spaces.

Controlling the Range of Your AirPort Network

You can also shorten the range of your AirPort network. This might be useful if you want to control who has access to the network by restricting the range to a single room, for example.

To shorten the range of your AirPort network:

- 1 Open AirPort Admin Utility (in Applications/Utilities).
- 2 Select your base station and click Configure.
- 3 Click AirPort and then click Wireless Options.
- 4 Choose a milliwatt setting from the Transmitter Power pop-up menu. The lower the milliwatt setting, the shorter the range.

Keeping Your Network Secure

Your network is protected by the password you assign to it. However, you can take additional steps to help keep your network secure.

Networks managed by Simple Network Management Protocol (SNMP) may be vulnerable to denial-of-service attacks. Similarly, if you configure your base station over the WAN port, it may be possible for unauthorized users to change network settings. When remote configuration is enabled, the base station's Rendezvous information (the base station name and IP address) is published over the WAN port. Turning off remote configuration may provide additional security.

To help protect your network and base station:

- 1 Open AirPort Admin Utility, select your base station, and click Configure.
- 2 Click Base Station Options in the AirPort pane.
- 3 Make sure the Enable SNMP Access and Enable Remote Configuration checkboxes are not selected.

Using Wi-Fi Protected Access (WPA)

This version of AirPort supports WPA, the latest security standard for wireless networks. Using Mac OS X 10.3 and its 802.1X authentication capabilities, WPA security delivers more sophisticated data encryption than WEP, and also provides user authentication, which was virtually unavailable with WEP.

Note: WPA security features are available only to AirPort Extreme Base Stations; AirPort Express; AirPort and AirPort Extreme clients using Mac OS X 10.3 or later and AirPort 3.2 or later, and non-Apple clients using other 802.11 wireless adapters that support WPA.

AirPort 3.2 and later supports two modes of WPA: Enterprise mode, which uses a RADIUS server for user authentication, and Personal mode, which relies on the capabilities of TKIP without requiring a RADIUS server.

Enterprise mode is designed for a larger network in which an IT professional is most likely setting up and managing the network. In order to set up a WPA Enterprise network, an 802.1X connection must be set up first in Internet Connect. The 802.1X connection requires an authentication protocol, like TTLS, LEAP, or PEAP. It also requires an authentication server to manage network users' credentials and certificates.

Personal mode is for the home or small office network and can be set up and managed by most users. Personal mode does not require a separate authentication server. Users of the network usually need only enter a user name and password to join the network.

To set up a WPA Enterprise network:

Setting up a WPA Enterprise network requires setting up a RADIUS server to manage and validate network users' credentials, such as user names, passwords, and user certificates. See the documentation that came with the RADIUS server to set it up. Once the server is set up, follow these steps to set up a WPA Enterprise network.

- 1 Open Internet Connect, located in the Applications folder.
- 2 Choose File > New 802.1X Connection.
- 3 Choose Edit Configurations from the Configuration pop-up menu.
- 4 Enter the settings for the connection.
 - Enter a name for the configuration.
 - Choose the network from the Wireless Network pop-up menu.
 - Choose the authentication protocol of the RADIUS server. See the documentation that came with the server for more information.
 - Configure the protocol, if necessary. Some authentication protocols require additional settings, like an outer identity or a digital certificate. See the documentation that came with the server for more information.

Note: Some of the authentication protocols require digital certificate authorization on the server. See the documentation that came with your server to create and distribute digital certificates.

- 5 Click OK to save the connection settings.

Choose File > Export Configurations to create a file you can distribute to network users.
- 6 Open AirPort Admin Utility, select your base station, and click Configure.
- 7 Click Change Wireless Security in the AirPort pane.
- 8 Choose WPA Enterprise from the Wireless Security pop-up menu.
- 9 Enter the IP address, port, and shared secret (or password) of the primary and secondary RADIUS authentication servers.

To set up a WPA Personal network:

- 1 Open AirPort Admin Utility, select your base station, and click Configure.
- 2 Click Change Wireless Security in the AirPort pane.
- 3 Choose WPA Personal from the Wireless Security pop-up menu.
- 4 Choose Password from the pop-up menu to enter an ASCII password of 8 to 63 ASCII characters, or choose Pre-Shared Key to enter a hexadecimal password of exactly 64 hexadecimal characters.

Setting Up Access Control

Access control lets you specify which AirPort computers can send or receive information through the base station to the wired network.

Each AirPort-equipped computer has a unique AirPort ID (also known as the MAC address). You can restrict access by creating an access control list that includes only the MAC addresses for computers you want to access your wired network.

To find the MAC address (AirPort ID) of your computer's AirPort Card, click the AirPort button in the Network pane of System Preferences.

