

# How to Build a Wireless Home Network - Tutorial

## Introduction to wireless computer networking

By [Bradley Mitchell](#), About.com wireless networking

<http://compnetworking.about.com/cs/wirelessproducts/a/howtobuildwlan.htm>

This tutorial will guide you through the process of planning, building, and testing a wireless home network. Although mainstream wireless networking has made amazing strides in the past few years, wireless technology and terminology remains a bit difficult for most of us to comprehend. This same guide will help small business networkers, too!

### Build a Wireless LAN, Step by Step

You can build any typical wireless home network, a [wireless LAN \(WLAN\)](#), using this simple three-step approach:

1. Identify the WLAN design that's best for your situation
2. Choose good wireless gear
3. Install gear and test the configured WLAN

In subsequent pages, I break down each of these steps in more detail.



Linksys wireless network adapter



Linksys wireless access point.

### Ready to Go Wireless?

This article assumes you've already made an informed decision to go wireless rather than build a traditional cabled network. Though prices have dropped dramatically from a few years ago, when wireless gear was quite expensive, wireless networks still aren't for everyone (yet). Unsure that wireless will really meet your needs? Use the following supplementary article to help you choose wisely:

- [Wired vs wireless - building the right home network](#)
- <http://compnetworking.about.com/cs/homenetworking/a/homewiredless.htm>

### Benefits of Wireless

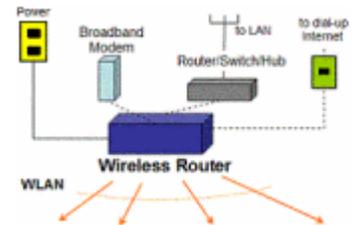
Wireless offers tangible benefits over traditional wired networking. Ever tried to quickly look up a recipe on the Net while cooking in the kitchen? Do the kids need a networked computer in their bedroom for school projects?

Have you dreamed of sending email, instant messaging, or playing games while relaxing on your outdoor patio? These are just some of the things wireless can do for you:

- [Why build a wireless home network?](#)
- <http://compnetworking.about.com/cs/wireless/f/whywirelesslan.htm>

## Wireless terms and jargon

When researching wireless equipment to buy, or talking about wireless networking with friends and family, you should have a solid understanding of this basic terminology.



### What is a WLAN?

We've already said that a WLAN is a "typical" wireless home network. That's because a WLAN is a wireless [LAN](#), and a LAN is a related group of networked computers situated in close physical proximity to each other. LANs can be found in many homes, schools, and businesses. Though it's technically possible to have more than one LAN in your home, few do this in practice. In this tutorial, we explain how to build a single standard WLAN for your home.

### What is Wi-Fi?

Wi-Fi is an industry name used to market wireless networking products. You'll find a black-and-white Wi-Fi logo or certification emblem on virtually any new wireless equipment you buy. Technically speaking, Wi-Fi signifies conformance to the 802.11 family of wireless communication standards (described below). But because all mainstream wireless home network gear uses the 802.11 standards today, basically the term "Wi-Fi" merely distinguishes wireless equipment from other network gear.

- [More about Wi-Fi](#)

### What is 802.11a/802.11b/802.11g?

[802.11a](#), [802.11b](#), and [802.11g](#) represent three popular wireless communication standards. Wireless networks can be built using any of the three, but 802.11a is less compatible with the others and tends to be a more expensive option implemented only by larger businesses. Use the supplemental article below to help you pick 802.11 standard(s) for your wireless LAN.

- [Choosing among 802.11a, 802.11b, and 802.11g wireless](#) (most routers are compatible)
- <http://compnetworking.about.com/cs/wireless80211/a/aa80211standard.htm>

### What is WEP?

The security of wireless home and small business networks remains a concern for many. Just like we use radio or television receivers to tune into station broadcasts, it's almost as easy to pick up signals from a nearby wireless home network. Sure, credit card transactions on the Web may be secure, but imagine your neighbors spying on every email and instant message you send!

[WEP](#) is an important feature of wireless networks designed to improve security. WEP scrambles (technically speaking, [encrypts](#)) network traffic mathematically so that other computers can understand it, but humans cannot read it. WEP helps protect your WLAN from wardrivers and nosy neighbors, and today, all popular wireless equipment supports it. Because WEP is a feature that can be turned "on" or "off," you'll simply need to ensure it is configured properly when setting up your network.

