AirPort Networks for Windows

For Windows XP and Windows 2000

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With this version of the AirPort software you can set up and manage an AirPort network using Microsoft Windows, and wirelessly share a single Internet connection with multiple computers.

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.

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, business, or classroom can be on the Internet at the same time.
- Create a wireless connection between a single computer and a standard computer network. Wireless computers can then have access to an entire network without being connected using a cable.
- Connect multiple computers in a wireless "ad-hoc" network so that you can share files or play network games.
- Connect a USB printer to the base station and all of the computers on the AirPort network can print to it.
- If you are using AirPort Express, connect it to your stereo or powered speakers and use AirTunes to play iTunes music.

You can set up an AirPort Extreme Base Station or an AirPort Express and connect to the Internet without wires in minutes. But since the AirPort base stations are flexible 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-wireless 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: This version of AirPort Admin Utility is compatible with Windows XP and Windows 2000. The instructions and screen images in this book are for Windows XP. If you are using Windows 2000, the images on your screen may look slightly different.

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.

You can create a wireless network using an AirPort Extreme Base Station or an AirPort Express, and 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. If you are setting up an AirPort Extreme Base Station, you can connect Ethernet computers to the base station LAN (⇠⇢) port.

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 802.11b or 802.11g wireless adapter, 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 the AirPort Extreme Base Station has an internal modem, you can connect it to a telephone line.) The AirPort Extreme Base Station or AirPort Express receives content from the Internet, such as webpages and email, via its Internet connection and then sends it to wireless-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. Wireless computers connect wirelessly to the base station and receive network and Internet content.

Configuring AirPort Extreme Base Station and AirPort Express for Internet Access

Like your computer, the AirPort base station must be set up with the appropriate Internet Protocol (IP) networking information to connect to the Internet.
To provide the Internet configuration information, you can use AirPort Admin Utility to set up an AirPort Extreme Base Station or an AirPort Express, or use the AirPort Express Assistant to set up an AirPort Express and control the AirPort network it creates.

Note: You can use the AirPort Express Assistant to set up an AirPort Express using Windows XP with Service Pack 1 (SP1). If you are using Windows 2000, use AirPort Admin Utility to set up your network and base station.

AirPort Express Assistant

You can use the AirPort Express Assistant to create a new wireless network with an AirPort Express, or join AirPort Express to an existing wireless network. You can also use the AirPort Express Assistant to set up an AirPort Express as a wireless bridge and extend the range of your existing AirPort Extreme or AirPort Express network. This is known as a Wireless Distribution System (WDS).

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 4, "Using AirPort Express," on page 55 for more information.

To use the AirPort Express Assistant, you need an AirPort Express, the AirPort Express Assistant (on the CD that came with AirPort Express), Windows XP with SP1, and AirPort 4.0 or later. To play music using AirTunes, you need iTunes 4.6 or later. If you are using Windows 2000, or are setting up an AirPort Extreme Base Station, use AirPort Admin Utility, located in Start > All Programs > AirPort.

AirPort Admin Utility

The AirPort Admin Utility is a convenient way to make quick adjustments to your base station configuration.

Use AirPort Admin Utility to:

- Set up an AirPort Extreme Base Station or AirPort Express to provide Internet access to computers that connect to the base station
- Change settings, such as the phone number for your ISP if your base station has a modem, Internet setup or your ISP account settings
- Configure advanced base station settings, such as channel frequency, security options, closed networks, DHCP lease time, access control, WAN privacy, power controls, port mapping, renaming a USB printer, or, if your base station has a modem, remote dial-in

For instructions on using AirPort Admin Utility, see "Using AirPort Admin Utility" on page 16.

Extending the Range of Your AirPort Network

You can extend the range of your network by setting up wireless connections between multiple base stations in your network, known as a Wireless Distribution System (WDS), or connecting multiple AirPort Extreme Base Stations via Ethernet to create a roaming network. If your base station has an antenna port, you can also extend the range of your wireless network by connecting an Apple-certified external antenna to the antenna port. 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 39.

Note: If you are using AirPort Express to extend the range of your AirPort Extreme or AirPort Express network, see Chapter 4, "Using AirPort Express," on page 55.

Some models of the AirPort Extreme Base Station can receive power through the Ethernet WAN port when 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 unless the antenna conforms to UL Standard 2043. Some external antennas are not compliant.

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, 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 help 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 the AirPort Extreme Base Station or AirPort Express, computers on the network can print to the printer by setting it up in Windows XP or Windows 2000. For detailed instructions on setting up a printer connected to the base station, see "Connecting a USB Printer to the AirPort Extreme Base Station or AirPort Express" on page 51.

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

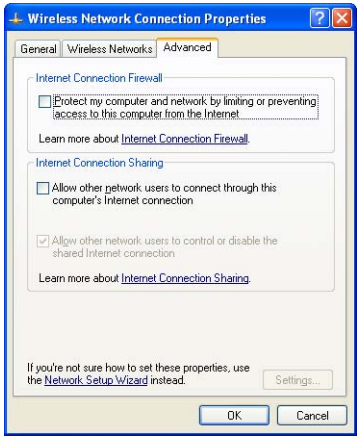
Sharing Your Computer's Internet Connection

If you have a wireless card installed in your computer and you are connected to the Internet, you can share your Internet connection with other computers. This is sometimes called using your computer as a *software access point*.

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 Control Panel and double-click Network Connections.
2. Click the network connection you want to share and click Properties.
3. Click "Change settings of this connection" under Network Tasks.
4. Click Advanced and then select "Allow other network users to connect through this computer's Internet connection."



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.

AirPort Security 2

This chapter provides an overview of the security features available with the AirPort Extreme Base Station and AirPort Express.

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 17.

Security for AirPort Networks at Home

Network attacks can occur through wireless as well as wired networks. Apple gives you ways to protect your entire 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 helps keep 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.

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 wireless Windows XP and Windows 2000 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 the base station.

Security for AirPort Networks in Business and Education

Businesses, schools, colleges, universities, and private homes want to restrict network communications to authorized users and keep data safe from prying eyes, so AirPort hardware and software provide a robust suite of security mechanisms.

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 or wireless card (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 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 encryptions, including the frequency with which keys are used to encrypt the wireless connection. 802.1X and EAP provide the ability to authenticate individual users 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) handles the presentation of 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 on the AirPort Extreme Base Station and AirPort Express has two modes: "WPA for enterprise," or WPA Enterprise, which uses a RADIUS server for user authentication, and "WPA for home/small office," or WPA Personal, which relies on the capabilities of TKIP without requiring a RADIUS server. WPA Personal uses a network password, sometime called a Pre-Shared Key (PSK).

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 Windows XP and Windows 2000 clients using other 802.11 wireless adapters that support WPA.

WPA Enterprise

WPA is a subset of the draft IEEE 802.11i standard. It effectively addresses the Wireless Local Area Network (WLAN) security requirements for the enterprise and 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 the local wireless network.

WPA Personal

For Small Office/Home Office (SO/HO) and private home networks, WPA runs in WPA Personal mode, taking into account the typical household or small office does not have an authentication server. Instead of authenticating with a RADIUS server, users enter a password or PSK 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.

AirPort Network Designs

3

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

Use this chapter to design and set up your AirPort Extreme or AirPort Express network. If you are using AirPort Express, you'll find additional information in Chapter 4, "Using AirPort Express," on page 55 to help set up your AirPort Express network.

Configuring your base station 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 set 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 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**
You can set up the base station as a bridge between your AirPort network and an Ethernet network, set advanced security options, set up a Wireless Distribution System (WDS) to extend the AirPort wireless network, and fine-tune other AirPort settings.