To set up the access control list:

- 1 Open AirPort Admin Utility, select your base station, and click Configure.
- 2 Click Access Control.
- 3 Click Add (+) and enter the AirPort ID (MAC address) and an optional description for the computers that will access the network. Select an AirPort ID and click Delete (-) to remove it from the list.

Important: AirPort access control prevents computers that aren't on the access control list from accessing the AirPort network. For information on how to prevent unauthorized computers from joining the AirPort network, see "Setting Up the AirPort Network" on page 23.

You can also add the MAC address of a third-party 802.11 wireless networking card to the access control list. Most third-party cards have the MAC address on a label attached to the metal case of the card.

Access control is not compatible with WPA Enterprise mode. You can use either access control or WPA Enterprise in a network, but you can't use both.

Using a RADIUS Server

Using a RADIUS (Remote Authentication Dial-In User Service) server on your network lets you authenticate MAC addresses (AirPort IDs) on a separate computer, so that each base station on the network doesn't need to store the MAC addresses of computers that have access to the network. Instead, all the addresses are stored on a server that is accessed through a specific IP address.

To set up authentication using a RADIUS server:

- 1 On the server, enter the MAC addresses of the computers that will access the network.
- 2 When the RADIUS server is set up, open AirPort Admin Utility, select your base station, and click Configure.
- 3 Click Access Control.
- 4 Choose a format from the RADIUS pop-up menu.

If you choose Default, the base station formats the MAC addresses as 010203-0a0b0c and they are used as the user names on the RADIUS server. The shared secret is the password for users joining the network. This format is often used for Lucent and Agere servers.

If you choose Alternate, MAC addresses are formatted as 0102030a0b0c and are used for both the user name and password by users joining the network. This format is often used for Cisco servers.

- 5 Enter the IP address, port, and shared secret (or password) for the primary and secondary servers.

See the RADIUS documentation that came with your server, or check with the network administrator for more information on setting up the RADIUS server.

The access control list and RADIUS work together. When a user tries to join a network that authenticates using access control or a RADIUS server, the base station looks first in the access control list, and if the MAC address is there the user can join the network. If the MAC address is not in the access control list, the base station checks the RADIUS server for the MAC address. If it is there, the user can join the network.

Note: RADIUS access control is not compatible with WPA Enterprise mode. You can use either RADIUS access control or WPA Enterprise in a network, but you can't use both.

Using Port Mapping

AirPort uses Network Address Translation (NAT) to share a single IP address with the computers that join the AirPort network. To provide Internet access to multiple computers with one IP address, NAT assigns private IP addresses to each computer on the AirPort network, then matches these addresses with port numbers. The base station creates a port-to-private IP address table entry when a computer on your AirPort (private) network sends a request for information to the Internet.

If you are running a web, AppleShare, or FTP server on your AirPort network, other computers initiate communication with your server. Since the base station has no table entries for these requests, it has no way of directing the information to the appropriate computer on your AirPort network.

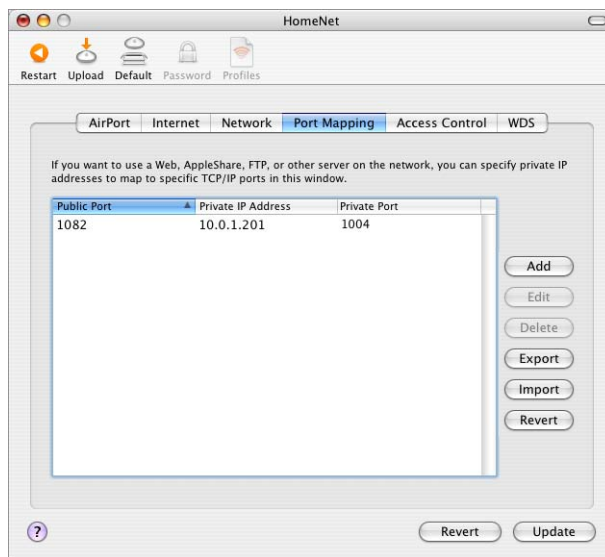
To ensure that requests are routed to your web, AppleShare, or FTP server properly, you need to establish a permanent IP address for your server and provide inbound port mapping information to the AirPort Extreme Base Station or AirPort Express.

To set up inbound port mapping:

- 1 Open AirPort Admin Utility, select your base station, and click Configure.
- 2 Click Port Mapping.

In the Port Mapping pane, click Add and enter the following information:

- **Public Port** The port number other computers will use to access the services provided by your computer. For example, computers look for web services on port 80.
- **Private IP Address** The manually assigned, private IP address of your computer.
- **Private Port** The port that will be used on your computer to provide services. In most cases, you can use the same number as the public port.



To use port mapping, you must configure TCP/IP manually on the computer that is running the web, AppleShare, or FTP server.

You can also set up a computer as a default host to establish a permanent IP address for the computer and provide inbound port mapping information to the AirPort Extreme Base Station or AirPort Express. This is sometimes known as a DMZ and is useful when playing some network games or videoconferencing.