# Choosing wireless gear

The building blocks of a wireless LAN are **network adapters**, **access points**, **wireless routers**, add-on wireless **antennas** and **signal boosters**. Of these, only network adapters are truly required to build a wireless home network. However, many wireless LANs also utilize some of the other equipment, as explained below.

## Wireless Network Adapters

Each computer you wish to connect to a WLAN must possess a wireless network [adapter](#). Wireless adapters are sometimes also called [NICs](#), short for Network Interface Cards. Wireless adapters for desktop computers are often small [PCI](#) cards or sometimes card-like [USB](#) adapters. Wireless adapters for notebook computers resemble a thick credit card (*see Page 1 sidebar for illustration*). Nowadays, though, an increasing number of wireless adapters are not cards but rather small chips embedded inside notebook or handheld computers.

Wireless network adapters contain a radio transmitter and receiver (transceiver). Wireless transceivers send and receive messages, translating, formatting, and generally organizing the flow of information between the computer and the network. Determining how many wireless network adapters you need to buy is the first critical step in building your home network. Check the technical specifications of your computers if you're unsure whether they contain built-in wireless adapter chips.

## Wireless Routers

A wireless router is a wireless access point with several other useful functions added. Like wired broadband routers, wireless routers also support Internet connection sharing and include [firewall](#) technology for improved network security. Wireless routers closely resemble access points (*see Page 1 sidebar for illustration*).

A key benefit of both wireless routers and access points is **scalability**. Their strong built-in transceivers are designed to spread a wireless signal throughout the home. A home WLAN with a router or access point can better reach corner rooms and backyards, for example, than one without. Likewise, home wireless networks with a router or access point support many more computers than those without one. As we'll explain in more detail later, if your wireless LAN design includes a router or access point, you must run all network adapters in so-called [infrastructure mode](#); otherwise they must run in [ad-hoc mode](#).

Wireless routers are a good choice for those building their first home network. See the following article for good examples of wireless router products for home networks:

- [Best 802.11g wireless routers for home](#)

## Wireless Signal Boosters

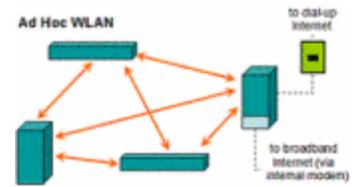
Some manufacturers of wireless access points and routers also sell a small piece of equipment called a signal booster. Installed together with a wireless access point or router, a signal booster serves to increase the strength of the base station transmitter. It's possible to use signal boosters and add-on antennas together, to improve both wireless network transmission and reception simultaneously.

Both antennas and signal boosters can be a useful addition to some home networks after the basics are in place. They can bring out-of-range computers back into range of the WLAN, and they can also improve network performance in some cases.

# Installing and Configuring your WLAN

To maximize benefit from the directions below, have your answers ready for the following questions:

- do you want to extend your wired home network with a WLAN, or are you building a completely new network?
- how many wireless computers do you plan to network, and where in the home will they be located?
- what operating systems do/will you run on your networked computers?
- do you need to share your Internet connection among the wireless computers? how else will you use this WLAN? file sharing? network gaming?



## Installing a Wireless Router

One wireless router supports one WLAN. Use a wireless router on your network if:

- you are building your first home network, or
- you want to re-build your home network to be all-wireless, or
- you want to keep your WLAN installation as simple as possible

Try to install your wireless router in a central location within the home. The way Wi-Fi networking works, computers closer to the router (generally in the same room or in "line of sight") realize better network speed than computers further away.

Connect the wireless router to a power outlet and optionally to a source of Internet connectivity. All wireless routers support broadband modems, and some support phone line connections to dial-up Internet service. If you need dial-up support, be sure to purchase a router having an **RS-232 serial port**. Finally, because wireless routers contain a built-in access point, you're also free to connect a wired router, [switch](#), or [hub](#). (See *diagram Page 2 sidebar*.)

Next, choose your **network name**. In Wi-Fi networking, the network name is often called the [SSID](#). Your router and all computers on the WLAN must share the same SSID. Although your router shipped with a default name set by the manufacturer, it's best to change it for security reasons. Consult product documentation to find the network name for your particular wireless router, and follow this [general advice for setting your SSID](#).

Last, follow the router documentation to enable WEP security, turn on firewall features, and set any other recommended parameters.

## Configuring the Wireless Adapters

Configure your adapters after setting up the wireless router or access point (if you have one). Insert the adapters into your computers as explained in your product documentation. Wi-Fi adapters require [TCP/IP](#) be installed on the host computer.

