The Windows XP compatibility screen will appear, as shown in Figure 4-2. As this card has been tested to work with Windows XP, click the Continue Anyway button to continue.

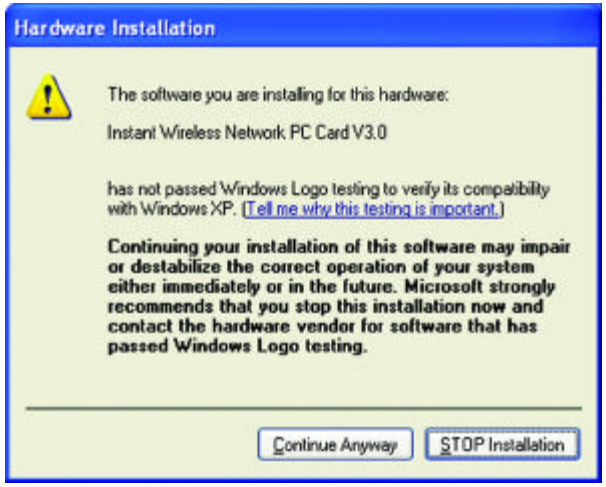

Figure 4-2

On the final installation screen, click the Finish button to complete installation.

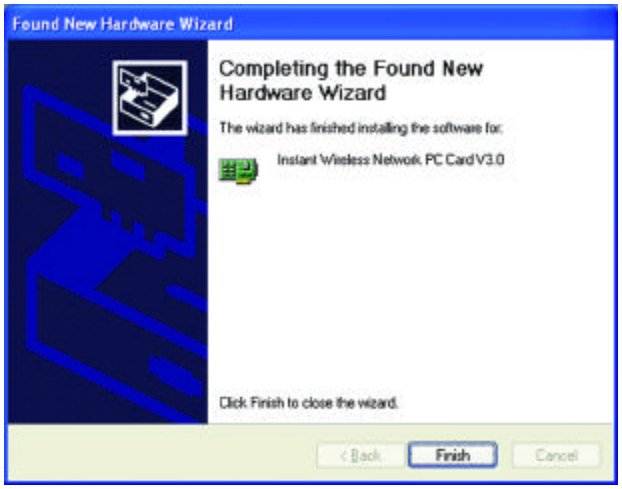

Figure 4-3

The Hardware Installation is complete.

Windows XP automatically detects and configures the Network PC Card for your wireless network. To adjust these settings, refer to your Windows XP documentation.

Chapter 5: Installing the Network PC Card

1. Locate an available Type II or Type III PCMCIA slot on your notebook computer.

2. With the Network PC Card's 68-pin connector facing the PCMCIA slot and the "Network PC Card" label facing up, as shown in Figure 5-1, slide the Network PC Card completely into the PCMCIA slot while the computer is restarting and before the Windows desktop appears.

3. You may see several screens appear as the driver installation is finalized. This is normal. No input should be necessary, and the screens should disappear when the card is ready for use.

The Hardware Installation is complete. Your Wireless Network PC Card is set up and ready for use. You may continue reading to learn about the card's Configuration Utility in Chapter 6 for Windows NT or Chapter 7 for other Windows Operating Systems.

Chapter 6: Installing the Drivers and Configuration Utility for Windows NT

Overview

The installation of the Network PC Card is different for users of Windows NT because it is not a Plug-and-Play (PnP) operating system. This means it will not automatically detect the presence of the Card when it is inserted. Consequently, the order of the installation is different. The steps involved in the installation are different, as well. *If you are using any other operating system than Windows NT, stop here and refer to the chapters regarding those operating systems.*

Installing the Network PC Card In Your Notebook PC

1. **Locate an available Type II or Type III PCMCIA slot** on your notebook computer.

2. **With the Network PC Card's 68-pin connector facing the PCMCIA slot** and the "Network PC Card" label facing up, slide the Network PC Card completely into the PCMCIA slot while the computer is restarting and before the Windows desktop appears.

The Hardware Installation is complete. Proceed to the next section for driver installation.

Installing the Drivers for Windows NT

Windows NT will set up the Network PC Card differently depending upon whether you've previously installed network hardware or not. Please follow the instructions appropriate for you.

If You Have Never Installed Network Hardware:

1. Windows NT is not a Plug-and-Play Operating System and will not automatically identify the Network PC Card. To begin setup, insert the **Setup Utility CD** into your CD-ROM drive. If the Setup Utility CD attempts to autorun, exit out of the utility to the desktop by clicking the **Exit** tab. Select **Settings** from the **Start** Menu and bring up the **Control Panel** (as shown in Figure 6-1). Double-click the **Network** icon.

Figure 6-1

2. Windows will display the screen in Figure 6-2, showing that Networking has not been installed. Click the **Yes** button to continue.

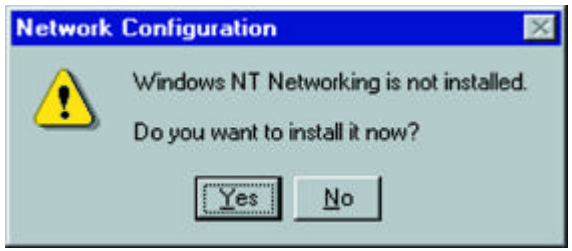

Figure 6-2

3. Installation will begin and you will reach the screen in Figure 6-3. You will want to select the box that reads **Wired to the network** since you are adding network hardware. Click the **Next** button to continue.

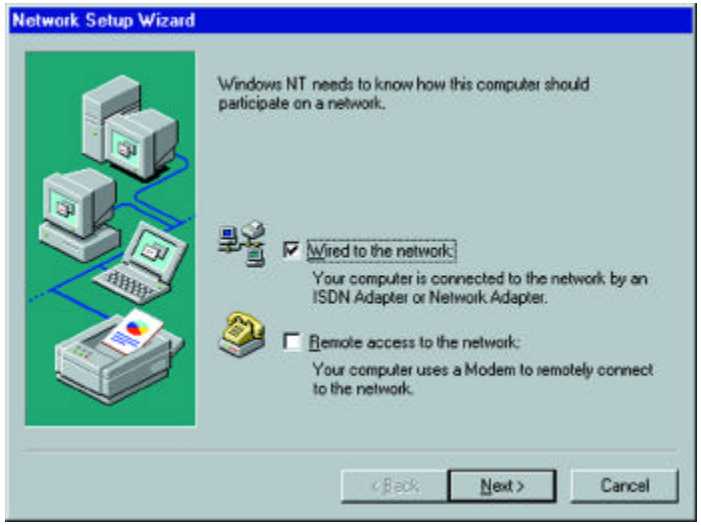

Figure 6-3

4. The screen shown in Figure 6-4 will not show any Network Adapters installed on your system; this signifies that no network adapter has been previously installed. Click the **Select from list** button to continue.

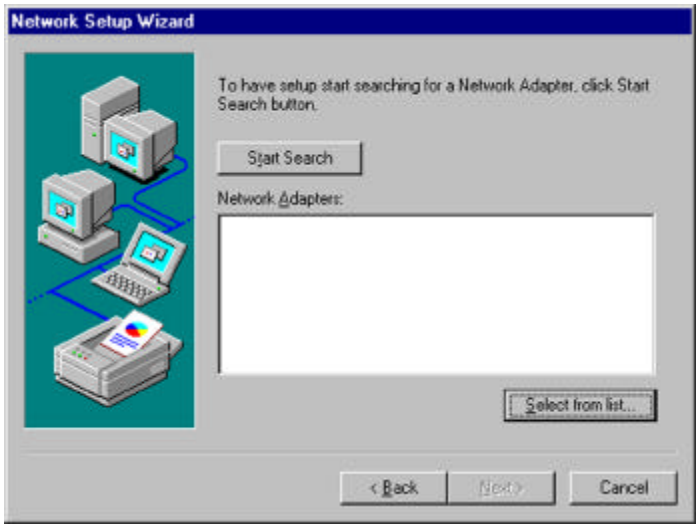

Figure 6-4

5. A list of adapters will appear as in Figure 6-5. You will not want to select one of these, however, as your installation disk (the **Setup Utility CD**) has all of the appropriate drivers. Click the **Have Disk** button to continue.

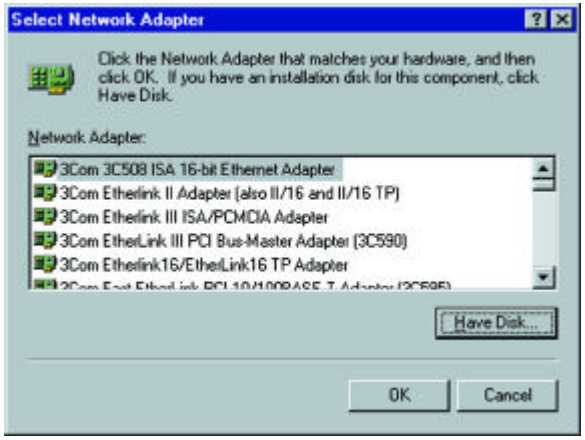

Figure 6-5

6. When the Insert Disk screen appears (shown in Figure 6-6), type "**D:\WINNT**" in the field provided and click the **OK** button to continue.

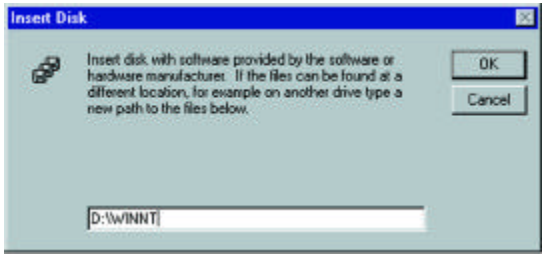

Figure 6-6

7. The Select OEM Option screen (shown in Figure 6-7) will display all available adapters. Make sure that **Instant Wireless - Network PC Card V3.0** is highlighted and click the **OK** button to continue.

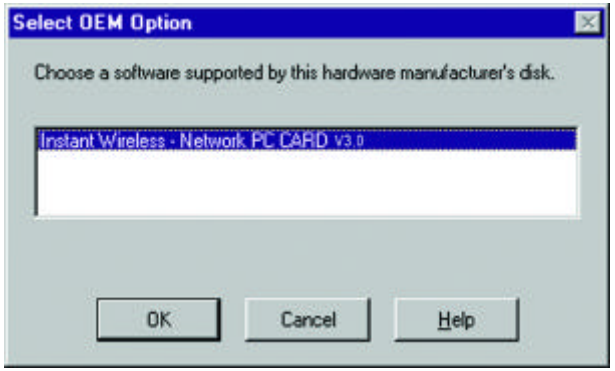

Figure 6-7

8. On the next screen, make sure there is a check mark in the box beside **Instant Wireless - Network PC Card** (as shown in Figure 6-8). Then click the **Next** button to continue.

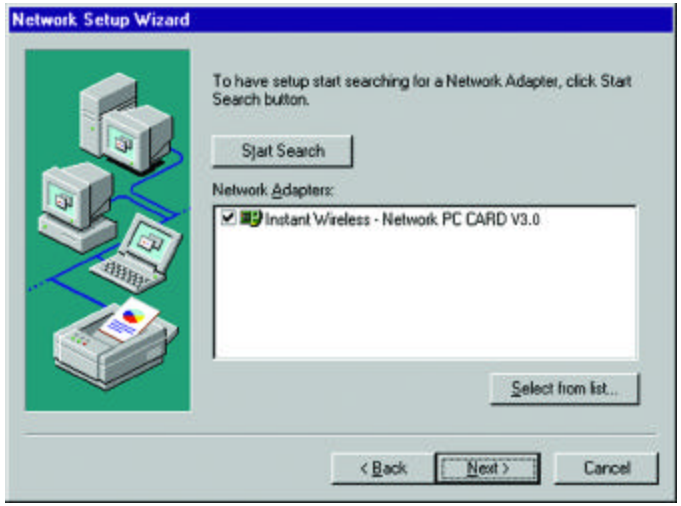

Figure 6-8

9. The next screen (Figure 6-9) will show the list of network protocols used on your network. While the **TCP/IP Protocol** is already selected by default, you should check with your network administrator before installing any additional network protocols. Click the **Next** button to continue.

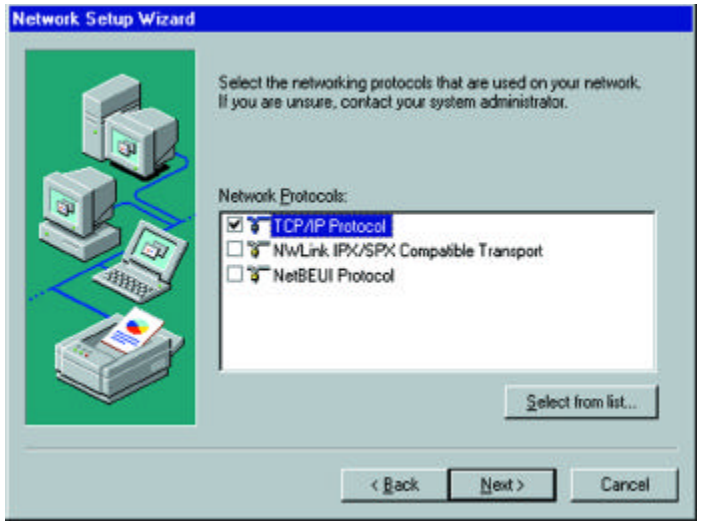

Figure 6-9

10. On the screen showing **Network Services** (Figure 6-10), the selections are automatically made. Click the **Next** button to continue.

