

54Mbps 802.11g Wireless LAN Card

User's Manual

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About This Manual

This manual was written for the following types of wireless adapter:

- PC Card
- PCI Card
- Mini PCI Card

For brevity, throughout this manual **Wireless LAN Card** is used to indicate both types. Also, the following terms/abbreviations are used interchangeably:

- Access Point – AP
- Peer-to-Peer – Ad Hoc
- Wireless LAN – WLAN
- Ethernet network – LAN – network

This User's Manual contains information on how to install and configure your Wireless LAN Card. From now on, we will guide you through the correct configuration steps to get your device up and run.

Chapter 1 Introduction

This Wireless LAN Card is an IEEE 802.11g wireless LAN adapter. 802.11g is the latest in the series of 802.11 specifications for wireless local area networks (WLANs) and provides data transfer of up to 54 Mbps. Since 802.11g operates on the same frequency of 2.4 GHz as 802.11b, so it is backwards compatible with existing Wi-Fi devices!

It allows your computer to connect to a wireless network and to share resources, such as files or printers without being bound to the network wires. Operating in 2.4GHz Direct Sequence Spread Spectrum (DSSS) radio transmission, the Wireless LAN Card transfers data at speeds up to 54Mbps. Both Ad-Hoc and Infrastructure mode are supported. For network security concern, 64/128-bit Wired Equivalent Protection (WEP) algorithm is used. In addition, its standard compliance ensures that it can communicate with any 802.11b/g networks.

Wireless LAN Basics

This section contains some Wireless LAN basics to help you better understand how the product works together to create a wireless network.

Local Area Network (LAN)

Simply put, a LAN is a network that exists in a relatively limited area. A network is two or more computers connected together sharing files and peripheral devices such as printers.

The Wireless LAN Card allows you to interact with other computers without having to run cables normally associated with networks. This lets you move your computer around while staying connected to your network.

There are two ways to use the Wireless LAN Card. One way is to connect directly to one or more Wireless LAN Card equipped computers, forming an Ad-Hoc wireless network. The second way is to connect to an Access Point that gives you access to an existing wired LAN, forming an Infrastructure wireless network.

Ad-Hoc Mode

The Ad-Hoc Group offers peer-to-peer connections between workstations, allowing communication between computers within range that have an 802.11g DSSS compatible PC card installed. A wireless Ad-Hoc network can also access a wired LAN's TCP/IP service (such as e-mail and the Internet) by using a TCP/IP software router on an Ethernet equipped PowerBook or notebook.

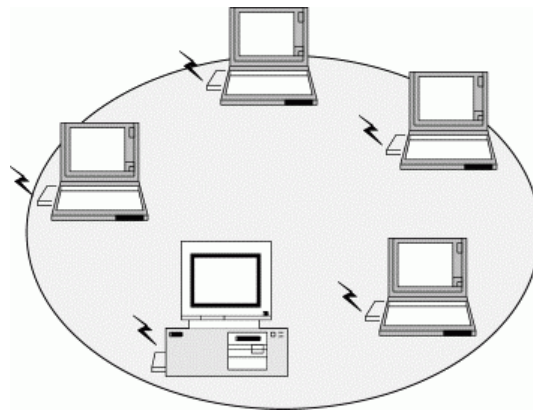


Figure 1-1 Ad-Hoc Mode

Infrastructure Mode

The Infrastructure network uses an AP or several APs as a gateway, linking the wireless network to a wired LAN. As a result, portable workstations or desktops on your wireless network have access to all of the features of your wired LAN including e-mail, Internet access, network printers and files server.

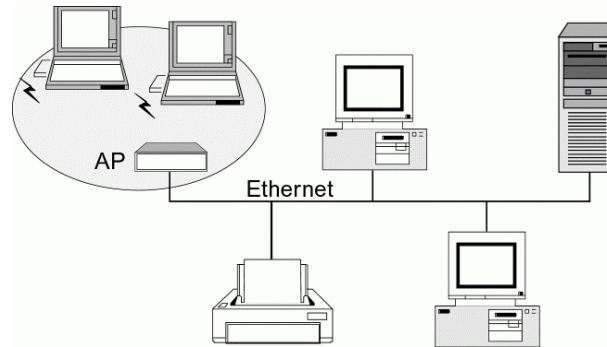


Figure 1-2 Infrastructure Mode

Roaming

Multiple Access Points can be installed to extend the wireless service coverage area for seamless wireless access. Within an extended service area, all Access Points and wireless clients must have the same Service Set Identity (SSID). Roaming among different Access Points is controlled automatically to maintain the wireless connectivity at all times.

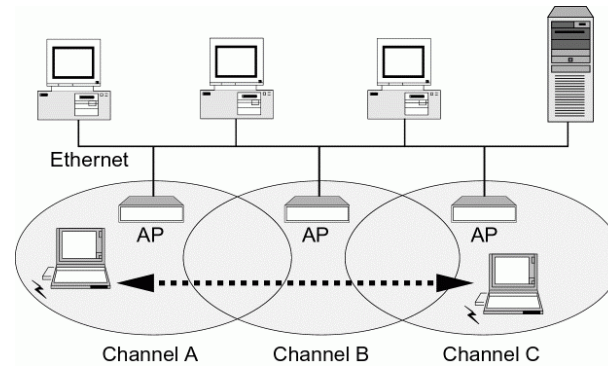


Figure 1-3 Roaming Across Multiple Access Points

Chapter 2 Installing the Wireless LAN Card

This chapter describes the installation process for the driver and software for the Wireless LAN Card. Proper driver installation is to allow the device to operate on your host computer while the utility software, Broadcom Wireless Configuration Utility, is to help you configure and monitor your Wireless LAN Card.

System Requirements

To use the Wireless LAN Card, your computer must meet the following minimum requirements:

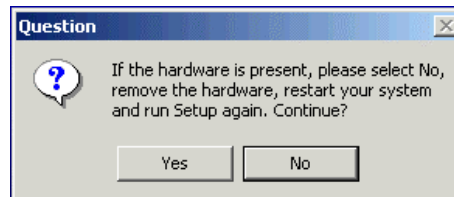
- Pentium-class PC, 300MHz or better recommended
- 64 MB of RAM, additional memory recommended
- Hard disk space at least 30 Mbytes
- Windows 98(SE)/Me/2000/XP
- UL listed I.T.E. computers

Installing Wireless LAN Driver and Software

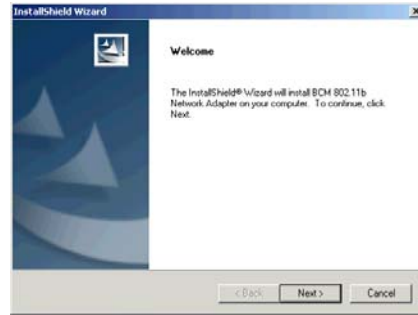
Follow these steps to install the Wireless LAN Card driver and software:

Caution: Do not connect the Wireless LAN Card device to your computer before installing its driver. If this happens, the Windows PnP function will detect the wireless adapter and issue a dialog box requesting for its driver. Click **Cancel** to quit the wizard and unplug the Wireless LAN Card.