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

Using AirPort Admin Utility

You can use AirPort Admin Utility to set up or modify an AirPort Extreme Base Station or AirPort Express. Before using AirPort Admin Utility, make sure you are connected to the network the base station creates.

To connect to the wireless network created by the base station:

- Hold the pointer over the wireless connection icon in the Windows task bar until you see your AirPort network name (SSID), and choose it from the list if there are multiple networks available.

  If you can't join the AirPort network, right-click the wireless connection icon and choose View Available Wireless Networks. Select your network and click Connect.

The network name (or SSID) of a new AirPort base station is "Apple Network xxxxxx," where xxxxxx is the last six characters of the AirPort ID (also known as the MAC address), located on the label on the bottom of the AirPort Extreme Base Station, and on the power adapter side of AirPort Express.

To open your base station's configuration:

1. Open AirPort Admin Utility, located in Start > All Programs > AirPort.
2. Select your base station in the Base Station Chooser, 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 Base Station Chooser window:

1. 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:
   a. Right-click the wireless connection icon that displays the AirPort network, and choose Status.
   b. Click Properties, select Internet Protocol (TCP/IP), and then click Properties.
   c. Make sure "Obtain an IP address automatically" is selected.

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

1. Make sure your network and TCP/IP settings are configured properly.
2. Make sure you entered the base station 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 to the default settings, press and 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 Base Station Chooser. 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. Use AirPort Admin Utility.

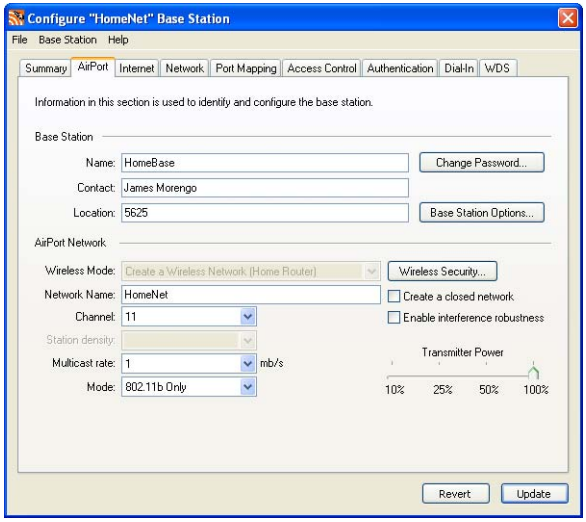
- To join the network for the base station you want to set up, use the instructions on the previous page.

To join the wireless network you can also:

1. Open Control Panel from the Start menu and click Network Connections.
2. Right-click the Wireless Network Connection icon and choose View Available Networks.
3. Select the network of the base station you want to configure, and then click Connect.
4. 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.
5. If you are prompted for a password, enter it, then click Configure.

   When AirPort Admin Utility opens, it displays a summary of the base station's current settings. To enter or change settings, click the tabs to open the panes.

6 In the AirPort pane, enter a base station name and password, a name for your AirPort network, and other information. (See the following sections for descriptions of the fields 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

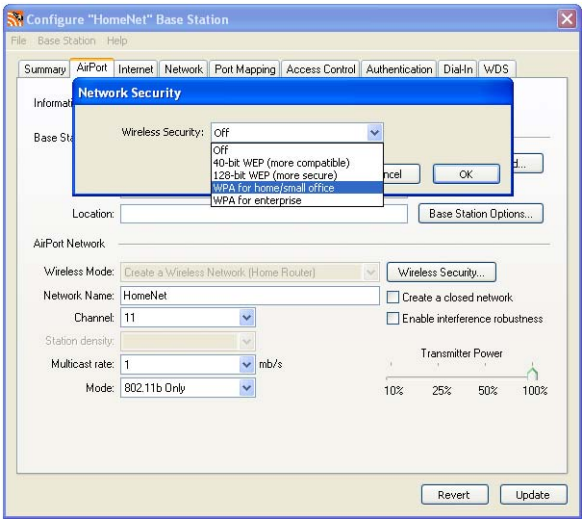
The base station password protects the base station configuration so that only the administrator can modify it. The default password is *public*. It is a good idea to change the base station password to prevent unauthorized changes to the base station.

Naming the AirPort Wireless Network

Give your AirPort network a name. This name appears in the wireless connection icon on the wireless-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 Wireless Security and choose one of the following options from the Wireless Security pop-up menu.



- **Off** 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 47.
- **128-bit or 40-bit WEP** Choose either of these options to protect your network with a Wireless Equivalent Protection password. 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 for home/small office** Choose this option and enter a password for the wireless network. When a wireless client enters the password, the base station starts the encryption process using TKIP.

  The password you choose can be between 8 and 63 ASCII characters.
- **WPA for 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 3.2 or later, and Windows XP or Windows 2000 clients using 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 46.

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, enter it exactly. 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 for home/small office" (also known as Pre-Shared Key), you must enter a password of either 8 to 63 ASCII characters, or 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 for enterprise" network, you were probably given a configuration file that contains network settings specific to the network you want to join. Double-click the configuration file to open it. If prompted, enter the user name and password you were given for the network, and if necessary, choose the network from the wireless connection icon.

Some authentication protocols, such as TLS, require a digital certificate to authenticate the user before joining 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.

Most wireless-equipped computers automatically tune to the channel frequency your base station is using when they join the network. If you change the channel frequency, client computers shouldn't 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. 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 AirPort Admin Utility.

Note: Using the closed network option can interfere with AirPort's automatic channel selection feature.

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

1. Right-click the wireless connection icon, choose View Available Wireless Networks, and then click Advanced.
2. Enter the name and password of the network you want to join.

Choosing the Network Mode

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

You can set the multicast rate of the network, enable interference robustness, and adjust the transmitter power of the base station. These settings 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 may affect 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 68.

Adjusting Transmitter Power

Use the Transmitter Power slider 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.

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 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.

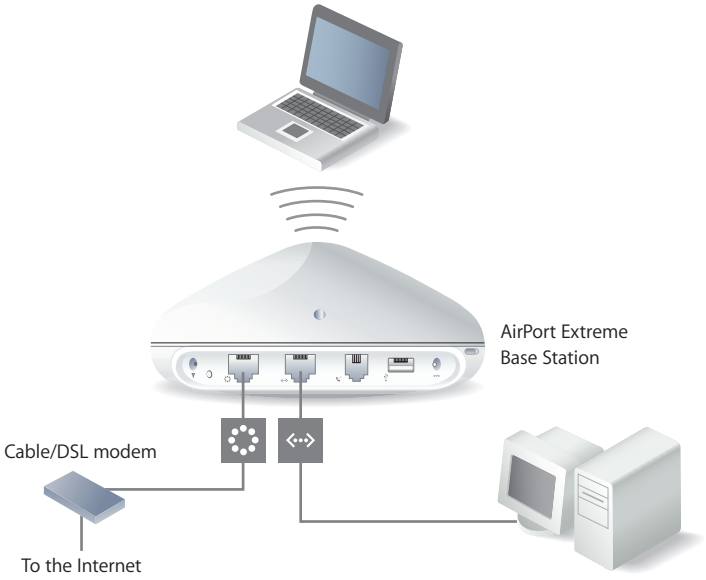
Configuring and Sharing Internet Access

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

You're Using a DSL or Cable Modem

You can use AirPort Admin Utility to set up the AirPort Extreme Base Station or AirPort Express to connect to the Internet with a DSL or cable modem. You can also adjust optional advanced base station settings, such as port mapping, advanced security options, or access to your AirPort network. See "Setting Advanced Options" on page 39.