Manufacturers each provide configuration utilities for their adapters. On the Windows operating system, for example, adapters generally have their own graphic user interface (GUI) accessible from the Start Menu or taskbar after the hardware is installed. Here's where you set the network name (SSID) and turn on WEP. You can also set a few other parameters as described in the next section. Remember, all of your wireless adapters must use the same parameter settings for your WLAN to function properly.

## Configuring Software Internet Connection Sharing

As shown in the diagram, you can share an Internet connection across an ad hoc wireless network. To do this, designate one of your computers as the host (effectively a substitute for a router). That computer will keep the modem connection and must obviously be powered on whenever the network is in use. Microsoft Windows offers a feature called [Internet Connection Sharing \(ICS\)](#) that works with ad hoc WLANs.

## Troubleshooting, Tips and Tweaks

Now let's cover some of the finer points you need to know about home wireless LANs.

### Wireless Routers Interference within the Home

When installing an 802.11b or 802.11g access point or router, beware of signal interference from other home appliances. In particular, do not install the unit within 3-10 feet (about 1-3 m) from a microwave oven. Other common sources of wireless interference are 2.4 GHz cordless phones, baby monitors, garage door openers, and some home automation devices.

If you live in a home with brick or plaster walls, or one with metal framing, you're may encounter difficulty maintaining a strong WLAN signal. Wi-Fi is designed to support signal range up to 300 feet (about 100 m), but barriers reduce this range substantially. All 802.11 communications (802.11a most of all) are affected by obstructions; keep this in mind when installing your access point.

- [Range of Wi-Fi LANs](#)

### Wireless Routers Interference from Outside

In densely populated areas, it's not uncommon for wireless signals from one person's home network to penetrate a neighboring home and interfere with their WLAN. This happens when both households set conflicting communication channels. Fortunately, when configuring an 802.11b or 802.11g access point or router, you can (except in a few locales) change the channel number employed.

In the United States, for example, you may choose any WLAN channel number between 1 and 11. If you encounter interference from neighbors, you should coordinate channel settings with them. Simply using different channel numbers won't always solve the problem. However, if both parties use a different one of the channel numbers **1, 6 or 11**, that will guarantee elimination of cross-WLAN interference.

- [Change the Wi-Fi Channel Number to Avoid Interference](#)

### MAC Address Filtering

Newer wireless routers and access points support a handy security feature called [MAC](#) address filtering. I wholeheartedly recommend it. This feature allows you to register wireless adapters with your access point (or router), and force the unit to reject communications from any wireless device that isn't on your list. MAC address filtering combined with WEP encryption affords very good security protection.

- [Tip - Enable MAC Address Filtering](#)

## Wireless Adapter Profiles

Many wireless adapters support a feature called **profiles** that allows you to set up and save multiple WLAN configurations. For example, you can create an ad hoc configuration for your home WLAN and an infrastructure mode configuration for your office, then switch between the two profiles as needed. I recommend setting up profiles on any computers you plan to move between your home network and some other WLAN; the time you spend now will save much more time and aggravation later.

## WEP Encryption

Among the options you'll see for activating wireless encryption, **128-bit WEP** is a safe bet. Older 40 or 64-bit WEP offers inadequate protection. A few 802.11g products support 152-bit or 256-bit WEP, that is fine too, if all of your gear supports it. Newer equipment offers [WPA](#). General-purpose WPA is unnecessarily complex for a home WLAN, but WPA-PSK works well.

To set 128-bit WEP, pick and assign a number called a **WEP passkey**. You must apply the same WEP settings and passkey to the access point (router) and all adapters.

## General Tips

If you've finished installing the components, but your home network isn't functioning correctly, **troubleshoot methodically**:

- Can't reach the Internet? Temporarily turn off your firewall to determine whether you have a firewall configuration problem, or some other issue.
- Likewise, turn on and test your wireless adapters one by one, to determine if problems are isolated to a single computer or common to all.
- Try ad hoc networking if infrastructure networking isn't functional, and perhaps you'll identify a problem with your access point or router.
- To help you work methodically, as you build your network, write down on paper the key settings like network name, WEP passkey, MAC addresses, and channel numbers (then eat the evidence afterward!).
- Don't worry about making mistakes; you can go back and alter any of your WLAN settings any time.