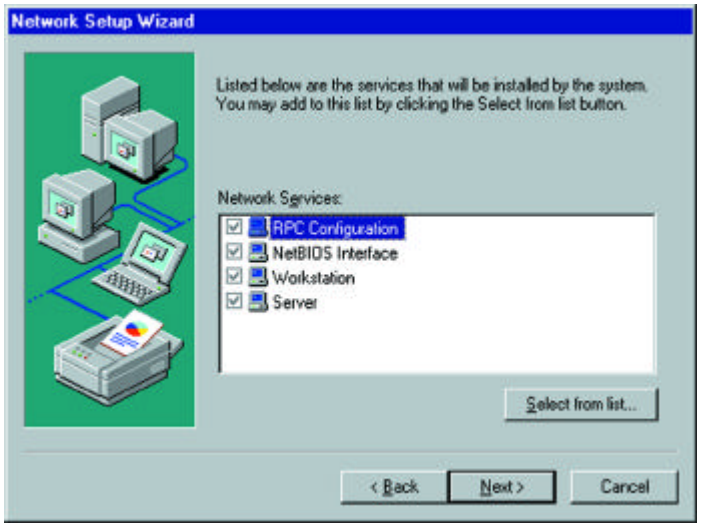

Figure 6-10

11. As displayed in Figure 6-11, Windows NT will now be ready to start installing networking components. After verifying your selections, click the **Next** button to continue or click the **Back** button to make any necessary corrections.

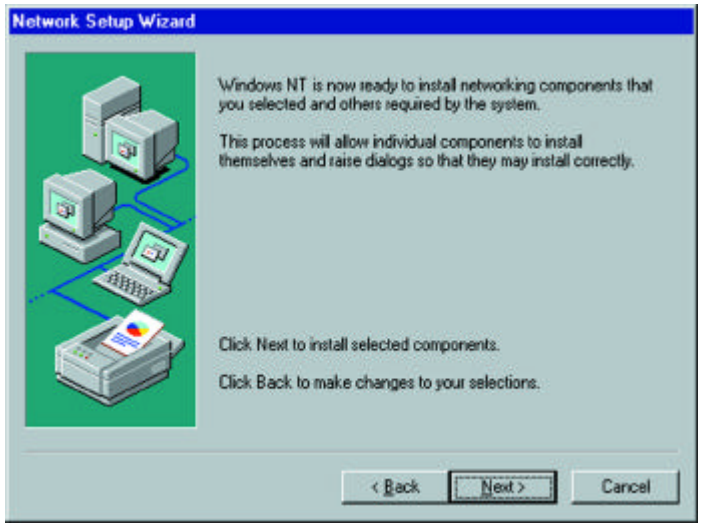

Figure 6-11

12. Windows NT may request further files at this point (as shown in Figure 6-12). Type "**D:\WINNT**" (where "D" represents your CD-ROM drive) in the field provided and click the **Continue** button.

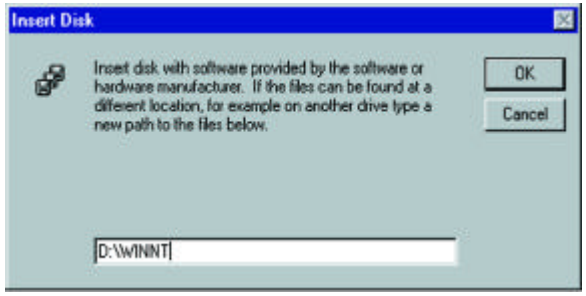

Figure 6-12

If files are still requested, insert your **Windows NT CD** into your CD-ROM drive and type "**D:\i386**" (where "D" represents your CD-ROM drive). Then, click the **Continue** button.

13. You will now reach the screen shown in Figure 6-13. This is called the Resources & Properties screen. It is recommended that you leave these options at their default settings. If settings must be changed, it is preferred that you use the Configuration Utility that came with the Network PC Card. If you must adjust the settings on this screen, refer to Chapter 9: Advanced Properties for more information on the Advanced Properties for Windows NT. Click the **OK** button to continue.

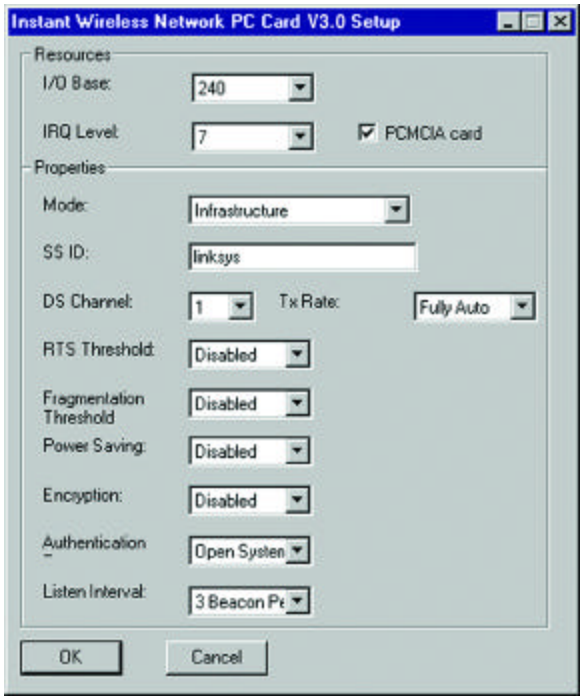

Figure 6-13

14. After setting the **Resource and Properties** fields, Windows NT will begin installing the network components you've selected. You may be presented with the screen shown in Figure 6-14, asking if you would like to configure the protocols with a DHCP server on your network. Click the **Yes** or **No** button to continue. This setting may also be changed at a later time.

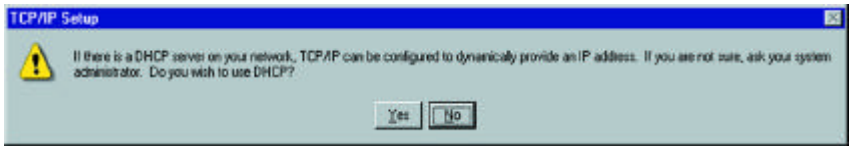

Figure 6-14

15. In the event that the screen shown in Figure 6-15 appears, do not make any changes unless you are proficient with the advanced networking properties of Windows NT. Click the **Next** button to continue.

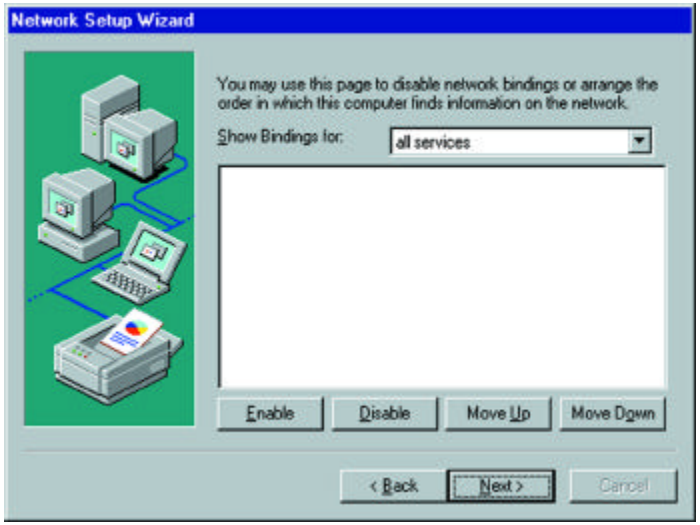

Figure 6-15

16. At this point, Windows NT will let you know that it is ready to start the network. If you'd like to stop the procedure, click the **Back** button. To continue, click the **Next** button.

17. On the screen shown in Figure 6-15, enter your **Computer Name**, how your computer is identified on the network. Then, assign the computer to either a **Workgroup** or **Domain**, whichever is appropriate. The Computer Name must be different than any other on the Workgroup or Domain. Click the **Next** button.

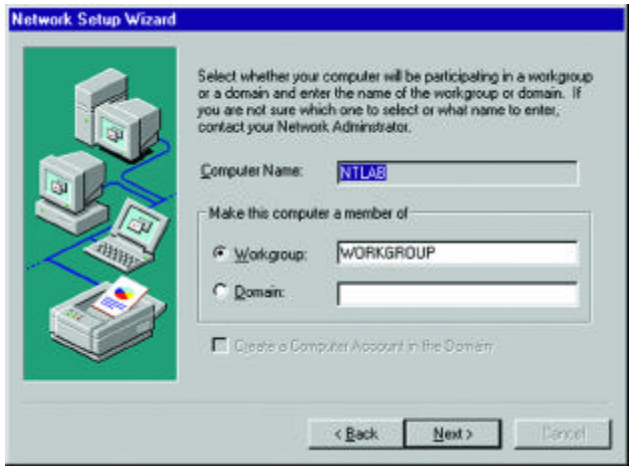

Figure 6-16

18. Once the drivers have been installed, the following screen (Figure 6-17) may appear.

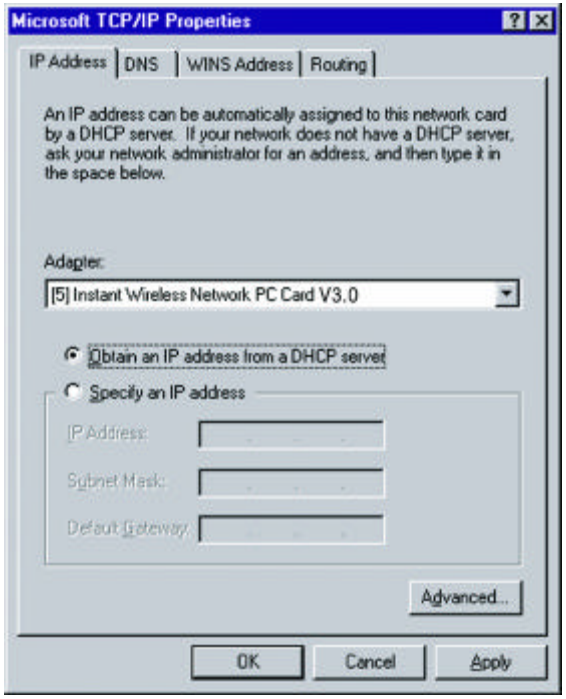

Figure 6-17

Make sure that the Instant Wireless Network PC Card ver. 3.0 appears in the Adapter window (as shown in Figure 6-17). Then, unless you need to assign a static IP address, select **Obtain an IP address from a DHCP server** and click the **OK** button. If you need to assign a static IP address, select **Specify an IP Address**, and enter the appropriate values under IP Address, Gateway Mask, and Default Gateway. After you have made your choice, click the **OK** button.

Windows NT has now completed installing the network. Remove the Setup Utility CD from the CD-ROM drive and click the **Finish** button to continue. Then, restart your computer.

The Driver Installation is complete. Continue now to the section called Installing the Configuration Utility for Windows NT.

Note: After you have installed the Network PC Card, reapply the Windows NT service pack.

If You Have Installed Network Hardware Before:

1. Windows NT is not a Plug-and-Play Operating System and will not automatically identify the Network PC Card. To begin setup, insert the **Setup Utility CD** into your CD-ROM drive and then select **Settings** from the **Start** Menu. Bring up the **Control Panel** (as shown in Figure 6-18) and double-click the **Network** icon.

Figure 6-18

2. To add the Network PC Card, click the **Adapters** tab (as shown in Figure 6-19) and click the **Add** button to continue.

Figure 6-19

3. A list of adapters will appear as shown in Figure 6-20. You will not want to select one of these, however, as the **Setup Utility CD** has all of the appropriate drivers. Click the **Have Disk** button to continue.

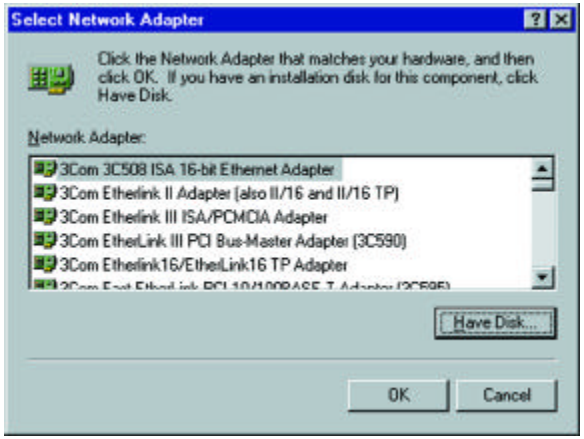

Figure 6-20

4. On the Insert Disk screen (Figure 6-21), type "**D:\WINNT**" in the field provided. Then, click the **OK** button to continue.

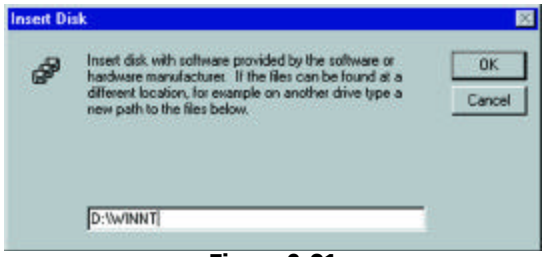

Figure 6-21

5. The **Select OEM Option** screen will display all available adapters. Make sure that **Instant Wireless - Network PC Card V3.0** is highlighted, as shown in Figure 6-22, and click the **OK** button to continue.

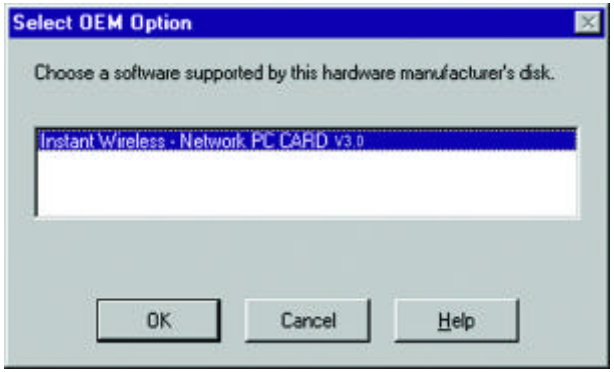

Figure 6-22

6. You will now reach the screen shown in Figure 6-13. This is called the Resources & Properties screen. It is recommended that you leave these options at their default settings. If settings must be changed, it is preferred that you use the Configuration Utility that came with the Network PC Card. If you must adjust the settings on this screen, refer to Chapter 9: Advanced Properties for more information on the Advanced Properties for Windows NT. Click the **OK** button to continue.