What It Looks Like



How It Works

- The AirPort Extreme Base Station connects to the Internet through its Ethernet WAN (⁘) port connected to your DSL or cable modem. The AirPort Express connects through its Ethernet port.
- Wireless computers or computers connected to the AirPort Extreme Base Station's Ethernet LAN (⇠⇢) port connect to the Internet through the base station.
- Wireless 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 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.
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 AirPort Extreme network using Ethernet, you need an Ethernet hub.

What to Do

To set up a base station using AirPort Admin Utility:

1. Make sure that your DSL or cable modem is connected to the Ethernet WAN (⁘) port on your AirPort Extreme Base Station or to the Ethernet port on your Airport Express.

   Important: If you are using a cable modem, turn the power off on the modem after connecting it to the base station, wait a few minutes, and then turn it back on.

2. Open AirPort Admin Utility, select your base station, and click Configure.

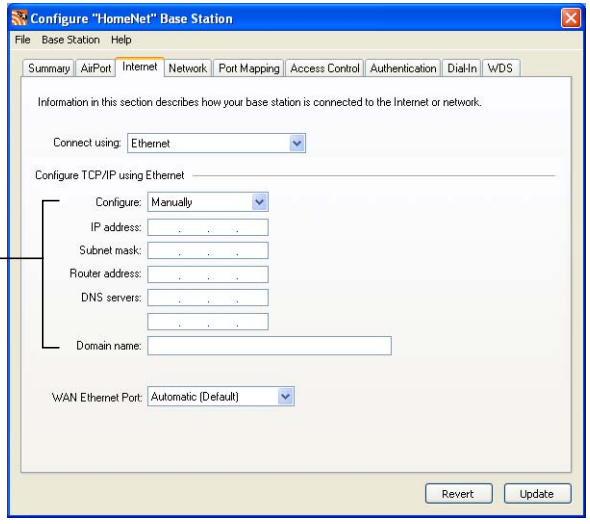
3. Click Internet. Choose Ethernet or "PPP over Ethernet (PPPoE)" from the "Connect using" pop-up menu, depending on which one your service provider requires. If your service provider gave you PPPoE connection software, such as EnterNet, choose PPPoE.

   Note: If you connect 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.

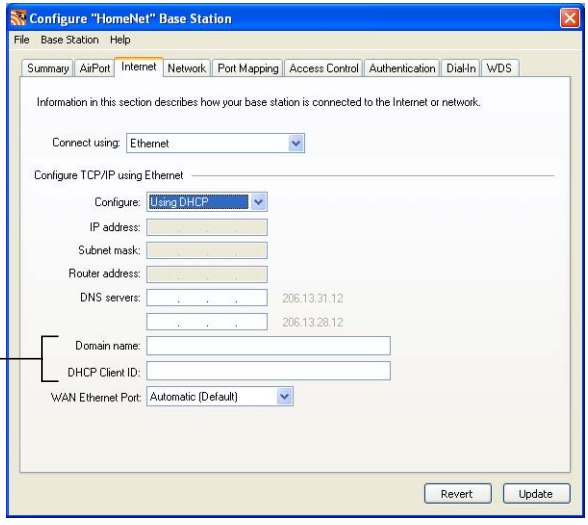
   If your service provider asks you for the MAC address of your base station, use the address of the Ethernet WAN (⁘) port, printed on the label on the bottom of the AirPort Extreme Base Station. If you are using AirPort Express, use the Ethernet port address, printed on the power adapter side of AirPort Express.

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.



Contact your service provider for the information you should enter in these fields.

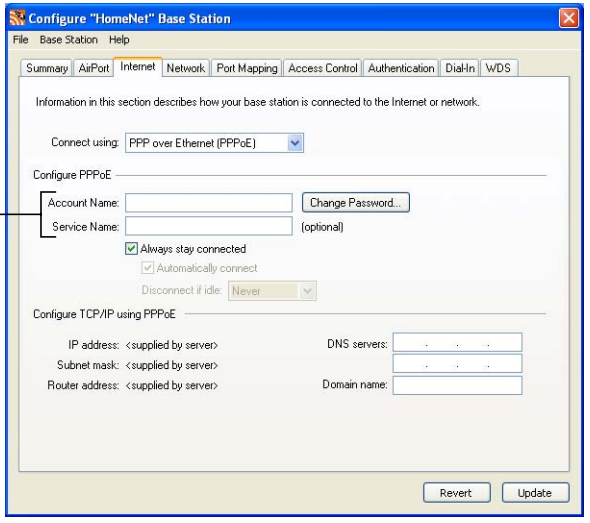
If you configure TCP/IP using DHCP, choose Using DHCP from the Configure pop-up menu. Your IP addresses are delivered by your service provider's DHCP server.



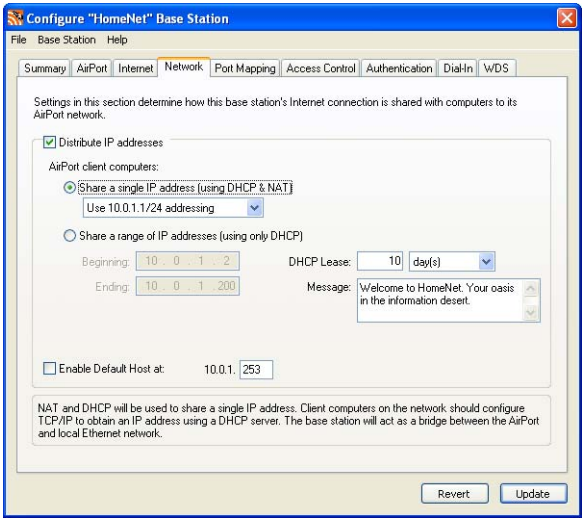
Your service provider may require you to enter information in these fields.

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.

Contact your service provider for the information you should enter in these fields.



6 Click the Network tab and configure how the base station will share its Internet access with wireless and Ethernet computers.



- To share a single Internet connection with wireless computers, make sure "Distribute IP addresses" and "Share a single IP address (using DHCP & 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 Ethernet printer to the AirPort Extreme Base Station or use AppleTalk between wired and wireless computers, make sure the devices are connected to the Ethernet LAN (⇠⇢) port on the AirPort Extreme Base Station.
- 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 wireless computers to communicate with one another using non-IP protocols.

Note: If you are using an AirPort Extreme Base Station that supports Power over Ethernet (PoE), the "Share a single IP address (using DHCP & NAT)" option is not selected by default, and the base station is set up to act as a bridge.

- 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, click the Dial-In tab to enable users to dial in to the AirPort Extreme Base Station from a computer modem over a standard 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:

  a Connect a phone line to the modem (✆) port on your base station.

  b Click Dial-In and 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 AirPort Extreme 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 AirPort Extreme 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.

7 If you want to adjust optional advanced settings, go to "Setting Advanced Options" on page 39. 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

Make sure you have installed the wireless adapter in your computer and the software necessary to set up the adapter.

To configure TCP/IP on client computers:

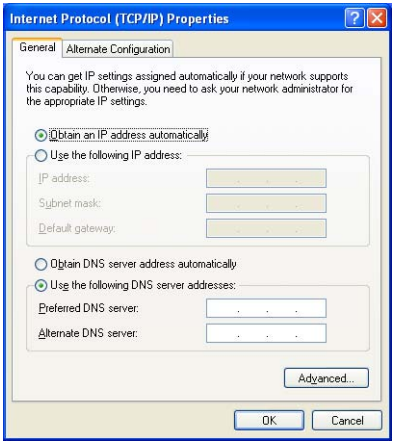
1 Open Control Panel from the Start menu and double-click Network Connections.