To set up a default host:

- 1 Open AirPort Admin Utility, select your base station, and click Configure.
- 2 Click Base Station Options.
- 3 Select the “Enable Default Host at” checkbox. The default IP address is 10.0.1.253.
- 4 Enter the same IP address on the host computer.
 - a Open the Network pane of System Preferences on the host computer.
 - b Choose AirPort from the Show pop-up menu.
 - c Choose Manually from the Configure IPv4 pop-up menu.
 - d Enter the same IP address you entered in the Enable Default Host pane of AirPort Admin Utility.

Setting DHCP Lease Time

Set the DHCP lease time to control the amount of time that an IP address is valid for a computer. This feature is especially useful in schools and other environments where users switch between computers frequently. Using very short leases, DHCP can dynamically reconfigure networks in which there are more computers than available IP addresses.

Set the DHCP lease time in the Network pane of AirPort Admin Utility.

Base Station Logging

You can set up the base station to log status information to the Mac OS X system log (or Syslog). This is helpful for troubleshooting problems and monitoring base station performance.

To set up base station logging:

- 1 Open AirPort Admin Utility, select your base station, and click Configure.
- 2 Click Base Station Options and then click Logging/NTP.
- 3 Select “Send Base Station Logging to” and enter the IP address of the computer that will receive the base station logs.
- 4 Choose a level from the Logging Level pop-up menu.
- 5 Select Set Date & Time Automatically and choose an NTP server from the pop-up menu.

You need to assign a Network Time Protocol (NTP) server for the base station, so the log information will contain the accurate time of the status logs.

Use the Mac OS X Console application, located in Applications/Utilities, to view the logs on the computer receiving them.

Connecting a USB Printer to the AirPort Extreme Base Station or AirPort Express

You can connect a USB printer to your base station, so that anyone on the network using Mac OS X v10.2.3 or later can print to that printer.

To use a printer on your network:

- 1 Connect the printer to the USB port on the AirPort Extreme Base Station.
- 2 On the client computers, open Printer Setup Utility (located in Applications/Utilities) and select the printer from the list. If the printer is not in the list, click Add and then choose Rendezvous from the pop-up menu, then select the printer from the list.

If you are using Power over Ethernet and the base station receives power and a network connection over the WAN port, the USB port is disabled. You can't use a USB printer if your base station is powered over Ethernet. See the documentation that came with your base station.

You can change the name of the printer from the default name to one you choose.

To change the name of your USB printer:

- 1 Open AirPort Admin Utility, select your base station, and click Configure.
- 2 Click Base Station Options and then click USB Printer.
- 3 Double-click the name of your printer and then enter a new name.

Solving Problems

If you have trouble connecting to the Internet with any AirPort network design, try the following:

- Make sure the base station is connected to the Internet. The computers on your AirPort network cannot connect to the Internet if your base station is not connected to the Internet.
- Check your Internet connection using your computer. If you can't connect with your computer, the problem may be with your Internet connection.
- Check the active network ports by choosing Active Network Ports from the Show pop-up menu in the Network pane of System Preferences. Make sure the ports you want to use are selected.

- Open Internet Connect (in the Applications folder on the hard disk) and choose AirPort from the Configuration pop-up menu.



- Check to make sure that the computer has joined the AirPort network created by your base station.
- Restart your computer. This renews the IP address you receive from the base station. The IP addresses should be in the range of 10.0.1.2 to 10.0.1.200, 172.16.1.2 to 172.16.1.200, or 192.168.1.2 to 192.168.1.200, depending on the address scheme the base station uses.
- If the base station is set up as a DHCP server, make sure the “Distribute IP addresses” checkbox is selected in the Network pane of AirPort Admin Utility.
- If you are using a cable modem and your base station cannot connect to the Internet, turn off the cable modem, wait a few minutes and then turn it back on.

More Information About AirPort

You can find more information about AirPort in the following locations:

- **AirPort Help**
Look in AirPort Help for information on setting up an AirPort network, using an AirPort Extreme Base Station or AirPort Express, editing base station settings, avoiding sources of interference, locating additional information on the Internet, and more. Choose Help > Mac Help, and then choose Library > AirPort Help.
- **World Wide Web**
Apple AirPort website at www.apple.com/airportextreme
Apple AirPort Express website at www.apple.com/airport
Apple Support website at www.apple.com/support

This chapter provides information and instructions for using the AirPort Setup Assistant to set up your AirPort Express.

You can use AirPort Express to share broadband Internet access with wireless computers on your network, play iTunes music on your home stereo, and much more. Your AirPort Express comes with AirTunes, so you can play iTunes music through remote speakers or your stereo.

Use the diagrams in the documentation that came with your AirPort Express to find out more about AirPort Express and to help you decide how you want to use it. Then use the instructions in this chapter to easily configure AirPort Express and set up your network.