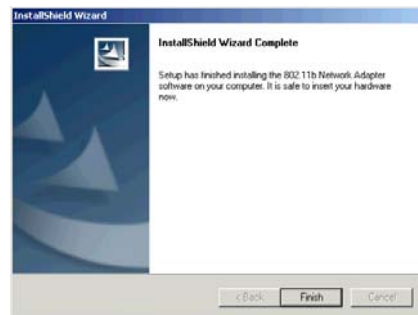
1. Close all Windows programs that are running. Insert the provided Software Utility CD into your CD-ROM drive. Run **setup.exe** from the **Driver** folder of the Software Utility CD.
2. If the wireless adapter is not yet inserted into your computer, click **Yes**. Otherwise click **No** to remove the device. Then restart your system and run **setup.exe** again.



3. When the welcome screen pops up, click **Next**.



4. Upon hardware detection, Windows OS hardware wizard will appear requesting for the driver. Just follow the on-screen instructions to proceed.
5. Click **Finish** when the following screen appears.



Now you are done with the installation procedure. The provided **Broadcom Wireless Configuration Utility** should be launched automatically with its icon appearing on the right side of the taskbar. Proceed to next chapter to configure or fine-tune your Wireless LAN Card settings.

Note: If you need to set up the TCP/IP address or the subnet mask, refer to “Appendix C Setting Up TCP/IP” for details.

Chapter 3 Using Broadcom Wireless Configuration Utility

Once your wireless adapter software is properly installed, the provided **Broadcom Wireless Configuration Utility** is ready for use. The utility comes with six tabs. The **Wireless Networks** tab allows to configure your wireless connection. The **Link Status** tab displays the current link status. The **Site Monitor** tab allows to monitor available networks. The **Diagnostic** tab allows to perform diagnostics. The utility information is displayed on the **Information** tab. The **Statistics** tab displays the statistics and status information pertaining to your Wireless LAN Card.

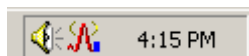
See the ensuing subsections for instructions to launch the utility and description of each tab.

Note: If you are using Windows XP, you can also use the Windows XP-included wireless utility to configure and monitor your wireless network. For more information on using Windows wireless utility, please refer to Windows XP on-line help.

Accessing Broadcom Wireless Configuration Utility

You can access the **Broadcom Wireless Configuration Utility** by any of the following methods:

- Double-click the **Broadcom Wireless Utility** icon on the system tray and then click **Advanced**.



- Right-click the tray icon and select **Open Utility** from its context menu.
- Under **Control Panel**, double-click the **Broadcom Wireless Utility** icon.

The **Broadcom Wireless Configuration Utility** screen pops up with six available tabs: **Wireless Network**, **Link Status**, **Statistics**, **Site Monitor**, **Diagnostics** and **Information**. Please see the appropriate section which describes each tab item.

Notice When Assessing Broadcom Utility under Windows XP

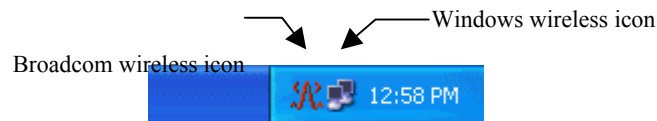
Aside from using **Broadcom Wireless Configuration Utility** for wireless network configuration, Windows XP includes a **Wireless Network Connection** utility to configure your wireless adapter. By default, your wireless adapter is controlled by Windows XP-included wireless utility.

You can choose to configure your wireless network via either the **Broadcom Wireless Configuration Utility** or Windows XP-included wireless utility.

Using Broadcom Wireless Configuration Utility

To use Broadcom Wireless Configuration Utility for configuration purpose, you should disable the Windows XP-included wireless utility by these steps:

1. Double-click the Broadcom wireless icon on system tray and click the **Wireless Networks** tab.
Or double-click the Windows wireless icon and then click **Advanced** (or **Properties**) > **Wireless Networks**.



2. On the **Wireless Networks** tab, uncheck the **Use Windows to configure my wireless network settings** box and click **OK**. This will restore the **Wireless Networks** tab in **Broadcom Wireless Configuration Utility**.



Reverting back to Windows XP-included Wireless Utility

To revert back to using Windows XP-included wireless utility, double-click the Windows wireless icon (not the Boradcom icon) and then click **Advanced** (or **Properties**). Click the **Wireless Networks** tab and check the **Use Windows to configure my wireless network settings** box and click **OK**.



Wireless Networks Tab

Wireless Networks tab allows to do the following task:

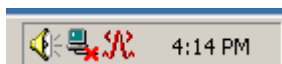
- Connecting to an Existing Wireless Network
- Configuring a New Wireless Network Connection
- Specifying a Network Type to Access

See the appropriate subsection according to your need.

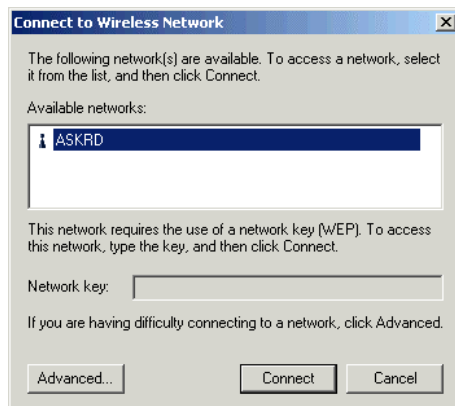
Connecting to an Existing Wireless Network

To connect to an existing Access Point/Wireless LAN Card, take the following steps:

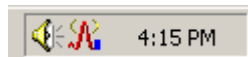
1. Double-click the **Broadcom Wireless Utility** icon on the system tray.



2. When the **Connect to Wireless Network** window pops up, you will see all the wireless networks available in the air. Under **Available networks**, select the wireless network you want to connect to.