2 Double-click Wireless Network Connection.

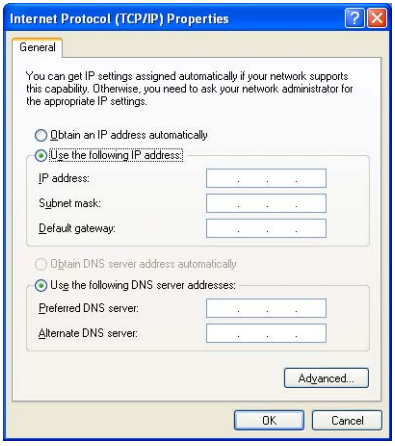
3 In the General pane, click Internet Protocol (TCP/IP), and then click Properties.

4 Do one of the following:

- *If you selected the "Distribute IP addresses" checkbox,* and either "Share a single IP address (using DHCP & NAT)" or "Share a range of IP addresses (using only DHCP)" in the Network pane of AirPort Admin Utility, select "Obtain an IP address automatically."



- *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 client computers by setting the client IP addresses manually. Select "Use the following IP address."



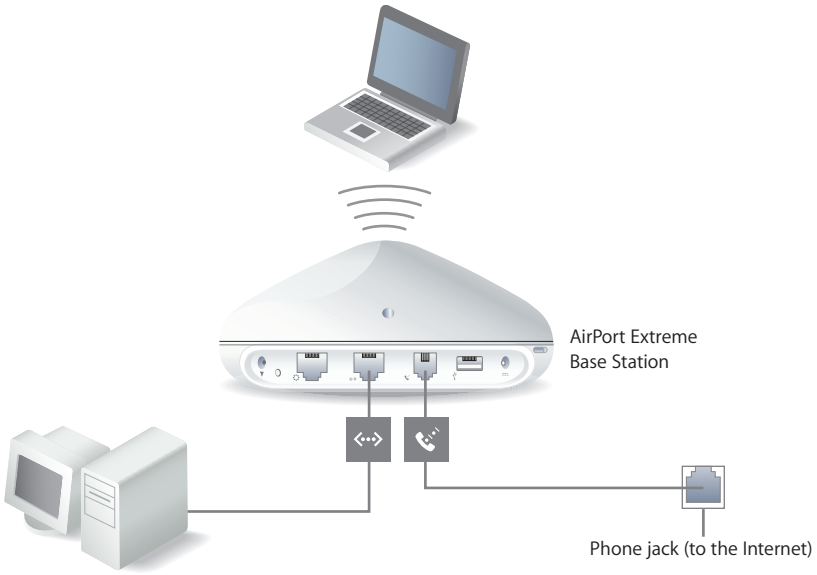
When you configure clients manually for a base station that provides NAT service, use IP addresses in the range 10.0.1.2 to 10.0.1.200, 172.16.1.2 to 172.16.1.200, or 192.168.1.2 to 192.168.1.200.

In the "Subnet mask" field, enter 255.255.255.0. In the "Default gateway" field, enter 10.0.1.1, 172.16.1.1, or 192.168.1.1, depending on which addressing scheme you used. Enter the same name server address and search domain information that you entered in the base station configuration.

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 using AirPort Admin Utility. You can also adjust optional advanced base station settings, such as port mapping, advanced security options, or 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 wireless adapters or computers connected to the base station's Ethernet LAN (⇠⇢) port can connect to the Internet through the AirPort Extreme Base Station.
- Wireless computers and Ethernet computers communicate with one another through the base station using networking protocols, such as TCP/IP.

What You Need for a Dial-Up Connection

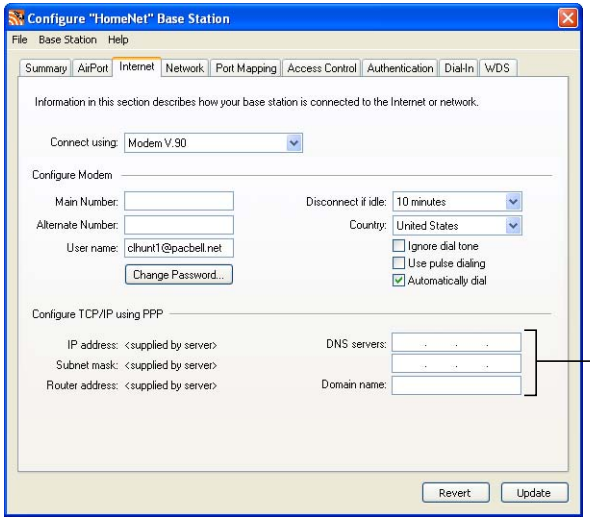
Components	Check √	Comments
Working dial-up ISP account using standard PPP	Make sure you have the following: • ISP phone number • account name and password • DNS address • other information your ISP may provide	You can get this information (except the account password) from the Dial-up connection settings in Control Panel, or from your ISP.
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 AirPort Extreme network using Ethernet, you need an Ethernet hub.

What to Do

To set up a base station using AirPort Admin Utility:

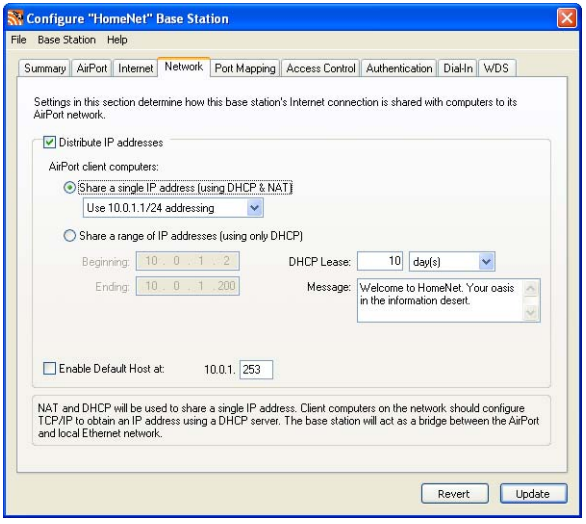
1 Open AirPort Admin Utility. Select your base station and click Configure.

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 wireless and Ethernet computers. Select the "Distribute IP addresses" checkbox and the "Share a single IP address (using DHCP & NAT)" button.



By default, wireless and Ethernet client computers share a single IP address using Network Address Translation (NAT).. 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.

Note: If you are using an AirPort Extreme Base Station that supports Power over Ethernet (PoE), the "Share a single IP address (using DHCP & NAT)" option is not selected by default, and the base station is set up to act as a bridge.

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 a wireless connection to communicate with one another.

4 If you want to adjust optional advanced settings, go to "Setting Advanced Options" on page 39. 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.