You can use the AirPort Setup Assistant to set up an AirPort Express or an AirPort Extreme Base Station. Use this chapter for information specific to setting up an AirPort Express using the AirPort Setup Assistant. Use the information elsewhere in this book to help you set up an AirPort Extreme Base Station.

With AirPort Express you can:

- Create a new network that wireless computers can use to communicate with each other. If you set up your AirPort Express as a base station and connect it to the Internet, wireless computers can also share the Internet connection.
- Connect AirPort Express to your existing wireless network
- Connect AirPort Express to your existing AirPort Extreme or AirPort Express network and extend the range of your wireless network using WDS
- Connect AirPort Express to your stereo or powered speakers and use AirTunes to play music from iTunes
- Connect AirPort Express to a compatible USB printer

Creating a New AirPort Network or Connecting to an Existing Wireless Network

With AirPort Express you can create a new wireless network, join an existing AirPort or other wireless network, or extend the range of your existing AirPort Extreme network. The way you set up AirPort Express depends on how you will be using it. Use the following information to help you decide what to do.

Creating a new AirPort network

If you are new to AirPort, and don't have a wireless network in your house, you can create a new wireless network. If you connect your wireless network to the Internet, you can share the Internet connection with up to ten wireless computers. You can also connect AirPort Express to your stereo or powered speakers and use iTunes to play music from iTunes, and connect a compatible USB printer so all of the computers on the network can print to it.

You may also want to use AirPort Express to create a second wireless network if you already have one in your house. This is useful if you only want to use AirPort Express to play iTunes music on your stereo, or you want to set up a wireless print server.

Connecting to an existing AirPort or other wireless network

If there is already an AirPort or other wireless network in your house, you can connect AirPort Express to the network. If you connect AirPort Express to your stereo or powered speakers you can use iTunes to play music from any computer on the network. You can also connect a compatible USB printer so all of the computers on the network can print to it.

Extending the range of an existing AirPort Extreme network

If you already have an AirPort Extreme network, you can use AirPort Express to extend the range of the network. This is helpful if there are areas in your house that are out of range of the AirPort Extreme network. Using AirPort Express to extend the range of the network insures that all of the compatible wireless computers in the house can connect to the network.

You can also connect AirPort Express to a stereo or powered speakers and use iTunes to play music from iTunes, and connect a compatible USB printer so all of the computers on the network can print to it.

Once you have decided which kind of network you are going to set up, configuring AirPort Express involves three steps:

Step 1: Connecting AirPort Express

Connect all of the cables you want to use with AirPort Express before you use the AirPort Setup Assistant to set it up.

Step 2: Using the AirPort Setup Assistant

Use the AirPort Setup Assistant to set up your AirPort Express network or join your existing wireless network.

Step 3: Setting Advanced AirPort Express Options

These settings are optional for most users. They include using the base station as a bridge between your AirPort network and an Ethernet network, controlling access to an AirPort network, and setting advanced security options.

Connecting AirPort Express

Before you plug AirPort Express into a power outlet, first connect the appropriate cables to the ports you want to use.

- Connect the Ethernet cable connected to your DSL or cable modem if you will connect to the Internet using AirPort Express.
- Connect the audio cable to your stereo if you will use AirTunes to play music from iTunes.
- Connect a USB cable to a compatible USB printer if you will print to a USB printer.

Note: AirPort Express does not support powered USB speakers. Use only powered speakers with a stereo mini-jack connector.

Once you have connected the cables for all the devices you plan to use, connect the AC plug adapter if necessary. Plug AirPort Express into the wall. There is no on switch.

After you plug in AirPort Express, use the AirPort Setup Assistant to set it up to work with your Internet connection, stereo, USB printer, or existing network.

Using the AirPort Setup Assistant

To set up and configure your AirPort Express to use AirPort for wireless networking and Internet access, use the AirPort Setup Assistant. (The assistant is installed on your computer when you install the software on the AirPort Express CD.)



- Open the AirPort Setup Assistant, located in Applications/Utilities, and follow the onscreen instructions for setting up your AirPort network.

You will be asked a series of questions about the type of network you want to use and the services you want to set up. The AirPort Setup Assistant helps you enter the appropriate settings for the network you are setting up.

If you are using AirPort Express to connect to the Internet, you need a broadband (DSL or cable modem) account with an Internet service provider. Fees may apply. If you received specific information from your ISP (such as a static IP address or a DHCP client ID), you may need to enter it in the AirPort Setup Assistant. Have this information available before you set up your AirPort Express.

Creating a New Wireless Network

You can use the AirPort Setup Assistant to create a new wireless network. The AirPort Setup Assistant guides you through the steps necessary to name your network, protect your network with a password, and set other options.