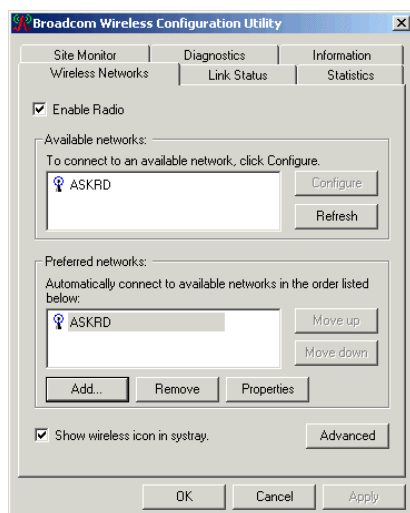
3. If the target wireless network has been set with WEP key, you must enter the same WEP key in the **Network key** field. Otherwise, this field is dimmed and you do not need to set up the WEP key.
4. Click **Connect**, then you will join the target network and this dialog window will disappear. When your wireless connection is established, the connection icon may appear as below:



Configuring a New Wireless Network Connection

When you open the **Connect to Wireless Network** window, a network which does not broadcast its network name will not appear under **Available networks**. To connect to an existing network but not appear under **Available networks**, take the following steps:

1. In **Connect to Wireless Network** window, click **Advanced** to launch the **Broadcom Wireless Configuration Utility** window. Then click **Add** under **Preferred networks** section.



2. In the **Wireless Network Properties** window, configure the settings below:

Network name (SSID): Specifies the name of the Wireless LAN group you want to participate in.

Network Authentication (Shared mode): Specifies the authentication type. You should use the same setting as the other wireless stations in your target wireless network.

Wireless network key (WEP): If a network key is required, do the following:

- If the WEP key is automatically provided (for example, the key is stored on the wireless network adapter given to you by your network administrator), check **The key is provided for me automatically** check box.
- If the WEP key is not automatically provided for you, leave **The key is provided for me automatically** check box blank and then enter the key in the **Network key** field.

When entering the key, the **Key format** and **Key length** are changed automatically according to the format and length of the characters you entered. When using **Hexadecimal** format, only digits 0-9 and letters a-f, A-F are allowed. Make sure to enter the character matching the required key format and length as below:

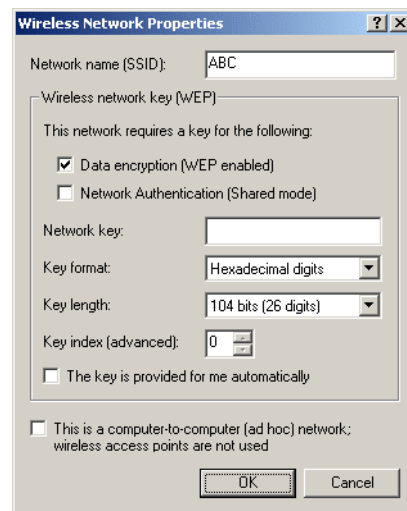
	ASCII characters	Hexadecimal digits
40 bit	5 alphanumeric characters	10 hexadecimal digits
104 bit	13 alphanumeric characters	26 hexadecimal digits

Key index (advanced): Specifies the key index value. You can specify up to four keys (the key index are 0, 1, 2 and 3).

Note: Contact your network administrator if you are unsure about the WEP setting.

Ad Hoc/ Infrastructure Network: If the network you are configuring is an Ad Hoc network, check **This is a computer-to-computer (ad hoc) network...** check box. Otherwise leave it unchecked for Infrastructure network connection.

- After entering required fields, click **OK** to exit this window.



Your newly configured network will be added under **Preferred networks**. Your wireless adapter will attempt to connect preferred networks in the order in which they appear in the list. You can change the order of preferred network by selecting the network that you want to move and clicking the **Move up** or **Move down** button.

Note that in the **Preferred networks** list, an Ad-hoc network can not be moved to a higher position than an Infrastructure network. If you want to connect to Ad Hoc network only, see “Specifying a Network Type to Access” for instructions.

Configuring an Existing Wireless Network Connection

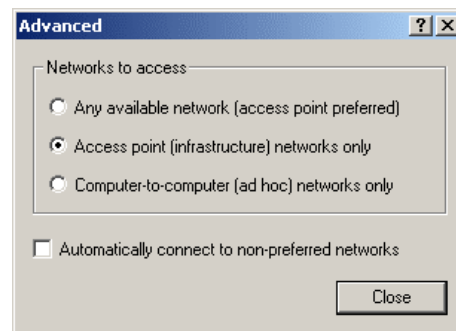
On the **Wireless Networks** tab, if your target network appears under the **Available networks** or **Preferred networks** list but you cannot connect to it, you may want to review or reconfigure the settings. If this is the case, just select your target network and then click **Configure** (for **Available networks**) or **Properties** (for **Preferred networks**) to open the properties window. Then configure the settings as needed.

Specifying a Network Type to Access

By default, your wireless station will attempt to connect to an Infrastructure network (if available) first. If an Infrastructure network is not available, an Ad Hoc network will then be attempted.

However, it is possible that you want connect to certain networks only. In this situation, you can specify the network to access by clicking the **Advanced** button on the **Wireless Networks** tab. Then select your preferred access type and click **OK**.

For example, you want to connect to an Ad Hoc network but both Ad Hoc and Infrastructure networks are available. In this case, you can select the **Computer-to-computer (ad hoc) networks only** option.



Note that if your preferred network is limited to Access Point or Ad Hoc network, the **Preferred networks** section on **Wireless Networks** tab will list only the networks of your preference. If you try to add a new network of non-preferred type, the addition will not appear in the list unless you change the preferred network types.

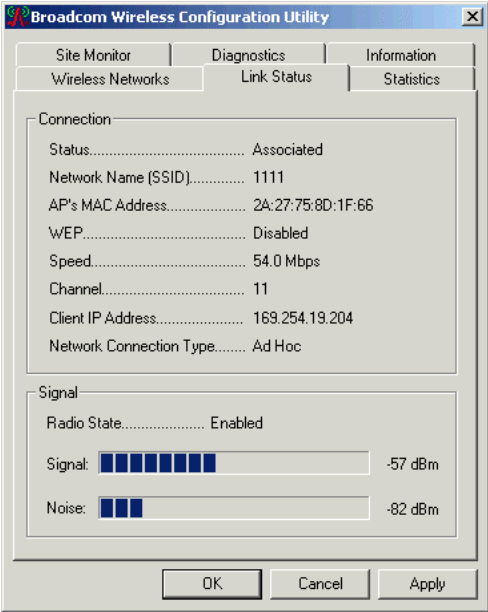
Link Status Tab

The Link Status tab contains general information about the connection and activity of your current link.

The following table describes the items found on the Link Status screen.

Screen Item	Description
Status	Displays whether the card is associated with a network.
Network Name (SSID)	Displays the name of the wireless network your station is currently connected to.