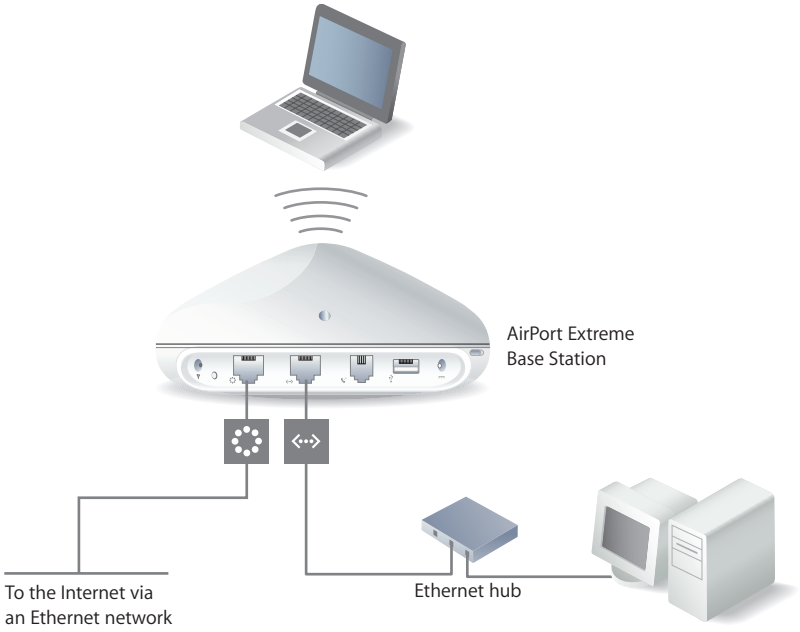
Setting Up Client Computers

To set up client computers to connect to the wireless network, see "Setting Up Client Computers" on page 28.

You're Using an Existing Ethernet Network

You can use the AirPort Express Assistant to set up an AirPort Express for Internet access through an existing Ethernet network. Use AirPort Admin Utility if you are setting up an AirPort Extreme Base Station or you need to adjust optional advanced base station settings. See "Setting Advanced Options" on page 39.

What It Looks Like



How It Works

- The base station uses your Ethernet network to communicate with the Internet through the Ethernet WAN (⁂) port on an AirPort Extreme Base Station, or through the Ethernet port on an AirPort Express.
- AirPort and Ethernet clients access the Internet and the Ethernet network through the AirPort Extreme Base Station or AirPort Express.

What You Need for an Ethernet Connection

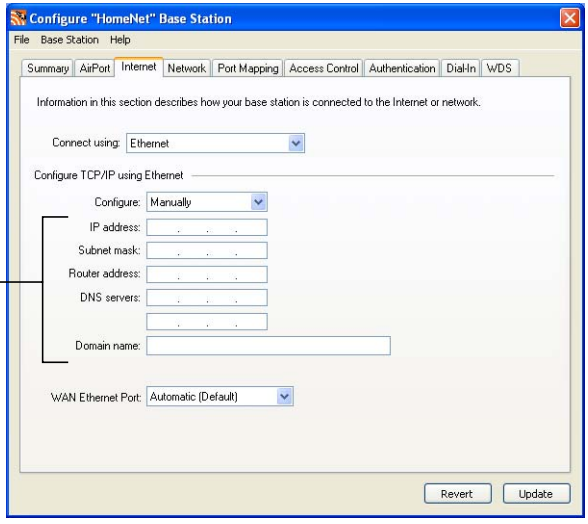
Components	Check √	Comments
AirPort Extreme Base Station or AirPort Express		
Ethernet hub		If you want to add more than one computer to your AirPort Extreme network using Ethernet, you need an Ethernet hub. If you use an Ethernet hub, make sure you connect the cable from your Ethernet network to the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

What to Do

To set up your base station using AirPort Admin Utility:

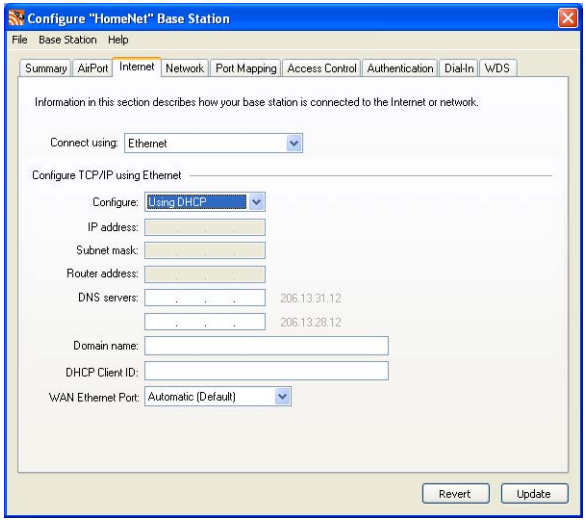
1. Open AirPort Admin Utility.
2. Select your base station and click Configure.
3. Click Internet and choose Ethernet from the "Connect using" pop-up menu.
4. Choose Manually or Using DHCP from the Configure pop-up menu, depending on how IP addresses are provided on your Ethernet network. If you aren't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

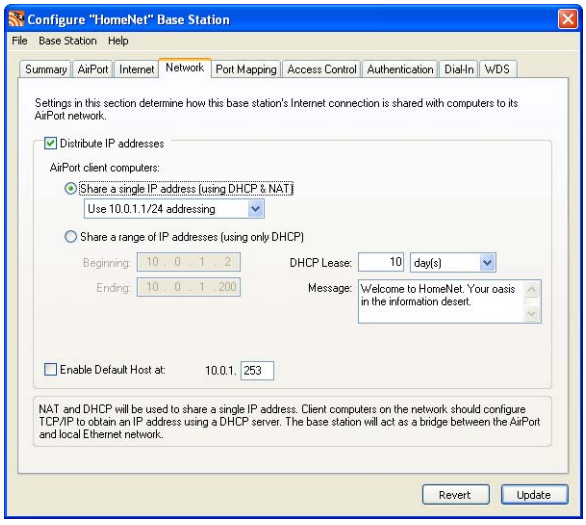


Contact your network administrator for the information you should enter in these fields.

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



5 Click the Network tab 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 & 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 39.

  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, click the Access Control tab and select the "Enable AOL Parental Control Filter (AOL only)" checkbox. This will copy the parental controls to your base station. For more information, contact AOL.
- If your AirPort Extreme Base Station has an internal modem, click the Dial-In tab to enable users to dial in to the AirPort Extreme Base Station from a computer modem over a standard 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:

a Connect a phone line to the modem (✆) port on your base station.

b Click Dial-In and 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.

6 If you want to adjust optional advanced settings, go to "Setting Advanced Options" on page 39. 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 set up client computers to access the wireless network, see "Setting Up Client Computers" on page 28.

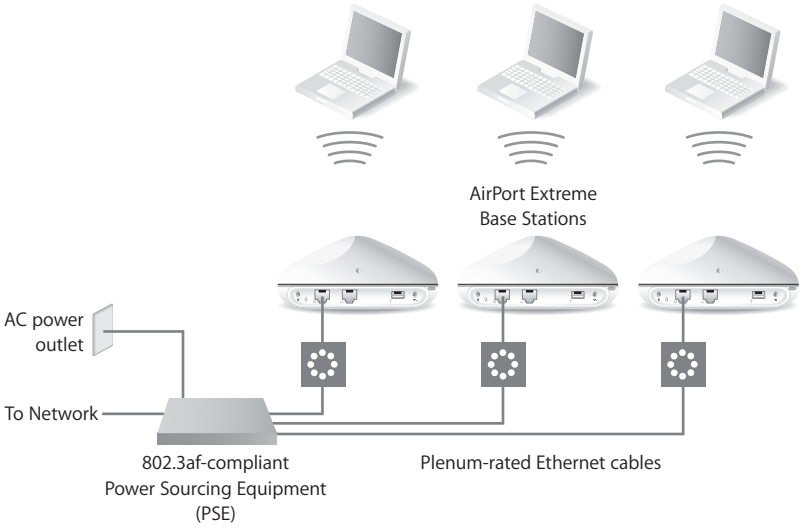
You're Using Base Stations Powered Over Ethernet on an Existing Network

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 AirPort Extreme 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: An AirPort Extreme Base Station that supports Power over Ethernet (PoE) is 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 previous section, "You're Using an Existing Ethernet Network" on page 33, to set up the AirPort network.