If you plan to use iTunes to play music on your stereo from iTunes, connect a Toslink digital fiber optic cable or a mini-stereo-to-dual-RCA cable to the AirPort Express Line Out port (🔊) and to your stereo.

Note: You cannot use powered USB speakers with AirPort Express. You can use only speakers with a stereo mini-jack connector.

If you plan to use AirPort Express to share a compatible USB printer, connect the printer to the USB port.

After you connect the audio cable and the USB printer cable:

- Open the AirPort Setup Assistant, located in Applications/Utilities, and follow the onscreen instructions to create a new network.

Configuring and Sharing Internet Access

If you plan to share your Internet connection with computers on your network, you need to set up your AirPort Express as an AirPort base station. Once it is set up, the base station connects to the Internet and transmits information to the computers over the AirPort network.

Before you use the AirPort Setup Assistant to set up your base station, connect your DSL or cable modem to the AirPort Express Ethernet port (↔). If you are using an existing Ethernet network with Internet access to connect to the Internet, you can connect the AirPort Express to the Ethernet network instead. If you plan to use AirTunes to play music on your stereo from iTunes, connect an audio cable to the analog and optical digital audio mini-jack (⏏) and to your stereo.

Use the AirPort Setup Assistant to provide AirPort Express with your ISP settings and configure how the base station shares the settings with other computers.

- Open the AirPort Setup Assistant, located in Applications/Utilities, and follow the onscreen instructions to configure and share Internet access on your AirPort Express.

Connecting to an Existing Wireless Network

You can use the AirPort Setup Assistant to join an existing wireless network. When you connect your AirPort Express to your home stereo, computers on your wireless network can use AirTunes to play music on the stereo from iTunes. If you connect a USB printer to your AirPort Express, all of the computers on the network can print to it.

Be sure to connect the audio cable to your stereo and the USB cable to your printer before you use the AirPort Setup Assistant.

- Open the AirPort Setup Assistant. Follow the onscreen instructions to connect your AirPort Express to your wireless network.

Extending the Range of an Existing AirPort Extreme or AirPort Express Network

You can use the AirPort Setup Assistant set up AirPort Express to extend the range of an existing AirPort Extreme or AirPort Express wireless network. Wireless computers can connect to the network and share the Internet connection, share files, and play network games. If you connect your AirPort Express to your home stereo, computers on your wireless network can use iTunes to play music on the stereo from iTunes. If you connect a USB printer to your AirPort Express, all of the computers on the network can print to it.

- Open the AirPort Setup Assistant. Follow the onscreen instructions to extend the range of your AirPort Express or AirPort Express network.

Note: Extending the range of a wireless network using WDS may affect overall network performance.

Setting Advanced AirPort Express Options

To set advanced options for AirPort Express, use AirPort Admin Utility.

You can use AirPort Admin Utility to configure advanced AirPort settings, such as advanced security options, closed networks, DHCP lease time, access control, WAN privacy, power controls, port mapping, and more.

For more information and instructions for using AirPort Admin Utility, see “Setting Advanced Options” on page 48.

You can use also AirPort Admin Utility set up exclusive AirPort Express features, such as setting up AirPort Express to create a new AirPort network or join an existing AirPort or other wireless network, setting up or changing the iTunes speaker name and password, controlling status light settings, and creating and managing configuration profiles.

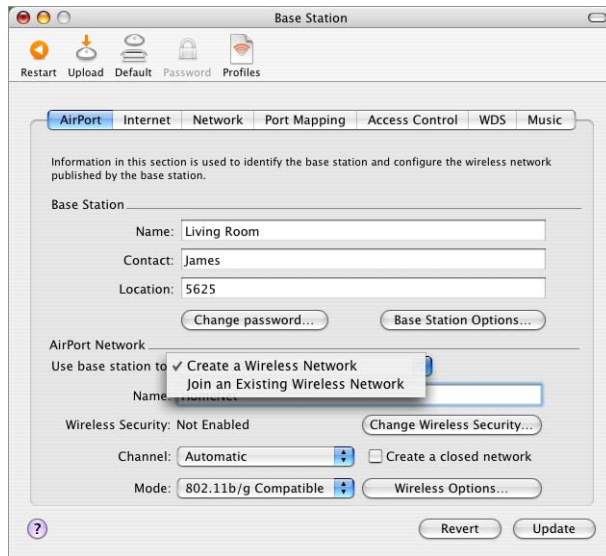
Creating a New AirPort Express Network or Joining an Existing Wireless Network

Use the information on page 66 to help you decide whether you want to create a new AirPort network or join an existing wireless network. Once you have decided, you can use AirPort Admin Utility to set up AirPort Express.

To use AirPort Admin Utility to set up AirPort Express to create a new AirPort network or join an existing wireless network:

- 1 Make sure you are in range of your AirPort Express and are connected to the network.
- 2 Open AirPort Admin Utility, select your AirPort Express, and click Configure.
- 3 Enter the password for AirPort Express. If no password has been set, the default password is “*public*.”