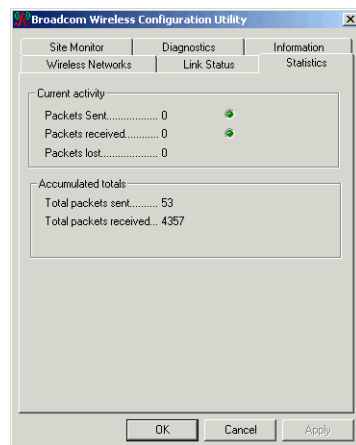
Screen Item	Description
AP's MAC Address	The MAC address of the associated AP.
Channel	The channel your wireless station is using.
WEP	Displays whether WEP is disabled or enabled in the current wireless network.
Speed	Displays the current packet transmit rate (Mbps).
Channel	Displays the channel the station is using.
Client IP Address	Displays the IP address of your wireless adapter.
Network Connection Type	Displays if the adapter is connected to an Access Point or Ad Hoc network.
Radio State	Displays whether the RF Signal is enabled or disabled.
Signal	Displays the signal strength (dBm). On the right side, signal strength is indicated by graphic.
Noise	Displays the noise level (dBm). Noise Level reflects the level of radio interference as measured at the Wireless LAN Card.



Statistics

The **Statistics** tab displays the current and accumulated statistics information pertaining to your Wireless LAN Card. The following transmit and receive statistics are provided:

- Packets Sent
- Packets received
- Packets lost
- Total packets sent
- Total packets received



Site Monitor

The **Site Monitor** tab displays the general information of the wireless network available in the air. You can use the **Site Monitor** feature to display the communications quality of your computer with multiple Access Points in its vicinity. The **Site Monitor** allows you to conduct a site survey to:

- Determine the overall wireless coverage of your wireless network.
- Optimize placement of the Access Point(s), to provide seamless connectivity to mobile stations.
- Roam throughout the wireless network environment with your station, you will be able to identify areas that may not have adequate coverage, or that suffer from interference by other (wireless) equipment such as microwave ovens.

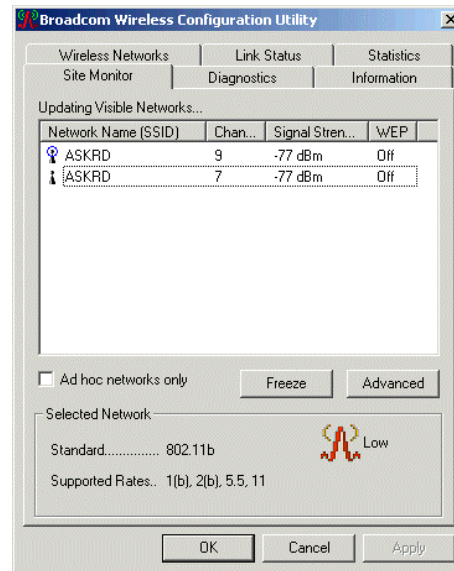
The **Visible Networks** list will update automatically to display all visible networks. Optionally you can click **Freeze** to temporarily stop the update of the list. To display only the Ad Hoc network, check the **Ad hoc networks only** checkbox.

For each network, the following information will be displayed:

Field	Description
Network Name (SSID)	Displays the name of the wireless network your station is currently connected to.
Channel	The channel your wireless station is using.
Signal Strength	Displays the signal strength (dBm).
WEP	Displays WEP whether is disabled/enabled.

For a selected network, the following information will be displayed:

Field	Description
Standard	The IEEE 802.11 wireless standard.
Supported Rates	The supported rates of the wireless network.



Advanced Site Monitor

Clicking the **Advanced** button on the **Site Monitor** tab brings out the **Advanced Site Monitor** screen. The screen displays the following information in addition to those appear on the **Site Monitor** tab:

Field	Description
AP MAC	The MAC address for the wireless network interface of the Access Point.
Signal	Signal level indicates the strength of the wireless signal as received at the Wireless LAN Card. Both dBm value and graphic indicator are displayed.
Noise (dBm)	Noise Level reflects the level of radio interference as measured at the Wireless LAN Card. Both dBm value and graphic indicator are displayed.
SNR (dBm)	The Signal-to-Noise Ratio (SNR) is the primary diagnostic counter to diagnose wireless performance. SNR indicates the relative strength of the received Signal Level compared to the Local Noise Level. In most environments, SNR is a good indicator for the quality of the radio link between transmitter and receiver. A higher SNR value means a better quality radio link. Both dBm value and graphic indicator are displayed.
Supported Data Rates	Displays the data rates supported by the Access Point.

You can sort the list of Access Points by clicking the filed you want to use as a criteria.

You can also create log files based on the monitor measurements on the **Advanced Site Monitor** screen. To create a log file, click the **Start Log** button and specify the path and filename for the log file. Then the system will automatically append log entry to the file at regular intervals until you click the **Stop Log** button.

Advanced Site Monitor											
	Network Name ...	AP MAC	AP Ch.	AP Band	Signal (dBm)	Noise (dBm)	SNR (dBm)	Signal	Noise	SNR	Supported Data Rates
	ASKRD	00:90:96:2A:C3:D0	9	802.11b	-83	-80	-3				1(b), 2(b), 5.5(b), 11(b)
	ASKRD	00:90:96:1C:C6:12	7	802.11b	-77	-85	8				1(b), 2(b), 5.5, 11

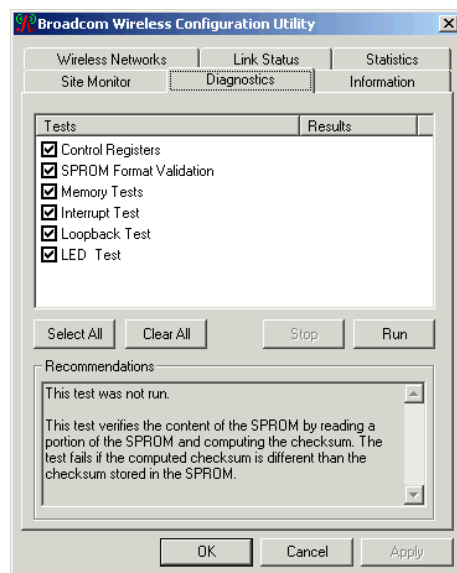
Start LogFreezeOK

Diagnostics Tab

To perform a diagnostics, select the test you want to perform and then click **Run** and then click **OK** if prompted. Note that by running diagnostics your network connection will be temporarily interrupted. Connection will be resume after the completion of selected tasks. After the selected tasks are completed, the test result (**Passed** or **Failed**) will be displayed. You can select desired task to see detailed test information in the **Status** section.

The diagnostic allows to perform the following test:

Test Item	Description
Control Registers	This test verifies the read and write capabilities of the network controller registers by writing various values to the registers and verifying the result. The device driver uses these registers to perform network functions such as sending and receive information. If the test fails, the network adapter may not work properly.
SPROM Format Validation	This test verifies the content of the SPROM by reading a portion of the SPROM and computing the checksum. The test fails if the computed checksum is different than the checksum stored in the SPROM.
Memory Tests	This tests verifies that the network controller internal memory is functioning properly. The test writes patterned values to the memory and reading back the results. The test fails if an erroneous value is read back. The network controller will not function without its internal memory.
Interrupt Test	This tests verifies that the network controller internal memory is functioning properly. The test writes patterned values to the memory and reading back the results. The test fails if an erroneous value is read back. The network controller will not function without its internal memory.
Loopback Test	This test verifies that the NDIS driver is able to receive interrupts from the network controller.
LED Test	This test verifies that your 802.11 wireless networking hardware is functioning correctly. This test is applicable to PC Card only.