Finally, don't be surprised if your **wireless LAN performance** doesn't match the numbers quoted by the manufacturer. For example, although 802.11b equipment technically supports 11 [Mbps](#) bandwidth, that is a theoretical maximum never achieved in practice. A significant amount of Wi-Fi network bandwidth is consumed by overhead that you cannot control. Expect to see more than about one-half the maximum bandwidth (5.5 Mbps at most for 802.11b, about 20 Mbps at most for the others) on your home WLAN.

## Conclusion

Armed with the information contained in this tutorial, you're now well on your way to building a working home WLAN. Welcome to the world of wireless networking!

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# Microsoft: 4 steps to set up your home wireless network

By Tony Northrup

You can use a wireless network to share Internet access, files, printers, and more. Or you can use it to surf the Web while you're sitting on your couch or in your yard. Plus, it's easier to install than you think.

There are 4 steps to creating a wireless network:

1. [Choose your wireless equipment](#)
2. [Connect your wireless router](#)
3. [Configure your wireless router](#)
4. [Connect your computers](#)

For [Windows XP](#) users, [Windows XP Service Pack 2](#) is not required for wireless networking, but it does make things much easier. Service Pack 2 also helps protect you against hackers, worms, and other Internet intruders.

## 1. Choose your wireless equipment

The first step is to make sure that you have the equipment you need. As you're looking for products in stores or on the Internet, you might notice that you can choose equipment that supports three different wireless networking technologies: 802.11a, 802.11b, and 802.11g. We recommend 802.11g, because it offers excellent performance and is compatible with almost everything.

### Shopping list

- Broadband Internet connection
- Wireless router
- A computer with built-in wireless networking support or a wireless network adapter

### A wireless router

The router converts the signals coming across your Internet connection into a wireless broadcast, sort of like a cordless phone base station. Be sure to get a wireless router, and not a wireless access point.

### A wireless network adapter

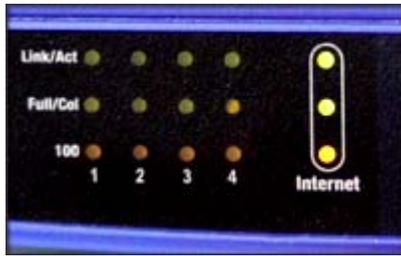
Network adapters wirelessly connect your computer to your wireless router. If you have a newer computer you may already have wireless capabilities built in. If this is the case, then you will not need a wireless network adapter. If you need to purchase an adapter for a desktop computer, buy a USB wireless network adapter. If you have a laptop, buy a PC card-based network adapter. Make sure that you have one adapter for every computer on your network.

**Note:** To make setup easy, choose a network adapter made by the same vendor that made your wireless router. For example, if you find a good price on a Linksys router, choose a Linksys network adapter to go with it. To make shopping even easier, buy a bundle, such as those available from D-Link, Netgear, Linksys, Microsoft, and Buffalo. If you have a desktop computer, make sure that you have an available USB port to plug the wireless network adapter into. If you don't have any open USB ports, buy a hub to add additional ports.

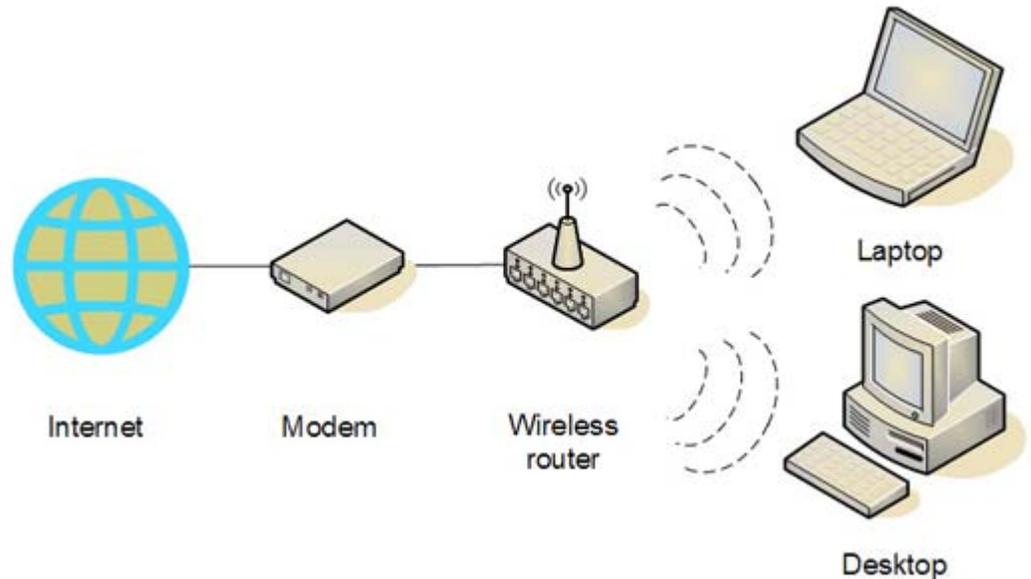
## 2. Connect your wireless router

Since you'll be temporarily disconnected from the Internet, print these instructions before you go any further.