- 4 Choose “Create a Wireless Network” or “Join an Existing Wireless Network” from the “Use base station to” pop-up menu.

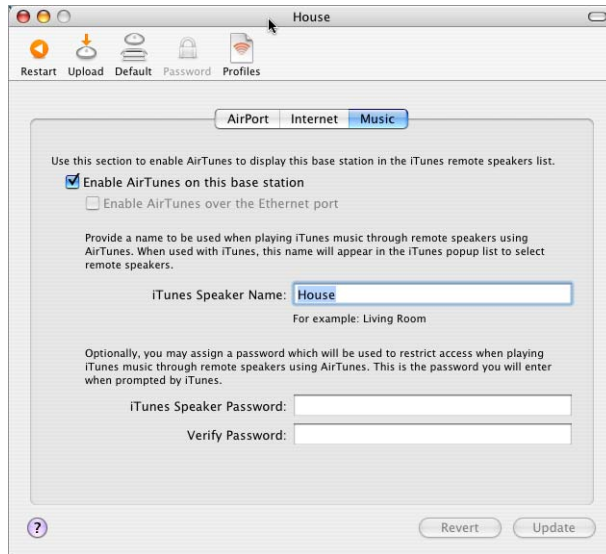


Changing iTunes Settings

To use AirPort Admin Utility to set up or change the name displayed in the iTunes speakers pop-up menu:

- 1 Make sure you are in range of your AirPort Express and are connected to the network.
- 2 Open AirPort Admin Utility, select your AirPort Express, and click Configure.
- 3 Enter the password for AirPort Express. If no password has been set, the default password is “public.”
- 4 Click Music and enter or change the name in the iTunes Speaker Name field. You can also enter a password in the iTunes Speaker Password field.

- 5 When you are finished, click Update.



The illustration above displays the AirPort Admin Utility settings available to AirPort Express when AirPort Express is set up to join an existing network. If AirPort Express is set up to create a wireless network, all of the AirPort Admin Utility features are available.

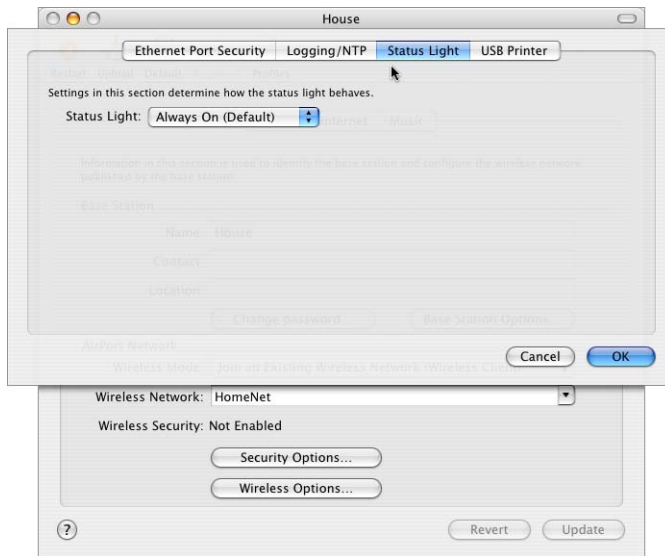
Changing Status Light Settings

These settings control how the status light behaves. You can set the status light to flash when AirPort Express is active, such as sending files or receiving Internet traffic, or you can set it to remain always on.

To control status light settings:

- 1 Make sure you are in range of the AirPort Express and are connected to the network.
- 2 Open AirPort Admin Utility, select your AirPort Express, and click Configure.
- 3 Enter the password for AirPort Express. If no password has been set, the default password is "public."
- 4 Click Base Station Options on the AirPort pane.

- 5 Click Status Light, and choose a setting from the Status Light pop-up menu.



Using Ethernet to Play iTunes Music on AirPort Express

You can enable AirTunes over Ethernet. This allows you to play iTunes music on the stereo or powered speakers connected to your AirPort Express from computers connected by Ethernet.

To use Ethernet to play iTunes Music:

Make sure your AirPort Express is connected to your computer using Ethernet, and to your stereo or powered speakers with an audio cable.

- 1 Open AirPort Admin Utility, select your AirPort Express, and click Configure.
- 2 Click Music, and select the “Enable AirTunes over the Ethernet port” checkbox.

Setting Up and Managing Configuration Profiles

AirPort Express can store up to 5 different configurations, known as *profiles*. A profile contains settings for your AirPort Express, such as the iTunes speaker name and password, and network information, such as network name and password.

To create a new profile:

- 1 Open AirPort Admin Utility, located in Applications/Utilities.
- 2 Select your AirPort Express in the list and click Configure.
- 3 Click the Profiles icon in the toolbar.
- 4 Click Add to create a new profile, give the profile a name, then click OK.