Information Tab

The **Information** tab displays the basic information about the device, including the hardware and software details.



Chapter 4 Windows XP Wireless Zero Configuration Utility

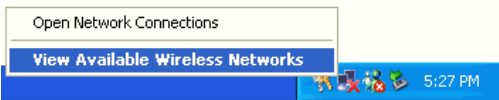
Windows XP provides built-in **Wireless Zero Configuration** utility for wireless configuration and monitoring. You can choose to configure your wireless network via either the **Wireless Client Manager** as described in preceding section, or to use the Windows XP **Wireless Zero Configuration** utility.

This section only provides the essential instructions on using Windows XP wireless utility to get your wireless network established. For more information please refer to Windows XP on-line help.

Connecting to an Access Point or Wireless LAN Card

To connect to an existing Access Point/Wireless LAN Card, take out the following steps:

1. Right-click the **Wireless Connection** icon on the system tray and select **View Available Wireless Networks** from the context menu.



Note: Depending on whether your wireless network is established, the context menu may come with different items.

2. When the **Connect to Wireless Network** window pops up, you will see all the Access Points or Wireless LAN Cards that are available in the air. Select the wireless network you want to connect to .

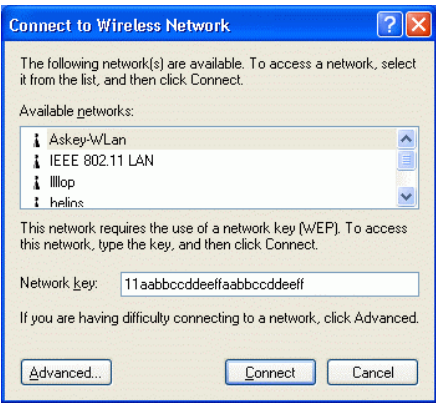
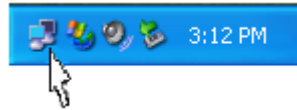


Figure 3-4 Windows XP Configuration Utility-Connect to Wireless Network

3. If the target Access Point/Wireless LAN Card has been set with WEP key, you must enter the same WEP key in the **Network key** field. Otherwise, leave it blank.

- Click **Connect**, then you will join the target network and this dialog window will disappear. When your wireless connection is established, the connection icon appears as below:



Note: If the wireless connection can't be established, double-click the connection icon and then click **Properties**. Go to **Authentication** tab first to make sure that you use the correct authentication type for the Wireless LAN Card. For more information, refer to "Authentication" on page 32.

Viewing Wireless Connection Status

After you successfully connect to the Access Point or Wireless LAN Card, double-click the icon in the system tray again. This will open the **Wireless Network Connection Status** window where you can see the general data of the Wireless LAN Card, such as Status, Duration, Speed, Signal Strength, etc.

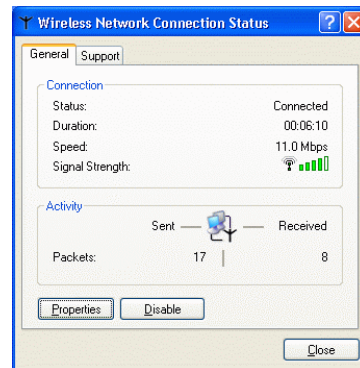


Figure 3-5 Windows XP- Connection Status

Configuring Your Wireless Properties

To configure your wireless properties, open the **Wireless Network Connection Status** window as described above, and then click the **Properties** button. This will open the **Wireless Network Connection Properties** window which allows you to configure more detailed items of the Wireless LAN Card. The following describes each tab of the properties window to help you do more settings of the Wireless LAN Card.

General

This tab allows you to specify the network methods to be used with your Wireless LAN Card. The network policy depends on your wireless network. For TCP/IP protocol, you should configure its properties as instructed by your network administrator. For more information on TCP/IP setting, please refer to “Appendix C Setting Up TCP/IP” on page 44.

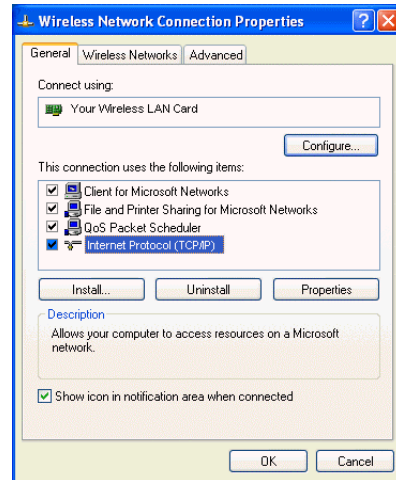


Figure 3-6 Windows XP Connection Properties -General

Wireless Networks

This tab contains two sections: **Available networks** and **Preferred networks** described as below.

Under **Available networks** section, you can also see all the Access Points and Wireless LAN Cards available in the air. Clicking **Refresh** will update the list of Access Points and Wireless LAN Cards.

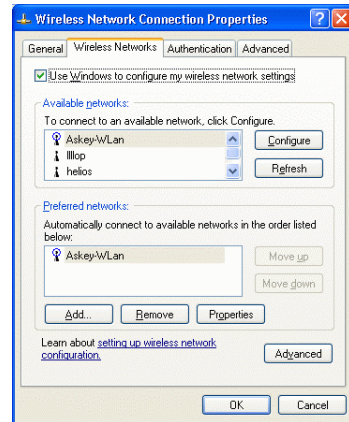


Figure 3-7 Windows XP Connection Properties-Wireless Networks

Under **Preferred networks** section, you can add any wireless networks that you wish to connect to. To do this, just click **Add** to add more Access Points or Wireless LAN Cards to the list.

After you click the **Add** button, the **Wireless Network Properties** window pops up. Type your network name (SSID) and, if needed, the wireless network WEP settings. Once the Access Point or Wireless LAN Card that you want to connect to has been set with WEP key, you must type the same WEP key as the Access Point's or Wireless LAN Card's.