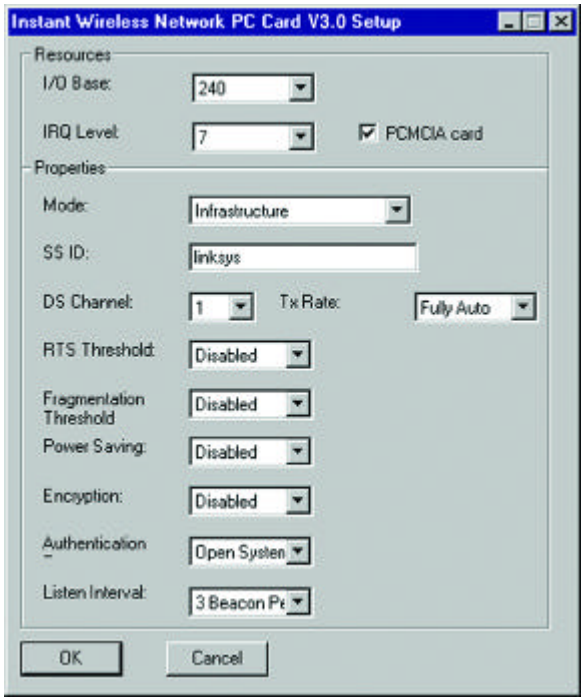

Figure 6-23

7. The Network PC Card has now been installed. You will see it added onto the screen shown in Figure 6-24. Click the **Close** button to continue and then restart your computer.

Figure 6-24

8. Once the drivers have been installed, the following screen (Figure 6-25) may appear.

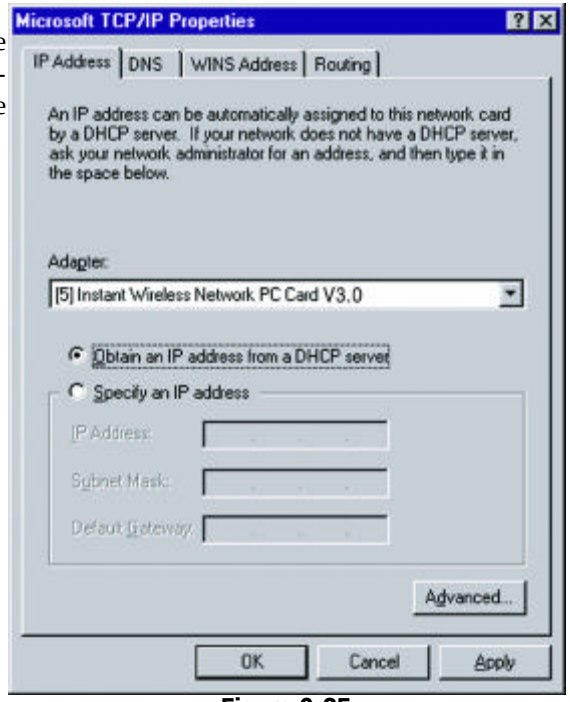

Figure 6-25

If the screen shown in Figure 4-25 appears, make sure that the Instant Wireless Network PC Card ver. 3.0 appears in the Adapter window. Then, unless you need to assign a static IP address, select **Obtain an IP address from a DHCP server** and click the **OK** button. If you need to assign a static IP address, select **Specify an IP Address**, and enter the appropriate values under **IP Address**, **Gateway Mask**, and **Default Gateway**. After you have made your choice, click the **OK** button.

Windows NT has now completed installing the drivers. Remove the Setup Utility CD from the CD-ROM drive and click the **Finish** button to continue. Then, restart your computer.

NOTE: After you have installed the Network PC Card, reapply the Windows NT service pack.

The Driver Installation is complete. Continue now to the section called Installing the Configuration Utility for Windows NT.

Installing the Configuration Utility for Windows NT

Once you have restarted your computer, the drivers for the Card should load successfully. Now it is necessary to install the Configuration Utility. Insert the Setup Utility CD in the CD-ROM drive. Unless you have deactivated the auto-run feature of Windows, the screen shown in Figure 6-26 should appear automatically.

Figure 6-26

If this screen does not appear automatically, you can access the installation by clicking the **Start** button and choosing **Run**. In the drop-down box provided, type **D:\setup.exe** (where D: is the letter of your CD-ROM drive). Alternately, double-click **My Computer**, and then double-click the CD-ROM drive where the Setup Utility CD is located. Double-click the **Setup.exe** icon that appears. Follow the instructions that appear on your screen. If you have any questions or difficulty, refer to the section called **Installing the Drivers and Configuration Utility for Windows 95, 98, ME, and 2000.**

Chapter 7: Configuration Utility

The **Configuration Utility** is provided to allow you further customization of the Network PC Card and your wireless network.

Using the Configuration Utility

Once the Configuration Utility has been installed, an icon will be placed in the system tray (next to the clock) when the Network PC Card is inserted, as shown in Figure 7-1.

Figure 7-1

You can also start the Configuration Utility by clicking the **Start** button, selecting **Programs**, and choosing the folder for the Network PC Card. Choose **Configuration Utility**. You will see the Wireless LAN Configuration Utility screen (shown in Figure 7-1). This utility is divided into six parts: **Link Info**, **Configuration**, **Site Survey**, **Encryption**, **Advanced**, and **About**. *You should change all configuration settings for your Network PC Card using this utility and not under the Network Properties section in your Control Panel.*

LINK INFO

The Link Info screen (shown in Figure 7-2) provides information about the current link between the Network PC Card and a wireless Access Point.

When in Infrastructure Mode, **State** will display the connection statistics for the network segment that you are on.

The **Current Channel** field shows to what channel the Network PC Card is set.

The **Current Transfer Rate** field shows the transfer rate in megabits per second.

The **Current Service Set Identifier** shows the current SSID set for the wireless network. This SSID can be modified at the **Configuration** screen.

The **Throughput** fields show the rate at which data is transferred and received in Bytes per second.

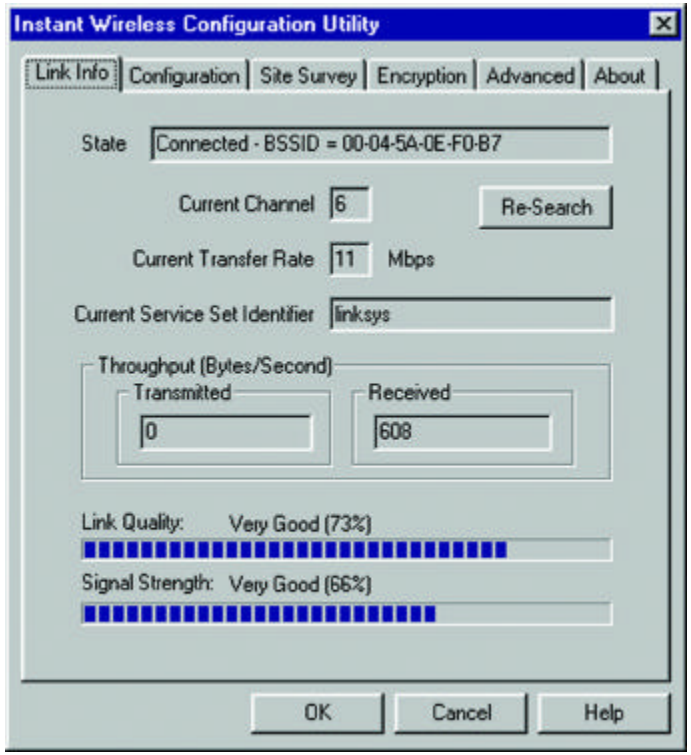

Figure 7-2

Note: When in Ad-Hoc mode, Link Quality and Signal Strength indicators will not be available.

The **Link Quality** field will display a bar indicating the percentage, between 0 and 100 percent, of the quality of the link. The higher the percentage, the better the link.

The **Signal Strength** field will display a bar indicating the percentage, between 0 and 100 percent, of the strength of the signal. The higher the percentage, the stronger the signal.

CONFIGURATION

The Configuration screen, shown in Figure 7-3, allows you to customize the settings for the Network PC Card and your wireless network.

The **Wireless Mode** setting determines the architecture of your wireless network. Select **Ad-Hoc** or **Infrastructure** Mode depending on your network type. The **Ad-Hoc** mode is used for a simple peer-to-peer network and allows the sharing of local resources only between Network PC Cards without needing a wireless Access Point. The **Infrastructure** mode allows a wireless network to be integrated into an existed, wired network through an Access Point.

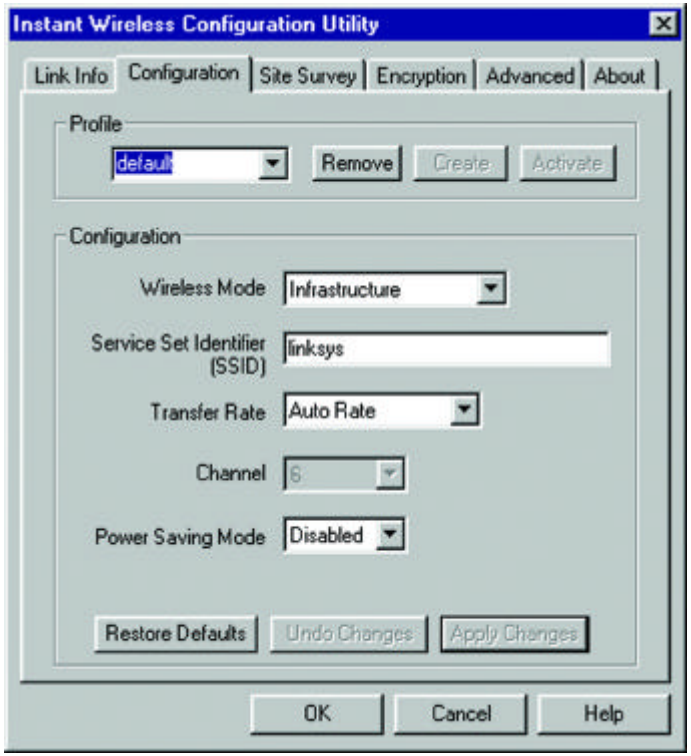

Figure 7-3

Infrastructure networks permit roaming between Access Points while maintaining a connection to all network resources.

An acronym for **S**ervice **S**et **I**dentifier, **SSID** is the unique name shared among all points in a wireless network. The SSID must be identical for all points in the network. *It is case sensitive and must not exceed 32 characters.*

The **Transfer Rate** field shows the current transfer rate for the Network PC Card. To optimize performance and range, the TX Rate should be set to Fully Automatic, which will automatically adjust the transfer speed for best performance and longest range.

The **Channel** setting specifies the channel used in wireless communication and should be set to the same channel as the other points in the wireless network. This setting can only be adjusted in Ad-Hoc mode.

Power Saving Mode, or **PS Mode**, enables or disables the power saving features of your Network PC Card.

SITE SURVEY

The Site Survey screen shows the available access points and their features. Click on the desired access point. Then click **Connect** to connect or **Search** to search for more access points.

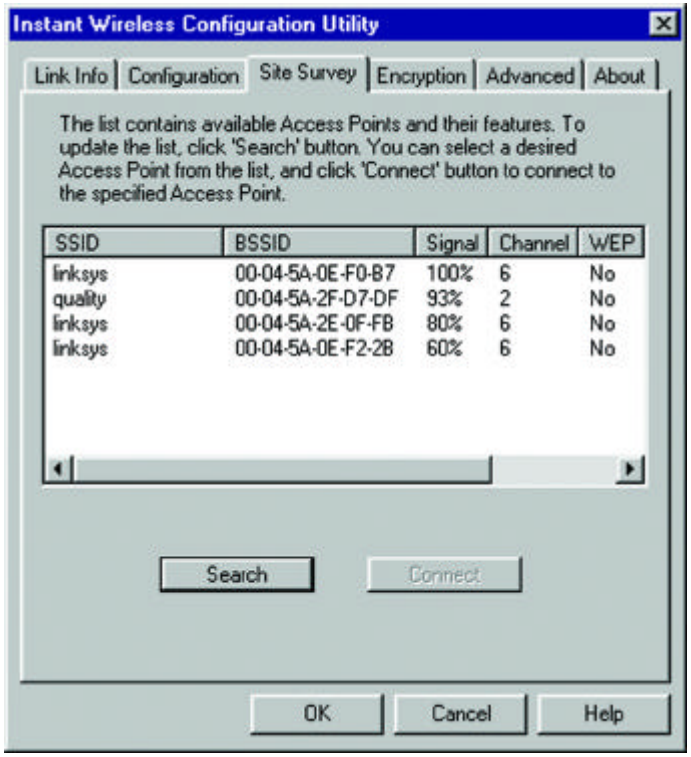

Figure 7-4

ENCRYPTION

On the Encryption screen, shown in Figure 7-5, you can set the level of security with which you will be using the Network PC Card.

Under the drop-down box, you can choose to have WEP encryption **Disabled**, **64-Bit**, or **128-Bit**. Wired Equivalent Privacy (WEP) is an encryption scheme used to protect wireless data communication. The Disabled setting prevents the sharing of data with other computers on the WEP network. When selecting **Manual Entry** for the WEP Key Entry, enter the hexadecimal number set by other wireless WEP settings; these settings have to be identical to the WEP encryption on all points in your wireless network in order to network to your Network PC Card.