- 5 Set options, such as network name, remote speaker name, passwords, and the Internet connection method.
- 6 When you are finished setting the options, click Update.



To edit an existing profile:

- 1 Open AirPort Admin Utility, located in Applications/Utilities.
- 2 Select your AirPort Express in the list and click Configure.
- 3 Click the Profiles icon in the toolbar.
- 4 Select a profile in the list and click OK.
- 5 Edit options for the profile. When you are finished editing the options, click Update to save the profile.

This chapter defines terms and concepts used when working with computer networks. Use it as a reference to help you understand what is taking place behind the scenes of your AirPort wireless network.

Basic Networking

Packets and Traffic

Information travels across a network in chunks called *packets*. Each packet has a *header* that tells where the packet is from and where it's going, like the address on the envelope when you send a letter. The flow of all these packets on the network is called *traffic*.

How Information Reaches Its Destination

Hardware Addresses

Your computer “listens” to all of the traffic on its local network and selects the packets that belong to it by checking for its hardware address (also called the *media access control*, or *MAC address*) in the packet header. This address is a number unique to your computer.

Every hardware product used for networking is required to have a unique hardware address permanently embedded in it. Your AirPort Card's number is called the AirPort ID.

IP Addresses

Since the Internet is a network of networks (connecting millions of computers), hardware addresses alone are not enough to deliver information on the Internet. It would be impossible for your computer to find its packets in all the world's network traffic, and impossible for the Internet to move all traffic to every network.

So your computer also has an IP (Internet Protocol) address that defines exactly where and in what network it's located. IP addresses ensure that your local Ethernet network only receives the traffic intended for it. Like the hierarchical system used to define zip codes, street names, and street numbers, IP addresses are created according to a set of rules, and their assignment is carefully administered.

The hardware address is like your name; it uniquely and permanently identifies you. But it doesn't offer any clues about your location, so it's only helpful in a local setting. An IP address is like your street address, which contains the information that helps letters and packages find your house.

Rules for Sending Information (Protocols)

A protocol is a set of rules that define how communication takes place. For instance, a networking protocol may define how information is formatted and addressed, just as there's a standard way to address an envelope when you send a letter.

Important Networking Devices

Bridges

A bridge joins two networks at the hardware level. Other protocols see the two networks as the same.

Routers

A router connects two IP networks. In contrast to a bridge, which joins networks at the hardware level, a router directs network IP traffic based on information stored in its routing tables. A routing table matches IP addresses with hardware addresses. The router stamps each incoming IP packet with the hardware address that corresponds to that IP address. As a result, the packet can be picked up by the right computer on the hardware network.

DNS (Domain Name Server)

Networks (domains) on the Internet have names that correspond to their IP addresses. A Domain Name Server maintains a list of domain names and their corresponding addresses. That is why you can go to the Apple website by typing *www.apple.com* instead of the IP address.

Important Networking Terms

TCP/IP (Transport Control Protocol/Internet Protocol)

TCP/IP is a collection of protocols that underlies almost every form of communication on the Internet.

DHCP (Dynamic Host Configuration Protocol)

DHCP is a method of automatically assigning IP addresses. Instead of permanently assigning addresses to individual users, addresses are assigned by the DHCP server when clients need them. This means that instead of entering several fields of long addresses, users need only to select DHCP as their configuration method for IP networking.

PPP (Point-to-Point Protocol)

PPP is the most common protocol for providing IP services over a dial-up modem.

PPPoE (Point-to-Point Protocol over Ethernet)

PPPoE is a protocol used on some DSL lines for providing IP services. It allows DSL network providers to bill customers using their existing PPP equipment. If your ISP provided you with PPPoE connection software, such as EnterNet or MacPoET, then you connect via PPPoE. With AirPort, you do not need to use a third-party PPPoE application.

NAT (Network Address Translation)

NAT is used to share one IP address among several computers. A device set up as a NAT router uses a collection of “private” IP addresses (in the range 10.0.1.2 to 10.0.1.200) to allow several computers to access the Internet using one “public” IP address. When a computer using a private IP address requests information from the Internet, the NAT router keeps a record of the computer making the request, and sends the information to the Internet using its own IP address. When the response comes back from the Internet, the NAT router forwards the packet to the appropriate computer.

IP Subnet

An IP subnet is a local network as defined by IP network numbers. Connecting to a subnet involves connecting to the appropriate hardware network and configuring IP for that network.