Setting Advanced Options

Use AirPort Admin Utility to adjust optional advanced base station settings.

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 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 the base stations wirelessly or, if you are using AirPort Extreme Base Stations, using Ethernet. A network with base stations connected using Ethernet is known as a *roaming network*. 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 can move from base station to base station with no interruption in service (a process known as *roaming*).

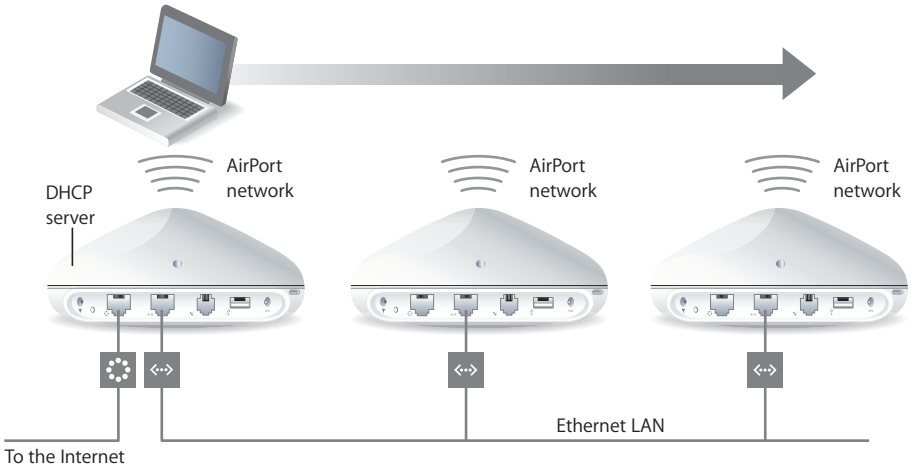
To set up roaming:

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.

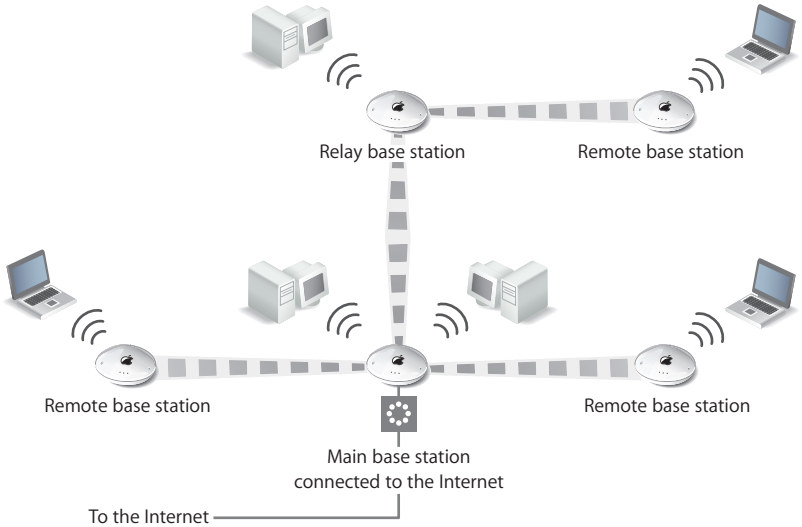
The base station acting as a DHCP server can receive its IP address from the DHCP server on the Ethernet network.



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 a relay base station.

Note: If you are setting up AirPort Express to extend the range of your network using WDS, use the AirPort Express Assistant that came with your AirPort Express. See "Extending the Range of an Existing AirPort Extreme or AirPort Express Network" on page 59.



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.

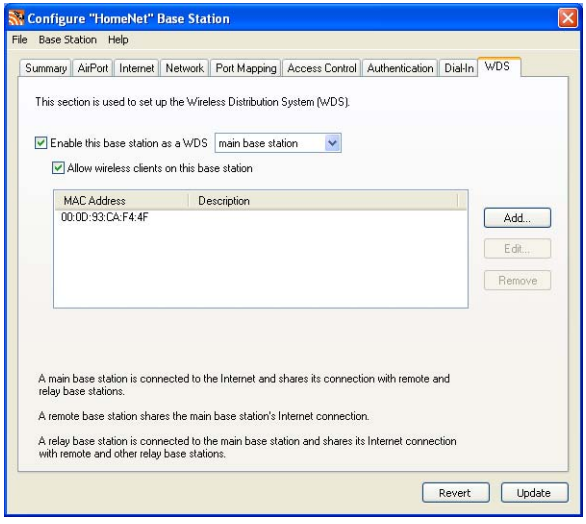
As part of the WDS setup process, you might consider giving all the base stations unique names, to make them easier to identify in the future.

Note: If you are using base station firmware version 5.5 or later with an AirPort Extreme Base Station, and firmware version 6.1 or later with AirPort Express, you can protect your network with WPA security. If you are changing an existing WDS network from WEP security to WPA security, you will need to reset the base stations after updating the firmware, and then set up your WDS again.

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

1. Connect to the wireless network created by the base station you want to set up as the main base station.
2. Open AirPort Admin Utility, select the main base station, and click Configure. Enter the base station 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 Add and enter the MAC address of a base station you want to set up as a remote base station. You can also enter a description for the base station, the base station name, or its location.

   Select a base station and click Remove to remove the base station from the list.



6. Select "Allow wireless clients on this base station" if you would like wireless client computers as well as base stations to share the connection. If you don't select 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.

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.

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 the 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 Right-click the wireless connection icon and choose View Available Wireless Networks. Choose the wireless network created by the base station you want to set up as a remote base station.

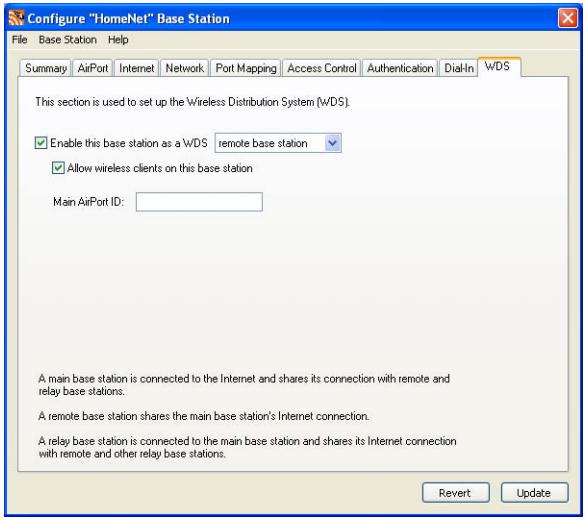
2 Open AirPort Admin Utility, select the remote base station, and click Configure. Enter the base station password, if necessary.

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 WDS 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.



Select "Allow wireless clients on this base station" if you would like wireless client computers as well as base stations to share the connection. If you don't select 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.

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

Important: You need to repeat these steps for each remote base station you include in the WDS.

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 43.

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.

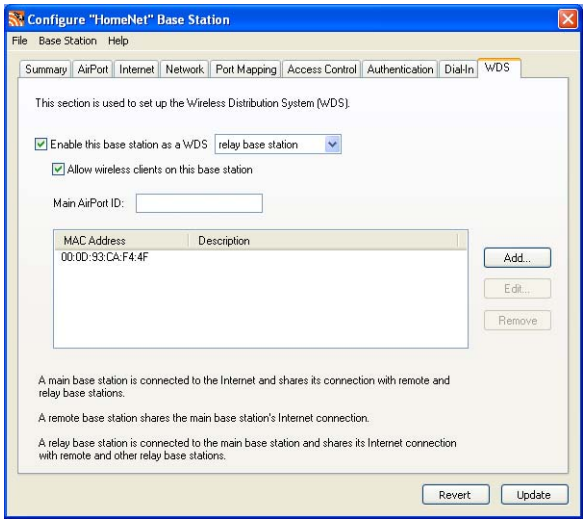
1 Right-click the wireless connection icon and choose View Available Wireless Networks. Choose the wireless network created by the base station you want to set up as a relay base station.