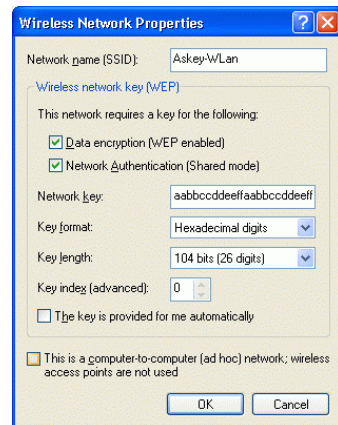


Figure 3-8 Windows XP-Add Preferred Networks

After you add several profiles into **Preferred networks**, you can change the order in which connection attempts to preferred networks are made. Just select the target wireless network and click **Move up** or **Move down** to move it to a desired position.

To Access Certain Wireless Network Only

If you just want to access certain wireless network type, click the **Advanced** button on the Wireless Networks tab (Figure 3-12) to open the **Advanced** window. You can choose to connect to the following networks:

- Any available network (access point preferred)
- Access point (infrastructure)
- Computer-to-computer (Peer-to-Peer Group)

The default network type is **Any available network (access point preferred)**. In this network type, your device will connect to any Access Points or Wireless LAN Cards available in the air but Access Point always demands higher connection attempt priority.

Once you finish the advanced setting, your wireless station will then connect to your desired network and the connected network will be listed under **Available networks**.

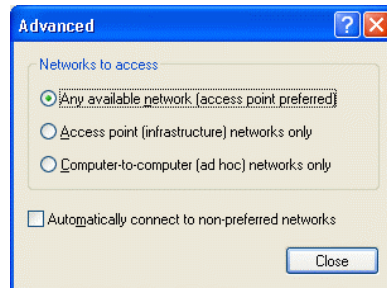


Figure 3-9 Windows XP Configuration Utility-Set up Network to Access

Authentication

This tab allows you to configure the authentication settings of your Wireless LAN Card. The most important setting for the Wireless LAN Card is to disable **Enable network access control using IEEE802.1X** to ensure successful connection between the Wireless LAN Cards and Access Points or other Wireless LAN Cards. You must disable this function for any reason. Otherwise, there may be some problems happening during connection. For other settings, we recommend you keep the default settings to minimize the problems during connection.

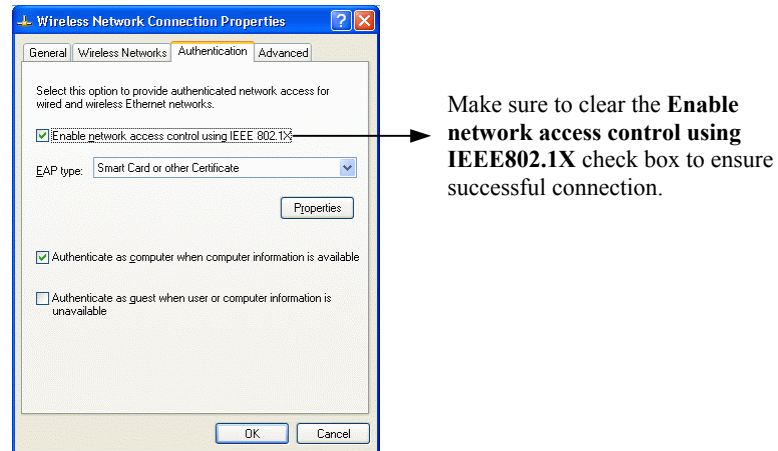


Figure 3-10 Windows XP Connection Properties -Authentication

Chapter 7 Troubleshooting

Radio Interference

You may be able to eliminate any interference by trying the following:

- Reseat the Wireless LAN Card.
- Increase the distance between the wireless computers and the device causing the radio interference.
- Plug the computer equipped with the Wireless LAN Card into an outlet on a different branch circuit from that used by the affecting device.
- Consult the dealer or an experienced radio technician for help.
- Keep the computer with the Wireless LAN Card away from the microwave oven and large metal objects.

Card Not Detected

If the Wireless LAN Card is not detected by Windows, try the following:

- Make sure the Wireless LAN Card is properly inserted in the computer.
- For PC Card, make sure the slot in your computer is working.
- Contact your dealer for additional testing if there is a hardware problem with the Wireless LAN Card.

Cannot Connect to Another Wireless LAN Card

If you cannot make a connection to another Wireless LAN Card from your computer, it could be due to one of the following reasons:

- Incorrect SSID. Make sure the SSID is the same for all computers that have a Wireless LAN Card.
- Changes are not being recognized by your computer. Restart your computer.
- If in Ad-Hoc mode, make sure the **Log on to Windows NT domain** check box is not selected in the **Client for Microsoft Networks Properties** dialog box in the **Network Configuration** tab.
- Incorrect IP Address or Subnet Mask. Check these settings in the **TCP/IP Properties** dialog box in the **Network Configuration** tab.

Poor Link Quality

If the Link Quality display stays in the Poor range, it could be due to one of the following reasons:

- Radio interference.
- Distance between Wireless LAN Card and Access Point is too far. Decrease the distance between the Wireless LAN Card and Access Point (or another card).

Cannot Connect to Access Point

If you cannot make a connection to the Access Point, it could be due to one of the following reasons:

- Make sure the Wireless LAN Card and Access Point have no physical connection problems.
- Make sure the SSID for the Wireless LAN Card is the same as the Access Point.
- Make sure the privacy type is the same as that of Access Point. Also, make sure the Default Key is the same for both computers.

Appendix A Limited Warranty

Wireless LAN Hardware

The seller warrants to the end user (“Customer”) that this hardware product will be free from defects in workmanship and materials, under normal use and service, for 1 year from the date of purchase from the seller or its authorized reseller. The seller’s sole obligation under this express warranty shall be, at the seller’s option and expense, to repair the defective product or part, deliver to Customer an equivalent product or part to replace the defective item, or if neither of the two foregoing options is reasonably available, The seller may, in its sole discretion, refund to the Customer the purchase price paid for the defective product. All products that are replaced will become the property of the seller. Replacement products may be new or reconditioned.

Wireless LAN Software

The seller warrants to Customer that each software program licensed from it , except as noted below, will perform in substantial conformance to its program specifications, for a period of 1 year from the date of purchase from the seller or its authorized reseller. The seller warrants the media containing software against failure during the warranty period. No updates are provided. The seller's sole obligation under this express warranty shall be, at the seller's option and expense, to refund the purchase price paid by Customer for any defective software product, or to replace any defective media with software which substantially conforms to applicable seller published specifications. Customer assumes responsibility for the selection of the appropriate application programs and associated reference materials. The seller makes no warranty or representation that its software products will meet Customer's requirements or work in combination with any hardware or software applications products provided by third parties, that the operation of the software products will be uninterrupted or error free, or that all defects in the software products will be corrected. For any third party products listed in the seller software product documentation or specifications as being compatible, the seller will make reasonable efforts to provide compatibility, except where the non-compatibility is caused by a defect in the third party's product or from use of the software product not in accordance with the seller's published specifications or user manual.