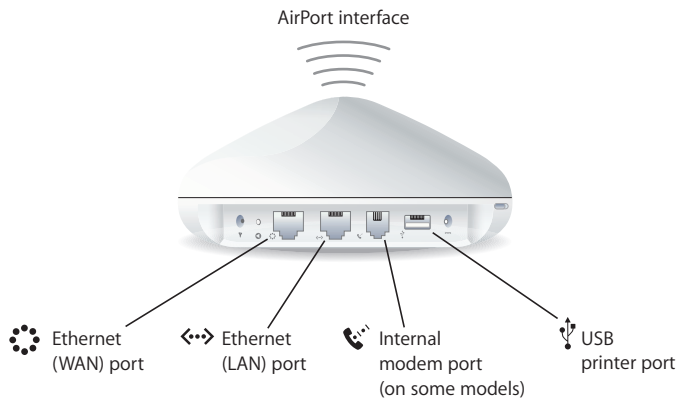
Using the AirPort Extreme Base Station

This section describes the different network interfaces of the AirPort Extreme Base Station and describes the functions the base station can provide.

Base Station Interfaces

To configure the AirPort Extreme Base Station, you configure how its networking interfaces will be used. The AirPort Extreme Base Station has five hardware networking interfaces:

- **AirPort interface** The AirPort interface creates an AirPort network for AirPort-equipped computers to join. The base station can provide IP services like DHCP and NAT over this interface. The base station cannot use the AirPort interface to establish a connection with the Internet.
- **Modem (📶) interface** The modem interface is used to establish PPP connections to the Internet. These connections provide IP services to the base station. (Available on some models.)
- **Ethernet WAN (🌐) interface** The Ethernet WAN interface is used to connect DSL or cable modems and connect to the Internet.
- **Ethernet LAN (↔) interface** The Ethernet LAN interface provides IP services to local Ethernet clients.
- **USB (🖨️) interface** The USB interface is used to connect a USB printer to the AirPort Extreme Base Station.



Base Station Functions

- **Bridge** The AirPort Extreme Base Station is configured by default as a bridge between the wireless AirPort network and the wired Ethernet network. Connecting an AirPort network to an Ethernet network through the base station Ethernet LAN (↔) port bridges the wireless AirPort network to the wired Ethernet network.

Important: If you are connecting an Ethernet network to the base station Ethernet LAN (↔) port, make sure the Ethernet network does not have an Internet connection.

- **NAT router** One of the most powerful features of the AirPort Extreme Base Station is its ability to share one Internet connection with multiple computers. To provide this service, the base station acts as a router. The base station can be configured to provide both bridging services and routing services at the same time.
- **DHCP server** When you configure the base station to act as a DHCP server, it provides IP addresses to client computers that are configured to obtain IP addresses using DHCP. Using DHCP makes IP configuration simple for client computers, since they don't need to enter their own IP information.

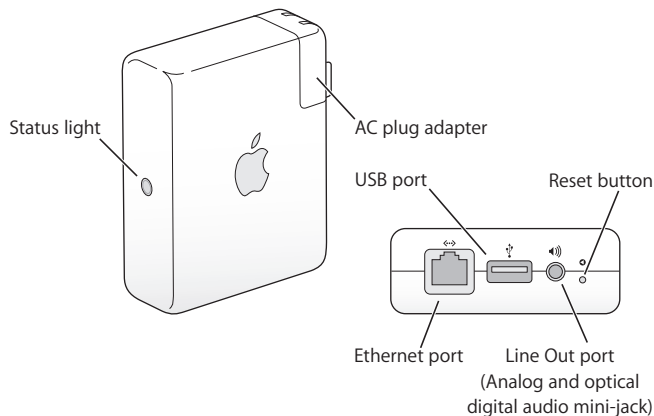
Using AirPort Express

This section describes the different network interfaces of the AirPort Express and describes the functions the base station can provide.

AirPort Express Interfaces

AirPort Express has three ports, located on the bottom side:

- Ethernet port (↔) for connecting a DSL or cable modem, or for connecting to an existing Ethernet network
- Analog and optical digital audio stereo mini-jack (🔊) for connecting AirPort Express to a home stereo or powered speakers
- USB port (🖨️) for connecting a compatible printer to AirPort Express



Next to the ports is a reset button, which is used for troubleshooting your AirPort Express. The status light on the side of AirPort Express shows the current status.

Items That Can Cause Interference With AirPort

The farther away the interference source, the less likely it is to cause a problem. The following items can cause interference with AirPort communication:

- Microwave ovens
- DSS (Direct Satellite Service) radio frequency leakage
- The original coaxial cable that came with certain types of satellite dishes. Contact the device manufacturer and obtain newer cables.
- Certain electrical devices, such as power lines, electrical railroad tracks, and power stations
- Cordless telephones that operate in the 2.4 gigahertz (GHz) range. If you have problems with your phone or AirPort communication, change the channel of your base station.
- Other AirPort networks
- Adjacent base stations using nearby channels. If base station A is set to channel 1, base station B should be set to channel 4 or higher.
- Moving objects that temporarily place metal between your computer and the base station

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