2 Open AirPort Admin Utility, 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 WDS 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.



6 Click Add and enter the MAC address of each base station you want to set up as a remote base station for this relay base station. You need to set up at least one additional remote base station to share the relay's connection.

Select a base station and click Remove to remove the base station from the list.

7 Click Update to transfer the new WDS settings to the relay and remote base stations.

Important: You need to repeat these steps for each remote base station you include in the WDS.

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 some models of base stations 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.

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 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.
2. Select your base station and click Configure.
3. Click AirPort.
4. Adjust the Transmitter Power slider. The lower the power, 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. SNMP is a network management protocol that can be turned on and off in AirPort Admin Utility.

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 name and IP address are 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 AirPort, and then click Base Station Options.
3. Deselect "Enable WAN Port Configuration" and "Enable SNMP."

Using Wi-Fi Protected Access (WPA)

This version of AirPort Admin Utility supports WPA, the latest security standard for wireless networks. WPA security delivers more sophisticated data encryption than WEP, and also provides user authentication, which was virtually unavailable with WEP.

Note: These WPA security features are available only to AirPort Extreme Base Stations and AirPort Express, and clients using 802.11 wireless adapters that support WPA.

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

WPA 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. 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.

WPA Personal mode is for the home or small office network and can be set up and managed by most users. WPA 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.

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.

To set up a WPA Enterprise network:

1. Open AirPort Admin Utility, select your base station, and click Configure.
2. Click AirPort, and then click Network Security.
3. Choose "WPA for enterprise" from the Network Security Level pop-up menu.
4. 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 AirPort, and then click Network Security.
3. Choose "WPA for home/small office" from the Network Security Level pop-up menu.
4. Click Set Pre-Shared Key and enter an ASCII password of 8 to 63 ASCII characters, or enter a 64 hexadecimal character Pre-Shared Key.

Setting Up Access Control

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

Each wireless computer has a unique 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 of your computer's wireless card, open Control Panel from the Start menu and right-click Wireless Network Connection. Click Configure and then click About.

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 MAC address and an optional description for the computers that will access the network. Select a MAC address and click Remove to remove it from the list.

   Important: Access control prevents computers that aren't on the access control list from accessing the wired network connected to the base station. It does not prevent computers from joining the AirPort wireless network. For information on how to prevent unauthorized computers from joining the AirPort network, see "Setting Up the AirPort Network" on page 17.

   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 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. See the documentation that came with the RADIUS server to set it up properly.
2. When the RADIUS server is set up, open AirPort Admin Utility, select your base station, and click Configure.
3. Click Authentication.
4. Choose a format from the RADIUS pop-up menu.

   If you choose "Default method," 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 method," 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 private network sends a request for information to the Internet.

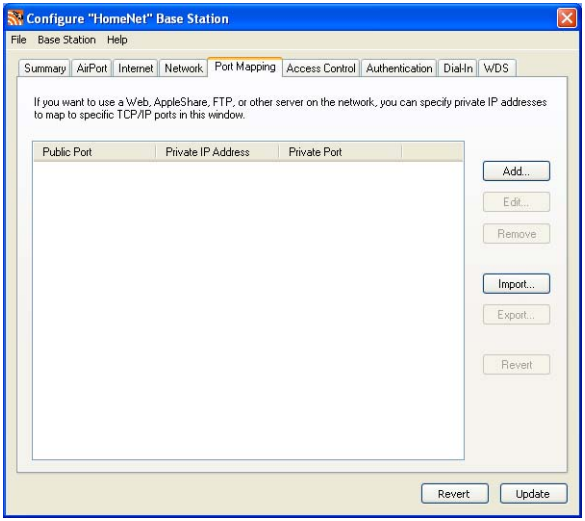
If you are running a web or FTP server on your network, other computers initiate communication with your server. Since the base station has no table entries for these requests, it has no way of directing the information to the appropriate computer on your network.

To ensure that requests are routed to your web 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 the server. For example, computers look for web services on port 80.
   - **Private IP Address** The manually assigned, private IP address of the server.
   - **Private Port** The port that will be used on the server 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 or FTP server.

You can also set up a computer as a default host to establish a permanent IP address for the server 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 Network, click "Enable Default Host at," then enter the default IP address, such as 10.0.1.200. The default address for the host is 10.0.1.253.
3. Enter the same IP address on the host computer.

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 a system log (or Syslog) host. 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 AirPort and then click Base Station Options.
3. Click Logging/NTP.
4. Select "Send Base Station Logging to" and enter the IP address of the computer that will receive the base station logs.
5. Choose a level from the Logging Level 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.

1. Select Set Date & Time Automatically.
2. Choose a time server from the pop-up menu.

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

You can connect a USB printer to the AirPort Extreme Base Station or AirPort Express, so that anyone on the network can print to that printer.

To use a printer on your network:

- Connect the printer to the USB port on the AirPort Extreme Base Station.

You can rename the printer you connect to the AirPort Extreme Base Station or to AirPort Express. If you are using an AirPort Extreme Base Station that supports Power over Ethernet (PoE), you can connect multiple printers to an Ethernet hub connected to the base station and give each on a unique name.

To rename a USB printer connected to an AirPort base station:

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

To set up client computers to use a printer connect to a base station:

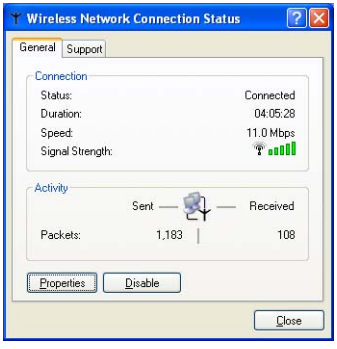
1. Open "Printers and Faxes" from the Start menu.
2. Click Add Printer and then follow the onscreen instructions.
3. Select "Local printer attached to this computer" and deselect "Automatically detect and install my Plug and Play printer."
4. In the "Select the Printer Port" screen, click "Create a new port" and choose Standard TCP/IP Port from the pop-up menu.
5. Click Next and follow the onscreen instructions.
6. In "Printer Name or IP Address," enter 10.0.1.1. "IP_10.0.1.1" is generated as the port name.

   If you set your base station IP address to something other than 10.0.0.1, enter that address instead. The port name will be generated based on the IP address you specify.
7. Select Standard for Device Type and select your printer in the list.

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.
- Right-click the wireless connection icon, and choose Status.



- 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 "Obtain an IP address automatically" checkbox is selected in the General pane of Internet Protocol (TCP/IP) Properties. Right-click the wireless connection icon and click Properties. Click Internet Protocol (TCP/IP), and then click Properties.

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, editing base station settings, avoiding sources of interference, locating additional information on the Internet, and more. Choose AirPort Help from the Help menu.
- **World Wide Web**
  Apple AirPort website at www.apple.com/airport or www.apple.com/airportextreme
  Apple Support website at www.apple.com/support.

Using AirPort Express

4

This chapter provides information and instructions for using the AirPort Express 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 using AirTunes, and much more.

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.