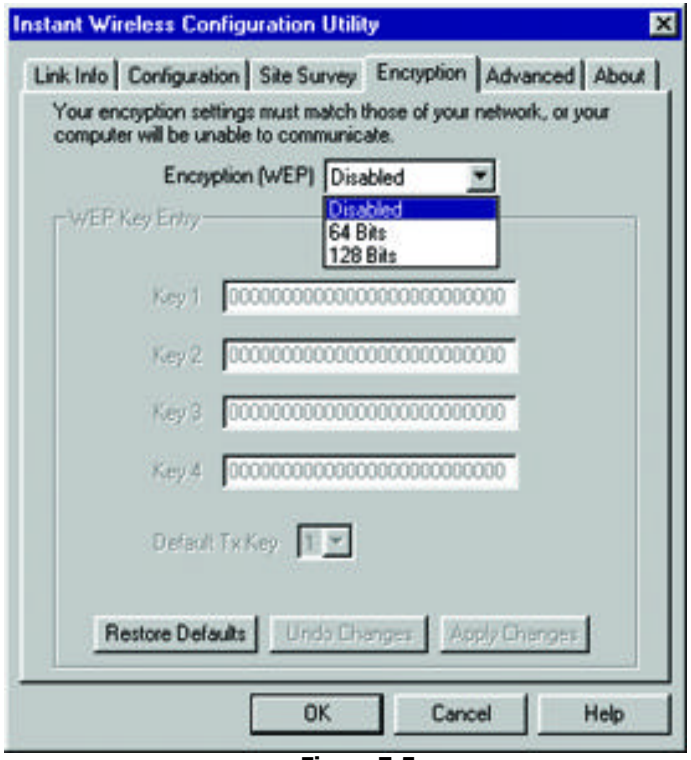

Figure 7-5

Note: In order to enable WEP encryption, hexadecimal values must be entered.

Note: The WEP Key Entry must match the Key on all other devices on the wireless network, or else this device will be unable to transmit or receive data.

In order to enable 128-bit WEP encryption, choose **128 Bits** in the drop-down box. In the drop-down box near the bottom right-hand corner of the page, choose which Default Tx Key will be used for the encryption. By default, Key 1 will be used. In the box corresponding to the default you chose, enter a hexadecimal number that the encryption algorithm will be based on. Click **Apply Changes** when you are done.

ADVANCED

The Advanced screen (Figure 7-6) allows you to set the **Fragmentation Threshold**, the **RTS/CTS Threshold**, and the **Preamble Type**. The **Fragmentation Threshold Value** indicates how much of the network resources is devoted to recovering packet errors. The value should remain at its default setting of 2,432. If you experience high packet error rates, you can decrease this value but it will likely decrease overall network performance. Only minor modifications of this value are recommended.

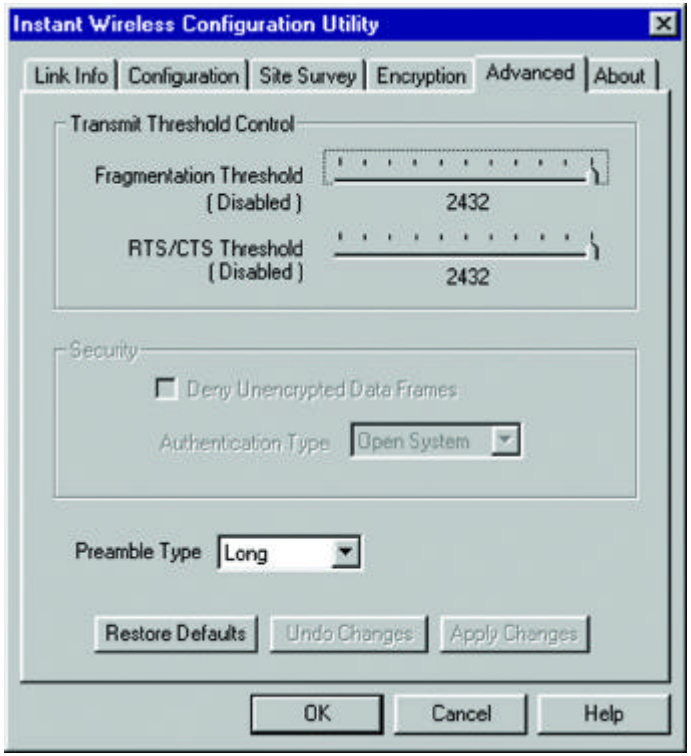

Figure 7-6

The **RTS Threshold Value** should remain at its default setting of 2,432. A preamble is a signal used to synchronize the transmission timing between two or more systems. A series of transmission pulses is sent before the data to indicate that "someone is about transmit data." This ensures that systems receiving the information correctly when the data transmission starts.

Security is used for WEP only. By selecting **Deny Unencrypted Data Frames**, all unencrypted data will not be seen. For **Authentication Type**, you may choose between **Open System** or **Shared Key**.

> **Shared Key** is when both the sender and recipient share a secret key. Both units use this key for an extended length of time, sometimes indefinitely. Any eavesdropper that discovers the key may decipher all packets until the key is changed.
>
> **Open System**, the default setting, is when the sender and the recipient do not share a secret key. Each party generates its own key-pair and asks the receiver to accept the (usually randomly) generated key. Once accepted, this key is used for a short time only; then a new key is generated and agreed upon.

The **Preamble Type** should be set to **Short** (if the network environment is "noisy") or **Long** (if the environment is clear). Click **OK** to complete the configuration.

ABOUT

The About screen (Figure 7-7) shows the release information for the Driver Version, Configuration Utility Version, and Firmware Version

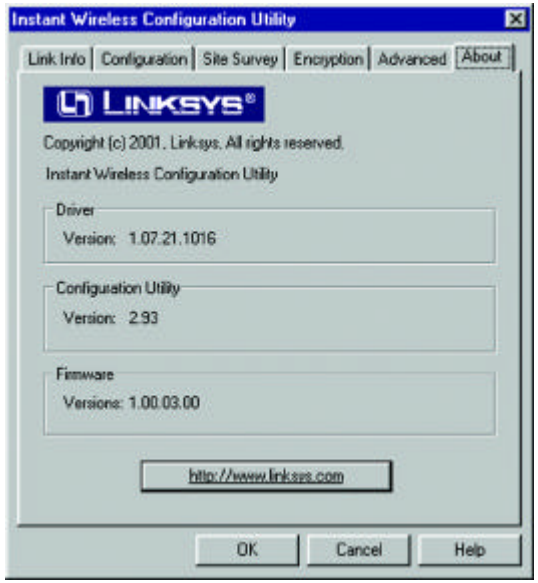

Figure 7-7

Chapter 8: Installing Network Protocols

Protocols are necessary for computers to communicate on your network.

1. From the **Start** Menu, select **Settings** and bring up the **Control Panel**, as shown in Figure 8-1. From the Control Panel, double-click the **Network** icon.

Figure 8-1

2. Select **Instant Wireless Network PC Card V3.0** from the list (as shown in Figure 8-2) and click the **Add** button.

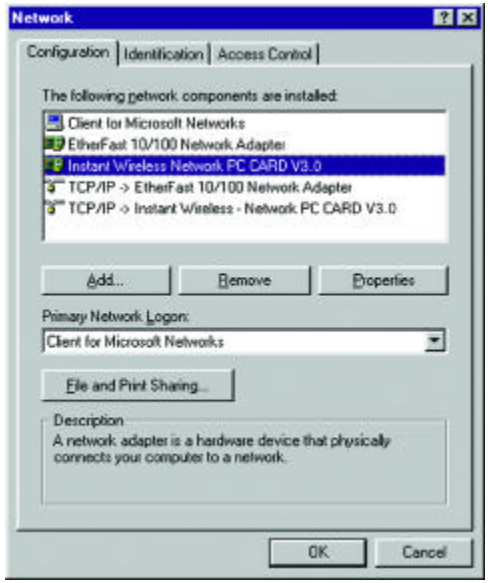

Figure 8-2

3. Highlight **Protocol** from the list of network component types, as shown in Figure 8-3, and click the **Add** button.

Figure 8-3

4. From the screen shown in Figure 8-4, select **Microsoft** from the list of "Manufacturers" and **TCP/IP** from the list of "Network Protocols" and click the **OK** button.

   Repeat steps two through four to install other protocols, such as NetBEUI or IPX/SPX.

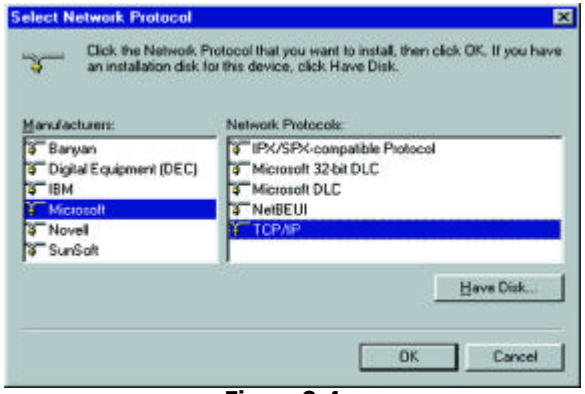

Figure 8-4

5. To verify that the drivers are working under Enhanced Mode on the **Driver Type** tab or reconfigure the card on the **Advanced** tab, go to the screen shown in Figure 8-2 and click the **Properties** button. This will bring up the Properties Tabs, where such values can be refined.

   When finished, you must restart your computer to complete installation.

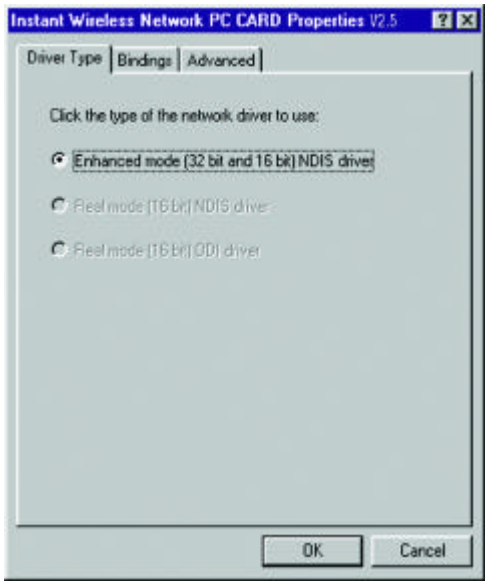

Figure 8-5

Chapter 9: Advanced Properties

The Advanced Properties for Windows 95, 98, ME, and 2000

The Advanced Properties of the card are supplied for fine tuning the card's settings. These values should only be changed by those completely familiar with both the operating system and the settings of the network. Unless your specific situation requires changing them, the default settings should be sufficient for your card's proper operation. *Linksys advises that you change these values in the Configuration Utility rather than using this method, to insure that the settings you change will be recognized everywhere.*

Check your wireless network settings before changing any of these values.

1. To access the Network Configuration screen (shown in Figure 9-1), click the **Start** button, choose **Settings** and open the **Control Panel**. Double-click the **Network** icon and choose the **Advanced** tab.

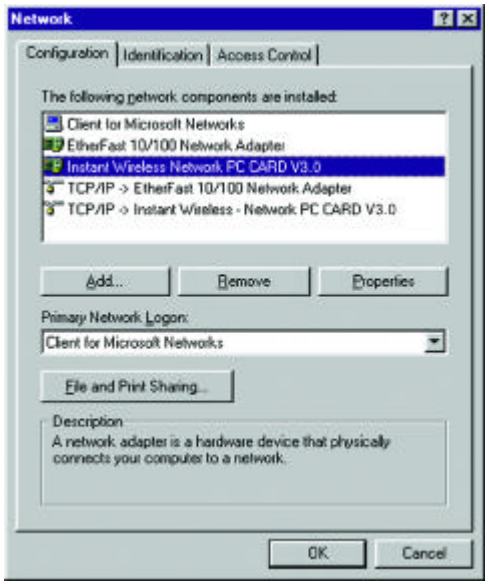

Figure 9-1

2. Select **Authentication Algorithm** from the list provided and select a Value from the drop-down menu on the right, as shown in Figure 9-2.

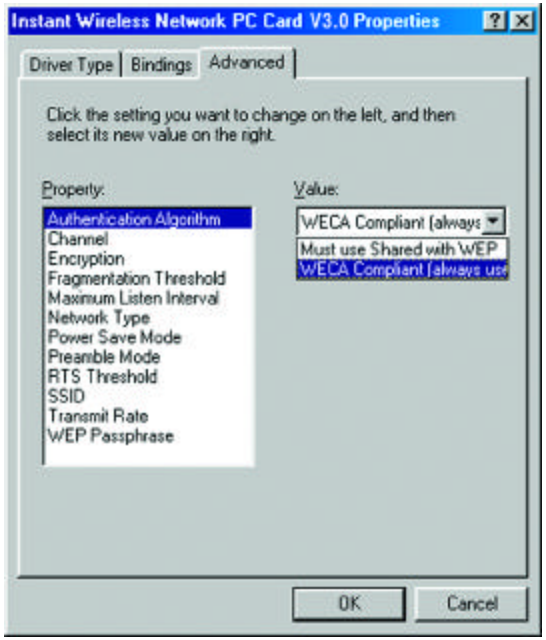

Figure 9-2

WECA Compliant (Default) (also referred to as **Open Authentication**) The sender and recipient do NOT share a secret key. Each party generates its own key-pair and asks the receiver to accept the generated key. Once accepted, this key is used for a short time only.

Must use Shared with WEP (Optional)
This is when both the sender and recipient share a secret key. They use this key for an extended length of time. Any eavesdropper that discovers the key may decipher all packets until the key is changed. As indicated, you should always use **WECA Compliant (Always Use)** unless you have some other reason to do so.

Choose **Channel** to continue or click the **OK** button to finish setting the Advanced Options

3. The **Channel** setting, shown in Figure 9-3, must be the same for all wireless points in the network. Use the settings, **1-11**, to find the best channel for your connection. For further information, see **Chapter 7: Configuration Utility**. Once your card is configured, click the **OK** button to finish setting the Advanced Options.