First, locate your cable modem or DSL modem and unplug it to turn it off.



Next, connect your wireless router to your modem. Your modem should stay connected directly to the Internet. Later, after you've hooked everything up, your computer will wirelessly connect to your router, and the router will send communications through your modem to the Internet.



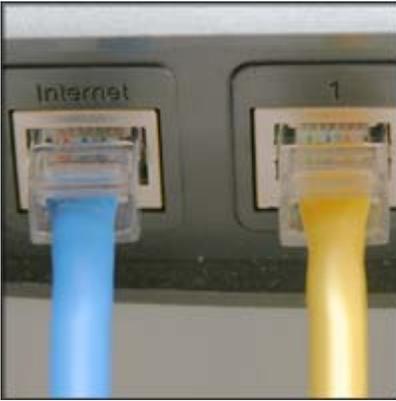
Next, connect your router to your modem:

**Note:** The instructions below apply to a Linksys wireless router. The ports on your router may be labeled differently, and the images may look different on your router. Check the documentation that came with your equipment for additional assistance.

- **If you currently have your computer connected directly to your modem:** Unplug the network cable from the back of your computer, and plug it into the port labeled Internet, WAN, or WLAN on the back of your router.
- **If you do not currently have a computer connected to the Internet:** Plug one end of a network cable (included with your router) into your modem, and plug the other end of the network cable into the Internet, WAN, or WLAN port on your wireless router.
- **If you currently have your computer connected to a router:** Unplug the network cable connected to the Internet, WAN, or WLAN port from your current router, and plug this end of the cable into the Internet, WAN, or WLAN port on your wireless router. Then, unplug any other network cables, and plug them into the available ports on your wireless router. You no longer need your original router, because your new wireless router replaces it.

Next, plug in and turn on your cable or DSL modem. Wait a few minutes to give it time to connect to the Internet, and then plug in and turn on your wireless router. After a minute, the Internet, WAN, or WLAN light on your wireless router should light up, indicating that it has successfully connected to your modem.

### 3. Configure your wireless router



Using the network cable that came with your wireless router, you should temporarily connect your computer to one of the open network ports on your wireless router (any port that isn't labeled Internet, WAN, or WLAN). If you need to, turn your computer on. It should automatically connect to your router.

Next, open Internet Explorer and type in the address to configure your router.

You might be prompted for a password. The address and password you use will vary depending on what type of router you have, so refer to the instructions included with your router.

As a quick reference, this table shows the default addresses, usernames, and passwords for some common router manufacturers.

| Router              | Address            | Username | Password |
|---------------------|--------------------|----------|----------|
| 3Com                | http://192.168.1.1 | admin    | admin    |
| D-Link              | http://192.168.0.1 | admin    |          |
| Linksys             | http://192.168.1.1 | admin    | admin    |
| Microsoft Broadband | http://192.168.2.1 | admin    | admin    |
| Netgear             | http://192.168.0.1 | admin    | password |

Internet Explorer will show your router's configuration page. Most of the default settings should be fine, but you should configure three things:

- 1. Your wireless network name, known as the SSID.** This name identifies your network. You should choose something unique that none of your neighbors will be using.
- 2. Wireless encryption (WEP) or Wi-Fi Protected Access (WPA), which help protect your wireless network.** For most routers, you will provide a passphrase that your router uses to generate several keys. Make sure your passphrase is unique and long (you don't need to memorize it).
- 3. Your administrative password, which controls your wireless network.** Just like any other password, it should not be a word that you can find in the dictionary, and it should be a combination of letters, numbers, and symbols. Be sure you can remember this password, because you'll need it if you ever have to change your router's settings.

The exact steps you follow to configure these settings will vary depending on the type of router you have. After each configuration setting, be sure to click **Save Settings**, **Apply**, or **OK** to save your changes.