Appendix B Regulatory Compliance

FCC Part 15 Declaration of Conformity (DoC)

The following equipment:

Product Name: Wireless LAN Card

is herewith confirmed to comply with the requirements of FCC Part 15 rules. The operation is subject to the following two conditions:

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

FCC Rules and Regulations - Part 15

Warning: This device has been tested and found to comply with the limits for a Class B digital device pursuant to Part 15 of the Federal Communications Commissions Rules and Regulation. These limits are designed to provide reasonable protection against harmful interference when the equipment is operated in a commercial environment. This equipment generates, uses, and can radiate radio frequency energy and, if not installed and used in accordance with the instruction manual, may cause harmful interference to radio communications.

However, there is no guarantee that interference will not occur in a particular installation. If this equipment does cause harmful interference to radio or television reception, which can be determined by turning the equipment off and on, the user is encouraged to try and correct the interference by one or more of the following measures:

- Relocate your WLAN equipped laptop computer.
- Increase the separation between the WLAN equipped laptop computer and other electronics.
- Connect the WLAN equipped laptop computer into an outlet on a circuit different from that of other electronics.
- Consult the dealer or an experienced radio/TV technician for help.

FCC Radiation Exposure Statement

This equipment complies with FCC radiation exposure limits set forth for an uncontrolled environment. This equipment should be installed and operated with minimum distance of 20cm between the radiator & your body.

This transmitter must not be co-located or operating in conjunction with any other antenna or transmitter.

FCC Caution:

Any changes or modifications not expressly approved by the party responsible for compliance could void the user's authority to operate this equipment.

Information to User:

The users manual or instruction manual for an intentional or unintentional radiator shall caution the user that changes or modifications not expressly approved by the party responsible for compliance could void the user's authority to operate the equipment.

This device is intended only for OEM integrators under the following conditions:

- 1) The antenna must be installed such that 20 cm is maintained between the antenna and users, and
 - 2) The transmitter module may not be co-located with any other transmitter or antenna.
- As long as 2 conditions above are met, further transmitter test will not be required. However, the OEM integrator is still responsible for testing their end-product for any additional compliance requirements required with this module installed (for example, digital device emissions, PC peripheral requirements, etc.).
-

IMPORTANT NOTE:

In the event that these conditions can not be met (for example certain laptop configurations or co-location with another transmitter), then the FCC authorization is no longer considered valid and the FCC ID can not be used on the final product. In these circumstances, the OEM integrator will be responsible for re-evaluating the end product (including the transmitter) and obtaining a separate FCC authorization.

End Product Labeling

This transmitter module is authorized only for use in device where the antenna may be installed such that 20 cm may be maintained between the antenna and users (for example: This module will be bundling into such as Wireless ADSL/Wireless Router/Wireless Cable Modem/Wireless Access Point). The final end product must be labeled in a visible area with the following: “Contains TX FCC ID: H8NWLC3012”.

Manual Information That Must be Included

The OEM integrator has to be aware not to provide information to the end user regarding how to install or remove this RF module in the users manual of the end product which integrate this module.

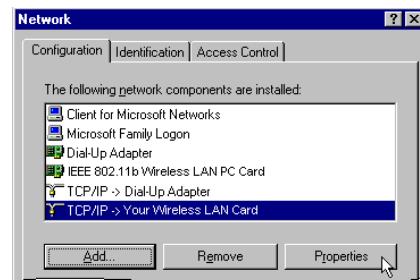
The users manual for OEM integrators must include the following information in a prominent location “ IMPORTANT NOTE: To comply with FCC RF exposure compliance requirements, the antenna used for this transmitter must be installed to provide a separation distance of at least 20 cm from all persons and must not be co-located or operating in conjunction with any other antenna or transmitter.

Appendix C Setting Up TCP/IP

This section contains instructions for configuring the TCP/IP protocol of the Wireless LAN Card. The IP address policy depends on your wireless network. You should configure your TCP/IP protocol as instructed by your network administrator.

For Windows 98/ME

1. Double-click the **Network** icon on the **Control Panel**.
2. Click the **Configuration** tab of the **Network** dialog box.
3. In the network components list, select the TCP/IP protocol of your Wireless LAN Card, e.g., **TCP/IP ->Broadcom 802.11g Network Adapter** and then click **Properties**.



4. On the **IP Address** tab, choose one of the methods as required:

Option A: Click **Specify an IP address**.

In the **IP Address** box, enter a valid four-component IP address, either a public or private one as required.

In the **Subnet Mask** box, enter a valid four-component IP address.

Then select the **Gateway** tab and enter your gateway information.

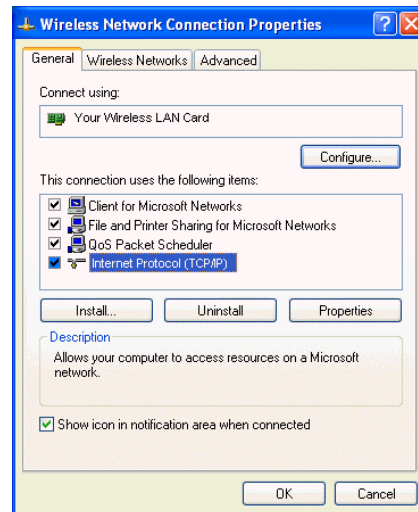
Option B: Select **Obtain an IP address automatically**.

Then an IP address will be automatically assigned to your computer.

5. Click **OK** to return to **Network** dialog box and click **OK** again to finish configuration. If your TCP/IP properties have been modified, you will be prompted to restart your computer. Click **Yes** to have new settings take effect.

For Windows 2000/XP

1. Double-click **Network Dial-up Connections** (Windows 2000) or **Network Connections** (Windows XP) on **Control Panel**.
2. Right-click the **Local Area Connection** icon corresponding to your wireless adapter (e.g., **Broadcom 802.11g Network Adapter**) and click **Properties**.



3. On the **General** tab, highlight **Internet Protocol (TCP/IP)** and then click **Properties**.

Option A: Use fixed IP address.

Enable the **Use the following IP Address** option. Enter the **IP address**, **Subnet Mask** and **Default gateway**. Then click **OK**.

Option B: Use dynamic IP address

Select **Obtain an IP address automatically**.

4. Close the **Local Area Connection Properties** window. For Windows 2000, if prompted, click **Yes** to restart your computer.