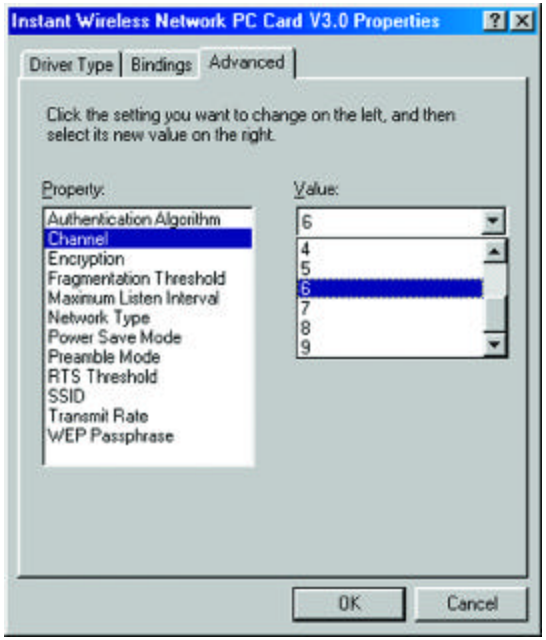

Figure 9-3

4. Select either **Disabled, 64 bit,** or **128 bit** as the value under **Encryption**, shown in Figure 9-4. Wired Equivalent Privacy (WEP) is an encryption method used to protect wireless data communication. The **Disabled** setting prevents the sharing of data with other computers on a WEP network. For data sharing to be enabled, select either 64 or 128 bit encryption, depending on your needs. For further information, see **Chapter 7: Configuration Utility**. Once your card is configured, click **OK** to finish setting the Advanced Options.

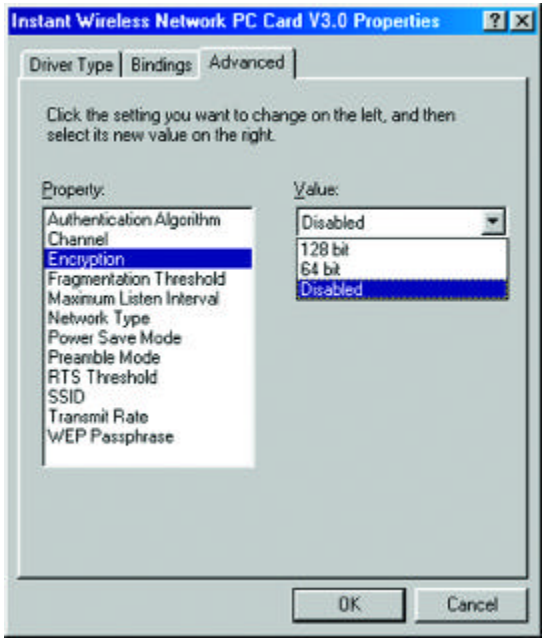

Figure 9-4

5. The **Fragmentation Threshold Value**, shown in Figure 9-5 indicates the maximum size of the transmit frame. Any data frame larger than this value will be fragmented into multiple frames. Lowering this value usually means a lower frame error rate, but a lower value also creates more overhead, which negatively affects network performance. The value can only be entered in increments of 128. Only minor modifications of this value are recommended. Click **Maximum Listen Interval** to continue or the **OK** button to finish setting the Advanced Options.

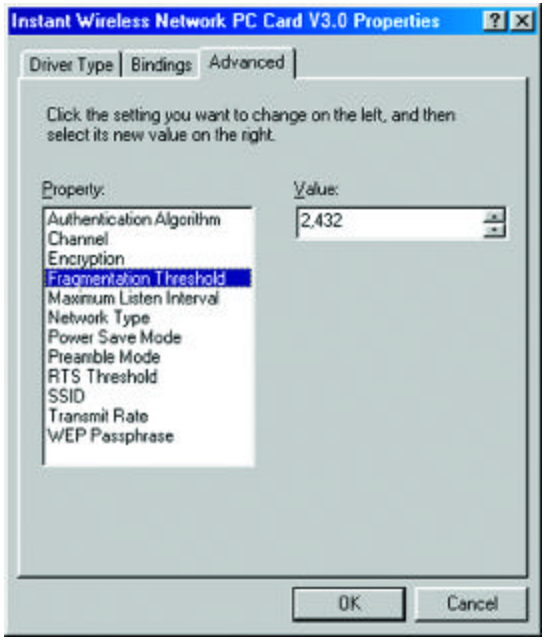

Figure 9-5

6. The **Maximum Listen Interval**, as shown in Figure 9-6, only applies when operating in the Infrastructure mode while Power Saving is enabled. The value you input here will determine how often the computer "wakes up" from the power saving mode to receive any packets that were sent while it was "asleep." The higher the value entered here, the longer the time your computer "sleeps" between waking up to check for packets. Click **Network Type** to continue or the **OK** button to finish setting the Advanced Options.

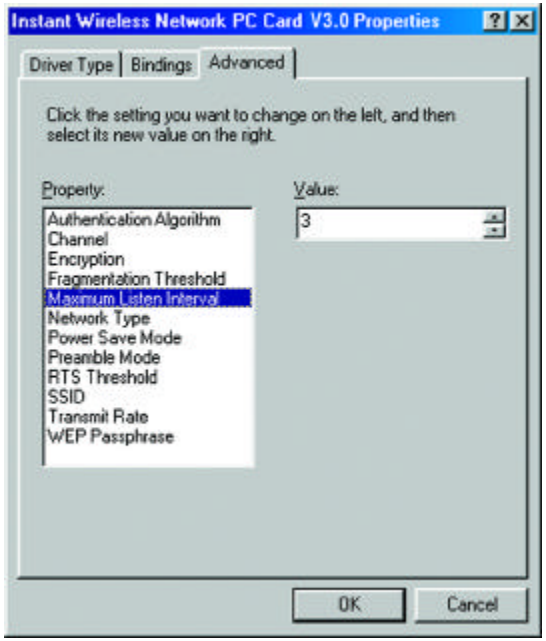

Figure 9-6

7. Select **Network Type** (Figure 9-7) and select a Value, from the drop down menu, of either **Infrastructure** or **Ad-Hoc**.

   The Infrastructure mode allows a Network PC Card to communicate with a wired network employing an access point, while the Ad-Hoc mode allows wireless-to-wireless, peer-to-peer communication. Click **Power Save Mode** to continue or the **OK** button to finish setting the Advanced Options.

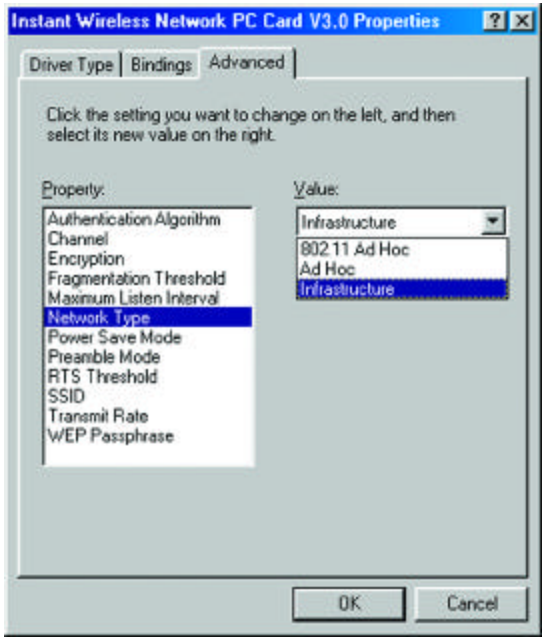

Figure 9-7

8. Select **Power Save Mode** (shown in Figure 9-8) and select either **Enabled** or **Disabled** for the **Value**. Disabled will allow for uninterrupted data communication. Selecting Enabled allows your notebook to enter "sleep" mode and could interrupt data communication. For further information about Power Save Mode, see **Chapter 7: Configuration Utility**. Click **Preamble Mode** to continue or the **OK** button to finish setting the Advanced Options.

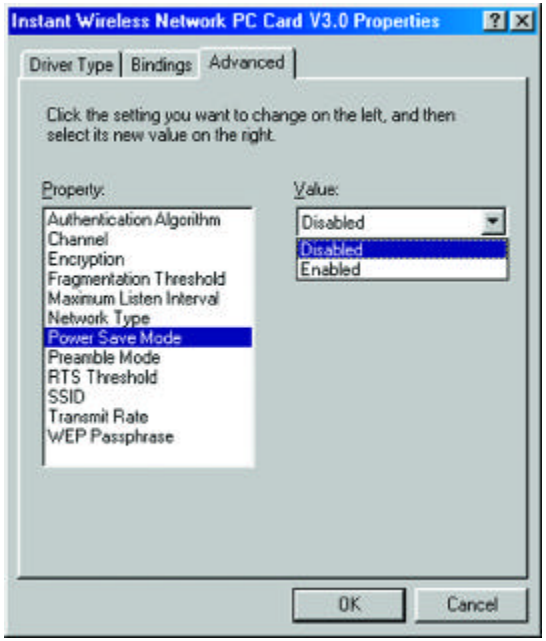

Figure 9-8

9. A preamble is a signal used to synchronize the transmission timing between two or more points in your wireless network. The default setting is **Long Tx Preamble** (as shown in Figure 9-9). Long Tx Preamble allows extra time for the digital decoder to process the initial header packets, but is transmitted at 11Mbps. Short Tx Preamble allows for less time to process the packets, but initial packets are transmitted at 2Mbps. Click **SSID** to continue or the **OK** button to finish setting the Advanced Options.

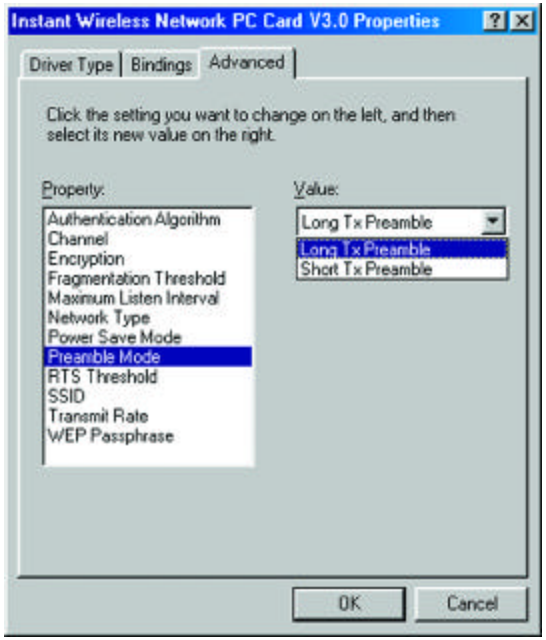

Figure 9-9

10. **RTS Threshold** should remain **Disabled** the default setting, as shown in Figure 9-10. Do not change the setting of the RTS Threshold unless connection quality is poor. Then, increase this setting by a small value to establish a better connection. Click **Network Type** to continue or the **OK** button to finish setting the Advanced Options.

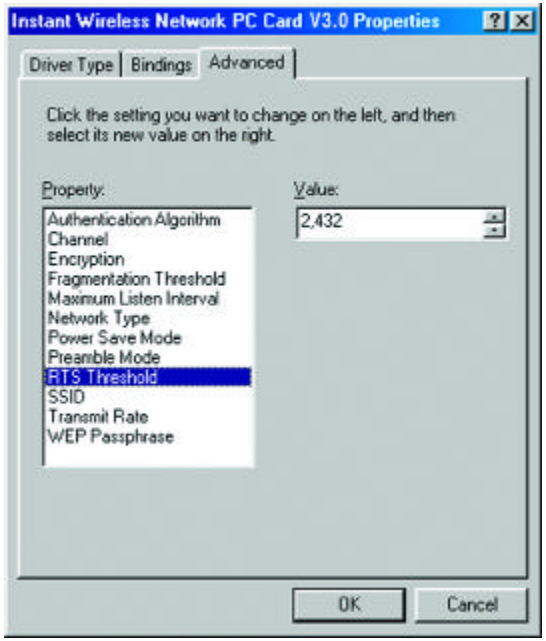

Figure 9-10

11. The value for **SSID** (Figure 9-11) depends on what **Network Type** was selected. **Infrastructure** networks should have the same SSID as the Access Point. All clients in an **Ad-Hoc** Network should share the same SSID. Click **Transmit Rate** to continue or the **OK** button to finish setting the Advanced Options.

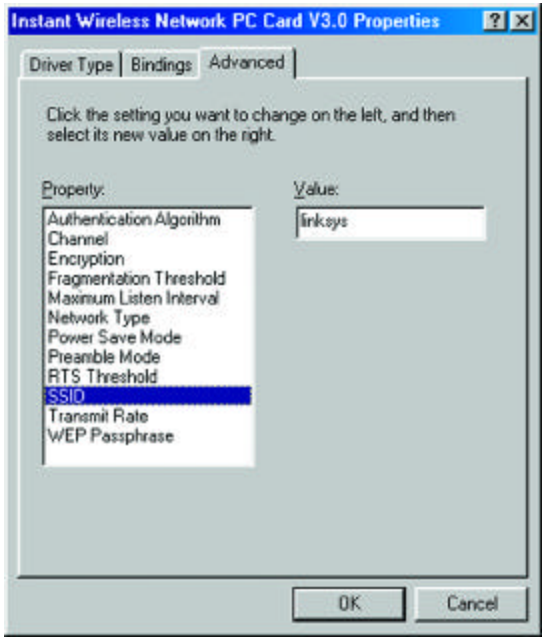

Figure 9-11

12. The **Transmit Rate** affects the speed of transmission to another wireless device. The rate can either be set to a fixed value or left at the default value of **Full Auto**, as shown in Figure 9-12, which lets the computer determine the best transfer rate. The first option, **Auto Select 1 or 2**, is for compatibility with older wireless equipment. Click **WEP Passphrase** to continue or the **OK** button to finish setting the Advanced Options.

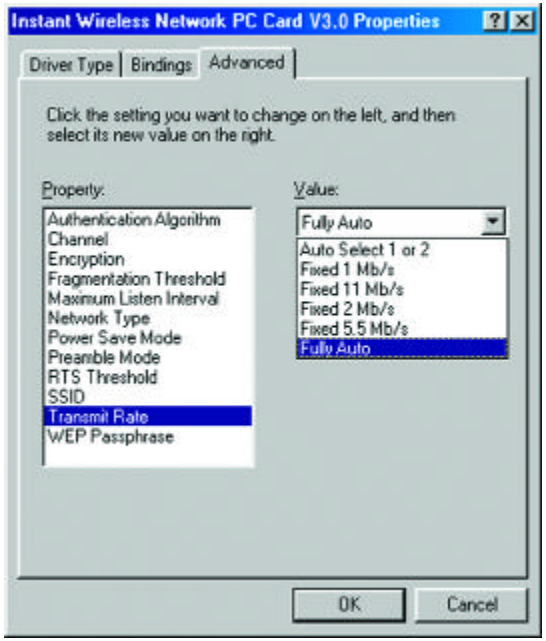

Figure 9-12

13. The **WEP Passphrase** (Figure 9-13) value allows the user to change the passphrase that is used to generate the encryption key for WEP. Any alphanumeric value can be entered here, but it will only be activated if you choose either 64 or 128 bit under **Encryption**. This value can also be changed using the Configuration Utility. For further information, see **Chapter 7: Configuration Utility**.