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 so that everyone on the wireless network can share the 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 AirTunes 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 to 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 AirTunes 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 or AirPort Express 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 AirTunes 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 Express Assistant to set it up. For example, connect an Ethernet cable to AirPort Express and to your DSL or cable modem, connect AirPort Express to your stereo or powered speakers, and connect a USB cable to AirPort Express and to your USB printer.

Step 2: Using AirPort Express Assistant

If you are using Windows XP, use the AirPort Express Assistant to set up your AirPort Express network or join your existing wireless network. If you are using Windows 2000, use AirPort Admin Utility to set up your AirPort Express. Follow the instructions in the previous chapter to use AirPort Admin Utility to set up your AirPort Express.

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 Express Assistant to set it up to work with your Internet connection, stereo, USB printer, or existing network.

Using the AirPort Express Assistant

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

- Open the AirPort Express Assistant, located in Start > All Programs > AirPort, and follow the onscreen instructions.

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 Express 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 Express Assistant. Have this information available before you set up your AirPort Express.

Creating a New Wireless Network

You can use the AirPort Express Assistant to create a new wireless network. The AirPort Express 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 AirTunes 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 Express Assistant, located in Start > All Programs > AirPort Express Assistant, 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 Express 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 Express Assistant to provide AirPort Express with your ISP settings and configure how the base station shares the settings with other computers.

- Open the AirPort Express Assistant, located in Start > All Programs > AirPort Express Assistant, 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 Express 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 Express Assistant.

- Open the AirPort Express 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 Express Assistant to set up AirPort Express to extend the range of an existing AirPort Extreme or AirPort Express wireless network. This is known as setting up a Wireless Distribution System (WDS). 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 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.

- Open the AirPort Express 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 a WDS may reduce 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 39.

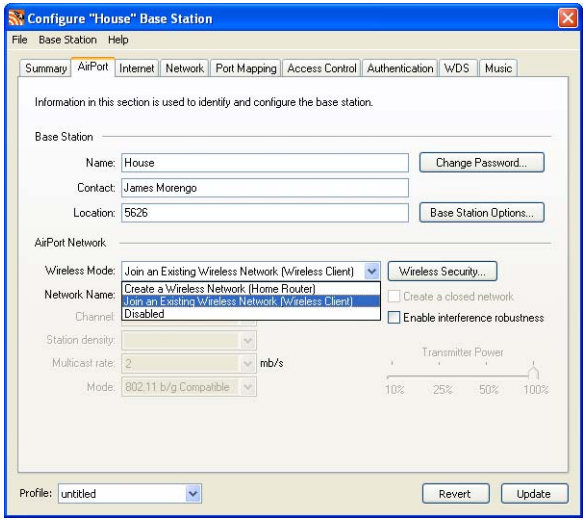
You can use also AirPort Admin Utility to set up exclusive AirPort Express features, such as setting up AirPort Express to create a new AirPort network or join an existing AirPort or other wireless network, setting up or changing the iTunes speaker name and password, changing the name of a USB printer that is connected to AirPort Express, 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 55 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 Wireless Mode pop-up menu.

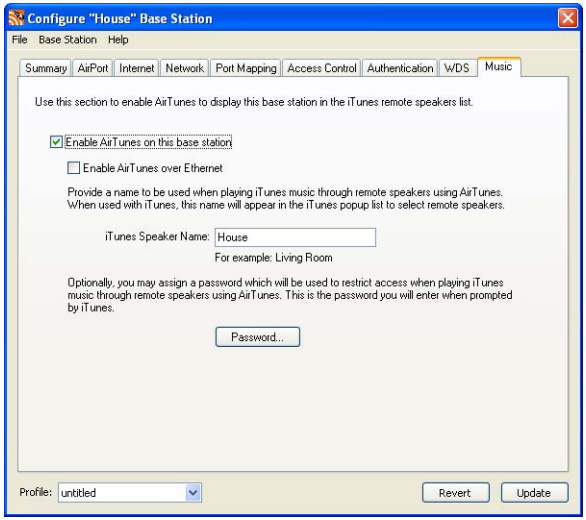


Changing iTunes Settings

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 AirPort Express 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 AirPort and then click Options

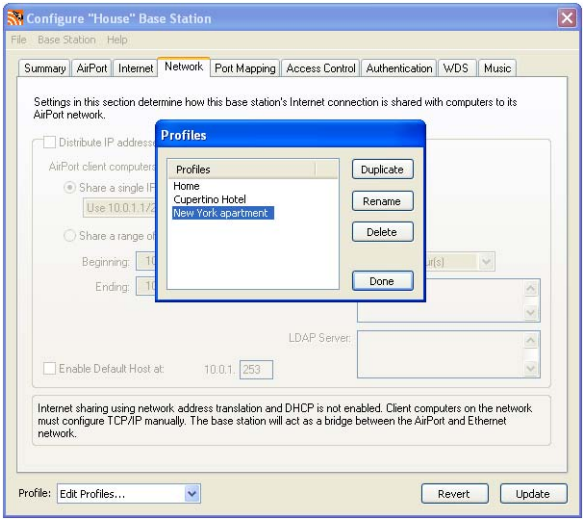
5 Choose a setting from the Status Light pop-up menu.

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 Start > All Programs > AirPort.
2. Select your AirPort Express in the list and click Configure.
3. Choose Create Profile from the Profiles pop-up menu, give the profile a name, then click OK.
4. Set options, such as network name, remote speaker name, passwords, and the Internet connection method.
5. When you are finished setting the options, click Update.



To edit an existing profile:

1. Open AirPort Admin Utility, located in Start > All Programs > AirPort.
2. Select your AirPort Express in the list and click Configure.
3. Choose Edit Profile from the Profiles pop-up menu.
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.

Behind the Scenes

5

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 Extreme Base Station'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.

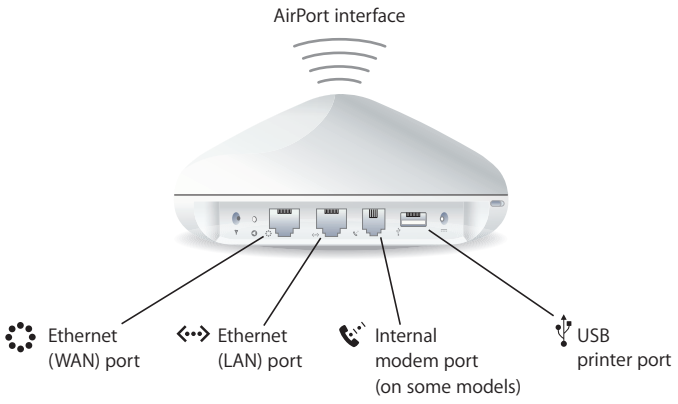
Using the AirPort Extreme Base Station

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.

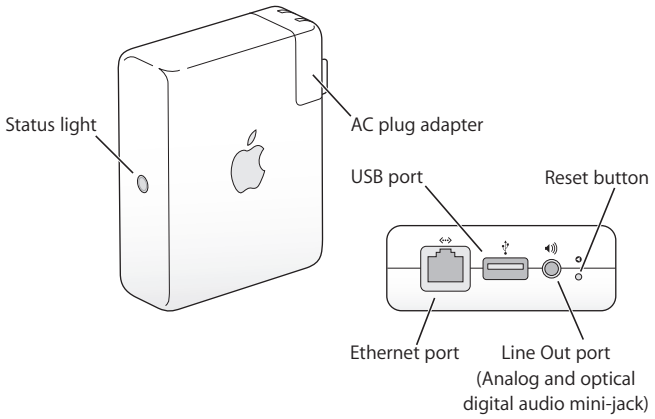
Using AirPort Express

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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