Appendix D Specifications

Host Interfaces	Mini PCI
Form factor	Type III B
Chipset	Broadcom BCM 4306 & BCM 2050
Operation Voltage	3.3VDC
Network Standards	IEEE 802.11b (Wi-Fi™) standard and IEEE 802.11g draft standard (54G)
Modulation Techniques	DBPSK,DQPSK,CCK,16QAM,64QAM
Modulation Technology	OFDM,DSSS
Data Rate	802.11b: 11, 5.5, 2, 1 Mbps 802.11g: 54, 48, 36, 24, 18, 12, 9, 6 Mbps
Network Architectures	Infrastructure and Ad Hoc
Operating Frequencies	2.412-2.462 GHz
Operating Channels	802.11b: 11 for North America, 14 for Japan, 13 for Europe (ETSI) 802.11g: 13 for North America, 13 for Europe (ETSI), 13 for Japan
RF Output Power	15 dBm maximum output power (14 dBm nominal $\pm$ 1 dBm over operating temperature)
Receiver sensitivity (PER <10%)	-80dBm @ 6Mbps
Antenna Type	Hardware diversity support: transmit and receive on Main and Auxiliary antenna connectors.
Range	802.11b: 11 Mbps up to 180m LOS, 60m indoors; 1 Mbps up to 570m LOS, 125m indoors 802.11g: 54 Mbps up to 50m LOS, 20m indoors; 18 Mbps up to 150m LOS, 75m indoors
Power Consumption	Tx peak: 550 ma @ 3.3VDC; Rx peak: 350 ma @ 3.3VDC; Idle: 225mA @ 3.3VDC
Security	Hardware 64/128-bit WEP engine; WEP weak-key avoidance, TKIP, hardware AES engine supporting CCM and OCB, 802.1x, SSN
Delay Tolerance	802.11b: Multipath R.M.S Delay Spread @ 1% FER: 11 Mbps > 250 nsec; 5.5 Mbps > 300 nsec
Client Utility	Automatic location profile, site monitor, current link status, and diagnostics
Software Support	Microsoft WHQL certified for Windows XP, 2000, and ME. Linux and VxWorks embedded drivers.
LED Indicators	WLAN Activity Monitor, WLAN Radio Status Indicators
Switch	Manual radio on/off disables transmit and receive to comply with aviation in-flight restrictions

Temperatures	Operates from 0 to 70 °C Storage from -40 to 90 °C
Humidity (non-condensing)	5 to 95%
Certifications	Wi-Fi; FCC part 15C/15.247; ETS 300 328-2; UL; IEC60950; EN 301 489-1,17; prEN50371 ;CE Mark; TELEC

Glossary

10BaseT	An IEEE standard (802.3) for operating 10 Mbps Ethernet networks (LANs) with twisted pair cabling and a wiring hub.
Access Point	An internetworking device that seamlessly connects wired and wireless networks. Access Points combined with a distributed system support the creation of multiple radio cells that enable roaming throughout a facility.
Ad-Hoc	A network composed solely of stations within mutual communication range of each other (no Access Point connected).
BSS	<i>Basic Service Set.</i> A set of stations controlled by a single coordination function.
Channel	A medium used to pass protocol data units that can be used simultaneously in the same volume of space by other channels of the same physical layer, with an acceptably low frame error ratio due to mutual interference.
Encapsulated	An Ethernet address mode that treats the entire Ethernet packet as a whole and places it inside an 802.11 frame along with a new header.
ESS	<i>Extended Service Set.</i> A set of one or more interconnected Basic Service Sets (BSSs) and integrated Local Area Networks (LANs) can be configured as an Extended Service Set.
Ethernet	The most widely used medium access method, which is defined by the IEEE 802.3 standard. Ethernet is normally a shared media LAN; i.e., all the devices on the network segment share total bandwidth. Ethernet networks operate at 10Mbps using CSMA/CD to run over 10BaseT cables.
Gateway	A network component that acts as an entrance to another network.
IEEE 802.11	The IEEE 802.xx is a set of specifications for LANs from the Institute of Electrical and Electronic Engineers (IEEE). Most wired networks conform to 802.3, the specification for CSMA/CD-based Ethernet networks or 802.5, the specification for token ring networks. 802.11 defines the standard for wireless LANs encompassing three incompatible (non-interoperable) technologies: Frequency Hopping Spread Spectrum (FHSS), Direct Sequence Spread Spectrum (DSSS), and Infrared. IEEE standards ensure interoperability between systems of the same type.
Infrastructure	A wireless network centered about an Access Point. In this environment, the Access Point not

only provides communication with the wired network but also mediates wireless network traffic in the immediate neighborhood.

IP *Internet Protocol*. The standard protocol within TCP/IP that defines the basic unit of information passed across an Internet connection by breaking down data messages into packets, routing and transporting the packets over network connections, then reassembling the packets at their destination. IP corresponds to the network layer in the ISO/OSI model.

- IP Address** An IP address is a 32-bit number that identifies each sender or receiver of information sent across the Internet. An IP address has two parts: the identifier of a particular network on the Internet and an identifier of the particular device (which can be a server or a workstation) within that network.
- ISP** *Internet Service Provider*. An organization that provides access to the Internet. Small ISPs provide service via modem and ISDN while the larger ones also offer private line hookups (T1, fractional T1, etc.).
- LAN** *Local Area Network*. A communications network that serves users within a defined geographical area. The benefits include the sharing of Internet access, files, and equipment, such as printers and storage devices. Special network cabling (10BaseT) is often used to connect the PCs together.
- NAT** *Network Address Translation*. The translation of an Internet Protocol address (IP address) used within one network to a different IP address known within another network. One network is designated the internal network and the other is the external. The internal network then appears as one entity to the outside world.
-

Radio Frequency	RF, Terms: GHz, MHz, Hz —The international unit for measuring frequency is Hertz (Hz), equivalent to the older unit of cycles per second. One megahertz (MHz) is one Million-Hertz. One giga hertz (GHz) is one Billion-Hertz. The standard U.S. electrical power frequency is 60 Hz, the AM broadcast radio frequency band is 0.55–1.6 MHz, the FM broadcast radio frequency band is 88–108 MHz, and wireless 802.11 LANs operate at 2.4GHz.
SSID	<i>Service Set ID</i> . A group name shared by every member of a wireless network. Only client PCs with the same SSID are allowed to establish a connection.
Subnet Mask	A value that defines whether your computer communicates only within your LAN or communicates outside of your LAN, where it is routed out to the rest of the Internet. A Subnet Mask that has the same first three components (for example, 255.255.255.0) is the routing pattern for a Class C address.
TCP	<i>Transmission Control Protocol</i> . The standard transport level protocol that provides the full duplex, stream service on which many applications' protocols depend. TCP allows a process on one machine to send a stream of data to a process on another. Software implementing TCP usually resides in the operating system and uses the IP to transmit information across the network.
WEP	<i>Wired Equivalent Privacy</i> . The optional cryptographic confidentiality algorithm specified by 802.11. The algorithm is being used to provide data confidentiality that is subjectively equivalent to the confidentiality of a wired LAN medium that does not employ cryptographic techniques to enhance privacy..