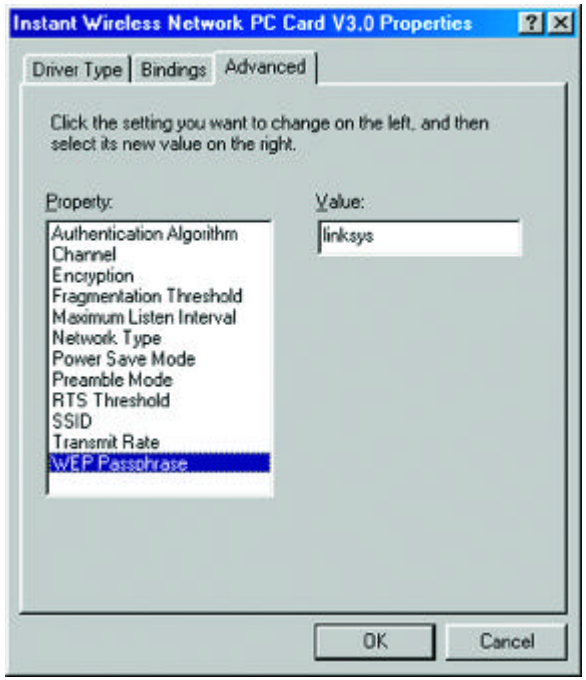

Figure 9-13

Once your card is configured, click the **OK** button to finish setting the Advanced Options.

The Advanced Properties for Windows NT

The **Advanced Properties** screen allows you to make modifications to your Network PC Card, optimizing performance. These properties are accessed by **right-clicking** on the **Network Neighborhood** icon on the desktop. Select **Properties** from the menu that appears. From the tabbed window that appears next, click the **Adapters** tab. Highlight **Instant Wireless Network PC Card V3.0** and then click the **Properties** button. The screen in Figure 9-14 should appear. Choosing improper settings in these fields can keep the Wireless Network PC Card from functioning properly. Follow these steps to configure the **Advanced Properties** fields:

1. The **I/O Base** setting, shown in Figure 9-14, should be unique and not conflict with any other device settings in your system.

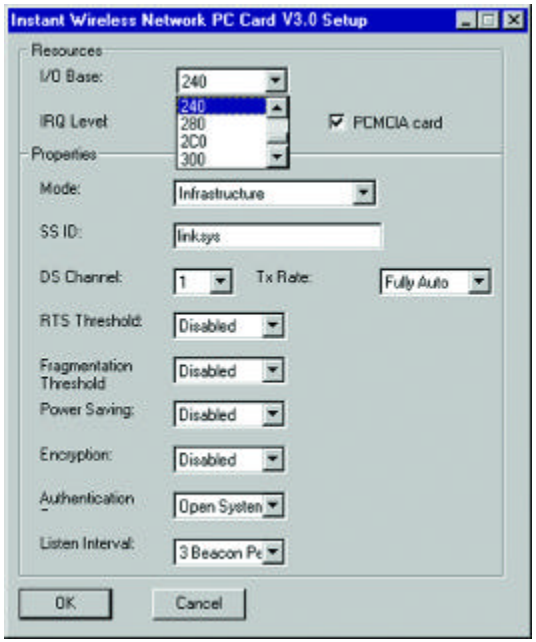

Figure 9-14

Note: In order to check for potential IRQ conflicts, run WINMSD by selecting RUN from the Start menu and typing **winmsd.exe** and pressing the **Enter** key.

2. The **IRQ Base** level (Figure 9-15) can be changed in order to avoid possible conflicts with other system devices. The default setting for the Network PC Card is **7**. This value should only be changed if the Card does not work properly.

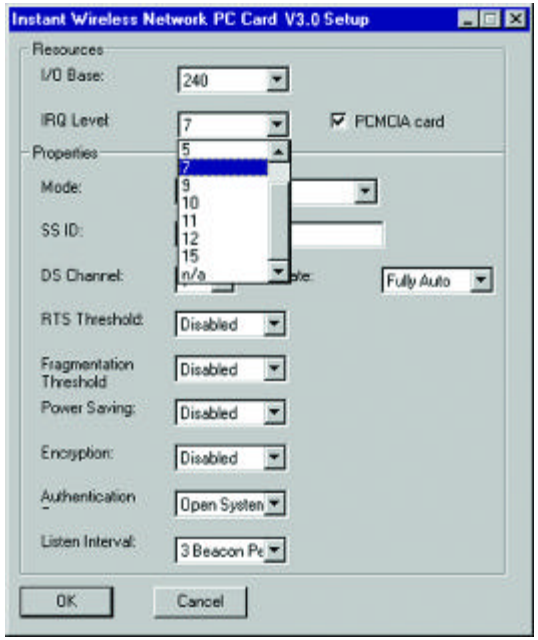

Figure 9-15

3. The **Mode** setting (Figure 9-16) should be either **Infrastructure** or **Ad-Hoc**, depending upon your network's settings. The **Infrastructure** mode allows a Network PC Card to communicate with a wired network employing an access point, while the **Ad-Hoc** mode allows wireless-to-wireless, peer-to-peer communication. For more information about these settings, refer to the section in Chapter 3 called **Ad-Hoc versus Infrastructure Mode**.

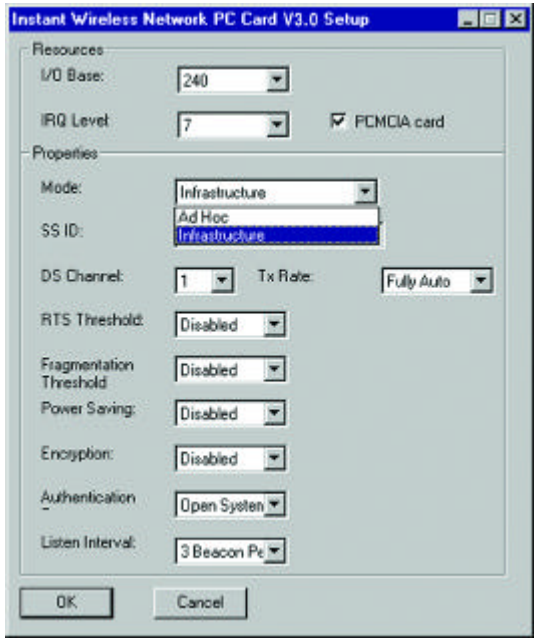

Figure 9-16

4. The **SSID** (as shown in Figure 9-17) depends on what **Mode** is selected. If the Mode is **Infrastructure**, it should have the same SSID name as the Access Point. If the Mode is **Ad-Hoc**, all clients should share the same SSID name.

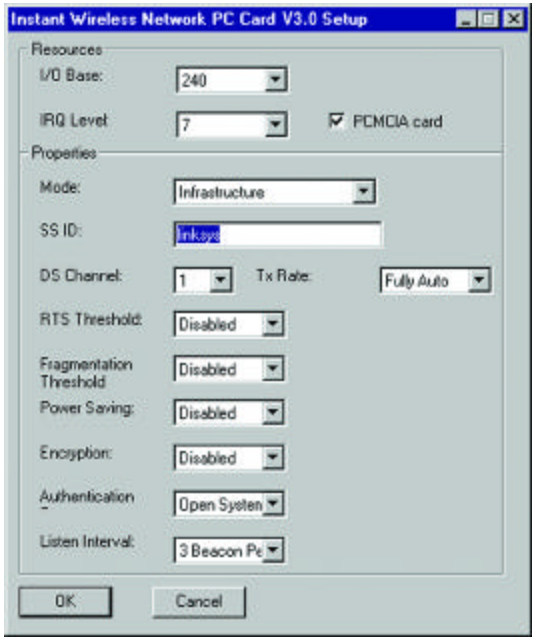

Figure 9-17

5. The **DS Channel** setting (Figure 9-18) must be the same for all wireless points in the network. Use the settings, **1-11**, to find the best channel for your connection.

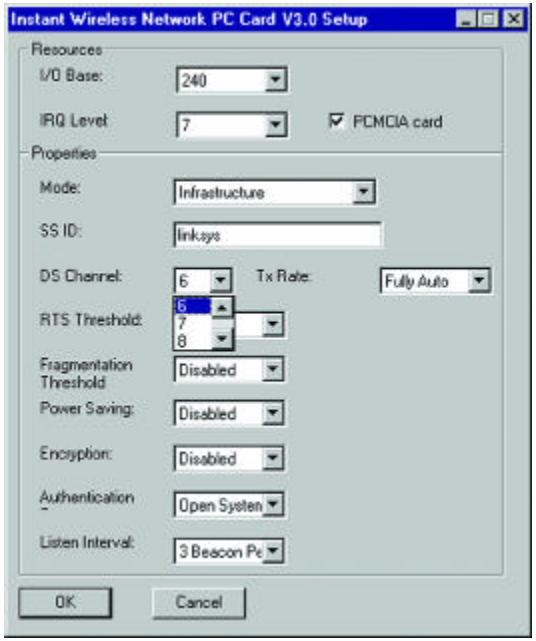

Figure 9-18

6. **RTS Threshold** should remain in the default setting of **Disabled**, as shown in Figure 9-19. Do not change the setting of the RTS Threshold unless connection quality is poor. Then, increase this setting by a small value to establish a better connection.

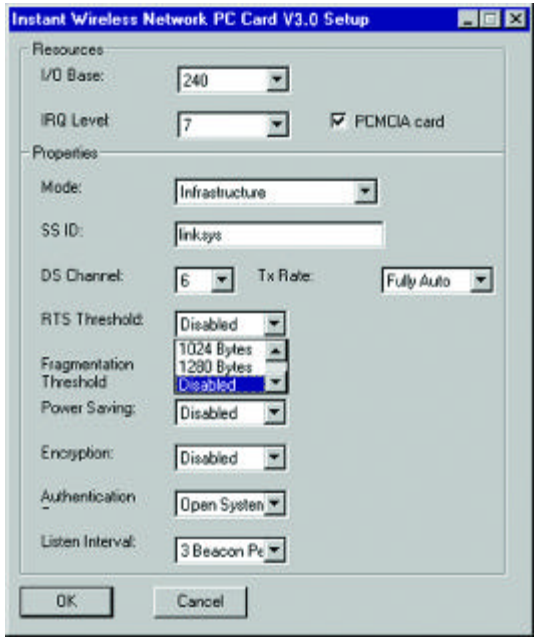

Figure 9-19

7. **Fragmentation Threshold** should remain in the default setting of **Disabled**, as shown in Figure 9-20. Do not change the setting of the Fragmentation Threshold unless connection quality is poor. Then, increase this setting by a small value to establish a better connection.

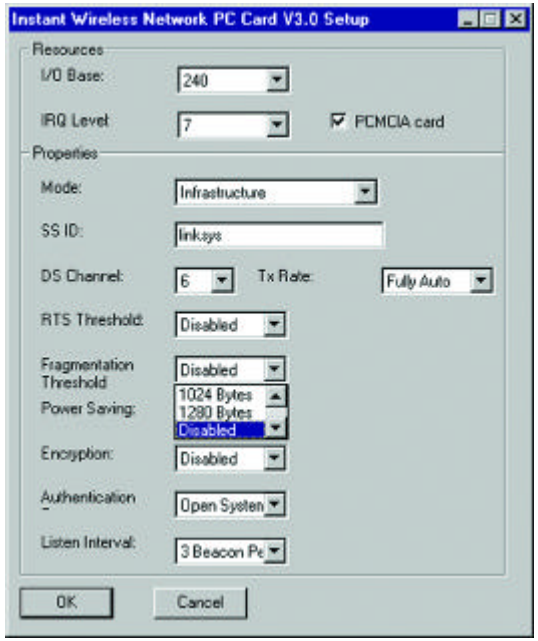

Figure 9-20

8. Under **Power Saving** mode (Figure 9-21), select either **Enabled** or **Disabled. Disabled** will allow for uninterrupted data communication. Selecting **Enabled** allows your notebook to enter "sleep" mode and could interrupt data communication. For further information about Power Save Mode, see **Chapter 7: Configuration Utility**.

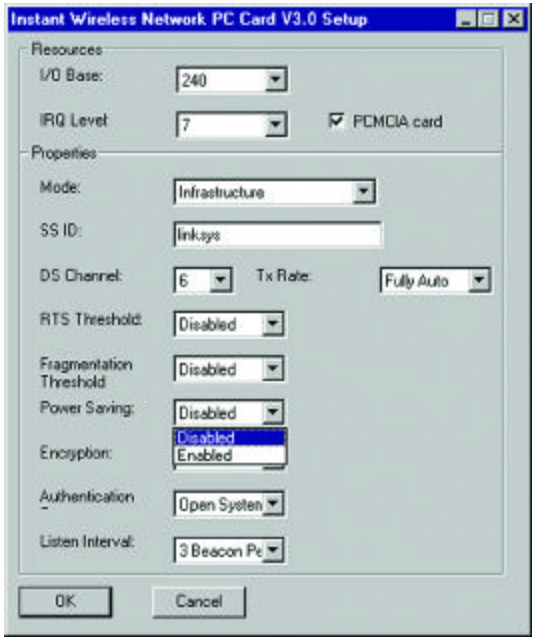

Figure 9-21

9. Select either **Disabled, 64 bit,** or **128 bit** as the value under **Encryption**, as shown in Figure 9-22). Wired Equivalent Privacy (WEP) is an encryption scheme used to protect wireless data communication. The **Disabled** setting prevents the sharing of data with other computers on a WEP network. For data sharing to be enabled, select either 64 or 128 bit encryption.