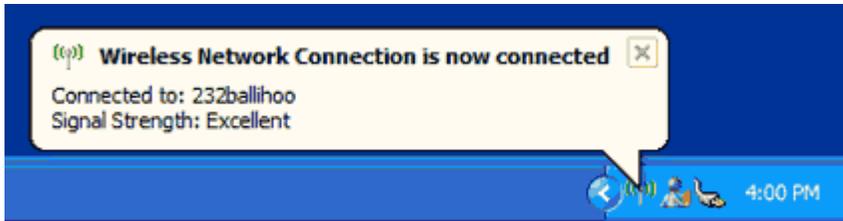
Now, you should disconnect the network cable from your computer.

#### 4. Connect your computers

If your computer does not have wireless network support built in, plug your network adapter into your USB port, and place the antenna on top of your computer (in the case of a desktop computer), or insert the network adapter into an empty PC card slot (in the case of a laptop). Windows XP will automatically detect the new adapter, and may prompt you to insert the CD that came with your adapter. The on-screen instructions will guide you through the configuration process.

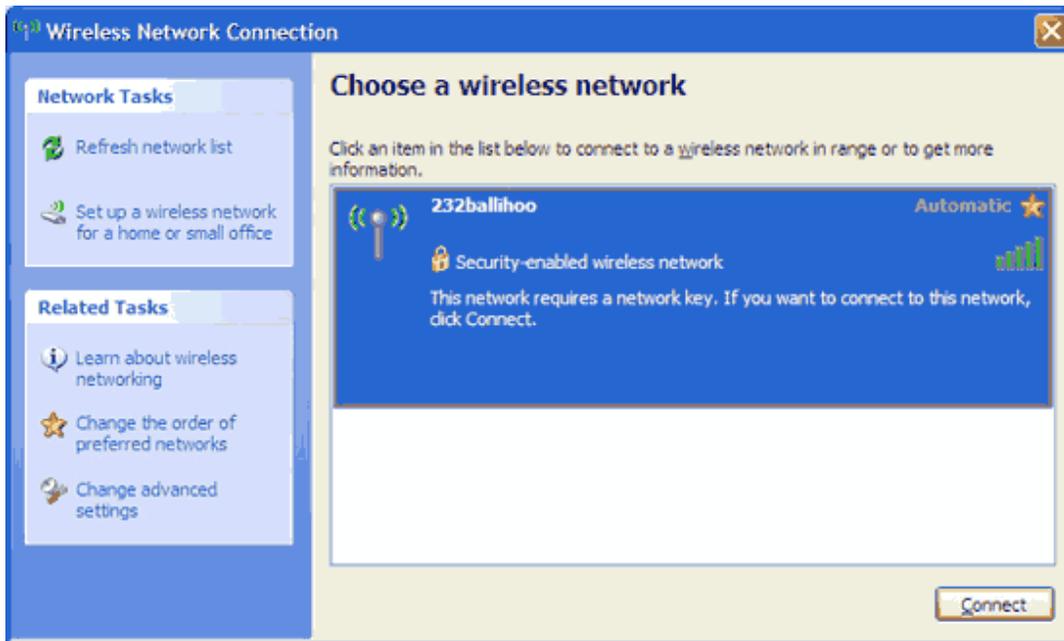
**Note:** The steps below only apply if you're using Windows XP Service Pack 2. If you're running Windows XP and you don't have Service Pack 2 yet, plug your computer into your wireless router and [download and install Windows XP Service Pack 2](#).

Windows XP should show an icon with a notification that says it has found a wireless network.



Follow these steps to connect your computer to your wireless network:

1. Right-click the wireless network icon in the lower-right corner of your screen, and then click **View Available Wireless Networks**. If you run into any problems, consult the documentation that came with your network adapter. Don't be afraid to call their tech support.
2. The Wireless Network Connection window should appear and you should see your wireless network listed with the network name you chose. If you don't see your network, click **Refresh network list** in the upper-left corner. Click your network, and then click **Connect** in the lower-right corner.



3. Windows XP prompts you to enter a key. Type the encryption key that you wrote down earlier in both the **Network key and Confirm network key** boxes, and then click **Connect**.
4. Windows XP will show its progress as it connects to your network. After you're connected, you can now close the Wireless Network Connection window. You're done.

**Note:** If the Wireless Network Connection window continues to show **Acquiring Network Address**, you may have mistyped the encryption key.

<http://www.microsoft.com/athome/moredone/wirelesssetup.mspix>