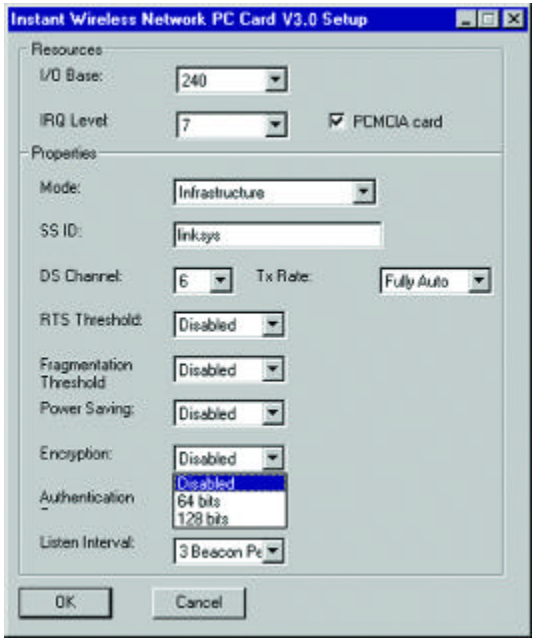

Figure 9-22

10. The **Authentication** setting, shown in Figure 9-23, is **Open System** by default. **Open System** is another name for WECA compliant.

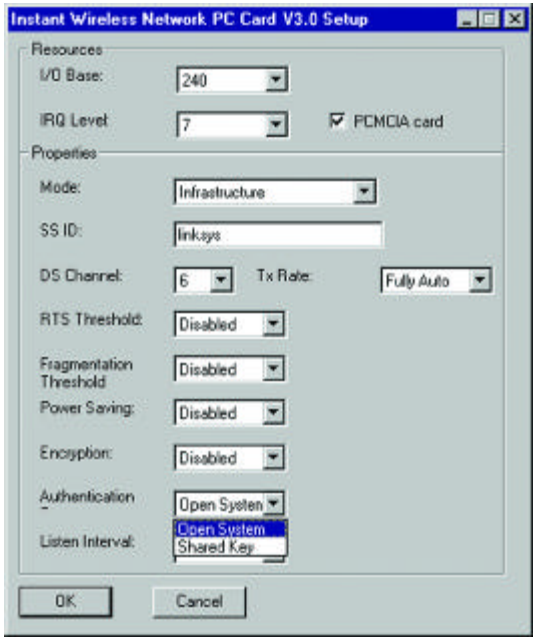

Figure 9-23

WECA Compliant (Default) (also referred to as **Open Authentication**) The sender and recipient do NOT share a secret key. Each party generates its own key-pair and asks the receiver to accept the generated key. Once accepted, this key is used for a short time only; thereafter a new key is generated and agreed upon.

Shared Key (Optional)
This is when both the sender and recipient share the same key. They use this key for an extended length of time. Any eavesdropper that discovers the key may decipher all packets until the key is changed. As indicated, you should always use **WECA Compliant (Always Use)** unless you have some other reason to do so.

Choose **Listen Interval** to continue or the **OK** button to finish setting the Advanced Options

11. The **Listen Interval** setting, as shown in Figure 9-24, should remain at **1 Beacon per Second**. Setting this higher could result in slower data transfer.

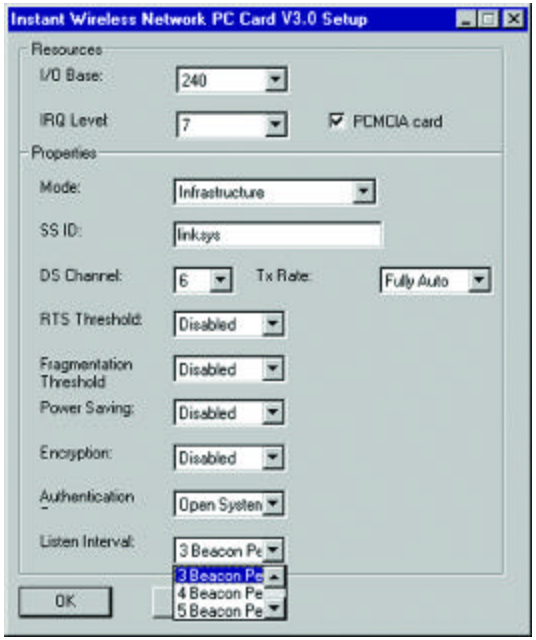

Figure 9-24

12. The **TX Rate** setting, as shown in Figure 9-25, should remain **Fully Auto** as set by default. Changing this to a different transfer rate will lock in that rate and may result in dropped connections.

    Click the **OK** button to complete setting these options.

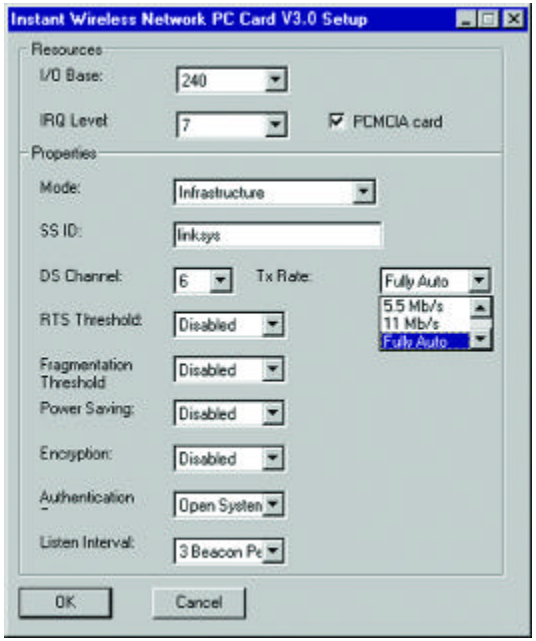

Figure 9-25

Chapter 10: Troubleshooting

This chapter provides solutions to problems usually occurring during the installation and operation of the Network PC Card. Read the description below to solve your problems. If you can't find an answer here, check the Linksys website at *www.linksys.com.*

Common Problems and Solutions

1. My computer does not recognize the Network PC Card.

Make sure that the Network PC Card is properly inserted into the PCMCIA slot. Note that the card can be inserted either way, but only correctly when it is inserted so that the "Instant Wireless" logo on the front of the card may not be seen. If in doubt, try inserting the card both ways. The card will slide in further when it is correct.

2. The Network PC Card does not work properly.

- Reinsert the Network PC Card into your notebook's PCMCIA slot. A beep should be heard if the card is properly inserted.
- For non-Windows environments, make sure that a PCMCIA card service driver is installed on your PC.
- Open the **Control Panel** and click on the **PC Card**. Check whether it has a PCMCIA card in one of the sockets or not. If you find the Network PC Card in one of the sockets, it means the card has been detected properly. If you see a yellow question mark, the resources are conflicting.
- Right-click on **My Computer** and select **Properties**. Select the device manager and click the **Network Adapter**. You will find the Network PC Card if it is installed successfully. If you see the yellow exclamation mark, the resources are conflicting. Click **PCMCIA card** and then click **PCMCIA card service**. You will see the status of the Network PC Card. If there is a yellow question mark, please check the following:
    - Make sure your notebook has a free IRQ.
    - Make sure you have inserted the right card and installed the proper driver.

If the Network PC Card does not function after attempting the above steps, remove the card and do the following:

- Uninstall the driver software from your PC.
- Restart your PC and repeat the hardware and software installation as specified in this User Guide.

3. I cannot communicate with the other computers linked via Ethernet in the Infrastructure configuration.

- Make sure that the notebook PC to which the Network PC Card is associated is powered on.
- Make sure that your Network PC Card is configured on the same channel and with the same security options as the other computers in the Infrastructure configuration.

Frequently Asked Questions

Can I run an application from a remote computer over the wireless network?
This will depend on whether or not the application is designed to be used over a network. Consult the application's documentation to determine if it supports operation over a network.

Can I play multiplayer games with other users of the wireless network?
Yes, as long as the game supports multiple players over a LAN (local area network). Refer to the game's documentation for more information.

What is the IEEE 802.11b standard?
The IEEE 802.11b Wireless LAN standards subcommittee formulatings standards for the industry. The objective is to enable wireless LAN hardware from different manufacturers to communicate.

What IEEE 802.11 features are supported?
The product supports the following IEEE 802.11 functions:

- CSMA/CA plus Acknowledge protocol
- Multi-Channel Roaming
- Automatic Rate Selection
- RTS/CTS feature
- Fragmentation
- Power Management

What is Ad-hoc?
An Ad-hoc wireless LAN is a group of computers, each with a Network PC Card, connected as an independent wireless LAN. An Ad-hoc wireless LAN is applicable at a departmental scale for a branch or SOHO operation.

What is Infrastructure?
An integrated wireless and wired LAN is called an Infrastructure configuration. Infrastructure is applicable to enterprise scale for wireless access to a central database, or wireless application for mobile workers.

What is Roaming?
Roaming is the ability of a portable computer user to communicate continuously while moving freely throughout an area greater than that covered by a single Wireless Network Access Point.

To achieve true seamless connectivity, the wireless LAN must incorporate a number of different functions. Each node and Wireless Network Access Point, for example, must always acknowledge receipt of each message. Each node must maintain contact with the wireless network even when not actually transmitting data. Achieving these functions simultaneously requires a dynamic RF networking technology that links Wireless Network Access Points and nodes. In such a system, the user's end node undertakes a search for the best possible access to the system. First, it evaluates such factors as signal strength and quality, as well as the message load currently being carried by each Wireless Network Access Point and the distance of each Wireless Network Access Point to the wired backbone. Based on that information, the node next selects the right Wireless Network Access Point and registers its address. Communications between end node and host computer can then be transmitted up and down the backbone.

As the user moves on, the end node's RF transmitter regularly checks the system to determine whether it is in touch with the original Wireless Network Access Point or whether it should seek a new one. When a node no longer receives acknowledgment from its original Wireless Network Access Point, it undertakes a new search. Upon finding a new Wireless Network Access Point, it then re-registers, and the communication process continues.

What is BSS ID?
A specific Ad-hoc LAN is called a Basic Service Set (BSS). Computers in a BSS must be configured with the same BSS ID.

What is ESSID?
An Infrastructure configuration could also support roaming capability for mobile workers. More than one BSS can be configured as an Extended Service Set (ESS). Users within an ESS could roam freely between BSSs while maintaining a continuous connection to the wireless network stations and Wireless Network Access Points.

What is ISM band?
The FCC and their counterparts outside of the U.S. have set aside bandwidth for unlicensed use in the ISM (Industrial, Scientific and Medical) band. Spectrum in the vicinity of 2.4 GHz, in particular, is being made available worldwide. This presents a truly revolutionary opportunity to place convenient high speed wireless capabilities in the hands of users around the globe.

What is Spread Spectrum?
Spread Spectrum technology is a wideband radio frequency technique developed by the military for use in reliable, secure, mission-critical communications systems. It is designed to trade off bandwidth efficiency for reliability, integrity, and security. In other words, more bandwidth is consumed than in the case of narrowband transmission, but the trade-off produces a signal that is, in effect, louder and thus easier to detect, provided that the receiver knows the parameters of the spread-spectrum signal being broadcast. If a receiver is not tuned to the right frequency, a spread-spectrum signal looks like background noise. There are two main alternatives, Direct Sequence Spread Spectrum (DSSS) and Frequency Hopping Spread Spectrum (FHSS).

What is DSSS? What is FHSS? And what are their differences?
Frequency Hopping Spread Spectrum (FHSS) uses a narrowband carrier that changes frequency in a pattern that is known to both transmitter and receiver. Properly synchronized, the net effect is to maintain a single logical channel. To an unintended receiver, FHSS appears to be short-duration impulse noise. Direct Sequence Spread Spectrum (DSSS) generates a redundant bit pattern for each bit to be transmitted. This bit pattern is called a chip (or chipping code). The longer the chip, the greater the probability that the original data can be recovered. Even if one or more bits in the chip are damaged during transmission, statistical techniques embedded in the radio can recover the original data without the need for retransmission. To an unintended receiver, DSSS appears as low power wideband noise and is rejected (ignored) by most narrowband receivers.

Would the information be intercepted while transmitting on air?
WLAN features two-fold protection in security. On the hardware side, as with Direct Sequence Spread Spectrum technology, it has the inherent security feature of scrambling. On the software side, the WLAN series offers the encryption function (WEP) to enhance security and access control. Users can set it up depending upon their needs.

Can Instant Wireless™ products support file and printer sharing?
Instant Wireless™ products perform the same function as LAN products. Therefore, Instant Wireless™ products can work with Netware, Windows NT/2000, or other LAN operating systems to support printer or file sharing.

What is WEP?
WEP is Wired Equivalent Privacy, a data privacy mechanism based on a 40 bit shared key algorithm, as described in the IEEE 802.11 standard.

Chapter 11: Glossary

Ad-hoc Network - An ad-hoc network is a wireless network or other small network in which some of the network devices are part of the network only for the duration of a communications session while in some close proximity to the rest of the network.

Architecture - The total design and implementation of the network. It includes the network's topology, transmission technologies and communications protocols, management and security systems, and any other attributes that give a network a particular set of capabilities and functionalities.

Backbone - The part of a network that connects most of the systems and networks together and handles the most data.

Bandwidth - The transmission capacity of a given facility, in terms of how much data the facility can transmit in a fixed amount of time; expressed in bits per second (bps).

Bit - A binary digit. The value - 0 or 1-used in the binary numbering system. Also, the smallest form of data.

BSS (**B**asic **S**ervice **S**et) - A group of Instant Wireless Network PC Card users and an Access Point.

Buffer - A buffer is a shared or assigned memory area used by hardware devices or program processes that operate at different speeds or with different sets of priorities. The buffer allows each device or process to operate without being held up by the other. In order for a buffer to be effective, the size of the buffer and the algorithms for moving data into and out of the buffer need to be considered by the buffer designer. Like a cache, a buffer is a "midpoint holding place" but exists not so much to accelerate the speed of an activity as to support the coordination of separate activities.

CSMA/CD (**C**arrier **S**ense **M**ultiple **A**ccess/**C**ollision **D**etection) - The LAN access method used in Ethernet. When a device wants to gain access to the network, it checks to see if the network is quiet (senses the carrier). If it is not, it waits a random amount of time before retrying. If the network is quiet and two

devices access the line at exactly the same time, their signals collide. When the collision is detected, they both back off and each wait a random amount of time before retrying.

Database - A database is a collection of data that is organized so that its contents can easily be accessed, managed, and updated.

Default Gateway - The routing device used to forward all traffic that is not addressed to a station within the local subnet.

DHCP (**D**ynamic **H**ost **C**onfiguration **P**rotocol) - A protocol that lets network administrators manage centrally and automate the assignment of Internet Protocol (IP) addresses in an organization's network. Using the Internet's set of protocol (TCP/IP), each machine that can connect to the Internet needs a unique IP address. When an organization sets up its computer users with a connection to the Internet, an IP address must be assigned to each machine. Without DHCP, the IP address must be entered manually at each computer and, if computers move to another location in another part of the network, a new IP address must be entered. DHCP lets a network administrator supervise and distribute IP addresses from a central point and automatically sends a new IP address when a computer is plugged into a different place in the network.

DHCP uses the concept of a "lease" or amount of time that a given IP address will be valid for a computer. The lease time can vary depending on how long a user is likely to require the Internet connection at a particular location. It's especially useful in education and other environments where users change frequently. Using very short leases, DHCP can dynamically reconfigure networks in which there are more computers than there are available IP addresses.

DHCP supports static addresses for computers containing Web servers that need a permanent IP address.

Domain - A subnetwork comprised of a group of clients and servers under the control of one security database. Dividing LANs into domains improves performance and security.

Driver - A workstation or server software module that provides an interface between a network interface card and the upper-layer protocol software running in the computer; it is designed for a specific NIC, and is installed during the initial installation of a network-compatible client or server operating system.

DSSS (**D**irect-**S**equence **S**pread-**S**pectrum) - DSSS generates a redundant bit pattern for each bit to be transmitted. This bit pattern is called a chip (or chipping code). The longer the chip, the greater the probability that the original data can be recovered. Even if one or more bits in the chip are damaged during transmission, statistical techniques embedded in the radio can recover the original data without -the need for retransmission. To an unintended receiver, DSSS appears as low power wideband noise and is rejected (ignored) by most narrowband receivers.

Encryption - A security method that applies a specific algorithm to data in order to alter the data's appearance and prevent other devices from reading the information.

ESS - More than one BSS in a network.

Ethernet - IEEE standard network protocol that specifies how data is placed on and retrieved from a common transmission medium. Has a transfer rate of 10 Mbps. Forms the underlying transport vehicle used by several upper-level protocols, including TCP/IP and XNS.

FHSS (**F**requency **H**opping **S**pread **S**pectrum) - FHSS continuously changes the center frequency of a conventional carrier several times per second according to a pseudo-random set of channels, while chirp spread spectrum changes the carrier frequency. Because a fixed frequency is not used, illegal monitoring of spread spectrum signals is extremely difficult, if not downright impossible depending on the particular method.

Firmware - Programming that is inserted into programmable read-only memory (programmable read-only memory), thus becoming a permanent part of a computing device.

Fragmentation - Breaking a packet into smaller units when transmitting over a network medium that cannot support the original size of the packet.

Gateway - A device that interconnects networks with different, incompatible communications protocols.

Hardware - Hardware is the physical aspect of computers, telecommunications, and other information technology devices. The term arose as a way to distinguish the "box" and the electronic circuitry and components of a computer from the program you put in it to make it do things. The program came to be known as the software.

Hop - The link between two network nodes.

IEEE (The **I**nstitute of **E**lectrical and **E**lectronics **E**ngineers) - The IEEE describes itself as "the world's largest technical professional society, promoting the development and application of electrotechnology and allied sciences for the benefit of humanity, the advancement of the profession, and the well-being of our members."

The IEEE fosters the development of standards that often become national and international standards. The organization publishes a number of journals, has many local chapters, and several large societies in special areas, such as the IEEE Computer Society.

Infrastructure - An infrastructure network is a wireless network or other small network in which the wireless network devices are made a part of the network through the Access Point which connects them to the rest of the network.

IP Address - In the most widely installed level of the Internet Protocol (Internet Protocol) today, an IP address is a 32-binary digit number that identifies each sender or receiver of information that is sent in packet across the Internet. When you request an HTML page or send e-mail, the Internet Protocol part of TCP/IP includes your IP address in the message (actually, in each of the packets if more than one is required) and sends it to the IP address that is obtained by looking up the domain name in the Uniform Resource Locator you requested or in the e-mail address you're sending a note to. At the other end, the recipient can see the IP address of the Web page requestor or the e-mail sender and can respond by sending another message using the IP address it received.

IPX (**I**nternetwork **P**acket E**X**change) - A NetWare communications protocol used to route messages from one node to another. IPX packets include network addresses and can be routed from one network to another.

IRQ (**I**nterrupt **R**e**Q**uest) - A hardware interrupt on a PC. There are 16 IRQ lines used to signal the CPU that a peripheral event has started or terminated. In most cases, two devices cannot use the same line.

ISM band - The FCC and their counterparts outside of the U.S. have set aside bandwidth for unlicensed use in the ISM (Industrial, Scientific and Medical) band. Spectrum in the vicinity of 2.4 GHz, in particular, is being made available worldwide. This presents a truly revolutionary opportunity to place convenient high-speed wireless capabilities in the hands of users around the globe.

LAN - A local area network (LAN) is a group of computers and associated devices that share a common communications line and typically share the resources of a single processor or server within a small geographic area (for example, within an office building).

Mbps (**M**ega**B**its **P**er **S**econd) - One million bits per second; unit of measurement for data transmission.

NetBEUI (NetBIOS Extended User Interface) - The transport layer for NetBIOS. NetBIOS and NetBEUI were originally part of a single protocol suite that was later separated. NetBIOS sessions can be transported over NetBEUI, TCP/IP and SPX/IPX protocols.

NetBIOS - The native networking protocol in DOS and Windows networks. Although originally combined with its transport layer protocol (NetBEUI), NetBIOS today provides a programming interface for applications at the session layer (layer 5). NetBIOS can ride over NetBEUI, its native transport, which is not routable, or over TCP/IP and IPX/SPX, which are routable protocols.

NetBIOS computers are identified by a unique 15-character name, and Windows machines (NetBIOS machines) periodically broadcast their names over the network so that Network Neighborhood can catalog them. For TCP/IP networks, NetBIOS names are turned into IP addresses via manual configuration in an LMHOSTS file or a WINS server.

There are two NetBIOS modes. The Datagram mode is the fastest mode, but does not guarantee delivery. It uses a self-contained packet with send and receive name, usually limited to 512 bytes. If the recipient device is not listening for messages, the datagram is lost. The Session mode establishes a connection until broken. It guarantees delivery of messages up to 64KB long.

Network - A system that transmits any combination of voice, video and/or data between users.

Node - A network junction or connection point, typically a computer or work station.

Notebook (PC) - A notebook computer is a battery-powered personal computer generally smaller than a briefcase that can easily be transported and conveniently used in temporary spaces such as on airplanes, in libraries, temporary offices, and at meetings. A notebook computer, sometimes called a laptop computer, typically weighs less than five pounds and is three inches or less in thickness.

Packet - A unit of data routed between an origin and a destination in a network.

Passphrase - Used much like a password, a passphrase simplifies the WEP encryption process by automatically generating the WEP encryption keys for Linksys products.

PC Card - A credit-card sized removable module that contains memory, I/O, or a hard disk.

PCMCIA - The PCMCIA (Personal Computer Memory Card International Association) is an industry group organized in 1989 to promote standards for a credit card-size memory or I/O device that would fit into a personal computer, usually a notebook or laptop computer.

Plug-and-Play - The ability of a computer system to configure expansion boards and other devices automatically without requiring the user to turn off the system during installation.

Roaming - The ability to use a wireless device and be able to move from one access point's range to another without losing the connection.

RTS (**R**equest **T**o **S**end) - An RS-232 signal sent from the transmitting station to the receiving station requesting permission to transmit.

Server - Any computer whose function in a network is to provide user access to files, printing, communications, and other services.

Software - Instructions for the computer. A series of instructions that performs a particular task is called a "program." The two major categories of software are "system software" and "application software." System software is made up of control programs such as the operating system and database management system (DBMS). Application software is any program that processes data for the user.

A common misconception is that software is data. It is not. Software tells the hardware how to process the data.

Spread Spectrum - Spread Spectrum technology is a wideband radio frequency technique developed by the military for use in reliable, secure, mission-critical communications systems. It is designed to trade off bandwidth efficiency for reliability, integrity, and security. In other words, more bandwidth is consumed than in the case of narrowband transmission, but the trade off produces a signal that is, in effect, louder and thus easier to detect, provided that the receiver knows the

parameters of the spread-spectrum signal being broadcast. If a receiver is not tuned to the right frequency, a spread-spectrum signal looks like background noise. There are two main alternatives, Direct Sequence Spread Spectrum (DSSS) and Frequency Hopping Spread Spectrum (FHSS).

Static IP Address - A permanent IP address that is assigned to a node in an IP or a TCP/IP network.

TCP (**T**ransmission **C**ontrol **P**rotocol) - A method (protocol) used along with the Internet Protocol (Internet Protocol) to send data in the form of message units between computers over the Internet. While IP takes care of handling the actual delivery of the data, TCP takes care of keeping track of the individual units of data (called packet) that a message is divided into for efficient routing through the Internet.

TCP/IP (**T**ransmission **C**ontrol **P**rotocol/**I**nternet **P**rotocol) - The basic communication language or protocol of the Internet. It can also be used as a communications protocol in a private network (either an intranet or an extranet). When you are set up with direct access to the Internet, your computer is provided with a copy of the TCP/IP program just as every other computer that you may send messages to or get information from also has a copy of TCP/IP.

Throughput - The amount of data moved successfully from one place to another in a given time period.

Topology - A network's topology is a logical characterization of how the devices on the network are connected and the distances between them. The most common network devices include hubs, switches, routers, and gateways. Most large networks contain several levels of interconnection, the most important of which include edge connections, backbone connections, and wide-area connections.

TX Rate - Transmission Rate.

WEP (**W**ired **E**quivalent **P**rivacy) - A data privacy mechanism based on a 64-bit or 128-bit shared key algorithm, as described in the IEEE 802.11 standard.

Workgroup - Two or more individuals that share files and databases.

Chapter 12: Specifications

Standards:	IEEE 802.11b
SAR Result:	maximum 0.989 w/kg
Channels:	11 Channels (US, Canada) 13 Channels (Europe) 14 Channels (Japan)
Operating Range:	
Indoors:	*Up to* 30M (100 ft.) @ 11 Mbps *Up to* 50M (165 ft.) @ 5.5 Mbps *Up to* 70M (230 ft.) @ 2 Mbps *Up to* 91M (300 ft.) @ 1 Mbps
Outdoors:	*Up to* 152M (500 ft.) @ 11 Mbps *Up to* 270M (885 ft.) @ 5.5 Mbps *Up to* 396M (1300 ft.) @ 2 Mbps *Up to* 457M (1500 ft.) @ 1 Mbps
Data Rate (Mbps):	Up to 11Mbps (with automatic scale back)
LEDs:	Link, Power

Environmental

Dimensions:	4.5" x 2" x 0.3" (115mm x 54mm x 8mm)
Unit Weight:	1.65 oz. (47g)
Power:	3.3V or 5V DC, 275mA Tx, 225mA Rx, 200mA Standby
Certifications:	FCC Class B, CE Mark Commercial
Operating Temp.:	32ºF to 131ºF (0ºC to 55ºC)
Storage Temp.:	-4ºF to 158ºF (-20ºC to 70ºC)
Operating Humidity:	0% to 90% Non-Condensing
Storage Humidity:	0% to 95% Non-Condensing

Chapter 13: Warranty Information

BE SURE TO HAVE YOUR PROOF OF PURCHASE AND A BARCODE FROM THE PRODUCT'S PACKAGING ON HAND WHEN CALLING. RETURN REQUESTS CANNOT BE PROCESSED WITHOUT PROOF OF PURCHASE.

IN NO EVENT SHALL LINKSYS'S LIABILITY EXCEED THE PRICE PAID FOR THE PRODUCT FROM DIRECT, INDIRECT, SPECIAL, INCIDENTAL, OR CONSEQUENTIAL DAMAGES RESULTING FROM THE USE OF THE PRODUCT, ITS ACCOMPANYING SOFTWARE, OR ITS DOCUMENTATION. LINKSYS DOES NOT OFFER REFUNDS FOR ANY PRODUCT.

LINKSYS OFFERS CROSS SHIPMENTS, A FASTER PROCESS FOR PROCESSING AND RECEIVING YOUR REPLACEMENT. LINKSYS PAYS FOR UPS GROUND ONLY. ALL CUSTOMERS LOCATED OUTSIDE OF THE UNITED STATES OF AMERICA AND CANADA SHALL BE HELD RESPONSIBLE FOR SHIPPING AND HANDLING CHARGES. PLEASE CALL LINKSYS FOR MORE DETAILS.

Chatper 14: Contact Information

For help with the installation or operation of this product, contact Linksys Technical Support at one of the phone numbers or Internet addresses below.

Sales Information	800-546-5797 (LINKSYS)
Technical Support	866-242-8558
RMA Issues	949-261-1288
Fax	949-261-8868
Email	support@linksys.com
Web	http://www.linksys.com
FTP Site	ftp.linksys.com

http://www.linksys.com

© Copyright 2002 Linksys, All Rights Reserved.